CITY OF ALBUQUERQUE
ENVIRONMENTAL HEALTH DEPARTMENT
AIR QUALITY PROGRAM

Permit Modification Application
ATC Permit #0047-M2-5AR

ABQ Terminal, LLC
Albuquerque Terminal

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1. EXECUTIVE SUMMARY

This application is being submitted for the proposed modification to ATC Permit #0047-M2-5AR for the Albuquerque Terminal facility owned and operated by ABQ Terminal, LLC (ABQT). The facility is located at 3200 Broadway Blvd SE in Albuquerque, NM.

The purpose of this application is to add a vapor combustion unit (VCU) which will operate during the vapor recovery unit (VRU) downtime. Additionally, another all-products storage tank will be installed which will also modify facility fugitive emissions. Finally, the methodology for the all-products tanks will be updated from historic TANKS 4.09d reports to the latest AP-42 Chapter 7 methodology.

In summary, the following updates are being requested for this application:

The addition of:

- One (1) vapor combustion unit (Unit 11); and
- One (1) All-Products storage tank (T-36 under Unit 4)

The modification of:

- Facility fugitives (Unit 8)

The calculation methodology was also updated for the eleven (11) All-Products storage tanks (T-21, T-22, T-23, T-24, T-25, T-29, T-30, T-31, T-32, T-33, & T-35 under Unit 4) which previously utilized historical TANKS 4.09d reports. They have now been updated to AP-42 Chapter 7 "Organic Liquid Storage Tanks" (06/2020). There are no physical changes or changes in the method of operation for these storage tanks.

In accordance with 20.11.41.13.E NMAC, this application submittal includes all of the requirements set forth by the department including:

i. Application Forms
ii. Owner and Operator's Name and Mailing Address
iii. Application Date
iv. Sufficient Attachments: Calculations, Potential Emission Rate, Nature of All Regulated Contaminants, Actual emissions
v. Operational and Maintenance Strategy
vi. Topographical Map
vii. Aerial Photograph of proposed location
viii. Complete Description of all Sources of Regulated Air Contaminants and Process Flow Diagram
ix. Full Description of Air Pollution Control Equipment
x. Description of Equipment or Methods used for emission measurement
xi. Maximum and Normal Operating Time Schedules of the Source
xii. Other Relevant Information
xiii. Applicant Signature
xiv. Accompanied by a Registration Fee
xv. Proof of Public Notice Requirements

2. DESCRIPTION OF FACILITY AND EMISSIONS INFORMATION

The following section summarizes the emission factors and methodology used to estimate air pollutant emissions from the Albuquerque Terminal.

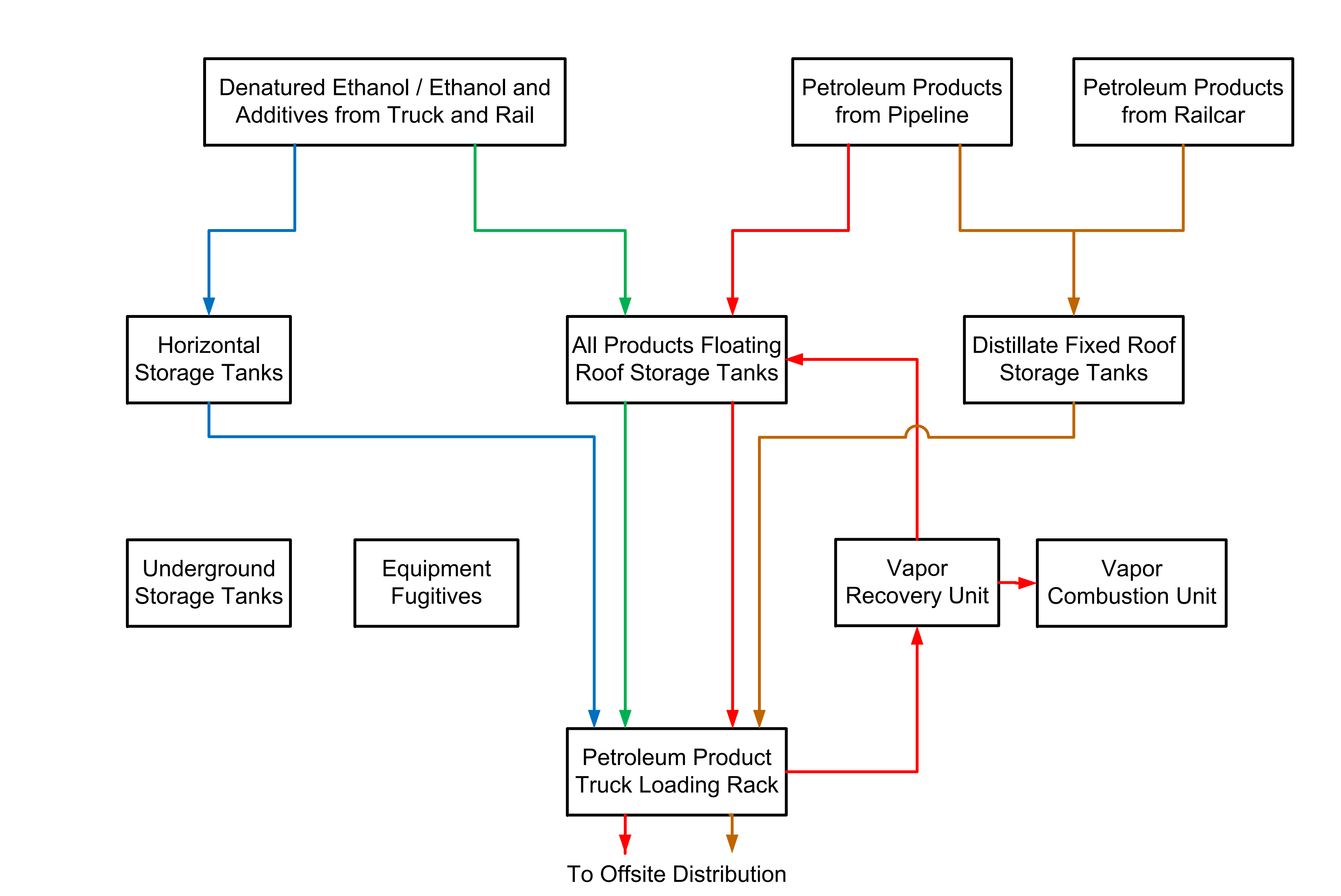
2.1 Description of the Facility

The Albuquerque Terminal is a bulk petroleum products terminal that receives gasoline and distillate fuel oil by pipeline and tank trucks. All petroleum products are received via tank trucks or railcar. The petroleum products are stored in aboveground storage tanks (ASTs) at the terminal for subsequent transfer to tank trucks by means of a four-bay loading rack. Vapors containing VOC's that are displaced during the tank truck loading operations are captured and routed to a carbon adsorption vapor recovery unit (VRU). During VRU downtime, the vapors are routed to a vapor combustion device (VCU). Other sources of emissions include storage tank working and breathing losses and fugitive emission from equipment leaks.

The facility is a source of nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), sulfur dioxide (SO_2), particulate matter equal to or under 10 mm or 2.5 mm in aerodynamic diameter (PM_{10} and $PM_{2.5}$), and hazardous air pollutants (HAPs).

2.2 Process Flow Diagram

The attached process flow diagram describes overall activities at the facility with respect to incoming and outgoing materials.



Additives
Denatured Ethanol / Ethanol
Gasoline
Diesel Fuel Oil
Biodiesel Fuel

Albuquerque Terminal
Process Flow Diagram

MUSKET

2.3 Air Pollutant Emissions and Calculation Methodology

2.3.1 All Products Storage Tanks (Unit 4)

The all products storage tanks consist of T-21, T-22, T-23, T-24, T-25, T-29, T-31, T-32, T-33, T-35, and T-36. "All Products" refers to any material with a Reid vapor pressure equal to or less than gasoline, including gasoline, ethanol, additives, and diesel fuel. The VOC and HAP emissions were calculated using the latest edition of EPA's AP-42 Chapter 7 "Liquid Storage Tanks." Specifically, AP-42 Section 7.1.3.2 "Routine Losses From Floating Roof Tanks" was used.

VOC routine losses are the sum of standing and working losses per Eq. 2-1. Standing losses are the sum of rim seal (Eq. 2-3), deck fitting (Eq. 2-13), and deck seam losses (Eq. 2-18) per Eq. 2-2. Working losses are determined using Eq. 2-19. It was conservatively assumed that all the tanks store gasoline RVP 13, consist of a white shell and roof with an average paint coat. Tank construction information (i.e. rim seals, deck type, diameter, deck seam length, column quantity, liquid bulk temperature, effective diameter) were taken from historic TANKS 4.09d reports. All other information was either taken from AP-42 Chapter 7 or calculated using AP-42 Chapter 7 calculations.

Individual HAP routine losses are calculated by multiplying the total loss by the vapor weight fraction of the desired HAP per Eq. 40-2. Total HAPs are then the sum of all the individually calculated HAPs. The component liquid mass fraction was determine using historic TANKS 4.09d reports for Gasoline RVP13. All other assumptions are the same from the VOC calculations.

Please refer to Section 2.5 for all supporting documentation which will include historical TANKS4.09d reports and highlighted equations and tables used from AP-42 Chapter 7.

2.3.2 Equipment Fugitives (Unit 8)

Equipment fugitive emissions were calculated using emission factors from Table 2-4 of EPA Protocol for Equipment Leak Emissions Estimates, 1995. Subcomponent counts for rail car unloading spots, the new T36 all products storage tank and additional piping, and the temporary VCU were provided by ABQT. It was conservatively assumed the gas/vapor and light liquid had a VOC content of 100% and a HAP content of 25%. The emission factors (kg/hr/component) are multiplied by 2.2046 lb/kg, the weight content of chemical component (%), and the subcomponent count to obtain lb/hr emissions. Hourly emissions are then multiplied by 8,760 hr/yr and divided by 2,000 lb/ton to obtain tpy emissions.

2.3.3 Vapor Combustion Unit (VCU) (Unit 11)

The facility employs a VRU for the vapor emissions from the all products tanks and the loading emissions from the loading rack. During the VRU downtime, the emissions will be sent to a new trailer mounted portable vapor combustion unit (VCU) (Unit 11).

The uncontrolled emissions at the VRU are from pilot emissions running 8,760 hr/yr. The NO_x, CO, and PM emissions factors are taken from AP-42 Chapter 1.4.1, "Natural Gas Combustion," Tables 1.4-1 & 2. HAP emissions factors are taken from Table 1.4-3. The VCU is assumed to operate 8,760 hr/yr with a 98% destruction rate efficiency.

Controlled emissions are based on a maximum heating rate of 60 MMBtu/hr as determined by the manufacturer. The maximum gas flow rate (MMscf/hr) was determined by taking the max heating rate (MMBtu/hr) and dividing it by the heating value of propane (2,572 Btu/scf) as a conservative estimate.

2.4 Emission Calculations

The following pages contain the emission calculations for this facility. The pages are broken down to the following:

- Emissions Summary Table
- All Products Storage Tanks (Unit 4) Calculations
  - Tank Throughputs
  - VOC Emissions Summary
  - HAP Emissions Summary
  - VOC Emission Inputs and Calculations
  - Deck Fitting Loss Factor for Floating Roof Tanks
  - HAP Emission Inputs and Calculations
- Loading Rack Fugitive (Unit 2) Calculations
- Loading Rack Vapor Recovery Unit (Unit 3) Calculations
- Equipment Fugitives (Unit 8) Calculations

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Emission Summary

Requested Uncontrolled Emissions

Unit ID	Description	NO_x (lb/hr)	NO_x (tpy)	CO (lb/hr)	CO (tpy)	VOC (lb/hr)	VOC (tpy)	SO_2 (lb/hr)	SO_2 (tpy)	PM (lb/hr)	PM (tpy)	HAP (lb/hr)	HAP (tpy)
2	Loading Rack Hose Fugitives (LR)	-	-	-	-	5.37	23.54	-	-	-	-	0.28	1.23
3	Loading Rack Vapor Recovery Unit (VRU)	-	-	-	-	6.30	27.59	-	-	-	-	0.33	1.44
4	Floating Roof Storage Tanks	-	-	-	-	5.43	23.79	-	-	-	-	0.22	0.97
6	Lubricity Tank T-106	-	-	-	-	0.017	0.072	-	-	-	-	-	-
8	Equipment Fugitives	-	-	-	-	2.71	11.87	-	-	-	-	0.68	2.97
11	Loading Rack Vapor Combustion Unit (VCU)	6.00E-03	0.026	5.04E-03	0.022	3.30E-04	1.45E-03	3.43E-04	1.50E-03	4.56E-04	2.00E-03	-	-
Total Site-Wide Emissions		***6.00E-03***	***0.026***	***5.04E-03***	***0.022***	***19.83***	***86.87***	***3.43E-04***	***1.50E-03***	***4.56E-04***	***2.00E-03***	***1.51***	***6.61***

Requested Controlled Emissions

Unit ID	Description	NO_x (lb/hr)	NO_x (tpy)	CO (lb/hr)	CO (tpy)	VOC (lb/hr)	VOC (tpy)	SO_2 (lb/hr)	SO_2 (tpy)	PM (lb/hr)	PM (tpy)	HAP (lb/hr)	HAP (tpy)
2	Loading Rack Hose Fugitives (LR)	-	-	-	-	5.37	23.54	-	-	-	-	0.28	1.23
3	Loading Rack Vapor Recovery Unit (VRU)	-	-	-	-	6.30	27.59	-	-	-	-	0.33	1.44
4	Floating Roof Storage Tanks	-	-	-	-	5.43	23.79	-	-	-	-	0.22	0.97
6	Lubricity Tank T-106	-	-	-	-	0.017	0.072	-	-	-	-	-	-
8	Equipment Fugitives	-	-	-	-	2.71	11.87	-	-	-	-	0.68	2.97
11	Loading Rack Vapor Combustion Unit (VCU)	0.25	1.10	0.21	0.92	0.13	0.55	3.43E-04	1.50E-03	4.56E-04	2.00E-03	6.56E-03	0.029
Total Site-Wide Emissions		***0.25***	***1.10***	***0.21***	***0.92***	***19.96***	***87.42***	***3.43E-04***	***1.50E-03***	***4.56E-04***	***2.00E-03***	***1.51***	***6.64***

Requested Controlled HAP Emissions

Unit ID	Description	Total HAP (lb/hr)	Total HAP (tpy)	Benzene (lb/hr)	Benzene (tpy)	Hexane (lb/hr)	Hexane (tpy)	Toluene 2,2,4-Trimethylpentane (lb/hr)	Toluene 2,2,4-Trimethylpentane (tpy)	Toluene (lb/hr)	Toluene (tpy)	Xylene (lb/hr)	Xylene (tpy)
2	Loading Rack Hose Fugitives (LR)	0.28	1.23	0.048	0.21	0.086	0.38	0.043	0.19	-	-	0.027	0.12
3	Loading Rack Vapor Recovery Unit (VRU)	0.33	1.44	0.057	0.25	0.10	0.44	0.050	0.22	-	-	0.031	0.14
4	Floating Roof Storage Tanks	0.22	0.97	0.033	0.15	0.032	0.14	0.057	0.25	0.053	0.23	0.027	0.12
6	Lubricity Tank T-106	-	-	-	-	-	-	-	-	-	-	-	-
8	Equipment Fugitives	0.68	2.97	-	-	-	-	-	-	-	-	-	-
11	Loading Rack Vapor Combustion Unit (VCU)	6.56E-03	0.029	1.13E-03	4.97E-03	2.02E-03	8.83E-03	1.01E-03	4.41E-03	-	-	6.30E-04	2.76E-03
Total Site-Wide Emissions		***1.51***	***6.64***	***0.14***	***0.61***	***0.22***	***0.97***	***0.15***	***0.66***	***0.053***	***0.23***	***0.086***	***0.37***

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Throughput Distribution

Total Combined Tank Capacity:	9,999,192	**gallons**
Total Annual Throughput:	664,800,000	**gal/yr**

Tank:	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**
	T-21	**T-22**	**T-23**	**T-24**	**T-25**	**T-29**	**T-31**	**T-32**	**T-33**	**T-35**	**T-36**
Contents:	**Gasoline**	**Gasoline**	**Gasoline**	**Gasoline**	**Gasoline**	**Gasoline**	**Gasoline**	**Gasoline**	**Gasoline**	**Gasoline**	**Gasoline**
Nominal Capacity (gal):	787,878	787,962	436,464	436,464	184,800	109,998	436,464	2,091,432	788,130	789,600	3,150,000
Annual Throughput (gal):	50,384,000	50,389,000	27,912,000	27,912,000	11,818,000	7,035,000	27,912,000	133,744,000	50,400,000	50,494,000	226,800,000
Monthly Throughput (gal):	4,198,667	4,199,083	2,326,000	2,326,000	984,833	586,250	2,326,000	11,145,333	4,200,000	4,207,833	18,900,000

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Tank VOC Emission Summary

Hours of Operation: 8760 hrs
Total Facility Throughput: 664,800,000 gal/yr

	T-21	T-22	T-23	T-24	T-25	T-29	T-31	T-32	T-33	T-35	T-36	
Tank Type	**EFRT**	**EFRT**	**EFRT**	**EFRT**	**IFRT**	**IFRT**	**Domed EFRT**	**IFRT**	**EFRT**	**IFRT**	**All Products**	**Total Tank Volume**
Tank Size (gal)	**787,878**	**787,962**	**436,464**	**436,464**	**184,800**	**109,998**	**436,464**	**2,091,432**	**788,130**	**789,600**	**3,150,000**	**9,999,192**
Turnovers	**63.95**	**63.95**	**63.95**	**63.95**	**63.95**	**63.96**	**63.95**	**63.95**	**63.95**	**63.95**	**72.00**	**Total Tank Throughput**
Throughput(gal/yr)[1]:	**50,384,000**	**50,389,000**	**27,912,000**	**27,912,000**	**11,818,000**	**7,035,000**	**27,912,000**	**133,744,000**	**50,400,000**	**50,494,000**	**226,800,000**	**664,800,000**
Components												
Rim Seal Losses, L_R (lbs/yr):	2,250.06	2,250.06	1,738.68	1,738.68	1,752.77	2,029.44	257.08	5,872.52	2,454.61	3,500.51	12,022.76	
Deck Fitting Losses, L_F (lbs/yr):	1,080.66	1,009.07	666.09	739.48	338.47	608.83	371.00	1,083.08	172.92	933.13	2,874.84	
Deck Seam Losses, L_D (lbs/yr):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Withdrawal Losses, L_{WD} (lbs/yr):	172.77	172.79	123.86	123.86	74.30	45.70	123.86	262.84	158.42	161.25	415.37	
Total Losses (lb/yr)	**3,503.49**	**3,431.92**	**2,528.63**	**2,602.03**	**2,165.53**	**2,683.98**	**751.95**	**7,218.43**	**2,785.95**	**4,594.90**	**15,312.96**	
Total Losses (lb/hr)	**0.40**	**0.39**	**0.29**	**0.30**	**0.25**	**0.31**	**0.09**	**0.82**	**0.32**	**0.52**	**1.75**	
Total Losses (ton/yr)	**1.75**	**1.72**	**1.26**	**1.30**	**1.08**	**1.34**	**0.38**	**3.61**	**1.39**	**2.30**	**7.66**	

Facility VOC Losses	
Total Losses (lb/hr)	**5.43**
Total Losses (ton/yr)	**23.79**

Note:

[1.] Annual throughputs for all tanks except for TK-36 are based on a historic facility wide throughput of 434,000,000 gal/yr and a historic total tank volume of 6,849,192 gal.

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Tank HAP Emission Summary

Hours of Operation: 8760 hrs
Total Facility Throughput: 664,800,000 gal/yr

	T-21	T-22	T-23	T-24	T-25	T-29	T-31	T-32	T-33	T-35	T-36	
Tank Type	**EFRT**	**EFRT**	**EFRT**	**EFRT**	**IFRT**	**IFRT**	**Domed EFRT**	**IFRT**	**EFRT**	**IFRT**	**All Products**	**Total Tank Volume**
Tank Size (gal)	**787,878**	**787,962**	**436,464**	**436,464**	**184,800**	**109,998**	**436,464**	**2,091,432**	**788,130**	**789,600**	**3,150,000**	**9999192**
Turnovers	**63.95**	**63.95**	**63.95**	**63.95**	**63.95**	**63.96**	**63.95**	**63.95**	**63.95**	**63.95**	**72.00**	**Total Tank Throughput**
Throughput(gal/yr):	**50,384,000**	**50,389,000**	**27,912,000**	**27,912,000**	**11,818,000**	**7,035,000**	**27,912,000**	**133,744,000**	**50,400,000**	**50,494,000**	**226,800,000**	**664,800,000**
Components												
RVP 13												**Totals(lb/yr)**
Benzene	22.14	21.73	15.97	16.39	13.02	15.58	5.74	43.68	17.86	27.71	90.89	290.70
Ethylbenzene	4.21	4.17	3.03	3.07	2.12	2.01	2.06	7.29	3.63	4.56	13.55	49.70
n-Hexane	20.75	20.34	14.97	15.39	12.47	15.27	4.76	41.71	16.59	26.50	87.84	276.59
Isooctane	38.42	37.75	27.71	28.40	22.28	26.21	10.75	74.87	31.20	47.43	154.43	499.44
Isopropyl Benzene	11.99	11.92	8.61	8.69	5.72	4.83	6.80	19.86	10.56	12.33	35.14	136.45
Toluene	36.84	36.31	26.54	27.08	20.28	22.25	13.20	68.69	30.61	43.30	136.76	461.85
m-Xylene	19.90	19.73	14.31	14.48	9.91	9.15	10.09	34.12	17.25	21.29	62.75	232.98
Total Losses (lb/yr)	**154.25**	**151.94**	**111.13**	**113.49**	**85.81**	**95.29**	**53.40**	**290.22**	**127.70**	**183.13**	**581.36**	
Total Losses (lb/hr)	**0.018**	**0.017**	**0.013**	**0.013**	**0.010**	**0.0109**	**0.0061**	**0.033**	**0.015**	**0.021**	**0.066**	
Total Losses (ton/yr)	**0.077**	**0.076**	**0.056**	**0.057**	**0.043**	**0.048**	**0.027**	**0.145**	**0.064**	**0.092**	**0.291**	

Facility HAP Losses	
Total Losses (lb/hr)	**0.22**
Total Losses (ton/yr)	**0.97**

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External Floating Roof Tanks - VOC Emission Inputs

Equipment ID	**T-21**	**T-22**	**T-23**	**T-24**	**T-31**	**T-33**	**Notes**
Mixture Type	**All Products**	**All Products**	**All Products**	**All Products**	**All Products**	**All Products**	
Tank Type:	**EFRT**	**EFRT**	**EFRT**	**EFRT**	**Domed EFRT**	**EFRT**	
Rim-Seal System (Primary Seal)	Mechanical Shoe	Mechanical Shoe	Mechanical Shoe	Mechanical Shoe	Mechanical Shoe	Mechanical Shoe	Historic Tanks 4.09d Reports
Rim-Seal System (Secondary Seal)	Rim-mounted	Rim-mounted	Rim-mounted	Rim-mounted	Rim-mounted	Rim-mounted	
Deck Characteristics (Deck Type)	Welded	Welded	Welded	Welded	Welded	Welded	
Diameter, **D** (ft) [1]	55	55	42.5	42.5	42.5	60	
Total Length of Deck Seams, $\mathbf{L_{seam}}$ (ft) [1]	-	-	-	-	-	-	
Number of Columns, $\mathbf{N_C}$ [1]	-	-	-	-	-	-	
Liquid Bulk Temperature, $\mathbf{T_B}$ (°F)	56.17	56.17	56.17	56.17	56.17	56.17	
Effective Column Diameter, $\mathbf{F_C}$ (ft) [1]	-	-	-	-	-	-	
Tank Capacity (gal)	787,878	787,962	436,464	436,464	436,464	788,130	From permit
Annual Throughput, **Q** (gal/yr) [2]	50,384,000	50,389,000	27,912,000	27,912,000	27,912,000	50,400,000	Assumed 5.33 tank turnovers per month.
Shell Height, $\mathbf{H_S}$ (ft)	44.33	44.34	41.13	41.13	41.13	37.26	$\mathbf{H_S}$ = Tank Capacity (ft^3) / (π $\mathbf{D}^2$ / 4)
Vapor Molecular Weight, $\mathbf{M_V}$ (lb/lbmol) [3]	62						AP-42 Table 7.1-2 (06/2020)
Average Organic Liquid Density, $\mathbf{W_L}$ (lb/gal) [3]	5.6						
Vapor Pressure Equation Constant, **A** [3]	11.644						
Vapor Pressure Equation Constant, **B** (°R) [3]	5043.6						
Roof Paint Solar Absorptance, $\propto_R$ [3]	0.25	0.25	0.25	0.25	0.25	0.25	AP-42 Table 7.1-6 (06/2020)
Shell Paint Solar Absorptance, $\propto_S$ [3]	0.25	0.25	0.25	0.25	0.25	0.25	
Hourly Average Minimum Ambient Temperature, $\mathbf{T_{AN}}$ (°F) [3]	69.5						AP-42 Table 7.1-7 (06/2020)
Hourly Average Maximum Ambient Temperature, $\mathbf{T_{AX}}$ (°F) [3]	46.3						
Average Ambient Wind Speed, **v** (mph) [3]	8.1	8.1	8.1	8.1	0.0	8.1	
Average daily total insolation factor, **I** (Btu/ft²-day) [3]	1722						
Atmospheric Pressure, $\mathbf{P_A}$ (psia) [3]	12.13						
Rim Seal Factor A, $\mathbf{K_{ra}}$ (lb-mole/ft-yr) [3]	0.6	0.6	0.6	0.6	0.6	0.6	AP-42 Table 7.1-8 (06/2020)
Rim Seal Factor B, $\mathbf{K_{Rb}}$ (lb-mole/(mph)^n-ft-yr) [3]	0.4	0.4	0.4	0.4	0.4	0.4	
Seal-related Wind Speed Exponent, **n** [3]	1.0	1.0	1.0	1.0	1.0	1.0	
Shell Clingage Factor, $\mathbf{C_S}$ (bbl/1000 ft²) [3]	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	AP-42 Table 7.1-10 (06/2020)
Working Loss Product Factor, $\mathbf{K_C}$ [3]	1.0	1.0	1.0	1.0	1.0	1.0	See footnote
Fitting Wind Speed Correction Factor, $\mathbf{K_v}$ [3]	0.7	0.7	0.7	0.7	0.0	0.7	See footnote
Deck Seam Loss-per-unit Seam Length Factor, $\mathbf{K_D}$ (lb-mole/ft-yr) [3]	0.0	0.0	0.0	0.0	0.0	0.0	See footnote

Notes:

[1] Value is taken from historic TANKS 4.09d reports.

[2] Annual tank throughputs are calculated based on about 3 tank turnovers per month (12 total per year)

[3] The following constants were taken from AP-42 Chapter 7 (06/2020):

- $\mathbf{M_v}$, $\mathbf{W_L}$, **A** and **B** from Table 7.1-2 for motor gasoline RVP 13
- $\propto_R$ and $\propto_S$ from Table 7.1-6 (all tanks have a white roof and shell with an average paint coat)
- $\mathbf{T_{AN}}$, $\mathbf{T_{AX}}$, **v**, **I** and $\mathbf{P_A}$ from Table 7.1-7 for Albuquerque, NM (average for whole year). If the tank is an internal or domed EFRT,**v** is 0 (Eq. 2-4 Note 1)
- $\mathbf{K_{Ra}}$, $\mathbf{K_{Rb}}$, and **n** from Table 7.1-8.
- $\mathbf{C_s}$ from Table 7.1-10 for gasoline storage light rust shell condition
- $\mathbf{K_c}$ equals 0.4 for crude oils, and 1 for all other organize liquids (Eq. 2-4)
- $\mathbf{K_v}$ equals 0.7 for external floating roof tanks, and 0 for internal and domed external floating roof tanks (Eq. 2-15)
- $\mathbf{K_d}$ equals 0.0 for welded deck, and 0.14 for bolted deck (Eq. 2-18)

External Floating Roof Tanks - VOC Emissions

Equipment ID	T-21	T-22	T-23	T-24	T-31	T-33	Notes
Mixture Type	All Products	All Products	All Products	All Products	All Products	All Products	
Tank Type:	EFRT	EFRT	EFRT	EFRT	Domed EFRT	EFRT	
True Vapor Pressure, $\mathbf{P_{VA}}$ (psia) [4]	7.06	7.06	7.06	7.06	6.75	7.06	AP-42 Chapter 7 Equation 1-25
Average daily ambient temperature, $\mathbf{T_{AA}}$ (°R) [4]	517.57	517.57	517.57	517.57	517.57	517.57	AP-42 Chapter 7 Equation 1-30
Vapor Pressure Function, **P*** [4]	0.17	0.17	0.17	0.17	0.16	0.17	AP-42 Chapter 7 Equation 2-4
Average Liquid Surface Temperature, $\mathbf{T_{LA}}$ (°R) [4]	520.50	520.50	520.50	520.50	518.12	520.50	AP-42 Chapter 7 Equation 2-5 for Domed EFRT and IFRT. Equation 2-7 for EFRT.
Deck Fitting Loss Factor, $\mathbf{F_F}$ (lb-mole/yr) [4]	101.44	94.72	62.52	69.41	36.80	16.23	AP-42 Chapter 7 Equation 2-14
Rim Seal Losses, $\mathbf{L_R}$ (lbs/yr) [5]	2,250.06	2,250.06	1,738.68	1,738.68	257.08	2,454.61	AP-42 Chapter 7 Equation 2-3
Deck Fitting Losses, $\mathbf{L_F}$ (lbs/yr) [5]	1,080.66	1,009.07	666.09	739.48	371.00	172.92	AP-42 Chapter 7 Equation 2-13
Deck Seam Losses, $\mathbf{L_D}$ (lbs/yr) [5]	0.00	0.00	0.00	0.00	0.00	0.00	AP-42 Chapter 7 Equation 2-18
Standing Losses, $\mathbf{L_S}$ (lb/yr) [5]	3,330.72	3,259.13	2,404.77	2,478.16	628.09	2,627.53	AP-42 Chapter 7 Equation 2-2
Working (withdrawal) Losses, $\mathbf{L_W}$ (lbs/yr) [9]	172.77	172.79	123.86	123.86	123.86	158.42	AP-42 Chapter 7 Equation 2-19
Total VOC Losses, $\mathbf{L_T}$ **(lbs/yr)**	**3,503.49**	**3,431.92**	**2,528.63**	**2,602.03**	**751.95**	**2,785.95**	$\mathbf{L_T}$ (lb/yr) = $\mathbf{L_S}$ + $\mathbf{L_W}$
Total VOC Losses, $\mathbf{L_T}$ **(tpy)**	**1.75**	**1.72**	**1.26**	**1.30**	**0.38**	**1.39**	$\mathbf{L_T}$ (tpy) = (lb/yr) / (2000 lb/ton)

Notes:

[4] The following equations are from AP-42 Chapter 7 (06/2020):

$\mathbf{P_{VA}} = \exp[\, \mathbf{A} - (\mathbf{B} / \mathbf{T_{LA}})\,]$ (Eq. 1-25)

where **A** = constant in the vapor pressure equation (dimensionless)
B = constant in the vapor pressure equation (°R)
$\mathbf{T_{LA}}$ = average daily liquid surface temperature (°R)

$\mathbf{P^*} = (\mathbf{P_{VA}} / \mathbf{P_A}) / (1 + [1 - (\mathbf{P_{VA}} / \mathbf{P_A})]^{0.5})^2$ (Eq. 2-4)

where $\mathbf{P_{VA}}$ = vapor pressure at average daily liquid surface temperature (psia)
$\mathbf{P_A}$ = vapor pressure at average daily liquid surface temperature (psia)

$$\mathbf{T_{LA}} = \frac{[\,2.86\,(\mathbf{H_S}/\mathbf{D}) + 1.43\,]\mathbf{T_{AA}} + [\,3.52(\mathbf{H_S}/\mathbf{D}) + 3.79\,]\mathbf{T_B} + 0.027 \propto_{\mathbf{R}} \mathbf{I} + 0.017(\mathbf{H_S}/\mathbf{D}) \propto_{\mathbf{S}} \mathbf{I}}{6.38(\mathbf{H_S}/\mathbf{D}) + 5.22} \quad (\text{Eq. } 2-5)$$

where $\mathbf{H_S}$ = tank shell height (ft)
D = tank diameter (ft)
$\mathbf{T_{AA}}$ = average daily ambient temperature (°R)
$\mathbf{T_B}$ = liquid bulk temperature (°R)
$\propto_{\mathbf{R}}$ = tank roof surface solar absorptance (Dimensionless)
$\propto_{\mathbf{S}}$ = tank shell surface solar absorptance (Dimensionless)
I = average daily total insolation factor (Btu/ft^2-day)

$$\mathbf{T_{LA}} = 0.7\mathbf{T_{AA}} + 0.3\mathbf{T_B} + 0.008 \propto_{\mathbf{R}} \mathbf{I} \quad (\text{Eq. } 2-7)$$

where $\mathbf{T_{AA}}$, $\mathbf{T_R}$, $\propto_{\mathbf{R}}$, and **I** are defined in Eq. 2-5

[5.] The following equations were used to calculate the Standing Losses for each tank:

$\mathbf{L_S} = \mathbf{L_R} + \mathbf{L_F} + \mathbf{L_D}$ (Eq. 2-2)

where $\mathbf{L_R}$ = rim seal loss (lb/yr)
$\mathbf{L_F}$ = deck fitting loss (lb/yr)
$\mathbf{L_D}$ = deck seam loss (internal floating roof tanks only) (lb/yr)

$\mathbf{L_R} = (\mathbf{K_{Ra}} + \mathbf{K_{Rb}}\, \mathbf{v}^{\mathbf{n}})\, \mathbf{D}\, \mathbf{P^*}\, \mathbf{M_v}\, \mathbf{K_c}$ (Eq. 2-3)

where $\mathbf{K_{Ra}}$ = zero wind speed rim seal loss factor (lbmol/ft-yr)
$\mathbf{K_{Rb}}$ = wind speed dependent rim seal loss factor (lbmol/mph$^{\mathbf{n}}$-ft-yr)
v = average ambient wind speed at tank site (mph)
n = seal-related wind speed exponent (dimensionless)
P* = vapor pressure function (dimensionless)
D = tank diameter (ft)
$\mathbf{M_v}$ = average vapor molecular weight (lb/lbmol)
$\mathbf{K_c}$ = product factor

$\mathbf{L_F} = \mathbf{F_F}\, \mathbf{P^*}\, \mathbf{M_V}\, \mathbf{K_C}$ (Eq. 2-13)

where $\mathbf{F_F}$ = total deck fitting loss factor (lbmol/yr)
P*, $\mathbf{M_V}$, $\mathbf{K_C}$ are as defined in Eq. 2-3

$\mathbf{L_D} = \mathbf{K_D}\, \mathbf{S_D}\, \mathbf{D}^2\, \mathbf{P^*}\, \mathbf{M_V}\, \mathbf{K_C}$ (Eq. 2-18)

where $\mathbf{K_D}$ = deck seam loss per unit seam length factor (lbmol/yr)
$\mathbf{S_D}$ = deck seam length factor (ft/ft^2)
= $\mathbf{L_{Seam}} / \mathbf{A_{Deck}}$
D, **P***, $\mathbf{M_V}$, $\mathbf{K_C}$ are as defined in Eq. 2-3

[6.] The following equation was used to calculate the Working (withdrawal) Losses for each tank:

$\mathbf{L_w} = (0.943\, \mathbf{Q}\, \mathbf{C_s}\, \mathbf{W_L} / \mathbf{D})(1 + \mathbf{N_c}\, \mathbf{F_c} / \mathbf{D})$ (Eq. 2-19)

Q = annual net throughput (bbl/yr)
$\mathbf{C_s}$ = shell clingage factor (bbl/1000 ft^2)
$\mathbf{W_L}$ = average organic liquid density (lb/gal)
D = tank diameter (ft)
0.943 = constant (1000 ft^3-gal/bbl^2)
$\mathbf{N_C}$ = number of fixed roof support columns (dimensionless)
$\mathbf{F_C}$ = effective column diameter (ft)

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Internal Floating Roof Tanks - VOC Emission Inputs

Equipment ID	T-25	T-29	T-32	T-35	T-36	Notes
Mixture Type	**All Products**	**All Products**	**All Products**	**All Products**	**All Products**	
Tank Type:	**IFRT**	**IFRT**	**IFRT**	**IFRT**	**IFRT**	
Rim-Seal System (Primary Seal)	Mechanical Shoe	Vapor-Mounted	Mechanical Shoe	Mechanical Shoe	Mechanical Shoe	Historic Tanks 4.09d Reports
Rim-Seal System (Secondary Seal)	None	None	None	None	None	
Deck Characteristics (Deck Type)	Welded	Welded	Welded	Welded	Welded	
Diameter, **D** (ft) [1]	30	30	100	59.75	110	
Total Length of Deck Seams, $\mathbf{L_{seam}}$ (ft) [1]	-	-	-	-	-	
Number of Columns, $\mathbf{N_C}$ [1]	0	1	6	1	9	
Liquid Bulk Temperature, $\mathbf{T_B}$ (°F)	56.17	56.17	56.17	56.17	56.17	
Effective Column Diameter, $\mathbf{F_C}$ (ft) [1]	0	1	0.7	0.70	0.83	
Tank Capacity (gal)	184,800	109,998	2,091,432	789,600	3,150,000	From permit
Annual Throughput, **Q** (gal/yr) [2]	11,818,000	7,035,000	133,744,000	50,494,000	226,800,000	Assumed 5.33 tank turnovers per month.
Shell Height, $\mathbf{H_S}$ (ft)	34.95	20.80	35.60	37.65	44.31	$\mathbf{H_S}$ = Tank Capacity (ft^3) / (π $\mathbf{D}^2$ / 4)
Vapor Molecular Weight, $\mathbf{M_V}$ (lb/lbmol) [3]	62					AP-42 Table 7.1-2 (06/2020)
Average Organic Liquid Density, $\mathbf{W_L}$ (lb/gal) [3]	5.6					
Vapor Pressure Equation Constant, **A** [3]	11.644					
Vapor Pressure Equation Constant, **B** (°R) [3]	5043.6					
Roof Paint Solar Absorptance, $\propto_R$ [3]	0.25	0.25	0.25	0.25	0.25	AP-42 Table 7.1-6 (06/2020)
Shell Paint Solar Absorptance, $\propto_S$ [3]	0.25	0.25	0.25	0.25	0.25	
Hourly Average Minimum Ambient Temperature, $\mathbf{T_{AN}}$ (°F) [3]	69.5					AP-42 Table 7.1-7 (06/2020)
Hourly Average Maximum Ambient Temperature, $\mathbf{T_{AX}}$ (°F) [3]	46.3					
Average Ambient Wind Speed, **v** (mph) [3]	0.0	0.0	0.0	0.0	0.0	
Average daily total insolation factor, **I** (Btu/ft^2-day) [3]	1722					
Atmospheric Pressure, $\mathbf{P_A}$ (psia) [3]	12.13					
Rim Seal Factor A, $\mathbf{K_{ra}}$ (lb-mole/ft-yr) [3]	5.8	6.7	5.8	5.8	10.8	AP-42 Table 7.1-8 (06/2020)
Rim Seal Factor B, $\mathbf{K_{Rb}}$ (lb-mole/(mph)^n-ft-yr) [3]	0.3	0.2	0.3	0.3	0.4	
Seal-related Wind Speed Exponent, **n** [3]	2.1	3.0	2.1	2.1	2.0	
Shell Clingage Factor, $\mathbf{C_S}$ (bbl/1000 ft^2) [3]	0.0015	0.0015	0.0015	0.0015	0.0015	AP-42 Table 7.1-10 (06/2020)
Working Loss Product Factor, $\mathbf{K_C}$ [3]	1.0	1.0	1.0	1.0	1.0	See footnote
Fitting Wind Speed Correction Factor, $\mathbf{K_v}$ [3]	0	0	0	0	0	See footnote
Deck Seam Loss-per-unit Seam Length Factor, $\mathbf{K_D}$ (lb-mole/ft-yr) [3]	0.0	0.0	0.0	0.0	0.14	See footnote

Notes:

[1] Value is taken from historic TANKS 4.09d reports.

[2] Annual tank throughputs are calculated based on about 3 tank turnovers per month (12 total per year)

[3] The following constants were taken from AP-42 Chapter 7 (06/2020):

- $\mathbf{M_v}$, $\mathbf{W_L}$, **A** and **B** from Table 7.1-2 for motor gasoline RVP 13
- $\propto_R$ and $\propto_S$ from Table 7.1-6 (all tanks have a white roof and shell with an average paint coat)
- $\mathbf{T_{AN}}$, $\mathbf{T_{AX}}$, **v, I** and $\mathbf{P_A}$ from Table 7.1-7 for Albuquerque, NM (average for whole year). If the tank is an internal or domed EFRT,**v** is 0 (Eq. 2-4 Note 1)
- $\mathbf{K_{Ra}}$, $\mathbf{K_{Rb}}$, and **n** from Table 7.1-8.
- $\mathbf{C_s}$ from Table 7.1-10 for gasoline storage light rust shell condition
- $\mathbf{K_c}$ equals 0.4 for crude oils, and 1 for all other organize liquids (Eq. 2-4)
- $\mathbf{K_v}$ equals 0.7 for external floating roof tanks, and 0 for internal and domed external floating roof tanks (Eq. 2-15)
- $\mathbf{K_d}$ equals 0.0 for welded deck, and 0.14 for bolted deck (Eq. 2-18)

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Internal Floating Roof Tanks - VOC Emissions

Equipment ID	T-25	T-29	T-32	T-35	T-36	Notes
Mixture Type	**All Products**	**All Products**	**All Products**	**All Products**	**All Products**	
Tank Type:	**IFRT**	**IFRT**	**IFRT**	**IFRT**	**IFRT**	
True Vapor Pressure, $\mathbf{P_{VA}}$ (psia) [4]	6.75	6.76	6.77	6.76	6.77	AP-42 Chapter 7 Equation 1-25
Average daily ambient temperature, $\mathbf{T_{AA}}$ (°R) [4]	517.57	517.57	517.57	517.57	517.57	AP-42 Chapter 7 Equation 1-30
Vapor Pressure Function, **P*** [4]	0.16	0.16	0.16	0.16	0.16	AP-42 Chapter 7 Equation 2-4
Average Liquid Surface Temperature, $\mathbf{T_{LA}}$ (°R) [4]	518.08	518.18	518.30	518.20	518.28	AP-42 Chapter 7 Equation 2-5 for Domed EFRT and IFRT. Equation 2-7 for EFRT.
Deck Fitting Loss Factor, $\mathbf{F_F}$ (lb-mole/yr) [4]	33.60	60.30	106.97	92.38	284.07	AP-42 Chapter 7 Equation 2-14
Rim Seal Losses, $\mathbf{L_R}$ (lbs/yr) [5]	1,752.77	2,029.44	5,872.52	3,500.51	12,022.76	AP-42 Chapter 7 Equation 2-3
Deck Fitting Losses, $\mathbf{L_F}$ (lbs/yr) [5]	338.47	608.83	1,083.08	933.13	2,874.84	AP-42 Chapter 7 Equation 2-13
Deck Seam Losses, $\mathbf{L_D}$ (lbs/yr) [5]	0.00	0.00	0.00	0.00	0.00	AP-42 Chapter 7 Equation 2-18
Standing Losses, $\mathbf{L_S}$ (lb/yr) [5]	2,091.23	2,638.28	6,955.60	4,433.65	14,897.59	AP-42 Chapter 7 Equation 2-2
Working (withdrawal) Losses, $\mathbf{L_W}$ (lbs/yr) [9]	74.30	45.70	262.84	161.25	415.37	AP-42 Chapter 7 Equation 2-19
Total VOC Losses, $\mathbf{L_T}$ **(lbs/yr)**	**2,165.53**	**2,683.98**	**7,218.43**	**4,594.90**	**15,312.96**	$\mathbf{L_T}$ (lb/yr) = $\mathbf{L_S}$ + $\mathbf{L_W}$
Total VOC Losses, $\mathbf{L_T}$ **(tpy)**	**1.08**	**1.34**	**3.61**	**2.30**	**7.66**	$\mathbf{L_T}$ (tpy) = (lb/yr) / (2000 lb/ton)

Notes:

[4] The following equations are from AP-42 Chapter 7 (06/2020):

$\mathbf{P_{VA}} = \exp[\,\mathbf{A} - (\mathbf{B} / \mathbf{T_{LA}})\,]$ (Eq. 1-25)

where **A** = constant in the vapor pressure equation (dimensionless)

B = constant in the vapor pressure equation (°R)

$\mathbf{T_{LA}}$ = average daily liquid surface temperature (°R)

$\mathbf{P^*} = (\mathbf{P_{VA}} / \mathbf{P_A}) / (1 + [1 - (\mathbf{P_{VA}} / \mathbf{P_A})]^{0.5})^2$ (Eq. 2-4)

where $\mathbf{P_{VA}}$ = vapor pressure at average daily liquid surface temperature (psia)

$\mathbf{P_A}$ = vapor pressure at average daily liquid surface temperature (psia)

$$\mathbf{T_{LA}} = \frac{[\,2.86\,(\mathbf{H_S}/\mathbf{D}) + 1.43\,]\mathbf{T_{AA}} + [\,3.52(\mathbf{H_S}/\mathbf{D}) + 3.79\,]\mathbf{T_B} + 0.027 \propto_{\mathbf{R}} \mathbf{I} + 0.017(\mathbf{H_S}/\mathbf{D}) \propto_{\mathbf{S}} \mathbf{I}}{6.38(\mathbf{H_S}/\mathbf{D}) + 5.22} \quad (\text{Eq. } 2-5)$$

where $\mathbf{H_S}$ = tank shell height (ft)

D = tank diameter (ft)

$\mathbf{T_{AA}}$ = average daily ambient temperature (°R)

$\mathbf{T_B}$ = liquid bulk temperature (°R)

$\propto_{\mathbf{R}}$ = tank roof surface solar absorptance (Dimensionless)

$\propto_{\mathbf{S}}$ = tank shell surface solar absorptance (Dimensionless)

I = average daily total insolation factor (Btu/ft^2-day)

$\mathbf{T_{LA}} = 0.7\mathbf{T_{AA}} + 0.3\mathbf{T_B} + 0.008 \propto_{\mathbf{R}} \mathbf{I}$ (Eq. 2 − 7)

where $\mathbf{T_{AA}}$, $\mathbf{T_R}$, $\propto_{\mathbf{R}}$, and **I** are defined in Eq. 2-5

[5.] The following equations were used to calculate the Standing Losses for each tank:

$\mathbf{L_S} = \mathbf{L_R} + \mathbf{L_F} + \mathbf{L_D}$ (Eq. 2-2)

where $\mathbf{L_R}$ = rim seal loss (lb/yr)

$\mathbf{L_F}$ = deck fitting loss (lb/yr)

$\mathbf{L_D}$ = deck seam loss (internal floating roof tanks only) (lb/yr)

$\mathbf{L_R} = (\mathbf{K_{Ra}} + \mathbf{K_{Rb}}\,\mathbf{v}^{\mathbf{n}})\,\mathbf{D}\,\mathbf{P^*}\,\mathbf{M_v}\,\mathbf{K_c}$ (Eq. 2-3)

where $\mathbf{K_{Ra}}$ = zero wind speed rim seal loss factor (lbmol/ft-yr)

$\mathbf{K_{Rb}}$ = wind speed dependent rim seal loss factor (lbmol/mph$^{\mathbf{n}}$-ft-yr)

v = average ambient wind speed at tank site (mph)

n = seal-related wind speed exponent (dimensionless)

P* = vapor pressure function (dimensionless)

D = tank diameter (ft)

$\mathbf{M_v}$ = average vapor molecular weight (lb/lbmol)

$\mathbf{K_c}$ = product factor

$\mathbf{L_F} = \mathbf{F_F}\,\mathbf{P^*}\,\mathbf{M_V}\,\mathbf{K_C}$ (Eq. 2-13)

where $\mathbf{F_F}$ = total deck fitting loss factor (lbmol/yr)

P*, $\mathbf{M_V}$, $\mathbf{K_C}$ are as defined in Eq. 2-3

$\mathbf{L_D} = \mathbf{K_D}\,\mathbf{S_D}\,\mathbf{D}^2\,\mathbf{P^*}\,\mathbf{M_V}\,\mathbf{K_C}$ (Eq. 2-18)

where $\mathbf{K_D}$ = deck seam loss per unit seam length factor (lbmol/yr)

$\mathbf{S_D}$ = deck seam length factor (ft/ft^2)

= $\mathbf{L_{Seam}} / \mathbf{A_{Deck}}$

D, **P***, $\mathbf{M_V}$, $\mathbf{K_C}$ are as defined in Eq. 2-3

[6.] The following equation was used to calculate the Working (withdrawal) Losses for each tank:

$\mathbf{L_w} = (0.943\,\mathbf{Q}\,\mathbf{C_s}\,\mathbf{W_L} / \mathbf{D})(1 + \mathbf{N_c}\,\mathbf{F_c} / \mathbf{D})$ (Eq. 2-19)

Q = annual net throughput (bbl/yr)

$\mathbf{C_s}$ = shell clingage factor (bbl/1000 ft^2)

$\mathbf{W_L}$ = average organic liquid density (lb/gal)

D = tank diameter (ft)

0.943 = constant (1000 ft^3-gal/bbl^2)

$\mathbf{N_C}$ = number of fixed roof support columns (dimensionless)

$\mathbf{F_C}$ = effective column diameter (ft)

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Deck Fitting Loss Factor (F_F) for External Floating Roof Tank (EFRT)

T-21	Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fb}[2]	m[2]	K_{Fi}[2,3]
	Roof Leg (3-in. Diameter)/Adjustable, Center Area, Gasketed	4	0.53	0.11	0.13	0.67
	Vacuum Breaker (10-in)/Weighted mech. Actuation, Gask	2	6.2	1.2	0.94	12.33
	Unslotted Guide-Pole Well/Gasketed Sliding Cover, w. Sleeve	1	8.6	12	0.81	57.53
	Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask	5	0.47	0.02	0.97	0.58
	Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Gasketed	6	1.30	0.08	0.65	1.55
	Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.8	0	0	2.80
	Access Hatch (24-in Diam)/Bolted Cover, Gasketed	1	1.6	0	0	1.60
	Deck Fitting Loss Factor (F_F)[4]	**101.44**	**lb-mole/yr**			

T-22	Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fb}[2]	m[2]	K_{Fi}[2,3]
	Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.6	0	0	1.60
	Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.8	0	0	2.80
	Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.2	1.2	0.94	12.33
	Unslotted Guide-Pole Well/Gasketed Sliding Cover, w. Sleeve	1	8.6	12	0.81	57.53
	Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1	0.47	0.02	0.97	0.58
	Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Gasketed	9	1.30	0.08	0.65	1.55
	Roof Leg (3-in. Diameter)/Adjustable, Center Area, Gasketed	7	0.53	0.11	0.13	0.67
	Rim Vent (6-in. Diameter)/Weighted Mech. Actuation, Gask.	1	0.71	0.1	1.0	1.28
	Deck Fitting Loss Factor (F_F)[4]	**94.72**	**lb-mole/yr**			

T-23	Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fb}[2]	m[2]	K_{Fi}[2,3]
	Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.8	0	0	2.80
	Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.2	1.2	0.94	12.33
	Unslotted Guide-Pole Well/Gasketed sliding Cover, w. Wiper	1	14	3.7	0.78	28.32
	Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Sock	10	1.20	0.14	0.65	1.63
	Roof Drain (3-in. Diameter)/90% Closed	1	1.8	0.14	1.1	2.74
	Deck Fitting Loss Factor (F_F)[4]	**62.52**	**lb-mole/yr**			

T-24	Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fb}[2]	m[2]	K_{Fi}[2,3]
	Access Hatch (24-in Diam)/Bolted Cover/Gasketed	1	1.6	0	0	1.60
	Vacuum Breaker (10-in Diam)/Weighted Mech. Actuation, Gask	2	6.2	1.2	0.94	12.33
	Unslotted Guide-Pole Well/Gasketed sliding Cover w Wiper	1	14	3.7	0.78	28.32
	Roof Leg (3-in Diameter)/Adjustable, Pontoon Area, Sock	6	1.3	0.08	0.65	1.55
	Automatic gauge Float Well/Bolted cover, Gasketed	1	2.8	0	0	2.80
	Roof Drain (3-in Diameter)/90% Closed	1	1.8	0.14	1.1	2.74
	Deck Fitting Loss Factor (F_F)[4]	**69.41**	**lb-mole/yr**			

T-31	Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fb}[2]	m[2]	K_{Fi}[2,3]
	Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.8			2.80
	Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.2			6.20
	Unslotted Guide-Pole Well/Gasketed sliding Cover, w. Wiper	1	14			14.00
	Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Sock	10	1.20			1.20
	Roof Drain (3-in. Diameter)/90% Closed	1	1.8			1.80
	Deck Fitting Loss Factor (F_F)[4]	**36.80**	**lb-mole/yr**			

T-33	Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fb}[2]	m[2]	K_{Fi}[2,3]
	Automatic Gauge Float Well/Bolted Cover, Gasketed	1	1.6	0	0	1.60
	Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Ungask.	1	2.3	0	0	2.30
	Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.2	1.2	0.94	12.33
	Deck Fitting Loss Factor (F_F)[4]	**16.23**	**lb-mole/yr**			

Notes:

1. Fitting Type and Construction Details as well as Quantities (N_{Fnf}) were taken from historic Tanks 4.09d reports.

2. $\mathbf{K_{Fa}}$, $\mathbf{K_{Fb}}$, and **m** were taken from AP-42 Table 7.1-12.

4 The following equations are from AP-42 Chapter 7 (06/2020):

$\mathbf{F_F} = [\ (\ \mathbf{N_{F1}}\ \mathbf{K_{F1}}\ ) + (\ \mathbf{N_{F2}}\ \mathbf{K_{F2}}\ ) + \ldots + (\ \mathbf{N_{F\_nf}}\ \mathbf{K_{F\_nf}}\ )\ ]$ (Eq. 2-14)

where $\mathbf{N_{Fi}}$ = number of deck fittings of a particular type (i = 0,1,2,…,n_f) (dimensionless)

$\mathbf{K_{Fi}}$ = deck fitting loss factor for a particular type fitting (I = 0,1,2,…,n_f) (lbmol/yr) (see Eq. 2-15)

$\mathbf{n_f}$ = total number of different types of fittings (dimensionless)

$\mathbf{K_{Fi}} = \mathbf{K_{Fa\_i}} + \mathbf{K_{Fb\_i}}\ (\mathbf{K_v}\ \mathbf{v})^{\mathbf{m}}$ (Eq. 2-15)

where $\mathbf{K_{Fa\_i}}$ = zero wind speed loss factor for a particular type of fitting (lbmol/yr)

$\mathbf{K_{Fb\_i}}$ = wind speed dependent loss factor for a particular type of fitting (lbmol/mph^m-yr)

$\mathbf{m_{\_i}}$ = loss factor for a particular type of deck fitting (dimensionless)

i = 1, 2, … n (dimensionless)

$\mathbf{K_v}$ = fitting wind speed correction factor (dimensionless)

v = average ambient wind speed (mph)

* **Note:** For internal and domed external floating roof tanks, **v** equals zero and Eq. 2-15 becomes:

$\mathbf{K_{Fi}} = \mathbf{K_{Fa\_i}}$ (Eq. 2-16)

ABQ Terminal, LLC - Albuquerque Terminal

Deck Fitting Loss Factor (F_F) for Internal Floating Roof Tank (IFRT)

T-25 Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fi}[2,3]
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.6	1.6
Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.8	2.8
Roof Leg or Hanger Well/Adjustable	10		0
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1	12	12
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.2	6.2
Slotted Guide-Pole/Sample Well/Gask. Sliding Cover, w. Pole Sleeve	1	11	11
Deck Fitting Loss Factor (F_F)[4]	**33.6**	**lb-mole/yr**	

T-29 Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fi}[2,3]
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1	36	36
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1	14	14
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Ungask.	1	2.3	2.3
Roof Drain (3-in. Diameter)/90% Closed	1	1.8	1.8
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.2	6.2
Deck Fitting Loss Factor (F_F)[4]	**60.3**	**lb-mole/yr**	

T-32 Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fi}[2,3]
Access Hatch (24-in. Diam.)/Bolted cover, gasketed	1	1.6	1.6
Gauge-Hatch/Sample Well (8-in Diam./Weighted Mech. Actuation, Gask	1	0.47	0.47
Ladder Well (36-in Diam.)/Sliding Cover, gasketed	1	56	56
Roof Drain (3-in. Diameter)/90% Closed	1	1.8	1.8
Roof Leg (3-in. Diameter)Adjustable, Pontoon Area, Gasketed	23	1.3	1.3
Vacuum Breaker (10-in. Diam.)Weighted Mech. Actuation, Gask.	1	6.2	6.2
Slotted Guide-Pole/Sample Well/Gask Sliding Cover, w. Float, Sleeve, Wiper	1	11	11
Deck Fitting Loss Factor (F_F)[4]	**106.97**	**lb-mole/yr**	

T-35 Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fi}[2,3]
Access Hatch (24-in diam)/Bolted Cover, Gasketed	1	1.6	1.6
Gauge-hatch/Sample Well (8-in Diam)/Weighed Mech Actuation, Gask	1	0.47	0.47
Ladder Well (36 in Diam)/Sliding Cover, Gasket	1	56	56
Roof Drain (3-in. Diameter)/90% Closed	1	1.8	1.8
Roof Leg (3-in. Diameter)Adjustable, Pontoon Area, Gasketed	16	1.3	1.3
Slotted Guide-Pole/Sample Well/Gask Sliding Cover, w. Pole Sleeve	1	11	11
Rim Vent (6-in Diameter)/Weighted Mech. Actuation, Gask.	1	0.71	0.71
Deck Fitting Loss Factor (F_F)[4]	**92.38**	**lb-mole/yr**	

T-36 Fitting Type and Construction Details[1]	Quantity (N_{F_nf})[1]	K_{Fa}[2]	K_{Fi}[2,3]
Access Hatch / Bolted Cover, Gasketed	1	1.6	1.60
Fixed Roof Support Column Well / Round Pipe, Gasketed Sliding Cover	9	25	25.00
Gauge-Float Well / Bolted Cover, Gasketed	1	2.8	2.80
Gauge-Hatch/Sample Port / Weighted Mechanical Actuation, Gasketed	1	0.47	0.47
Vacuum Breaker / Weighted Mechanical Actuation, Gasketed	1	6.2	6.20
Deck Drain / Stub Drain	40	1.2	1.20
Deck Fitting Loss Factor (F_F)[4]	**284.07**	**lb-mole/yr**	

Notes:

1. Fitting Type and Construction Details as well as Quantities (N_{Fnf}) were taken from historic Tanks 4.09d reports.

2. KFa, KFb, m, and KFi were taken from AP-42 Table 7.1-12.

4 The following equations are from AP-42 Chapter 7 (06/2020):

$\mathbf{F_F} = [\,(\mathbf{N_{F1}}\,\mathbf{K_{F1}}) + (\mathbf{N_{F2}}\,\mathbf{K_{F2}}) + \ldots + (\mathbf{N_{F\_nf}}\,\mathbf{K_{F\_nf}})\,]$ (Eq. 2-14)

where NFi = number of deck fittings of a particular type (i = 0,1,2,…,nf) (dimensionless)

$\mathbf{K_{Fi}}$ = deck fitting loss factor for a particular type fitting (I = 0,1,2,…,n_f) (lbmol/yr) (see Eq. 2-15)

$\mathbf{n_f}$ = total number of different types of fittings (dimensionless)

KFi = KFa_i + KFb_i (Kv v)m (Eq. 2-15)

where $\mathbf{K_{Fa\_i}}$ = zero wind speed loss factor for a particular type of fitting (lbmol/yr)

$\mathbf{K_{Fb\_i}}$ = wind speed dependent loss factor for a particular type of fitting (lbmol/mph^m-yr)

$\mathbf{m_{\_i}}$ = loss factor for a particular type of deck fitting (dimensionless)

i = 1, 2, … n (dimensionless)

$\mathbf{K_v}$ = fitting wind speed correction factor (dimensionless)

v = average ambient wind speed (mph)

* **Note:** For internal and domed external floating roof tanks, **v** equals zero and Eq. 2-15 becomes:

$\mathbf{K_{Fi}} = \mathbf{K_{Fa\_i}}$ (Eq. 2-16)

ABQ Terminal, LLC - Albuquerque Terminal

External Floating Roof Tanks - HAPs Emission Inputs

Equipment ID	T-21	T-22	T-23	T-24	T-31	T-33	Notes
Mixture Type	All Products	All Products	All Products	All Products	All Products	All Products	
Tank Type:	EFRT	EFRT	EFRT	EFRT	Domed EFRT	EFRT	
Liquid Stock Molecular Weight, M_L (lb/lbmol)	92						AP-42 Table 7.1-2 (06/2
Vapor Molecular Weight, M_V (lb/lbmol)	62						
Total Vapor Pressure of Liquid Mixture, P_{VA} (psia) [2]	7.06	7.06	7.06	7.06	6.75	7.06	Determined on VOC calculations
Average Liquid Surface Temperature, T_{LA} (°R) [2]	520.50	520.50	520.50	520.50	518.12	520.50	
Rim Seal Losses, L_R (lbs/yr) [2]	2,250.06	2,250.06	1,738.68	1,738.68	257.08	2,454.61	
Deck Fitting Losses, L_F (lbs/yr) [2]	1,080.66	1,009.07	666.09	739.48	371.00	172.92	
Deck Seam Losses, L_D (lbs/yr) [2]	0.00	0.00	0.00	0.00	0.00	0.00	
Working (withdrawal) Losses, L_W (lbs/yr) [2]	172.77	172.79	123.86	123.86	123.86	158.42	

Component Liquid Mass Fractions, ZL_i (Gasoline RVP 13)	Component Liquid Mass Fractions, ZL_i (Gasoline RVP 13) 3	Component Liquid Mole Fractions, x_i (lbmol/lbmol) [4]	Antoine's Constant, **A** (dimensionless) [1]	Antoine's Constant, **B** (°C) [1]	Antoine's Constant, **C** (°C) [1]	Molecular Weight of Component, M_i (lb/lbmol) [1]
Benzene	0.0180	0.0267	6.906	1,211.0	220.79	78.11
Ethylbenzene	0.0140	0.0208	6.950	1,419.3	212.61	106.17
Hexane (n)	0.0100	0.0148	6.878	1,171.5	224.37	86.16
Isooctane	0.0400	0.0594	6.812	1,257.8	220.74	114.23
Cumene	0.0500	0.0742	6.929	1,455.8	207.20	120.19
Toluene	0.0700	0.1039	7.017	1,377.6	222.64	92.14
Xylene (m)	0.0700	0.1039	7.009	1,462.3	215.11	106.17

Notes:

[1] The following constants were taken from AP-42 Chapter 7 (06/2020):

M_v and W_L from Table 7.1-2 for motor gasoline RVP 13

A, **B**, **C**, and M_i from Table 7.1-3 for each individual HAP

2 PVA, TLA, LR, LF, LD, and LW were determined on the VOC calculations for each tank.

[3] The component liquid mass fraction, Z_{L_i} was taken from historic TANKS 4.09d reports for Gasoline RVP 13.

[4] The following equation is from AP-42 Chapter 7 (06/2020):

$x_i = (Z_{L\_i} M_L / M_i)$ (Eq. 40-4)

where Z_{L_i} = weight fraction of component i in the liquid

M_L = molecular weight of liquid stock (lb/lbmol)

M_i = molecular weight of component i (lb/lbmol)

ABQ Terminal, LLC - Albuquerque Terminal

External Floating Roof Tanks - HAPs Emission Calculations

Equipment ID	T-21	T-22	T-23	T-24	T-31	T-33	Notes
Mixture Type	**All Products**	**All Products**	**All Products**	**All Products**	**All Products**	**All Products**	
Tank Type:	**EFRT**	**EFRT**	**IFRT**	**EFRT**	**Domed EFRT**	**EFRT**	
Vapor Pressure of Pure Component at Average Daily Liquid Surface Temperature, **P** (psia) [5]							
Benzene	1.20	1.20	1.20	1.20	1.12	1.20	AP-42 Chapter 7 Equation 1-26
Ethylbenzene	0.11	0.11	0.11	0.11	0.10	0.11	
Hexane (n)	1.95	1.95	1.95	1.95	1.84	1.95	
Isooctane	0.61	0.61	0.61	0.61	0.57	0.61	
Cumene	0.05	0.05	0.05	0.05	0.05	0.05	
Toluene	0.34	0.34	0.34	0.34	0.32	0.34	
Xylene (m)	0.09	0.09	0.09	0.09	0.09	0.09	
Partial Pressure of Component i, $\mathbf{P_i}$ (psia) [5]							
Benzene	0.032	0.032	0.032	0.032	0.030	0.032	AP-42 Chapter 7 Equation 40-3
Ethylbenzene	0.002	0.002	0.002	0.002	0.002	0.002	
Hexane (n)	0.029	0.029	0.029	0.029	0.027	0.029	
Isooctane	0.036	0.036	0.036	0.036	0.034	0.036	
Cumene	0.004	0.004	0.004	0.004	0.003	0.004	
Toluene	0.035	0.035	0.035	0.035	0.033	0.035	
Xylene (m)	0.010	0.010	0.010	0.010	0.009	0.010	
Vapor Mole Fraction of Component i, $\mathbf{y_i}$ (lbmol/lbmol) [5]							
Benzene	0.0045	0.0045	0.0045	0.0045	0.0044	0.0045	AP-42 Chapter 7 Equation 40-5
Ethylbenzene	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	
Hexane (n)	0.0041	0.0041	0.0041	0.0041	0.0040	0.0041	
Isooctane	0.0051	0.0051	0.0051	0.0051	0.0050	0.0051	
Cumene	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Toluene	0.0050	0.0050	0.0050	0.0050	0.0049	0.0050	
Xylene (m)	0.0014	0.0014	0.0014	0.0014	0.0013	0.0014	
Weight Fraction of Component i in the Vapor, $\mathbf{Z_{V\_i}}$ (lb/lb) [5]							
Benzene	0.0057	0.0057	0.0057	0.0057	0.0056	0.0057	AP-42 Chapter 7 Equation 40-6
Ethylbenzene	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
Hexane (n)	0.0057	0.0057	0.0057	0.0057	0.0056	0.0057	
Isooctane	0.0095	0.0095	0.0095	0.0095	0.0092	0.0095	
Cumene	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	
Toluene	0.0074	0.0074	0.0074	0.0074	0.0072	0.0074	
Xylene (m)	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	
Emission Rate of Component i, $\mathbf{L_{T\_i}}$ (lb/yr) [5]							
Benzene	**22.14**	**21.73**	**15.97**	**16.39**	**5.74**	**17.86**	AP-42 Chapter 7 Equation 40-2
Ethylbenzene	**4.21**	**4.17**	**3.03**	**3.07**	**2.06**	**3.63**	
Hexane (n)	**20.75**	**20.34**	**14.97**	**15.39**	**4.76**	**16.59**	
Isooctane	**38.42**	**37.75**	**27.71**	**28.40**	**10.75**	**31.20**	
Cumene	**11.99**	**11.92**	**8.61**	**8.69**	**6.80**	**10.56**	
Toluene	**36.84**	**36.31**	**26.54**	**27.08**	**13.20**	**30.61**	
Xylene (m)	**19.90**	**19.73**	**14.31**	**14.48**	**10.09**	**17.25**	
Total HAPs (lb/yr)	**154.25**	**151.94**	**111.13**	**113.49**	**53.40**	**127.70**	Total HAPs = Σ individual HAPs

Notes:

5. The following equations were used to calculate the emission rate for individual HAPs for each tank

$\mathbf{L_{T\_i}} = (\mathbf{Z_{V\_i}}) (\mathbf{L_R} + \mathbf{L_F} + \mathbf{L_D}) + (\mathbf{Z_{L\_i}}) (\mathbf{L_W})$ (Eq. 40-2)

where $\mathbf{Z_{V\_i}}$ = weight fraction of component I in the vapor (lb/lb)

$\mathbf{L_R}$ = rim seal losses (lb/yr)

$\mathbf{L_F}$ = decking fitting losses (lb/yr)

$\mathbf{L_D}$ = decking seam losses (lb/yr)

$\mathbf{Z_{L\_i}}$ = weight fraction of component I in the liquid (lb/lb)

$\mathbf{L_W}$ = working (withdrawal) losses (lb/yr)

$\mathbf{P_i} = (\mathbf{P}) (\mathbf{x_i})$ (Eq. 40-3)

where $\mathbf{P}$ = vapor pressure of pure component I at the average daily liquid surface temperature (psia)

$\mathbf{x_i}$ = liquid mole fraction (lbmol/lbmol)

$\mathbf{y_i} = \mathbf{P_i} / \mathbf{P_{VA}}$ (Eq. 40-5)

where $\mathbf{P_i}$ = partial pressure of component i (psia)

$\mathbf{P_{VA}}$ = total vapor pressure of liquid mixture (psia)

$\mathbf{Z_{V\_i}} = \mathbf{y_i}\, \mathbf{M_i} / \mathbf{M_V}$ (Eq. 40-6)

where $\mathbf{y_i}$ = vapor mole fraction of component i (lbmol/lbmol)

$\mathbf{M_i}$ = molecular weight of component i (lb/lbmol)

$\mathbf{M_v}$ = molecular weight of vapor stock (lb/lbmol)

$\log \mathbf{P_{VA}} = \mathbf{A} - \mathbf{B} / (\mathbf{T_{LA}} + \mathbf{C})$ (Eq. 1-26)

where $\mathbf{P_{VA}}$ = vapor pressure at average liquid surface temperature (mmHg)

$\mathbf{A}$ = constant in the vapor pressure equation (dimensionless)

$\mathbf{B}$ = constant in the vapor pressure equation (°C)

$\mathbf{T_{LA}}$ = average daily liquid surface temperature (°C)

ABQ Terminal, LLC - Albuquerque Terminal

Internal Floating Roof Tanks - HAPs Emission Inputs

Equipment ID	T-25	T-29	T-32	T-35	T-36	Notes
Mixture Type	All Products	All Products	All Products	All Products	All Products	
Tank Type:	IFRT	IFRT	IFRT	IFRT	IFRT	
Liquid Stock Molecular Weight, M_L (lb/lbmol)	92					AP-42 Table 7.1-2 (06/2
Vapor Molecular Weight, M_V (lb/lbmol)	62					
Total Vapor Pressure of Liquid Mixture, P_{VA} (psia) [2]	6.75	6.76	6.77	6.76	6.77	Determined on VOC calculations
Average Liquid Surface Temperature, T_{LA} (°R) [2]	518.08	518.18	518.30	518.20	518.28	
Rim Seal Losses, L_R (lbs/yr) [2]	1,752.77	2,029.44	5,872.52	3,500.51	12,022.76	
Deck Fitting Losses, L_F (lbs/yr) [2]	338.47	608.83	1,083.08	933.13	2,874.84	
Deck Seam Losses, L_D (lbs/yr) [2]	0.00	0.00	0.00	0.00	0.00	
Working (withdrawal) Losses, L_W (lbs/yr) [2]	74.30	45.70	262.84	161.25	415.37	

Component Liquid Mass Fractions, ZL_i (Gasoline RVP 13)	Component Liquid Mass Fractions, ZL_i (Gasoline RVP 13) 3	Component Liquid Mole Fractions, x_i (lbmol/lbmol) [4]	Antoine's Constant, **A** (dimensionless) [1]	Antoine's Constant, **B** (°C) [1]	Antoine's Constant, **C** (°C) [1]	Molecular Weight of Component, M_i (lb/lbmol) [1]
Benzene	0.0180	0.0267	6.906	1,211.0	220.79	78.11
Ethylbenzene	0.0140	0.0208	6.950	1,419.3	212.61	106.17
Hexane (n)	0.0100	0.0148	6.878	1,171.5	224.37	86.16
Isooctane	0.0400	0.0594	6.812	1,257.8	220.74	114.23
Cumene	0.0500	0.0742	6.929	1,455.8	207.20	120.19
Toluene	0.0700	0.1039	7.017	1,377.6	222.64	92.14
Xylene (m)	0.0700	0.1039	7.009	1,462.3	215.11	106.17

Notes:

[1] The following constants were taken from AP-42 Chapter 7 (06/2020):

M_v and W_L from Table 7.1-2 for motor gasoline RVP 13

A, **B**, **C**, and M_i from Table 7.1-3 for each individual HAP

[2] P_{VA}, T_{LA}, L_R, L_F, L_D, and L_W were determined on the VOC calculations for each tank.

[3] The component liquid mass fraction, Z_{L_i} was taken from historic TANKS 4.09d reports for Gasoline RVP 13.

[4] The following equation is from AP-42 Chapter 7 (06/2020):

$x_i = (Z_{L\_i} M_L / M_i)$ (Eq. 40-4)

where Z_{L_i} = weight fraction of component i in the liquid

M_L = molecular weight of liquid stock (lb/lbmol)

M_i = molecular weight of component i (lb/lbmol)

ABQ Terminal, LLC - Albuquerque Terminal

Internal Floating Roof Tanks - HAPs Emission Calculations

Equipment ID	T-25	T-29	T-32	T-35	T-36	Notes
Mixture Type	**All Products**	**All Products**	**All Products**	**All Products**	**All Products**	
Tank Type:	**IFRT**	**IFRT**	**IFRT**	**IFRT**	**IFRT**	
Vapor Pressure of Pure Component at Average Daily Liquid Surface Temperature, **P** (psia) [5]						
Benzene	1.12	1.12	1.13	1.12	1.13	AP-42 Chapter 7 Equation 1-26
Ethylbenzene	0.10	0.10	0.10	0.10	0.10	
Hexane (n)	1.83	1.84	1.85	1.84	1.84	
Isooctane	0.57	0.57	0.57	0.57	0.57	
Cumene	0.05	0.05	0.05	0.05	0.05	
Toluene	0.32	0.32	0.32	0.32	0.32	
Xylene (m)	0.09	0.09	0.09	0.09	0.09	
Partial Pressure of Component i, $\mathbf{P_i}$ (psia) [5]						
Benzene	0.030	0.030	0.030	0.030	0.030	AP-42 Chapter 7 Equation 40-3
Ethylbenzene	0.002	0.002	0.002	0.002	0.002	
Hexane (n)	0.027	0.027	0.027	0.027	0.027	
Isooctane	0.034	0.034	0.034	0.034	0.034	
Cumene	0.003	0.003	0.003	0.003	0.003	
Toluene	0.033	0.033	0.033	0.033	0.033	
Xylene (m)	0.009	0.009	0.009	0.009	0.009	
Vapor Mole Fraction of Component i, $\mathbf{y_i}$ (lbmol/lbmol) [5]						
Benzene	0.0044	0.0044	0.0044	0.0044	0.0044	AP-42 Chapter 7 Equation 40-5
Ethylbenzene	0.0003	0.0003	0.0003	0.0003	0.0003	
Hexane (n)	0.0040	0.0040	0.0040	0.0040	0.0040	
Isooctane	0.0050	0.0050	0.0050	0.0050	0.0050	
Cumene	0.0005	0.0005	0.0005	0.0005	0.0005	
Toluene	0.0049	0.0049	0.0049	0.0049	0.0049	
Xylene (m)	0.0013	0.0013	0.0013	0.0013	0.0013	
Weight Fraction of Component i in the Vapor, $\mathbf{Z_{V\_i}}$ (lb/lb) [5]						
Benzene	0.0056	0.0056	0.0056	0.0056	0.0056	AP-42 Chapter 7 Equation 40-6
Ethylbenzene	0.0005	0.0005	0.0005	0.0005	0.0005	
Hexane (n)	0.0056	0.0056	0.0056	0.0056	0.0056	
Isooctane	0.0092	0.0092	0.0093	0.0092	0.0093	
Cumene	0.0010	0.0010	0.0010	0.0010	0.0010	
Toluene	0.0072	0.0072	0.0072	0.0072	0.0072	
Xylene (m)	0.0023	0.0023	0.0023	0.0023	0.0023	
Emission Rate of Component i, $\mathbf{L_{T\_i}}$ (lb/yr) [5]						
Benzene	**13.02**	**15.58**	**43.68**	**27.71**	**90.89**	AP-42 Chapter 7 Equation 40-2
Ethylbenzene	**2.12**	**2.01**	**7.29**	**4.56**	**13.55**	
Hexane (n)	**12.47**	**15.27**	**41.71**	**26.50**	**87.84**	
Isooctane	**22.28**	**26.21**	**74.87**	**47.43**	**154.43**	
Cumene	**5.72**	**4.83**	**19.86**	**12.33**	**35.14**	
Toluene	**20.28**	**22.25**	**68.69**	**43.30**	**136.76**	
Xylene (m)	**9.91**	**9.15**	**34.12**	**21.29**	**62.75**	
Total HAPs (lb/yr)	**85.81**	**95.29**	**290.22**	**183.13**	**581.36**	Total HAPs = Σ individual HAPs

Notes:

[5] The following equations were used to calculate the emission rate for individual HAPs for each tank

$\mathbf{L_{T\_i}} = (\mathbf{Z_{V\_i}})(\mathbf{L_R} + \mathbf{L_F} + \mathbf{L_D}) + (\mathbf{Z_{L\_i}})(\mathbf{L_W})$ (Eq. 40-2)

where $\mathbf{Z_{V\_i}}$ = weight fraction of component I in the vapor (lb/lb)

$\mathbf{L_R}$ = rim seal losses (lb/yr)

$\mathbf{L_F}$ = decking fitting losses (lb/yr)

$\mathbf{L_D}$ = decking seam losses (lb/yr)

$\mathbf{Z_{L\_i}}$ = weight fraction of component I in the liquid (lb/lb)

$\mathbf{L_W}$ = working (withdrawal) losses (lb/yr)

$\mathbf{P_i} = (\mathbf{P})(\mathbf{x_i})$ (Eq. 40-3)

where $\mathbf{P}$ = vapor pressure of pure component I at the average daily liquid surface temperature (psia)

$\mathbf{x_i}$ = liquid mole fraction (lbmol/lbmol)

$\mathbf{y_i} = \mathbf{P_i} / \mathbf{P_{VA}}$ (Eq. 40-5)

where $\mathbf{P_i}$ = partial pressure of component i (psia)

$\mathbf{P_{VA}}$ = total vapor pressure of liquid mixture (psia)

$\mathbf{Z_{V\_i}} = \mathbf{y_i}\,\mathbf{M_i} / \mathbf{M_V}$ (Eq. 40-6)

where $\mathbf{y_i}$ = vapor mole fraction of component i (lbmol/lbmol)

$\mathbf{M_i}$ = molecular weight of component i (lb/lbmol)

$\mathbf{M_v}$ = molecular weight of vapor stock (lb/lbmol)

$\log \mathbf{P_{VA}} = \mathbf{A} - \mathbf{B} / (\mathbf{T_{LA}} + \mathbf{C})$ (Eq. 1-26)

where $\mathbf{P_{VA}}$ = vapor pressure at average liquid surface temperature (mmHg)

$\mathbf{A}$ = constant in the vapor pressure equation (dimensionless)

$\mathbf{B}$ = constant in the vapor pressure equation (°C)

$\mathbf{T_{LA}}$ = average daily liquid surface temperature (°C)

ABQ Terminal, LLC - Albuquerque Terminal

Loading Rack Hose Fugitives

Hours of Operation:	8760	hrs
Total Facility Throughput:	434000000	gal/yr

VOC EF[1]	13	mg/l
	0.10849	lb VOC/1000 gal
Loading Rack Emission Rate VOC:	47084.66	lb/yr
	23.54	tpy

[1] VOC emission rate from AP-42 5.2 Transportation and Marketing of Petroleum Liquids Table 5.2-5

HAP Emissions		
	lb/hr	tpy
Benzene	0.048	0.21
Ethylbenzene	5.37E-03	0.024
Hexane (-n)	0.086	0.38
Isooctane (2,2,4-Trimethylpentane)	0.043	0.19
Isopropyl Benzene (Cumene)	5.37E-04	2.35E-03
Toluene	0.070	0.31
Xylene (-m)	0.027	0.12
Total HAP Emissions:	0.28	1.23

	HAP Vapor Mass Fractions * †	
	mass fraction	weight %
Benzene	0.009	0.9
Ethylbenzene	0.001	0.1
Hexane (-n)	0.016	1.6
Isooctane (2,2,4-Trimethylpentane)	0.008	0.8
Isopropyl Benzene (Cumene)	0.0001	0.01
Toluene	0.013	1.3
Xylene (-m)	0.005	0.5

ABQ Terminal, LLC - Albuquerque Terminal

Equipment Fugitive Emissions

Emission unit number: 8
Source description: Equipment Fugitive Emissions
Total Operating Hours 8,760
Safety Factor 25%

Component		Emission factor[1] (lb/hr/source)	VOC Content[2] (wt%)	HAP Content[2] (wt%)	Subcomponent Count[3]	VOC Emissions[4,5] lb/hr	VOC Emissions[4,5] tpy	HAP Emissions[4,5] lb/hr	HAP Emissions[4,5] tpy
Valves	Gas/Vapor	9.92E-03	100%	25%	5	0.05	0.22	0.012	0.054
	Light Liquid	5.51E-03	100%	25%	48	0.26	1.16	0.066	0.290
Connectors	Gas/Vapor	4.41E-04	100%	25%	19	8.38E-03	0.037	2.09E-03	9.17E-03
	Light Liquid	1.65E-02	100%	25%	88	1.46	6.37	0.36	1.59
Flanges	Gas/Vapor	8.60E-04	100%	25%	19	0.016	0.072	4.08E-03	0.018
	Light Liquid	2.43E-04	100%	25%	88	0.021	0.09	5.34E-03	0.023
Pump Seals	Gas/Vapor	5.29E-03	100%	25%	0	-	-	-	-
	Light Liquid	2.87E-02	100%	25%	0	-	-	-	-
Other	Gas/Vapor	1.94E-02	100%	25%	8	0.16	0.68	0.039	0.17
	Light Liquid	1.65E-02	100%	25%	12	0.20	0.87	0.050	0.22
					Total:	**2.17**	**9.50**	**0.54**	**2.37**
					Total with Safety Factor:	**2.71**	**11.87**	**0.68**	**2.97**

[1] Emission factors from Table 2-4 of EPA Protocol for Equipment Leak Emission Estimates, 1995.
[2] Weight percent of gas and liquid components are conservatively assumed to be 100% VOC and 25% HAPs.
[3] Component counts are based on facility design.
[4] Hourly Emissions [lb/hr] = Emissions Factor [lb/hr/component] * Weight Content of Chemical Component [%] * Subcomponent Count.
[5] Annual Emissions [ton/yr] = Hourly Emissions [lb/hr] * Operating Hours [hr/yr] * 1/2000 [ton/lb].

ABQ Terminal, LLC - Albuquerque Terminal

Vapor Recovery Unit

Hours of Operation:	8760	hrs
Estimated Total Facility Throughput:	664,800,000	gal/yr

VOC EF[1]	10	mg/l
	0.083	lb VOC/1000 gal
VRU Emission Rate VOC:	55178.4	lb/yr
	27.59	tpy

[1] VOC emission rate from AP-42 5.2 Transportation and Marketing of Petroleum Liquids Table 5.2-5

HAP Emissions		
	lb/hr	tpy
Benzene	0.057	0.25
Ethylbenzene	0.006	0.03
Hexane (-n)	0.101	0.44
Isooctane (2,2,4-Trimethylpentane)	0.050	0.22
Isopropyl Benzene (Cumene)	0.001	0.003
Toluene	0.082	0.36
Xylene (-m)	0.031	0.138
Total HAP Emissions:	0.33	1.44

	HAP Vapor Mass Fractions * †	
	mass fraction	weight %
Benzene	0.009	0.9
Ethylbenzene	0.001	0.1
Hexane (-n)	0.016	1.6
Isooctane (2,2,4-Trimethylpentane)	0.008	0.8
Isopropyl Benzene (Cumene)	0.0001	0.01
Toluene	0.013	1.3
Xylene (-m)	0.005	0.5

ABQ Terminal, LLC - Albuquerque Terminal

Vapor Combustion Device

Combustor Information	
Unit(s):	VCU
Description:	Vapor Combustor
Unit Count:	1
VRU Downtime (hrs/yr):	8,760
Capture Efficiency (%):	100%
DRE (%):	98%

Heat Input and Flow Rate Calculation			
Parameters	**Value**	**Unit**	**Notes:**
Process Gas Flow Rate	0.023	MMscf/day	Calculated based on maximum heating rate of VCU
Process Gas Heating Value	2,572	Btu/scf	Heating Value of Propane
Total Heating Rate	60.00	MMBtu/hr	Maximum manufacturer design
Annual Flow Rate	8.51	MMBtu/yr	
Total Annual Heating Rate	0.53	MMBtu/yr	
Pilot Input Information			
Hourly Volume Flow Rate	60	scf/hr	Mfg. specification.
Natural Gas Heat Value	1,020	Btu/scf	As per natural gas composition
Pilot Operation	8,760	hr/yr	Design Specification
Annual Volume Flow Rate	0.53	MMscf/yr	
Hourly Heat Rate	0.061	MMBtu/hr	
Annual Heat Rate	5.36E-04	MMBtu/yr	

Emission Summary								
	NO_x[1]	CO[1]	VOC[2,3]	SO_2[4]	PM[1,5]	HAPs[2,3]	Unit	Notes
Emission Factors	100.00	84.00	5.50		7.60		lb/MMscf	AP-42 Table 1.4-1 & 2
	252.16	211.81			19.16		lb/MMscf	Corrected Factor for Process Gas*
			6.30			0.33	lb/hr	Mass Flow Rate - Captured VRU Emissions
				0.02			gr S/scf	Fuel sulfur content (2 gr S/100 scf)
Pilot Emissions	6.00E-03	5.04E-03	3.30E-04	3.43E-04	4.56E-04	-	lb/hr	
	0.026	0.022	1.45E-03	1.50E-03	2.00E-03	-	tpy	
Process Emissions[6]	0.25	0.21	0.13	-	-	6.56E-03	lb/hr	
	1.07	0.90	0.55	-	-	0.029	tpy	
Total Emissions	**0.25**	**0.21**	**0.13**	**3.43E-04**	**4.56E-04**	**6.56E-03**	lb/hr	
	1.10	**0.92**	**0.55**	**1.50E-03**	**2.00E-03**	**0.029**	tpy	

[1] NO_x, CO and PM are calculated using AP-42 Table 1.4-1 & 2 emission factors corrected using the ratio of the heat value to the reference heat value (1020 Btu/scf)

lb/hr emissions = EF (lb/MMscf)* Flowrate (scf/hr) / (10^6 scf/MMscf)

ton/yr emissions = EF (lb/MMscf) * Flowrate (MMscf/yr) / (2000 lb/ton)

[2] VOC and HAP emissions are based on the mass flow from the VRU routed to the combustor during downtime * (1 - DRE).

[3] There is assumed to be no VOC or HAP pilot emissions associated with the combustion of natural gas.

[4] SO_2 pilot emissions are based on a fuel sulfur content of 2 gr S/100 scf.

SO_2 emissions = (0.02 gr S/scf) / (7000 gr/lb) * Flowrate (scf/hr) * (64 lb/lbmol SO_2 / 32 lb/lbmol S)

[5] Assumes PM = PM_{10} = $PM_{2.5}$

[6] Annual process emissions are based on 8760 hr/yr VRU downtime.

[*] Corrected emission factor for process gas = AP-42 Emission factor (lb/MMscf) * Process Stream Heat value (Btu/scf) / (1020 Btu/scf)

Exhaust Parameters

Heat Rate:	60061.20	MBtu/hr	Design Specification
Exhaust temp (Tstk):	650	°F	Missing Modeling Stack Parameter NMED Guidelines
Site Elevation:	3,420	ft MSL	
Ambient pressure (Pstk):	26.38	in. Hg	Calculated based on elevation
F factor:	10,610	wscf/MMBtu	40 CFR 60 Appx A Method 19
Exhaust flow	10,621	scfm	Calculated from F factor and heat rate
Exhaust flow:	25,715	acfm	scfm * (Pstd/Pstk)*(Tstk/Tstd), Pstd = 29.92 "Hg, Tstd = 520 °R
Stack diameter:	8.0	ft	Design
Stack height:	13.10	ft	Design
Exhaust velocity:	8.53	ft/sec	Exhaust flow ÷ stack area

ABQ Terminal, LLC - Albuquerque Terminal

Lubricity Tank Calculation

Equipment ID:	6
Site Tank ID:	T-106
Mixture Type:	MCC Lubricity 2115 SD
Tank Type:	Horizontal Tank
Diameter (ft): [1]	8.0
Tank Shell Height / Length (ft): [1]	26.7
Effective Diameter (ft), D_E: [1]	16.5
Annual Throughput (gal/yr): [1]	8,400
Liquid Height (ft): [1]	--
Roof Outage (ft): [1]	0.0833
Vapor Space Outage (ft): [1, 2]	4.0000
Tank Capacity (gal): [11]	10,000
Tank Vapor Space Volume, V_V (ft^3): [1, 3]	201.0619
Vapor Molecular Weight, M_V: [1]	138
Average Liquid Surface Temp. (F): [1]	58.54
Vapor Pressure (psia): [1, 9]	0.2100
Vapor Density, W_V (lb/ft^2) [Temp(F) Converted to R]: [3]	0.0052
Vapor Space Expansion Factor, K_E: [1]	0.380
Tank Paint Solar Absorptance: [1]	0.17
Daily Total Solar Insolation on a Horizontal Surface: [1]	1,765.3167
Vented Vapor Saturation Factor, K_S: [4]	0.9574
Annual Turnovers: [5]	0.93
Working Loss Turnover Factor, K_N [6]	1.0000
Working Loss Product Factor, K_P: [1]	1
Control Efficiency: [10]	0
Standing Storage Loss, L_S (lb/yr) [7]	139.16
Working Losses, L_W (lb/yr) [8]	5.80
Total Losses (lb/yr)	144.96

Notes

1.) Information provided by Vecenergy per email 9/2021.
2.) Value calculated using equation from EPA's AP-42, Section 7.1.
3.) Vapor Density calculated using Equation 1-21 from EPA's AP-42, Section 7.1.
4.) Vented Vapor Saturation Factor calculated using Equation 1-20 from EPA's AP-42, Section 7.1.
5.) Annual Turnovers calculated by dividing annual throughput by 90% of the nominal tank capacity.
6.) Working Loss Turnover Factor calculated using equation from Section 7.1 of EPA's AP-42.
7.) Standing Losses calculated using Equation 1-2 from EPA's AP-42, Section 7.1.
8.) Working Losses calculated pursuant to Equation 1-29 of EPA's AP-42, Section 7.1.
9.) For T-106 vapor pressure was estimated using Promax with SDS component analysis.
10.) Control efficiency assumed as 0%.

2.5 Supporting Information

The following is a list of supporting information for this application. This information also carries forward documentation from previous technical revisions. Please refer to Appendix F for all documentation.

- A copy of the relevant sections of the EPA's Protocol for Equipment Leak Emission Estimates
- Historic Tanks 4.09d reports
- Current version of AP-42 located online at: US EPA AP-42 Compilation of Air Emissions Factors
  - Specific sections used in this application:
    - AP-42 Section 1.4, "Natural Gas Combustion"
    - AP-42 Section 5.2, "Transportation and Marketing of Petroleum Liquids"
    - AP-42 Chapter 7, "Organic Liquid Storage Tanks"
  - All equations and tables used have been marked

3. OPERATIONAL PLAN – AIR EMISSIONS DURING SSM

Emissions during startups, shutdowns, and malfunctions will be minimized through the use of industry standards and/or manufacturer recommended operating practices.

Key to minimizing excess emissions during non-routine operating conditions is minimizing the occurrence of such conditions. To this end, ABQT has taken a proactive approach to facility and equipment maintenance and environmental awareness. Operations personnel are aware of the importance of proper and efficient operation of equipment, and of the potential liabilities associated with improper operation. Moreover, ABQT recognizes the economic incentives to maintain and operate equipment efficiently. Malfunctioning equipment wastes resources and costs money.

Equipment at the facility is maintained in accordance with manufacturers' recommendations, industry best operating practices, and ABQT's own practices designed to minimize downtime and non-routine operations. Procedures exist for maintenance of each major piece of equipment; personnel are trained in proper procedures; and ABQT's own internal review processes ensure that procedures are followed. As a result, non-routine operational events and consequent excess emissions are minimized.

In the event that a startup, shutdown, or malfunction event violates an applicable requirement or results in emissions greater than the allowable emission rate for the affected emissions unit(s) considered over an averaging time consistent with the averaging time for the most stringent applicable emissions limit, ABQT will report such an event.

4. AIR DISPERSION MODELING ANALYSIS

The following pages contain the information below regarding air dispersion modeling analysis for the Albuquerque Terminal facility:

- Air Dispersion Modeling Report
- Email from CABQ EHD of Approval of the Submitted Modeling Protocol

AIR DISPERSION MODELING REPORT

Permit Modification Application
#0047-M2-5AR

ABQ Terminal, LLC
Albuquerque Terminal

Prepared By:

Adam Erenstein – Principal Consultant

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Albuquerque, NM 87122
(505) 266-6611

October 2024

Project 233201.0139

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I. APPLICANT AND CONSULTANT INFORMATION

This modeling report is being submitted as part of a permit modification application submitted pursuant to 20.2.11.41.29 NMAC for the Albuquerque Terminal , which is owned and operated by ABQ Terminal, LLC (ABQT). This report and accompanying modeling files are being submitted to the City of Albuquerque (CABQ) Environmental Health Department (EHD), Air Quality Program (AQP) to satisfy the requirements of 20.11.41.13.E NMAC. This report includes all required components requested in the "Completeness Requirements" section of the CABQ's Air Dispersion Modeling Guidelines (revised May 2024)[1].

a. Name of Facility and Company

Facility Name: Albuquerque Terminal
Company: ABQ Terminal, LLC

b. Permit Numbers Currently Registered for the Facility

This facility operates under **ATC #0047-M2-5AR**.

c. Contact Information for Modeling Questions

Contact Name: Adam Erenstein
Phone Number: (505) 266-6611
E-mail Address: AErenstein@trintiyconsultants.com

[1] Air Quality Program. (2024, May). *Air Dispersion Modeling Guidelines for Air Quality Permitting*. City of Albuquerque, Environemntal Heatlh Department. https://www.cabq.gov/airquality/air-quality-permits/dispersion-modeling-guidelines

II. FACILITY AND OPERATIONS DESCRIPTION

a. Narrative Summary of Proposed Modification

The purpose of this application is to add a vapor combustion unit (VCU) which will operate during the permitted vapor recovery unit (VRU) downtime. Additionally, another all-products storage tank will be installed which will also modify facility fugitive emissions. Finally, the methodology for the all-products tanks will be updated from historic TANKS4.0.9d reports to the latest AP-42 Chapter 7 methodology.

In summary, the following changes are being requested for this application:

- The addition of:
  - One (1) vapor combustion unit (Unit 11); and
  - One (1) All-Products storage tank (T-36 under Unit 4)

- The modification of:
  - Eleven (11) All-Products storage tanks (T-22, T-23, T-24, T-25, T-29, T-30, T-31, T-32, T-33, & T-35 under Unit 4); and
  - Facility fugitives (Unit 8)

b. Brief Physical Description of the Location

The Albuquerque Terminal is currently located at 3200 Broadway Blvd SE in Albuquerque, NM 87105 (UTM Zone 13, 349,904 meters E and 3,879,477 meters N).

c. Duration of Time that the Facility will be Located at This Location

The facility will be at this location for more than one (1) year.

d. Facility Maps – Google Earth Imagery Dated August 19, 2024

Figure 1. Location of the Facility

Figure 2. Location of On-Site Buildings

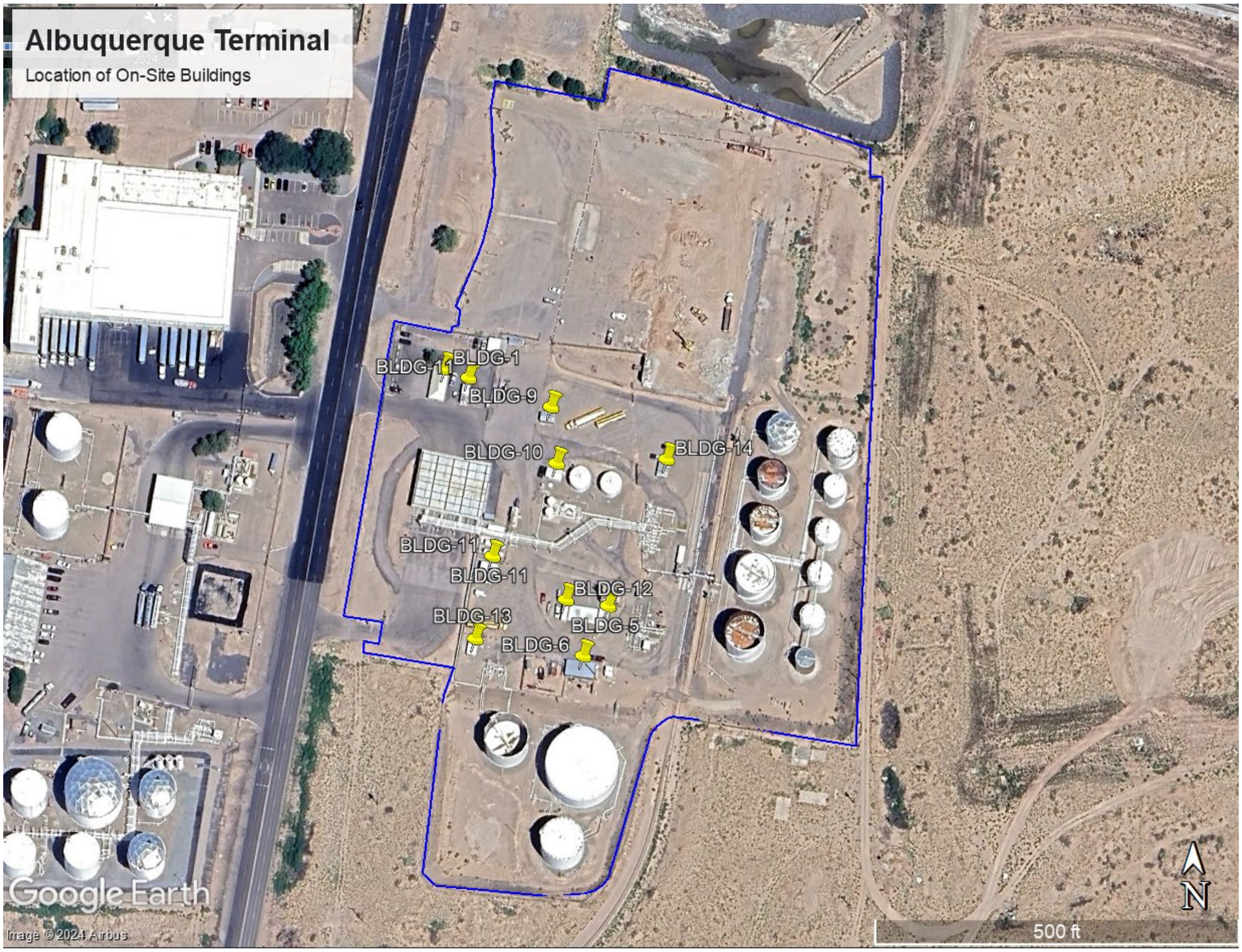


Figure 3. Location of On-Site Tanks

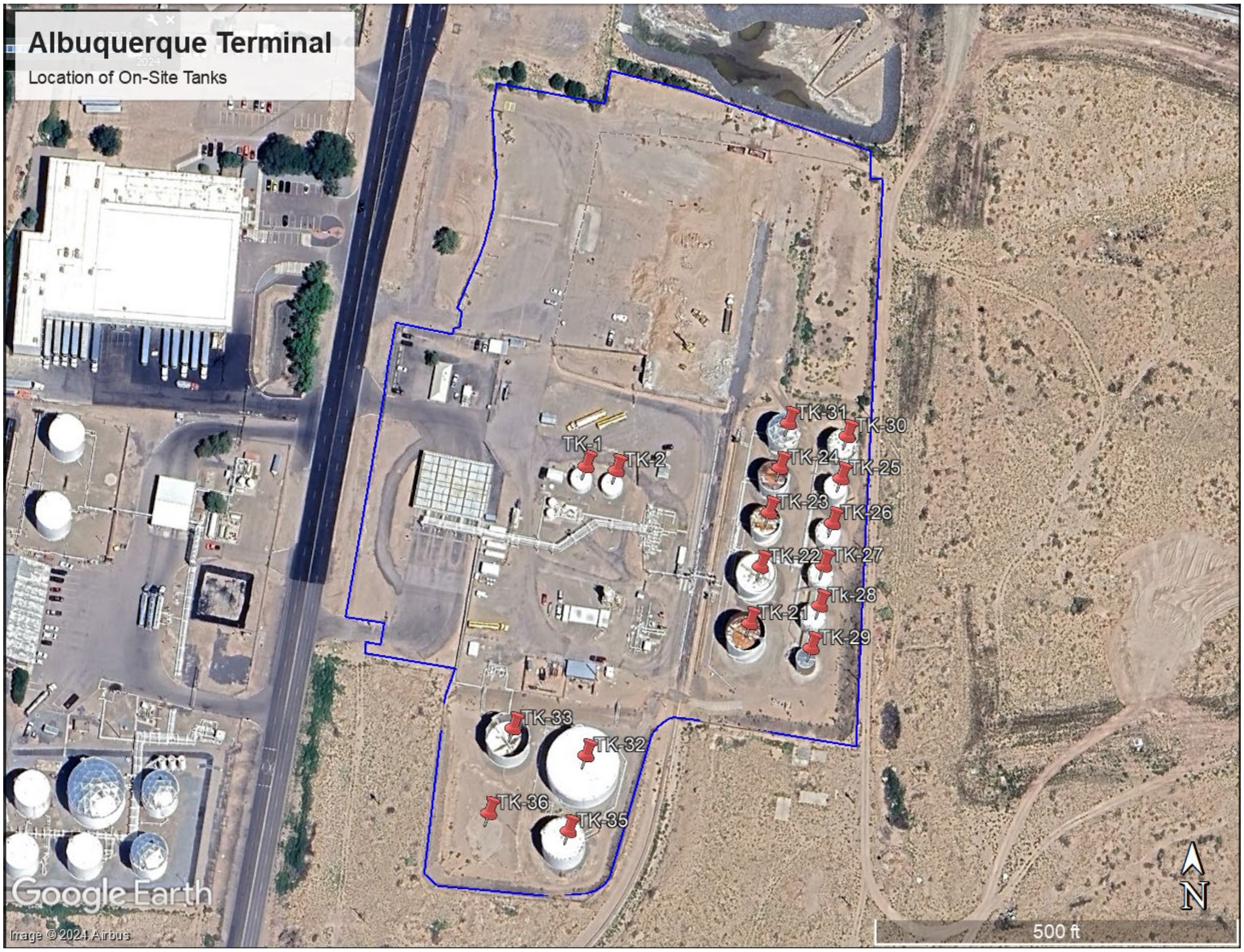


Figure 4. Location of Emission Points

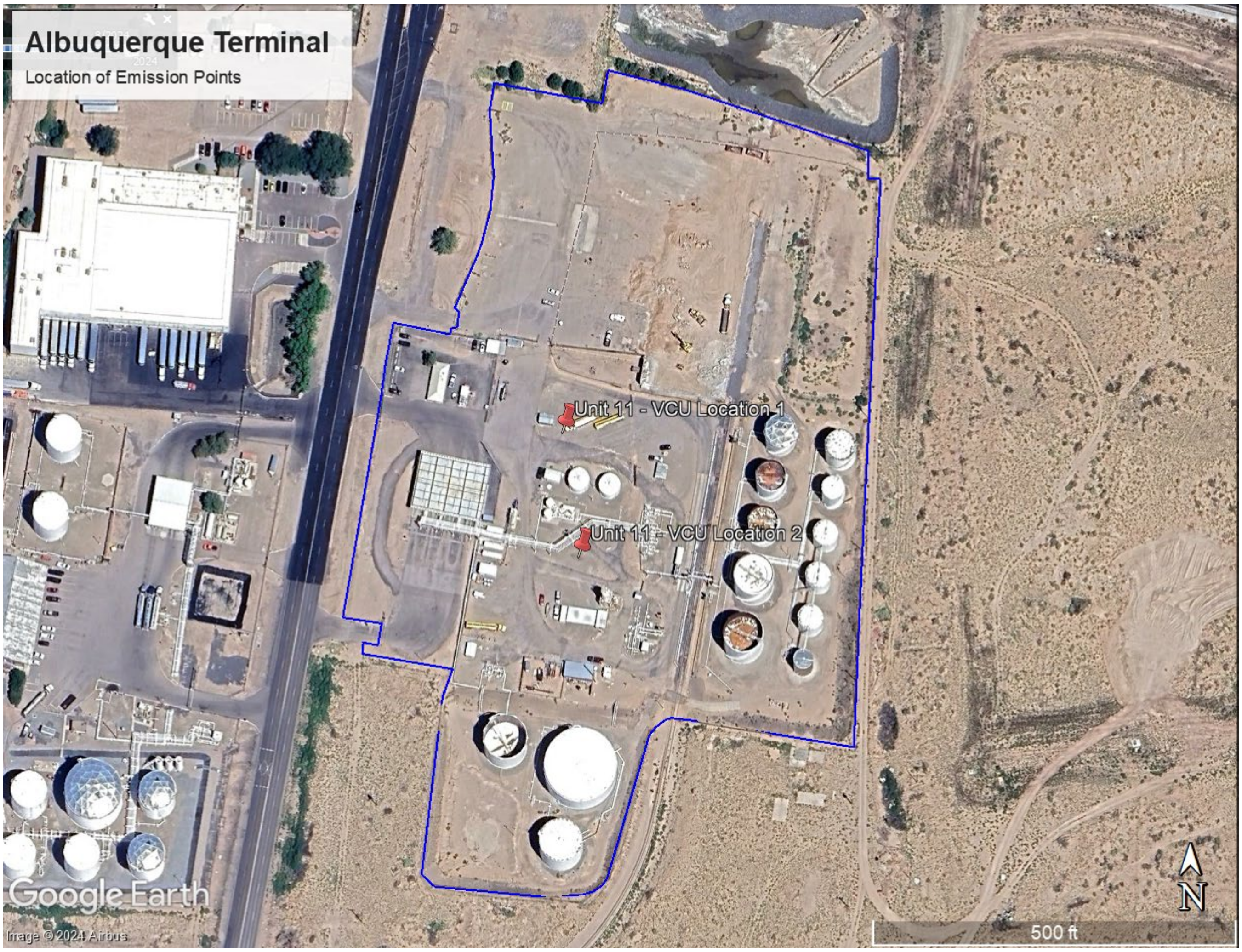


Figure 5. Location of Fence Line

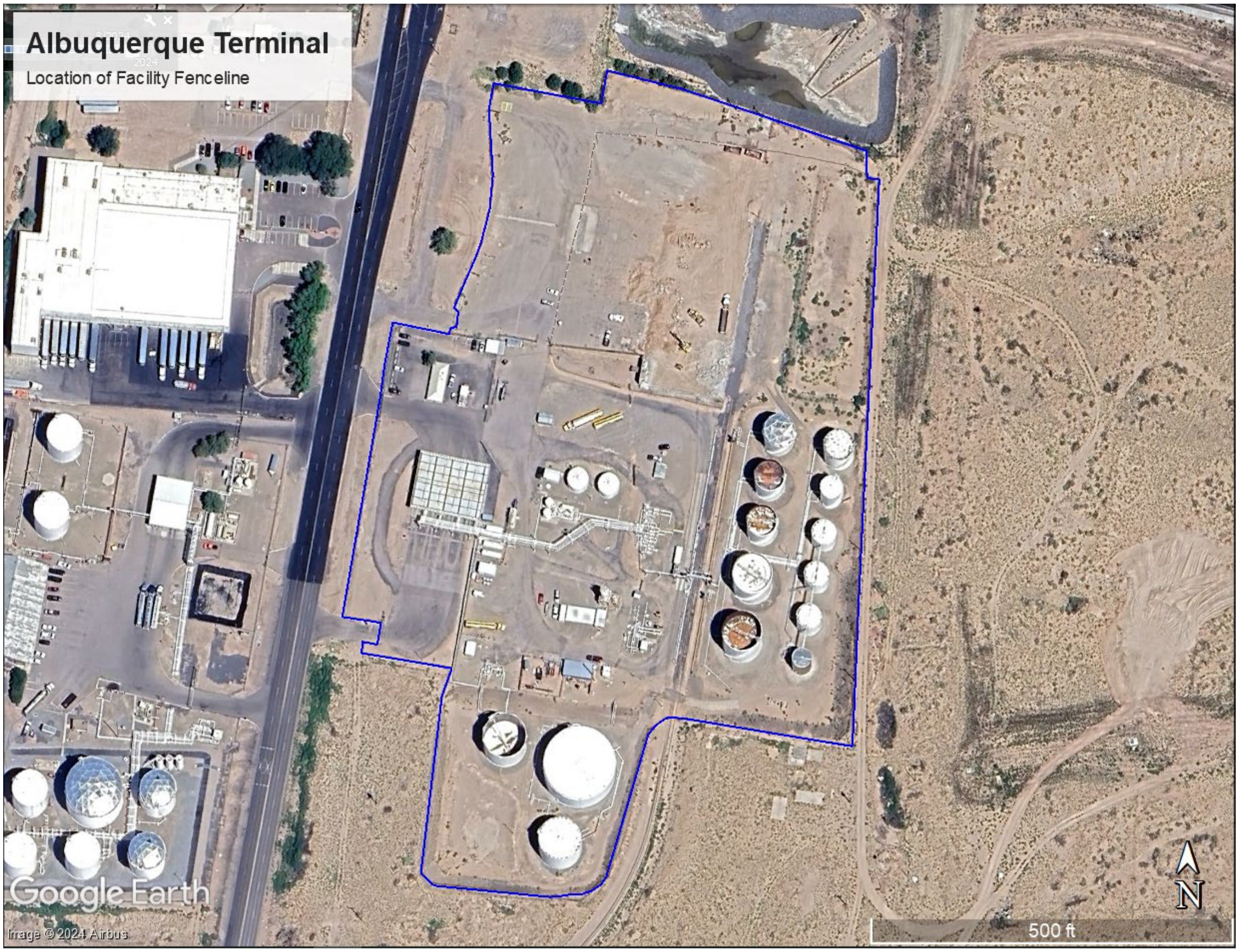


Figure 6. Location of Property Boundary

III. MODELING REQUIREMENTS DESCRIPTION

a. List of Pollutants Requiring NAAQS and/or NMAAQS Modeling

This air dispersion modeling evaluation is for a permit modification that will authorize the addition of a point source with combustion emissions. As such, averaging periods will be evaluated for CO, NO_2, PM_{10}, $PM_{2.5}$, and SO_2. There are no sources of lead or H_2S at this facility and therefore these pollutants will not be modeled.

Table 1. Modeled Pollutants and Averaging Periods to Show Compliance with the NAAQS and NMAAQS

Pollutant	Averaging Periods	Waiver Granted	Modeled
CO	8-hr		☑
	1-hr		☑
H_2S	1/2-hr		
Pb	Quarterly		
NO_2	Annual		☑
	24-hr		☑
	1-hr		☑
$PM_{2.5}$	Annual		☑
	24-hr		☑
PM_{10}	Annual		☑
	24-hr		☑
SO_2	Annual		☑
	24-hr		☑
	3-hr		☑
	1-hr		☑

b. Additional Modeling Required

No additional New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), or Prevention of Significant Deterioration (PSD) modeling is required as part of this modification application. The Albuquerque Terminal is located in an area that is classified by the EPA as in attainment with the National Ambient Air Quality Standard (NAAQS) for all regulated pollutants.

IV. MODELING INPUTS

a. General Modeling Approach

i. Models Used and Justification

The most recent executable of AERMOD (v23132) was used to perform all air dispersion modeling. All models were run in regulatory default mode and Building Profile Input Program (BPIP) Prime was used to address building downwash associated with the tanks and structures located at this facility as well as the surrounding area.

ii. Operational Flexibility

No operational flexibility is required for the modeling of the Albuquerque Terminal.

iii. Source Groups

Both potential locations of the VCU were modeled simultaneously. Two source groups (VCU1 and VCU2) were created to determine the impacts of the VCU at each location. Two other source groups (SS1 and SS2) contained the surrounding sources near the facility provided by the CABQ EHD modeling department on January 11, 2024 . SS1 and SS2 are identical and are only separated to note the location of the VCU being modeled. The ALL source group was used to determine the combined facility and surrounding source contribution to the ambient air quality.

iv. Hourly Emission Factors

No hourly emission factors were used as part of the air dispersion modeling evaluation. All lb/hr values were calculated as the maximum and conservative concentration for each of the sources.

v. Gravitational Settling/Plume Depletion

Wet and dry depletion were not used to model ambient impacts of PM_{10} and $PM_{2.5}$.

vi. Reduction of NO_x to NO_2

The Tier 2, Ambient Ratio Method 2 (ARM2) was used to model ambient impacts of NO_2. The default minimum ambient ratio of 0.5 and maximum ambient ratio of 0.9 was used.

vii. Background Concentrations

Per *Attachment C: Background Values Memo* of the CABQ EHD modeling guidelines[2], it is stated "background values for all pollutants should normally come from the Del Norte monitor and be used across the Albuquerque metro area within the jurisdiction of the Air Quality Program."

[2] Air Quality Program. (2024, May). *Air Dispersion Modeling Guidelines for Air Quality Permitting*. City of Albuquerque, Environemntal Heatlh Department. https://www.cabq.gov/airquality/air-quality-permits/dispersion-modeling-guidelines

Background concentrations shown in Table 2 have been added to the calculated facility and neighboring source impacts for each pollutant and averaging period. These background concentrations were provided by the Air Quality Program (AQP) via email on December 29, 2023 and have been preserved as provided.

Table 2. Background Concentrations from the Del Norte Monitor

Pollutant	Averaging Periods	Value (μg/m^3)
CO	8-hr	1336
	1-hr	1870
NO_2	Annual	18
	1-hr	83.1
$PM_{2.5}$	Annual	6.4
	24-hr	16.0
PM_{10}	24-hr	22.9
SO_2	Annual	0
	24-hr	0
	1-hr	13.1

viii. Method for Demonstrating Compliance in Nearby Facilities

Discrete receptors were included in all surrounding sources and facilities. Receptors were only deleted inside the Albuquerque Terminal building outline.

b. Meteorological and Ozone Data

i. Discussion of Meteorological and Ozone Data

The most recent meteorological data set from the Albuquerque Airport from 2014 to 2018 provided by the CABQ was used for the air dispersion modeling. The airport is located nearby, and this meteorological data is assumed to be adequately representative of conditions at the Albuquerque Terminal.

ii. Actual Data

No further justification is required as the data was provided by the CABQ.

c. Receptor and Terrain Discussion

i. Spacing of Receptor Grids

The originally proposed receptor grid spacing was updated per the latest CABQ EHD modeling guidelines. The updated spacing is as follows:

- Fence line spacing: 25 meters
- Very fine grid spacing: 50 meters from 0 meters to 500 meters of facility
- Fine grid spacing: 100 meters from 500 meters to 1000 meters of facility
- Course grid spacing: 250 meters from 1000 meters to 2500 meters of facility
- Very course grid spacing: 500 meters from 2500 meters to 5000 meters of facility

ii. Terrain Discussion

USGS National Elevation Dataset (NED) 1 arc-second data files were provided on the CABQ EHD dispersion modeling guidelines website[3]. These files were imported into AERMAP to determine elevations for sources, receptors, and buildings. There is no complex terrain requiring modifications to air dispersion modeling inputs.

iii. Reduction in Receptor Grid Size

The full receptor grid was utilized for all SIL models. Receptors not exceeding significance thresholds per Table 18 of the NMED Air Dispersion Modeling Guidelines[4] were removed for all CIA modeling.

d. Emission Sources

i. Description of Sources at Facility

1. Source Types

Table 3. Modeled Point Source Types

Model ID	Description	Vertical	Horizontal	Rain Capped
VCU	Vapor Combustion Unit	☑		

There are no area or volume sources located at this facility.

2. Emission Rates and Stack Parameters

Table 4. Source Emission Rates and Stack Parameters

ID	NO_2 (lb/hr)	CO (lb/hr)	SO_2 (lb/hr)	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	Height (ft)	Temp. (°F)	Velocity (ft/s)	Diameter (ft)
VCU	0.25	0.21	3.43E-04	4.56E-04	4.56E-04	13.1	650	8.5	8.0

* The VCU has two potential locations at the Albuquerque Terminal. Both locations were modeled.

3. Summary of Actual and Modeled Dimensions of Volume Sources

There are no volume sourced located at the Albuquerque Terminal.

[3] City of Albuquerque, Environmental Health Department, Air Quality Bureau. (n.d.). *Dispersion Modeling Guidelines & Data*. https://www.cabq.gov/airquality/air-quality-permits/dispersion-modeling-guidelines

[4] New Mexico Air Quality Bureau. (July 2024). *Air Dispersion Modeling Guidelines*. New Mexico Environment Department. https://www.env.nm.gov/air-quality/modeling-publications/

4. *Table of Proposed Changes*

Table 5. Modeled Emission Rates for Modified or New Sources

Model ID	NO_2 (lb/hr)	CO (lb/hr)	SO_2 (lb/hr)	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)
VCU	0.25	0.21	3.43E-04	4.56E-04	4.56E-04

5. *Treatment of Operating Hours*

No reductions were claimed to represent non-continuous annual operation for any of the emission sources located on site.

6. *Particle Size Characteristics*

No particle size distribution characteristics were included in the particulate matter modeling.

7. *Discrepancies Between Modeled Parameters and Those in the Application*

Modeled stack parameters and those represented in the application are identical.

8. *Flare Calculations*

There are no flares at the Albuquerque Terminal.

9. *Cross-Reference of Model Input Numbers and Names*

The modeled units share the same names as the permit ID names.

e. Building Downwash

i. Dimension of Buildings

Table 6. Rectangular Building Dimensions and Locations

Model ID	Description	X Coordinate (m)	Y Coordinate (m)	Height (ft)	X Length (ft)	Y Length (ft)	Angle
BLDG-1	Terminal Office	349834	3879480	10.0	54.2	24.0	-79.9
BLDG-5	Pipeline Office	349897	3879392	8.0	25.0	14.0	97.3
BLDG-6	Pipeline Maint Building	349883	3879370	12.0	22.0	40.0	97.8
BLDG-8	BOL Shack	349840	3879487	8.0	13.1	11.2	99.7
BLDG-9	Tool Shed	349874	3879475	8.0	13.1	21.3	98.0
BLDG-10	Shed	349876	3879451	10.0	13.8	22.3	102.0
BLDG-11	Shed	349848	3879412	10.0	13.8	24.3	101.8
BLDG-12	Conex Trailer	349881	3879394	8.0	23.3	8.9	96.3
BLDG-13	TBD	349840	3879373	8.0	13.5	18.0	14.6
BLDG-14	TBD	349922	3879447	8.0	15.1	19.0	15.0

Table 7. Circular Building Dimensions and Locations

Model ID	X Coordinate (m)	Y Coordinate (m)	Height (ft)	Radius (ft)	Corners
TK-1	349890	3879447	18.0	15.0	24
TK-2	349903	3879445	18.0	15.0	24
TK-21	349960	3879380	50.0	27.5	24
TK-22	349964	3879404	50.0	27.5	24
TK-23	349968	3879427	42.0	21.3	24
TK-24	349972	3879447	42.0	21.3	24
TK-25	349998	3879441	42.0	15.0	24
TK-26	349995	3879423	30.0	17.5	24
TK-27	349992	3879405	30.0	17.5	24
TK-28	349988	3879386	30.0	17.5	24
TK-29	349985	3879369	30.0	13.5	24
TK-30	350002	3879460	42.0	21.3	24
TK-31	349976	3879466	42.0	21.3	24
TK-32	349888	3879325	40.0	50.0	24
TK-33	349857	3879338	40.0	30.0	24
TK-35	349879	3879293	40.0	29.9	24
TK-36	349849	3879301	48.0	55.0	24
TK-UNK1	349877	3879432	17.3	5.9	24
TK-UNK2	349878	3879436	17.3	6.3	24

ii. Discussion in Included and Excluded Buildings

The Albuquerque Terminal contains on-site office buildings as well as numerous all-products storage tanks. The Albuquerque Terminal also contains various awnings or open structures for their various loading activities. All buildings modeled were identified as completely enclosed structures. Neighboring buildings were excluded from the model as they were not within the GEP 5L area of influence of any point source.

V. MODELING FILES DESCRIPTION

a. List of File Names

Table 8. Modeling Files and Description

Name	Description
ABQ Terminal_CO SIL_v1.0_2024 1025	CO 1hr and 8hr SIL model
ABQ Terminal _NO2 SIL_v1.0_2024 1025	NO_2 1hr, 24 hr, and Annual SIL model
ABQ Terminal _PM2.5 SIL_v1.0_2024 1025	$PM_{2.5}$ 24 hr and Annual SIL model
ABQ Terminal _PM10 SIL_v1.0_2024 1025	PM_{10} 24 hr and Annual SIL model
ABQ Terminal _SO2 SIL_v1.0_2024 1025	SO_2 1hr, 3 hr, 24 hr, and Annual SIL model
ABQ Terminal _NO2 1hr NAAQS (1)_v1.0_2024 1025	NO_2 1hr NAAQS CIA Model – VCU Location #1
ABQ Terminal _NO2 1hr NAAQS (2)_v1.0_2024 1025	NO_2 1hr NAAQS CIA Model – VCU Location #2

b. Description of Scenarios

All files labeled "SIL" represent the Significance Impact Level analysis. Both VCU locations were modeled in all SIL models using different source groups to determine the ambient air impacts at each location. Modeled concentrations were below the SIL for CO, $PM_{2.5}$, PM_{10}, and SO_2 for both locations. For VCU Location #1, the NO_2 1-hr and 24-hr averaging periods were above the significance thresholds. For VCU Location #2, only the NO_2 1-hr averaging period was above the significance thresholds. Thus both locations required cumulative impacts analysis (CIA) modeling. All files labeled with "CIA" represent the Cumulative Impacts Analysis. The file with a (1) represents the CIA model for VCU Location #1 and the file with a (2) represents the CIA model for VCU Location #2. Per NMED Modeling Guidelines[5], the NO_2 24-hr NMAAQS does not need to be modeled as the NO_2 1-hr NAAQS model will demonstrate compliance with the NMAAQS standard.

[5] New Mexico Air Quality Bureau. (July 2024). *Air Dispersion Modeling Guidelines*. New Mexico Environment Department. https://www.env.nm.gov/air-quality/modeling-publications/

a. Summary of Modeling Results

Table 9. Model Results, Maximum Concentration and Location, and Comparison to Significance Thresholds

	Pollutant	Averaging Period	Significance Level (µg/m³)	Modeled Concentration (µg/m³)	Percent of Significance	Location of Maximum Concentration X	Location of Maximum Concentration Y	Elevation (m)
VCU Location #1	CO	8-hr	500	6.67	1.33%	349802	3879463	1508.47
		1-hr	2000	10.67	0.53%	349835	3879509	1508.65
	NO_2	Annual	1.0	0.22	22.3%	349802	3879463	1508.47
		24-hr	5.0	5.39	Significant	349802	3879463	1508.47
		1-hr	7.52	11.44	Significant	349835	3879509	1508.65
	$PM_{2.5}$	Annual	0.13	0.00045	0.35%	349802	3879463	1508.47
		24-hr	1.2	0.0109	0.91%	349802	3879463	1508.47
	PM_{10}	Annual	1.0	0.00045	0.045%	349802	3879463	1508.47
		24-hr	5.0	0.011	0.22%	349802	3879463	1508.47
	SO_2	Annual	1.0	0.00034	0.034%	349802	3879463	1508.47
		24-hr	5.0	0.0082	0.16%	349802	3879463	1508.47
		3-hr	25	0.012	0.049%	349807	3879488	1508.51
		1-hr	7.8	0.017	0.22%	349835	3879509	1508.65
VCU Location #2	CO	8-hr	500	4.53	0.91%	349805	3879386	1508.49
		1-hr	2000	7.75	0.39%	349834	3879367	1508.67
	NO_2	Annual	1.0	0.12	12.3%	349923	3879342	1509.18
		24-hr	5.0	2.72	54.3%	349793	3879414	1508.52
		1-hr	7.52	8.30	Significant	349834	3879367	1508.67
	$PM_{2.5}$	Annual	0.13	0.00025	0.19%	349923	3879342	1509.18
		24-hr	1.2	0.0055	0.46%	349793	3879414	1508.52
	PM_{10}	Annual	1.0	0.00025	0.025%	349923	3879342	1509.18
		24-hr	5.0	0.0055	0.11%	349793	3879414	1508.52
	SO_2	Annual	1.0	0.00019	0.019%	349923	3879342	1509.18
		24-hr	5.0	0.0041	0.083%	349793	3879414	1508.52
		3-hr	25	0.0093	0.037%	349805	3879386	1508.49
		1-hr	7.8	0.013	0.16%	349834	3879367	1508.67

Both locations of the VCU were modeled in the SIL models and compared to the significant thresholds for each pollutant and averaging period. VCU Location #1 was significant for NO_2 1-hr and 24-hr averaging periods. VCU Location #2 was only significant for the NO_2 1-hr averaging period. All other pollutants and averaging periods are below the significant level thresholds. Since both locations had one significant pollutant and averaging period, a cumulative impacts analysis was performed for both locations. For the VCU Location #1, modeling of the NO_2 24-hr averaging period to demonstrate compliance with the NMAAQS is not required as the NO_2 1-hr NAAQS model demonstrates compliance, per the NMED modeling guidelines. Both VCU locations were modeled with surrounding sources provided by CABQ. The background concentration form the Del Norte monitor was also added to the results.

Table 10. Cumulative Impact Analysis Comparison to NAAQS/NMAAQS Thresholds

	Pollutant	Averaging Period	NAAQS / NMAAQS (μg/m³)	Facility Modeled Concentration (μg/m³)	Facility and Surrounding Sources (μg/m³)	Background Concentration (μg/m³)	Cumulative Total	Percent of Standard
#1	NO_2	24-hr	188.03	Standard was not modeled as the NO_2 1-hr NAAQS demonstrates compliance.				
		1-hr	188.03	7.92	28.59	54.50	83.09	44.2%
#2	NO_2	1-hr	188.03	6.87	28.04	54.50	82.54	43.9%

Both locations were modeled with surrounding sources with background concentration added to the final results. Both locations are below the NAAQS and are in compliance with air quality regulations and standards.

VII. SUMMARY/CONCLUSIONS

a. Modeling Statement

The submitted air dispersion modeling and report demonstrate compliance with the National and New Mexico Ambient Air Quality Standards. All requirements have been satisfied. There are no exceedances which would prohibit approval of the permit modification.

b. Expected Permit Conditions

The new vapor combustion unit will be allowed to operate at either of the two proposed locations and will be allowed to operate continuously.

Daniel Dolce

From: Adam Erenstein
Sent: Friday, February 9, 2024 9:06 AM
To: Tumpane, Kyle; Kevin.Sokolowski@loves.com
Cc: Stonesifer, Jeff W.; Lopez, Angela; Daniel Dolce
Subject: RE: ABQ Terminal Facility Modeling Protocol Approval

Kyle,
Thank you for the approval of the modeling protocol for the ABQ Terminal. Below are our responses in **blue** to your questions. Please contact us if you have any questions.

Regards,

Adam Erenstein
Principal Consultant, Manager of Consulting Services

P 505.266.6611 M 480.760.3860
Email: aerenstein@trinityconsultants.com
9400 Holly Avenue NE, Building 3, Suite B, Albuquerque, NM 87122

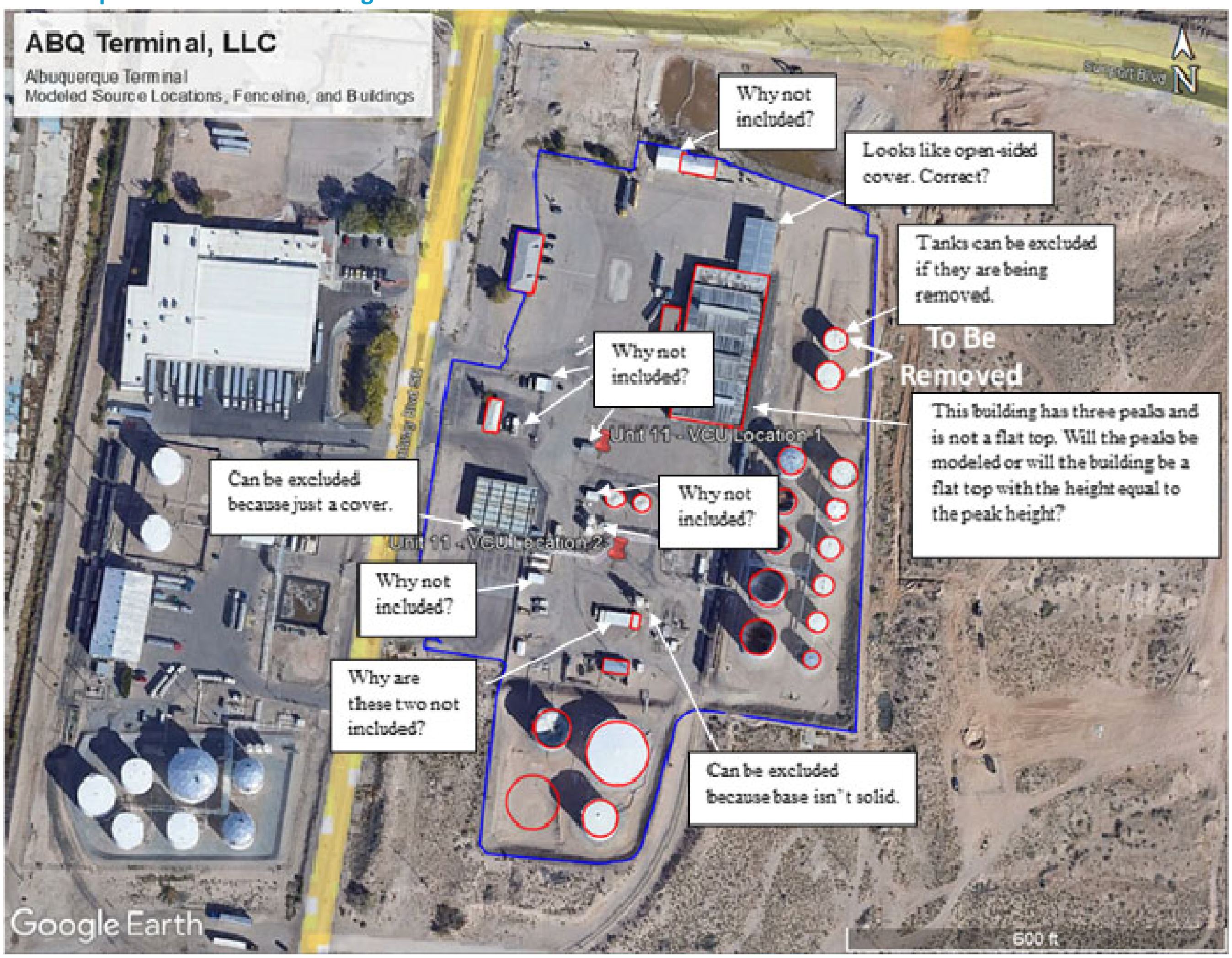
From: Tumpane, Kyle <ktumpane@cabq.gov>
Sent: Thursday, January 11, 2024 3:07 PM
To: Adam Erenstein <AErenstein@trinityconsultants.com>; Kevin.Sokolowski@loves.com
Cc: Stonesifer, Jeff W. <JStonesifer@cabq.gov>; Lopez, Angela <angelalopez@cabq.gov>; Daniel Dolce <Daniel.Dolce@trinityconsultants.com>
Subject: ABQ Terminal Facility Modeling Protocol Approval

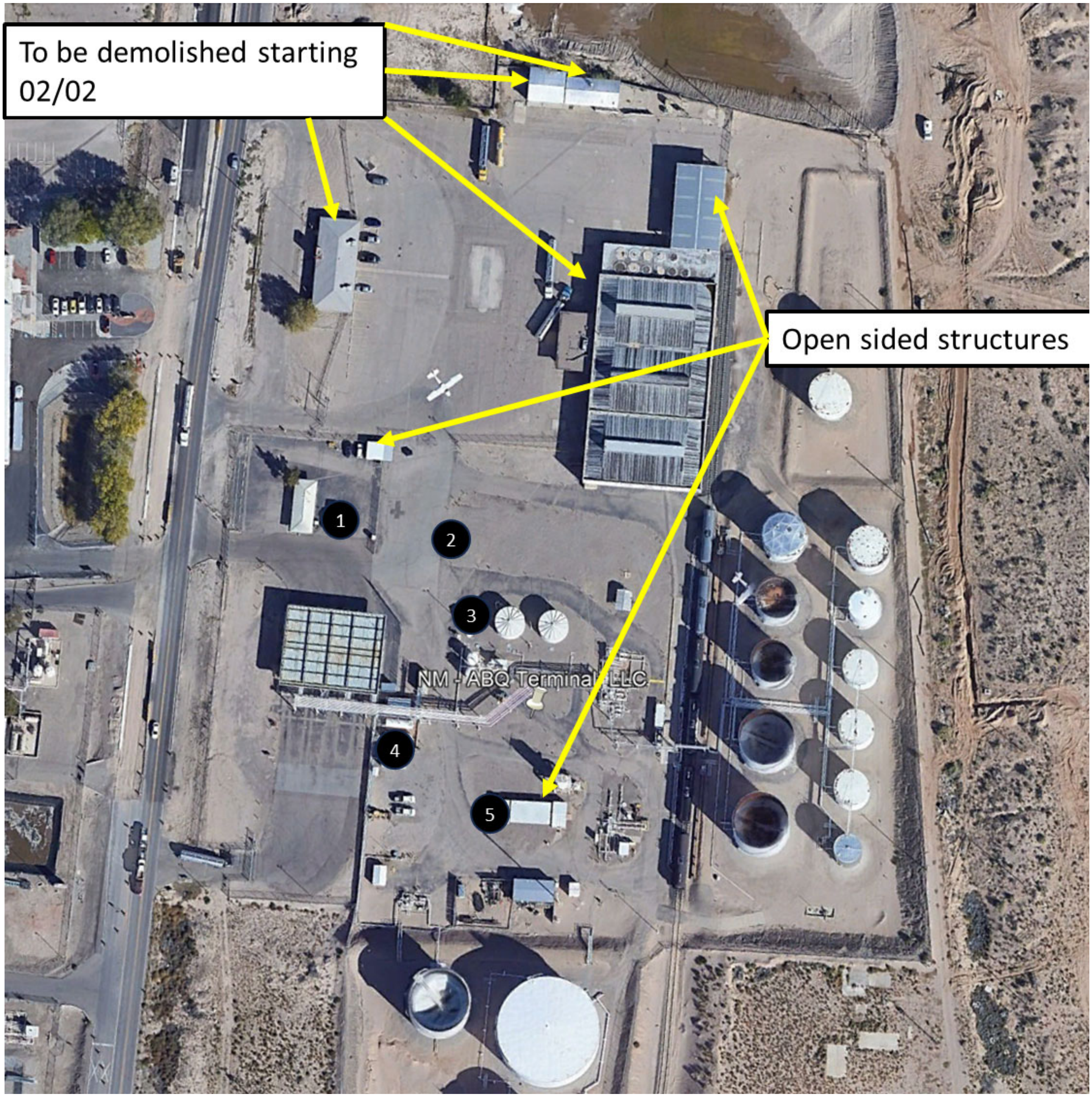
Mr. Erenstein and Mr. Sokolowski,
The City of Albuquerque Air Quality Program (AQP) has finished reviewing the modeling protocol submitted on November 14, 2023 on behalf of ABQ Terminal, LLC for the proposed modification to permit #0047-M2-5AR. Just to clarify, since it was hard for me to figure out: permit #0047-M2-5AR was issued on November 9, 2022 to transfer ownership and is the current permit number, although the terms and conditions of permit #0047-M2-3AR are still in effect. The modeling protocol is approved with some comments and questions.

- The receptor grid is not sufficient as described. The receptor grid beyond the fence should start with 50 m spacing, then go to 100 m spacing, not jump straight to 100 m spacing. Also, the 100 m spacing must extend to at least 1000 m from the fence, as stated in our modeling guidelines, not 500 m. **The grid will be updated for the final model.**

- What is the parcel inside the ABQ Terminal property that is owned by Chevron? This parcel, in the center of the image below, shows up on the Bernalillo Count Parcel search. Is that leased by ABQ Terminal or is this an error in the parcel data? Or is there a different explanation? **The parcel owned by Chevron is the pipeline manifold. I believe this is run by Magellan now.**

- There are some structures on ABQ Terminal property not proposed to be included that are right next to another structure that will be included in the models for downwash, or very close to the proposed locations for the VCU. No explanation is provided in Section 3.4, which discusses which buildings were included and why outside buildings were not included, for why these structures are not included. Are these just covers with no sides and shouldn't be downwash structures? Are there other reasons for these structures not being included? An image with the structures in question is included below. **I have included the below image which addresses the questions on the buildings.**





- Please use the most recent background values, which were updated on Dec. 29, 2023, for this modeling. Also, please use the most recent AERMOD executable, v23132, if possible. **Yes, we will.**

The following are minor issues for Trinity to correct in their documents going forward: **Noted, thank you.**

- Trinity needs to update their references to the NMED Modeling Guidelines in their protocol, and possibly modeling report, templates. They are still referencing the 2020 version with table numbers that have changed. The information has not changed in this case but the references are out of date.

- The description of the design value for 24-hr PM_{10} in Section 2.3.2 does not match the form of the 24-hr PM_{10} standard at all. It appears to be copied from $PM_{2.5}$. It should be the H6H result with 5 years of MET data.

A follow-up email will be sent with the surrounding sources to be included in the modeling. **Received. Thank you.**

Let us know if you have any questions.

Thank you,

KYLE TUMPANE
senior environmental health scientist | environmental health department
o 505.768.2872
m 505.366.9985
cabq.gov/airquality

5. APPLICABLE REGULATIONS

5.1 Applicable City of Albuquerque Regulations

5.1.1 20.11.41 NMAC – Construction Permits

This facility is required to have a permit pursuant to 20.11.41.2 NMAC and is currently operating under ATC Permit #0047-M2-5AR.

5.1.2 20.11.65 NMAC - VOLATILE ORGANIC COMPOUNDS

Process Equipment Unit #4 (T-21, T-22, T-23, T-24, T-25, T-29, T-31, T-32, T-33, T-35, and T-36) are gasoline storage containers each having a capacity of 40,000 gallons or greater and shall comply with all applicable requirements of this regulation. Process equipment #1 (gasoline loading rack) has a 30-day throughput greater than 600,000 gallons and shall comply with all applicable requirements of this regulation.

5.2 Applicable Federal Regulations

5.2.1 40 CFR 60 Subpart A

Those portions of the facility subject to 40 CFR 60, Subparts Kb, Kc, and XX are also subject to this NSPS.

5.2.2 40 CFR 60 Subpart Kb

Tanks T-25, and T-32 are subject to this NSPS because they were constructed or modified after July 23, 1984, have capacities greater than 75 m^3, and are used to store volatile organic liquids.

5.2.3 40 CFR 60 Subpart Kc

Tank T-36 is subject to this NSPS because it will be constructed after October 4, 2023, has a capacity greater than 20,000 gallons (75.7 m^3), and is used to store volatile organic liquids.

5.2.4 40 CFR 60 Subpart XX

The loading rack is subject to this NSPS because it is at a bulk gasoline terminal, it delivers gasoline into gasoline tank trucks, and it was modified after December 17, 1980.

5.2.5 40 CFR 63, Subpart A

Those portions of the facility subject to 40 CFR 63, Subpart BBBBBB are also subject to this regulation.

5.2.6 40 CFR 63, Subpart BBBBBB

The facility is subject to this GACT because it is an area source gasoline distribution bulk terminal. The affected source is the bulk gasoline terminal and it is an existing source because it commenced construction before November 9, 2006.

MM

Analysis received April 15, 2025

CITY OF ALBUQUERQUE
ENVIRONMENTAL HEALTH DEPARTMENT
AIR QUALITY PROGRAM

HAP BACT Analysis

ABQ Terminal, LLC
Albuquerque Terminal

Prepared By:

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Adam Erenstein – Principle Consultant

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April 2025

Project 233201.0139

Trinity Consultants

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LIST OF FIGURES

1. EXECUTIVE SUMMARY

The Albuquerque Terminal facility (ABQT) is located at 3200 Broadway Blvd SE, Albuquerque, New Mexico 87105 and operates under ATC #0047-M2-3AR. In December 2024, ABQT submitted a permit modification application (ATC Permit #0047-M2-5AR) to the City of Albuquerque Environmental Health Department Air Quality Program which proposed to add a vapor combustion unit (VCU) which will operate during the vapor recovery unit (VRU) downtime. This application also proposed one (1) new all-products storage tank and to update the methodology for existing and proposed all-products tanks from historic TANKS 4.09d reports to the latest AP-42 Chapter 7 methodology.

In accordance with New Mexico Administrative Code (NMAC) rules 20.11.72.8 each new or modified stationary source which is subject to permitting and within a 1 mile radius of an overburdened area is required to conduct a Best Available Control Technology (BACT) analysis for all new and modified sources which have the potential to emit one or any combination of the following fifteen Hazardous Air Pollutants (HAP): acetaldehyde, acrolein, benzene, 1,3-butadiene, carbon tetrachloride, ethyl benzene, ethylene oxide, formaldehyde, hydrochloric acid, methyl bromide, methylene chloride, naphthalene, toluene, vinyl chloride, and xylenes. Of these HAP, ABQT only has the potential to emit benzene, toluene, and xylene.

1.1 Definition of BACT

NMAC 20.11.61.7.M Contains the following definition of BACT:

> ***"Best available control technology (BACT)"*** *means an emissions limitation … based on the maximum degree of reduction for each regulated [New Source Review] NSR pollutant which would be emitted from any proposed major stationary source or major modification, which the director on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant.*

This definition is consistent with federal regulations as codified in 40 CFR 52.21(b)(12) which goes on to define an NSR pollutant to be any pollutant for which a National Ambient Air Quality Standard (NAAQs) has been established, including Volatile Organic Compounds (VOC) as a precursor to ozone emissions.[1] In order to appropriately apply federal guidance and national resources, ABQT has used VOC as a surrogate for the HAP listed within the regulation. VOC is an appropriate surrogate because the listed HAP also meet the definition of a VOC:

> ***Volatile organic compounds (VOC)*** *means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions.*[2]

The chemical structure of benzene, toluene and xylene are variations of a six-sided carbon ring and have the potential to participate in atmospheric chemical reactions, thus they can be classified as VOC. Any

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[1] 40 CFR 52.21(b)(50)(i)(B)

[2] 40 CFR 51.100(s)

control device with the potential to reduce VOC emissions will naturally reduce emissions from the target HAP.

The BACT definition goes on to add the following baseline:

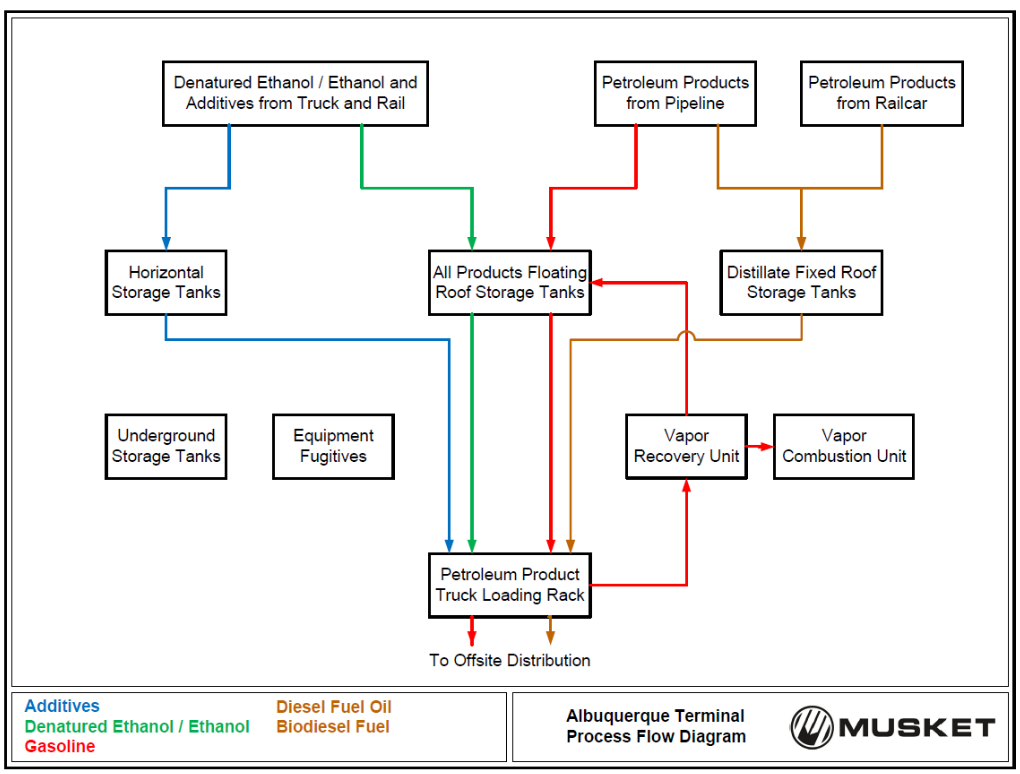
> *In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61.*

Control technologies for VOC specific to tanks and loading racks, similar to those at ABQT, are listed within the Federal Regulations (40 CFR Parts 60, 61, and 63), Reasonably Available (RACT)/BACT/Lowest Available Emission Rate (LAER) Clearinghouse (RBLC) and EPA published guidance. These resources establish national BACT standards and were reviewed in preparation of this report.

1.2 Description of Source and Processes

The Albuquerque Terminal is a bulk petroleum products terminal that receives gasoline and distillate fuel oil by pipeline and tank trucks. All petroleum products are received via tank trucks or railcar. The petroleum products are stored in aboveground storage tanks (ASTs) at the terminal for subsequent transfer to tank trucks by means of a four-bay loading rack. Vapors containing the targeted HAPs are displaced during the tank truck loading operations are captured and routed to a carbon adsorption vapor recovery unit (VRU). During VRU downtime, the vapors are routed to a vapor combustion device (VCU). Other sources of emissions include storage tank working and breathing losses and fugitive emission from equipment leaks. A high-level process flow diagram is contained in Figure 1.

Figure 1. Process Flow Diagram



The proposed modification includes the addition of a vapor combustion unit (VCU) (Unit 11) that operates during the permitted loading rack vapor recovery unit (VRU) (Unit 3) downtime, the addition of one all-products tank (T-36 Under Unit 4) and updating the associated fugitive equipment sources (Unit 8), and the removal of two distillate storage tanks which are no longer in service (Units T-1 and T-2 under Unit 5). Each of these modifications has the potential to emit the target HAP as demonstrated in Figure 2.

Figure 2. Potential to Emit of Target HAP

Requested Controlled HAP Emissions							
Unit ID	**Description**	**Benzene**		**Toluene**		**Xylene**	
		(lb/hr)	**(tpy)**	**(lb/hr)**	**(tpy)**	**(lb/hr)**	**(tpy)**
2	Loading Rack Hose Fugitives (LR)	0.048	0.21	-	-	0.027	0.12
3	Loading Rack Vapor Recovery Unit (VRU)	0.057	0.25	-	-	0.031	0.14
4	Floating Roof Storage Tanks	0.033	0.15	0.053	0.23	0.027	0.12
6	Lubricity Tank T-106	-	-	-	-	-	-
8	Equipment Fugitives	-	-	-	-	-	-
11	Loading Rack Vapor Combustion Unit (VCU)	1.13E-03	4.97E-03	-	-	6.30E-04	2.76E-03
Total Site-Wide Emissions		***0.14***	***0.61***	***0.053***	***0.23***	***0.086***	***0.37***

2. HAP BACT

2.1 Storage and Loading Equipment BACT

Benzene, Tolune, and Xylene emissions result from storage tanks and loading equipment as the materials stored evaporate and the air within the equipment is displaced. ABQT has installed several control technologies to both limit evaporation and treat emission laden air which is displaced. The focus of this BACT analysis is the new T-36 tank proposed with this application, as well as the installation of a VCU unit to control VRU downtime emissions.

2.1.1 Limit Evaporation

Evaporation is generally limited through tank design. The BACT definition established a federal baseline for tank design through the following federal standards:

- New Source Performance Standards (NSPS) Subpart Kb (Volatile Organic Liquid Storage Vessels [Including Petroleum Liquid Storage Vessels] for which Construction, Reconstruction, or Modification Commenced after July 23, 1983 and on or Before October 4, 2023) which is codified in 40 CFR 60.110b-60.117b.
  - Stored liquids with a maximum true vapor pressure less than 3.5 kPa (0.5 psia) are exempt from this subpart.[3]
- NSPS Subpart Kc (Volatile Organic Liquid Storage Vessels [Including Petroleum Liquid Storage Vessels] for which Construction, Reconstruction, or Modification Commenced after October 4, 2023) which is codified in 40 CFR 60.110c-60.117c.[4]
  - Vessels containing a volatile organic liquid with a maximum true vapor pressure equal to or greater than 10.3 kPa (1.5 psia) are subject to the control requirements in Subpart Kc.

In general, these regulations along with the RBLC included the following tank design features for tanks larger than 20,000 gallons:

- Internal Floating Roof[5]
- Primary Mechanical Shoe Seals
- Secondary Seals
- Drain-Dry Design
- Submerged Fill Pipe
- Tank Color

Internal Floating Roof

Internal floating roofs are used in conjunction with storage tanks that also have fixed roofs. The floating roof rests upon the stored liquid (either directly or several inches above the liquid surface) and moves with the liquid level as it changes. This reduces the amount of vapor space above the liquid, reducing emissions

[3] ABQT may or may not be applicable to this tank based on the material stored.

[4] ABQT may or may not be applicable to this tank based on the material stored.

[5] External floating roofs operate in a similar manner but generally produce higher emission rates than internal floating roofs. Since ABQT is proposing the use of an internal floating roof for T-36, an external floating roof design was not further evaluated.

as there is less air that can mix with readily available hydrocarbons that are prone to evaporation. With the floating roof existing within the tank, this mitigates wind-induced emission losses.

ABQT is planning to use an internal floating roof tank for T-36 (listed Under Unit 4). Therefore, this control technology is considered technically feasible.

Primary Mechanical Shoe Seals

Mechanical shoe seals are used within storage tanks in conjunction with the floating roof. The seals rest against the tank wall, creating a barrier between the liquid surface and the vapor space above. As the floating roof moves due to the changes in liquid level, the seal is designed to compress against the tank walls to create a seal. This process ensures that less VOC vapors escape from the tank.

EPA has encouraged the use of liquid-mounted seals, in which "a foam- or liquid-filled seal mounted in contact with the liquid between the wall of the storage vessel and the floating roof, extending continuously around the circumference of the tank".[6] This version of the seal ensures continuous contact with the liquid within the tank, reducing vapor space and limiting emissions even further.

Per 40 CFR 60 Kc, a primary seal is required in the design of an internal floating roof tank.[7] The shoe seal must be installed in the manner that one end of the extends into the stored liquid, and the other end extends at least 6 inches above the surface of the liquid. This control technology is already in use at ABQT; therefore, it is technically feasible.

Secondary Seals

Secondary seals are used in conjunction with the primary seals to further reduce emissions. Essentially, if emissions escape from the primary seals, the secondary seals offer additional resistance and protection against vapor loss. They mainly minimize emissions that escape from when the primary seal is under stress due to liquid level fluctuations or wear and tear.

Per 40 CFR 60 Kc, if the primary seal is a mechanical shoe seal, the secondary seal must be rim mounted.[8] Therefore, this technology is considered technically feasible.

Drain-Dry Design

This engineering design ensures that accumulation of liquids in a tank, whether it be on the roof or in the vapor space, can be adequately removed. Tanks with a drain-dry design typically have common drainage features, such as drain ports, sump areas, and piping systems. These allow any accumulated liquids to be removed from the interior workings of the tank. The internal floating roof may also be designed to drain off liquids accumulated at the roof back into the tank. Drain-dry designs are no longer considered in this application of BACT as they are only required within the state of Texas due to state-specific air quality concerns and demands.[9]

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[6] AP-42 Chapter 7.1 Organic Liquid Storage Tanks, Section 7.1.2.2 – Floating Roof Tanks

[7] 40 CFR Part 60 Subpart Kc – Standards of Performance for Volatile Organic Liquid Storage Vessels for Which Construction, Reconstruction, or Modification Commenced After October 4, 2023. Per 60.112c (b)(2)(i).

[8] 40 CFR Part 60 Subpart Kc – Standards of Performance for Volatile Organic Liquid Storage Vessels for Which Construction, Reconstruction, or Modification Commenced After October 4, 2023. Per 60.112c(b)(2)(iii).

[9] Texas Commission on Environmental Quality (TCEQ) – BACT Guidelines for Chemical Sources.

Filling Procedure

This procedure requires that internal floating roof tanks be filled, emptied, or refilled continuously and as quickly as possible when the roof is resting on its supports. Adhering to this process is crucial for minimizing the time the tank remains partially filled and exposed to the atmosphere, which could otherwise lead to increased vapor evaporation. Rapid and continuous filling and emptying reduces both the vapor space within the tank and the time it remains in this state, thereby limiting the amount of vapors that can escape.

Per 40 CFR 60 Subpart Kc, all internal floating roof tanks that are applicable to the regulation must follow this procedure in order to reduce vapor loss. Therefore, this control technology is technically feasible and is proposed for use.

Tank Color

Color has the property of albedo, which is known as the ability of a surface to reflect sunlight. Light colors can reflect more solar energy while dark colors tend to absorb more solar energy. Tanks with lighter colors will absorb less sunlight, reducing the rise in temperature which also reduces the vapor pressure of the stored liquid. This can help reduce emissions of VOCs and HAPs.

The tank (T-36) subject to BACT will be painted white. The control technology is being readily used to reduce emissions and is therefore technically feasible.

Conclusion

ABQT has installed all available controls to eliminate evaporation from these tanks and proposes that the tanks meet BACT as designed.

2.1.2 Treat Emissions from Tanks and Loading Rack

The BACT definition utilizes Federal, and by extension local regulations, to establish a BACT baseline for tanks and loading racks. Applicable regulations include the following:

- NMAC 20.11.65,
- NSPS Subpart XX (Gasoline Distribution Technology Review and Standards of Performance for Bulk Gasoline Terminals Review), and
- National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart BBBBBB (Gasoline Distribution Bulk Terminals, Bulk Plants, and Pipeline Facilities).

These regulations limit VOC or Total Organic Carbon (TOC) Vapors to the following limits:

- 1.24lbs of VOC per 1,000 gallons for organic fluids [10]
- Less than 80 milligrams of TOC per liter of gasoline loaded for a VRU[11]
- Less than 35 milligrams of TOC per liter of gasoline loaded for a VCU[12]

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[10] 20.11.65.13 (B)(1)

[11] NSPS Subpart XX, 60.502(c)

[12] NSPS Subpart XX, 60.502(b)

These emission limits are achieved through the use of the following technologies:

- Vapor Recovery System /Vapor Collection System (VRU)
- Vapor Combustion Unit (VCU)

Vapor Recovery Unit

A VRU is a system designed to capture and remove hydrocarbons from gases or vapors in order to remove emissions and recycle resources. The process begins when vapors through the VRU unit from the emission unit (in this case, storage tanks and loading rack), and are filtered through a carbon vessel. In the carbon vessel, carbon absorbs the hydrocarbons from the vapors, cleaning the air in the process. To reuse the carbon, a vacuum system is used to remove the captured hydrocarbons in a process called desorption. After desorption, the hydrocarbons are separated and sent to an absorber, where they are converted back into liquid form and returned to the storage tank from which they originally came from. If the hydrocarbons cannot be economically recovered or reused, they are routed to the VCU for destruction.

The facility is routing all storage tank and loading rack emissions to a VRU; therefore, this control technology is technically feasible.

Vapor Combustion Unit

A VCU is a control technology that is designed to destroy VOCs and HAPs. The technology requires adequate fuel and air supply in order to have enough oxygen to burn VOCs and HAPs, among other hydrocarbons. If the tank is subject to 40 CFR 60 Subpart Kc and has a maximum true vapor pressure greater than or equal to 76.6 kPa (11.1 psia), VOC emissions are required to be reduced by 98% through a closed vent system routed to a control device.[13]

The control technology is being used during VRU downtime at the facility. It requires that the unit can handle sufficient pressure and flow rate changes during alternate operating scenarios. The control technology is technically feasible.

Conclusion

As seen in Figure 1, all vapors produced from storage tanks and the loading rack which contain HAP emissions are directed first to a Vapor Recovery Unit (VRU). Should the VRU be down for maintenance or malfunction, emissions can be routed to a Vapor Combustion Unit (VCU) to combust VOCs and HAPs into less harmful substances. Since ABQT complies with all federal regulations and implements all available control technologies, ABQT proposes that the tanks and loading rack meet BACT as currently designed.

2.2 Fugitives BACT

Fugitive emissions are unintentional releases of vapors or gases that occur during facility operations. Unlike emissions that are actively captured and controlled through designated venting systems, fugitive emissions escape into the atmosphere due to inherent system limitations. These emissions can originate from a variety of sources, including leaky fugitive components (such as valves, flanges, connectors, and pump seals), storage tanks, piping systems, ventilation systems, and loading/unloading operations. Because these emissions cannot be routed through a controlled collection system, achieving 100% capture efficiency is not

[13] 40 CFR Part 60 Subpart Kc – Standards of Performance for Volatile Organic Liquid Storage Vessels for Which Construction, Reconstruction, or Modification Commenced After October 4, 2023. Per 60.112c (d)(3).

feasible. However, through BACT, facilities implement stringent measures to minimize fugitive emissions as much as possible.

At a gasoline bulk terminal, the primary sources of fugitive emissions stem from storage tanks, piping systems, and loading operations. To mitigate emissions from storage tanks, the facility implements regular maintenance programs and ensures that all tanks are equipped with high-integrity seals (such as rim seals for floating roof tanks or pressure-vacuum vents for fixed roof tanks). These measures help contain vapors and significantly reduce unintended atmospheric releases from the tanks, which is a critical aspect of controlling fugitive emissions.

In the case of piping systems to the VRU, vapors that could otherwise be emitted from piping components are actively managed through a closed vent system (CVS). This system is designed to capture and route vapors to a designated control device, preventing direct atmospheric release. Managing pressure fluctuations within the CVS is also critical—not only to optimize emissions control but also to maintain worker safety and system integrity. By carefully regulating pressure, the system ensures that fugitive emissions are safely captured and sent to a recovery or treatment system, thus preventing unintentional releases.

By implementing these control measures in alignment with BACT, the facility ensures that fugitive emissions are minimized to the greatest extent technically feasible.

APPENDIX A. APPLICATION FORMS

- Air Quality Permit Application (updated February 2022)
- Permit Application Review Fee Checklist (Updated Review Fees for January 1, 2025 through December 31, 2025)
- Permit Application Checklist (Updated November 2023)
- Compliance History Disclosure Form (Updated March 1, 2024)

City of Albuquerque – Environmental Health Department
Air Quality Program
Please mail this application to **P.O. Box 1293, Albuquerque, NM 87103**
or hand deliver between 8:00 am – 5:00 pm Monday – Friday to:
3rd Floor, Suite 3023 – One Civic Plaza NW, Albuquerque, NM 87102
(505) 768-1972 aqd@cabq.gov

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

Submittal Date: January 24, 2025

Owner/Corporate Information ☐ **Check here and leave this section blank if information is exactly the same as Facility Information below.**

Company Name: **ABQ Terminal, LLC**			
Mailing Address: **2929 Allen Parkway, Ste. 4100**	City: **Houston**	State: **TX**	Zip: **77019**
Company Phone: **(346) 397-7792**	Company Contact: **Kevin Sokolowski**		
Company Contact Title: **Manager of Environmental Compliance**	Phone: **(346) 397-7792**	E-mail: **Kevin. Sokolowski@Loves.com**	

Stationary Source (Facility) Information: **Provide a plot plan (legal description/drawing of the facility property) with overlay sketch of facility processes, location of emission points, pollutant type, and distances to property boundaries.**

Facility Name: **Albuquerque Terminal**			
Facility Physical Address: **3200 Broadway Blvd SE**	City: **Albuquerque**	State: **NM**	Zip: **87105**
Facility Mailing Address (if different):	City:	State:	Zip:
Facility Contact: **Kevin Sokolowski**	Title: **Manager of Environmental Compliance**		
Phone: **(346) 397-7792**	E-mail: **Kevin.Sokolowski@Loves.com**		
Authorized Representative Name[1]:	Authorized Representative Title:		

Billing Information ☒ **Check here if same contact and mailing address as corporate** ☐ **Check here if same as facility**

Billing Company Name:			
Mailing Address:	City:	State:	Zip:
Billing Contact:	Title:		
Phone:	E-mail:		

Preparer/Consultant(s) Information ☐ **Check here and leave section blank if no Consultant used or Preparer is same as Facility Contact.**

Name: **Adam Erenstein**	Title: **Principal Consultant**		
Mailing Address: **9400 Holly Ave, Bldg. 3, Ste. B**	City: **Albuquerque**	State: **NM**	Zip: **87122**
Phone: **(505) 266-6611**	Email: **AErenstein@trinityconsultants.com**		

1. See 20.11.41.13(E)(13) NMAC.

Application for Air Pollutant Sources in Bernalillo County
Source Registration (20.11.40 NMAC) and Construction Permits (20.11.41 NMAC)

General Operation Information (if any question does not pertain to your facility, type N/A on the line or in the box)

Permitting action being requested (please refer to the definitions in 20.11.40 NMAC or 20.11.41 NMAC):			
☐ New Permit	☒ Permit Modification Current Permit #: **0047-M2-5AR**	☐ Technical Permit Revision Current Permit #:	☐ Administrative Permit Revision Current Permit #:
☐ New Registration Certificate	☐ Modification Current Reg. #:	☐ Technical Revision Current Reg. #:	☐ Administrative Revision Current Reg. #:

UTM coordinates of facility (Zone 13, NAD 83): **349,904 m E, 3,879,477 m N**	
Facility type (*i.e.*, a description of your facility operations): **Petroleum Bulk Terminal Receiving, Storing, Handling, and Loading**	
Standard Industrial Classification (SIC Code #): **5171**	North American Industry Classification System (NAICS Code #): **424710**
Is this facility currently operating in Bernalillo County? **Yes**	If **YES**, list date of original construction: **1954** If **NO**, list date of planned startup:
Is the facility permanent? **Yes**	If **NO**, list dates for requested temporary operation: From Through
Is the facility a portable stationary source? **No**	If **YES**, is the facility address listed above the main permitted location for this source?
Is the application for a physical or operational change, expansion, or reconstruction (*e.g.*, altering process, or adding, or replacing process or control equipment, etc.) to an existing facility? **Yes**	
Provide a description of the requested changes: **One (1) vapor combustion unit (VCU) (Unit 11) will be installed to operate during the permitted vapor recovery unit (VRU) (Unit 3) downtime, one (1) all products storage tank (T-36 under Unit 4) will be installed, and fugitive equipment (Unit 8) will be modified.**	
What is the facility's operation? ☒ Continuous ☐ Intermittent ☐ Batch	

Estimated percent of production/operation:	Jan-Mar: **25%**	Apr-Jun: **25%**	Jul-Sep: **25%**	Oct-Dec: **25%**
Requested operating times of facility:	**24** hours/day	**7** days/week	**4.34** weeks/month	**12** months/year

Will there be special or seasonal operating times other than shown above? This includes monthly- or seasonally-varying hours. **No**
If **YES**, please explain:
List raw materials processed: **N/A - Storage and handling of petroleum products; no raw materials processed.**
List saleable item(s) produced: **N/A - Storage and handling of petroleum products; no production of saleable items.**

USE INSTRUCTIONS: For the forms on the following pages, please do not alter or delete the existing footnotes or page breaks. If additional footnotes are needed then add them to the end of the existing footnote list for a given table. Only update the rows and cells within tables as necessary for your project. Unused rows can be deleted from tables. If multiple scenarios will be represented then the Uncontrolled and Controlled Emission Tables, and other tables as needed, can be duplicated and adjusted to indicate the different scenarios.

Regulated Emission Sources Table

(*E.g.*, Generator-Crusher-Screen-Conveyor-Boiler-Mixer-Spray Guns-Saws-Sander-Oven-Dryer-Furnace-Incinerator-Haul Road-Storage Pile, etc.) Match the Units listed on this Table to the same numbered line if also listed on Emissions Tables & Stack Table.

Unit Number and Description[1]		Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date[2]	Process Rate or Capacity (Hp, kW, Btu, ft^3, lbs, tons, yd^3, etc.)[3]	Fuel Type
1	**Loading Rack**	**N/A**	**4-Bay Bottom Loading Rack**	**N/A**	**1954**	**1954**	**1989-1990**	**168,000 gal/hr**	**All Products**
3	**Loading Rack Vapor Recovery Unit (VRU)**	**John Zink**	**Series 2000™**	**N/A**	**1997**	**1997**	**N/A**	**168,000 gal/hr**	**All Products**
4	**All Products Storage Tank (T-21)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**18,759 bbl**	**All Products**
4	**All Products Storage Tank (T-22)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**18,761 bbl**	**All Products**
4	**All Products Storage Tank (T-23)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**10,392 bbl**	**All Products**
4	**All Products Storage Tank (T-24)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**10,392 bbl**	**All Products**
4	**All Products Storage Tank (T-25)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**4,400 bbl**	**All Products**
4	**All Products Storage Tank (T-29)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**2,619 bbl**	**All Products**
4	**All Products Storage Tank (T-30)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**9,430 bbl**	**All Products**
4	**All Products Storage Tank (T-31)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**10,392 bbl**	**All Products**
4	**All Products Storage Tank (T-32)**	**N/A**	**N/A**	**N/A**	**1958**	**1958**	**N/A**	**49,796 bbl**	**All Products**
4	**All Products Storage Tank (T-33)**	**N/A**	**N/A**	**N/A**	**1962**	**1962**	**N/A**	**18,765 bbl**	**All Products**
4	**All Products Storage Tank (T-35)**	**N/A**	**N/A**	**N/A**	**1970**	**1970**	**N/A**	**18,800 bbl**	**All Products**
4	**All Products Storage Tank (T-36)**	**N/A**	**N/A**	**N/A**	**2024**	**2024**	**N/A**	**75,000 bbl**	**All Products**
5	**Distillate Storage Tank (T-1)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**7,760 bbl**	**Distillate**
5	**Distillate Storage Tank (T-2)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**5,140 bbl**	**Distillate**
5	**Distillate Storage Tank (T-26)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**4,709 bbl**	**Distillate**
5	**Distillate Storage Tank (T-27)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**4,709 bbl**	**Distillate**
5	**Distillate Storage Tank (T-28)**	**N/A**	**N/A**	**N/A**	**1954**	**1954**	**N/A**	**4,709 bbl**	**Distillate**
6	**Additives Storage Tank (T-51)**	**N/A**	**N/A**	**N/A**	**1989**	**1989**	**N/A**	**242 bbl**	**Additives**
6	**Comingle Storage Tank (T-52)**	**N/A**	**N/A**	**N/A**	**1989**	**1989**	**N/A**	**242 bbl**	**Comingle**
6	**Additives Storage Tank (T-101)**	**N/A**	**N/A**	**N/A**	**1983**	**1983**	**N/A**	**234 bbl**	**Additives**

Unit Number and Description[1]		Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date[2]	Process Rate or Capacity (Hp, kW, Btu, ft^3, lbs, tons, yd^3, etc.)[3]	Fuel Type
6	**Additives Storage Tank (T-102)**	**N/A**	**N/A**	**N/A**	**1983**	**1983**	**N/A**	**47 bbl**	**Additives**
6	**Additives Storage Horizontal Tote Tank – Lubricity for Diesel (T-105)**	**N/A**	**N/A**	**N/A**	**2020**	**2020**	**N/A**	**550 gal (13 bbl)**	**Additives – Lubricity for Diesel**
7	**Comingle Storage Tank (T-40)**	**N/A**	**N/A**	**N/A**	**Unknown**	**Unknown**	**N/A**	**199 bbl**	**Comingle**
7	**Tank for vapor Drop-Out for the VRU (T-41)**	**N/A**	**N/A**	**N/A**	**Unknown**	**Unknown**	**N/A**	**120 bbl**	**Vapor Drop Out VRU**
7	**Comingle Storage Tank (T-42)**	**N/A**	**N/A**	**N/A**	**Unknown**	**Unknown**	**N/A**	**13 bbl**	**Comingle**
7	**Comingle Storage Tank (T-43)**	**N/A**	**N/A**	**N/A**	**Unknown**	**Unknown**	**N/A**	**24 bbl**	**Comingle**
7	**Comingle Storage Tank (T-44)**	**N/A**	**N/A**	**N/A**	**Unknown**	**Unknown**	**N/A**	**238 bbl**	**Comingle**
8	**Equipment Fugitives**	**N/A**	**N/A**	**N/A**	**N/A**	**1954**	**2024**	**N/A**	**All Products**
9	**Railcar Off-Load Stations**	**N/A**	**N/A**	**N/A**	**N/A**	**1989**	**N/A**	**N/A**	**All Products**
10	**Truck Off-Load Stations**	**N/A**	**N/A**	**N/A**	**N/A**	**1989**	**N/A**	**N/A**	**All Products**
11	**Loading Rack Vapor Combustion Unit (VCU)**	**Jordan Technologies**	**PVCU 300**	**TBD**	**2024**	**2024**	**N/A**	**60 MMBtu/hr**	**All Products**

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.
2. To determine whether a unit has been modified, evaluate if changes have been made to the unit that impact emissions or that trigger modification as defined in 20.11.41.7(U) NMAC. If not, put N/A.
3. Basis for Equipment Process Rate or Capacity (*e.g.*, Manufacturer's Data, Field Observation/Test, etc.) **Manufacturer's Data**
   Submit information for each unit as an attachment.

"All Products" referes to any material with a Reid vapor pressure equal to or less than gasoline, including gasoline, ethanol, additives, and diesel fuel.

"Distillate" includes diesel fuel oil, ethanol, denatured ethanol, jet fuel, biodiesel, transmix, and other similar petroleum products.

"Additives" refers to any organic compound or proprietary blend of organic compounds used mainly for improving the combustion qualities of gasoline or diesel motor fuels. Additives are added to gasoline or diesel usually at the loading rack, and the exact composition of these materials are varied in accordance with market demands and consumer requirements. Additives, for bulk terminal storage purposes, may include (but are not limited to) Additive OGA 72015, Additive OAG 72308, and BK 50 red dye for diesel fuel.

Emissions Control Equipment Table

Control Equipment Units listed on this Table should either match up to the same Unit number as listed on the Regulated Emission Sources, Controlled Emissions and Stack Parameters Tables (if the control equipment is integrated with the emission unit) or should have a distinct Control Equipment Unit Number and that number should then also be listed on the Stack Parameters Table.

Control Equipment Unit Number and Description		Controlling Emissions for Unit Number(s)	Manufacturer	Model # | Serial #	Date Installed	Controlled Pollutant(s)	% Control Efficiency[1]	Method Used to Estimate Efficiency	Rated Process Rate or Capacity or Flow
11	**Loading Rack Vapor Combustion Unit (VCU)**	**3**	**Jordan Technologies**	**PVCU 300 | TBD**	**TBD**	**VOC, HAP**	**98%**	**Manufacturer's Data**	**60 MMBtu/hr**

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Basis for Control Equipment % Efficiency (*e.g.*, Manufacturer's Data, Field Observation/Test, AP-42, etc.). **Manufacturer's data, AP-42 Table 1.4-1 & 2** Submit information for each unit as an attachment.

Exempted Sources and Exempted Activities Table

See 20.11.41 NMAC for exemptions.

Unit Number and Description	Manufacturer	Model #	Serial #	Manufacture Date	Installation Date	Modification Date[1]	Process Rate or Capacity (Hp, kW, Btu, ft^3, lbs, tons, yd^3, etc.)[2]	Fuel Type
N/A								

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. To determine whether a unit has been modified, evaluate if changes have been made to the unit that impact emissions or that trigger modification as defined in 20.11.41.7(U) NMAC. Also, consider if any changes that were made alter the status from exempt to non-exempt. If not, put N/A.
2. Basis for Equipment Process Rate or Capacity (*e.g.*, Manufacturer's Data, Field Observation/Test, etc.) **N/A**
   Submit information for each unit as an attachment.

Uncontrolled Emissions Table

(Process potential under physical/operational limitations during a 24 hr/day and 365 day/year = 8760 hrs)

Regulated Emission Units listed on this Table should match up to the same numbered line and Unit as listed on the Regulated Emissions and Controlled Tables. List total HAP values per Emission Unit if overall HAP total for the facility is ≥ 1 ton/yr.

Unit Number*	Nitrogen Oxides (NO_X)		Carbon Monoxide (CO)		Nonmethane Hydrocarbons/Volatile Organic Compounds (NMHC/VOCs)		Sulfur Dioxide (SO_2)		Particulate Matter ≤ 10 Microns (PM_{10})		Particulate Matter ≤ 2.5 Microns ($PM_{2.5}$)		Hazardous Air Pollutants (HAPs)		Method(s) used for Determination of Emissions (AP-42, Material Balance, Field Tests, etc.)
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	
2	**-**	**-**	**-**	**-**	**5.37**	**23.54**	**-**	**-**	**-**	**-**	**-**	**-**	**0.28**	**1.23**	**AP-42 Table 5.2-5**
3	**-**	**-**	**-**	**-**	**6.30**	**27.59**	**-**	**-**	**-**	**-**	**-**	**-**	**0.33**	**1.44**	**AP-42 Table 5.2-5**
4	**-**	**-**	**-**	**-**	**5.43**	**23.79**	**-**	**-**	**-**	**-**	**-**	**-**	**0.22**	**0.97**	**Tanks 4.0.9.d and AP-42 Chapter 7 Methodology**
6	**-**	**-**	**-**	**-**	**0.017**	**0.072**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**N/A**
8	**-**	**-**	**-**	**-**	**2.71**	**11.87**	**-**	**-**	**-**	**-**	**-**	**-**	**0.68**	**2.97**	**N/A**
11	**0.0060**	**0.026**	**0.0050**	**0.022**	**0.00033**	**0.0015**	**0.00034**	**0.0015**	**0.00046**	**0.0020**	**0.00046**	**0.0020**	**-**	**-**	**AP-42 Table 1.4-1 & 2**
Totals of Uncontrolled Emissions	**0.0060**	**0.026**	**0.0050**	**0.022**	**19.83**	**86.87**	**0.00034**	**0.0015**	**0.00046**	**0.0020**	**0.00046**	**0.0020**	**1.51**	**6.61**	

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

*A permit is required and this application along with the additional checklist information requested on the Permit Application checklist must be provided if:

(1) any one of these process units <u>or</u> combination of units, has an uncontrolled emission rate greater than or equal to (≥) 10 lbs/hr or 25 tons/yr for any of the above pollutants, excluding HAPs, based on 8,760 hours of operation; or

(2) any one of these process units <u>or</u> combination of units, has an uncontrolled emission rate ≥ 2 tons/yr for any single HAP or ≥ 5 tons/yr for any combination of HAPs based on 8,760 hours of operation; or

(3) any one of these process units <u>or</u> combination of units, has an uncontrolled emission rate ≥ 5 tons/yr for lead (Pb) or any combination of lead and its compounds based on 8,760 hours of operation; or

(4) any one of the process units <u>or</u> combination of units is subject to an Air Board or federal emission limit or standard.

* If all of these process units, individually <u>and</u> in combination, have an uncontrolled emission rate less than (<) 10 lbs/hr or 25 tons/yr for all of the above pollutants (based on 8,760 hours of operation), but > 1 ton/yr for any of the above pollutants, then a source registration is required. <u>A Registration is required, at minimum, for any amount of HAP emissions. Please complete the remainder of this form.</u>

Controlled Emissions Table

(Based on current operations with emission controls OR requested operations with emission controls)

Regulated Emission Units listed on this Table should match up to the same numbered line and Unit as listed on the Regulated Emissions and Uncontrolled Tables. List total HAP values per Emission Unit if overall HAP total for the facility is ≥ 1 ton/yr.

Unit Number	Nitrogen Oxides (NO_X)		Carbon Monoxide (CO)		Nonmethane Hydrocarbons/Volatile Organic Compounds (NMHC/VOCs)		Sulfur Dioxide (SO_2)		Particulate Matter ≤ 10 Microns (PM_{10})		Particulate Matter ≤ 2.5 Microns ($PM_{2.5}$)		Hazardous Air Pollutants (HAPs)		Control Method	% Efficiency[1]
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr		
2	-	-	-	-	**5.37**	**23.54**	-	-	-	-	-	-	**0.28**	**1.23**	**VCU**	**98%**
3	-	-	-	-	**6.30**	**27.59**	-	-	-	-	-	-	**0.33**	**1.44**	**N/A**	**N/A**
4	-	-	-	-	**5.43**	**23.79**	-	-	-	-	-	-	**0.22**	**0.97**	**N/A**	**N/A**
6	-	-	-	-	**0.017**	**0.072**	-	-	-	-	-	-	-	-	**N/A**	**N/A**
8	-	-	-	-	**2.71**	**11.87**	-	-	-	-	-	-	**0.68**	**2.97**	**N/A**	**N/A**
11	**0.25**	**1.10**	**0.21**	**0.92**	**0.13**	**0.55**	**0.00034**	**0.0015**	**0.00046**	**0.0020**	**0.00046**	**0.0020**	**0.0066**	**0.029**	**N/A**	**N/A**
Totals of Controlled Emissions	**0.25**	**1.10**	**0.21**	**0.92**	**20.24**	**88.65**	**0.00034**	**0.0015**	**0.00046**	**0.0020**	**0.00046**	**0.0020**	**1.51**	**6.64**		

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Basis for Control Method % Efficiency (*e.g.*, Manufacturer's Data, Field Observation/Test, AP-42, etc.). **Manufacturer's Data**
   Submit information for each unit as an attachment.

Hazardous Air Pollutants (HAPs) Emissions Table

Report the Potential Emission Rate for each HAP from each source on the Regulated Emission Sources Table that emits a given HAP. Report individual HAPs with ≥ 1 ton/yr total emissions for the facility on this table. Otherwise, report total HAP emissions for each source that emits HAPs and report individual HAPs in the accompanying application package in association with emission calculations. If this application is for a Registration solely due to HAP emissions, report the largest HAP emissions on this table and the rest, if any, in the accompanying application package.

Unit Number	Total HAPs		Hexane		Benzene		Toluene		2,2,4-Trimethylpentane		Xylene	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
2	0.28	1.23	0.048	0.21	0.086	0.38	0.043	0.19	-	-	0.027	0.12
3	0.33	1.44	0.057	0.25	0.10	0.44	0.050	0.22	-	-	0.031	0.14
4	0.22	0.97	0.033	0.15	0.032	0.14	0.057	0.25	0.053	0.23	0.027	0.12
6	-	-	-	-	-	-	-	-	-	-	-	-
8	0.68	2.97	-	-	-	-	-	-	-	-	-	-
11	6.56E-03	0.029	1.13E-03	4.97E-03	2.02E-03	8.83E-03	1.01E-03	4.41E-03	-	-	6.30E-04	2.76E-03
Totals of HAPs for all units:	**1.51**	**6.64**	**0.14**	**0.61**	**0.22**	**0.97**	**0.151**	**0.66**	**0.053**	**0.23**	**0.086**	**0.37**

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

Use Instructions: Copy and paste the HAPs table here if need to list more individual HAPs.

Purchased Hazardous Air Pollutant Table*

Product Categories (Coatings, Solvents, Thinners, etc.)	Hazardous Air Pollutant (HAP), or Volatile Hazardous Air Pollutant (VHAP) Primary To The Representative As Purchased Product	Chemical Abstract Service (CAS) Number of HAP or VHAP from Representative As Purchased Product	HAP or VHAP Concentration of Representative As Purchased Product (pounds/gallon, or %)	Concentration Determination (CPDS, SDS, etc.)[1]	Total Product Purchases For Category	(-)	Quantity of Product Recovered & Disposed For Category	(=)	Total Product Usage For Category
N/A									

NOTE: To add extra rows in Word, click anywhere in the second-to-last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

NOTE: Product purchases, recovery/disposal and usage should be converted to the units listed in this table. If units cannot be converted please contact the Air Quality Program prior to making changes to this table.

1. Submit, as an attachment, information on one (1) product from each Category listed above which best represents the average of all the products purchased in that Category. CPDS = Certified Product Data Sheet; SDS = Safety Data Sheet

*** A Registration is required, at minimum, for any amount of HAP or VHAP emission.**
Emissions from purchased HAP usage should be accounted for on previous tables as appropriate.
A permit may be required for these emissions if the source meets the requirements of 20.11.41 NMAC.

Material and Fuel Storage Table

(*E.g.*, Tanks, barrels, silos, stockpiles, etc.)

Storage Equipment		Product Stored	Capacity (bbls, tons, gals, acres, etc.)	Above or Below Ground	Construction (Welded, riveted) & Color	Installation Date	Loading Rate[1]	Offloading Rate[1]	True Vapor Pressure	Control Method	Seal Type	% Eff.[2]
4 (T-21)	**Tank**	**All Products**	**18,759 bbl**	**Above**	**Welded/ White**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe/Rim-Mounted**	**N/A**
4 (T-22)	**Tank**	**All Products**	**18,761 bbl**	**Above**	**Welded/ White**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe/Rim-Mounted**	**N/A**
4 (T-23)	**Tank**	**All Products**	**10,392 bbl**	**Above**	**Welded/ White**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe/Rim-Mounted**	**N/A**
4 (T-24)	**Tank**	**All Products**	**10,392 bbl**	**Above**	**Welded/ White**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe/Rim-Mounted**	**N/A**
4 (T-25)	**Tank**	**All Products**	**4,400 bbl**	**Above**	**Welded/ White**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe**	**N/A**
4 (T-29)	**Tank**	**All Products**	**2,619 bbl**	**Above**	**Welded/ White**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe**	**N/A**
4 (T-30)	**Tank**	**All Products**	**9,430 bbl**	**Above**	**Welded/ White**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe**	**N/A**
4 (T-31)	**Tank**	**All Products**	**10,392 bbl**	**Above**	**Welded/ White**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe/Rim-Mounted**	**N/A**
4 (T-32)	**Tank**	**All Products**	**49,796 bbl**	**Above**	**Welded/ White**	**1958**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe**	**N/A**
4 (T-33)	**Tank**	**All Products**	**18,765 bbl**	**Above**	**Welded/ White**	**1962**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe/Rim-Mounted**	**N/A**
4 (T-35)	**Tank**	**All Products**	**18,800 bbl**	**Above**	**Welded/ White**	**1970**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe**	**N/A**
4 (T-36)	**Tank**	**All Products**	**75,000 bbl**	**Above**	**Welded/ White**	**2024**	**N/A**	**N/A**	**N/A**	**N/A**	**Mechanical Shoe**	**N/A**
5 (T-1)	**Tank**	**Distillate**	**7,760 bbl**	**Above**	**N/A**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
5 (T-2)	**Tank**	**Distillate**	**5,140 bbl**	**Above**	**N/A**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
5 (T-26)	**Tank**	**Distillate**	**4,709 bbl**	**Above**	**N/A**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
5 (T-27)	**Tank**	**Distillate**	**4,709 bbl**	**Above**	**N/A**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
5 (T-28)	**Tank**	**Distillate**	**4,709 bbl**	**Above**	**N/A**	**1954**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
6 (T-51)	**Tank**	**Additives**	**242 bbl**	**Above**	**N/A**	**1989**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
6 (T-52)	**Tank**	**Comingle**	**242 bbl**	**Above**	**N/A**	**1989**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
6 (T-101)	**Tank**	**Additives**	**234 bbl**	**Above**	**N/A**	**1983**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
6 (T-102)	**Tank**	**Additives**	**47 bbl**	**Above**	**N/A**	**1983**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Storage Equipment		Product Stored	Capacity (bbls, tons, gals, acres, etc.)	Above or Below Ground	Construction (Welded, riveted) & Color	Installation Date	Loading Rate[1]	Offloading Rate[1]	True Vapor Pressure	Control Method	Seal Type	% Eff.[2]
6 (T-105)	**Tank**	**Additives – Lubricity for Diesel**	**550 gal (13 bbl)**	**Above**	**N/A**	**2020**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
7 (T-40)	**Tank**	**Comingle**	**199 bbl**	**Above**	**N/A**	**Unknown**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
7 (T-41)	**Tank**	**Vapor Drop Out VRU**	**120 bbl**	**Above**	**N/A**	**Unknown**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
7 (T-42)	**Tank**	**Comingle**	**13 bbl**	**Above**	**N/A**	**Unknown**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
7 (T-43)	**Tank**	**Comingle**	**24 bbl**	**Above**	**N/A**	**Unknown**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
7 (T-44)	**Tank**	**Comingle**	**238 bbl**	**Above**	**N/A**	**Unknown**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

1. Basis for Loading/Offloading Rate (*e.g.*, Manufacturer's Data, Field Observation/Test, etc.). **N/A**
   Submit information for each unit as an attachment.
2. Basis for Control Method % Efficiency (*e.g.*, Manufacturer's Data, Field Observation/Test, AP-42, etc.). **N/A**
   Submit information for each unit as an attachment.

Stack Parameters Table

If any equipment from the Regulated Emission Sources Table is also listed in this Stack Table, use the same numbered line for the emission unit on both tables to show the association between the Process Equipment and its stack.

Unit Number and Description		Pollutant (CO, NOx, PM_{10}, etc.)	UTM Easting (m)	UTM Northing (m)	Stack Height (ft)	Stack Exit Temp. (°F)	Stack Velocity (fps)	Stack Flow Rate (acfm)	Stack Inside Diameter (ft)	Stack Type
11	**VCU**	**NO_x, CO, VOC, PM_{10}, $PM_{2.5}$, HAP**	**349883**	**3879466**	**13.10**	**650**	**8.53**	**25,714**	**8.00**	**Vertical**

NOTE: To add extra rows in Word, click anywhere in the last row. A plus (+) sign should appear on the bottom right corner of the row. Click the plus (+) sign to add a row. Repeat as needed.

Certification

NOTICE REGARDING SCOPE OF A PERMIT: The Environmental Health Department's issuance of an air quality permit only authorizes the use of the specified equipment pursuant to the air quality control laws, regulations and conditions. Permits relate to air quality control only and are issued for the sole purpose of regulating the emission of air contaminants from said equipment. Air quality permits are not a general authorization for the location, construction and/or operation of a facility, nor does a permit authorize any particular land use or other form of land entitlement. It is the applicant's/permittee's responsibility to obtain all other necessary permits from the appropriate agencies, such as the City of Albuquerque Planning Department or Bernalillo County Department of Planning and Development Services, including but not limited to site plan approvals, building permits, fire department approvals and the like, as may be required by law for the location, construction and/or operation of a facility. For more information, please visit the City of Albuquerque Planning Department website at https://www.cabq.gov/planning and the Bernalillo County Department of Planning and Development Services website at https://www.bernco.gov/planning.

NOTICE REGARDING ACCURACY OF INFORMATION AND DATA SUBMITTED: Any misrepresentation of a material fact in this application and its attachments is cause for denial of a permit or revocation of part or all of the resulting registration or permit, and revocation of a permit for cause may limit the permitee's ability to obtain any subsequent air quality permit for ten (10) years. Any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained under the Air Quality Control Act, NMSA 1978 §§ 74-2-1 to 74-2-17, is guilty of a misdemeanor and shall, upon conviction, be punished by a fine of not more than ten thousand dollars ($10,000) per day per violation or by imprisonment for not more than twelve months, or by both.

I, the undersigned, hereby certify that I have knowledge of the information and data represented and submitted in this application and that the same is true and accurate, including the information and date in any and all attachments, including without limitation associated forms, materials, drawings, specifications, and other data. I also certify that the information represented gives a true and complete portrayal of the existing, modified existing, or planned new stationary source with respect to air pollution sources and control equipment. I understand that there may be significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations. I also understand that the person who has applied for or has been issued an air quality permit by the Department is an obligatory party to a permit appeal filed pursuant to 20.11.81 NMAC. Further, I certify that I am qualified and authorized to file this application, to certify the truth and accuracy of the information herein, and bind the source. Moreover, I covenant and agree to comply with any requests by the Department for additional information necessary for the Department to evaluate or make a final decision regarding the application.

Signed this 16th day of December, 20 24

JP Fjeld-Hansen
Print Name

Executive Vice President
Print Title

Signature

Role: ☐ Owner ☐ Operator

☑ Other Authorized Representative

City of Albuquerque
Environmental Health Department
Air Quality Program

Permit Application Review Fee Instructions

All source registration and construction permit applications for stationary or portable sources shall be charged an application review fee according to the fee schedule in 20.11.2 NMAC. These filing fees are required for both new construction, reconstruction, and permit modification/revision applications. Most air quality notification (AQN) applications shall be charged an application review fee according to 20.11.39 NMAC. Qualified small businesses as defined in 20.11.2 NMAC may be eligible to pay one-half of the application review fees and 100% of all applicable federal program review fees.

Please fill out the permit application review fee checklist completely and submit with a check or money order payable to the "City of Albuquerque Fund 242" and:

1. Deliver it in person to the Albuquerque Environmental Health Department, 3rd floor, Room 3023, Albuquerque-Bernalillo County Government Center, south building, One Civic Plaza NW, Albuquerque, NM 87102; or

2. Mail it to Albuquerque Environmental Health Department, Air Quality Program, Permitting Division, P.O. Box 1293, Albuquerque, NM 87103; or

3. Online fee payments are now accepted as well. Application must be submitted first, then Department will provide invoice for online payment. Fill out form completely and mark check box below fee amount due on last page to request an invoice to pay the fee online.

The Department will provide a receipt of payment to the applicant. The person delivering or filing a submittal shall attach a copy of the receipt of payment to the submittal as proof of payment. Application review fees shall not be refunded without the written approval of the manager. If a refund is requested, a reasonable professional service fee to cover the costs of staff time involved in processing such requests shall be assessed. Please refer to 20.11.2 NMAC (effective January 10, 2011) for more detail concerning the "Fees" regulation as this checklist does not relieve the applicant from any applicable requirement of the regulation.

City of Albuquerque
Environmental Health Department
Air Quality Program

Permit Application Review Fee Checklist Effective January 1, 2025 – December 31, 2025

Please completely fill out the information in each section. Incompleteness of this checklist may result in the Albuquerque Environmental Health Department not accepting the application review fees. If you should have any questions concerning this checklist, please call (505) 768-1972.

I. COMPANY INFORMATION:

Company Name	ABQ Terminal, LLC	
Company Address	2929 Allen Parkway, Ste. 4100, Houston, TX 77019	
Facility Name	Albuquerque Terminal	
Facility Address	3200 Broadway Blvd SE, Albuquerque, NM 87105	
Contact Person	Kevin Sokolowski	
Contact Person Phone Number/Email	(346) 397-7792	
Are these application review fees for an existing permitted source located within the City of Albuquerque or Bernalillo County?	**Yes** ☒	**No** ☐
If yes, what is the current permit number for this facility?	**Permit #** 0047-M2-5AR	
Is this application review fee for a Qualified Small Business as defined in 20.11.2 NMAC? (See Definition of Qualified Small Business on Page 4)	**Yes** ☐	**No** ☒

II. STATIONARY SOURCE APPLICATION REVIEW FEES:
If the application is for a new stationary source facility, please check all that apply. If this application is for a modification to an existing permit please see Section III. For revisions or relocations please see Sections IV or V.

Check All That Apply	Stationary Sources	Review Fee	Program Element
	Air Quality Notifications		
☐	AQN New Application	$701.00	2801
☐	AQN Technical Amendment	$383.00	2802
☐	AQN Transfer of a Prior Authorization	$383.00	2803
☒	*Not Applicable*	*See Sections Below*	
	Stationary Source Review Fees (Not Based on Proposed Allowable Emission Rate)		
☐	Source Registration required by 20.11.40 NMAC	$715.00	2401
☐	A Stationary Source that requires a permit pursuant to 20.11.41 NMAC or other board regulations and are not subject to the below proposed allowable emission rates	$1,429.00	2301
☒	*Not Applicable*	*See Sections Below*	
	Stationary Source Review Fees (Based on the Proposed Allowable Emission Rate for the single highest fee pollutant)		
☐	Proposed Allowable Emission Rate equal to or greater than 1 tpy and less than 5 tpy	$1,072.00	2302
☐	Proposed Allowable Emission Rate equal to or greater than 5 tpy and less than 25 tpy	$2,144.00	2303
☐	Proposed Allowable Emission Rate equal to or greater than 25 tpy and less than 50 tpy	$4,288.00	2304
☐	Proposed Allowable Emission Rate equal to or greater than 50 tpy and less than 75 tpy	$6,432.00	2305
☐	Proposed Allowable Emission Rate equal to or greater than 75 tpy and less than 100 tpy	$8,577.00	2306
☐	Proposed Allowable Emission Rate equal to or greater than 100 tpy	$10,721.00	2307
☒	*Not Applicable*	*See Sections Below*	

	Federal Program Review Fees for each subpart (In addition to the Stationary Source Application Review Fees above)		
☐	40 CFR 60 – "New Source Performance Standards" (NSPS)	$1,429.00	2308
☐	40 CFR 61 – "National Emission Standards for Hazardous Air Pollutants" (NESHAPs)	$1,429.00	2309
☐	40 CFR 63 – (NESHAPs) Promulgated Standards	$1,429.00	2310
☐	20.11.64 – (NESHAPs) Case-by-Case MACT Review (Major HAP sources)	$14,294.00	2311
☐	20.11.61 NMAC – Prevention of Significant Deterioration (PSD) Permit	$7,147.00	2312
☐	20.11.60 NMAC – Non-Attainment Area Permit	$7,147.00	2313
☒	*Not Applicable*	*Not Applicable*	

III. MODIFICATION TO EXISTING PERMIT APPLICATION REVIEW FEES:

If the application is for a modification to an existing permit, please check all that apply. If this application is for a new stationary source facility, please see Section II. For revisions or relocations please see Sections IV or V.

Check All That Apply	Modifications	Review Fee	Program Element
	Modification Application Review Fees (Not Based on Proposed Allowable Emission Rate)		
☐	Proposed modification to an existing Source Registration required by 20.11.40 NMAC	$715	2401
☒	Proposed modification to an existing stationary source that requires a permit pursuant to 20.11.41 NMAC or other board regulations and are not subject to the below proposed allowable emission rates	$1,429	2321
☐	*Not Applicable*	*See Sections Below*	
	Modification Application Review Fees (Based on the Proposed Allowable Emission Rate for the single highest fee pollutant)		
☐	Proposed Allowable Emission Rate equal to or greater than 1 tpy and less than 5 tpy	$1,072.00	2322
☐	Proposed Allowable Emission Rate equal to or greater than 5 tpy and less than 25 tpy	$2,144.00	2323
☐	Proposed Allowable Emission Rate equal to or greater than 25 tpy and less than 50 tpy	$4,288.00	2324
☐	Proposed Allowable Emission Rate equal to or greater than 50 tpy and less than 75 tpy	$6,432.00	2325
☒	Proposed Allowable Emission Rate equal to or greater than 75 tpy and less than 100 tpy	$8,577.00	2326
☐	Proposed Allowable Emission Rate equal to or greater than 100 tpy	$10,721.00	2327
☐	*Not Applicable*	*See Sections Below*	
	Major Modifications Review Fees (In addition to the Modification Application Review Fees above)		
☐	20.11.60 NMAC – Permitting in Non-Attainment Areas	$7,147.00	2333
☐	20.11.61 NMAC – Prevention of Significant Deterioration	$7,147.00	2334
☒	*Not Applicable*	*Not Applicable*	
	Federal Program Review Fees for each subpart (This section applies only if a Federal Program Review is triggered by the proposed modification) (These fees are in addition to the Modification and Major Modification Application Review Fees above)		
☒	40 CFR 60 – "New Source Performance Standards" (NSPS)	$1,429.00	2328
☐	40 CFR 61 – "National Emission Standards for Hazardous Air Pollutants" (NESHAPs)	$1,429.00	2329
☐	40 CFR 63 – (NESHAPs) Promulgated Standards	$1,429.00	2330
☐	20.11.64 – (NESHAPs) Case-by-Case MACT Review (Major HAP sources)	$14,294.00	2331
☐	20.11.61 NMAC – Prevention of Significant Deterioration (PSD) Permit	$7,147.00	2332
☐	20.11.60 NMAC – Non-Attainment Area Permit	$7,147.00	2333
☐	*Not Applicable*	*Not Applicable*	

IV. ADMINISTRATIVE AND TECHNICAL REVISION APPLICATION REVIEW FEES:
If the application is for an administrative or technical revision of an existing permit issued pursuant to 20.11.40 or 20.11.41 NMAC, please check one that applies.

Check One	Revision Type	Review Fee	Program Element
☐	Administrative Revisions	$250.00	2340
☐	Technical Revisions	$500.00	2341
☒	*Not Applicable*	*See Sections II, III or V*	

V. PORTABLE STATIONARY SOURCE RELOCATION FEES:
If the application is for a portable stationary source relocation of an existing permit, please check one that applies.

Check One	Portable Stationary Source Relocation Type	Review Fee	Program Element
☐	No New Air Dispersion Modeling Required	$500.00	2501
☐	New Air Dispersion Modeling Required	$750.00	2502
☒	*Not Applicable*	*See Sections II, III or IV*	

VI. Please submit payment in the amount shown for the total application review fee.

Section Totals	Review Fee Amount
Section II Total	$0.00
Section III Total	$11,435.00
Section IV Total	$0.00
Section V Total	$0.00
Total Application Review Fee	**$11,435.00**

☐ **Check here if an invoice is requested so Application Review Fee can be paid online.**

I, the undersigned, a responsible officer of the applicant company, certify that to the best of my knowledge, the information stated on this checklist gives a true and complete representation of the permit application review fees which are being submitted. I also understand that an incorrect submittal of permit application reviews may cause an incompleteness determination of the submitted permit application and that the balance of the appropriate permit application review fees shall be paid in full prior to further processing of the application.

Signed this _______ day of _________________ , 20 _______

_________________________________ Print Name

_________________________________ Print Title

_________________________________ Signature

Definition of Qualified Small Business as defined in 20.11.2 NMAC:
"Qualified small business" means a business that meets all of the following requirements:
(1) a business that has 100 or fewer employees;
(2) a small business concern as defined by the federal Small Business Act;
(3) a source that emits less than 50 tons per year of any individual regulated air pollutant, or less than 75 tons per year of all regulated air pollutants combined; and
(4) a source that is not a major source or major stationary source.

Note: Beginning January 1, 2011, and every January 1 thereafter, an increase based on the consumer price index shall be added to the application review fees. The application review fees established in Subsection A through D of 20.11.2.18 NMAC shall be adjusted by an amount equal to the increase in the consumer price index for the immediately-preceding year. Application review fee adjustments equal to or greater than fifty cents ($0.50) shall be rounded up to the next highest whole dollar. Application review fee adjustments totaling less than fifty cents ($0.50) shall be rounded down to the next lowest whole dollar. The department shall post the application review fees on the city of Albuquerque environmental health department air quality program website.

IV. ADMINISTRATIVE AND TECHNICAL REVISION APPLICATION REVIEW FEES:

If the permit application is for an administrative or technical revision of an existing permit issued pursuant to 20.11.41 NMAC, please check one that applies.

Check One	Revision Type	Review Fee	Program Element
☐	Administrative Revisions	$250.00	2340
☐	Technical Revisions	$500.00	2341
☒	*Not Applicable*	*See Sections II, III or V*	

V. PORTABLE STATIONARY SOURCE RELOCATION FEES:

If the permit application is for a portable stationary source relocation of an existing permit, please check one that applies.

Check One	Portable Stationary Source Relocation Type	Review Fee	Program Element
☐	No New Air Dispersion Modeling Required	$500.00	2501
☐	New Air Dispersion Modeling Required	$750.00	2502
☒	*Not Applicable*	*See Sections II, III or IV*	

VI. Please submit payment in the amount shown for the total application review fee.

Section Totals	Review Fee Amount
Section II Total	$0.00
Section III Total	$0.00
Section IV Total	$11,082.00
Section V Total	$0.00
Total Application Review Fee	**$11,082.00**

I, the undersigned, a responsible official of the applicant company, certify that to the best of my knowledge, the information stated on this checklist, give a true and complete representation of the permit application review fees which are being submitted. I also understand that an incorrect submittal of permit application reviews may cause an incompleteness determination of the submitted permit application and that the balance of the appropriate permit application review fees shall be paid in full prior to further processing of the application.

Signed this 13 day of December, 20 24

JP Fjeld-Hansen
Print Name

Executive Vice President
Print Title

Signature

Definition of Qualified Small Business as defined in 20.11.2 NMAC:

"Qualified small business" means a business that meets all of the following requirements:

(1) a business that has 100 or fewer employees;
(2) a small business concern as defined by the federal Small Business Act;
(3) a source that emits less than 50 tons per year of any individual regulated air pollutant, or less than 75 tons per year of all regulated air pollutants combined; and
(4) a source that is not a major source or major stationary source.

Note: Beginning January 1, 2011, and every January 1 thereafter, an increase based on the consumer price index shall be added to the application review fees. The application review fees established in Subsection A through D of 20.11.2.18 NMAC shall be adjusted by an amount equal to the increase in the consumer price index for the immediately-preceding year. Application review fee adjustments equal to or greater than fifty cents ($0.50) shall be rounded up to the next highest whole dollar. Application review fee adjustments totaling less than fifty cents ($0.50) shall be rounded down to the next lowest whole dollar. The department shall post the application review fees on the city of Albuquerque environmental health department air quality program website.

City of Albuquerque
Environmental Health Department
Air Quality Program

Construction Permit (20.11.41 NMAC)
Application Checklist

This checklist must be returned with the application

Any person seeking a new air quality permit, a permit modification, or an emergency permit under 20.11.41 NMAC (Construction Permits) shall do so by filing a written application with the Albuquerque-Bernalillo County Joint Air Quality Program, which administers and enforces local air quality laws for the City of Albuquerque ("City") and Bernalillo County ("County"), on behalf of the City Environmental Health Department ("Department").

The Department will rule an application administratively incomplete if it is missing or has incorrect information. The Department may require additional information that is necessary to make a thorough review of an application, including but not limited to technical clarifications, emission calculations, emission factor usage, additional application review fees if any are required by 20.11.2 NMAC, and new or additional air dispersion modeling.

If the Department has ruled an application administratively incomplete three (3) times, the Department will deny the permit application. Any fees submitted for processing an application that has been denied will not be refunded. If the Department denies an application, a person may submit a new application and the fee required for a new application. The applicant has the burden of demonstrating that a permit should be issued.

The following are the minimum elements that shall be included in the permit application before the Department can determine whether an application is administratively complete and ready for technical review. It is not necessary to include an element if the Department has issued a written waiver regarding the element and the waiver accompanies the application. However, the Department shall not waive any federal requirements.

At all times before the Department has made a final decision regarding the application, an applicant has a duty to promptly supplement and correct information the applicant has submitted in an application to the Department. The applicant's duty to supplement and correct the application includes but is not limited to relevant information acquired after the applicant has submitted the application and additional information the applicant otherwise determines is relevant to the application and the Department's review and decision. While the Department is processing an application, regardless of whether the Department has determined the application is administratively complete, if the Department determines that additional information is necessary to evaluate or make a final decision regarding the application, the Department may request additional information and the applicant shall provide the requested additional information.

NOTICE REGARDING PERMIT APPEALS: A person who has applied for or has been issued an air quality permit by the Department shall be an obligatory party to a permit appeal filed pursuant to 20.11.81 NMAC.

NOTICE REGARDING SCOPE OF A PERMIT: The Department's issuance of an air quality permit only authorizes the use of the specified equipment pursuant to the air quality control laws, regulations and conditions. Permits relate to air quality control only and are issued for the sole purpose of regulating the emission of air contaminants from said equipment. Air quality permits are not a general authorization for the location, construction and/or operation of a facility, nor does a permit authorize any particular land use or other form of land entitlement. It is the applicant's/permittee's responsibility to obtain all other necessary permits from the appropriate agencies, such as the City Planning Department or County Department of Planning and Development Services, including but not limited to site plan approvals, building permits, fire department approvals and the like, as may be required by law for the location, construction and/or operation of a facility. For more information, please visit the City Planning Department website at https://www.cabq.gov/planning and the County Department of Planning and Development Services website at https://www.bernco.gov/planning.

The Applicant shall:

20.11.41.13(A) NMAC – Pre-Application Requirements:

Item	Completed	N/A[1]	Waived[2]
(1) Request a pre-application meeting with the Department using the pre-application meeting request form. Include a copy of the request form submitted to the Department.	☒	☐	☐
(2) Attend the pre-application meeting. Date of pre-application meeting: **August 2, 2023**	☒	☐	☐
Pre-application meeting agenda and public notice sign checklists included with application?	☒	☐	☐

1. *Not Applicable*
2. *It is not necessary to include an element if the Department has issued a written waiver regarding the element and the waiver accompanies the application. However, the Department shall not waive any federal requirements.*

20.11.41.13(B) NMAC – Applicant's Public Notice Requirements:

Item	Included in Application	N/A[1]	Waived[2]
(1) Provide public notice in accordance with the regulation, including by certified mail or electronic copy to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are within one-half mile of the exterior boundaries of the property on which the source is or is proposed to be located.	☒	☐	☐
• Contact list of representative(s) of recognized neighborhood associations and recognized coalitions cannot be more than three months old from the application submittal date. • Include contact list provided by Department in application submittal.	☒	☐	☐
• Provide notice using the Notice of Intent to Construct form and Applicant Notice Cover Letter.	☒	☐	☐
(2) In accordance with the regulation, post and maintain in a visible location a weather proof sign provided by the Department. Include pictures in application.	☒	☐	☐
Documentary proof of all public notice requirements listed above and required by 20.11.41.13(E)(15) included with application?	☒	☐	☐

1. *Not Applicable; For emergency permits, the public notice requirements in 20.11.41.24 NMAC shall apply instead.*
2. *It is not necessary to include an element if the Department has issued a written waiver regarding the element and the waiver accompanies the application. However, the Department shall not waive any federal requirements.*

20.11.41.13(D) NMAC

Item	Included in Application
A person who is seeking a construction permit pursuant to 20.11.41 NMAC shall complete a permit application and file one complete original and one duplicate copy with the Department.	☒
• A high-quality electronic duplicate copy is required by the Department to speed up review and allow for the Department public notice to be posted online. The electronic copy must be an exact duplicate of the hardcopy original, including pages with signatures such as the application certification page. Note: Do not include financial information, such as a copy of a check, in the electronic PDF.	☒
The electronic submittal on thumb drive, unless alternate method is allowed by the Department, must also include modeling files, if applicable, and emission calculations file(s) in Microsoft Excel-compatible format.	☒

The Permit Application shall include:

20.11.41.13(E) NMAC – Application Contents

Item	Included in Application	N/A[1]	Waived[2]
(1) A complete permit application on the most recent form provided by the Department.	☒	☐	☐
(2) The application form includes:			
a. The applicant's name, street and post office address, and contact information;	☒	☐	☐
b. The facility owner/ operator's name, street address and mailing address, if different from the applicant;	☒	☐	☐
c. The consultant's name and contact information, if applicable;	☒	☐	☐
d. All information requested on the application form is included (*i.e.*, the form is complete).	☒	☐	☐
(3) The date the application was submitted to the Department.	☒	☐	☐
(4) Sufficient attachments for the following:			
a. Ambient impact analysis using an atmospheric dispersion model approved by the U.S. Environmental Protection Agency, and the Department to demonstrate compliance with the applicable National Ambient Air Quality Standards (NAAQS). *See* 20.11.1 NMAC. If you are modifying an existing source, the modeling must include the emissions of the entire source to demonstrate the impact the new or modified source(s) will have on existing plant emissions.	☒	☐	☐
b. The air dispersion model has been executed pursuant to a protocol that was approved in advance by the Department.	☒	☐	☐
c. Air dispersion modeling approved (or 2nd denied) protocol date: **January 11, 2024**	☒	☐	☐
d. Basis or source for each emission rate (including manufacturer's specification sheets, AP-42 section sheets, test data, or corresponding supporting documentation for any other source used).	☒	☐	☐
e. All calculations used to estimate potential emission rates and controlled/proposed emissions.	☒	☐	☐
f. Basis for the estimated control efficiencies and sufficient engineering data for verification of the control equipment operation, including if necessary, design, drawing, test report and factors which affect the normal operation.	☒	☐	☐
g. Fuel data for each existing and/or proposed piece of fuel burning equipment.	☒	☐	☐
h. Anticipated maximum production capacity of the entire facility and the requested production capacity after construction and/or modification.	☒	☐	☐
i. Stack and exhaust gas parameters for all existing and proposed emission stacks.	☒	☐	☐
(5) An operational and maintenance strategy detailing:	☒	☐	☐
a. the steps the applicant will take if a malfunction occurs that may cause emission of a regulated air contaminant to exceed a limit that is included in the permit;	☒	☐	☐
b. the nature of emissions during routine startup or shutdown of the source and the source's air pollution control equipment; and	☒	☐	☐
c. the steps the applicant will take to minimize emissions during routine startup or shutdown.	☒	☐	☐
(6) A map, such as a 7.5'-topographic quadrangle map published by the U.S. Geological Survey or a map of equivalent or greater scale, detail, and precision, including a City or County zone atlas map that shows the proposed location of each process equipment unit involved in the proposed construction, modification, or operation of the source, as applicable.	☒	☐	☐

Item	Included in Application	N/A[1]	Waived[2]
(7) An aerial photograph showing the proposed location of each process equipment unit involved in the proposed construction, modification, relocation or technical revision of the source except for federal agencies or departments involved in national defense or national security as confirmed and agreed to by the Department in writing.	☒	☐	☐
(8) A complete description of all sources of regulated air contaminants and a process flow diagram depicting the process equipment unit or units at the facility, both existing and proposed, that are proposed to be involved in routine operations and from which regulated air contaminant emissions are expected to be emitted.	☒	☐	☐
(9) A full description of air pollution control equipment, including all calculations and the basis for all control efficiencies presented, manufacturer's specifications sheets, and site layout and assembly drawings; UTM (universal transverse mercator) coordinates shall be used to identify the location of each emission unit.	☒	☐	☐
(10) A description of the equipment or methods proposed by the applicant to be used for emission measurement.	☒	☐	☐
(11) The maximum and normal operating time schedules of the source after completion of construction or modification, as applicable.	☒	☐	☐
(12) Any other relevant information as the Department may reasonably require, including without limitation:	☒	☐	☐
a. Provide an applicability determination for all potentially applicable federal regulations.	☒	☐	☐
b. Applicants shall provide documentary proof that the proposed air quality permitted use of the facility's subject property is allowed by the zoning designation of the City or County zoning laws, as applicable. Sufficient documentation includes: (i) a zoning certification from the City Planning Department or County Department of Planning and Development Services, as applicable, if the property is subject to City or County zoning jurisdiction; or (ii) a zoning verification from both planning departments if the property is not subject to City or County zoning jurisdiction.[3] A zone atlas map shall not be sufficient.	☒	☐	☐
c. Compliance History Disclosure Form[4]	☒	☐	☐
(13) The signature of the applicant, operator, owner or an authorized representative, certifying to the accuracy of all information as represented in the application and attachments, if any.	☒	☐	☐
(14) A check or money order for the appropriate application fee or fees required by 20.11.2 NMAC, *Fees*. (Online fee payments are now accepted as well. Application must be submitted first, then Department will provide invoice for online payment.)	☒	☐	☐

1. *Not Applicable*
2. *It is not necessary to include an element if the Department has issued a written waiver regarding the element and the waiver accompanies the application. However, the Department shall not waive any federal requirements.*
3. *Applicants are not required to submit documentation for the subject property's zoning designation when applying for a relocation of a portable stationary source, or a technical or administrative revision to an existing permit.*
4. *Required for applications filed pursuant to the following regulations: Construction Permits (20.11.41 NMAC); Operating Permits (20.11.42 NMAC); Nonattainment Areas (20.11.60 NMAC); Prevention of Significant Deterioration (20.11.61 NMAC); and Acid Rain (20.11.62 NMAC); except this Form shall not be required for asbestos notifications under 20.11.20.22 NMAC, and this Form shall only be required for administrative permit revision (20.11.41.28(A) NMAC) and administrative permit amendments (20.11.42.12(E)(1) NMAC) when the action requested is a transfer of ownership. Air Quality Program staff can answer basic questions about the Compliance History Disclosure Form but will not provide specific advice about which boxes to check or whether information must be disclosed. The decision about how to answer a question and whether there is information to disclose is the responsibility of applicants/permittees.*

City of Albuquerque
Environmental Health Department
Air Quality Program

Air Quality
Compliance History Disclosure Form

The Albuquerque-Bernalillo County Joint Air Quality Program ("Program") administers and enforces local air quality laws for the City of Albuquerque ("City") and Bernalillo County ("County") on behalf of the City Environmental Health Department, including the New Mexico Air Quality Control Act ("AQCA"), NMSA 1978, Sections 74-2-1 to -17. In accordance with Sections 74-2-7(P) and (S) of the AQCA, the Program may deny any permit application or revoke any permit issued pursuant to the AQCA if, within ten years immediately preceding the date of submission of the permit application, the applicant or permittee meets any one of the criteria outlined in the AQCA. The Program requires applicants to file this Compliance History Disclosure Form in order for the Program to deem an air permit application administratively complete, or issue an air permit for those permits without an initial administrative completeness determination process. Additionally, an existing permit holder (permits issued prior to the Effective Date of this Form) shall provide this Compliance History Disclosure Form to the Program upon the Program's request. Note: Program Staff can answer basic questions about this Compliance History Disclosure Form but cannot provide specific guidance or legal advice.

Instructions

1. Applications filed pursuant to the following regulations shall include this Compliance History Disclosure Form, in accordance with Section 74-2-7(S) of the AQCA: *Construction Permits* (20.11.41 NMAC); *Operating Permits* (20.11.42 NMAC); *Nonattainment Areas* (20.11.60 NMAC); *Prevention of Significant Deterioration* (20.11.61 NMAC); *Acid Rain* (20.11.62 NMAC); and *Fugitive Dust* (20.11.20 NMAC) except this Form shall not be required for asbestos notifications under 20.11.20.22 NMAC.
2. This Compliance History Disclosure Form is not site specific: responses shall be based on the applicant/permittee as an entity and not be limited to the application, site, facility or source.
3. The permittee identified on this Compliance History Disclosure Form shall match the permittee in the existing permit or new application. If the information in an existing permit needs to be changed, please contact the Program about revisions and ownership transfers.
4. Answer every question completely and truthfully, and do not leave any blank spaces. If there is nothing to disclose in answer to a particular question, check the box labeled "No" except for Question 5b. Failure to provide any of the information requested in this Compliance History Disclosure Form may constitute grounds for an incompleteness determination, application denial, or permit revocation.
5. Be especially careful not to leave out information in a way that might create an impression that you are trying to hide it. Omitting information, even unintentionally, may result in application denial or permit revocation.
6. For any required explanations, be sure to identify the question to which the explanation is responsive. If you submit any document in connection with your answer to any question, refer to it as, "Exhibit No.__", and attach it after the explanation(s) at the end of the Compliance History Disclosure Form, consecutively numbering each additional page at the top right corner.
7. The Program may require additional information to make a thorough review of an application. At all times before the Program has made a final decision regarding the application, an applicant has a duty to promptly supplement and correct information the applicant has submitted in an application to the Program. The applicant's duty to supplement and correct the application includes, but is not limited to, relevant information acquired after the applicant has submitted the application and additional information the applicant otherwise determines is relevant to the application and the Program's review and decision. While the Program is processing an application, regardless of whether the Program has determined the application is administratively complete, if the Program determines that additional information is necessary to evaluate or make a final decision regarding the application, the Program may request additional information and the applicant shall provide the requested additional information.
8. Supplementary information required by the Program may include responses to public comment received by the Program during the application review process.
9. Any fees submitted for processing an application that has been denied will not be refunded. If the Program denies an application, a person may submit a new application and the fee required for a new application. The applicant has the burden of demonstrating that a permit should be issued.

COMPLIANCE HISTORY		
A. Applicant/Permittee Name: **ABQ Terminal, LLC**		*Check Applicable Box*: ☒ Applicant ☐ Permittee
B. Time Period of Compliance Reporting (10 Years): December 13, 2014 to December 13, 2024 *Instructions: For applicants, answer the following questions with information from within the 10 years preceding the current application. For existing permit holders requested to submit this form by the Program outside of an application, answer the following questions with information from within the 10 years preceding the Program's issuance of each permit.*		
C. Questions		
1	Knowingly misrepresented a material fact in an application for a permit?	☐ Yes ☒ No
2	Refused to disclose information required by the provisions of the New Mexico Air Quality Control Act?	☐ Yes ☒ No
3	Been convicted in any court of any state or the United States of a felony related to environmental crime?	☐ Yes ☒ No
4	Been convicted in any court of any state or the United States of a crime defined by state or federal statute as involving or being in restraint of trade, price fixing, bribery, or fraud?	☐ Yes ☒ No
5a	Constructed or operated any facility for which a permit was sought, including the current application, without the required air quality permit(s) under 20.11.41 NMAC, 20.11.42 NMAC, 20.11.60 NMAC, 20.11.61 NMAC, or 20.11.62 NMAC?	☐ Yes ☒ No
5b	If "No" to question 5a, mark N/A and go to question 6. If "Yes" to question 5a, state whether each facility that was constructed or operated without the required air quality permit met at least one of the following exceptions: i. The unpermitted facility was discovered after acquisition during a timely environmental audit that was authorized by the Program or the New Mexico Environment Department; or ii. The operator of the facility, using good engineering practices and established approved calculation methodologies, estimated that the facility's emissions would not require an air permit, **and** the operator applied for an air permit within 30 calendar days of discovering that an air permit was required for the facility.	☐ Yes ☐ No ☒ N/A
6	Had any permit revoked or permanently suspended for cause under the environmental laws of any state or the United States?	☐ Yes ☒ No
7	For each "yes" answer, or "no" to 5b, please attach an explanation and supporting documentation.	

I, the undersigned, hereby certify under penalty of law that this Compliance History Disclosure Form (Form) and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. I have knowledge of the information in this Form and it is, to the best of my knowledge and belief, true, accurate, and complete. I understand that there are significant penalties for submitting false information, including denial of the application or revocation of a permit, as well as fines and imprisonment for knowing violations. If I filed an application, I covenant and agree to promptly supplement and correct information in this Form until the Program makes a final decision regarding the application. Further, I certify that I am qualified and authorized to file this Form, to certify to the truth and accuracy of the information herein, and bind the permittee and source.

Signed on January 13, 2025

JP Fjeld-Hansen
Print Name

Signature

Executive Vice President
Print Title

ABQ Terminal, LLC
Company Name

APPENDIX B. PRE-APPLICATION MEETING

- Pre-Permit Meeting Request Form (Updated November 2023)
- Pre-Permit Meeting Agenda & Public Notice Sign Checklists (Updated November 2023)

Pre-Permit Application Meeting Request Form

Air Quality Program- Environmental Health Department

Please complete appropriate boxes and email to aqd@cabq.gov or mail to:

Environmental Health Department
Air Quality Program
P.O. Box 1293
Room 3047
Albuquerque, NM 87103

Name:	**Albuquerque Terminal**
Company/Organization:	ABQ Terminal, LLC, Permit 0047-M2-3AR
Point of Contact: **(phone number and email):** **Preferred form of contact (circle one):** Phone E-mail ☑	Kevin Sokolowski Manager of Environmental Compliance Phone: (346) 397-7792 Email: Kevin.Sokolowski@Loves.com Adam Erenstein, Principal Consultant Phone: (505) 266-6611 Email: AErenstein@trinityconsultants.com
Preferred meeting date/times:	ABQ Terminal, LLC is requesting a pre-permit application meeting sometime during the week of July 31st.

Description of Project:	The proposed application will be submitted to add a vapor combustor unit (VCU) to the facility to operate during downtimes of the VRU (vapor recovery unit), a new tank, and the associated fugitive equipment sources.

City of Albuquerque

Environmental Health Department
Air Quality Program

Pre-Permit Application Meeting Checklist

Any person seeking a permit under 20.11.41 NMAC, Authority-to-Construct Permits, shall do so by filing a written application with the Department. Prior to submitting an application, the applicant shall contact the department in writing and request a pre-application meeting for information regarding the contents of the application and the application process. This checklist is provided to aid the applicant and **a copy must be submitted with the application.**

Applications that are ruled incomplete because of missing information will delay any determination or the issuance of the permit. The Department reserves the right to request additional relevant information prior to ruling the application complete in accordance with 20.11.41 NMAC.

Name: Albuquerque Terminal
Contact: Kevin Sokolowski
Company/Business: ABQ Terminal, LLC

☐ Fill out and submit a Pre-Permit Application Meeting Request form
⇒ Available online at http://www.cabq.gov/airquality

☐ Emission Factors and Control Efficiencies
Notes:

☐ Air Dispersion modeling guidelines and protocol
Notes:

☐ Department Policies
Notes:

☐ Air quality permit fees
Notes:

City of Albuquerque- Environmental Health Department
Air Quality Program- Permitting Section
Phone: (505) 768-1972 Email: aqd@cabq.gov

- Public notice requirements
  - Replacement Part 41 Implementation
    - *20.11.41.*13 B. Applicant's public notice requirements
      - Providing public notice to neighborhood association/coalitions
        - Neighborhood association:______________________________
        - Coalition: ____

        Notes:

      - Posting and maintaining a weather-proof sign

      Notes:

- Regulatory timelines
  - 30 days to rule application complete
  - 90 days to issue completed permit
  - Additional time allotted if there is significant public interest and/or a significant air quality issue
    - Public Information Hearing
    - Complex permitting action

  Notes:

City of Albuquerque- Environmental Health Department
Air Quality Program- Permitting Section
Phone: (505) 768-1972   Email: aqd@cabq.gov

APPENDIX C. NOTICE OF INTENT TO CONSTRUCT

- Notice of Intent (NOI) to Construct Form
- Applicant Notice Cover Letter (Updated November 2023)
- Email and Certified Mail Documentation of NOI Sent to Neighborhood Associations and Coalitions
- Pictures of Posted Public Notice Sign

NOTICE FROM THE APPLICANT

Notice of Intent to Apply for Air Quality Construction Permit

You are receiving this notice because the New Mexico Air Quality Control Act (20.11.41.13B NMAC) requires any owner/operator proposing to construct or modify a facility subject to air quality regulations to provide public notice by certified mail or electronic mail to designated representatives of recognized neighborhood associations and coalitions within 0.5-mile of the property on which the source is or is proposed to be located.

This notice indicates that the owner/operator intends to apply for an Air Quality Construction Permit from the Albuquerque – Bernalillo County Joint Air Quality Program. Currently, no application for this proposed project has been submitted to the Air Quality Program. Applicants are required to include a copy of this form and documentation of mailed notices with their Air Quality Construction Permit Application.

Proposed Project Information

Applicant's name and address:
Nombre y domicilio del solicitante:
Albuquerque Terminal
3200 Broadway Blvd SE
Albuquerque, NM 87105

Owner / operator's name and address:
Nombre y domicilio del propietario u operador:
ABQ Terminal, LLC
2929 Allen Parkway
Ste 4100
Houston, TX 77019

Contact for comments and inquires:
Datos actuales para comentarios y preguntas:

Name *(Nombre)*: Kevin Sokolowski
Address *(Domicilio)*: 2929 Allen Parkway, Ste. 4100, Houston, TX 77019
Phone Number *(Número Telefónico)*: (346) 397-7792
E-mail Address *(Correo Electrónico)*: Kevin.Sokolowski@loves.com

Actual or estimated date the application will be submitted to the department:
Fecha actual o estimada en que se entregará la solicitud al departamento: November 1, 2024

Description of the source:
Descripción de la fuente: Bulk Petroleum Products Terminal

Exact location of the source or proposed source:
Ubicación exacta de la fuente o fuente propuesta:
3200 Broadway Blvd SE, Albuquerque, NM 87105
UTM Zone 13, 349,904 meters E and 3,879,477 meters N

Nature of business:
Tipo de negocio: Petroleum bulk terminal receiving, storing, handling, and loading.

Process or change for which the permit is requested:
Proceso o cambio para el cuál de solicita el permiso:
Installation of one vapor combustion unit, one all products storage tank, and the modification of fugitives.

Maximum operating schedule:
Horario máximo de operaciones: 24 hours a day, 7 days a week, 52 weeks per year, 8760 hours per year

Normal operating schedule:
Horario normal de operaciones: 24 hours a day, 7 days a week, 52 weeks per year, 8760 hours per year

Preliminary estimate of the maximum quantities of each regulated air contaminant the source will emit:
Estimación preliminar de las cantidades máximas de cada contaminante de aire regulado que la fuente va a emitir:

Air Contaminant *Contaminante de aire*	**Proposed Construction Permit** *Permiso de Construcción Propuesto*		**Net Changes (for permit modification or technical revision)** *Cambio Neto de Emisiones (para modificación de permiso o revisión técnica)*	
	pounds per hour *libras por hora*	tons per year *toneladas por año*	pounds per hour *libras por hora*	tons per year *toneladas por año*
NO_x	0.25	1.10	+0.25	+1.10
CO	0.21	0.92	+0.21	+0.92
VOC	19.96	87.42	+5.96	+27.12
SO_2	0.00034	0.0015	+0.00034	+0.0015
PM_{10}	0.00046	0.0020	+0.00046	+0.0020
$PM_{2.5}$	0.00046	0.0020	+0.00046	+0.0020
HAP	1.51	6.64	+1.11	+4.88

NOTE: To add extra rows for H_2S or Pb in Word, click in a box in the last row. Click the plus (+) sign that appears on the right of the row to add a row.

Questions or comments regarding this Notice of Intent should be directed to the Applicant. Contact information is provided with the Proposed Project Information on the first page of this notice. To check the status of an Air Quality Construction Permit application, call 311 and provide the Applicant's information, or visit www.cabq.gov/airquality/air-quality-permits.

The Air Quality Program will issue a Public Notice announcing a 30-day public comment period on the permit application for the proposed project when the application is deemed complete. The Air Quality Program does not process or issue notices on applications that are deemed incomplete. More information about the air quality permitting process is attached to this notice.

Air Quality Construction Permitting Overview

This is the typical process to obtain an Air Quality Construction Permit for Synthetic Minor and Minor sources of air pollution from the Albuquerque – Bernalillo County Joint Air Quality Program.

Step 1: Pre-application Meeting: The Applicant and their consultant must request a meeting with the Air Quality Program to discuss the proposed action. If air dispersion modeling is required, Air Quality Program staff discuss the modeling protocol with the Applicant to ensure that all proposed emissions are considered.

> **Notice of Intent from the Applicant:** Before submitting their application, the Applicant is required to notify all nearby neighborhood associations and interested parties that they intend to apply for an air quality permit or modify an existing permit. The Applicant is also required to post a notice sign at the facility location.

Step 2: Administrative Completeness Review and Preliminary Technical Review: The Air Quality Program has 30 days from the day the permit is received to review the permit application to be sure that it is administratively complete. This means that all application forms must be signed and filled out properly, and that all relevant technical information needed to evaluate any proposed impacts is included. If the application is not complete, the permit reviewer will return the application and request more information from the Applicant. Applicants have three opportunities to submit an administratively complete application with all relevant technical information.

> **Public Notice from the Department:** When the application is deemed complete, the Department will issue a Public Notice announcing a 30-day public comment period on the permit application. This notice is distributed to the same nearby neighborhood associations and interested parties that the Applicant sent notices to, and published on the Air Quality Program's website.
>
> During this 30-day comment period, individuals have the opportunity to submit written comments expressing their concerns or support for the proposed project, and/or to request a Public Information Hearing. If approved by the Environmental Health Department Director, Public Information Hearings are held after the technical analysis is complete and the permit has been drafted.

Step 3: Technical Analysis and Draft Permit: Air Quality Program staff review all elements of the proposed operation related to air quality, and review outputs from advanced air dispersion modeling software that considers existing emission levels in the area surrounding the proposed project, emission levels from the proposed project, and meteorological data. The total calculated level of emissions is compared to state and federal air quality standards and informs the decision on whether to approve or deny the Applicant's permit.

Draft Permit: The permit will establish emission limits, standards, monitoring, recordkeeping, and reporting requirements. The draft permit undergoes an internal peer review process to determine if the emissions were properly evaluated, permit limits are appropriate and enforceable, and the permit is clear, concise, and consistent.

> **Public Notice from the Department:** When the technical analysis is complete and the permit has been drafted, the Department will issue a second Public Notice announcing a 30-day public comment period on the technical analysis and draft permit. This second Public Notice, along with the technical analysis documentation and draft permit, will be published on the Air Quality Program's website, and the public notice for availability of the technical analysis and draft permit will only be directly sent to those who requested further information during the first comment period.

During this second 30-day comment period, residents have another opportunity to submit written comments expressing their concerns or support for the proposed project, and/or to request a Public Information Hearing.

Possible Public Information Hearing: The Environmental Health Department Director may decide to hold a Public Information Hearing for a permit application if there is significant public interest and a significant air quality issue. If a Public Information Hearing is held, it will occur after the technical analysis is complete and the permit has been drafted.

Step 4: Public Comment Evaluation and Response: The Air Quality Program evaluates all public comments received during the two 30-day public comment periods and Public Information Hearing, if held, and updates the technical analysis and draft permit as appropriate. The Air Quality Program prepares a response document to address the public comments received, and when a final decision is made on the permit application, the comment response document is published on the Air Quality Program's website and distributed to the individuals who participated in the permit process. If no comments are received, a response document is not prepared.

Step 5: Final Decision on the Application: After public comments are addressed and the final technical review is completed, the Environmental Health Department makes a final decision on the application. If the permit application meets all applicable requirements set forth by the New Mexico Air Quality Control Act and the federal Clean Air Act, the permit is approved. If the permit application does not meet all applicable requirements, it is denied.

Notifications of the final decision on the permit application and the availability of the comment response document is published on the Air Quality Program's website and distributed to the individuals who participated in the permit process.

The Department must approve a permit application if the proposed action will meet all applicable requirements and if it demonstrates that it will not result in an exceedance of ambient air quality standards. Permit writers are very careful to ensure that estimated emissions have been appropriately identified or quantified and that the emission data used are acceptable.

The Department must deny a permit application if it is deemed incomplete three times, if the proposed action will not meet applicable requirements, if estimated emissions have not been appropriately identified or quantified, or if the emission data are not acceptable for technical reasons.

For more information about air quality permitting, visit www.cabq.gov/airquality/air-quality-permits

Fill out the required highlighted information below. Then use the Subject as the Subject line of the required public notice email(s) sent to nearby neighborhood associations/neighborhood coalitions. Copy and paste the rest of the completed information on this page into the body of the email(s) and attach the completed NOI form. If providing notice by certified mail, use this page as the cover letter and attach the NOI form.

SUBJECT: Public Notice of Proposed Air Quality Construction Permit Application ABQ Terminal, LLC, Albuquerque Terminal

Dear Neighborhood Association/Coalition Representative(s),

Why did I receive this public notice?
You are receiving this notice in accordance with New Mexico Administrative Code (NMAC) 20.11.41.13.B(1) which requires any applicant seeking an Air Quality Construction Permit pursuant to 20.11.41 NMAC to provide public notice by certified mail or electronic mail to the designated representative(s) of the recognized neighborhood associations and recognized coalitions that are within one-half mile of the exterior boundaries of the property on which the source is or is proposed to be located.

What is the Air Quality Permit application review process?
The City of Albuquerque, Environmental Health Department, Air Quality Program (Program) is responsible for the review and issuance of Air Quality Permits for any stationary source of air contaminants within Bernalillo County. Once the application is received, the Program reviews each application and rules it either complete or incomplete. Complete applications will then go through a 30-day public comment period. Within 90 days after the Program has ruled the application complete, the Program shall issue the permit, issue the permit subject to conditions, or deny the requested permit or permit modification. The Program shall hold a Public Information Hearing pursuant to 20.11.41.15 NMAC if the Director determines there is significant public interest and a significant air quality issue is involved.

What do I need to know about this proposed application?

Applicant Name	ABQ Terminal, LLC
Site or Facility Name	Albuquerque Terminal
Site or Facility Address	3200 Broadway Blvd SE, Albuquerque, NM
New or Existing Source	Existing
Anticipated Date of Application Submittal	November 1, 2024
Summary of Proposed Source to Be Permitted	This application describes operations at the ABQ Terminal, LLC Albuquerque Terminal facility located at 3200 Broadway Blvd SE in Albuquerque, NM. The facility currently operates under Authority to Construct Permit #0047-M2-3AR issued on December 18th, 2020. The purpose of this application is the addition of the following units: a vapor combustion unit (VCU) (Unit 11) that operates during the permitted vapor recovery unit (VRU) (Unit 3) downtime, one All-Products tank (T-36 under Unit 4), and updating the associated fugitive emissions (Unit 8).

What emission limits and operating schedule are being requested?
See attached Notice of Intent to Construct form for this information.

How do I get additional information regarding this proposed application?
For inquiries regarding the proposed source, contact:

- Kevin Sokolowski
- Kevin.Sokolowski@loves.com
- (346) 397-7792

For inquiries regarding the air quality permitting process, contact:

- City of Albuquerque Environmental Health Department Air Quality Program
- aqd@cabq.gov
- (505) 768-1972

Daniel Dolce

From:	Daniel Dolce
Sent:	Friday, November 1, 2024 2:09 PM
To:	bna@seanpotter.co; gcolts66@outlook.com; barelasna505@gmail.com; mbfernandez1@gmail.com; dpatriciod@gmail.com
Cc:	Adam Erenstein; Kevin Sokolowski
Subject:	Public Notice of Proposed Air Quality Construction Permit Application: ABQ Terminal, LLC
Attachments:	ABQT_NOI to Construct Request_v1.0_2024 1101.pdf

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- Kevin Sokolowski
- Kevin.Sokolowski@loves.com
- (346) 397-7792

For inquiries regarding the air quality permitting process, contact:

- City of Albuquerque Environmental Health Department Air Quality Program
- aqd@cabq.gov
- (505) 768-1972

Thank you and regards,
Daniel Dolce

Daniel Dolce
Consultant

P 505.266.6611, Ext. 3208   M 505.818.8761
Email: Daniel.Dolce@trinityconsultants.com
9400 Holly Avenue NE, Building 3, Suite B, Albuquerque, NM 87122


NO SMOKING
GRAINGER
Proposed Air Quality Construction Permit
Permiso de Construcción de Calidad del Aire Propuesta
Albuquerque Terminal
ABQ Terminal, LLC
Bulk petroleum products terminal

Proposed Air Quality Construction Permit

Permiso de Construcción de Calidad del Aire Propuesto

1. **Applicant's Name:**
   Nombre del solicitante: Albuquerque Terminal
   Owner or Operator's Name:
   Nombre del Propietario u Operador: ABQ Terminal, LLC
2. **Actual or Estimated Date the Application will be Submitted to the Department:**
   Fecha Actual o Estimada en que se Entragará la Solicitud al Departamento: November 1, 2024
3. **Exact Location of the Source or Proposed Source:** 3200 Broadway Blvd SE, Albuquerque, NM 8710
   Ubicación Excata de la Fuente o Fuente Propuesta: UTM Zone 13, 349,904 meters E and 3,878,477 meters
4. **Description of the Source:**
   Descripción de la Fuente: Bulk petroleum products terminal
   Nature of Business:
   Tipo de Negocio: Petroleum bulk terminal receiving, storing, handling, and loading
   Process or change for which a permit is requested:
   Proceso o cambio para el cuál se solicita el permiso: Installation of one (1) vapor combustion unit, one (1) all-products storage tank, and fugitive updates.

Preliminary estimate of the maximum quantities of each regulated air contaminant the source will emit:
Estimación preliminar de las cantidades máximas de cada contaminante de aire regulado que la fuente va a emitir:

Air Contaminant *Contaminante de Aire*	**Proposed Construction Permit** *Permiso de Construcción Propuesto*		**Net Change Emissions (for permit modification or technical revision)** *Cambio Neto de Emisiones (para modificación de permiso o revisión técnica)*	
	Pounds per hour *libras por hora*	Tons per year *toneladas por año*	Pounds per hour *libras por hora*	Tons per year *toneladas por año*
NO_x	0.25	1.10	+0.25	+ 1.10
CO	0.21	0.92	+0.21	+ 0.92
VOC	19.96	87.42	+5.96	+27.12
SO_2	0.00034	0.0015	+0.00034	+ 0.0015
PM_{10}	0.00046	0.0020	+ 0.00046	+ 0.0020
$PM_{2.5}$	0.00046	0.0020	+0.00046	+ 0.0020
HAP	1.51	6.64	+1.11	+ 4.88

5. **Maximum Operating Schedule:**
   Horario Máximo de Operaciones: 24 hr/day, 7 days/week, 52 weeks/year, 8760 hr/day
   Normal Operation Schedule:
   Horario Normal de Operaciones: 24 hr/day, 7 days/week, 52 weeks/year, 8760 hr/day
6. **Current Contact Information for Comments and Inquiries**
   Datos actuales para Comentarios y Preguntas

Name *(Nombre):* Kevin Sokolowski
Address *(Domicilio):* 2929 Allen Parkway, Ste. 4100, Houston, TX 77019
Phone Number *(Número Telefónico):* (346) 397-7792
Email Address *(Correo Electrónico):* Kevin.Sokolowski@loves.com

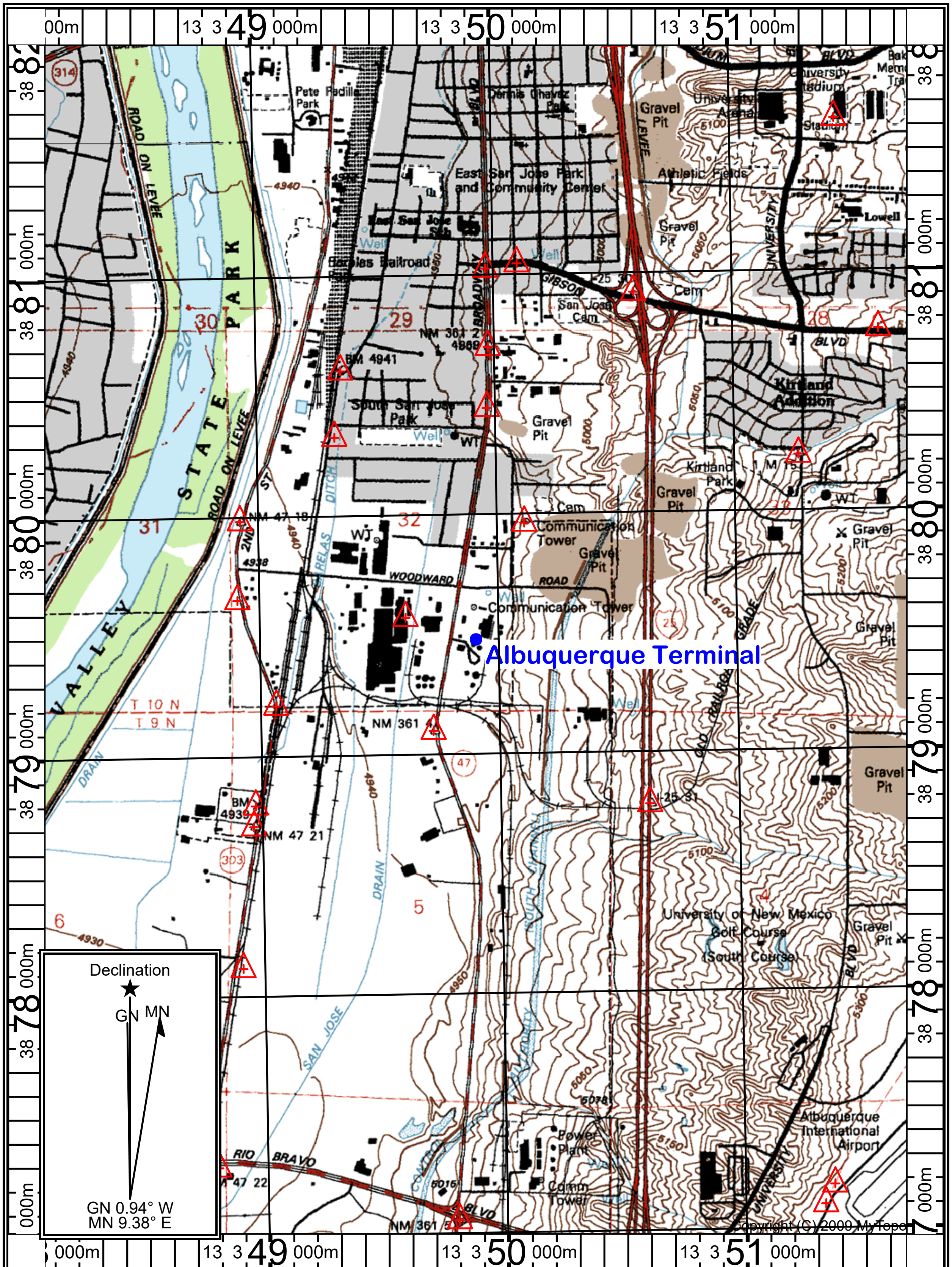
Call 311 for additional information concerning this project, the Air Quality Program, or to file a complaint.
Llame al 311 para obtener información adicional sobre este proyecto, del Programa de Calidad del Aire, o para presenter una queja.
Gọi 311 để biết thêm thông tin hoặc để khiếu nại về dự án này, Chương Trình Chất Lượng Không Khí

City of Albuquerque, Environmental Health Department, Air Quality Program – Stationary Source Permitting
Ciudad de Albuquerque, Departamento de Salud Ambiental, Programa de Calidad del Aire - Permisos para Fuentes Inmóviles
(505) 768-1972, aqd@cabq.gov

THIS SIGN SHALL REMAIN POSTED UNTIL THE DEPARTMENT TAKES FINAL ACTION ON THE PERMIT APPLICATION
ESTE AVISO DEBERÁ DE MANTENERSE PUESTO HASTA QUE EL DEPARTAMENTO TOME UNA DECISIÓN SOBRE LA SOLICITUD DE PERMISO

APPENDIX D. FACILITY LOCATION AND AERIAL PHOTOGRAPH

- Figure D-1: Facility Location
- Figure D-2: Aerial Photograph of Process Location (dated 8/19/2024)



Map Name: ALBUQUERQUE WE: Scale: 1 inch = 2,000 ft. Horizontal Datum: WGS84
Print Date: 08/23/24 Map Center: 13 0349903 E 38794

Albuquerque Terminal

Source Locations, Fenceline, and Buildings

APPENDIX E. ZONING REQUIREMENTS

The following page contains the following for zoning requirements of the Albuquerque Terminal:

- Zoning Requirement Cover Letter (Revised November 3, 2023)
- Zone Designation Letter from the City of Albuquerque

CITY OF ALBUQUERQUE PLANNING DEPARTMENT
CODE ENFORCEMENT DIVISION

REQUEST FOR ZONAL CERTIFICATION

A zoning certification letter is written confirmation provided by the City of Albuquerque referencing the zoning designation of a particular piece of property, listing certain compliance information, and whether or not the existing development on the property is considered a permitted use.

A completed certification letter includes the assigned address, legal description and zoning designation of the subject site; if applicable, reference to the overlay district, sector plan, development plan, project number and/or pertinent special exceptions(variance, conditional use approvals, etc.), and either a statement confirming zoning compliance or a brief description of any outstanding zoning code violations affecting the site.

A certification letter does not include reference to the zoning designations of abutting or nearby properties; copies of site plans, special exceptions, certificates of occupancy, or other approvals; or reference to building codes, fire codes, subdivision requirements, flood plain standards or similar development prerequisites.

There is a $200 fee plus a 2% Technolgy Fee for each separate parcel, even if the property includes multiple contiguous parcels held in single ownership. A minimum processing period of thirty (30) business days from receipt of the completed application and full payment can be expected; but depending upon the related research, necessary site inspections, and similar service demands, some certification letters may take up to 45 business days to complete.

Please return this completed application form and related fee by mail or in person to:
City of Albuquerque – Code Enforcement Division, 600 2nd St. NW, Suite 500, Albuquerque, New Mexico 87102

APPLICATION FOR ZONAL CERTIFICATION

PROPERTY TO BE CERTIFIED

ADDRESS: 3200 Broadway Blvd SE, Albuquerque, NM 87105

LOT(S)*: MAP 44 TR 64C2 EXC 0.30 AC X ALL TR 64C3A2 CONT 21.43 AC BLOCK: N/A

SUBDIVISION: Legal Description: MAP 44 TR 64C2 EXC 0.30 AC X ALL TR 64C3A2 CONT 21.43 AC

UNIFORM PROPERTY CODE*: 101405533908840121

There is a $165 research/administration fee, $35 application fee and a 2% Technology Fee ($204 total) for each separate parcel included in the property, even if there are multiple parcels held in single ownership and/or assigned the same UPC number.

APPLICANT

NAME: Albuquerque Terminal

COMPANY / ORG.: ABQ Terminal, LLC

ADDRESS: 3200 Broadway Blvd SE, Albuquerque, NM 87105

PHONE: (346) 397-7792 EMAIL: Kevin.Sokolowski@Loves.com

LETTER SHOULD BE ADDRESSED TO: ☐ SAME AS APPLICANT

NAME: Kevin Sokolowski

COMPANY/ORG.: ABQ Terminal, LLC

ADDRESS: 2929 Allen Parkway, Suite 4100, Houston, TX 77019

PHONE: (346) 397-7792 EMAIL: Kevin.Sokolowski@Loves.com

(continued on next page)

CITY OF ALBUQUERQUE PLANNING DEPARTMENT
CODE ENFORCEMENT DIVISION

APPLICATION FOR ZONAL CERTIFICATION

GENERAL PROPERTY INFORMATION

PROPERTY TYPE (retail, multi-family residential, office, etc.): Bulk Products Terminal

SITE AREA (acres or sq. ft.): 21.43 acres APPROX. AGE(S) OF EXISTING DEVELOPMENT: 70

TOTAL NUMBER OF BUILDINGS: 7 buildings

USE FOR EACH BUILDING (e.g., 5 multi-family, 1 office, 2 laundry, 1 garage, etc.): 4 office, 1 warehouse, 1 storage, 1 maintenace

FOR MULTI-FAMILY RESIDENTIAL DEVELOPMENT: N/A total number of units N/A total number of baths

N/A efficiency units

N/A 1 bedroom units

N/A 2 bedroom units

N/A 3 or more bedroom units

NUMBER OF STORIES (note if basements are present): 1 story for all buildings

GROSS FLOOR AREA (if multiple buildings, list for each): Warehouse (0.68 acres), all other buildings (<5000 ft^2)

TOTAL NUMBER OF SIGNS (both free-standing and building-mounted): 1 free-standing sign

TOTAL NUMBER OF PARKING SPACES: 16

16 standard spaces

0 handicap accessible spaces

0 motorcycle spaces

I HEREBY AUTHORIZE CITY CODE ENFORCEMENT STAFF TO INSPECT THE SUBJECT PROPERTY FOR THE PURPOSE OF DETERMINING THE STATUS OF THE EXISTING USE AND RELATED ZONING REQUIREMENTS. FURTHER, I UNDERSTAND THAT ANY AND ALL VIOLATIONS NOTED AS A RESULT OF THIS INSPECTION ARE SUBJECT TO IMMEDIATE CORRECTION.

BY: [signature] DATE: August 23, 2024
OWNER / AGENT SIGNATURE

OFFICIAL USE ONLY

ACCEPTED BY: Geraldine Delgado DATE: 8.27.24

ZONE: ______ ZAP: ______ ASSIGNED TO: ______

Technology Fee 2%

Fee:	441008 - 4919000	$200
Tech Fee:	445048 - 4910000	$ 4
Total:		$204

*Applications are not processed until all fees have been paid.

CITY OF ALBUQUERQUE

CODE ENFORCEMENT
Plaza Del Sol Building, Suite 500
600 2nd Street NW
Albuquerque, NM 87102
Tel: (505) 924-3850 Fax: (505) 924-3847

Date: December 4, 2024

VIA Email, kevin.sokolowski@loves.com
ABQ Terminal LLC
2929 Allen Parkway, Suite 4100
Houston, TX 77019

RE: 3200 Broadway Blvd. SE, Albuquerque, NM 87105 the "property".
UPC: 101405533908840121

To Whom It May Concern:

This letter will certify that according to the map on file in this office on December 4, 2024, the referenced property, legally described as: MAP 44 TR 64C2 EXC 0.30 AC X ALL TR 64C3A2 CONT 21.43 AC located in Albuquerque, Bernalillo County New Mexico is Zoned: Non-Residential Light Manufacturing (NR-LM) .

The current use of the property is Above-Ground Storage of Fuels. This site is legally non-conforming use in this zone.

This property has been inspected and it was found to be in compliance with the applicable provisions of the Integrated Development Ordinance. This property is not controlled by an approved site development plan. There are no special exemptions associated with this site. This property is within the Airport Protection Overlay Zone (Albuquerque Int'l Sunport), Kirtland AFB Military Influence Area, South Broadway Small Area and Railroad and Spur Small Area.

If you have any questions regarding this matter please contact me at (505) 924-3301 or by email at ametzgar@cabq.gov.

Sincerely:

Angelo Metzgar,
Code Compliance Manager, Code Enforcement, Planning Department

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

4-2 ALLOWABLE USES

Table 4-2-1: Allowable Uses

P = Permissive Primary C = Conditional Primary A = Permissive Accessory CA = Conditional Accessory
CV = Conditional if Structure Vacant for 5+ years T = Temporary CT = Conditional Temporary
Blank Cell = Not Allowed

Zone District >>	Residential						Mixed-use				Non-residential								Use-specific Standards
																NR-PO			
Land Uses	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	A	B	C	
PRIMARY USES THAT MAY BE ACCESSORY IN SOME ZONE DISTRICTS																			
RESIDENTIAL USES																			
Household Living																			
Dwelling, single-family detached	P	P	P	P	P		P												4-3(B)(1)
Dwelling, mobile home			P																4-3(B)(2)
Dwelling, cluster development	P	P		P	P		P												4-3(B)(3)
Dwelling, cottage development	P	P	P	P	P		P												4-3(B)(4)
Dwelling, two-family detached (duplex)		P		P	P		P												4-3(B)(5)
Dwelling, townhouse				P	P	P	P	P	P	P									4-3(B)(6)
Dwelling, live-work				C	C	P	P	P	P	P	CA	CA							4-3(B)(7)
Dwelling, multi-family					P	P	P	P	P	P		CV							4-3(B)(8)
Group Living																			
Assisted living facility or nursing home				C	P	P	P	P	P	P									
Community residential facility, small	P	P		P	P	P	P	P	P	P									4-3(B)(9)
Community residential facility, large					P	P	P	P	P	P									4-3(B)(9)
Dormitory						P	C	P	P	P									
Group home, small					C	P	P	P	P										4-3(B)(10)
Group home, medium					C	C	C	P	P	P									4-3(B)(10)
Group home, large						C			C	C									4-3(B)(10)
CIVIC AND INSTITUTIONAL USES																			
Adult or child day care facility			C	C	C	P	P	P	P	P	P	P	A	A					
BioPark																P (in D)			4-3(C)(7)
Cemetery															P				
Community center or library	C	P		P	P	P	P	P	P	P	C	C	C	C		P		C	4-3(C)(1)
Correctional facility															P				
Elementary or middle school	C	C		C	P	P	P	P	P	P	P	P	CV			P		C	4-3(C)(2)
Fire station or police station															P				
High school	C	C		C	C	P	P	P	P	P	P	P	C			P			4-3(C)(3)
Hospital									P	P	P	P							4-3(C)(4)
Museum				CV	CV	C	P	P	P	P	P	P	P	P		P	A		4-3(C)(5)
Overnight shelter									C	C	C	C	C	C					4-3(C)(6)
Parks and open space	P	P		P	P	P	P	P	P	P	P	P	C	C	A	P	P	P	4-3(C)(7)
Religious institution	P	P		P	P	P	P	P	P	P	P	P	CV	CV					4-3(C)(8)
Sports field							CV	C	P	P	P	P	P	C		P		C	

Table 4-2-1: Allowable Uses
P = Permissive Primary C = Conditional Primary A = Permissive Accessory CA = Conditional Accessory
CV = Conditional if Structure Vacant for 5+ years T = Temporary CT = Conditional Temporary
Blank Cell = Not Allowed

Zone District >>	Residential						Mixed-use				Non-residential								Use-specific Standards
Land Uses	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	NR-PO A	NR-PO B	NR-PO C	
University or college						CV	CV	C	P	P	P	P	CV	CV					
Vocational school						CV	P	P	P	P	P	P	P	P					
COMMERCIAL USES																			
Agriculture and Animal-related																			
Community garden	P	P	P	P	P	P	P	P	P	P	P	P	C	C		A	A	A	4-3(D)(1)
Equestrian facility	P																P	C	4-3(D)(2)
General agriculture	P											C	P	P			P	A	4-3(D)(3)
Kennel	C							C	C		P	P	P	P					4-3(D)(4)
Nursery	P								A		P	P	P	P		A	A		
Veterinary hospital	C						C	P	P	P	P	P	P	P					4-3(D)(5)
Other pet services	C						C	P	P	P	P	P	P	P					
Food, Beverage, and Indoor Entertainment																			
Adult entertainment												P	P	P					4-3(D)(6)
Auditorium or theater						A	A	A	P	P	P	P	P	P					4-3(D)(7)
Bar							C	C	P	P	P	P	P	P					4-3(D)(8)
Catering service									P	P	P	P	P	P					
Health club or gym			A		A	A	P	P	P	P	P	P	P	A					4-3(D)(9)
Mobile food truck court							C	P	P	P	P	P	P	C					4-3(D)(10)
Nightclub									P	P	P	P	P						4-3(D)(8)
Residential community amenity, indoor	P	P	P	P	P	P	P	P	P	P								C	4-3(D)(11)
Restaurant							C	P	P	P	P	P	P	P					4-3(D)(8)
Tap room or tasting room							C	C	P	P	P	P	P	P					4-3(D)(8)
Other indoor entertainment							C	P	P	P	P	P	P	P		P		C	4-3(D)(12)
Lodging																			
Bed and breakfast	A	CA		A	A	P	P												4-3(D)(13)
Campground or recreational vehicle park									C		P	P					A	C	4-3(D)(14)
Hotel or motel							P	P	P	P	P	P	P	P					4-3(D)(15)
Motor Vehicle-related																			
Car wash								P	P	P	P	P	P	P					4-3(D)(16)
Heavy vehicle and equipment sales, rental, fueling, and repair											P	C	P	P					4-3(D)(17)
Light vehicle fueling station								C	P	P	P	P	P	P					4-3(D)(18)
Light vehicle repair								P	P	P	P	P	P	P					4-3(D)(19)
Light vehicle sales and rental								C	P	P	P	P	P	P					4-3(D)(20)
Outdoor vehicle storage											C	C	P	P			A		4-3(D)(21)
Paid parking lot			A		A	A	C	P	P	A	P	P	P	P	A	A	A		4-3(D)(22)
Parking structure			A		A	A	CA	P	P	P	P	P	P	P	A				4-3(D)(22)
Offices and Services																			
Bank							P	P	P	P	P	P	P	CV					4-3(D)(23)

Table 4-2-1: Allowable Uses

P = Permissive Primary C = Conditional Primary A = Permissive Accessory CA = Conditional Accessory CV = Conditional if Structure Vacant for 5+ years T = Temporary CT = Conditional Temporary Blank Cell = Not Allowed

Zone District >>	Residential						Mixed-use				Non-residential								Use-specific Standards
																NR-PO			
Land Uses	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	A	B	C	
Blood services facility									C	C	C	P	P	P					
Club or event facility							C	P	P	P	P	P	P	CV		P	P	C	4-3(D)(24)
Commercial services								P	P	P	P	P	P	P					
Construction contractor facility and yard										C	P	P	P	P					4-3(D)(25)
Crematorium															P				
Medical or dental clinic							P	P	P	P	P	P	P	P					4-3(D)(26)
Mortuary								C	P	P	P	P	C		A				
Office							P	P	P	P	P	P	P	P					
Personal and business services, small							P	P	P	P	P	P	P	P					4-3(D)(27)
Personal and business services, large									P	P	P	P	P	P					4-3(D)(27)
Research or testing facility							P	P	P	P	P	P	P	P					4-3(D)(28)
Self-storage								C	C	P	P	P	P	P			A		4-3(D)(29)
Outdoor Recreation and Entertainment																			
Amphitheater										C	C	C	C	C	A	P	A	C	
Balloon Fiesta Park events and activities																P			4-3(D)(30)
Drive-in theater									C	C	C	C	C						4-3(D)(31)
Fairgrounds															P				
Residential community amenity, outdoor	P	P	P	P	P	P	P	P	P	P								A	
Stadium or racetrack															P	P			
Other outdoor entertainment	CA	CA	CA	CA	CA	CA	A	A	A	A	P	P	P	A		P		P	4-3(D)(32)
Retail Sales																			
Adult retail										P		P	P	P					4-3(D)(6)
Art gallery	CV	CV	C	P	P	P	P	P	P	P	P		P	A					4-3(D)(33)
Bakery goods or confectionery shop							C	P	P	P	P	P	P	P					
Building and home improvement materials store									C	C	P	P	P	C					4-3(D)(34)
Cannabis retail							P	P	P	P	P	P	A	A					4-3(D)(35)
Farmers' market	T		T	T	T	T	T	P	P	P	P	P	CV	CV		P	A	CA	4-3(D)(36)
General retail, small			A			A	P	P	P	P	P	P	P	P					4-3(D)(37)
General retail, medium									P	P	P	C	C						4-3(D)(37)
General retail, large									C	C	P	P							4-3(D)(37)
Grocery store								P	P	P	P		P	P					4-3(D)(38)
Liquor retail							C	A	C	C	C	C	C	C					4-3(D)(39)
Nicotine retail							CA	A	C	C	C	C	C	C					4-3(D)(40)
Pawn shop								C	P	P	P	P	P	P					4-3(D)(41)

Table 4-2-1: Allowable Uses

P = Permissive Primary C = Conditional Primary A = Permissive Accessory CA = Conditional Accessory
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Blank Cell = Not Allowed

Zone District >>	Residential						Mixed-use				Non-residential								Use-specific Standards
Land Uses	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	NR-PO A	NR-PO B	NR-PO C	
Transportation																			
Airport															P				4-3(D)(42)
Freight terminal or dispatch center												C	P	P					4-3(D)(43)
Helipad									CA	CA	A	P	P	P	A				4-3(D)(44)
Park-and-ride lot						C	C	C	P	C	C	P	C	C	A	A			4-3(D)(45)
Railroad yard												C	P	P					4-3(D)(46)
Transit facility						C	C	C	P	P	P	P	P	P					4-3(D)(47)
INDUSTRIAL USES																			
Manufacturing, Fabrication, and Assembly																			
Artisan manufacturing							C	P	P	P	P	P	P	P					4-3(E)(1)
Cannabis cultivation							C	P	P	P	P	P	P	P					4-3(E)(2)
Cannabis-derived products manufacturing							C	P	P	P	P	P	P	P					4-3(E)(3)
Light manufacturing										A	P	P	P	P					4-3(E)(4)
Heavy manufacturing														P					4-3(E)(5)
Natural resource extraction															P				4-3(E)(6)
Special manufacturing														C					4-3(E)(7)
Telecommunications, Towers, and Utilities																			
Drainage facility	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A	A	C	
Electric utility	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A	A	A	4-3(E)(8)
Geothermal energy generation	A	A	A	A	A	A	A	A	A	A	A	P	P	P		A	A		4-3(E)(9)
Major utility, other	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	A	A	A	
Solar energy generation	P	P	P	P	P	P	P	P	P	P	P	P	P	P	A	P	P	P	4-3(E)(10)
Wind energy generation							A	A	A	A	A	A	A	C	A	A	A		4-3(E)(11)
Wireless Telecommunications Facility (WTF)																			4-3(E)(12)
Architecturally integrated	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
Collocation	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
Freestanding							P	P	P	P	P	P	P	P	A				
Non-commercial or broadcasting antenna	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
Public utility collocation	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
Roof-mounted			A		A	A	A	A	A	A	A	A	A	A	A				
Small cell	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Waste and Recycling																			
Recycling drop-off bin facility						A	A	A	A	A	P	P	P	P					4-3(E)(13)
Salvage yard												C	C	P					4-3(E)(14)
Solid waste convenience center															P				4-3(E)(15)
Waste and/or recycling transfer station															P				4-3(E)(16)
Wholesaling and Storage																			

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Zone District >>	Residential						Mixed-use				Non-residential								Use-specific Standards
																NR-PO			
Land Uses	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	A	B	C	
Above-ground storage of fuels or feed													C	P					
Outdoor storage								CA	C	C	C	A	P	P					4-3(E)(17)
Warehousing									C	C	P	P	P	P					4-3(E)(18)
Wholesaling and distribution center									C	C	P	P	P	P					4-3(E)(19)
ACCESSORY AND TEMPORARY USES																			
ACCESSORY USES																			**4-3(F)(1)**
Agriculture sales stand	A	A	A	A	A	A	A	A	A	A	A	A	CA	CA			A		4-3(F)(2)
Animal keeping	A	A	A	A	A	A	A	A	A	A	A	A	A	A				CA	4-3(F)(3)
Automated Teller Machine (ATM)			A		A	A	A	A	A	A	A	A	A	A		T	T		
Clean Room												CA	A	A					4-3(F)(4)
Drive-through or drive-up facility								A	A	CA	A	A	A						4-3(F)(5)
Dwelling unit, accessory	A	A		A	A		A	A	A		A	A	A	A	A		A		4-3(F)(6)
Family care facility	A	A	A	A	A	A	A	A	A	A									4-3(F)(7)
Family home day care	CA	CA	CA	CA	A	A	A												4-3(F)(8)
Garden	A	A	A	A	A	A	A	A	A	A	A	A	A				A		
Hobby breeder	A	A	A	A															4-3(F)(9)
Home occupation	A	A	A	A	A	A	A	A	A	A									4-3(F)(10)
Independent living facility				A	A	A	A	A	A	A									4-3(F)(11)
Mobile food truck	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			4-3(F)(12)
Mobile vending cart							A	A	A	A	A	A	A	A		A		A	4-3(F)(13)
Outdoor animal run	A							CA	CA		CA		A	A					4-3(F)(14)
Outdoor dining area							CA	A	A	A	A	A	A	A	A				4-3(F)(15)
Second kitchen in a dwelling	A	A	A	A	A	A	A												4-3(F)(16)
Other use accessory to non-residential primary use							A	A	A	A	A	A	A	A	A			A	4-3(F)(17)
Other use accessory to residential primary use	A	A	A	A	A	A	A	A	A	A									4-3(F)(18)
TEMPORARY USES																			
Temporary Uses That Require A Permit																			
Circus									T		T	T	T						4-3(G)(1)
Construction staging area, trailer, or office	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T		4-3(G)(2)
Dwelling, temporary	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T		4-3(G)(3)
Fair, festival, or theatrical performance	T	T	T	T	T	T	T	T	T	T	T	T			T	T	T		4-3(G)(4)
Film production	T	T	T	T	T	T	T	T	T	T	T	T	T	T		T			4-3(G)(5)
Open air market							T	T	T	T	T						T		4-3(G)(6)
Park-and-ride facility, temporary						T	T	T	T	T	T	T	T	T	T		T		4-3(G)(7)

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Zone District >>	Residential						Mixed-use				Non-residential								Use-specific Standards
Land Uses	R-A	R-1	R-MC	R-T	R-ML	R-MH	MX-T	MX-L	MX-M	MX-H	NR-C	NR-BP	NR-LM	NR-GM	NR-SU	NR-PO A	NR-PO B	NR-PO C	
Real estate office or model home	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T				4-3(G)(8)
Safe outdoor space							CT	CT	CT	CT	T	T	T	T					4-3(G)(9)
Seasonal outdoor sales							T	T	T	T	T	T	T	T					4-3(G)(10)
Temporary use not listed			T			T	T	T	T	T	T	T	T	T	T		T		4-3(G)(11)
Temporary Uses That Do Not Require A Permit																			
Garage or yard sale	T	T	T	T	T	T	T												4-3(G)(12)
Hot air balloon takeoff/landing	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	4-3(G)(13)

APPENDIX F. SUPPORTING INFORMATION

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

EPA-453/R-95-017
November 1995

Air

EPA

Protocol for Equipment Leak Emission Estimates

EPA-453/R-95-017

1995 Protocol for Equipment Leak Emission Estimates

Emission Standards Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

November 1995

TABLE 2-4. OIL AND GAS PRODUCTION OPERATIONS AVERAGE EMISSION FACTORS (kg/hr/source)

Equipment Type	Service[a]	Emission Factor (kg/hr/source)[b]
Valves	Gas	4.5E-03
	Heavy Oil	8.4E-06
	Light Oil	2.5E-03
	Water/Oil	9.8E-05
Pump seals	Gas	2.4E-03
	Heavy Oil	NA
	Light Oil	1.3E-02
	Water/Oil	2.4E-05
Others[c]	Gas	8.8E-03
	Heavy Oil	3.2E-05
	Light Oil	7.5E-03
	Water/Oil	1.4E-02
Connectors	Gas	2.0E-04
	Heavy Oil	7.5E-06
	Light Oil	2.1E-04
	Water/Oil	1.1E-04
Flanges	Gas	3.9E-04
	Heavy Oil	3.9E-07
	Light Oil	1.1E-04
	Water/Oil	2.9E-06
Open-ended lines	Gas	2.0E-03
	Heavy Oil	1.4E-04
	Light Oil	1.4E-03
	Water/Oil	2.5E-04

[a]Water/Oil emission factors apply to water streams in oil service with a water content greater than 50%, from the point of origin to the point where the water content reaches 99%. For water streams with a water content greater than 99%, the emission rate is considered negligible.

[b]These factors are for total organic compound emission rates (including non-VOC's such as methane and ethane) and apply to light crude, heavy crude, gas plant, gas production, and off shore facilities. "NA" indicates that not enough data were available to develop the indicated emission factor.

[c]The "other" equipment type was derived from compressors, diaphrams, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents. This "other" equipment type should be applied for any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.

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

Identification

User Identification:	Vecenergy ABQ Terminal Tank 21
City:	Albuquerque
State:	New Mexico
Company:	Vecenergy
Type of Tank:	External Floating Roof Tank
Description:	Gasoline Storage Tank

Tank Dimensions

Diameter (ft):	55.00
Volume (gallons):	787,878.00
Turnovers:	68.90

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/Bolted Cover, Gasketed	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Unslotted Guide-Pole Well/Gasketed Sliding Cover, w. Sleeve	1
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Gasketed	9
Roof Leg (3-in. Diameter)/Adjustable, Center Area, Gasketed	7
Rim Vent (6-in. Diameter)/Weighted Mech. Actuation, Gask.	1

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

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

Vecenergy ABQ Terminal Tank 21 - External Floating Roof Tank
Albuquerque, New Mexico

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
Gasoline (RVP 13)	Jan	47.89	42.17	53.62	56.17	5.5115	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0124	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8266	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8644	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0703	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3838	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3503	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0320	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2239	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0936	N/A	N/A	61.6390	0.7456	0.9822	89.36	
Xylene (-m)						0.0583	N/A	N/A	106.1700	0.0700	0.0011	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Feb	50.81	44.36	57.26	56.17	5.8334	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0140	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9000	N/A	N/A	78.1100	0.0180	0.0041	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9393	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0782	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.4987	N/A	N/A	86.1700	0.0100	0.0038	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4026	N/A	N/A	114.2200	0.0400	0.0041	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0359	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2464	N/A	N/A	92.1300	0.0700	0.0044	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.5042	N/A	N/A	61.6207	0.7456	0.9814	89.36	
Xylene (-m)						0.0649	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Mar	54.35	47.06	61.64	56.17	6.2437	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0162	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9963	N/A	N/A	78.1100	0.0180	0.0043	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.0373	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0889	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.6484	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4709	N/A	N/A	114.2200	0.0400	0.0045	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0412	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2762	N/A	N/A	92.1300	0.0700	0.0046	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.0270	N/A	N/A	61.5987	0.7456	0.9805	89.36	
Xylene (-m)						0.0739	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Apr	58.66	50.46	66.86	56.17	6.7749	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0194	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1251	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1681	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1036	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8476	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5541	N/A	N/A	114.2200	0.0400	0.0049	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0486	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3166	N/A	N/A	92.1300	0.0700	0.0049	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.7038	N/A	N/A	61.5739	0.7456	0.9794	89.36	
Xylene (-m)						0.0862	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	May	62.97	54.46	71.47	56.17	4.8867	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0230	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56

Benzene						1.2673	N/A	N/A	78.1100	0.0180	0.0064	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3120	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1202	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0658	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6488	N/A	N/A	114.2200	0.0400	0.0073	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0571	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3619	N/A	N/A	92.1300	0.0700	0.0071	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.2269	N/A	N/A	66.4282	0.7456	0.9698	89.36	
Xylene (-m)						0.1002	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jun	67.53	58.77	76.29	56.17	5.3367	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0275	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4339	N/A	N/A	78.1100	0.0180	0.0066	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4804	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1404	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3198	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7547	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0674	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4157	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.7932	N/A	N/A	66.3970	0.7456	0.9683	89.36	
Xylene (-m)						0.1172	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jul	69.19	61.28	77.09	56.17	5.5079	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0293	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4987	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.5457	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1484	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4181	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7932	N/A	N/A	114.2200	0.0400	0.0079	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0716	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4368	N/A	N/A	92.1300	0.0700	0.0076	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0086	N/A	N/A	66.3864	0.7456	0.9678	89.36	
Xylene (-m)						0.1240	N/A	N/A	106.1700	0.0700	0.0022	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Aug	67.74	60.39	75.10	56.17	5.3584	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0277	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4421	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4886	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1414	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3323	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7597	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0680	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4184	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.8205	N/A	N/A	66.3956	0.7456	0.9683	89.36	
Xylene (-m)						0.1181	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Sep	64.12	57.10	71.14	56.17	4.9973	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0241	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3077	N/A	N/A	78.1100	0.0180	0.0065	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3530	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1251	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1277	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6756	N/A	N/A	114.2200	0.0400	0.0074	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0596	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3749	N/A	N/A	92.1300	0.0700	0.0072	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.3661	N/A	N/A	66.4200	0.7456	0.9694	89.36	
Xylene (-m)						0.1043	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Oct	58.55	51.73	65.37	56.17	6.7611	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0193	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1217	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1646	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1032	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8424	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5520	N/A	N/A	114.2200	0.0400	0.0048	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0484	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3155	N/A	N/A	92.1300	0.0700	0.0048	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.6862	N/A	N/A	61.5745	0.7456	0.9794	89.36	
Xylene (-m)						0.0859	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Nov	52.41	46.40	58.41	56.17	6.0159	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

1,2,4-Trimethylbenzene						0.0150	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9425	N/A	N/A	78.1100	0.0180	0.0042	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9826	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0829	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.5649	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4334	N/A	N/A	114.2200	0.0400	0.0043	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0383	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2595	N/A	N/A	92.1300	0.0700	0.0045	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.7368	N/A	N/A	61.6106	0.7456	0.9810	89.36	
Xylene (-m)						0.0689	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Dec	48.22	42.74	53.70	56.17	5.5467	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0126	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8346	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8726	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0712	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3963	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3560	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0324	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2264	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.1386	N/A	N/A	61.6370	0.7456	0.9821	89.36	
Xylene (-m)						0.0590	N/A	N/A	106.1700	0.0700	0.0011	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

Vecenergy ABQ Terminal Tank 21 - External Floating Roof Tank
Albuquerque, New Mexico

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 13)	1,419.95	100.78	618.61	0.00	2,139.34
1,2,4-Trimethylbenzene	0.14	2.52	0.06	0.00	2.71
Benzene	6.02	1.81	2.62	0.00	10.45
Cyclohexane	0.84	0.24	0.36	0.00	1.44
Ethylbenzene	0.42	1.41	0.18	0.00	2.01
Hexane (-n)	5.54	1.01	2.41	0.00	8.95
Isooctane	6.22	4.03	2.70	0.00	12.95
Isopropyl benzene	0.07	0.50	0.03	0.00	0.60
Toluene	6.48	7.05	2.82	0.00	16.35
Unidentified Components	1,392.51	75.14	606.68	0.00	2,074.34
Xylene (-m)	1.73	7.05	0.75	0.00	9.54
Gasoline (RVP 9)	909.61	71.99	391.71	0.00	1,373.31
1,2,4-Trimethylbenzene	0.16	1.80	0.07	0.00	2.02
Benzene	5.99	1.30	2.58	0.00	9.86
Cyclohexane	0.82	0.17	0.36	0.00	1.35
Ethylbenzene	0.45	1.01	0.19	0.00	1.66
Hexane (-n)	5.39	0.72	2.32	0.00	8.43
Isooctane	6.95	2.88	2.99	0.00	12.83
Isopropyl benzene	0.08	0.36	0.03	0.00	0.47
Toluene	6.73	5.04	2.90	0.00	14.66
Unidentified Components	881.16	53.67	379.45	0.00	1,314.28
Xylene (-m)	1.89	5.04	0.81	0.00	7.74

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

Identification

User Identification:	Vecenergy ABQ Terminal Tank 22
City:	Albuquerque
State:	New Mexico
Company:	Vecenergy
Type of Tank:	External Floating Roof Tank
Description:	Gasoline Storage Tank

Tank Dimensions

Diameter (ft):	55.00
Volume (gallons):	787,962.00
Turnovers:	68.90

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/Bolted Cover, Gasketed	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Unslotted Guide-Pole Well/Gasketed Sliding Cover, w. Sleeve	1
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Gasketed	9
Roof Leg (3-in. Diameter)/Adjustable, Center Area, Gasketed	7
Rim Vent (6-in. Diameter)/Weighted Mech. Actuation, Gask.	1

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

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

Vecenergy ABQ Terminal Tank 22 - External Floating Roof Tank
Albuquerque, New Mexico

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
Gasoline (RVP 13)	Jan	47.89	42.17	53.62	56.17	5.5115	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0124	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8266	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8644	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0703	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3838	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3503	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0320	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2239	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0936	N/A	N/A	61.6390	0.7456	0.9822	89.36	
Xylene (-m)						0.0583	N/A	N/A	106.1700	0.0700	0.0011	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Feb	50.81	44.36	57.26	56.17	5.8334	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0140	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9000	N/A	N/A	78.1100	0.0180	0.0041	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9393	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0782	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.4987	N/A	N/A	86.1700	0.0100	0.0038	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4026	N/A	N/A	114.2200	0.0400	0.0041	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0359	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2464	N/A	N/A	92.1300	0.0700	0.0044	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.5042	N/A	N/A	61.6207	0.7456	0.9814	89.36	
Xylene (-m)						0.0649	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Mar	54.35	47.06	61.64	56.17	6.2437	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0162	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9963	N/A	N/A	78.1100	0.0180	0.0043	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.0373	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0889	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.6484	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4709	N/A	N/A	114.2200	0.0400	0.0045	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0412	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2762	N/A	N/A	92.1300	0.0700	0.0046	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.0270	N/A	N/A	61.5987	0.7456	0.9805	89.36	
Xylene (-m)						0.0739	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Apr	58.66	50.46	66.86	56.17	6.7749	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0194	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1251	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1681	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1036	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8476	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5541	N/A	N/A	114.2200	0.0400	0.0049	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0486	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3166	N/A	N/A	92.1300	0.0700	0.0049	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.7038	N/A	N/A	61.5739	0.7456	0.9794	89.36	
Xylene (-m)						0.0862	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	May	62.97	54.46	71.47	56.17	4.8867	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0230	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56

Benzene						1.2673	N/A	N/A	78.1100	0.0180	0.0064	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3120	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1202	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0658	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6488	N/A	N/A	114.2200	0.0400	0.0073	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0571	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3619	N/A	N/A	92.1300	0.0700	0.0071	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.2269	N/A	N/A	66.4282	0.7456	0.9698	89.36	
Xylene (-m)						0.1002	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jun	67.53	58.77	76.29	56.17	5.3367	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0275	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4339	N/A	N/A	78.1100	0.0180	0.0066	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4804	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1404	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3198	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7547	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0674	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4157	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.7932	N/A	N/A	66.3970	0.7456	0.9683	89.36	
Xylene (-m)						0.1172	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jul	69.19	61.28	77.09	56.17	5.5079	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0293	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4987	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.5457	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1484	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4181	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7932	N/A	N/A	114.2200	0.0400	0.0079	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0716	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4368	N/A	N/A	92.1300	0.0700	0.0076	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0086	N/A	N/A	66.3864	0.7456	0.9678	89.36	
Xylene (-m)						0.1240	N/A	N/A	106.1700	0.0700	0.0022	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Aug	67.74	60.39	75.10	56.17	5.3584	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0277	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4421	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4886	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1414	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3323	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7597	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0680	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4184	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.8205	N/A	N/A	66.3956	0.7456	0.9683	89.36	
Xylene (-m)						0.1181	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Sep	64.12	57.10	71.14	56.17	4.9973	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0241	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3077	N/A	N/A	78.1100	0.0180	0.0065	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3530	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1251	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1277	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6756	N/A	N/A	114.2200	0.0400	0.0074	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0596	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3749	N/A	N/A	92.1300	0.0700	0.0072	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.3661	N/A	N/A	66.4200	0.7456	0.9694	89.36	
Xylene (-m)						0.1043	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Oct	58.55	51.73	65.37	56.17	6.7611	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0193	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1217	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1646	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1032	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8424	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5520	N/A	N/A	114.2200	0.0400	0.0048	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0484	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3155	N/A	N/A	92.1300	0.0700	0.0048	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.6862	N/A	N/A	61.5745	0.7456	0.9794	89.36	
Xylene (-m)						0.0859	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Nov	52.41	46.40	58.41	56.17	6.0159	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

1,2,4-Trimethylbenzene						0.0150	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9425	N/A	N/A	78.1100	0.0180	0.0042	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9826	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0829	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.5649	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4334	N/A	N/A	114.2200	0.0400	0.0043	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0383	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2595	N/A	N/A	92.1300	0.0700	0.0045	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.7368	N/A	N/A	61.6106	0.7456	0.9810	89.36	
Xylene (-m)						0.0689	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Dec	48.22	42.74	53.70	56.17	5.5467	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0126	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8346	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8726	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0712	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3963	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3560	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0324	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2264	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.1386	N/A	N/A	61.6370	0.7456	0.9821	89.36	
Xylene (-m)						0.0590	N/A	N/A	106.1700	0.0700	0.0011	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

Vecenergy ABQ Terminal Tank 22 - External Floating Roof Tank
Albuquerque, New Mexico

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 13)	1,419.95	100.79	618.61	0.00	2,139.35
1,2,4-Trimethylbenzene	0.14	2.52	0.06	0.00	2.71
Benzene	6.02	1.81	2.62	0.00	10.45
Cyclohexane	0.84	0.24	0.36	0.00	1.44
Ethylbenzene	0.42	1.41	0.18	0.00	2.01
Hexane (-n)	5.54	1.01	2.41	0.00	8.95
Isooctane	6.22	4.03	2.70	0.00	12.95
Isopropyl benzene	0.07	0.50	0.03	0.00	0.60
Toluene	6.48	7.06	2.82	0.00	16.35
Unidentified Components	1,392.51	75.15	606.68	0.00	2,074.35
Xylene (-m)	1.73	7.06	0.75	0.00	9.54
Gasoline (RVP 9)	909.61	72.00	391.71	0.00	1,373.32
1,2,4-Trimethylbenzene	0.16	1.80	0.07	0.00	2.02
Benzene	5.99	1.30	2.58	0.00	9.86
Cyclohexane	0.82	0.17	0.36	0.00	1.35
Ethylbenzene	0.45	1.01	0.19	0.00	1.66
Hexane (-n)	5.39	0.72	2.32	0.00	8.43
Isooctane	6.95	2.88	2.99	0.00	12.83
Isopropyl benzene	0.08	0.36	0.03	0.00	0.47
Toluene	6.73	5.04	2.90	0.00	14.66
Unidentified Components	881.16	53.68	379.45	0.00	1,314.29
Xylene (-m)	1.89	5.04	0.81	0.00	7.74

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

Identification

User Identification:	Vecenergy ABQ Terminal Tank 23
City:	Albuquerque
State:	New Mexico
Company:	Vecenergy
Type of Tank:	External Floating Roof Tank
Description:	Gasoline Storage Tank

Tank Dimensions

Diameter (ft):	42.50
Volume (gallons):	380,898.00
Turnovers:	68.90

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**
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Unslotted Guide-Pole Well/Gasketed sliding Cover, w. Wiper	1
Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Sock	10
Roof Drain (3-in. Diameter)/90% Closed	1

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

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

Vecenergy ABQ Terminal Tank 23 - External Floating Roof Tank
Albuquerque, New Mexico

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
Gasoline (RVP 13)	Jan	47.89	42.17	53.62	56.17	5.5115	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0124	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8266	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8644	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0703	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3838	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3503	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0320	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2239	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0936	N/A	N/A	61.6390	0.7456	0.9822	89.36	
Xylene (-m)						0.0583	N/A	N/A	106.1700	0.0700	0.0011	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Feb	50.81	44.36	57.26	56.17	5.8334	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0140	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9000	N/A	N/A	78.1100	0.0180	0.0041	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9393	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0782	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.4987	N/A	N/A	86.1700	0.0100	0.0038	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4026	N/A	N/A	114.2200	0.0400	0.0041	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0359	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2464	N/A	N/A	92.1300	0.0700	0.0044	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.5042	N/A	N/A	61.6207	0.7456	0.9814	89.36	
Xylene (-m)						0.0649	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Mar	54.35	47.06	61.64	56.17	6.2437	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0162	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9963	N/A	N/A	78.1100	0.0180	0.0043	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.0373	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0889	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.6484	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4709	N/A	N/A	114.2200	0.0400	0.0045	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0412	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2762	N/A	N/A	92.1300	0.0700	0.0046	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.0270	N/A	N/A	61.5987	0.7456	0.9805	89.36	
Xylene (-m)						0.0739	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Apr	58.66	50.46	66.86	56.17	6.7749	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0194	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1251	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1681	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1036	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8476	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5541	N/A	N/A	114.2200	0.0400	0.0049	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0486	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3166	N/A	N/A	92.1300	0.0700	0.0049	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.7038	N/A	N/A	61.5739	0.7456	0.9794	89.36	
Xylene (-m)						0.0862	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	May	62.97	54.46	71.47	56.17	4.8867	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0230	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56

Benzene						1.2673	N/A	N/A	78.1100	0.0180	0.0064	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3120	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1202	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0658	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6488	N/A	N/A	114.2200	0.0400	0.0073	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0571	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3619	N/A	N/A	92.1300	0.0700	0.0071	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.2269	N/A	N/A	66.4282	0.7456	0.9698	89.36	
Xylene (-m)						0.1002	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jun	67.53	58.77	76.29	56.17	5.3367	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0275	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4339	N/A	N/A	78.1100	0.0180	0.0066	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4804	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1404	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3198	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7547	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0674	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4157	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.7932	N/A	N/A	66.3970	0.7456	0.9683	89.36	
Xylene (-m)						0.1172	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jul	69.19	61.28	77.09	56.17	5.5079	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0293	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4987	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.5457	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1484	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4181	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7932	N/A	N/A	114.2200	0.0400	0.0079	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0716	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4368	N/A	N/A	92.1300	0.0700	0.0076	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0086	N/A	N/A	66.3864	0.7456	0.9678	89.36	
Xylene (-m)						0.1240	N/A	N/A	106.1700	0.0700	0.0022	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Aug	67.74	60.39	75.10	56.17	5.3584	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0277	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4421	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4886	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1414	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3323	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7597	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0680	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4184	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.8205	N/A	N/A	66.3956	0.7456	0.9683	89.36	
Xylene (-m)						0.1181	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Sep	64.12	57.10	71.14	56.17	4.9973	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0241	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3077	N/A	N/A	78.1100	0.0180	0.0065	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3530	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1251	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1277	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6756	N/A	N/A	114.2200	0.0400	0.0074	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0596	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3749	N/A	N/A	92.1300	0.0700	0.0072	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.3661	N/A	N/A	66.4200	0.7456	0.9694	89.36	
Xylene (-m)						0.1043	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Oct	58.55	51.73	65.37	56.17	6.7611	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0193	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1217	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1646	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1032	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8424	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5520	N/A	N/A	114.2200	0.0400	0.0048	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0484	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3155	N/A	N/A	92.1300	0.0700	0.0048	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.6862	N/A	N/A	61.5745	0.7456	0.9794	89.36	
Xylene (-m)						0.0859	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Nov	52.41	46.40	58.41	56.17	6.0159	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

1,2,4-Trimethylbenzene						0.0150	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9425	N/A	N/A	78.1100	0.0180	0.0042	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9826	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0829	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.5649	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4334	N/A	N/A	114.2200	0.0400	0.0043	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0383	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2595	N/A	N/A	92.1300	0.0700	0.0045	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.7368	N/A	N/A	61.6106	0.7456	0.9810	89.36	
Xylene (-m)						0.0689	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Dec	48.22	42.74	53.70	56.17	5.5467	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0126	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8346	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8726	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0712	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3963	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3560	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0324	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2264	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.1386	N/A	N/A	61.6370	0.7456	0.9821	89.36	
Xylene (-m)						0.0590	N/A	N/A	106.1700	0.0700	0.0011	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

Vecenergy ABQ Terminal Tank 23 - External Floating Roof Tank
Albuquerque, New Mexico

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 13)	1,097.23	72.25	402.69	0.00	1,572.17
1,2,4-Trimethylbenzene	0.10	1.81	0.04	0.00	1.95
Benzene	4.65	1.30	1.70	0.00	7.65
Cyclohexane	0.65	0.17	0.24	0.00	1.06
Ethylbenzene	0.32	1.01	0.12	0.00	1.45
Hexane (-n)	4.28	0.72	1.57	0.00	6.57
Isooctane	4.80	2.89	1.76	0.00	9.45
Isopropyl benzene	0.05	0.36	0.02	0.00	0.43
Toluene	5.00	5.06	1.83	0.00	11.89
Unidentified Components	1,076.03	53.87	394.92	0.00	1,524.83
Xylene (-m)	1.34	5.06	0.49	0.00	6.88
Gasoline (RVP 9)	702.88	51.61	253.44	0.00	1,007.93
1,2,4-Trimethylbenzene	0.12	1.29	0.04	0.00	1.46
Benzene	4.63	0.93	1.67	0.00	7.22
Cyclohexane	0.64	0.12	0.23	0.00	0.99
Ethylbenzene	0.35	0.72	0.13	0.00	1.20
Hexane (-n)	4.17	0.52	1.50	0.00	6.18
Isooctane	5.37	2.06	1.94	0.00	9.37
Isopropyl benzene	0.06	0.26	0.02	0.00	0.34
Toluene	5.20	3.61	1.87	0.00	10.68
Unidentified Components	680.89	38.48	245.51	0.00	964.88
Xylene (-m)	1.46	3.61	0.53	0.00	5.60

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

Identification

User Identification:	Vecenergy ABQ Terminal Tank 24
City:	Albuquerque
State:	New Mexico
Company:	Vecenergy
Type of Tank:	External Floating Roof Tank
Description:	Gasoline Storage Tank

Tank Dimensions

Diameter (ft):	42.50
Volume (gallons):	380,898.00
Turnovers:	68.90

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
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Unslotted Guide-Pole Well/Gasketed sliding Cover, w. Wiper	1
Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Sock	10
Roof Drain (3-in. Diameter)/90% Closed	1

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

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Emissions Report - Summary Format
Liquid Contents of Storage Tank

Vecenergy ABQ Terminal Tank 24 - External Floating Roof Tank
Albuquerque, New Mexico

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
Gasoline (RVP 13)	Jan	47.89	42.17	53.62	56.17	5.5115	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0124	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8266	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8644	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0703	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3838	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3503	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0320	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2239	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0936	N/A	N/A	61.6390	0.7456	0.9822	89.36	
Xylene (-m)						0.0583	N/A	N/A	106.1700	0.0700	0.0011	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Feb	50.81	44.36	57.26	56.17	5.8334	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0140	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9000	N/A	N/A	78.1100	0.0180	0.0041	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9393	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0782	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.4987	N/A	N/A	86.1700	0.0100	0.0038	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4026	N/A	N/A	114.2200	0.0400	0.0041	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0359	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2464	N/A	N/A	92.1300	0.0700	0.0044	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.5042	N/A	N/A	61.6207	0.7456	0.9814	89.36	
Xylene (-m)						0.0649	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Mar	54.35	47.06	61.64	56.17	6.2437	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0162	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9963	N/A	N/A	78.1100	0.0180	0.0043	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.0373	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0889	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.6484	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4709	N/A	N/A	114.2200	0.0400	0.0045	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0412	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2762	N/A	N/A	92.1300	0.0700	0.0046	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.0270	N/A	N/A	61.5987	0.7456	0.9805	89.36	
Xylene (-m)						0.0739	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Apr	58.66	50.46	66.86	56.17	6.7749	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0194	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1251	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1681	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1036	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8476	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5541	N/A	N/A	114.2200	0.0400	0.0049	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0486	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3166	N/A	N/A	92.1300	0.0700	0.0049	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.7038	N/A	N/A	61.5739	0.7456	0.9794	89.36	
Xylene (-m)						0.0862	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	May	62.97	54.46	71.47	56.17	4.8867	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0230	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56

Benzene						1.2673	N/A	N/A	78.1100	0.0180	0.0064	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3120	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1202	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0658	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6488	N/A	N/A	114.2200	0.0400	0.0073	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0571	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3619	N/A	N/A	92.1300	0.0700	0.0071	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.2269	N/A	N/A	66.4282	0.7456	0.9698	89.36	
Xylene (-m)						0.1002	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jun	67.53	58.77	76.29	56.17	5.3367	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0275	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4339	N/A	N/A	78.1100	0.0180	0.0066	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4804	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1404	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3198	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7547	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0674	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4157	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.7932	N/A	N/A	66.3970	0.7456	0.9683	89.36	
Xylene (-m)						0.1172	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jul	69.19	61.28	77.09	56.17	5.5079	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0293	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4987	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.5457	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1484	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4181	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7932	N/A	N/A	114.2200	0.0400	0.0079	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0716	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4368	N/A	N/A	92.1300	0.0700	0.0076	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0086	N/A	N/A	66.3864	0.7456	0.9678	89.36	
Xylene (-m)						0.1240	N/A	N/A	106.1700	0.0700	0.0022	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Aug	67.74	60.39	75.10	56.17	5.3584	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0277	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4421	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4886	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1414	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3323	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7597	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0680	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4184	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.8205	N/A	N/A	66.3956	0.7456	0.9683	89.36	
Xylene (-m)						0.1181	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Sep	64.12	57.10	71.14	56.17	4.9973	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0241	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3077	N/A	N/A	78.1100	0.0180	0.0065	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3530	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1251	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1277	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6756	N/A	N/A	114.2200	0.0400	0.0074	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0596	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3749	N/A	N/A	92.1300	0.0700	0.0072	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.3661	N/A	N/A	66.4200	0.7456	0.9694	89.36	
Xylene (-m)						0.1043	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Oct	58.55	51.73	65.37	56.17	6.7611	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0193	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1217	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1646	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1032	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8424	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5520	N/A	N/A	114.2200	0.0400	0.0048	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0484	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3155	N/A	N/A	92.1300	0.0700	0.0048	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.6862	N/A	N/A	61.5745	0.7456	0.9794	89.36	
Xylene (-m)						0.0859	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Nov	52.41	46.40	58.41	56.17	6.0159	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

1,2,4-Trimethylbenzene						0.0150	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9425	N/A	N/A	78.1100	0.0180	0.0042	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9826	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0829	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.5649	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4334	N/A	N/A	114.2200	0.0400	0.0043	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0383	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2595	N/A	N/A	92.1300	0.0700	0.0045	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.7368	N/A	N/A	61.6106	0.7456	0.9810	89.36	
Xylene (-m)						0.0689	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Dec	48.22	42.74	53.70	56.17	5.5467	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0126	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8346	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8726	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0712	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3963	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3560	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0324	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2264	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.1386	N/A	N/A	61.6370	0.7456	0.9821	89.36	
Xylene (-m)						0.0590	N/A	N/A	106.1700	0.0700	0.0011	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

Vecenergy ABQ Terminal Tank 24 - External Floating Roof Tank
Albuquerque, New Mexico

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 13)	1,097.23	72.25	402.69	0.00	1,572.17
1,2,4-Trimethylbenzene	0.10	1.81	0.04	0.00	1.95
Benzene	4.65	1.30	1.70	0.00	7.65
Cyclohexane	0.65	0.17	0.24	0.00	1.06
Ethylbenzene	0.32	1.01	0.12	0.00	1.45
Hexane (-n)	4.28	0.72	1.57	0.00	6.57
Isooctane	4.80	2.89	1.76	0.00	9.45
Isopropyl benzene	0.05	0.36	0.02	0.00	0.43
Toluene	5.00	5.06	1.83	0.00	11.89
Unidentified Components	1,076.03	53.87	394.92	0.00	1,524.83
Xylene (-m)	1.34	5.06	0.49	0.00	6.88
Gasoline (RVP 9)	702.88	51.61	253.44	0.00	1,007.93
1,2,4-Trimethylbenzene	0.12	1.29	0.04	0.00	1.46
Benzene	4.63	0.93	1.67	0.00	7.22
Cyclohexane	0.64	0.12	0.23	0.00	0.99
Ethylbenzene	0.35	0.72	0.13	0.00	1.20
Hexane (-n)	4.17	0.52	1.50	0.00	6.18
Isooctane	5.37	2.06	1.94	0.00	9.37
Isopropyl benzene	0.06	0.26	0.02	0.00	0.34
Toluene	5.20	3.61	1.87	0.00	10.68
Unidentified Components	680.89	38.48	245.51	0.00	964.88
Xylene (-m)	1.46	3.61	0.53	0.00	5.60

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

Identification

User Identification:	Vecenergy ABQ Terminal Tank 25
City:	Albuquerque
State:	New Mexico
Company:	Vecenergy
Type of Tank:	Internal Floating Roof Tank
Description:	Gasoline Storage Tank

Tank Dimensions

Diameter (ft):	30.00
Volume (gallons):	184,800.00
Turnovers:	68.90
Self Supp. Roof? (y/n):	Y
No. of Columns:	0.00
Eff. Col. Diam. (ft):	0.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Mechanical Shoe
Secondary Seal	None

Deck Characteristics

Deck Fitting Category:	Detail
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Roof Leg or Hanger Well/Adjustable	10
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Slotted Guide-Pole/Sample Well/Gask. Sliding Cover, w. Pole Sleeve	1

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

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

Vecenergy ABQ Terminal Tank 25 - Internal Floating Roof Tank
Albuquerque, New Mexico

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
Gasoline (RVP 13)	Jan	47.89	42.17	53.62	56.17	5.5115	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0124	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8266	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8644	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0703	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3838	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3503	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0320	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2239	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0936	N/A	N/A	61.6390	0.7456	0.9822	89.36	
Xylene (-m)						0.0583	N/A	N/A	106.1700	0.0700	0.0011	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Feb	50.81	44.36	57.26	56.17	5.8334	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0140	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9000	N/A	N/A	78.1100	0.0180	0.0041	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9393	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0782	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.4987	N/A	N/A	86.1700	0.0100	0.0038	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4026	N/A	N/A	114.2200	0.0400	0.0041	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0359	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2464	N/A	N/A	92.1300	0.0700	0.0044	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.5042	N/A	N/A	61.6207	0.7456	0.9814	89.36	
Xylene (-m)						0.0649	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Mar	54.35	47.06	61.64	56.17	6.2437	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0162	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9963	N/A	N/A	78.1100	0.0180	0.0043	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.0373	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0889	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.6484	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4709	N/A	N/A	114.2200	0.0400	0.0045	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0412	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2762	N/A	N/A	92.1300	0.0700	0.0046	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.0270	N/A	N/A	61.5987	0.7456	0.9805	89.36	
Xylene (-m)						0.0739	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Apr	58.66	50.46	66.86	56.17	6.7749	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0194	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1251	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1681	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1036	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8476	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5541	N/A	N/A	114.2200	0.0400	0.0049	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0486	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3166	N/A	N/A	92.1300	0.0700	0.0049	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.7038	N/A	N/A	61.5739	0.7456	0.9794	89.36	
Xylene (-m)						0.0862	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	May	62.97	54.46	71.47	56.17	4.8867	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0230	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56

Benzene						1.2673	N/A	N/A	78.1100	0.0180	0.0064	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3120	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1202	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0658	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6488	N/A	N/A	114.2200	0.0400	0.0073	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0571	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3619	N/A	N/A	92.1300	0.0700	0.0071	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.2269	N/A	N/A	66.4282	0.7456	0.9698	89.36	
Xylene (-m)						0.1002	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jun	67.53	58.77	76.29	56.17	5.3367	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0275	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4339	N/A	N/A	78.1100	0.0180	0.0066	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4804	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1404	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3198	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7547	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0674	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4157	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.7932	N/A	N/A	66.3970	0.7456	0.9683	89.36	
Xylene (-m)						0.1172	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jul	69.19	61.28	77.09	56.17	5.5079	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0293	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4987	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.5457	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1484	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4181	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7932	N/A	N/A	114.2200	0.0400	0.0079	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0716	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4368	N/A	N/A	92.1300	0.0700	0.0076	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0086	N/A	N/A	66.3864	0.7456	0.9678	89.36	
Xylene (-m)						0.1240	N/A	N/A	106.1700	0.0700	0.0022	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Aug	67.74	60.39	75.10	56.17	5.3584	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0277	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4421	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4886	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1414	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3323	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7597	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0680	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4184	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.8205	N/A	N/A	66.3956	0.7456	0.9683	89.36	
Xylene (-m)						0.1181	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Sep	64.12	57.10	71.14	56.17	4.9973	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0241	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3077	N/A	N/A	78.1100	0.0180	0.0065	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3530	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1251	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1277	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6756	N/A	N/A	114.2200	0.0400	0.0074	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0596	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3749	N/A	N/A	92.1300	0.0700	0.0072	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.3661	N/A	N/A	66.4200	0.7456	0.9694	89.36	
Xylene (-m)						0.1043	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Oct	58.55	51.73	65.37	56.17	6.7611	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0193	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1217	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1646	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1032	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8424	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5520	N/A	N/A	114.2200	0.0400	0.0048	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0484	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3155	N/A	N/A	92.1300	0.0700	0.0048	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.6862	N/A	N/A	61.5745	0.7456	0.9794	89.36	
Xylene (-m)						0.0859	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Nov	52.41	46.40	58.41	56.17	6.0159	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

1,2,4-Trimethylbenzene						0.0150	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9425	N/A	N/A	78.1100	0.0180	0.0042	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9826	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0829	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.5649	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4334	N/A	N/A	114.2200	0.0400	0.0043	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0383	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2595	N/A	N/A	92.1300	0.0700	0.0045	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.7368	N/A	N/A	61.6106	0.7456	0.9810	89.36	
Xylene (-m)						0.0689	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Dec	48.22	42.74	53.70	56.17	5.5467	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0126	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8346	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8726	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0712	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3963	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3560	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0324	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2264	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.1386	N/A	N/A	61.6370	0.7456	0.9821	89.36	
Xylene (-m)						0.0590	N/A	N/A	106.1700	0.0700	0.0011	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

Vecenergy ABQ Terminal Tank 25 - Internal Floating Roof Tank
Albuquerque, New Mexico

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 13)	1,089.97	43.34	705.35	0.00	1,838.66
1,2,4-Trimethylbenzene	0.10	1.08	0.07	0.00	1.25
Benzene	4.61	0.78	2.98	0.00	8.37
Cyclohexane	0.64	0.10	0.41	0.00	1.16
Ethylbenzene	0.32	0.61	0.21	0.00	1.13
Hexane (-n)	4.24	0.43	2.74	0.00	7.42
Isooctane	4.74	1.73	3.07	0.00	9.55
Isopropyl benzene	0.05	0.22	0.03	0.00	0.30
Toluene	4.95	3.03	3.21	0.00	11.19
Unidentified Components	1,068.99	32.31	691.77	0.00	1,793.07
Xylene (-m)	1.32	3.03	0.86	0.00	5.21
Gasoline (RVP 9)	677.50	30.96	438.43	0.00	1,146.89
1,2,4-Trimethylbenzene	0.12	0.77	0.08	0.00	0.97
Benzene	4.46	0.56	2.89	0.00	7.91
Cyclohexane	0.61	0.07	0.40	0.00	1.09
Ethylbenzene	0.34	0.43	0.22	0.00	0.99
Hexane (-n)	4.02	0.31	2.60	0.00	6.93
Isooctane	5.18	1.24	3.35	0.00	9.78
Isopropyl benzene	0.06	0.15	0.04	0.00	0.25
Toluene	5.01	2.17	3.24	0.00	10.42
Unidentified Components	656.29	23.08	424.70	0.00	1,104.07
Xylene (-m)	1.41	2.17	0.91	0.00	4.49

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

Identification

User Identification:	Vecenergy ABQ Terminal Tank 29
City:	Albuquerque
State:	New Mexico
Company:	Vecenergy
Type of Tank:	Internal Floating Roof Tank
Description:	Gasoline Storage Tank

Tank Dimensions

Diameter (ft):	30.00
Volume (gallons):	109,998.00
Turnovers:	68.90
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Vapor-mounted
Secondary Seal	None

Deck Characteristics

Deck Fitting Category:	Detail
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Ungask.	1
Roof Drain (3-in. Diameter)/90% Closed	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

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

Vecenergy ABQ Terminal Tank 29 - Internal Floating Roof Tank
Albuquerque, New Mexico

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
Gasoline (RVP 13)	Jan	47.89	42.17	53.62	56.17	5.5115	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0124	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8266	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8644	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0703	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3838	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3503	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0320	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2239	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0936	N/A	N/A	61.6390	0.7456	0.9822	89.36	
Xylene (-m)						0.0583	N/A	N/A	106.1700	0.0700	0.0011	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Feb	50.81	44.36	57.26	56.17	5.8334	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0140	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9000	N/A	N/A	78.1100	0.0180	0.0041	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9393	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0782	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.4987	N/A	N/A	86.1700	0.0100	0.0038	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4026	N/A	N/A	114.2200	0.0400	0.0041	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0359	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2464	N/A	N/A	92.1300	0.0700	0.0044	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.5042	N/A	N/A	61.6207	0.7456	0.9814	89.36	
Xylene (-m)						0.0649	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Mar	54.35	47.06	61.64	56.17	6.2437	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0162	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9963	N/A	N/A	78.1100	0.0180	0.0043	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.0373	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0889	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.6484	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4709	N/A	N/A	114.2200	0.0400	0.0045	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0412	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2762	N/A	N/A	92.1300	0.0700	0.0046	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.0270	N/A	N/A	61.5987	0.7456	0.9805	89.36	
Xylene (-m)						0.0739	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Apr	58.66	50.46	66.86	56.17	6.7749	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0194	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1251	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1681	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1036	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8476	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5541	N/A	N/A	114.2200	0.0400	0.0049	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0486	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3166	N/A	N/A	92.1300	0.0700	0.0049	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.7038	N/A	N/A	61.5739	0.7456	0.9794	89.36	
Xylene (-m)						0.0862	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	May	62.97	54.46	71.47	56.17	4.8867	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0230	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56

Benzene						1.2673	N/A	N/A	78.1100	0.0180	0.0064	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3120	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1202	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0658	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6488	N/A	N/A	114.2200	0.0400	0.0073	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0571	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3619	N/A	N/A	92.1300	0.0700	0.0071	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.2269	N/A	N/A	66.4282	0.7456	0.9698	89.36	
Xylene (-m)						0.1002	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jun	67.53	58.77	76.29	56.17	5.3367	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0275	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4339	N/A	N/A	78.1100	0.0180	0.0066	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4804	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1404	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3198	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7547	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0674	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4157	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.7932	N/A	N/A	66.3970	0.7456	0.9683	89.36	
Xylene (-m)						0.1172	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jul	69.19	61.28	77.09	56.17	5.5079	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0293	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4987	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.5457	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1484	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4181	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7932	N/A	N/A	114.2200	0.0400	0.0079	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0716	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4368	N/A	N/A	92.1300	0.0700	0.0076	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0086	N/A	N/A	66.3864	0.7456	0.9678	89.36	
Xylene (-m)						0.1240	N/A	N/A	106.1700	0.0700	0.0022	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Aug	67.74	60.39	75.10	56.17	5.3584	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0277	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4421	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4886	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1414	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3323	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7597	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0680	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4184	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.8205	N/A	N/A	66.3956	0.7456	0.9683	89.36	
Xylene (-m)						0.1181	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Sep	64.12	57.10	71.14	56.17	4.9973	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0241	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3077	N/A	N/A	78.1100	0.0180	0.0065	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3530	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1251	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1277	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6756	N/A	N/A	114.2200	0.0400	0.0074	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0596	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3749	N/A	N/A	92.1300	0.0700	0.0072	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.3661	N/A	N/A	66.4200	0.7456	0.9694	89.36	
Xylene (-m)						0.1043	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Oct	58.55	51.73	65.37	56.17	6.7611	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0193	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1217	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1646	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1032	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8424	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5520	N/A	N/A	114.2200	0.0400	0.0048	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0484	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3155	N/A	N/A	92.1300	0.0700	0.0048	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.6862	N/A	N/A	61.5745	0.7456	0.9794	89.36	
Xylene (-m)						0.0859	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Nov	52.41	46.40	58.41	56.17	6.0159	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

1,2,4-Trimethylbenzene						0.0150	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9425	N/A	N/A	78.1100	0.0180	0.0042	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9826	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0829	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.5649	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4334	N/A	N/A	114.2200	0.0400	0.0043	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0383	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2595	N/A	N/A	92.1300	0.0700	0.0045	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.7368	N/A	N/A	61.6106	0.7456	0.9810	89.36	
Xylene (-m)						0.0689	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Dec	48.22	42.74	53.70	56.17	5.5467	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0126	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8346	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8726	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0712	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3963	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3560	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0324	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2264	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.1386	N/A	N/A	61.6370	0.7456	0.9821	89.36	
Xylene (-m)						0.0590	N/A	N/A	106.1700	0.0700	0.0011	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

Vecenergy ABQ Terminal Tank 29 - Internal Floating Roof Tank
Albuquerque, New Mexico

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 13)	1,259.10	26.66	377.73	0.00	1,663.49
1,2,4-Trimethylbenzene	0.12	0.67	0.04	0.00	0.82
Benzene	5.32	0.48	1.60	0.00	7.40
Cyclohexane	0.74	0.06	0.22	0.00	1.02
Ethylbenzene	0.37	0.37	0.11	0.00	0.85
Hexane (-n)	4.90	0.27	1.47	0.00	6.64
Isooctane	5.48	1.07	1.64	0.00	8.19
Isopropyl benzene	0.06	0.13	0.02	0.00	0.21
Toluene	5.72	1.87	1.72	0.00	9.31
Unidentified Components	1,234.87	19.87	370.46	0.00	1,625.20
Xylene (-m)	1.53	1.87	0.46	0.00	3.85
Gasoline (RVP 9)	782.63	19.04	234.79	0.00	1,036.46
1,2,4-Trimethylbenzene	0.14	0.48	0.04	0.00	0.65
Benzene	5.15	0.34	1.55	0.00	7.04
Cyclohexane	0.71	0.05	0.21	0.00	0.97
Ethylbenzene	0.39	0.27	0.12	0.00	0.77
Hexane (-n)	4.64	0.19	1.39	0.00	6.22
Isooctane	5.99	0.76	1.80	0.00	8.55
Isopropyl benzene	0.07	0.10	0.02	0.00	0.18
Toluene	5.79	1.33	1.74	0.00	8.86
Unidentified Components	758.13	14.20	227.44	0.00	999.76
Xylene (-m)	1.63	1.33	0.49	0.00	3.45

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

Identification

User Identification:	Vecenergy ABQ Terminal Tank 31
City:	Albuquerque
State:	New Mexico
Company:	Vecenergy
Type of Tank:	External Floating Roof Tank
Description:	Gasoline Storage Tank

Tank Dimensions

Diameter (ft):	42.50
Volume (gallons):	380,898.00
Turnovers:	68.90

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
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Unslotted Guide-Pole Well/Gasketed sliding Cover, w. Wiper	1
Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Sock	10
Roof Drain (3-in. Diameter)/90% Closed	1

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

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

Vecenergy ABQ Terminal Tank 31 - External Floating Roof Tank
Albuquerque, New Mexico

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
Gasoline (RVP 13)	Jan	47.89	42.17	53.62	56.17	5.5115	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0124	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8266	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8644	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0703	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3838	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3503	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0320	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2239	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0936	N/A	N/A	61.6390	0.7456	0.9822	89.36	
Xylene (-m)						0.0583	N/A	N/A	106.1700	0.0700	0.0011	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Feb	50.81	44.36	57.26	56.17	5.8334	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0140	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9000	N/A	N/A	78.1100	0.0180	0.0041	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9393	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0782	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.4987	N/A	N/A	86.1700	0.0100	0.0038	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4026	N/A	N/A	114.2200	0.0400	0.0041	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0359	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2464	N/A	N/A	92.1300	0.0700	0.0044	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.5042	N/A	N/A	61.6207	0.7456	0.9814	89.36	
Xylene (-m)						0.0649	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Mar	54.35	47.06	61.64	56.17	6.2437	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0162	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9963	N/A	N/A	78.1100	0.0180	0.0043	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.0373	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0889	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.6484	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4709	N/A	N/A	114.2200	0.0400	0.0045	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0412	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2762	N/A	N/A	92.1300	0.0700	0.0046	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.0270	N/A	N/A	61.5987	0.7456	0.9805	89.36	
Xylene (-m)						0.0739	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Apr	58.66	50.46	66.86	56.17	6.7749	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0194	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1251	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1681	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1036	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8476	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5541	N/A	N/A	114.2200	0.0400	0.0049	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0486	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3166	N/A	N/A	92.1300	0.0700	0.0049	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.7038	N/A	N/A	61.5739	0.7456	0.9794	89.36	
Xylene (-m)						0.0862	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	May	62.97	54.46	71.47	56.17	4.8867	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0230	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56

Benzene						1.2673	N/A	N/A	78.1100	0.0180	0.0064	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3120	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1202	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0658	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6488	N/A	N/A	114.2200	0.0400	0.0073	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0571	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3619	N/A	N/A	92.1300	0.0700	0.0071	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.2269	N/A	N/A	66.4282	0.7456	0.9698	89.36	
Xylene (-m)						0.1002	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jun	67.53	58.77	76.29	56.17	5.3367	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0275	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4339	N/A	N/A	78.1100	0.0180	0.0066	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4804	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1404	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3198	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7547	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0674	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4157	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.7932	N/A	N/A	66.3970	0.7456	0.9683	89.36	
Xylene (-m)						0.1172	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jul	69.19	61.28	77.09	56.17	5.5079	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0293	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4987	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.5457	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1484	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4181	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7932	N/A	N/A	114.2200	0.0400	0.0079	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0716	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4368	N/A	N/A	92.1300	0.0700	0.0076	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0086	N/A	N/A	66.3864	0.7456	0.9678	89.36	
Xylene (-m)						0.1240	N/A	N/A	106.1700	0.0700	0.0022	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Aug	67.74	60.39	75.10	56.17	5.3584	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0277	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4421	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4886	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1414	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3323	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7597	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0680	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4184	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.8205	N/A	N/A	66.3956	0.7456	0.9683	89.36	
Xylene (-m)						0.1181	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Sep	64.12	57.10	71.14	56.17	4.9973	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0241	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3077	N/A	N/A	78.1100	0.0180	0.0065	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3530	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1251	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1277	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6756	N/A	N/A	114.2200	0.0400	0.0074	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0596	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3749	N/A	N/A	92.1300	0.0700	0.0072	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.3661	N/A	N/A	66.4200	0.7456	0.9694	89.36	
Xylene (-m)						0.1043	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Oct	58.55	51.73	65.37	56.17	6.7611	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0193	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1217	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1646	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1032	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8424	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5520	N/A	N/A	114.2200	0.0400	0.0048	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0484	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3155	N/A	N/A	92.1300	0.0700	0.0048	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.6862	N/A	N/A	61.5745	0.7456	0.9794	89.36	
Xylene (-m)						0.0859	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Nov	52.41	46.40	58.41	56.17	6.0159	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

1,2,4-Trimethylbenzene						0.0150	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9425	N/A	N/A	78.1100	0.0180	0.0042	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9826	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0829	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.5649	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4334	N/A	N/A	114.2200	0.0400	0.0043	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0383	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2595	N/A	N/A	92.1300	0.0700	0.0045	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.7368	N/A	N/A	61.6106	0.7456	0.9810	89.36	
Xylene (-m)						0.0689	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Dec	48.22	42.74	53.70	56.17	5.5467	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0126	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8346	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8726	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0712	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3963	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3560	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0324	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2264	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.1386	N/A	N/A	61.6370	0.7456	0.9821	89.36	
Xylene (-m)						0.0590	N/A	N/A	106.1700	0.0700	0.0011	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

Vecenergy ABQ Terminal Tank 31 - External Floating Roof Tank
Albuquerque, New Mexico

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 13)	1,097.23	72.25	402.69	0.00	1,572.17
1,2,4-Trimethylbenzene	0.10	1.81	0.04	0.00	1.95
Benzene	4.65	1.30	1.70	0.00	7.65
Cyclohexane	0.65	0.17	0.24	0.00	1.06
Ethylbenzene	0.32	1.01	0.12	0.00	1.45
Hexane (-n)	4.28	0.72	1.57	0.00	6.57
Isooctane	4.80	2.89	1.76	0.00	9.45
Isopropyl benzene	0.05	0.36	0.02	0.00	0.43
Toluene	5.00	5.06	1.83	0.00	11.89
Unidentified Components	1,076.03	53.87	394.92	0.00	1,524.83
Xylene (-m)	1.34	5.06	0.49	0.00	6.88
Gasoline (RVP 9)	702.88	51.61	253.44	0.00	1,007.93
1,2,4-Trimethylbenzene	0.12	1.29	0.04	0.00	1.46
Benzene	4.63	0.93	1.67	0.00	7.22
Cyclohexane	0.64	0.12	0.23	0.00	0.99
Ethylbenzene	0.35	0.72	0.13	0.00	1.20
Hexane (-n)	4.17	0.52	1.50	0.00	6.18
Isooctane	5.37	2.06	1.94	0.00	9.37
Isopropyl benzene	0.06	0.26	0.02	0.00	0.34
Toluene	5.20	3.61	1.87	0.00	10.68
Unidentified Components	680.89	38.48	245.51	0.00	964.88
Xylene (-m)	1.46	3.61	0.53	0.00	5.60

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

Identification

User Identification:	Vecenergy ABQ Terminal Tank 32
City:	Albuquerque
State:	New Mexico
Company:	Vecenergy
Type of Tank:	Internal Floating Roof Tank
Description:	Gasoline Storage Tank

Tank Dimensions

Diameter (ft):	100.00
Volume (gallons):	2,091,432.00
Turnovers:	68.90
Self Supp. Roof? (y/n):	N
No. of Columns:	3.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Mechanical Shoe
Secondary Seal	None

Deck Characteristics

Deck Fitting Category:	Detail
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Gasketed	1
Rim Vent (6-in. Diameter)/Weighted Mech. Actuation, Gask.	19
Roof Drain (3-in. Diameter)/90% Closed	1
Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Gasketed	15
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Slotted Guide-Pole/Sample Well/Gask Sliding Covr, w. Float,Sleeve,Wiper	1

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

TANKS 4.0.9d
Emissions Report - Summary Format

Liquid Contents of Storage Tank

Vecenergy ABQ Terminal Tank 32 - Internal Floating Roof Tank
Albuquerque, New Mexico

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
Gasoline (RVP 13)	Jan	47.89	42.17	53.62	56.17	5.5115	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0124	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8266	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8644	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0703	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3838	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3503	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0320	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2239	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0936	N/A	N/A	61.6390	0.7456	0.9822	89.36	
Xylene (-m)						0.0583	N/A	N/A	106.1700	0.0700	0.0011	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Feb	50.81	44.36	57.26	56.17	5.8334	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0140	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9000	N/A	N/A	78.1100	0.0180	0.0041	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9393	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0782	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.4987	N/A	N/A	86.1700	0.0100	0.0038	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4026	N/A	N/A	114.2200	0.0400	0.0041	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0359	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2464	N/A	N/A	92.1300	0.0700	0.0044	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.5042	N/A	N/A	61.6207	0.7456	0.9814	89.36	
Xylene (-m)						0.0649	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Mar	54.35	47.06	61.64	56.17	6.2437	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0162	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9963	N/A	N/A	78.1100	0.0180	0.0043	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.0373	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0889	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.6484	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4709	N/A	N/A	114.2200	0.0400	0.0045	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0412	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2762	N/A	N/A	92.1300	0.0700	0.0046	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.0270	N/A	N/A	61.5987	0.7456	0.9805	89.36	
Xylene (-m)						0.0739	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Apr	58.66	50.46	66.86	56.17	6.7749	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0194	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1251	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1681	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1036	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8476	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5541	N/A	N/A	114.2200	0.0400	0.0049	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0486	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3166	N/A	N/A	92.1300	0.0700	0.0049	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.7038	N/A	N/A	61.5739	0.7456	0.9794	89.36	
Xylene (-m)						0.0862	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	May	62.97	54.46	71.47	56.17	4.8867	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0230	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.2673	N/A	N/A	78.1100	0.0180	0.0064	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3120	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1202	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0658	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41

Isooctane						0.6488	N/A	N/A	114.2200	0.0400	0.0073	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0571	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3619	N/A	N/A	92.1300	0.0700	0.0071	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.2269	N/A	N/A	66.4282	0.7456	0.9698	89.36	
Xylene (-m)						0.1002	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jun	67.53	58.77	76.29	56.17	5.3367	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0275	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4339	N/A	N/A	78.1100	0.0180	0.0066	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4804	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1404	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3198	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7547	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0674	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4157	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.7932	N/A	N/A	66.3970	0.7456	0.9683	89.36	
Xylene (-m)						0.1172	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jul	69.19	61.28	77.09	56.17	5.5079	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0293	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4987	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.5457	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1484	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4181	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7932	N/A	N/A	114.2200	0.0400	0.0079	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0716	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4368	N/A	N/A	92.1300	0.0700	0.0076	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0086	N/A	N/A	66.3864	0.7456	0.9678	89.36	
Xylene (-m)						0.1240	N/A	N/A	106.1700	0.0700	0.0022	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Aug	67.74	60.39	75.10	56.17	5.3584	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0277	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4421	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4886	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1414	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3323	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7597	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0680	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4184	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.8205	N/A	N/A	66.3956	0.7456	0.9683	89.36	
Xylene (-m)						0.1181	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Sep	64.12	57.10	71.14	56.17	4.9973	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0241	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3077	N/A	N/A	78.1100	0.0180	0.0065	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3530	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1251	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1277	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6756	N/A	N/A	114.2200	0.0400	0.0074	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0596	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3749	N/A	N/A	92.1300	0.0700	0.0072	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.3661	N/A	N/A	66.4200	0.7456	0.9694	89.36	
Xylene (-m)						0.1043	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Oct	58.55	51.73	65.37	56.17	6.7611	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0193	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1217	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1646	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1032	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8424	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5520	N/A	N/A	114.2200	0.0400	0.0048	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0484	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3155	N/A	N/A	92.1300	0.0700	0.0048	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.6862	N/A	N/A	61.5745	0.7456	0.9794	89.36	
Xylene (-m)						0.0859	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Nov	52.41	46.40	58.41	56.17	6.0159	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0150	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9425	N/A	N/A	78.1100	0.0180	0.0042	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9826	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0829	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21

Hexane (-n)						1.5649	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4334	N/A	N/A	114.2200	0.0400	0.0043	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0383	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2595	N/A	N/A	92.1300	0.0700	0.0045	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.7368	N/A	N/A	61.6106	0.7456	0.9810	89.36	
Xylene (-m)						0.0689	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Dec	48.22	42.74	53.70	56.17	5.5467	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0126	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8346	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8726	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0712	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3963	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3560	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0324	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2264	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.1386	N/A	N/A	61.6370	0.7456	0.9821	89.36	
Xylene (-m)						0.0590	N/A	N/A	106.1700	0.0700	0.0011	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

Vecenergy ABQ Terminal Tank 32 - Internal Floating Roof Tank
Albuquerque, New Mexico

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 13)	3,633.23	151.56	689.44	0.00	4,474.22
1,2,4-Trimethylbenzene	0.34	3.79	0.07	0.00	4.20
Benzene	15.36	2.73	2.91	0.00	21.00
Cyclohexane	2.13	0.36	0.40	0.00	2.90
Ethylbenzene	1.06	2.12	0.20	0.00	3.38
Hexane (-n)	14.14	1.52	2.68	0.00	18.34
Isooctane	15.81	6.06	3.00	0.00	24.87
Isopropyl benzene	0.18	0.76	0.03	0.00	0.97
Toluene	16.51	10.61	3.13	0.00	30.26
Unidentified Components	3,563.29	113.00	676.17	0.00	4,352.46
Xylene (-m)	4.40	10.61	0.84	0.00	15.85
Gasoline (RVP 9)	2,258.34	108.25	428.54	0.00	2,795.14
1,2,4-Trimethylbenzene	0.39	2.71	0.07	0.00	3.17
Benzene	14.87	1.95	2.82	0.00	19.65
Cyclohexane	2.05	0.26	0.39	0.00	2.70
Ethylbenzene	1.12	1.52	0.21	0.00	2.85
Hexane (-n)	13.39	1.08	2.54	0.00	17.02
Isooctane	17.28	4.33	3.28	0.00	24.89
Isopropyl benzene	0.19	0.54	0.04	0.00	0.77
Toluene	16.71	7.58	3.17	0.00	27.46
Unidentified Components	2,187.64	80.71	415.12	0.00	2,683.47
Xylene (-m)	4.69	7.58	0.89	0.00	13.16

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

Identification

User Identification:	Vecenergy ABQ Terminal Tank 33
City:	Albuquerque
State:	New Mexico
Company:	Vecenergy
Type of Tank:	External Floating Roof Tank
Description:	Gasoline Storage Tank

Tank Dimensions

Diameter (ft):	60.00
Volume (gallons):	788,130.00
Turnovers:	68.90

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
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Ungask.	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

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

Vecenergy ABQ Terminal Tank 33 - External Floating Roof Tank
Albuquerque, New Mexico

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
Gasoline (RVP 13)	Jan	47.89	42.17	53.62	56.17	5.5115	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0124	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8266	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8644	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0703	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3838	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3503	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0320	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2239	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0936	N/A	N/A	61.6390	0.7456	0.9822	89.36	
Xylene (-m)						0.0583	N/A	N/A	106.1700	0.0700	0.0011	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Feb	50.81	44.36	57.26	56.17	5.8334	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0140	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9000	N/A	N/A	78.1100	0.0180	0.0041	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9393	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0782	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.4987	N/A	N/A	86.1700	0.0100	0.0038	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4026	N/A	N/A	114.2200	0.0400	0.0041	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0359	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2464	N/A	N/A	92.1300	0.0700	0.0044	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.5042	N/A	N/A	61.6207	0.7456	0.9814	89.36	
Xylene (-m)						0.0649	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Mar	54.35	47.06	61.64	56.17	6.2437	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0162	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9963	N/A	N/A	78.1100	0.0180	0.0043	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.0373	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0889	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.6484	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4709	N/A	N/A	114.2200	0.0400	0.0045	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0412	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2762	N/A	N/A	92.1300	0.0700	0.0046	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.0270	N/A	N/A	61.5987	0.7456	0.9805	89.36	
Xylene (-m)						0.0739	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Apr	58.66	50.46	66.86	56.17	6.7749	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0194	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1251	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1681	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1036	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8476	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5541	N/A	N/A	114.2200	0.0400	0.0049	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0486	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3166	N/A	N/A	92.1300	0.0700	0.0049	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.7038	N/A	N/A	61.5739	0.7456	0.9794	89.36	
Xylene (-m)						0.0862	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	May	62.97	54.46	71.47	56.17	4.8867	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0230	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56

Benzene						1.2673	N/A	N/A	78.1100	0.0180	0.0064	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3120	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1202	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0658	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6488	N/A	N/A	114.2200	0.0400	0.0073	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0571	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3619	N/A	N/A	92.1300	0.0700	0.0071	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.2269	N/A	N/A	66.4282	0.7456	0.9698	89.36	
Xylene (-m)						0.1002	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jun	67.53	58.77	76.29	56.17	5.3367	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0275	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4339	N/A	N/A	78.1100	0.0180	0.0066	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4804	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1404	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3198	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7547	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0674	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4157	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.7932	N/A	N/A	66.3970	0.7456	0.9683	89.36	
Xylene (-m)						0.1172	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jul	69.19	61.28	77.09	56.17	5.5079	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0293	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4987	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.5457	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1484	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4181	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7932	N/A	N/A	114.2200	0.0400	0.0079	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0716	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4368	N/A	N/A	92.1300	0.0700	0.0076	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0086	N/A	N/A	66.3864	0.7456	0.9678	89.36	
Xylene (-m)						0.1240	N/A	N/A	106.1700	0.0700	0.0022	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Aug	67.74	60.39	75.10	56.17	5.3584	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0277	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4421	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4886	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1414	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3323	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7597	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0680	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4184	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.8205	N/A	N/A	66.3956	0.7456	0.9683	89.36	
Xylene (-m)						0.1181	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Sep	64.12	57.10	71.14	56.17	4.9973	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0241	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3077	N/A	N/A	78.1100	0.0180	0.0065	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3530	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1251	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1277	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6756	N/A	N/A	114.2200	0.0400	0.0074	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0596	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3749	N/A	N/A	92.1300	0.0700	0.0072	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.3661	N/A	N/A	66.4200	0.7456	0.9694	89.36	
Xylene (-m)						0.1043	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Oct	58.55	51.73	65.37	56.17	6.7611	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0193	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1217	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1646	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1032	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8424	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5520	N/A	N/A	114.2200	0.0400	0.0048	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0484	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3155	N/A	N/A	92.1300	0.0700	0.0048	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.6862	N/A	N/A	61.5745	0.7456	0.9794	89.36	
Xylene (-m)						0.0859	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Nov	52.41	46.40	58.41	56.17	6.0159	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

1,2,4-Trimethylbenzene						0.0150	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9425	N/A	N/A	78.1100	0.0180	0.0042	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9826	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0829	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.5649	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4334	N/A	N/A	114.2200	0.0400	0.0043	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0383	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2595	N/A	N/A	92.1300	0.0700	0.0045	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.7368	N/A	N/A	61.6106	0.7456	0.9810	89.36	
Xylene (-m)						0.0689	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Dec	48.22	42.74	53.70	56.17	5.5467	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0126	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8346	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8726	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0712	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3963	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3560	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0324	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2264	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.1386	N/A	N/A	61.6370	0.7456	0.9821	89.36	
Xylene (-m)						0.0590	N/A	N/A	106.1700	0.0700	0.0011	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

Vecenergy ABQ Terminal Tank 33 - External Floating Roof Tank
Albuquerque, New Mexico

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 13)	1,549.03	92.41	112.30	0.00	1,753.75
1,2,4-Trimethylbenzene	0.15	2.31	0.01	0.00	2.47
Benzene	6.56	1.66	0.48	0.00	8.70
Cyclohexane	0.91	0.22	0.07	0.00	1.20
Ethylbenzene	0.45	1.29	0.03	0.00	1.78
Hexane (-n)	6.04	0.92	0.44	0.00	7.40
Isooctane	6.78	3.70	0.49	0.00	10.97
Isopropyl benzene	0.08	0.46	0.01	0.00	0.54
Toluene	7.06	6.47	0.51	0.00	14.05
Unidentified Components	1,519.11	68.90	110.14	0.00	1,698.15
Xylene (-m)	1.89	6.47	0.14	0.00	8.49
Gasoline (RVP 9)	992.31	66.01	70.68	0.00	1,128.99
1,2,4-Trimethylbenzene	0.17	1.65	0.01	0.00	1.83
Benzene	6.53	1.19	0.47	0.00	8.19
Cyclohexane	0.90	0.16	0.06	0.00	1.12
Ethylbenzene	0.49	0.92	0.04	0.00	1.45
Hexane (-n)	5.88	0.66	0.42	0.00	6.96
Isooctane	7.58	2.64	0.54	0.00	10.76
Isopropyl benzene	0.08	0.33	0.01	0.00	0.42
Toluene	7.34	4.62	0.52	0.00	12.48
Unidentified Components	961.26	49.22	68.47	0.00	1,078.95
Xylene (-m)	2.06	4.62	0.15	0.00	6.83

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

Identification

User Identification:	Vecenergy ABQ Terminal Tank 35
City:	Albuquerque
State:	New Mexico
Company:	Vecenergy
Type of Tank:	Internal Floating Roof Tank
Description:	Gasoline Storage Tank

Tank Dimensions

Diameter (ft):	59.75
Volume (gallons):	789,600.00
Turnovers:	68.90
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Mechanical Shoe
Secondary Seal	None

Deck Characteristics

Deck Fitting Category:	Detail
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Gasketed	1
Rim Vent (6-in. Diameter)/Weighted Mech. Actuation, Gask.	16
Roof Drain (3-in. Diameter)/90% Closed	1
Roof Leg (3-in. Diameter)/Adjustable, Pontoon Area, Gasketed	16
Slotted Guide-Pole/Sample Well/Gask. Sliding Cover, w. Pole Sleeve	1

Meterological Data used in Emissions Calculations: Albuquerque, New Mexico (Avg Atmospheric Pressure = 12.15 psia)

TANKS 4.0.9d
Emissions Report - Summary Format

Liquid Contents of Storage Tank

Vecenergy ABQ Terminal Tank 35 - Internal Floating Roof Tank
Albuquerque, New Mexico

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
Gasoline (RVP 13)	Jan	47.89	42.17	53.62	56.17	5.5115	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0124	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8266	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8644	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0703	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3838	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3503	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0320	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2239	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0936	N/A	N/A	61.6390	0.7456	0.9822	89.36	
Xylene (-m)						0.0583	N/A	N/A	106.1700	0.0700	0.0011	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Feb	50.81	44.36	57.26	56.17	5.8334	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0140	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9000	N/A	N/A	78.1100	0.0180	0.0041	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9393	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0782	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.4987	N/A	N/A	86.1700	0.0100	0.0038	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4026	N/A	N/A	114.2200	0.0400	0.0041	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0359	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2464	N/A	N/A	92.1300	0.0700	0.0044	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.5042	N/A	N/A	61.6207	0.7456	0.9814	89.36	
Xylene (-m)						0.0649	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Mar	54.35	47.06	61.64	56.17	6.2437	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0162	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9963	N/A	N/A	78.1100	0.0180	0.0043	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.0373	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0889	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.6484	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4709	N/A	N/A	114.2200	0.0400	0.0045	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0412	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2762	N/A	N/A	92.1300	0.0700	0.0046	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.0270	N/A	N/A	61.5987	0.7456	0.9805	89.36	
Xylene (-m)						0.0739	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Apr	58.66	50.46	66.86	56.17	6.7749	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0194	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1251	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1681	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1036	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8476	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5541	N/A	N/A	114.2200	0.0400	0.0049	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0486	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3166	N/A	N/A	92.1300	0.0700	0.0049	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.7038	N/A	N/A	61.5739	0.7456	0.9794	89.36	
Xylene (-m)						0.0862	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	May	62.97	54.46	71.47	56.17	4.8867	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0230	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.2673	N/A	N/A	78.1100	0.0180	0.0064	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3120	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1202	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0658	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41

Isooctane						0.6488	N/A	N/A	114.2200	0.0400	0.0073	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0571	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3619	N/A	N/A	92.1300	0.0700	0.0071	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.2269	N/A	N/A	66.4282	0.7456	0.9698	89.36	
Xylene (-m)						0.1002	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jun	67.53	58.77	76.29	56.17	5.3367	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0275	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4339	N/A	N/A	78.1100	0.0180	0.0066	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4804	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1404	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3198	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7547	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0674	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4157	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.7932	N/A	N/A	66.3970	0.7456	0.9683	89.36	
Xylene (-m)						0.1172	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Jul	69.19	61.28	77.09	56.17	5.5079	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0293	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4987	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.5457	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1484	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4181	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7932	N/A	N/A	114.2200	0.0400	0.0079	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0716	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4368	N/A	N/A	92.1300	0.0700	0.0076	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.0086	N/A	N/A	66.3864	0.7456	0.9678	89.36	
Xylene (-m)						0.1240	N/A	N/A	106.1700	0.0700	0.0022	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Aug	67.74	60.39	75.10	56.17	5.3584	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0277	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.4421	N/A	N/A	78.1100	0.0180	0.0067	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.4886	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1414	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3323	N/A	N/A	86.1700	0.0100	0.0060	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.7597	N/A	N/A	114.2200	0.0400	0.0078	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0680	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.4184	N/A	N/A	92.1300	0.0700	0.0075	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.8205	N/A	N/A	66.3956	0.7456	0.9683	89.36	
Xylene (-m)						0.1181	N/A	N/A	106.1700	0.0700	0.0021	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 9)	Sep	64.12	57.10	71.14	56.17	4.9973	N/A	N/A	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0241	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.3077	N/A	N/A	78.1100	0.0180	0.0065	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.3530	N/A	N/A	84.1600	0.0024	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1251	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1277	N/A	N/A	86.1700	0.0100	0.0058	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.6756	N/A	N/A	114.2200	0.0400	0.0074	114.22	Option 1: VP60 = .58 VP70 = .812
Isopropyl benzene						0.0596	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3749	N/A	N/A	92.1300	0.0700	0.0072	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.3661	N/A	N/A	66.4200	0.7456	0.9694	89.36	
Xylene (-m)						0.1043	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Oct	58.55	51.73	65.37	56.17	6.7611	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0193	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.1217	N/A	N/A	78.1100	0.0180	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.1646	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1032	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.8424	N/A	N/A	86.1700	0.0100	0.0040	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.5520	N/A	N/A	114.2200	0.0400	0.0048	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0484	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.3155	N/A	N/A	92.1300	0.0700	0.0048	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						8.6862	N/A	N/A	61.5745	0.7456	0.9794	89.36	
Xylene (-m)						0.0859	N/A	N/A	106.1700	0.0700	0.0013	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Nov	52.41	46.40	58.41	56.17	6.0159	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0150	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.9425	N/A	N/A	78.1100	0.0180	0.0042	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.9826	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0829	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21

Hexane (-n)						1.5649	N/A	N/A	86.1700	0.0100	0.0039	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.4334	N/A	N/A	114.2200	0.0400	0.0043	114.22	Option 1: VP50 = .387 VP60 = .58
Isopropyl benzene						0.0383	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2595	N/A	N/A	92.1300	0.0700	0.0045	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.7368	N/A	N/A	61.6106	0.7456	0.9810	89.36	
Xylene (-m)						0.0689	N/A	N/A	106.1700	0.0700	0.0012	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 13)	Dec	48.22	42.74	53.70	56.17	5.5467	N/A	N/A	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3
1,2,4-Trimethylbenzene						0.0126	N/A	N/A	120.1900	0.0250	0.0001	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.8346	N/A	N/A	78.1100	0.0180	0.0040	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.8726	N/A	N/A	84.1600	0.0024	0.0006	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0712	N/A	N/A	106.1700	0.0140	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.3963	N/A	N/A	86.1700	0.0100	0.0037	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.3560	N/A	N/A	114.2200	0.0400	0.0038	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0324	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.2264	N/A	N/A	92.1300	0.0700	0.0042	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						7.1386	N/A	N/A	61.6370	0.7456	0.9821	89.36	
Xylene (-m)						0.0590	N/A	N/A	106.1700	0.0700	0.0011	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

Vecenergy ABQ Terminal Tank 35 - Internal Floating Roof Tank
Albuquerque, New Mexico

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 13)	2,170.86	94.53	645.40	0.00	2,910.79
1,2,4-Trimethylbenzene	0.21	2.36	0.06	0.00	2.63
Benzene	9.18	1.70	2.73	0.00	13.61
Cyclohexane	1.27	0.23	0.38	0.00	1.88
Ethylbenzene	0.63	1.32	0.19	0.00	2.15
Hexane (-n)	8.45	0.95	2.51	0.00	11.90
Isooctane	9.45	3.78	2.81	0.00	16.04
Isopropyl benzene	0.10	0.47	0.03	0.00	0.61
Toluene	9.87	6.62	2.93	0.00	19.42
Unidentified Components	2,129.07	70.48	632.98	0.00	2,832.53
Xylene (-m)	2.63	6.62	0.78	0.00	10.03
Gasoline (RVP 9)	1,349.36	67.52	401.17	0.00	1,818.05
1,2,4-Trimethylbenzene	0.23	1.69	0.07	0.00	1.99
Benzene	8.89	1.22	2.64	0.00	12.75
Cyclohexane	1.22	0.16	0.36	0.00	1.75
Ethylbenzene	0.67	0.95	0.20	0.00	1.82
Hexane (-n)	8.00	0.68	2.38	0.00	11.06
Isooctane	10.32	2.70	3.07	0.00	16.09
Isopropyl benzene	0.11	0.34	0.03	0.00	0.49
Toluene	9.99	4.73	2.97	0.00	17.68
Unidentified Components	1,307.11	50.34	388.61	0.00	1,746.06
Xylene (-m)	2.80	4.73	0.83	0.00	8.36

Table 1.4-1. EMISSION FACTORS FOR NITROGEN OXIDES (NO_x) AND CARBON MONOXIDE (CO) FROM NATURAL GAS COMBUSTION[a]

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO_x[b]		CO	
	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS)[c]	280	A	84	B
Uncontrolled (Post-NSPS)[c]	190	A	84	B
Controlled - Low NO_x burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO_x burners	50	D	84	B
Controlled - Low NO_x burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170	A	24	C
Controlled - Flue gas recirculation	76	D	98	D
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. SCC = Source Classification Code. ND = no data. NA = not applicable.

[b] Expressed as NO_2. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate NO_X emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate NO_X emission factor.

[c] NSPS=New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction modification, or reconstruction after June 19, 1984.

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
CO_2[b]	120,000	A
Lead	0.0005	D
N_2O (Uncontrolled)	2.2	E
N_2O (Controlled-low-NO_X burner)	0.64	E
PM (Total)[c]	7.6	D
PM (Condensable)[c]	5.7	D
PM (Filterable)[c]	1.9	B
SO_2[d]	0.6	A
TOC	11	B
Methane	2.3	B
VOC	5.5	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6\ m^3$, multiply by 16. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. TOC = Total Organic Compounds. VOC = Volatile Organic Compounds.

[b] Based on approximately 100% conversion of fuel carbon to CO_2. $CO_2[lb/10^6\ scf] = (3.67)\ (CON)\ (C)(D)$, where CON = fractional conversion of fuel carbon to CO_2, C = carbon content of fuel by weight (0.76), and D = density of fuel, $4.2x10^4\ lb/10^6$ scf.

[c] All PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{10}, $PM_{2.5}$ or PM_1 emissions. Total PM is the sum of the filterable PM and condensible PM. Condensible PM is the particulate matter collected using EPA Method 202 (or equivalent). Filterable PM is the particulate matter collected on, or prior to, the filter of an EPA Method 5 (or equivalent) sampling train.

[d] Based on 100% conversion of fuel sulfur to SO_2.
Assumes sulfur content is natural gas of 2,000 grains/10^6 scf. The SO_2 emission factor in this table can be converted to other natural gas sulfur contents by multiplying the SO_2 emission factor by the ratio of the site-specific sulfur content (grains/10^6 scf) to 2,000 grains/10^6 scf.

5.2 Transportation And Marketing Of Petroleum Liquids[1-3]

5.2.1 General

The transportation and marketing of petroleum liquids involve many distinct operations, each of which represents a potential source of evaporation loss. Crude oil is transported from production operations to a refinery by tankers, barges, rail tank cars, tank trucks, and pipelines. Refined petroleum products are conveyed to fuel marketing terminals and petrochemical industries by these same modes. From the fuel marketing terminals, the fuels are delivered by tank trucks to service stations, commercial accounts, and local bulk storage plants. The final destination for gasoline is usually a motor vehicle gasoline tank. Similar distribution paths exist for fuel oils and other petroleum products. A general depiction of these activities is shown in Figure 5.2-1.

5.2.2 Emissions And Controls

Evaporative emissions from the transportation and marketing of petroleum liquids may be considered, by storage equipment and mode of transportation used, in four categories:

1. Rail tank cars, tank trucks, and marine vessels: loading, transit, and ballasting losses.
2. Service stations: bulk fuel drop losses and underground tank breathing losses.
3. Motor vehicle tanks: refueling losses.
4. Large storage tanks: breathing, working, and standing storage losses. (See Chapter 7, "Liquid Storage Tanks".)

Evaporative and exhaust emissions are also associated with motor vehicle operation, and these topics are discussed in AP-42 *Volume II: Mobile Sources*.

5.2.2.1 Rail Tank Cars, Tank Trucks, And Marine Vessels -

Emissions from these sources are from loading losses, ballasting losses, and transit losses.

5.2.2.1.1 Loading Losses -

Loading losses are the primary source of evaporative emissions from rail tank car, tank truck, and marine vessel operations. Loading losses occur as organic vapors in "empty" cargo tanks are displaced to the atmosphere by the liquid being loaded into the tanks. These vapors are a composite of (1) vapors formed in the empty tank by evaporation of residual product from previous loads, (2) vapors transferred to the tank in vapor balance systems as product is being unloaded, and (3) vapors generated in the tank as the new product is being loaded. The quantity of evaporative losses from loading operations is, therefore, a function of the following parameters:

- Physical and chemical characteristics of the previous cargo;
- Method of unloading the previous cargo;
- Operations to transport the empty carrier to a loading terminal;
- Method of loading the new cargo; and
- Physical and chemical characteristics of the new cargo.

The principal methods of cargo carrier loading are illustrated in Figure 5.2-2, Figure 5.2-3, and Figure 5.2-4. In the splash loading method, the fill pipe dispensing the cargo is lowered only part way into the cargo tank. Significant turbulence and vapor/liquid contact occur during the splash

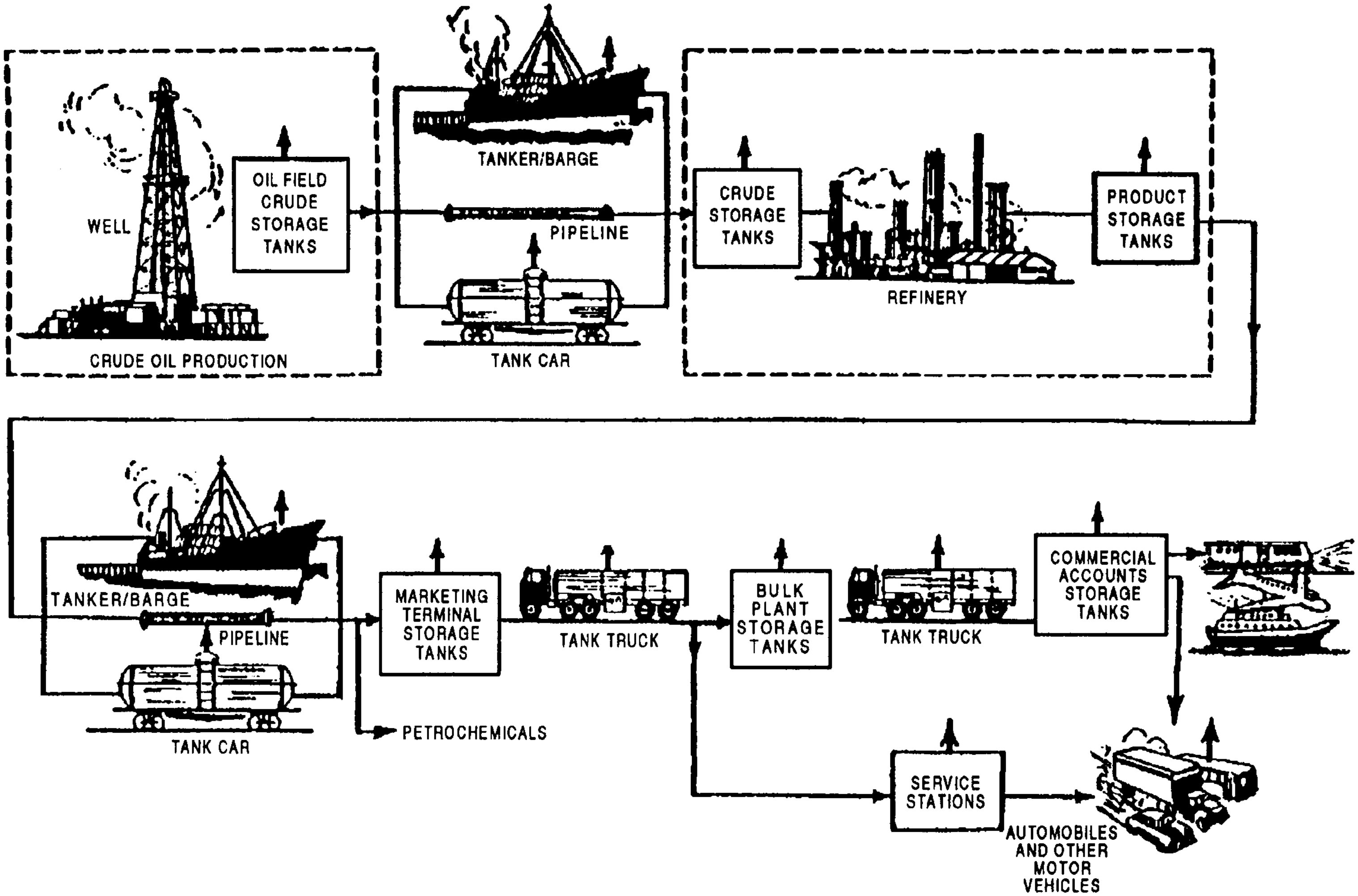

Figure 5.2-1. Flow sheet of petroleum production, refining, and distribution systems.
(Points of organic emissions are indicated by vertical arrows.)

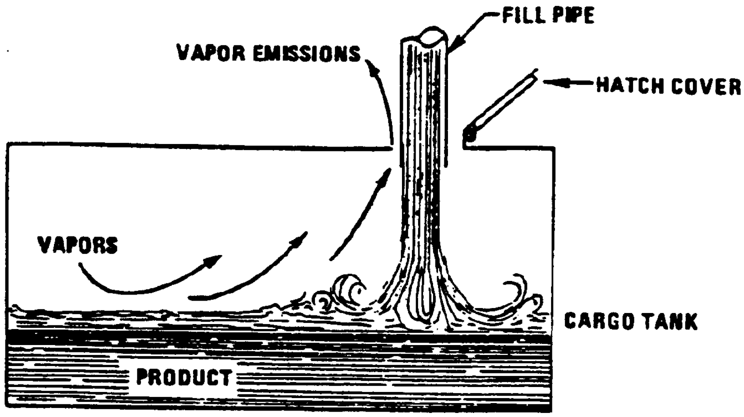

Figure 5.2-2. Splash loading method.

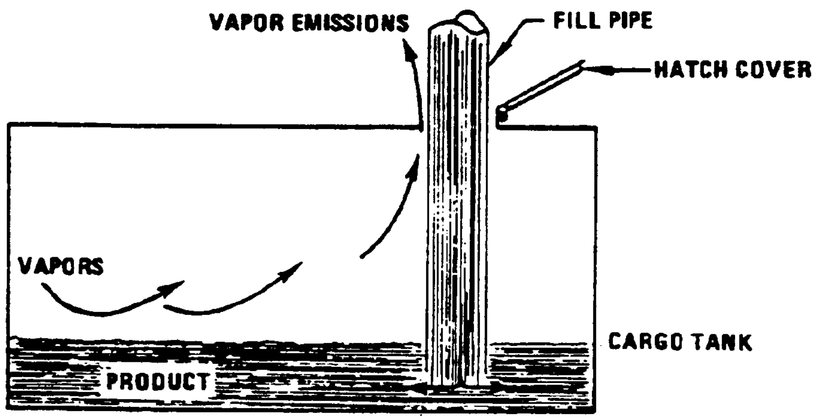

Figure 5.2-3. Submerged fill pipe.

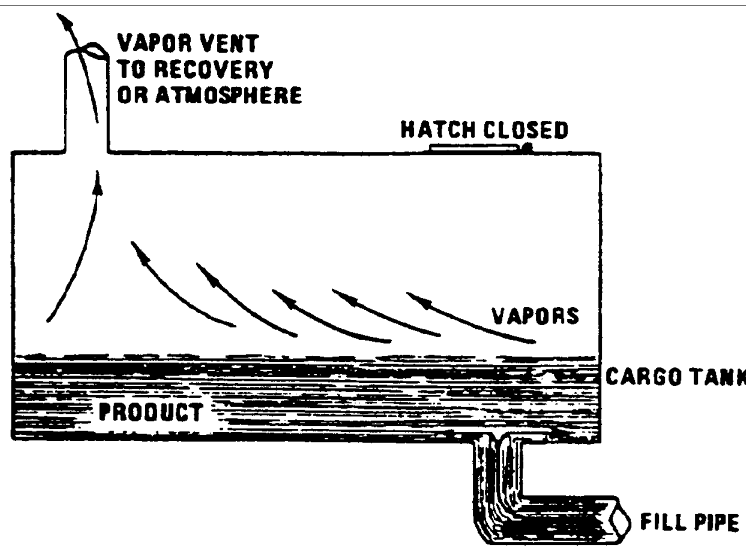

Figure 5.2-4. Bottom loading.

loading operation, resulting in high levels of vapor generation and loss. If the turbulence is great enough, liquid droplets will be entrained in the vented vapors.

A second method of loading is submerged loading. Two types are the submerged fill pipe method and the bottom loading method. In the submerged fill pipe method, the fill pipe extends almost to the bottom of the cargo tank. In the bottom loading method, a permanent fill pipe is attached to the cargo tank bottom. During most of submerged loading by both methods, the fill pipe opening is below the liquid surface level. Liquid turbulence is controlled significantly during submerged loading, resulting in much lower vapor generation than encountered during splash loading.

The recent loading history of a cargo carrier is just as important a factor in loading losses as the method of loading. If the carrier has carried a nonvolatile liquid such as fuel oil, or has just been cleaned, it will contain vapor-free air. If it has just carried gasoline and has not been vented, the air in the carrier tank will contain volatile organic vapors, which will be expelled during the loading operation along with newly generated vapors.

Cargo carriers are sometimes designated to transport only one product, and in such cases are practicing "dedicated service". Dedicated gasoline cargo tanks return to a loading terminal containing air fully or partially saturated with vapor from the previous load. Cargo tanks may also be "switch loaded" with various products, so that a nonvolatile product being loaded may expel the vapors remaining from a previous load of a volatile product such as gasoline. These circumstances vary with the type of cargo tank and with the ownership of the carrier, the petroleum liquids being transported, geographic location, and season of the year.

One control measure for vapors displaced during liquid loading is called "vapor balance service", in which the cargo tank retrieves the vapors displaced during product unloading at bulk plants or service stations and transports the vapors back to the loading terminal. Figure 5.2-5 shows a tank truck in vapor balance service filling a service station underground tank and taking on displaced gasoline vapors for return to the terminal. A cargo tank returning to a bulk terminal in vapor balance service normally is saturated with organic vapors, and the presence of these vapors at the start of submerged loading of the tanker truck results in greater loading losses than encountered during nonvapor balance, or "normal", service. Vapor balance service is usually not practiced with marine vessels, although some vessels practice emission control by means of vapor transfer within their own cargo tanks during ballasting operations, discussed below.

Emissions from loading petroleum liquid can be estimated (with a probable error of ±30 percent)[4] using the following expression:

$$L_L = 12.46 \frac{SPM}{T} \qquad (1)$$

where:

L_L = loading loss, pounds per 1000 gallons (lb/10^3 gal) of liquid loaded

S = a saturation factor (see Table 5.2-1)
P = true vapor pressure of liquid loaded, pounds per square inch absolute (psia) (see Section 7.1, "Organic Liquid Storage Tanks")
M = molecular weight of vapors, pounds per pound-mole (lb/lb-mole) (see Section 7.1, "Organic Liquid Storage Tanks")
T = temperature of bulk liquid loaded, °R (°F + 460)

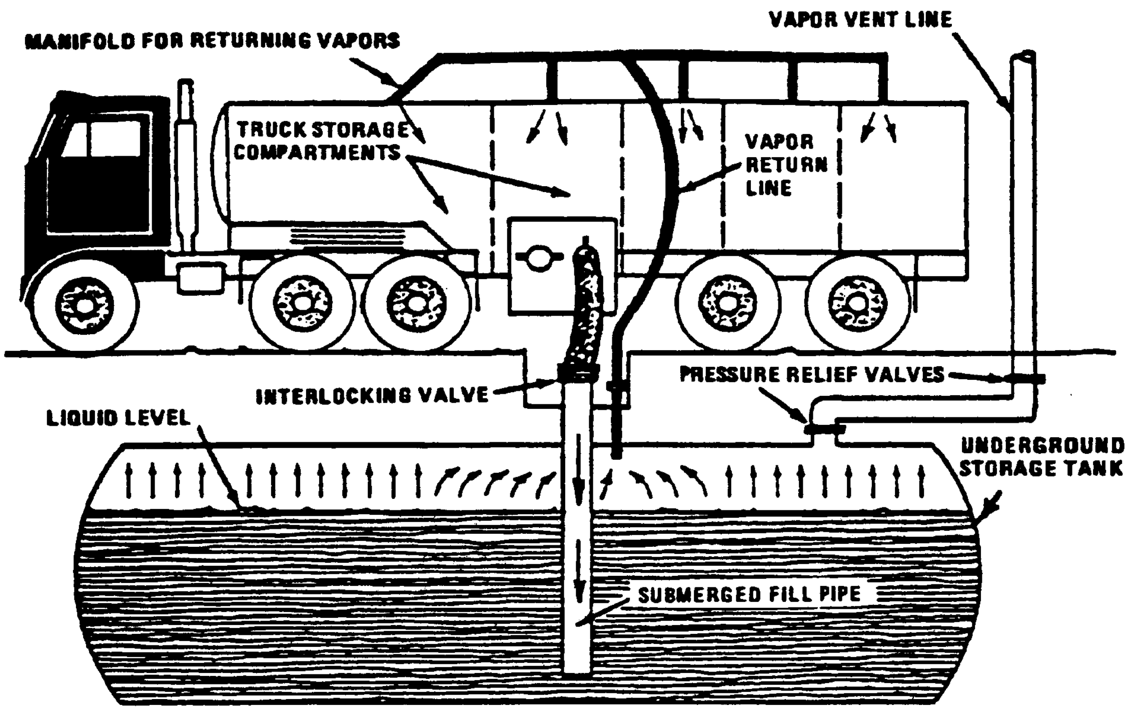

Figure 5.2-5. Tank truck unloading into a service station underground storage tank and practicing "vapor balance" form of emission control.

Table 5.2-1. SATURATION (S) FACTORS FOR CALCULATING PETROLEUM LIQUID LOADING LOSSES

Cargo Carrier	Mode Of Operation	S Factor
Tank trucks and rail tank cars	Submerged loading of a clean cargo tank	0.50
	Submerged loading: dedicated normal service	0.60
	Submerged loading: dedicated vapor balance service	1.00
	Splash loading of a clean cargo tank	1.45
	Splash loading: dedicated normal service	1.45
	Splash loading: dedicated vapor balance service	1.00
Marine vessels[a]	Submerged loading: ships	0.2
	Submerged loading: barges	0.5

[a] For products other than gasoline and crude oil. For marine loading of gasoline, use factors from Table 5.2-2. For marine loading of crude oil, use Equations 2 and 3 and Table 5.2-3.

The saturation factor, S, represents the expelled vapor's fractional approach to saturation, and it accounts for the variations observed in emission rates from the different unloading and loading methods. Table 5.2-1 lists suggested saturation factors.

Emissions from controlled loading operations can be calculated by multiplying the uncontrolled emission rate calculated in Equation 1 by an overall reduction efficiency term:

$$\left(1 - \frac{eff}{100}\right)$$

The overall reduction efficiency should account for the capture efficiency of the collection system as well as both the control efficiency and any downtime of the control device. Measures to reduce loading emissions include selection of alternate loading methods and application of vapor recovery equipment. The latter captures organic vapors displaced during loading operations and recovers the vapors by the use of refrigeration, absorption, adsorption, and/or compression. The recovered product is piped back to storage. Vapors can also be controlled through combustion in a thermal oxidation unit, with no product recovery. Figure 5.2-6 demonstrates the recovery of gasoline vapors from tank trucks during loading operations at bulk terminals. Control efficiencies for the recovery units range from 90 to over 99 percent, depending on both the nature of the vapors and the type of control equipment used.[5-6] However, not all of the displaced vapors reach the control device, because of leakage from both the tank truck and collection system. The collection efficiency should be assumed to be 99.2 percent for tanker trucks passing the MACT-level annual leak test (not more than 1 inch water column pressure change in 5 minutes after pressurizing to 18 inches water followed by pulling a vacuum of 6 inches water).[7] A collection efficiency of 98.7 percent (a 1.3 percent leakage rate) should be assumed for trucks passing the NSPS-level annual test (3 inches pressure change) A collection efficiency of 70 percent should be assumed for trucks not passing one of these annual leak tests[6].

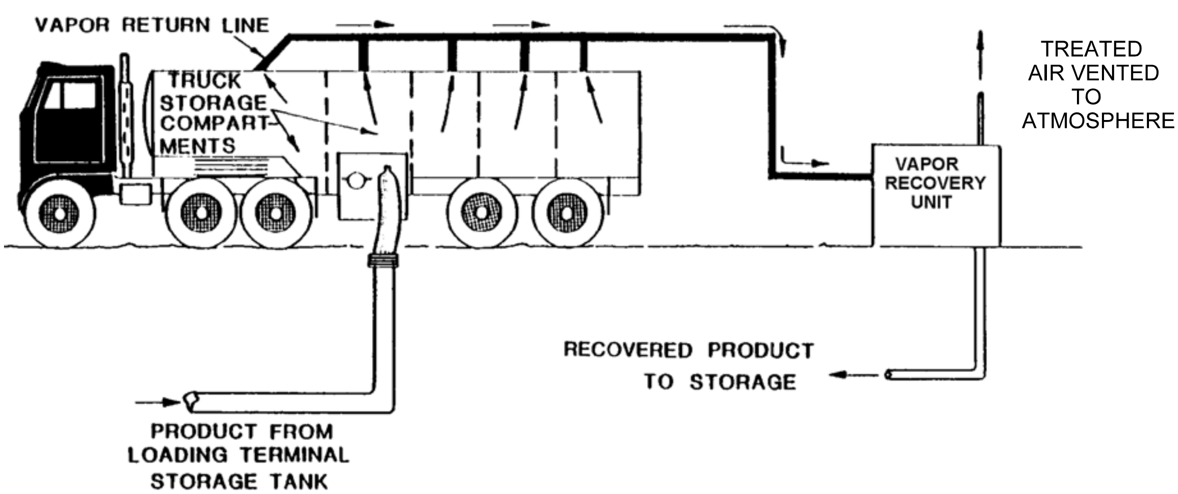

Figure 5.2-6. Tank truck loading with vapor recovery.

Sample Calculation -

Loading losses (L_L) from a gasoline tank truck in dedicated vapor balance service and practicing vapor recovery would be calculated as follows, using Equation 1:

Design basis -

Cargo tank volume is 8000 gal
Gasoline Reid vapor pressure (RVP) is 9 psia
Product temperature is 80°F
Vapor recovery efficiency is 95 percent
Vapor collection efficiency is 98.7 percent (NSPS-level annual leak test)

Loading loss equation -

$$L_L = 12.46 \frac{SPM}{T} \left(1 - \frac{eff}{100}\right)$$

where:

S = saturation factor (see Table 5.2-1) - 1.00
P = true vapor pressure of gasoline = 6.6 psia
M = molecular weight of gasoline vapors = 66
T = temperature of gasoline = 540°R
eff = overall reduction efficiency (95 percent control x 98.7 percent collection) = 94 percent

$$L_L = 12.46 \frac{(1.00)(6.6)(66)}{540} \left(1 - \frac{94}{100}\right)$$

$$= 0.60 \ lb/10^3 gal$$

Total loading losses are:

$$(0.60 \ lb/10^3 \ gal)(8.0 \ x \ 10^3 \ gal) = 4.8 \ pounds \ (lb)$$

Measurements of gasoline loading losses from ships and barges have led to the development of emission factors for these specific loading operations.[8] These factors are presented in Table 5.2-2 and should be used instead of Equation 1 for gasoline loading operations at marine terminals. Factors are expressed in units of milligrams per liter (mg/L) and pounds per 1000 gallons ($lb/10^3$ gal).

Table 5.2-2 (Metric And English Units). VOLATILE ORGANIC COMPOUND (VOC) EMISSION FACTORS FOR GASOLINE LOADING OPERATIONS AT MARINE TERMINALS[a]

Vessel Tank Condition	Previous Cargo	Ships/Ocean Barges[b] mg/L Transferred	Ships/Ocean Barges[b] $lb/10^3$ gal Transferred	Barges[b] mg/L Transferred	Barges[b] $lb/10^3$ gal Transferred
Uncleaned	Volatile[c]	315	2.6	465	3.9
Ballasted	Volatile	205	1.7	—[d]	—[d]
Cleaned	Volatile	180	1.5	ND	ND
Gas-freed	Volatile	85	0.7	ND	ND
Any condition	Nonvolatile	85	0.7	ND	ND
Gas-freed	Any cargo	ND	ND	245	2.0
Typical overall situation[e]	Any cargo	215	1.8	410	3.4

[a] References 2,9. Factors are for both VOC emissions (which excludes methane and ethane) and total organic emissions, because methane and ethane have been found to constitute a negligible weight fraction of the evaporative emissions from gasoline. ND = no data.
[b] Ocean barges (tank compartment depth about 12.2 m [40 ft]) exhibit emission levels similar to tank ships. Shallow draft barges (compartment depth 3.0 to 3.7 m [10 to 12 ft]) exhibit higher emission levels.
[c] Volatile cargoes are those with a true vapor pressure greater than 10 kilopascals (kPa) (1.5 psia).
[d] Barges are usually not ballasted.
[e] Based on observation that 41% of tested ship compartments were uncleaned, 11% ballasted, 24% cleaned, and 24% gas-freed. For barges, 76% were uncleaned.

In addition to Equation 1, which estimates emissions from the loading of petroleum liquids, Equation 2 has been developed specifically for estimating emissions from the loading of crude oil into ships and ocean barges:

$$C_L = C_A + C_G \qquad (2)$$

where:

C_L = total loading loss, $lb/10^3$ gal of crude oil loaded
C_A = arrival emission factor, contributed by vapors in the empty tank compartment before loading, $lb/10^3$ gal loaded (see Note below)
C_G = generated emission factor, contributed by evaporation during loading, $lb/10^3$ gal loaded

Note: Values of C_A for various cargo tank conditions are listed in Table 5.2-3.

5.2-3 (English Units). AVERAGE ARRIVAL EMISSION FACTORS, C_A, FOR CRUDE OIL LOADING EMISSION EQUATION[a]

Ship/Ocean Barge Tank Condition	Previous Cargo	Arrival Emission Factor, lb/10^3 gal
Uncleaned	Volatile[b]	0.86
Ballasted	Volatile	0.46
Cleaned or gas-freed	Volatile	0.33
Any condition	Nonvolatile	0.33

[a] Arrival emission factors (C_A) to be added to generated emission factors (C_G) calculated in Equation 3 to produce total crude oil loading loss (C_L). Factors are for total organic compounds; VOC emission factors average about 15% lower, because VOC does not include methane or ethane.
[b] Volatile cargoes are those with a true vapor pressure greater than 10 kPa (1.5 psia).

This equation was developed empirically from test measurements of several vessel compartments.[8] The quantity C_G can be calculated using Equation 3:

$$C_G = 1.84\ (0.44\ P - 0.42)\ \frac{M\,G}{T} \tag{3}$$

where:

P = true vapor pressure of loaded crude oil, psia
M = molecular weight of vapors, lb/lb-mole
G = vapor growth factor = 1.02 (dimensionless)
T = temperature of vapors, °R (°F + 460)

Emission factors derived from Equation 3 and Table 5.2-3 represent total organic compounds. Volatile organic compound (VOC) emission factors (which exclude methane and ethane because they are exempted from the regulatory definition of "VOC") for crude oil vapors have been found to range from approximately 55 to 100 weight percent of these total organic factors. When specific vapor composition information is not available, the VOC emission factor can be estimated by taking 85 percent of the total organic factor.[3]

5.2.2.1.2 Ballasting Losses -

Ballasting operations are a major source of evaporative emissions associated with the unloading of petroleum liquids at marine terminals. It is common practice to load several cargo tank compartments with sea water after the cargo has been unloaded. This water, termed "ballast", improves the stability of the empty tanker during the subsequent voyage. Although ballasting practices vary, individual cargo tanks are ballasted typically about 80 percent, and the total vessel 15 to 40 percent, of capacity. Ballasting emissions occur as vapor-laden air in the "empty" cargo tank is displaced to the atmosphere by ballast water being pumped into the tank. Upon arrival at a loading port, the ballast water is pumped from the cargo tanks before the new cargo is loaded. The ballasting of cargo tanks reduces the quantity of vapors returning in the empty tank, thereby reducing the quantity of vapors emitted during subsequent tanker loading. Regulations administered by the U. S. Coast Guard require that, at marine terminals located in ozone nonattainment areas, large tankers with crude oil washing systems contain the organic vapors from ballasting.[10] This is accomplished principally by displacing the vapors during ballasting into a cargo tank being simultaneously unloaded. In other areas, marine vessels emit organic vapors directly to the atmosphere.

Equation 4 has been developed from test data to calculate the ballasting emissions from crude oil ships and ocean barges[8]:

$$L_B = 0.31 + 0.20\ P + 0.01\ PU_A \tag{4}$$

where:

L_B = ballasting emission factor, lb/10^3 gal of ballast water
P = true vapor pressure of discharged crude oil, psia
U_A = arrival cargo true ullage, before dockside discharge, measured from the deck, feet; (the term "ullage" here refers to the distance between the cargo surface level and the deck level)

Table 5.2-4 lists average total organic emission factors for ballasting into uncleaned crude oil cargo compartments. The first category applies to "full" compartments wherein the crude oil true ullage just before cargo discharge is less than 1.5 meters (m) (5 ft). The second category applies to lightered, or short-loaded, compartments (part of cargo previously discharged, or original load a partial fill), with an arrival true ullage greater than 1.5 m (5 ft). It should be remembered that these tabulated emission factors are examples only, based on average conditions, to be used when crude oil vapor pressure is unknown. Equation 4 should be used when information about crude oil vapor pressure and cargo compartment condition is available. The following sample calculation illustrates the use of Equation 4.

5.2-4 (Metric And English Units). TOTAL ORGANIC EMISSION FACTORS FOR CRUDE OIL BALLASTING[a]

	Average Emission Factors			
	By Category		Typical Overall[b]	
Compartment Condition Before Cargo Discharge	mg/L Ballast Water	lb/10^3 gal Ballast Water	mg/L Ballast Water	lb/10^3 gal Ballast Water
Fully loaded[c]	111	0.9	129	1.1
Lightered or previously short loaded[d]	171	1.4 A		

[a] Assumes crude oil temperature of 16°C (60°F) and RVP of 34 kPa (5 psia). VOC emission factors average about 85% of these total organic factors, because VOCs do not include methane or ethane.
[b] Based on observation that 70% of tested compartments had been fully loaded before ballasting. May not represent average vessel practices.
[c] Assumed typical arrival ullage of 0.6 m (2 ft).
[d] Assumed typical arrival ullage of 6.1 m (20 ft).

Sample Calculation -

Ballasting emissions from a crude oil cargo ship would be calculated as follows, using Equation 4:

Design basis -

Vessel and cargo description: 80,000 dead-weight-ton tanker, crude oil capacity 500,000 barrels (bbl); 20 percent of the cargo capacity is filled with ballast water after cargo discharge. The crude oil has an RVP of 6 psia and is discharged at 75°F.

Compartment conditions: 70 percent of the ballast water is loaded into compartments that had been fully loaded to 2 ft ullage, and 30 percent is loaded into compartments that had been lightered to 15 ft ullage before arrival at dockside.

Ballasting emission equation -

$$L_B = 0.31 + 0.20\ P + 0.01\ PU_A$$

where:

P = true vapor pressure of crude oil
= 4.6 psia
U_A = true cargo ullage for the full compartments = 2 ft, and true cargo ullage for the lightered compartments = 15 ft

$$L_B = 0.70\ [0.31 + (0.20)\ (4.6) + (0.01)\ (4.6)\ (2)] + 0.30\ [0.31 + (0.20)\ (4.6) + (0.01)\ (4.6)\ (15)]$$

$$= 1.5\ \text{lb}/10^3\ \text{gal}$$

Total ballasting emissions are:

$$(1.5\ \text{lb}/10^3\ \text{gal})\ (0.20)\ (500{,}000\ \text{bbl})\ (42\ \text{gal/bbl}) = 6{,}300\ \text{lb}$$

Since VOC emissions average about 85 percent of these total organic emissions, emissions of VOCs are about: (0.85)(6,300 lb) = 5,360 lb

5.2.2.1.3 Transit Losses -

In addition to loading and ballasting losses, losses occur while the cargo is in transit. Transit losses are similar in many ways to breathing losses associated with petroleum storage (see Section 7.1, "Organic Liquid Storage Tanks"). Experimental tests on ships and barges[4] have indicated that transit losses can be calculated using Equation 5:

$$L_T = 0.1\ PW \tag{5}$$

where:

L_T = transit loss from ships and barges, lb/week-10^3 gal transported
P = true vapor pressure of the transported liquid, psia
W = density of the condensed vapors, lb/gal

Emissions from gasoline truck cargo tanks during transit have been studied by a combination of theoretical and experimental techniques, and typical emission values are presented in Table 5.2-5.[11-12] Emissions depend on the extent of venting from the cargo tank during transit, which in turn depends on the vapor tightness of the tank, the pressure relief valve settings, the pressure in the tank at the start of the trip, the vapor pressure of the fuel being transported, and the degree of fuel vapor saturation of the space in the tank. The emissions are not directly proportional to the time spent in transit. If the vapor leakage rate of the tank increases, emissions increase up to a point, and then the rate changes as other determining factors take over. Truck tanks in dedicated vapor balance service usually contain saturated vapors, and this leads to lower emissions during transit because no additional fuel evaporates to raise the pressure in the tank to cause venting. Table 5.2-5 lists "typical" values for transit emissions and "extreme" values that could occur in the unlikely event that all determining factors combined to cause maximum emissions.

Table 5.2-5 (Metric And English Units). TOTAL UNCONTROLLED ORGANIC EMISSION FACTORS FOR PETROLEUM LIQUID RAIL TANK CARS AND TANK TRUCKS

Emission Source	Gasoline[a]	Crude Oil[b]	Jet Naphtha (JP-4)	Jet Kerosene	Distillate Oil No. 2	Residual Oil No. 6
Loading operations[c]						
Submerged loading - Dedicated normal service[d]						
mg/L transferred	590	240	180	1.9	1.7	0.01
lb/10^3 gal transferred	5	2	1.5	0.016	0.014	0.0001
Submerged loading - Vapor balance service[d]						
mg/L transferred	980	400	300	—[e]	—[e]	—[e]
lb/10^3 gal transferred	8	3	2.5	—[e]	—[e]	—[e]
Splash loading - Dedicated normal service						
mg/L transferred	1,430	580	430	5	4	0.03
lb/10^3 gal transferred	12	5	4	0.04	0.03	0.0003
Splash loading - Vapor balance service						
mg/L transferred	980	400	300	—[e]	—[e]	—[e]
lb/10^3 gal transferred	8	3	2.5	—[e]	—[e]	—[e]

Table 5.2-5 (cont.).

Emission Source	Gasoline[a]	Crude Oil[b]	Jet Naphtha (JP-4)	Jet Kerosene	Distillate Oil No. 2	Residual Oil No. 6
Transit losses						
Loaded with product						
mg/L transported						
Typical	0 - 1.0	ND	ND	ND	ND	ND
Extreme	0 - 9.0	ND	ND	ND	ND	ND
$lb/10^3$ gal transported						
Typical	0 - 0.01	ND	ND	ND	ND	ND
Extreme	0 - 0.08	ND	ND	ND	ND	ND
Return with vapor						
mg/L transported						
Typical	0 - 13.0	ND	ND	ND	ND	ND
Extreme	0 - 44.0	ND	ND	ND	ND	ND
$lb/10^3$ gal transported						
Typical	0 - 0.11	ND	ND	ND	ND	ND
Extreme	0 - 0.37	ND	ND	ND	ND	ND

[a] Reference 2. Gasoline factors represent emissions of VOC as well as total organics, because methane and ethane constitute a negligible weight fraction of the evaporative emissions from gasoline. VOC factors for crude oil can be assumed to be 15% lower than the total organic factors, to account for the methane and ethane content of crude oil evaporative emissions. All other products should be assumed to have VOC factors equal to total organics. The example gasoline has an RVP of 69 kPa (10 psia). ND = no data.
[b] The example crude oil has an RVP of 34 kPa (5 psia).
[c] Loading emission factors are calculated using Equation 1 for a dispensed product temperature of 16°C (60°F).
[d] Reference 2.
[e] Not normally used.

In the absence of specific inputs for Equations 1 through 5, the typical evaporative emission factors presented in Tables 5.2-5 and 5.2-6 should be used. It should be noted that, although the crude oil used to calculate the emission values presented in these tables has an RVP of 5, the RVP of crude oils can range from less than 1 up to 10. Similarly, the RVP of gasolines ranges from 7 to 13. In areas where loading and transportation sources are major factors affecting air quality, it is advisable to obtain the necessary parameters and to calculate emission estimates using Equations 1 through 5.

5.2.2.2 Service Stations -

Another major source of evaporative emissions is the filling of underground gasoline storage tanks at service stations. Gasoline is usually delivered to service stations in 30,000-liter (8,000-gal) tank trucks or smaller account trucks. Emissions are generated when gasoline vapors in the underground storage tank are displaced to the atmosphere by the gasoline being loaded into the tank. As with other loading losses, the quantity of loss in service station tank filling depends on several variables, including the method and rate of filling, the tank configuration, and the gasoline temperature, vapor pressure and composition. An average emission rate for submerged filling is 880 mg/L (7.3 lb/1000 gal) of transferred gasoline, and the rate for splash filling is 1380 mg/L (11.5 lb/1000 gal) transferred gasoline (see Table 5.2-7).[5]

Table 5.2-6 (Metric And English Units). TOTAL ORGANIC EMISSION FACTORS FOR PETROLEUM MARINE VESSEL SOURCES[a]

Emission Source	Gasoline[b]	Crude Oil[c]	Jet Naphtha (JP-4)	Jet Kerosene	Distillate Oil No. 2	Residual Oil No. 6
Loading operations						
Ships/ocean barges						
mg/L transferred	—[d]	73	60	0.63	0.55	0.004
lb/10^3 gal transferred	—[d]	0.61	0.50	0.005	0.005	0.00004
Barges						
mg/L transferred	—[d]	120	150	1.60	1.40	0.011
lb/10^3 gal transferred	—[d]	1.0	1.2	0.013	0.012	0.00009
Tanker ballasting						
mg/L ballast water	100	—[e]	ND	ND	ND	ND
lb/10^3 gal ballast water	0.8	—[e]	ND	ND	ND	ND
Transit						
mg/week-L transported	320	150	84	0.60	0.54	0.003
lb/week-10^3 gal transported	2.7	1.3	0.7	0.005	0.005	0.00003

[a] Factors are for a dispensed product of 16°C (60°F). ND = no data.
[b] Factors represent VOC as well as total organic emissions, because methane and ethane constitute a negligible fraction of gasoline evaporative emissions. All products other than crude oil can be assumed to have VOC factors equal to total organic factors. The example gasoline has an RVP of 69 kPa (10 psia).
[c] VOC emission factors for a typical crude oil are 15% lower than the total organic factors shown, in order to account for methane and ethane. The example crude oil has an RVP of 34 kPa (5 psia).
[d] See Table 5.2-2 for these factors.
[e] See Table 5.2-4 for these factors.

Emissions from underground tank filling operations at service stations can be reduced by the use of a vapor balance system such as in Figure 5.2-5 (termed Stage I vapor control). The vapor balance system employs a hose that returns gasoline vapors displaced from the underground tank to the tank truck cargo compartments being emptied. The control efficiency of the balance system ranges from 93 to 100 percent. Organic emissions from underground tank filling operations at a service station employing a vapor balance system and submerged filling are not expected to exceed 40 mg/L (0.3 lb/1000 gal) of transferred gasoline.

Table 5.2-7 (Metric And English Units). EVAPORATIVE EMISSIONS FROM GASOLINE SERVICE STATION OPERATIONS[a]

Emission Source	Emission Rate	
	mg/L Throughput	$lb/10^3$ gal Throughput
Filling underground tank (Stage I)		
Submerged filling	880	7.3
Splash filling	1,380	11.5
Balanced submerged filling	40	0.3
Underground tank breathing and emptying[b]	120	1.0
Vehicle refueling operations (Stage II)		
Displacement losses (uncontrolled)[c]	1,320	11.0
Displacement losses (controlled)	132	1.1
Spillage	80	0.7

[a] Factors are for VOC as well as total organic emissions, because of the methane and ethane content of gasoline evaporative emissions is negligible.
[b] Includes any vapor loss between underground tank and gas pump.
[c] Based on Equation 6, using average conditions.

A second source of vapor emissions from service stations is underground tank breathing. Breathing losses occur daily and are attributable to gasoline evaporation and barometric pressure changes. The frequency with which gasoline is withdrawn from the tank, allowing fresh air to enter to enhance evaporation, also has a major effect on the quantity of these emissions. An average breathing emission rate is 120 mg/L (1.0 lb/1000 gal) of throughput.

5.2.2.3 Motor Vehicle Refueling -

Service station vehicle refueling activity also produces evaporative emissions. Vehicle refueling emissions come from vapors displaced from the automobile tank by dispensed gasoline and from spillage. The quantity of displaced vapors depends on gasoline temperature, auto tank temperature, gasoline RVP, and dispensing rate. Equation 6 can be used to estimate uncontrolled displacement losses from vehicle refueling for a particular set of conditions.[14]

$$E_R = 264.2\ [(-5.909) - 0.0949\ (\Delta T) + 0.0884\ (T_D) + 0.485\ (RVP)] \tag{6}$$

where:

E_R = refueling emissions, mg/L
ΔT = difference between temperature of fuel in vehicle tank and temperature of dispensed fuel, °F
T_D = temperature of dispensed fuel, °F
RVP = Reid vapor pressure, psia

Note that this equation and the spillage loss factor are incorporated into the *MOBILE* model. The *MOBILE* model allows for disabling of this calculation if it is desired to include these emissions in the stationary area source portion of an inventory rather than in the mobile source portion. It is estimated that the uncontrolled emissions from vapors displaced during vehicle refueling average 1320 mg/L (11.0 lb/1000 gal) of dispensed gasoline.[5,13]

Spillage loss is made up of contributions from prefill and postfill nozzle drip and from spit-back and overflow from the vehicles's fuel tank filler pipe during filling. The amount of spillage loss can depend on several variables, including service station business characteristics, tank configuration, and operator techniques. An average spillage loss is 80 mg/L (0.7 lb/1000 gal) of dispensed gasoline.[5,13]

Control methods for vehicle refueling emissions are based on conveying the vapors displaced from the vehicle fuel tank to the underground storage tank vapor space through the use of a special hose and nozzle, as depicted in Figure 5.2-7 (termed Stage II vapor control). In "balance" vapor control systems, the vapors are conveyed by natural pressure differentials established during refueling. In "vacuum assist" systems, the conveyance of vapors from the auto fuel tank to the underground storage tank is assisted by a vacuum pump. Tests on a few systems have indicated overall systems control efficiencies in the range of 88 to 92 percent.[5,13] When inventorying these emissions as an area source, rule penetration and rule effectiveness should also be taken into account. *Procedures For Emission Inventory Preparation, Volume IV: Mobile Sources*, EPA-450/4-81-026d, provides more detail on this.

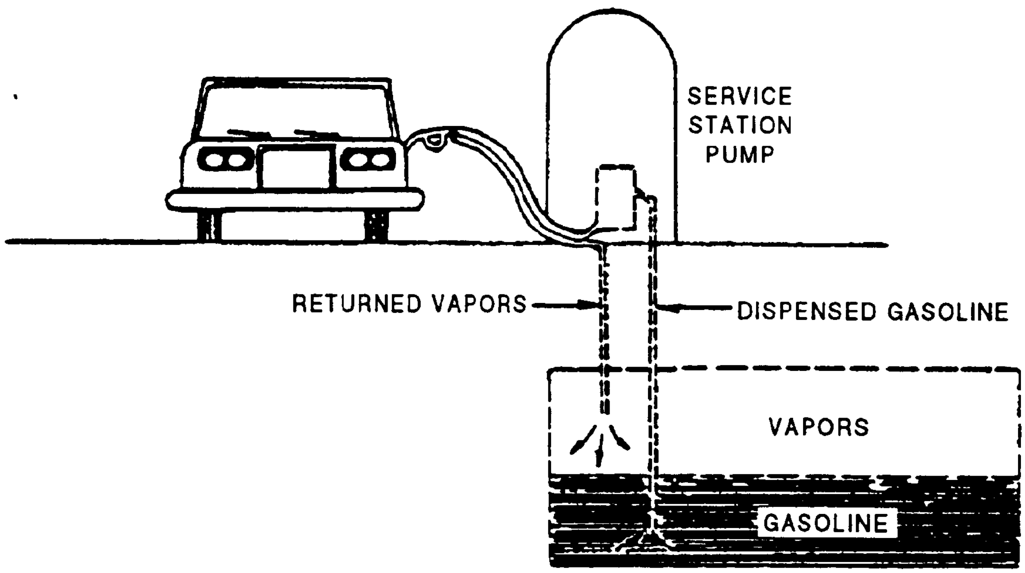

Figure 5.2-7. Automobile refueling vapor recovery system.

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7.1 Organic Liquid Storage Tanks

7.1.1 General

7.1.1.1 Scope

Section 7.1 presents emissions estimating methodologies for storage tanks of various types and operating conditions. The methodologies are intended for storage tanks that are properly maintained and in normal working condition. The methodologies do not address conditions of deteriorated or otherwise damaged materials of construction, nor do they address operating conditions that differ significantly from the scenarios described herein. To estimate losses that occur from underground gasoline storage tanks at service stations, please see AP-42 Section 5.2, "Transportation and Marketing of Petroleum Liquids."

Sections 7.1.3.1 and 7.1.3.2 present emissions estimating methodologies for routine emissions from fixed roof tanks and floating roof tanks. Use of the terminology "routine emissions" to refer to standing and working losses applies only for the purposes of this document, and not for any other air quality purposes such as New Source Review (NSR) permitting. The equations for routine emissions were developed to estimate average annual losses for storage tanks, but provisions for applying the equations to shorter periods of time are addressed in Section 7.1.3.8.1. The equations for routine emissions are a function of temperatures that are derived from a theoretical energy transfer model. In order to simplify the calculations, default values were assigned to certain parameters in the energy transfer equations. The accuracy of the resultant equations for an individual tank depends upon how closely that tank fits the assumptions inherent to these default values. The associated uncertainty may be mitigated by using measured values for the liquid bulk temperature. The equations for routine emissions are not intended to include emissions from the following events (these are addressed separately):

a) To estimate losses that result from the landing of a floating roof. A separate methodology is presented for floating roof landing losses in Section 7.1.3.3.

b) To estimate losses that result from cleaning a tank. A separate methodology is presented for tank cleaning losses in Section 7.1.3.4.

c) To estimate losses from variable vapor space tanks. Variable vapor space tanks are discussed in Section 7.1.3.6.

d) To estimate losses from equipment leaks associated with pressure tanks designed as closed systems without emissions to the atmosphere. Pressure tanks are discussed in Section 7.1.3.7.

Section 7.1.3.8 addresses the following additional scenarios that are outside the scope of the methodologies for routine emissions presented in Sections 7.1.3.1 and 7.1.3.2.

e) Time periods shorter than one year. Certain assumptions in the equations for routine emissions are based on annual averages, and thus the equations have greater uncertainty for a period of time less than a year. Section 7.1.3.8.1 addresses application of the equations to time periods shorter than one year, with the caveat that a one-month time frame is recommended as the shortest time period for which routine emissions should be estimated using these methodologies.

f) Internal floating roof tanks with closed vent systems. The equations for routine emissions from internal floating roof tanks assume that the tank has open vents in the fixed roof.

Section 7.1.3.8.2 addresses estimation of emissions when an internal floating roof tank has closed pressure/vacuum vents.

g) Case-specific liquid surface temperature determination. Several parameters pertaining to liquid surface temperature are assigned default values for incorporation into the equations for routine emissions. Section 7.1.3.8.3 presents methodology to account for these parameters as variables in the estimation of emissions from a particular storage tank at a particular location.

h) Heating cycles in fixed roof tanks. The equations for standing loss from fixed roof tanks are based on a daily cycle of warming and cooling of the vapor space due to heat exchange between the vapor space and ambient air through the shell and roof of the tank. This heat exchange results in daytime expansion and nighttime contraction of vapors in the vapor space, with each expansion causing some portion of the vapors to be expelled from the vapor space. A similar cycle of expansion and contraction of the vapors may be driven by cyclic heating of the bulk liquid. Section 7.1.3.8.4 provides guidance for adapting the equations for fixed roof tank standing loss to the case of cyclic heating of the bulk liquid.

Section 7.1.4 presents calculations for applying Raoult's Law to calculate the contribution of individual chemical species to the total emissions.

Section 7.1.5 presents worked examples, with estimated emissions shown to two significant figures. This level of precision is chosen arbitrarily and may overstate the accuracy of the loss estimates given the uncertainty associated with the multiple parameters affecting emissions from storage tanks.

Section 7.1.6 contains equations that have been used historically to obtain approximate values, but which have been replaced with more accurate equations.

7.1.1.2 Process Description[1-3]

Storage tanks containing organic liquids can be found in many industries, including (1) petroleum producing and refining, (2) petrochemical and chemical manufacturing, (3) bulk storage and transfer operations, and (4) other industries consuming or producing organic liquids.

Six basic types of designs are used for organic liquid storage tanks: fixed roof (vertical and horizontal), external floating roof, domed external (or covered) floating roof, internal floating roof, variable vapor space, and pressure (low and high). A brief description of each tank is provided below. Loss mechanisms associated with each type of tank are described in Section 7.1.2.

The emission estimating equations presented in Section 7.1 were developed by the American Petroleum Institute (API). API retains the copyright to these equations. API has granted permission for the nonexclusive; noncommercial distribution of this material to governmental and regulatory agencies. However, API reserves its rights regarding all commercial duplication and distribution of its material. Therefore, the material presented in Section 7.1 is available for public use, but the material cannot be sold without written permission from the American Petroleum Institute and the U. S. Environmental Protection Agency.

7.1.1.2.1 Fixed Roof Tanks

A typical vertical fixed roof tank is shown in Figure 7.1-1. This type of tank consists of a cylindrical steel shell with a permanently affixed roof, which may vary in design from cone- or dome-shaped to flat. Losses from fixed roof tanks are caused by changes in temperature, pressure, and liquid level.

Fixed roof tanks are either freely vented or equipped with a pressure/vacuum vent. The latter allows the tanks to operate at a slight internal pressure or vacuum to prevent the release of vapors during small changes in temperature, pressure, or liquid level. Fixed roof tanks may have additional vents or hatches, referred to as emergency vents, to provide increased vent flow capacity in the event of excessive pressure in the tank. Of current tank designs, the fixed roof tank is the least expensive to construct and is generally considered the minimum acceptable equipment for storing organic liquids.

Horizontal fixed roof tanks are constructed for both above-ground and underground service and are usually constructed of steel, steel with a fiberglass overlay, or fiberglass-reinforced polyester. Horizontal tanks are generally small storage tanks with capacities of less than 40,000 gallons. Horizontal tanks are constructed such that the length of the tank is not greater than six times the diameter to ensure structural integrity. Horizontal tanks are usually equipped with pressure-vacuum vents, gauge hatches and sample wells, and manholes to provide access.

The potential emission sources for above-ground horizontal tanks are the same as those for vertical fixed roof tanks. Emissions from underground storage tanks are associated mainly with changes in the liquid level in the tank. Losses due to changes in temperature or barometric pressure are minimal for underground tanks because the surrounding earth limits the diurnal temperature change, and changes in the barometric pressure result in only small losses. However, standing losses from underground gasoline tanks, which can experience relatively fast vapor growth after the ingestion of air and dilution of the headspace, are addressed in Section 5.2 of AP-42.

7.1.1.2.2 External Floating Roof Tanks

A typical external floating roof tank (EFRT) consists of an open-top cylindrical steel shell equipped with a roof that floats on the surface of the stored liquid. The floating roof consists of a deck, deck fittings, and a rim seal system. Floating decks that are currently in use are constructed of welded steel plate and are most commonly of two general types: pontoon or double-deck. Pontoon-type and double-deck-type external floating roof tanks are shown in Figures 7.1-2 and 7.1-3, respectively. With all types of external floating roof tanks, the roof rises and falls with the liquid level in the tank. External floating decks are equipped with a rim seal system, which is attached to the deck perimeter and contacts the tank wall. The purpose of the floating roof and rim seal system is to reduce evaporative loss of the stored liquid. Some annular space remains between the seal system and the tank wall. The seal system slides against the tank wall as the roof is raised and lowered. The floating deck is also equipped with deck fittings that penetrate the deck and serve operational functions. The external floating roof design is such that routine evaporative losses from the stored liquid are limited to losses from the rim seal system and deck fittings (standing loss) and any liquid on the tank walls that is exposed by the lowering of the liquid level associated with the withdrawal of liquid (working loss). Because of the open-top configuration of this tank, wind effects have a significant impact on evaporative losses from this type of tank.

7.1.1.2.3 Internal Floating Roof Tanks

An internal floating roof tank (IFRT) has both a permanent fixed roof and a floating roof inside. There are two basic types of internal floating roof tanks: tanks in which the fixed roof is supported by vertical columns within the tank, and tanks with a self-supporting fixed roof and no internal support columns. Fixed roof tanks that have been retrofitted to use a floating roof are typically of the first type. External floating roof tanks that have been converted to internal floating roof tanks typically have a self-supporting roof. Newly constructed internal floating roof tanks may be of either type. The deck in internal floating roof tanks rises and falls with the liquid level and either floats directly on the liquid surface (contact deck) or rests on pontoons several inches above the liquid surface (noncontact deck). The majority of aluminum internal floating roofs currently in service have noncontact decks. A typical internal floating roof tank is shown in Figure 7.1-4.

Contact decks include (1) aluminum sandwich panels that are bolted together, with a honeycomb aluminum core floating in contact with the liquid; (2) pan steel decks floating in contact with the liquid, with or without pontoons; and (3) resin-coated, fiberglass reinforced polyester (FRP), buoyant panels floating in contact with the liquid. Variations on these designs are also available. The majority of internal contact floating decks currently in service are aluminum sandwich panel-type or pan steel-type. The FRP decks are less common. The panels of pan steel decks are usually welded together.

Noncontact decks are the most common type currently in use. Typical noncontact decks are constructed of an aluminum deck and an aluminum grid framework supported above the liquid surface by tubular aluminum pontoons or some other buoyant structure. The noncontact decks usually have bolted deck seams.

Installing a floating roof minimizes evaporative losses of the stored liquid. Both contact and noncontact decks incorporate rim seals and deck fittings for the same purposes previously described for external floating roof tanks. Evaporative losses from floating roofs may come from deck fittings, nonwelded deck seams, and the annular space between the deck and tank wall. In addition, these tanks are freely vented by circulation vents at the top of the fixed roof. The vents minimize the possibility of organic vapor accumulation in the tank vapor space in concentrations approaching the flammable range. An internal floating roof tank not freely vented is considered an internal floating roof tank with a closed vent system. Emission estimation methods for such tanks are addressed in Section 7.1.3.8.2.

7.1.1.2.4 Domed External Floating Roof Tanks

Domed external (or covered) floating roof tanks have the heavier type of deck used in external floating roof tanks as well as a fixed roof at the top of the shell like internal floating roof tanks. Domed external floating roof tanks usually result from retrofitting an external floating roof tank with a fixed roof. This type of tank is very similar to an internal floating roof tank with a welded deck and a self-supporting fixed roof. A typical domed external floating roof tank is shown in Figure 7.1-5.

As with the internal floating roof tanks, the function of the fixed roof with respect to emissions is not to act as a vapor barrier, but to block the wind. The estimations of rim seal losses and deck fitting losses include a loss component that is dependent on wind speed and a loss component that is independent of wind speed. When a tank is equipped with a fixed roof, the wind-dependent component is zero due to the blocking of the wind by the fixed roof, leaving only the wind-independent loss component.

The type of fixed roof most commonly used is a self-supporting aluminum dome roof, which is of bolted construction. Like the internal floating roof tanks, these tanks are freely vented by circulation vents at the top and around the perimeter of the fixed roof. The deck fittings and rim seals, however, are identical to those on external floating roof tanks. In the event that the floating deck is replaced with the lighter IFRT-type deck, the tank would then be considered an internal floating roof tank.

The distinction between a domed external floating roof tank and an internal floating roof tank is primarily for purposes of recognizing differences in the deck fittings when estimating emissions. In particular, the domed external floating roof deck typically has significantly taller leg sleeves than are typical of an internal floating roof deck. The longer leg sleeves of the domed external floating roof deck have lower associated emissions than the shorter leg sleeves of the internal floating roof deck. While a domed external floating roof tank is distinct from an internal floating roof tank for purposes of estimating emissions, the domed external floating roof tank would be deemed a type of internal floating roof tank under air regulations that do not separately specify requirements for a domed external floating roof tank.

7.1.1.2.5 Variable Vapor Space Tanks

Variable vapor space tanks are equipped with expandable vapor reservoirs to accommodate vapor volume fluctuations attributable to temperature and barometric pressure changes. Although variable vapor space tanks are sometimes used independently, they are normally connected to the vapor spaces of one or more fixed roof tanks. The two most common types of variable vapor space tanks are lifter roof tanks and flexible diaphragm tanks.

Lifter roof tanks have a telescoping roof that fits loosely around the outside of the main tank wall. The space between the roof and the wall is closed by either a wet seal, which is a trough filled with liquid, or a dry seal, which uses a flexible coated fabric.

Flexible diaphragm tanks use flexible membranes to provide expandable volume. They may be either separate gasholder units or integral units mounted atop fixed roof tanks. A variable vapor space tank that utilizes a flexible diaphragm will emit standing losses to the extent that the flexible diaphragm is permeable or there is leakage through the seam where the flexible diaphragm is attached to the tank wall.

A variable vapor space tank will emit vapors during tank filling when vapor is displaced by liquid, if the tank's vapor storage capacity is exceeded.

7.1.1.2.6 Pressure Tanks

Two classes of pressure tanks are in general use: low pressure (2.5 to 15 psig) and high pressure (higher than 15 psig). Pressure tanks generally are used for storing organic liquids and gases with high vapor pressures and are found in many sizes and shapes, depending on the operating pressure of the tank. Low-pressure tanks are equipped with a pressure/vacuum vent that is set to prevent venting loss from boiling and breathing loss from daily temperature or barometric pressure changes. High-pressure storage tanks can be operated so that virtually no evaporative or working losses occur. In low-pressure tanks, working losses can occur with atmospheric venting of the tank during filling operations. Vapor losses from low-pressure tanks storing non-boiling liquids are estimated in the same manner as for fixed roof tanks, with the vent set pressure accounted for in both the standing and working loss equations.

7.1.2 Emission Mechanisms And Control[2-8]

Emissions from the storage of organic liquids occur because of evaporative loss of the liquid during its storage and as a result of changes in the liquid level. The emission mechanisms vary with tank design, as does the relative contribution of each type of emission mechanism. Emissions from fixed roof tanks are a result of evaporative losses during storage (known as breathing losses or standing losses) and evaporative losses during filling operations (known as working losses). External and internal floating roof tanks are emission sources because of evaporative losses that occur during standing storage and withdrawal of liquid from the tank. Standing losses are a result of evaporative losses through rim seals, deck fittings, and/or deck seams. The loss mechanisms for routine emissions from fixed roof and external and internal floating roof tanks are described in more detail in this section.

7.1.2.1 Fixed Roof Tanks

The two significant types of routine emissions from fixed roof tanks are standing and working losses. The standing loss mechanism for a fixed roof tank is known as breathing, which is the expulsion of vapor from a tank through vapor expansion and contraction that results from changes in temperature and barometric pressure. This loss occurs without any liquid level change in the tank. The emissions estimating methodology presented in Section 7.1 assumes the barometric pressure to be constant, and standing losses from fixed roof tanks are attributed only to changes in temperature. As vapors expand in the vapor space due to warming, the pressure of the vapor space increases and expels vapors from the tank through the vent(s) on the fixed roof. If the venting is of a type that is closed in the absence of pressure, such as a weighted-pallet pressure-vacuum vent, then vapors are assumed to not be expelled until the pressure in the vapor space exceeds the set pressure of the vent.

The evaporative loss from filling is called working loss. Emissions due to filling operations are the result of an increase in the liquid level in the tank. As the liquid level increases, the pressure inside the vapor space increases and vapors are expelled from the tank through the vent(s) on the fixed roof as described above for standing loss. No emissions are attributed to emptying, in that the increasing size of the vapor space during emptying is assumed to exceed the rate at which evaporation increases the volume of vapors. That is, it would be expected that flow through the vents during emptying would be into the tank, and thus there are no emissions actually occurring during emptying of a fixed roof tank.

A third type of emissions from fixed roof tanks is commonly referred to as flashing losses. This emission type is not an evaporative loss, but rather involves entrained gases bubbling out of solution when a liquid stream experiences a pressure drop upon introduction into a storage tank. As such, it occurs only in storage tanks that receive pressurized liquid streams containing entrained gases. This scenario is typical of storage tanks receiving liquids from a separator in oil and gas production operations, but does not typically occur at downstream facilities. Flashing losses are discussed in Section 7.1.3.5, but guidance for estimating flashing losses is beyond the scope of this section.

Fixed roof tank emissions from standing and working vary as a function of tank capacity, vapor pressure of the stored liquid, utilization rate of the tank, and atmospheric conditions at the tank location.

Several methods are used to control emissions from fixed roof tanks. Emissions from fixed roof tanks can be controlled by installing an internal floating roof and seals to minimize evaporation of the product being stored. The control efficiency of this method ranges from 60 to 99 percent, depending on the type of roof and seals installed and on the type of organic liquid stored.

Fixed roof tank emissions may also be reduced by increasing the vent set pressure, and routine emissions may be eliminated if the vent set pressure is higher than the pressure that develops in the vapor space during normal operations. See Section 7.1.3.7 for a discussion of estimating emissions from pressure tanks. However, the structural design of most storage tanks would not normally accommodate internal pressures of the magnitude required to significantly reduce emissions, and thus vent set pressures should not be altered without consideration of the tank design including all appropriate safety factors. Subjecting a storage tank to greater pressure or vacuum than that for which the tank was designed could potentially result in failure of the tank.

Vapor balancing is another means of emission control. Vapor balancing is probably most common in the filling of tanks at gasoline service stations. As the storage tank is filled, the vapors expelled from the storage tank are directed to the emptying gasoline tanker truck. The truck then transports the vapors to a centralized station where a vapor recovery or control system may be used to control emissions. Vapor balancing can have control efficiencies as high as 90 to 98 percent if the vapors are subjected to vapor recovery or control. If the truck vents the vapor to the atmosphere instead of to a recovery or control system, no control is achieved.

Vapor recovery systems collect emissions from storage tanks and convert them to liquid product. Several vapor recovery procedures may be used, including vapor/liquid absorption, vapor compression, vapor cooling, vapor/solid adsorption, or a combination of these.

Vapors from fixed roof tanks may also be collected and combusted. There are several types of units at facilities used to accomplish this, including various types of flares and thermal oxidation units.

7.1.2.2 Floating Roof Tanks

Routine emissions from floating roof tanks are the sum of working losses and standing losses. The working loss mechanism for a floating roof tank is also known as withdrawal loss, in that it occurs as the liquid level, and thus the floating roof, is lowered rather than raised. Some liquid remains on the inner tank wall surface and evaporates. For an internal floating roof tank that has a column supported fixed roof, some liquid also clings to the columns and evaporates. Evaporative loss occurs until the tank is filled and the exposed surfaces are again covered. Standing losses from floating roof tanks include rim seal and deck fitting losses for floating roof tanks with welded decks and include deck seam losses for constructions other than welded decks. Both the working and standing loss mechanisms for floating roof tanks pertain to the accumulation of vapors in the headspace above the floating roof. It is assumed that vapors in the headspace will eventually be expelled from the tank, but this emission estimating methodology does not address the rate or time at which the vapors actually leave the tank.

Rim seal losses can occur through many complex mechanisms, but for external floating roof tanks, the majority of rim seal vapor losses have been found to be wind induced. No dominant wind loss mechanism has been identified for internal floating roof or domed external floating roof tank rim seal losses. Losses can also occur due to permeation of the rim seal material by the vapor or via a wicking effect of the liquid, but permeation of the rim seal material generally does not occur if the correct seal fabric is used. Testing has indicated that breathing, solubility, and wicking loss mechanisms are small in comparison to the wind-induced loss. The rim seal factors presented in this section incorporate all types of losses.

The rim seal system is used to allow the floating roof to rise and fall within the tank as the liquid level changes. The rim seal system also helps to fill the annular space between the rim and the tank shell and therefore minimize evaporative losses from this area. A rim seal system may consist of just a primary seal or a primary and a secondary seal, which is mounted above the primary seal. Examples of primary and secondary seal configurations are shown in Figures 7.1-6, 7.1-7, and 7.1-8.

The primary seal serves as a vapor conservation device by closing the annular space between the edge of the floating deck and the tank wall. Three basic types of primary seals are used on floating roofs: mechanical (metallic) shoe, resilient filled (nonmetallic), and flexible wiper seals. Some primary seals on external floating roof tanks are protected by a weather shield. Weather shields may be of metallic, elastomeric, or composite construction and provide the primary seal with longer life by protecting the primary seal fabric from deterioration due to exposure to weather, debris, and sunlight. Mechanical shoe seals, resilient filled seals, and wiper seals are discussed below.

A mechanical shoe seal uses a light-gauge metallic band as the sliding contact with the shell of the tank, as shown in Figure 7.1-7. The band is formed as a series of sheets (shoes) which are joined together to form a ring and are held against the tank shell by a mechanical device. The shoes are normally 3 to 5 feet deep when used on an external floating roof and are often shorter when used on an internal floating roof. Expansion and contraction of the ring can be provided for as the ring passes over shell irregularities or rivets by jointing narrow pieces of fabric into the ring or by crimping the shoes at intervals. The bottoms of the shoes extend below the liquid surface to confine the rim vapor space between the shoe and the floating deck.

The rim vapor space, which is bounded by the shoe, the rim of the floating deck, and the liquid surface, is sealed from the atmosphere by bolting or clamping a coated fabric, called the primary seal fabric, which extends from the shoe to the rim to form an "envelope". Two locations are used for attaching the primary seal fabric. The fabric is most commonly attached to the top of the shoe and the rim of the floating deck. To reduce the rim vapor space, the fabric can be attached to the shoe and the floating deck rim near the liquid surface. Rim vents can be used to relieve any excess pressure or vacuum in the vapor space.

A resilient filled seal can be mounted to eliminate the vapor space between the rim seal and liquid surface (liquid mounted) or to allow a vapor space between the rim seal and the liquid surface (vapor mounted). Both configurations are shown in Figures 7.1-6 and 7.1-7. Resilient filled seals work because of the expansion and contraction of a resilient material to maintain contact with the tank shell while accommodating varying annular rim space widths. These rim seals allow the roof to move up and down freely, without binding.

Resilient filled seals typically consist of a core of open-cell foam encapsulated in a coated fabric. The seals are attached to a mounting on the deck perimeter and extend around the deck circumference. Polyurethane-coated nylon fabric and polyurethane foam are commonly used materials. For emission control, it is important that the attachment of the seal to the deck and the radial seal joints be vapor-tight and that the seal be in substantial contact with the tank shell.

Wiper seals generally consist of a continuous annular blade of flexible material fastened to a mounting bracket on the deck perimeter that spans the annular rim space and contacts the tank shell. This type of seal is depicted in Figure 7.1-6. New tanks with wiper seals may have dual wipers, one mounted above the other. The mounting is such that the blade is flexed, and its elasticity provides a sealing pressure against the tank shell.

Wiper seals are vapor mounted; a vapor space exists between the liquid stock and the bottom of the seal. For emission control, it is important that the mounting be vapor-tight, that the seal extend around the circumference of the deck and that the blade be in substantial contact with the tank shell. Two types of materials are commonly used to make the wipers. One type consists of a cellular, elastomeric material tapered in cross section with the thicker portion at the mounting. Rubber is a commonly used material; urethane and cellular plastic are also available. All radial joints in the blade are joined. The second type of material that can be used is a foam core wrapped with a coated fabric. Polyurethane on nylon fabric and polyurethane foam are common materials. The core provides the flexibility and support, while the fabric provides the vapor barrier and wear surface.

A secondary seal may be used to provide some additional evaporative loss control over that achieved by the primary seal. Secondary seals can be either flexible wiper seals or resilient filled seals. For mechanical shoe primary seals, two configurations of secondary seals are available: shoe mounted and rim mounted, as shown in Figure 7.1-8. Rim mounted secondary seals are more effective in reducing losses than shoe mounted secondary seals because they cover the entire rim vapor space. For internal floating roof tanks, the secondary seal is mounted to an extended vertical rim plate, above the primary seal, as shown in Figure 7.1-8. However, for some floating roof tanks, using a secondary seal further limits the tank's operating capacity due to the need to keep the seal from interfering with fixed roof rafters or to keep the secondary seal in contact with the tank shell when the tank is filled.

The deck fitting losses from floating roof tanks can be explained by the same mechanisms as the rim seal losses. While the relative contribution of each mechanism to the total emissions from a given deck fitting is not known, emission factors were developed for individual deck fittings by testing, thereby accounting for the combined effect of all of the mechanisms.

Numerous fittings pass through or are attached to floating roof decks to accommodate structural support components or allow for operational functions. Internal floating roof deck fittings are typically of different configuration than those for external floating roof decks. Rather than having tall housings to avoid rainwater entry, internal floating roof deck fittings tend to have lower profile housings to minimize the potential for the fitting to contact the fixed roof when the tank is filled. Deck fittings can be a source of evaporative loss when they require openings in the deck. The most common components that require openings in the deck are described below.

1. Access hatches. An access hatch is an opening in the deck with a peripheral vertical well that is large enough to provide passage for workers and materials through the deck for construction or servicing. Attached to the opening is a removable cover that may be bolted and/or gasketed to reduce evaporative loss. On internal floating roof tanks with noncontact decks, the well should extend down into the liquid to seal off the vapor space below the noncontact deck. A typical access hatch is shown in Figure 7.1-9.

2. Gauge-floats. A gauge-float is used to indicate the level of liquid within the tank. The float rests on the liquid surface and is housed inside a well that is closed by a cover. The cover may be bolted

and/or gasketed to reduce evaporation loss. As with other similar deck penetrations, the well extends down into the liquid on noncontact decks in internal floating roof tanks. A typical gauge-float and well are shown in Figure 7.1-9.

3. Gauge-hatch/sample ports. A gauge-hatch/sample port consists of a pipe sleeve through the deck for hand-gauging or sampling of the stored liquid. The gauge-hatch/sample port is usually located beneath the gauger's platform, which is mounted on top of the tank shell. A cover may be attached to the top of the opening, and the cover may be equipped with a gasket to reduce evaporative losses. A cord may be attached to the cover so that the cover can be opened from the platform. Alternatively, the opening may be covered with a slit-fabric seal. A funnel may be mounted above the opening to guide a sampling device or gauge stick through the opening. A typical gauge-hatch/sample port is shown in Figure 7.1-9.

4. Rim vents. Rim vents are used on tanks equipped with a seal design that creates a vapor pocket in the seal and rim area, such as a mechanical shoe seal. A typical rim vent is shown in Figure 7.1-10. The vent is used to release any excess pressure that is present in the vapor space bounded by the primary-seal shoe and the floating roof rim and the primary seal fabric and the liquid level. Rim vents usually consist of weighted pallets that rest over the vent opening.

5. Deck drains. Currently two types of deck drains are in use (closed and open deck drains) to remove rainwater from the floating deck. Open deck drains can be either flush or overflow drains. Both types of open deck drains consist of a pipe that extends below the deck to allow the rainwater to drain into the stored liquid. Only open deck drains are subject to evaporative loss. Flush drains are flush with the deck surface. Overflow drains are elevated above the deck surface. Typical overflow and flush deck drains are shown in Figure 7.1-10. Overflow drains are used to limit the maximum amount of rainwater that can accumulate on the floating deck, providing emergency drainage of rainwater if necessary. Closed deck drains carry rainwater from the surface of the deck though a flexible hose or some other type of piping system that runs through the stored liquid prior to exiting the tank. The rainwater does not come in contact with the liquid, so no evaporative losses result. Overflow drains are usually used in conjunction with a closed drain system to carry rainwater outside the tank.

6. Deck legs. Deck legs are used to prevent damage to fittings underneath the deck and to allow for tank cleaning or repair, by holding the deck at a predetermined distance off the tank bottom. These supports consist of adjustable or fixed legs attached to the floating deck or hangers suspended from the fixed roof. For adjustable legs or hangers, the load-carrying element may pass through a well or sleeve into the deck. With noncontact decks, the well should extend into the liquid. Evaporative losses may occur in the annulus between the deck leg and its sleeve. A typical deck leg is shown in Figure 7.1-10.

7. Unslotted guidepoles and wells. A guidepole is an antirotational device that is fixed to the top and bottom of the tank, passing through a well in the floating roof. The guidepole is used to prevent adverse movement of the roof and thus damage to deck fittings and the rim seal system. In some cases, an unslotted guidepole is used for gauging purposes, but there is a potential for differences in the pressure, level, and composition of the liquid inside and outside of the guidepole. A typical guidepole and well are shown in Figure 7.1-11.

8. Slotted (perforated) guidepoles and wells. The function of the slotted guidepole is similar to the unslotted guidepole but also has additional features. Perforated guidepoles can be either slotted or drilled hole guidepoles. A typical slotted guidepole and well are shown in Figure 7.1-11. As shown in this figure,

the guide pole is slotted to allow stored liquid to enter. The same can be accomplished with drilled holes. The liquid entering the guidepole has the same composition as the remainder of the stored liquid,and is at the same liquid level as the liquid in the tank. Representative samples can therefore be collected from the slotted or drilled hole guidepole. Evaporative loss from the guidepole can be reduced by some combination of modifying the guidepole or well with the addition of gaskets, sleeves, or enclosures or placing a float inside the guidepole, as shown in Figures 7.1-11 and 7.1-22. Guidepoles are also referred to as gauge poles, gauge pipes, or stilling wells.

9. Vacuum breakers. A vacuum breaker equalizes the pressure of the vapor space across the deck as the deck is either being landed on or floated off its legs. A typical vacuum breaker is shown in Figure 7.1-10. As depicted in this figure, the vacuum breaker consists of a well with a cover. Attached to the underside of the cover is a guided leg long enough to contact the tank bottom as the floating deck approaches. When in contact with the tank bottom, the guided leg mechanically opens the breaker by lifting the cover off the well; otherwise, the cover closes the well. The closure may be gasketed or ungasketed. Because the purpose of the vacuum breaker is to allow the free exchange of air and/or vapor, the well does not extend appreciably below the deck. While vacuum breakers have historically tended to be of the leg-actuated design described above, they may also be vacuum actuated similar to the pressure/vacuum vent on a fixed roof tank such that they do not begin to open until the floating roof has actually landed. In some cases, this is achieved by replacing the rim vent described above with a pressure/vacuum vent.

Fittings typically used only on internal floating roof tanks include column wells, ladder wells, and stub drains.

1. Columns and wells. Some fixed-roof designs are normally supported from inside the tank by means of vertical columns, which necessarily penetrate an internal floating deck. (Some fixed roofs are entirely self-supporting from the perimeter of the roof and, therefore, have no interior support columns.) Column wells are similar to unslotted guide pole wells on external floating roofs. Columns are made of pipe with circular cross sections or of structural shapes with irregular cross sections (built-up). The number of columns varies with tank diameter, from a minimum of 1 to over 50 for very large diameter tanks. A typical fixed roof support column and well are shown in Figure 7.1-9.

The columns pass through deck openings via peripheral vertical wells. With noncontact decks, the well should extend down into the liquid stock. Generally, a closure device exists between the top of the well and the column. Several proprietary designs exist for this closure, including sliding covers and fabric sleeves, which must accommodate the movements of the deck relative to the column as the liquid level changes. A sliding cover rests on the upper rim of the column well (which is normally fixed to the deck) and bridges the gap or space between the column well and the column. The cover, which has a cutout, or opening, around the column slides vertically relative to the column as the deck raises and lowers. At the same time, the cover may slide horizontally relative to the rim of the well to accommodate out-of-plumbness of the column. A gasket around the rim of the well reduces emissions from this fitting. A flexible fabric sleeve seal between the rim of the well and the column (with a cutout or opening, to allow vertical motion of the seal relative to the columns) similarly accommodates limited horizontal motion of the deck relative to the column.

2. Ladders and wells. Some tanks are equipped with internal ladders that extend from a manhole in the fixed roof to the tank bottom. The deck opening through which the ladder passes is constructed

with similar design details and considerations to deck openings for column wells, as previously discussed. A typical ladder well is shown in Figure 7.1-12.

Tanks are sometimes equipped with a ladder-slotted guidepole combination, in which one or both legs of the ladder is a slotted pipe that serves as a guidepole for purposes such as level gauging and sampling. A ladder-slotted guidepole combination is shown in Figure 7.1-21 with a ladder sleeve to reduce emissions.

3. Stub drains. Bolted internal floating roof decks are typically equipped with stub drains to allow any stored product that may be on the deck surface to drain back to the underside of the deck. The drains are attached so that they are flush with the upper deck. Stub drains are approximately 1 inch in diameter and extend down into the product on noncontact decks. A typical flush stub drain is shown in Figure 7.1-10. Stub drains may be equipped with floating balls to reduce emissions. The floating ball acts as a check valve, in that it remains covering the stub drain unless liquid is present to lift it.

Deck seams in internal floating roof tanks are a source of emissions to the extent that these seams may not be completely vapor tight if the deck is not welded. A weld sealing a deck seam does not have to be structural (i.e., may be a seal weld) to constitute a welded deck seam for purposes of estimating emissions, but a deck seam that is bolted or otherwise mechanically fastened and sealed with elastomeric materials or chemical adhesives is not a welded seam. Generally, the same loss mechanisms for deck fittings apply to deck seams. The predominant mechanism depends on whether or not the deck is in contact with the stored liquid. The deck seam loss equation accounts for the effects of all contributing loss mechanisms.

7.1.3 Emission Estimation Procedures

The following section presents the emission estimation procedures for fixed roof, external floating roof, domed external floating roof, and internal floating roof tanks. These procedures are valid for all volatile organic liquids and chemical mixtures. It is important to note that in all the emission estimation procedures the physical properties of the vapor do not include the noncondensibles in the atmosphere but only refer to the volatile components of the stored liquid. For example, the vapor-phase molecular weight is determined from the weighted average of the evaporated components of the stored liquid and does not include the contribution of atmospheric gases such as nitrogen and oxygen. To aid in the emission estimation procedures, a list of variables with their corresponding definitions was developed and is presented in Table 7.1-1.

The factors presented in AP-42 are those that are currently available and have been reviewed and approved by the U. S. Environmental Protection Agency. As storage tank equipment vendors design new floating decks and equipment, new emission factors may be developed based on that equipment. If the new emission factors are reviewed and approved, the emission factors will be added to AP-42 during the next update.

The emission estimation procedures outlined in this chapter have been used as the basis for the development of a software program to estimate emissions from storage tanks. The software program entitled "TANKS" is available through the U. S. Environmental Protection Agency website. While this software does not address all of the scenarios described in this chapter, is known to have errors, and is no longer supported, it is still made available for historical purposes.

There are also commercially available storage tank emissions estimation software programs. Users of these programs are advised to understand the extent of agreement with AP-42 Chapter 7 calculation methodology and assume responsibility of the accuracy of the output as they have not been reviewed or approved by the EPA.

7.1.3.1 Routine Losses From Fixed Roof Tanks[8-14,22]

The following equations, provided to estimate standing and working loss emissions, apply to tanks with vertical cylindrical shells and fixed roofs and to tanks with horizontal cylindrical shells. These tanks must be substantially liquid- and vapor-tight. The equations are not intended to be used in estimating losses from tanks which have air or other gases injected into the liquid, or which store unstable or boiling stocks or mixtures of hydrocarbons or petrochemicals for which the vapor pressure is not known or cannot be readily predicted. Tanks containing aqueous mixtures in which phase separation has occurred, resulting in a free layer of oil or other volatile materials floating on top of the water, should have emissions estimated on the basis of the properties of the free top layer.

Total routine losses from fixed roof tanks are equal to the sum of the standing loss and working loss:

$$L_T = L_S + L_W \tag{1-1}$$

where:

L_T = total routine losses, lb/yr

L_S = standing losses, lb/yr, see Equation 1-2

L_W = working losses, lb/yr, see Equation 1-35

7.1.3.1.1 Standing Loss

The standing loss, L_S, for a fixed roof tank refers to the loss of stock vapors as a result of tank vapor space breathing. Fixed roof tank standing losses can be estimated from Equation 1-2.

$$L_S = 365\ V_V\ W_V\ K_E\ K_S \tag{1-2}$$

where:

L_S = standing loss, lb/yr

V_V = vapor space volume, ft^3, see Equation 1-3

W_V = stock vapor density, lb/ft^3

K_E = vapor space expansion factor, per day

K_S = vented vapor saturation factor, dimensionless

365 = constant, the number of daily events in a year, (days/year)

<u>Tank Vapor Space Volume, V_V</u> - The tank vapor space volume is calculated using the following equation:

$$V_V = \left(\frac{\pi}{4} D^2\right) H_{VO} \tag{1-3}$$

where:

V_V = vapor space volume, ft^3

D = tank diameter, ft, see Equation 1-14 for horizontal tanks

H_{VO} = vapor space outage, ft, see Equation 1-16

The standing loss equation can be simplified by combining Equation 1-2 with Equation 1-3. The result is Equation 1-4.

$$L_S = 365 K_E \left(\frac{\pi}{4} D^2 \right) H_{VO} K_S W_V \tag{1-4}$$

where:

L_S = standing loss, lb/yr

K_E = vapor space expansion factor, per day, see Equation 1-5, 1-12, or 1-13

D = diameter, ft, see Equation 1-14 for horizontal tanks

H_{VO} = vapor space outage, ft, see Equation 1-16; use $H_E/2$ from Equation 1-15 for horizontal tanks

K_S = vented vapor saturation factor, dimensionless, see Equation 1-21

W_V = stock vapor density, lb/ft^3, see Equation 1-22

365 = constant, the number of daily events in a year, (days/year)

Vapor Space Expansion Factor, K_E

The calculation of the vapor space expansion factor, K_E, depends upon the properties of the liquid in the tank and the breather vent settings, as shown in Equation 1-5. As shown in the equation, K_E is greater than zero. If K_E is less than zero, standing losses will not occur. In that K_E represents the fraction of vapors in the vapor space that are expelled by a given increase in temperature, a value of 1 would indicate that the entire vapor space has been expelled. Thus the value of K_E must be less than 1, in that it is not physically possible to expel more than 100% of what is present to begin with.

$$0 < K_E \leq 1$$

$$K_E = \frac{\Delta T_V}{T_{LA}} + \frac{\Delta P_V - \Delta P_B}{P_A - P_{VA}} \tag{1-5}$$

where:

ΔT_V = average daily vapor temperature range, °R; see Note 1

ΔP_V = average daily vapor pressure range, psi; see Note 2

ΔP_B = breather vent pressure setting range, psi; see Note 3

P_A = atmospheric pressure, psia

P_{VA} = vapor pressure at average daily liquid surface temperature, psia; see Notes 1 and 2 for Equation 1-22

T_{LA} = average daily liquid surface temperature, °R; see Note 3 for Equation 1-22

Notes:

1. The average daily vapor temperature range, ΔT_V, refers to the daily temperature range of the tank vapor space averaged over all of the days in the given period of time, such as one year, and should

not be construed as being applicable to an individual day. The average daily vapor temperature range is calculated for an uninsulated tank using Equation 1-6.

$$\Delta T_V = \left(1 - \frac{0.8}{2.2\,(H_S/D) + 1.9}\right)\Delta T_A + \frac{0.042\alpha_R I + 0.026(H_S/D)\alpha_S I}{2.2\,(H_S/D) + 1.9} \tag{1-6}$$

where:

ΔT_V = average daily vapor temperature range, °R

H_S = tank shell height, ft

D = tank diameter, ft,

ΔT_A = average daily ambient temperature range, °R; see Note 4

α_R = tank roof surface solar absorptance, dimensionless; see Table 7.1-6

α_S = tank shell surface solar absorptance, dimensionless; see Table 7.1-6

I = average daily total insolation factor, Btu/ft^2 d; see Table 7.1-7.

API assigns a default value of $H_s/D = 0.5$ and an assumption of $\alpha_R = \alpha_S$, resulting in the simplified equation shown below for an uninsulated tank:[22]

$$\Delta T_V = 0.7\,\Delta T_A + 0.02\,\alpha\,I \tag{1-7}$$

where:

α = average tank surface solar absorptance, dimensionless

For purposes of estimating emissions, a storage tank should be deemed insulated only if the roof and shell are both sufficiently insulated so as to minimize heat exchange with ambient air. If only the shell is insulated, and not the roof, the temperature equations are independent of H_s/D. Also, there likely will be sufficient heat exchange through the roof such that Equation 1-7 would be applicable.

A more accurate method of accounting for the average daily vapor temperature range, ΔT_V, in partially insulated scenarios is given below. When the tank shell is insulated but the tank roof is not, heat gain to the tank from insolation is almost entirely through the tank roof and thus the liquid surface temperature is not sensitive to H_S/D.

$$\Delta T_V = 0.6\,\Delta T_A + 0.02\,\alpha_R\,I \tag{1-8}$$

In the case of a fully insulated tank maintained at constant temperature, the average daily vapor temperature range, ΔT_V, should be taken as zero. This assumption that ΔT_V is equal to zero addresses only temperature differentials resulting from the diurnal ambient temperature cycle. In the case of cyclic heating of the bulk liquid, see Section 7.1.3.8.4.

2. The average daily vapor pressure range, ΔP_V, refers to the daily vapor pressure range at the liquid surface temperature averaged over all of the days in the given period of time, such as one year, and should not be construed as being applicable to an individual day. The average daily vapor pressure range can be calculated using the following equation:

$$\Delta P_V = P_{VX} - P_{VN} \tag{1-9}$$

where:

ΔP_V = average daily vapor pressure range, psia

P_{VX} = vapor pressure at the average daily maximum liquid surface temperature, psia; see Note 5

P_{VN} = vapor pressure at the average daily minimum liquid surface temperature, psia; see Note 5

See Section 7.1.6.1 for a more approximate equation for ΔP_V that was used historically, but which is no longer recommended.

In the case of a fully insulated tank maintained at constant temperature, the average daily vapor pressure range, ΔP_V, should be taken as zero, as discussed for the vapor temperature range in Note 1.

3. The breather vent pressure setting range, ΔP_B, is calculated using the following equation:

$$\Delta P_B = P_{BP} - P_{BV} \tag{1-10}$$

where:

ΔP_B = breather vent pressure setting range, psig

P_{BP} = breather vent pressure setting, psig

P_{BV} = breather vent vacuum setting, psig

If specific information on the breather vent pressure setting and vacuum setting is not available, assume 0.03 psig for P_{BP} and -0.03 psig for P_{BV} as typical values. If the fixed roof tank is of bolted or riveted construction in which the roof or shell plates are not vapor tight, assume that $\Delta P_B = 0$, even if a breather vent is used.

4. The average daily ambient temperature range, ΔT_A, refers to the daily ambient temperature range averaged over all of the days in the given period of time, such as one year, and should not be construed as being applicable to an individual day. The average daily ambient temperature range is calculated using the following equation:

$$\Delta T_A = T_{AX} - T_{AN} \tag{1-11}$$

where:

ΔT_A = average daily ambient temperature range, °R

T_{AX} = average daily maximum ambient temperature, °R

T_{AN} = average daily minimum ambient temperature, °R

Table 7.1-7 gives historical values of T_{AX} and T_{AN} in degrees Fahrenheit for selected cities in the United States. These values are converted to degrees Rankine by adding 459.7.

5. The vapor pressures associated with the average daily maximum and minimum liquid surface temperatures, P_{VX} and P_{VN}, respectively, are calculated by substituting the corresponding temperatures, T_{LX} and T_{LN}, into Equation 1-25 or 1-26 after converting the temperatures to the units indicated for the respective equation. If T_{LX} and T_{LN} are unknown, Figure 7.1-17 can be used to calculate their values. In

the case of a fully insulated tank maintained at constant temperature, the average daily vapor pressure range, ΔP_V, should be taken as zero.

If the liquid stored in the fixed roof tank has a true vapor pressure less than 0.1 psia and the tank breather vent settings are not greater than ±0.03 psig, Equation 1-12 or Equation 1-13 may be used with an acceptable loss in accuracy.

If the tank location and tank color and condition are known, K_E may be calculated using the following equation in lieu of Equation 1-5:

$$K_E = 0.0018\, \Delta T_V = 0.0018\, [0.7\, (T_{AX} - T_{AN}) + 0.02\, \alpha\, I] \tag{1-12}$$

where:

K_E = vapor space expansion factor, per day

ΔT_V = average daily vapor temperature range, °R

T_{AX} = average daily maximum ambient temperature, °R

T_{AN} = average daily minimum ambient temperature, °R

α = tank surface solar absorptance, dimensionless

I = average daily total insolation on a horizontal surface, Btu/(ft^2 day)

0.0018 = constant, (°R)$^{-1}$

0.7 = constant, dimensionless

0.02 = constant, (°R ft^2 day)/Btu

Average daily maximum and minimum ambient temperatures and average daily total insolation can be determined from historical meteorological data for the location or may be obtained from historical meteorological data for a nearby location. Historical meteorological data for selected locations are given in Table 7.1-7, where values of T_{AX} and T_{AN} are given in degrees Fahrenheit. These values are converted to degrees Rankine by adding 459.7.

If the tank location is unknown, a value of K_E can be calculated using typical meteorological conditions for the lower 48 states. The typical value for daily insolation is 1,370 Btu/(ft^2 day), the average daily range of ambient temperature is 21°R, and the tank surface solar absorptance is 0.25 for white paint in average condition. Substituting these values into Equation 1-12 results in a value of 0.04, as shown in Equation 1-13.

$$K_E = 0.04 \tag{1-13}$$

Diameter

For vertical tanks, the diameter is straightforward. If a user needs to estimate emissions from a horizontal fixed roof tank, some of the tank parameters can be modified before using the vertical tank emission estimating equations. First, by assuming that the tank is one-half filled, the surface area of the liquid in the tank is approximately equal to the length of the tank times the diameter of the tank. Next, assume that this area represents a circle, i.e., that the liquid is an upright cylinder. Therefore, the effective diameter, D_E, is then equal to:

$$D_E = \sqrt{\frac{LD}{\frac{\pi}{4}}} \tag{1-14}$$

where:

D_E = effective tank diameter, ft

L = length of the horizontal tank, ft (for tanks with rounded ends, use the overall length)

D = diameter of a vertical cross-section of the horizontal tank, ft

By assuming the volume of the horizontal tank to be approximately equal to the cross-sectional area of the tank times the length of the tank, an effective height, H_E, of an equivalent upright cylinder may be calculated as:

$$H_E = \frac{\pi}{4} D \tag{1-15}$$

D_E should be used in place of D in Equation 1-4 for calculating the standing loss (or in Equation 1-3, if calculating the tank vapor space volume). One-half of the effective height, H_E, should be used as the vapor space outage, H_{VO}, in these equations. This method yields only a very approximate value for emissions from horizontal storage tanks. For underground horizontal tanks, assume that no breathing or standing losses occur ($L_S = 0$) because the insulating nature of the earth limits the diurnal temperature change. No modifications to the working loss equation are necessary for either aboveground or underground horizontal tanks. However, standing losses from underground gasoline tanks, which can experience relatively fast vapor growth after the ingestion of air and dilution of the headspace, are addressed in Section 5.2 of AP-42.

Vapor Space Outage

The vapor space outage, H_{VO} is the height of a cylinder of tank diameter, D, whose volume is equivalent to the vapor space volume of a fixed roof tank, including the volume under the cone or dome roof. The vapor space outage, H_{VO}, is estimated from:

$$H_{VO} = H_S - H_L + H_{RO} \tag{1-16}$$

where:

H_{VO} = vapor space outage, ft; use $H_E/2$ from Equation 1-15 for horizontal tanks

H_S = tank shell height, ft

H_L = liquid height, ft; typically assumed to be at the half-full level, unless known to be maintained at some other level

H_{RO} = roof outage, ft; see Note 1 for a cone roof or Note 2 for a dome roof

Notes:

1. For a cone roof, the roof outage, H_{RO}, is calculated as follows:

$$H_{RO} = (1/3)\ H_R \tag{1-17}$$

where:

H_{RO} = roof outage (or shell height equivalent to the volume contained under the roof), ft
H_R = tank roof height, ft

$$H_R = S_R\ R_S \tag{1-18}$$

where: S_R = tank cone roof slope, ft/ft; if unknown, a standard value of 0.0625 is used
R_S = tank shell radius, ft

2. For a dome roof, the roof outage, H_{RO}, is calculated as follows:

$$H_{RO} = H_R \left[\frac{1}{2} + \frac{1}{6} \left[\frac{H_R}{R_S} \right]^2 \right] \tag{1-19}$$

where:

H_{RO} = roof outage, ft
R_S = tank shell radius, ft
H_R = tank roof height, ft

$$H_R = R_R - \left(R_R^2 - R_S^2 \right)^{0.5} \tag{1-20}$$

H_R = tank roof height, ft R_R = tank dome roof radius, ft R_S = tank shell radius,ft

The value of R_R usually ranges from 0.8D - 1.2D, where D = 2 R_S. If R_R is unknown, the tank diameter is used in its place. If the tank diameter is used as the value for R_R, Equations 1-19 and 1-20 reduce to H_{RO} = 0.137 R_S and H_R = 0.268 R_S.

Vented Vapor Saturation Factor, K_S

The vented vapor saturation factor, K_S, is calculated using the following equation:

$$K_S = \frac{1}{1 + 0.053 P_{VA}\ H_{VO}} \tag{1-21}$$

where:

K_S = vented vapor saturation factor, dimensionless
P_{VA} = vapor pressure at average daily liquid surface temperature, psia; see Notes 1 and 2 to Equation 1-22
H_{VO} = vapor space outage, ft, see Equation 1-16

0.053 = constant, $(psia\text{-}ft)^{-1}$

Stock Vapor Density, W_V - The density of the vapor is calculated using the following equation:

$$W_V = \frac{M_V P_{VA}}{R T_V} \tag{1-22}$$

where:

W_V = vapor density, lb/ft^3

M_V = vapor molecular weight, lb/lb-mole; see Note 1

R = the ideal gas constant, 10.731 psia ft^3/lb-mole °R

P_{VA} = vapor pressure at average daily liquid surface temperature, psia; see Notes 1 and 2

T_V = average vapor temperature, °R; see Note 6

Notes:

1. The molecular weight of the vapor, M_V, can be determined from Table 7.1-2 and 7.1-3 for selected petroleum liquids and selected petrochemicals, respectively, or by analyzing vapor samples. Where mixtures of organic liquids are stored in a tank, M_V can be calculated from the liquid composition. The molecular weight of the vapor, M_V, is equal to the sum of the molecular weight, M_i, multiplied by the vapor mole fraction, y_i, for each component. The vapor mole fraction is equal to the partial pressure of component i divided by the total vapor pressure. The partial pressure of component i is equal to the true vapor pressure of component i (P) multiplied by the liquid mole fraction, (x_i). Therefore,

$$M_V = \sum M_i \, y_i = \sum M_i \left(\frac{Px_i}{P_{VA}} \right) \tag{1-23}$$

where:

P_{VA}, total vapor pressure of the stored liquid, by Raoult's Law[30], is:

$$P_{VA} = \sum Px_i \tag{1-24}$$

For more detailed information on Raoult's Law, please refer to Section 7.1.4. Frequently, however, the vapor pressure is not known for each component in a mixture. For more guidance on determining the total vapor pressure at a given temperature (*i.e.*, the true vapor pressure), see Note 2 below.

2. True vapor pressure is defined in various ways for different purposes within the industry, such as "bubble point" for transportation specifications, but for purposes of these emissions estimating methodologies it is the sum of the equilibrium partial pressures exerted by the components of a volatile organic liquid, as shown in Equation 1-24. True vapor pressure may be determined by ASTM D 2879 (or ASTM D 6377 for crude oils with a true vapor pressure greater than 3.6 psia) or obtained from standard reference texts. For certain petroleum liquids, true vapor pressure may be predicted from Reid vapor pressure, which is the absolute vapor pressure of volatile crude oil and volatile non-viscous petroleum

liquids, as determined by ASTM D 323. ASTM D 5191 may be used as an alternative method for determining Reid vapor pressure for petroleum products, however, it should not be used for crude oils.

Caution should be exercised when considering ASTM D 2879 for determining the true vapor pressure of certain types of mixtures. Vapor pressure is sensitive to the lightest components in a mixture, and the de-gassing step in ASTM D 2879 can remove lighter fractions from mixtures such as No. 6 fuel oil if it is not done with care (*i.e.* at an appropriately low pressure and temperature). In addition, any dewatering of a sample prior to measuring its vapor pressure must be done using a technique that has been demonstrated to not remove the lightest organic compounds in the mixture. Alternatives to the method may be developed after publication of this chapter.

True vapor pressure can be determined for crude oils from Reid vapor pressure using Figures 7.1-13a and 7.1-13b. However, the nomograph in Figure 7.1-13a and the correlation equation in Figure 7.1-13b for crude oil are known to have an upward bias, and thus use of ASTM D 6377 is more accurate for crude oils with a true vapor pressure greater than 3.6 psia. ASTM D 6377 may be used to directly measure true vapor pressure at a given temperature. In order to utilize ASTM D 6377 to predict true vapor pressure values over a range of temperatures, the method should be applied at multiple temperatures. A regression of the log-transformed temperature versus vapor pressure data thus obtained may be performed to obtain A and B constants for use in Equation 1-25. In order to determine true vapor pressure for purposes of estimating emissions of volatile organic compounds, ASTM D 6377 should be performed using a vapor-to-liquid ratio of 4:1, which is expressed in the method as $VPCR_4$.

For light refined stocks (gasolines and naphthas) for which the Reid vapor pressure and distillation slope are known, Figures 7.1-14a and 7.1-14b can be used. For refined stocks with Reid vapor pressure below the 1 psi applicability limit of Figures 7.1-14a and 7.1-14b, true vapor pressure can be determined using ASTM D 2879. In order to use Figures 7.1-13a, 7.1-13b, 7.1-14a, or 7.1-14b, the stored liquid surface temperature, T_{LA}, must be determined in degrees Fahrenheit. See Note 3 to determine T_{LA}.

Alternatively, true vapor pressure for selected petroleum liquid stocks, at the stored liquid surface temperature, can be determined using the following equation:

(1-25)

$$P_{VA} = \exp\left[A - \left(\frac{B}{T_{LA}}\right)\right]$$

where:

exp = exponential function

A = constant in the vapor pressure equation, dimensionless

B = constant in the vapor pressure equation, °R

T_{LA} = average daily liquid surface temperature, °R; see Note 3

P_{VA} = true vapor pressure, psia

For selected petroleum liquid stocks, physical property data including vapor pressure constants A and B for use in Equation 1-25 are presented in Table 7.1-2. For refined petroleum stocks with Reid vapor pressure within the limits specified in the scope of ASTM D 323, the constants A and B can be calculated from the equations presented in Figure 7.1-15 and the distillation slopes presented in Table 7.1-2. For crude oil stocks, the constants A and B can be calculated from Reid vapor pressure using the equations presented in Figure 7.1-16. However, the equations in Figure 7.1-16 are known to have an upward bias[29], and thus use of ASTM D 6377 is more accurate. Note that in Equation 1-25, T_{LA} is determined in degrees Rankine instead of degrees Fahrenheit.

The true vapor pressure of organic liquids at the stored liquid temperature can also be estimated by Antoine's equation:

$$\log P_{VA} = A - \left(\frac{B}{T_{LA} + C} \right) \tag{1-26}$$

where:

log = log 10
A = constant in vapor pressure equation, dimensionless
B = constant in vapor pressure equation, °C
C = constant in vapor pressure equation, °C
T_{LA} = average daily liquid surface temperature, °C
P_{VA} = vapor pressure at average liquid surface temperature, mm Hg

For selected pure chemicals, the values for the constants A, B, and C are listed in Table 7.1-3. Note that in Equation 1-26, T_{LA} is determined in degrees Celsius instead of degrees Rankine. Also, in Equation 1-26, P_{VA} is determined in mm of Hg rather than psia (760 mm Hg = 14.7 psia).

More rigorous thermodynamic equations of state are available in process simulation software packages. The use of such programs may be preferable in determining the true vapor pressure of mixtures that are not adequately characterized by Raoult's Law.

3. The average daily liquid surface temperature, T_{LA}, refers to the liquid surface temperature averaged over all of the days in the given period of time, such as one year, and should not be construed as being applicable to an individual day. While the accepted methodology is to use the average temperature, this approach introduces a bias in that the true vapor pressure, P_{VA}, is a non-linear function of temperature. However, the greater accuracy that would be achieved by accounting for this logarithmic function is not warranted, given the associated computational burden. The average daily liquid surface temperature is calculated for an uninsulated fixed roof tank using Equation 1-27.

$$T_{LA} = \left(0.5 - \frac{0.8}{4.4(H_S/D) + 3.8}\right) T_{AA} + \left(0.5 + \frac{0.8}{4.4(H_S/D) + 3.8}\right) T_B + \frac{0.021 \propto_R I + 0.013(H_S/D) \propto_S I}{4.4(H_S/D) + 3.8} \tag{1-27}$$

where:

T_{LA} = average daily liquid surface temperature, °R
H_S = tank shell height, ft
D = tank diameter, ft,
T_{AA} = average daily ambient temperature, °R; see Note 4
T_B = liquid bulk temperature, °R; see Note 5

α_R = tank roof surface solar absorptance, dimensionless; see Table 7.1-6
α_S = tank shell surface solar absorptance, dimensionless; see Table 7.1-6
I = average daily total insolation factor, Btu/(ft^2 day); see Table 7.1-7

API assigns a default value of $H_s/D = 0.5$ and an assumption of $\alpha_R = \alpha_S$, resulting in the simplified equation shown below for an uninsulated fixed roof tank:[22]

$$T_{LA} = 0.4T_{AA} + 0.6T_B + 0.005\,\alpha\,I \tag{1-28}$$

where:

α = average tank surface solar absorptance, dimensionless

Equation 1-27 and Equation 1-28 should not be used to estimate liquid surface temperature for insulated tanks. In the case of fully insulated tanks, the average liquid surface temperature should be assumed to equal the average liquid bulk temperature (see Note 5). For purposes of estimating emissions, a storage tank should be deemed insulated only if the roof and shell are both fully insulated so as to minimize heat exchange with ambient air. If only the shell is insulated, and not the roof, there likely will be sufficient heat exchange through the roof such that Equation 1-28 would be applicable.

A more accurate method of estimating the average liquid surface temperature, T_{LA}, in partially insulated fixed roof tanks is given below. When the tank shell is insulated but the tank roof is not, heat gain to the tank from insolation is almost entirely through the tank roof and thus the liquid surface temperature is not sensitive to H_S/D.

$$T_{LA} = 0.3\,T_{AA} + 0.7\,T_B + 0.005\,\alpha_R\,I \tag{1-29}$$

If T_{LA} is used to calculate P_{VA} from Figures 7.1-13a, 7.1-13b, 7.1-14a, or 7.1-14b, T_{LA} must be converted from degrees Rankine to degrees Fahrenheit (°F = °R – 459.7). If T_{LA} is used to calculate P_{VA} from Equation 1-26, T_{LA} must be converted from degrees Rankine to degrees Celsius (°C = [°R – 491.7]/1.8).

4. The average daily ambient temperature, T_{AA}, is calculated using the following equation:

$$T_{AA} = \left(\frac{T_{AX} + T_{AN}}{2}\right) \tag{1-30}$$

where:

T_{AA} = average daily ambient temperature, °R
T_{AX} = average daily maximum ambient temperature, °R
T_{AN} = average daily minimum ambient temperature, °R

Table 7.1-7 gives historical values of T_{AX} and T_{AN} in degrees Fahrenheit for selected U.S. cities. These values are converted to degrees Rankine by adding 459.7.

5. The liquid bulk temperature, T_B, should preferably be based on measurements or estimated from process knowledge. For uninsulated fixed roof tanks known to be in approximate equilibrium with

ambient air, heat gain to the bulk liquid from insolation is almost entirely through the tank shell; thus the liquid bulk temperature is not sensitive to H_S/D and may be calculated using the following equation:

$$T_B = T_{AA} + 0.003\ \alpha_S\ I \tag{1-31}$$

where:

T_B = liquid bulk temperature, °R
T_{AA} = average daily ambient temperature, °R, as calculated in Note 4
α_S = tank shell surface solar absorptance, dimensionless; see Table 7.1-6
I = average daily total insolation factor, Btu/(ft^2 day); see Table 7.1-7.

6. The average vapor temperature, T_V, for an uninsulated tank may be calculated using the following equation:

$$T_V = \frac{[2.2\ (H_S/D)+1.1]\ T_{AA} + 0.8\ T_B + 0.021\alpha_R I + 0.013(H_S/D)\alpha_S I}{2.2\ (H_S/D) + 1.9} \tag{1-32}$$

where:

H_S = tank shell height, ft
D = tank diameter, ft,
T_{AA} = average daily ambient temperature, °R
T_B = liquid bulk temperature, °R
α_R = tank roof surface solar absorptance, dimensionless
α_S = tank shell surface solar absorptance, dimensionless
I = average daily total insolation factor, Btu/(ft^2 day).

API assigns a default value of $H_s/D = 0.5$ and an assumption of $\alpha_R = \alpha_S$, resulting in the simplified equation shown below for an uninsulated tank:[22]

$$T_V = 0.7T_{AA} + 0.3T_B + 0.009\ \alpha\ I \tag{1-33}$$

where:

α = average tank surface solar absorptance, dimensionless

When the shell is insulated, but not the roof, the temperature equations are independent of H_s/D.

$$T_V = 0.6T_{AA} + 0.4T_B + 0.01\ \alpha_R\ I \tag{1-34}$$

When the tank shell and roof are fully insulated, the temperatures of the vapor space and the liquid surface are taken as equal to the temperature of the bulk liquid.

7.1.3.1.2 Working Loss

The fixed roof tank working loss, L_W, refers to the loss of stock vapors as a result of tank filling operations. Fixed roof tank working losses can be estimated from:

$$L_W = V_Q K_N K_P W_V K_B \tag{1-35}$$

where:

L_W = working loss, lb/yr

V_Q = net working loss throughput, ft^3/yr, see Note 1

K_N = working loss turnover (saturation) factor, dimensionless

for turnovers > 36, $K_N = (180 + N)/6N$

for turnovers ≤ 36, $K_N = 1$

for tanks that are vapor balanced and tanks in which flashing occurs, $K_N = 1$ regardless of the number of turnovers; further adjustment of K_N may be appropriate in the case of splash loading into a tank.

N = number of turnovers per year, dimensionless:

$$N = \Sigma H_{QI} / (H_{LX} - H_{LN}) \tag{1-36}$$

ΣH_{QI} = the annual sum of the increases in liquid level, ft/yr

If ΣH_{QI} is unknown, it can be estimated from pump utilization records. Over the course of a year, the sum of increases in liquid level, ΣH_{QI}, and the sum of decreases in liquid level, ΣH_{QD}, will be approximately the same. Alternatively, ΣH_{QI} may be approximated as follows:

$$\Sigma H_{QI} = (5.614\ Q) / ((\pi/4)\ D^2) \tag{1-37}$$

5.614 =the conversion of barrels to cubic feet, ft^3/bbl

Q = annual net throughput, bbl/yr

For horizontal tanks, use D_E (Equation 1-14) in place of D in Equation 1-37

H_{LX} = maximum liquid height, ft

If the maximum liquid height is unknown, for vertical tanks use one foot less than the shell height and for horizontal tanks use $(\pi/4)$ D where D is the diameter of a vertical cross-section of the horizontal tank

H_{LN} = minimum liquid height, ft

If the minimum liquid height is unknown, for vertical tanks use 1 and for horizontal tanks use 0

K_P = working loss product factor, dimensionless

for crude oils, $K_P = 0.75$; adjustment of K_P may be appropriate in the case of splash loading into a tank

for all other organic liquids, $K_P = 1$

W_V = vapor density, lb/ft^3, see Equation 1-22

K_B = vent setting correction factor, dimensionless, see Note 2 for open vents and for a vent setting range up to ± 0.03 psig, $K_B = 1$

1. Net Working Loss Throughput.

The net working loss throughput, V_Q, is the volume associated with increases in the liquid level, and is calculated as follows:

$$V_Q = (\Sigma H_{QI})(\pi/4)\, D^2 \tag{1-38}$$

where:

ΣH_{QI} = the annual sum of the increases in liquid level, ft/yr

D_E should be used for horizontal tanks in place of D in Equation 1-38.

If ΣH_{QI} is unknown, ΣH_{QI} can be estimated from pump utilization records. Over the course of a year, the sum of increases in liquid level, ΣH_{QI}, and the sum of decreases in liquid level, ΣH_{QD}, will be approximately the same. Alternatively, V_Q may be approximated as follows:

$$V_Q = 5.614\ Q \tag{1-39}$$

where:

5.614 = the conversion of barrels to cubic feet, ft^3/bbl

Q = annual net throughput, bbl/yr
Use of gross throughput to approximate the sum of increases in liquid level will significantly overstate emissions if pumping in and pumping out take place at the same time. However, use of gross throughput is still allowed, since it is clearly a conservative estimate of emissions.

2. Vent Setting Correction Factor

When the breather vent settings are greater than the typical values of ± 0.03 psig, and the condition expressed in Equation 1-40 is met, a vent setting correction factor, K_B, must be determined using Equation 1-41. This value of K_B will be used in Equation 1-35 to calculate working losses.

When:

(1-40)

$$K_N\left[\frac{P_{BP}+P_A}{P_I+P_A}\right]>1.0$$

Then:

(1-41)

$$K_B=\left[\frac{\dfrac{P_I+P_A}{K_N}-P_{VA}}{P_{BP}+P_A-P_{VA}}\right]$$

where:

K_B = vent setting correction factor, dimensionless

P_I = pressure of the vapor space at normal operating conditions, psig
P_I is an actual pressure reading (the gauge pressure). If the tank is held at atmospheric pressure (not held under a vacuum or at a steady pressure) P_I would be 0.

P_A = atmospheric pressure, psia

K_N = working loss turnover (saturation) factor (dimensionless), see Equation 1-35 P_{VA} = vapor pressure at the average daily liquid surface temperature, psia; see Notes 1 and 2 to Equation 1-22

P_{BP} = breather vent pressure setting, psig.

See Section 7.1.6.2 for a more approximate equation for fixed roof tank working loss that was used historically, but which is no longer recommended.

7.1.3.2 Routine Losses From Floating Roof Tanks[3-5,13-17]

Routine floating roof tank emissions are the sum of standing and working losses. Routine losses from floating roof tanks may be written as:

$$L_T = L_S + L_W \tag{2-1}$$

where:

L_T = total routine loss, lb/yr
L_S = standing loss, lb/yr; see Equation 2-2
L_W = working (withdrawal) loss, lb/yr; see Equation 2-19

The equations presented in this subsection apply only to floating roof tanks. The equations are not intended to be used in the following applications:

1. To estimate losses from unstable or boiling stocks (see Section 7.1.3.5) or from mixtures of hydrocarbons or petrochemicals for which the vapor pressure is not known or cannot readily be predicted;

2. To estimate losses from floating roof tanks vented only through a pressure/vacuum vent in the fixed roof (*i.e.*, no open vents) (see Section 7.1.3.8.2);

3. To estimate losses from tanks in which the materials used in the rim seal and/or deck fittings are either deteriorated or significantly permeated by the stored liquid;

4. To estimate losses that result from the landing of a floating roof (see Section 7.1.3.3); or

5. To estimate losses that result from cleaning a tank (see Section 7.1.3.4).

7.1.3.2.1 Standing Loss

Standing losses from floating roof tanks are the sum of rim seal, deck fitting and deck seam losses, and may be written as:

$$L_S = L_R + L_F + L_D \tag{2-2}$$

where:

L_S = standing loss, lb/yr
L_R = rim seal loss, lb/yr; see Equation 2-3
L_F = deck fitting loss, lb/yr; see Equation 2-13
L_D = deck seam loss (internal floating roof tanks only), lb/yr; see Equation 2-18

<u>Rim Seal Loss</u> - Rim seal loss from floating roof tanks can be estimated using the following equation:

$$L_R = (K_{Ra} + K_{Rb}\, v^n) D P^*\, M_V\, K_C \tag{2-3}$$

where:

L_R = rim seal loss, lb/yr
K_{Ra} = zero wind speed rim seal loss factor, lb-mole/ft•yr; see Table 7.1-8
K_{Rb} = wind speed dependent rim seal loss factor, lb-mole/(mph)^{n}ft•yr; see Table 7.1-8
v = average ambient wind speed at tank site, mph; see Note 1
n = seal-related wind speed exponent, dimensionless; see Table 7.1-8
P^* = vapor pressure function, dimensionless; see Note 2

$$P^* = \frac{\frac{P_{VA}}{P_A}}{\left(1 + \left[1 - \left(\frac{P_{VA}}{P_A}\right)\right]^{0.5}\right)^2} \qquad \textbf{(2-4)}$$

where: P_{VA} = vapor pressure at average daily liquid surface temperature, psia; See Note 3 below and Notes 1 and 2 to Equation 1-22P_A = atmospheric pressure, psia

D = tank diameter, ft
M_V = average vapor molecular weight, lb/lb-mole; see Note 1 to Equation 1-22,
K_C = product factor;
K_C = 0.4 for crude oils; K_C = 1 for all other organic liquids.

Notes:

1. If the ambient wind speed at the tank site is not available, use wind speed data from the nearest local weather station or values from Table 7.1-7. Ambient wind speed should be measured at an elevation of at least 10 meters above grade. If the tank is an internal or domed external floating roof tank, the value of v is zero.

2. P^* can be calculated or read directly from Figure 7.1-19.

3. The average daily liquid surface temperature, T_{LA}, for calculation of vapor pressure, P_{VA}, for floating roof tanks shall be determined as follows:

<u>For internal and domed external floating roof tanks</u>:

$$T_{LA} = \frac{[2.86\,(H_S/D)+1.43]\,T_{AA} + [3.52\,(H_S/D)+3.79]\,T_B + 0.027\alpha_R I + 0.017(H_S/D)\alpha_S I}{6.38\,(H_S/D) + 5.22} \qquad (2\text{-}5)$$

where:

T_{LA} = average daily liquid surface temperature, °R
H_S = tank shell height, ft
D = tank diameter, ft,
T_{AA} = average daily ambient temperature, °R; see Equation 1-30
T_B = liquid bulk temperature, °R;
α_R = tank roof surface solar absorptance, dimensionless; see Table 7.1-6
α_S = tank shell surface solar absorptance, dimensionless; see Table 7.1-6
I = average daily total insolation factor, Btu/(ft^2 day); see Table 7.1-7

API assigns a default value of $H_s/D = 0.5$ and an assumption of $\alpha_R = \alpha_S$, resulting in the simplified equation shown below for an uninsulated internal or domed external floating roof tank:[22]

$$T_{LA} = 0.3\ T_{AA} + 0.7\ T_B + 0.004\ \alpha\ I \tag{2-6}$$

where:

α = average tank surface solar absorptance, dimensionless

The average daily liquid surface temperature, T_{LA}, for external floating roof tanks is independent of H_s/D for a given value of T_B. Different expressions for T_{LA} are given for the two common types of external floating roof deck. If the type of external floating roof deck is unknown, assume the deck to be the steel peripheral pontoon type.

For external floating roof tanks with a steel peripheral pontoon deck (single deck center area):

$$T_{LA} = 0.7\ T_{AA} + 0.3\ T_B + 0.008\ \alpha_R I \tag{2-7}$$

where the liquid bulk temperature, T_B, is preferably determined from measurements or estimated from process knowledge, but otherwise may be estimated as follows:

$$T_B = T_{AA} + [0.71\ \alpha_R I + 0.485\ (H_s/D)\ \alpha_S I] / (170\ H_s/D + 57) \tag{2-8}$$

For default H_s/D = 0.5, when $\alpha_R = \alpha_S$:

$$T_B = T_{AA} + 0.007\ \alpha\ I \tag{2-9}$$

For external floating roof tanks with a steel double deck:

$$T_{LA} = 0.3\ T_{AA} + 0.7\ T_B + 0.009\ \alpha_R I \tag{2-10}$$

where the liquid bulk temperature, T_B, is preferably determined from measurements or estimated from process knowledge, but otherwise may be estimated as follows:

$$T_B = T_{AA} + [0.39\ \alpha_R I + 0.485\ (H_s/D)\ \alpha_S I] / (170\ H_s/D + 45) \tag{2-11}$$

For default H_s/D = 0.5, when $\alpha_R = \alpha_S$:

$$T_B = T_{AA} + 0.005\ \alpha\ I \tag{2-12}$$

Deck Fitting Loss - Deck fitting losses from floating roof tanks can be estimated by the following equation:

$$L_F = F_F\ P^* M_V K_C \tag{2-13}$$

where:

L_F = the deck fitting loss, lb/yr

F_F = total deck fitting loss factor, lb-mole/yr

$$F_F = [(N_{F_1} K_{F_1}) + (N_{F_2} K_{F_2}) + \dots + (N_{F_{n_f}} K_{F_{n_f}})] \tag{\textbf{2-14}}$$

where:

N_{F_i} = number of deck fittings of a particular type (i = 0,1,2,...,n_f), dimensionless

K_{F_i} = deck fitting loss factor for a particular type fitting (i = 0,1,2,...,n_f), lb-mole/yr; see Equation 2-15

n_f = total number of different types of fittings, dimensionless

P^*, M_V, K_C are as defined for Equation 2-3.

The value of F_F may be calculated by using actual tank-specific data for the number of each fitting type (N_F) and then multiplying by the fitting loss factor for each fitting (K_F).

The deck fitting loss factor, K_{F_i} for a particular type of fitting, can be estimated by the following equation:

$$K_{F_i} = K_{Fa_i} + K_{Fb_i}(K_v v)^{m_i} \qquad \textbf{(2-15)}$$

where:

K_{F_i} = loss factor for a particular type of deck fitting, lb-mole/yr

K_{Fa_i} = zero wind speed loss factor for a particular type of fitting, lb-mole/yr

K_{Fb_i} = wind speed dependent loss factor for a particular type of fitting, lb-mole/$(mph)^m$•yr

m_i = loss factor for a particular type of deck fitting, dimensionless

i = 1, 2, ..., n, dimensionless

K_v = fitting wind speed correction factor, dimensionless; see below

v = average ambient wind speed, mph

For external floating roof tanks, the fitting wind speed correction factor, K_v, is equal to 0.7. For internal and domed external floating roof tanks, the value of v in Equation 2-15 is zero and the equation becomes:

$$K_{Fi} = K_{Fai} \qquad \textbf{(2-16)}$$

Loss factors K_{Fa}, K_{Fb}, and m are provided in Table 7.1-12 for the most common deck fittings used on floating roof tanks. These factors apply only to typical deck fitting conditions and when the average ambient wind speed is below 15 miles per hour. Typical numbers of deck fittings for floating roof tanks are presented in Tables 7.1-11, 7.1-12, 7.1-13, 7.1-14, and 7.1-15.

Loss factors may be estimated for deck fitting configurations that are not listed in Table 7.1-12, at the zero miles-per-hour wind speed condition (IFRTs and Domed EFRTs), from the following equation:

$$K_{fai} = 0.27(A_{fi})^{0.86} \qquad (2\text{-}17)$$

Where:

K_{fai} = zero-wind-speed loss factor for a particular type of deck fitting, in pound-moles per year.

A_{fi} = liquid surface area within a particular type of deck fitting, in square inches. The liquid surface area is the area inside the deck fitting well or leg sleeve, less any area occupied by an obstruction in the deck fitting well or leg sleeve (such as a fixed-roof support column, unslotted guidepole, guidepole float, or deck support leg).

The coefficient, 0.27, has units of pound-moles per (square inches)$^{0.86}$-year, and the exponent, 0.86, is dimensionless.

This equation is only applicable when the distance from the liquid surface to the top of the deck fitting well or leg sleeve is 12 inches or greater. Shorter deck fitting wells or leg sleeves may result in higher loss rates. There are no similar algorithms available for estimating loss factors for shorter deck fitting wells or leg sleeves.

This equation is for an uncontrolled deck fitting. Effective deck fitting controls would be expected to result in lower loss factors than would be estimated by this equation, but there are no algorithms available for estimating the effectiveness of deck fitting controls.

This equation is for the zero miles-per-hour wind speed condition. There are no algorithms available for estimating loss factors at non-zero wind speeds (EFRTs).

Deck Seam Loss – Deck seams that are welded are assumed to have no deck seam loss (i.e., $L_D = 0$). All external floating roofs are assumed to be of welded construction, and some internal floating roofs are of welded construction. Internal floating roof tanks with bolted decks may have deck seam losses. Deck seam loss can be estimated by the following equation:

$$L_D = K_D S_D D^2 P^* M_V K_C \tag{2-18}$$

where:

K_D = deck seam loss per unit seam length factor, lb-mole/ft-yr
= 0.0 for welded deck
= 0.14 for bolted deck; see Note

S_D = deck seam length factor, ft/ft^2

$$= \frac{L_{seam}}{A_{deck}}$$

where: L_{seam} = total length of deck seams, ft A_{deck} = area of deck, ft^2 = $\frac{\pi \cdot D^2}{4}$

D, P^*, M_V, and K_C are as defined for Equation 2-3.

If the total length of the deck seam is not known, Table 7.1-16 can be used to determine S_D. For a deck constructed from continuous metal sheets with a 7-ft spacing between the seams, a value of 0.14 ft/ft^2 can be used. A value of 0.33 ft/ft^2 can be used for S_D when a deck is constructed from rectangular panels 5 ft by 7.5 ft. Where tank-specific data concerning width of deck sheets or size of deck panels are unavailable, a default value for S_D can be assigned. A value of 0.20 ft/ft^2 can be assumed to represent the most common bolted decks currently in use.

Note: Recently vendors of bolted decks have been using various techniques, such as gasketing the deck seams, in an effort to reduce deck seam losses. However, emission factors are not currently available in AP-42 that represent the emission reduction, if any, achieved by these techniques. Some vendors have developed specific factors for their deck designs; however, use of these factors is not recommended until approval has been obtained from the governing regulatory agency or permitting authority. A weld seam does not have to be structural (*i.e.*, may be seal welded) to constitute a welded deck seam for purposes of estimating emissions, but a deck seam that is bolted or otherwise mechanically fastened and sealed with elastomeric materials or chemical adhesives is not a welded seam.

7.1.3.2.2 Working (withdrawal) Loss

The working loss from floating roof storage tanks, also known as withdrawal loss, can be estimated using Equation 2-19.

$$L_W = \frac{0.943\, Q\, C_S\, W_L}{D}\left(1 + \frac{N_C\, F_C}{D}\right) \qquad \textbf{(2-19)}$$

where:

L_W = working (withdrawal) loss, lb/yr

Q = annual net throughput, bbl/yr; see Note 1

C_S = shell clingage factor, bbl/1,000 ft^2; see Table 7.1-10

W_L = average organic liquid density, lb/gal; see Note 2

D = tank diameter, ft

0.943 = constant, 1,000 ft^3•gal/bbl^2

N_C = number of fixed roof support columns, dimensionless; see Note 3

F_C = effective column diameter, ft (column perimeter [ft]/π); see Note 4

Notes:

1. For tanks in which liquid is pumped in and out at the same time, the use of gross throughput to estimate working loss would overstate emissions, but the overestimation would not be as significant as for the working loss of fixed roof tanks. It would be more appropriate to express Q in terms of the sum of the decreases in liquid level ΣH_{QD}. Over the course of a year, the sum of decreases in liquid level, ΣH_{QD}, and the sum of increases in liquid level, ΣH_{QI}, will be approximately the same. The effective annual throughput, Q, may be calculated in terms of ΣH_{QD} as follows:

$$Q = (\pi/4)\, D^2\, (\Sigma H_{QD}/5.614) \qquad (2\text{-}20)$$

ΣH_{QD} = the annual sum of the decreases in liquid level, ft/yr

D = tank diameter, ft

5.614 = the conversion of barrels to cubic feet, ft^3/bbl

If ΣH_{QD} is unknown, Q can be taken as the annual net throughput.

2. A listing of the average organic liquid density for select petrochemicals is provided in Tables 7.1-2 and 7.1-3. If W_L is not known for gasoline, an average value of 5.6 lb/gal can be assumed.

3. For a self-supporting fixed roof or an external floating roof tank:

$N_C = 0.$

For a column-supported fixed roof:

N_C = use tank-specific information or see Table 7.1-11.

4. Use tank-specific effective column diameter or

F_C = 1.1 for 9-inch by 7-inch built-up columns, 0.7 for 8-inch-diameter pipe columns, and 1.0 if column construction details are not known

7.1.3.3 Floating Roof Landing Losses[21]

When using floating roof tanks, the roof floats on the surface of the liquid inside the tank and reduces evaporative losses during routine operations. However, when the tank is emptied to the point that the roof lands on deck legs or hangers, there is a period where the roof is not floating and other mechanisms contribute to emissions. These emissions continue until the tank is refilled to a sufficient level to again float the roof. Therefore, these emission estimation calculations are applicable each time there is a landing of the floating roof.

This model does not directly address standing idle losses for partial days, but it would be reasonable to estimate the emissions for a partial day by estimating the standing idle emissions for a single day and then pro-rating that estimate by the number of hours that the floating roof was actually landed. For example, if the floating roof were landed for 6 hours, then the estimated standing idle losses would be 6/24, or one quarter, of the estimated daily standing idle losses.

The total loss from floating roof tanks during a roof landing is the sum of the standing idle losses and the filling losses. This relationship may be written in the form of an equation:

$$L_{TL} = L_{SL} + L_{FL} \tag{3-1}$$

where:

L_{TL} = total losses during roof landing, lb per landing episode

L_{SL} = standing idle losses during roof landing, lb per landing episode

L_{FL} = filling losses during roof landing, lb per landing episode

The group of applicable equations to estimate the landing losses differs according to the type of floating roof tank that is being used. The equations needed to estimate landing losses from internal or domed external floating roof tanks are contained in Table 7.1-17; equations for external floating roof tanks are contained in Table 7.1-18; and equations for drain-dry floating roof tanks are contained in Table 7.1-19. The following sections explain these equations in more detail.

7.1.3.3.1 Standing Idle Losses

After the floating roof is landed and the liquid level in the tank continues to drop, a vacuum is created which could cause the floating roof to collapse. To prevent damage and to equalize the pressure, a breather vent (vacuum breaker) is actuated. Then, a vapor space is formed between the floating roof and the liquid. The breather vent may remain open until the roof is again floated, so whenever the roof is landed, vapor can be lost through this vent as well as through other deck fittings and past the rim seal. Even in the case of a self-closing breather vent, the vapor space beneath the floating roof is vented via the other deck fittings and the rim seal, which is effectively rendered vapor mounted once the liquid level drops below the bottom of the rim seal. These losses are called “standing idle losses.”

The three different mechanisms that contribute to standing idle losses are (1) breathing losses from vapor space, (2) wind losses, and (3) clingage losses. The specific loss mechanism is dependent on the type of floating roof tank and the bottom condition.

For internal or domed external floating roof tanks with liquid remaining in the bottom (liquid heel), the breathing losses originate from a discernible level of liquid that remains in the tank. This is typically the case for internal or domed external floating roof tanks with nominally flat bottoms (including those built with a slight upward cone), due to the flatness of the tank bottom and the position of the withdrawal line. If the remaining liquid covers the entire bottom of the tank, this is known as a full liquid heel. The liquid evaporates into the vapor space beneath the landed floating roof and daily changes in ambient temperature cause this vapor space to breathe in a manner similar to a fixed roof tank. A partial liquid heel may be left in tanks with sloped bottoms, if the withdrawal of liquid ceases while some free standing liquid remains in a sump or elsewhere in the bottom of the tank.

For external floating roof tanks, which are not fully shielded from the surrounding atmosphere, wind action across the landed floating roof can create pressure differentials that cause vapors to flow from beneath the floating roof. The higher the wind speeds, the more vapor that can be expelled. These are known as wind losses.

For tanks with a cone-down or shovel bottom, the floor of the tank is sloped to allow for more thorough emptying of the tank contents, therefore, the amount of liquid remaining may differ significantly from tanks with flat bottoms (see Figure 7.1-20). When the emptying operation drains the tank bottom but leaves a heel of liquid in or near the sump, the tank is considered to have a partial liquid heel. A drain-dry condition is attained only when all of the standing liquid has been removed, including from the bottom of the sump. However, due to sludge buildup, irregularity of the tank bottom and roughness of the inside of the tank, a small layer of liquid can remain clinging to the sloped bottom of a drain-dry tank. This layer of liquid will create vapor that can result in clingage losses. The amount of vapor produced within a drain-dry tank is directly related to this clingage. Clingage factors for various tank conditions are contained in Table 7.1-10. However, the clingage factors given in Table 7.1-10 are for the vertical shell of the tank, which is wiped by the rim seal each time the tank is emptied. The bottom of the tank is more nearly horizontal and is not wiped by a rim seal, and thus the clingage factors for a vertical shell would not be directly applicable. A clingage factor of 0.15 bbl/10^3ft^2 should be used to represent the clingage on the tank bottom.

Standing Idle Loss for Tanks with a Liquid Heel

A constraint on the standing idle loss is added for floating roof tanks with a liquid heel in that the total emissions cannot exceed the available stock liquid in the tank. This upper limit, represented as L_{SLmax}, is a function of the volume and density of the liquid inside the tank.

$$L_{SL\max} = \text{(area of tank) (height of liquid) (density of liquid)} \tag{3-2}$$

Assuming that the tank has a circular bottom and adding a volume conversion unit, the equation can be simplified to Equation 3-3 and Equation 3-4.

$$L_{SL\max} = \left(\frac{\pi}{4}\right) D^2 \ h_{le} \ W_l \ (7.48) \tag{3-3}$$

$$L_{SLmax} = 5.9\ D^2\ h_{le}\ W_l \tag{3-4}$$

where:

L_{SLmax} = limit on standing idle loss, lb per landing episode
7.48 = volume conversion factor, gal/ft^3
D = diameter of the tank, feet
h_{le} = effective height of the stock liquid, feet
W_l = density of the liquid inside the tank, lb/gal

Internal or Domed External Floating Roof Tank with a Liquid Heel

For internal or domed external floating roof tanks with liquid heels, the amount of "standing idle loss" depends on the amount of vapor within the vapor space under the floating roof. Essentially, the mechanism is identical to the breathing losses experienced with fixed roof tanks. The mechanism shown in Equation 3-5 is identical to Equation 1-2.

$$L_{SL} = 365\, V_V\ W_V\ K_E\ K_S \tag{3-5}$$

where

L_{SL} = annual breathing loss from standing idle during roof landing, lb/yr
365 = number of days in a year, days/yr
V_V = volume of the vapor space, ft^3
W_V = stock vapor density, lb/ft^3

$$W_V = \frac{M_V P_{VA}}{RT_V} \tag{3-6}$$

M_V = stock vapor molecular weight, lb/lb-mole
P_{VA} = true vapor pressure of the stock liquid, psia at the temperature beneath the landed floating roof (given that the tank bottom is in contact with the ground, assume the temperature to be equal to ground temperature, which is taken as the average ambient temperature for the month in which the landing occurs, unless a different temperature is known)
R = ideal gas constant, 10.731 (psia-ft^3)/(lb-mole °R)
T_V = average vapor temperature, °R, given that the tank bottom is in contact with the ground, the temperature is assumed to be equal to ground temperature, which is taken as the average ambient temperature for the month in which the landing occurs, unless a different temperature is known
K_E = vapor space expansion factor, per day, calculated from Equation 1-5, 1-12 or 1-13 as appropriate, with the value of ΔP_B set equal to zero
K_S = standing idle saturation factor, dimensionless, calculated from Equation 1-21.

This equation requires adjustment, however, in that floating roof landing episodes are measured in days rather than years. Assuming that n_d equals the number of days that the tank stands idle and substituting for the stock vapor density according to Equation 3-6, the equation is further simplified to Equation 3-7.

$$L_{SL} = n_d \, K_E \, \frac{P_{VA} V_V}{R \, T_V} M_V \, K_S \tag{3-7}$$

The term with the highest amount of uncertainty is the saturation of the vapor beneath the landed floating roof. The standing idle saturation factor, K_S, is estimated with the same method used to calculate the vented vapor saturation factor for fixed roof tanks in Equation 1-21. In order to establish limits on the value of K_S, the estimated factor is assumed to be less than or equal to the filling saturation factor (S). (For more information see Filling Losses.)

The bottom of the tank may be flooded with a light distillate material, such as diesel, to reduce volatility when the original heel is a relatively volatile liquid such as gasoline. This procedure is referred to as distillate flushing. Testing has shown that, when the characteristics of the liquid heel beneath a landed floating roof are changed, the characteristics of the vapor space beneath the floating roof will tend toward equilibrium with the new liquid heel within 24 hours. The values for K_E, P_{VA}, and M_V in Equation 3-7 may, then, be based on the properties of the mixture resulting from distillate flushing the day following the introduction of the distillate into the tank. Properties of this mixture would be a weighted average of the properties of the original heel and the properties of the distillate material, proportional to the remaining quantities of each. [add reference]

External Floating Roof Tank with a Liquid Heel

For external floating roof tanks with a liquid heel, wind affects emission releases from the tanks. As a starting point, begin with a basic equation based on rim-seal loss. The equation, shown as Equation 3-8, is equivalent to Equation 2-3.

$$L_{RL} = (K_{Ra} + K_{Rb} \, v^n) D \, P^* \, M_V \, K_C \tag{3-8}$$

where

L_{RL} = annual rim seal loss during roof landing, lb/yr

K_{Ra} = zero wind speed rim seal loss factor, lb-mole/ft-yr

K_{Rb} = wind speed dependent rim seal loss factor, lb-mole/((mph)^n-ft-yr))

n = seal-related wind speed loss exponent, dimensionless

(K_{Ra}, K_{Rb}, and n are specific to a given configuration of rim seal)

v = average ambient wind speed, mph

D = tank diameter, ft

M_V = stock vapor molecular weight, lb/lb-mole

K_C = product factor, dimensionless

P^* = a vapor pressure function, dimensionless

$$P^* = \frac{\frac{P_{VA}}{P_A}}{\left(1 + \left[1 - \left(\frac{P_{VA}}{P_A}\right)\right]^{0.5}\right)^2} \tag{3-9}$$

where: P_A = atmospheric pressure, psia P_{VA} = true vapor pressure of the stock liquid, psia.

Assuming that the stock properties included in the vapor pressure function will adequately account for differences in liquid product type, K_C is assumed to equal 1. Regardless of the type of rim seal that is in use, it is effectively rendered a 'vapor-mounted' seal when the liquid level falls such that the rim seal is no longer in contact with the liquid. The contribution of a secondary seal is neglected in that it is offset by emissions through the deck fittings. The emissions are therefore based on the case of a welded tank with an average-fitting vapor-mounted primary seal. According to Table 7.1-8, the values of K_{ra}, K_{rb}, and n are 6.7, 0.2, and 3.0, respectively. The variables were substituted and the equation was converted from annual emissions to daily emissions by dividing the equation by 365. A value of 10 mph is assigned to the wind speed, so that estimated standing idle losses from an external floating roof tank will not be less than for a typical internal or domed external floating roof tank. Lower values for the rim seal loss factors or the wind speed should not be used. The equation for standing idle loss due to wind can be simplified to Equation 3-10.

$$L_{SLwind} = 0.57 \, n_d \, D \, P^* \, M_V \tag{3-10}$$

where:

L_{SLwind} = standing idle loss due to wind, lb per landing episode

n_d = number of days that the tank is standing idle, days

D = tank diameter, ft

P* = a vapor pressure function, dimensionless

M_V = stock vapor molecular weight, lb/lb-mole

As with internal or domed external floating roof tanks with a liquid heel, distillate flushing may be used to reduce the volatility of the liquid heel and thus the values used for the stock properties. The value for M_V, and for P_{VA} in the calculation of P*, may be based on the properties of the mixture resulting from distillate flushing the day following the introduction of the distillate into the tank.

After the wind empties the vapor space above the remaining liquid heel, the liquid will continue to produce vapor. Thus, this standing idle loss will occur every day that the tank stands idle with liquid remaining in the tank. This equation is adequate at this time but could be revised as additional testing is conducted and studied.

Limit on Standing Idle Losses from Drain-Dry Tanks

When a drain-dry tank has been emptied, the only stock liquid available inside the tank is a thin layer that clings to the wetted surface of the tank interior (if free-standing liquid remains in or near a sump, or in puddles on the tank bottom, then the tank should be evaluated as having a partial heel, and not as drain dry – see Figure 7.1-20). The slope prevents a significant amount of stock liquid from remaining in the tank so that evaporation is much lower than from tanks with liquid heels. Due to the limited amount of liquid clinging to the interior of the tank, as shown in Figure 7.1-20, there would be no liquid remaining to replenish vapors once the clingage layer has evaporated. For this model, standing idle loss due to clingage is a one-time event rather than a daily event, involving only evaporation of the clingage layer.

The loss due to clingage is proportional to a clingage factor, which varies with the condition of the inside of the tank. A list of clingage factors are shown in Table 7.1-10. However, the clingage factors given in Table 7.1-10 are for the vertical shell of the tank, which is wiped by the rim seal each time the tank is emptied. The bottom of the tank is more nearly horizontal and is not wiped by a rim seal, and thus the clingage factors for a vertical shell would not be directly applicable to the tank bottom.

The factors are given in terms of barrels per thousand square feet. To convert the loss to pounds, the density of the liquid and the area of the tank bottom must be taken into account, as shown in Equation 3-11.

$$L_C = 0.042\, C_S\, W_l (Area) \tag{3-11}$$

where:

L_C = clingage loss from the drain-dry tank, lb
0.042 = conversion factor, 1,000 gal/bbl
C_S = clingage factor, bbl/1,000 ft^2
W_l = density of the liquid, lb/gal
Area = area of the tank bottom, ft^2

$$Area = \left(\frac{\pi D^2}{4} \right) \tag{3-12}$$

Among the conditions shown in Table 7.1-10, the one that best approximates a sludge-lined tank bottom is gunite-lined, particularly given that the tank bottom is nearly horizontal and is not wiped by a rim seal. Assuming that gasoline is being stored in the tank, a clingage factor of 0.15 and the area term in Equation 3-12 were substituted into Equation 3-11, which simplifies to Equation 3-13.

$$L_{SL} = 0.0063\, W_l\, \frac{\pi D^2}{4} \tag{3-13}$$

The clingage loss should be constrained by an upper limit equal to the filling loss for an internal or domed external floating roof tank with a liquid heel. This is demonstrated in Equation 3-14.

$$L_{SL\max} = 0.60 \frac{P_{VA} V_V}{R\, T_V} M_V \tag{3-14}$$

where:

L_{SLmax} = maximum standing idle loss for drain-dry tanks due to clingage, lb
W_l = density of the liquid inside the tank, lb/gal

D = diameter of the tank, feet
P_{VA} = true vapor pressure of the liquid inside the tank, psia
V_V = volume of the vapor space, ft^3
R = ideal gas constant, 10.731 psia ft^3 /lb-mole °R
T_V = average temperature of the vapor and liquid below the floating roof, °R (= T_{AA})
M_V = stock vapor molecular weight, lb/lb-mole

Therefore, the standing idle loss for drain-dry tanks, shown in Equation 3-13, must be less than or equal to Equation 3-14. This relationship is shown by Equation 3-15.

$$L_{SL} \leq 0.60 \frac{P_{VA} V_V}{R\ T_V} M_V \quad \textbf{(3-15)}$$

7.1.3.3.2 Filling Losses

When a floating roof tank is refilled, there are additional emissions resulting from the roof being landed. These losses are called "filling losses" and continue until the liquid reaches the level of the floating roof.

The first contributor to filling losses is called the "arrival" component. These are the vapors that remain under the floating roof at the end of the standing idle period but have not been accounted for as standing idle losses. For example, in the case of a liquid heel evaporation takes place into the vapor space beneath the landed floating roof. The vapors that are expelled from this vapor space by breathing are accounted for as standing idle losses, and the vapors that remain upon the commencement of refilling are deemed the arrival component of filling losses.

The second contributor to filling losses is called the "generated" component. These are the vapors created by the incoming liquid as it evaporates during the filling operation. Even when filling a completely clean and gas-free tank, the incoming liquid will generate a certain amount of vapors.

Limit on Filling Loss for Tanks with a Liquid Heel

A constraint on the filling loss is added for floating roof tanks with a liquid heel in that the total emissions cannot exceed the amount of stock liquid initially left in the tank less the amount attributed to standing idle loss, plus the vapors generated by incoming liquid upon refilling. This upper limit, represented as L_{FLmax}, may be determined as follows:

Initial amount of stock liquid = 5.9 D^2 h_{le} W_l — from Equation 3-4

Amount attributed to standing idle loss = L_{SL} — from the applicable equation above for the given type of tank

Amount generated by incoming liquid = 0.15 P_{VA} V_V M_V / R T_V — from Equation 3-18 evaluated for a drain-dry tank, to account for only the generated component of vapors

These components of the upper limit on filling loss for a tank with a liquid heel may be combined into the following equation:

$$L_{FL} \leq (5.9 D^2 h_{le} W_l) - L_{SL} + 0.15 \frac{P_{VA} V_V}{R\, T_V} M_V \tag{3-16}$$

General Equation for Filling Loss

The amount of vapor that is lost during filling is directly related to the volume of the vapor space and the saturation level of the vapor within the vapor space, as shown in Equation 3-17.

L_{FL} = (*vapor space volume*)(*vapor concentration*)(*vapor mol wt*)(*saturation factor*)

After substituting for the major terms in Equation 3-17, the equation can be simplified to Equation 3-18.

(3-17)

$$L_{FL} = \left(\frac{P_{VA} V_V}{R\, T_V} \right) M_V \left(C_{sf} S \right) \tag{3-18}$$

where:

L_{FL} = filling loss during roof landing, lb

P_{VA} = true vapor pressure of the liquid within the tank, psia

V_V = volume of the vapor space, ft^3

R = ideal gas constant, 10.731 psia-ft^3/(lb-mole-°R)

T_V = average temperature of the vapor below the floating roof, °R(see Equation 3-6)

M_V = stock vapor molecular weight, lb/lb-mole

C_{sf} = filling saturation correction factor for wind, dimensionless

S = filling saturation factor, dimensionless (0.60 for a full liquid heel; 0.50 for a partial liquid heel).

In the event of a change of service during the landing event, the equation should be run separately for the arrival and generated components. The arrival component should be based on the liquid properties of the prior service and a saturation factor of (Csf S – 0.15). The generated component should be based on the properties of the incoming liquid and a saturation factor of 0.15. Internal or Domed External Floating Roof Tank with a Liquid Heel

A value of 0.6 for the filling saturation factor, which is used in Section 5.2, Table 5.2-1 for submerged loading of tank trucks and rail cars, has been demonstrated to be suitable for the case of a full liquid heel. A value of 0.5 has been demonstrated for the case of a partial liquid heel. In that the landed floating roof in an internal or domed external floating roof tank is shielded from wind by the fixed roof, the value of C_{sf} is taken as 1.0.

External Floating Roof Tank with a Liquid Heel

For external floating roof tanks with a liquid heel, the amount of vapor lost during filling will be less than the amount for internal or domed external floating roof tanks because of wind effects. The “arrival” component will have been partially flushed out of the tank by the wind, so the preceding equation requires evaluation of the filling saturation correction factor for wind, C_{sf}. The basic premise of the correction factor is that the vapors expelled by wind action will not be present in the vapor space when the tank is refilled, so the amount of saturation is lowered. This is demonstrated in Equation 3-19.

$$C_{sf} = 1 - \frac{(\text{one day of wind driven standing idle loss}) - (\text{one day without wind standing idle loss})}{\text{one day without wind total loss}} \quad \textbf{(3-19)}$$

The equation for the filling saturation correction factor can be simplified based on other equations contained in this section as shown in Equation 3-20 and Equation 3-21.

$$C_{sf} = 1 - \left(\frac{(Equation\ 3-10) - (Equation\ 3-7)}{(Equation\ 3-7) + (Equation\ 3-18)} \right) \quad \textbf{(3-20)}$$

Substituting the indicated equations, with the number of days set equal to 1 and C_{sf} set equal to 1 in Equation 3-18 for the case without wind:

$$C_{sf} = 1 - \left(\frac{(0.57 \cdot 1 \cdot D \cdot P^* \cdot M_V) - \left(1 \cdot K_E \cdot \left(\frac{P_{VA} \cdot V_V}{R \cdot T_V}\right) \cdot M_V \cdot K_S\right)}{\left(1 \cdot K_E \cdot \left(\frac{P_{VA} \cdot V_V}{R \cdot T_V}\right) \cdot M_V \cdot K_S\right) + \left(\left(\frac{P_{VA} \cdot V_V}{R \cdot T_V}\right) \cdot M_V \cdot (1 \cdot S)\right)} \right) \quad \textbf{(3-21)}$$

where:

C_{sf} = filling saturation correction factor for wind, dimensionless

n_d = set equal to 1, days

K_E = vapor space expansion factor, per day, calculated from Equation 1-5, 1-12 or 1-13 as appropriate, with the value of ΔP_B set equal to zero

V_V = volume of the vapor space, ft^3

$$V_V = \frac{h_v \ \pi D^2}{4} \quad \textbf{(3-22)}$$

h_v = height of the vapor space under the floating roof, ft D = tank diameter, ft

R = ideal gas constant, 10.731 psia ft^3 / lb-mole R

M_V = stock vapor molecular weight, lb/lb-mole

K_S = standing idle saturation factor, dimensionless

S = filling saturation factor, dimensionless

P^* = vapor pressure function, dimensionless

W_l = stock liquid density, lb/gal

Drain-Dry Tanks

The "arrival" component of filling losses for drain-dry tanks is completely covered by the "clingage" loss. Once this initial loss occurs, there is no remaining liquid inside the tank. Therefore, any vapors remaining in the tank prior to introducing the incoming liquid would have already been accounted for as standing idle loss, and thus saturation of the arrival component for drain-dry tank filling losses is taken as 0. Similarly, a tank with a full or partial liquid heel for which evaporation of the entire heel has been accounted for as standing idle loss should be considered to have no arrival component of filling losses, nor should a tank that has been cleaned. Each of these scenarios is deemed "drain dry" for purposes of estimating the filling loss.

However, the "generated" component remains a valid aspect of the model. Therefore, the filling saturation factor will be lower for drain-dry tanks than for tanks with a liquid heel due to the lack of an "arrival" component. And, given the absence of an arrival component of vapors for filling loss, the filling saturation correction factor for wind is taken as 1.0.

AP-42 Chapter 5, *Petroleum Industry*, provides emission factors for the loading of gasoline and crude oil into compartments according to the prior state of the compartment. A drain-dry tank would be most similar to a tank that was cleaned before filling because a cleaned tank also lacks "arrival" losses. The emission factor (0.33 lb/1000 gallons) for this kind of tank can be converted to a saturation factor by assuming a pressure of 8 psia (the same assumption used in the formulation of the emission factor) and substituting the molecular weight of gasoline (64 lb/lb-mole). The resulting saturation factor of 0.15 is applied as the filling saturation factor for drain-dry tanks regardless of the stored liquid.

7.1.3.4 Tank Cleaning Emissions[23]

The methodology presented in this section for estimating emissions associated with tank cleaning events is expressly for the estimation of vapors that are expelled from the tank during forced ventilation. These vapors potentially occur whenever forced ventilation of the tank is in operation while volatile organic material remains in the tank, regardless of whether any tank cleaning is actually taking place.

For purposes of estimating emissions, tank cleaning may be characterized as comprising the steps listed below.

Prior to commencement of forced ventilation (*i.e.*, not included in the tank cleaning calculations):

> Normal Pumpout: As much stock liquid as possible is pumped out through the tank outlet in the normal manner (*i.e.*, until the liquid level has dropped below the open end of the outlet line, and no more liquid moves through the outlet). If the tank has a floating roof, the floating roof will have landed on its legs and the vacuum breaker vent will have opened, causing air to be drawn into the space beneath the floating roof. Emissions that occur during normal pumpout are accounted for as routine emissions for fixed-roof tanks and as floating roof landing losses for floating roof tanks, and thus the normal pumpout period does not require additional calculations pertaining to tank cleaning.
>
> Standing Idle: The tank may remain in the condition resulting from normal pumpout for some

period of time until the next step begins. Emissions that occur during this period are accounted for as routine standing (breathing) loss for fixed roof tanks, and as standing idle loss during a floating roof landing for floating roof tanks, and thus the standing idle period does not require additional calculations pertaining to tank cleaning.

During forced ventilation (these are the steps for which additional tank cleaning calculations are required):

a) Vapor Space Purge: When eductors, fans, or blowers are started up, either at the top of the tank or at a shell manhole, cleanout fitting or other shell fitting, the first air change is deemed to expel those vapors that remain from the prior standing idle period. This first air change is characterized as a purge of vapors from the tank. Emissions associated with subsequent air changes are accounted for under continued forced ventilation.

   A vapor space purge will occur each time that ventilation commences after a period of standing idle without forced ventilation.

b) Continued Forced Ventilation: Forced ventilation refers to the removal of vapors from a tank by means of eductors, fans, or blowers. As long as volatile materials remain in the tank, some portion of the volatile material will evaporate into the air being moved through the tank by forced ventilation. The forced ventilation will then expel these vapors from the tank.

   If forced ventilation is discontinued, such as during the overnight period, then the tank is returned to a standing idle condition. A subsequent restarting of forced ventilation will result in another vapor space purge followed by a period of continued forced ventilation.

After the tank is clean and gas free, even if forced ventilation is continuing (not included in the tank cleaning calculations):

Remain Clean: Once the tank has been rendered clean and gas free it may remain in the clean condition for some period of time. While forced ventilation may continue, there would be no further emissions in that there would be no remaining sources of vapors once the tank has been cleaned. Thus the period of remaining clean does not require additional calculations pertaining to tank cleaning.

Refilling: If the tank is subsequently refilled, there will be vapors generated by the incoming stock which would then be expelled from the tank by the rising liquid level. For a fixed roof tank, these refilling emissions are accounted for as routine working (filling) losses. For a floating roof tank, these refilling emissions are calculated in the same manner as for the refilling after a floating roof landing. In that the tank has been cleaned, the filling saturation factor for the refilling should be 0.15, as for a drain dry tank. The refilling losses, then, do not require additional methodology in this section pertaining to tank cleaning.

The emissions to be accounted for in this section on tank cleaning emissions, then, are those associated with forced ventilation while volatile material remains in the tank. The equations needed to estimate emissions resulting from forced ventilation during tank cleaning are contained in Tables 7.1-20 and 7.1-21; equations for the vapor space purge are contained in Table 7.1-20 and equations for continued forced ventilation are contained in Table 7.1-21. The following sections explain these equations in more detail.

$$L_{FV} = L_P + L_{CV} \tag{4-1}$$

where:

L_{FV} = total emissions due to forced ventilation during a tank cleaning event, lb

L_P = vapor space purge emissions associated with the first air change following commencement of forced ventilation, lb

L_{CV} = emissions from continued forced ventilation following the first air change, lb

7.1.3.4.1 Vapor Space Purge Emissions

The daily breathing cycle that produces the standing idle emissions causes only a portion of the vapors in the vapor space to be expelled from the tank. The vapors that remain in the vapor space are not accounted for in the calculation of standing idle emissions. Commencement of forced ventilation expels these remaining vapors from the tank. The first air change of the vapor space upon commencing forced ventilation may be referred to as the vapor space purge, and the emissions may be estimated as follows:

$$L_P = (P_{VA}\ V_V\ /\ R\ T_V)\ M_V\ S \tag{4-2}$$

where:

P_{VA} = the true vapor pressure of the exposed volatile material in the tank (psia),

V_V = volume (ft^3) of the vapor space,

R = the ideal gas constant (psia ft^3 per lb-mole ^oR),

= 10.731 psia ft^3 per lb-mole ^oR,

T_V = the average temperature of the vapor space (^oR),

= the average ambient temperature (^oR),

M_V = the stock vapor molecular weight (lb/lb-mole),

S is a saturation factor evaluated as a function of the tank type and heel condition, as discussed later in this section

The volatility of the remaining materials may be less than the volatility of the previously stored stock liquid, and thus an appropriate judgment should be made in assigning properties to the residual material in the tank bottom for purposes of determining values for the true vapor pressure, P_{VA}, and the stock vapor molecular weight, M_V.

The bottom of the tank may be flooded with a light distillate material, such as diesel, to facilitate removal of sludge from the bottom of the tank. This procedure is referred to as distillate flushing. Testing has shown that, when the characteristics of the liquid heel beneath a landed floating roof are changed, the characteristics of the vapor space beneath the floating roof will tend toward equilibrium with the new liquid heel within 24 hours. The values for P_{VA} and M_V in Equation 4-2 may, then, be based on the properties of the mixture resulting from distillate flushing the day following the introduction of the distillate into the tank. Properties of this mixture would be a weighted average of the properties of the original heel and the properties of the distillate material, proportional to the remaining quantities of each.[24]

The vapor space purge comprises the expulsion of one vapor space volume, similar to one working-loss (filling) cycle of the vapor space. Emissions associated with subsequent air changes are accounted for as continued forced ventilation emissions.

<u>Fixed Roof Tanks</u>

The volume of the vapor space for estimating working loss from a fixed-roof tank is calculated from the maximum liquid height to which the tank may be filled. For a vapor space purge, however, the volume of the vapor space is the entire volume under the tank roof:

$$V_V = H_{VO} (\pi D^2/4) \tag{4-3}$$

where:

H_{VO} = the fixed-roof tank vapor space outage (ft)

$$H_{VO} = H_S - h_l + H_{RO} \tag{4-4}$$

where:

H_S = the height of the tank shell (ft),

h_l = the height of the stock liquid and sludge above the tank bottom at the tank shell (ft), and

H_{RO} = the roof outage (the effective height of the vapor space enclosed by the tank roof, ft)

= $S_R D/6$ for a cone-shaped roof, where S_R is the roof slope in feet per foot.

The vapor space outage, H_{VO}, would be slightly greater for the case of a cone-down bottom in a tank that does not have a full liquid heel. The slope of bottoms tends to be much less than the slope of roofs, however, and the contribution of the bottom cone to the vapor space outage would be very small compared to the full shell height.

The saturation factor for filling a fixed-roof tank is given as the turnover factor, K_N, in Equation 1-35, and defined as:

$$K_N = (180 + N)/6N$$

where:

N = number of turnovers per year, dimensionless

It would be advantageous to express this saturation factor in terms of days between turnovers (*i.e.*, days standing idle, n_d). The number of days between turnovers may be expressed as follows:

$$n_d = 365 / N$$

and thus the equation for K_N may be rewritten as:

$$K_N = (0.5\, n_d + 1) / 6 \tag{4-5}$$

Recognizing that the turnover factor, K_N, is the saturation factor to be used for calculating filling losses from a fixed-roof tank, the saturation factor, S, may be substituted for the turnover factor, K_N.

$$S = (0.5\, n_d + 1) / 6 \tag{4-6}$$

For periods of less than one day, a value of 1 should be used for the standing idle time, n_d. This effectively imposes a minimum value of 0.25 for the saturation factor, S. Thus a value of 0.25 should be used for S when the vapor space purge follows a standing idle period that was limited to an overnight cessation of forced ventilation.

The saturation factor value of 0.5 for an internal or domed external floating roof tank with a partial heel, as shown in Equation 3-18, may be reasonably chosen as an upper bound on the value of S for a fixed roof tank vapor space purge. It would be expected, for a given diameter of tank and type of liquid heel, that the accumulated vapors would be less concentrated in the larger vapor space of the fixed roof tank than under a landed floating roof, and thus a value of 0.5 should be a conservative upper bound for the fixed roof tank vapor space purge saturation factor.

These limits are expressed as follows:

$$S \geq 0.25 \tag{4-7}$$

$$S \leq 0.5 \tag{4-8}$$

<u>Floating Roof Tanks</u>

The volume of the vapor space for estimating the vapor space purge loss from a floating-roof tank is limited to the space under the floating roof, in that vapors which escape past the floating roof prior to the commencement of forced ventilation are separately accounted for as standing idle loss from the floating roof landing event:

V_V = volume (ft^3) of the vapor space under the floating roof,

$$= (h_v)\,(\pi D^2/4), \tag{4-9}$$

where:

h_v = the height (ft) of the vapor space under the floating roof for the given vapor space purge (see Table 7.1-4)

The saturation factor, S, for the initial vapor space purge is evaluated as specified for the filling saturation factor for a floating roof landing. This approach is conservative in that filling losses have both an arrival component, from resident vapors, and a generated component, from vapors generated by incoming liquid (*e.g.*, 25% of the filling saturation factor for an internal or domed external floating-roof tank with a full liquid heel may be attributable to the incoming liquid – the contribution of the incoming liquid to the vapor concentration varies with the filling scenario). The vapor space purge does not involve incoming liquid, however, and therefore would have only the arrival component of vapors. It is conservative, therefore, to use saturation factors that include allowance for the generated component of vapors.

When forced ventilation is discontinued overnight, then the tank cleaning process will involve a daily cycle that includes a period of standing idle (overnight) followed by a vapor space purge (when forced ventilation resumes the next morning). Emissions from overnight standing idle periods are accounted for in the estimate of the next morning's vapor space purge. In that the overnight standing idle emissions are taken as zero, there is no accounting for wind-driven losses of vapor from under external floating roofs. These vapors must then be accounted for with the following morning's vapor space purge. That is, the neglect of wind driven emissions during the overnight period means that the vapors must be considered to still be present when estimating the next morning's vapor space purge, and thus there must be no factoring down of the saturation level for the case of external floating-roof tanks. In other words, C_{sf} should be taken as 1.0 when the vapor space purge follows a standing idle period that was limited to an overnight cessation of forced ventilation.

Saturation factor values to be used for floating roof tanks are summarized as follows:

Full liquid heel

Internal or domed external floating roof tank
S = 0.6

External floating roof tank
S = ($0.6\ C_{sf}$), where C_{sf} is evaluated as shown in Equation 3-21 with n_d set to 1 for the initial vapor space purge; for subsequent vapor space purges that follow a cessation of forced ventilation overnight, C_{sf} shall be taken as 1.0

Partial liquid heel

Internal or domed external floating roof tank
S = 0.5

External floating roof tank
S = ($0.5\ C_{sf}$), where C_{sf} is evaluated as shown in Equation 3-21 with n_d set to 1 for the initial vapor space purge; for subsequent vapor space purges that follow a cessation of forced ventilation overnight, C_{sf} shall be taken as 1.0

If all free flowing liquid has been removed, and only sludge remains, use the saturation factor for a partial heel, in that there is still volatile material in the tank but not free liquid across the entire bottom.

If the heel condition is drain dry, use a saturation factor value of 0, in that evaporation of the clingage would have already been accounted for in the estimation of the floating roof landing losses.

7.1.3.4.2 Continued Forced Ventilation Emissions

The calculation of vapor space purge emissions account for the vapors that are expelled by the first air change of the vapor space upon commencing forced ventilation at the end of a standing idle period. There may still be volatile materials remaining in the tank, however, that will continue to evaporate and generate vapors, and these additional vapors are expelled by continued forced ventilation.

Continued forced ventilation emissions are calculated from the average vapor concentration in the vapor space (which may be reported as a percent of the lower explosive limit, or %LEL), the ventilation rate, and the length of time during which forced ventilation continues to operate. These parameters are often known since they may be monitored for safety reasons.

The vapor concentration may be approximated from the reading of an LEL monitor, which is generally displayed as a percent of the LEL for the gas to which the monitor has been calibrated. LEL values for selected calibration gases are given in Table 7.1-5. The vapor concentration may also be approximated from the reading of an organic or toxic vapor analyzer, which may be displayed in parts per million by volume as the calibration gas.

To determine the vapor concentration from a %LEL reading, the LEL of the calibration gas is multiplied by the reading from the LEL monitor, after each has been divided by 100 to convert from a percent to a decimal fraction. This gives a volume concentration (mole fraction) in terms of the calibration gas. This concentration is corrected by a response factor (RF) to account for the difference in the sensitivity of the LEL monitor to the actual vapors as compared to its sensitivity to the calibration gas. When the response factor is unknown, use a value of one (RF = 1.0).

If the vapor concentration is very low, it may be below the minimum detection level of the LEL monitor. In this case, it may be reasonable to use half the minimum detection level as the %LEL for determining the vapor concentration.

In order to estimate the mass of vapors that are expelled from the tank by continued forced ventilation, the vapor concentration in terms of volume must be converted to vapor density in terms of mass. In order to convert vapor concentration to density, use the molecular weight of the calibration gas for the LEL monitor. Uncertainty is reduced if the molecular weight of the calibration gas is similar to the molecular weight of the stock vapors.

The continued forced ventilation emissions (L_{CV}) estimated by the vapor concentration method are:

$$L_{CV} = 60\, Q_V\, n_{CV}\, t_V\, C_V \left(P_a\, M_{CG} / R\, T_V\right) \tag{4-10}$$

where:

60 is the conversion of hours to minutes, min/hr

Q_V = average ventilation rate during continued forced ventilation, ft^3/min [Note: The nominal rated capacity of eductors, fans, or blowers should be factored by the resistance associated with ductwork or other obstructions in order to estimate the actual air flow rate. Fan capacity may be governed by a required number of air changes per hour.]

n_{CV} = the duration of continued forced ventilation, days

t_V = the daily period of forced ventilation, hr/day [Note: Do not include the initial time for the vapor space purge. It would be reasonable to neglect the first half hour from each stage of continued forced ventilation],

CV = average vapor concentration by volume during continued forced ventilation, dimensionless

= (average LEL as displayed) (LEL of the calibration gas) RF

"average LEL as displayed" is the average of the % LEL readings during a given stage of continued forced ventilation, divided by 100 to convert to a decimal fraction; LEL readings from the first half hour may be neglected in the determination of an average value

"LEL of the calibration gas" is the LEL of the gas used to calibrate the LEL monitor, expressed as a decimal fraction

RF = response factor, dimensionless

= 1.0 if unknown. EPA Method 21 allows usage of a vapor monitoring instrument without correction for the response factor, as long as the response factor is less than 10 (40 CFR Part 60 Appendix A-7, Method 21, paragraph 8.1.1.2).

Alternatively, CV may be obtained from an organic vapor analyzer or toxic vapor analyzer that displays directly in terms of volume concentration, rather than displaying in terms of LEL.

P_a = atmospheric pressure at the tank location, psia

MCG = calibration gas molecular weight, lb/lb-mole

R = ideal gas constant

= 10.731 psia-ft^3/(lb-mole ^{o}R),

TV = average temperature of the vapor below the floating roof, ^{o}R

= the average ambient temperature, ^{o}R

The vapor concentration (CV) is limited by saturation of the vapor space. This limit may be expressed as:

$$CV \leq PVA/P_a \tag{4-11}$$

where:

PVA = the true vapor pressure of the exposed volatile material in the tank, psia

The estimate of continued forced ventilation emissions should be compared to an upper limit equal to the total weight of volatile sludge remaining in the tank. While there is free-standing stock liquid remaining in the tank, the sludge may conservatively be assumed to consist entirely of stock liquid in establishing the emissions upper limit. This limit is expressed as follows:

$$LCV \leq 5.9D^2\, h_{le}\, W_l \tag{4-12}$$

where:

D = the tank diameter, feet

h_{le} = the effective height of the stock liquid and sludge for the given stage of continued forced ventilation, ft (see Table 7.1-4)

W_l = the density of the stock liquid, pounds per gallon

the constant, 5.9, has units of gal/ft^3 (the product of the constant term π/4 and the conversion factor 7.48 gal/ft^3).

$$L_{CV} \leq (\pi/4)(D\ \text{ft})^2\ F_e\ (d_s\ \text{in.})(W_l\ \text{lb/gal})(\text{ft}/12\ \text{in.})(7.48\ \text{gal/ft}^3)$$

$$L_{CV} \leq 0.49\ F_e\ D^2\ d_s\ W_l$$

Once the free-standing stock liquid has been vacuumed out (or drained out, in the case of a drain-dry tank), however, much of the remaining sludge consists of relatively non-volatile residue. The upper limit on emissions from the vacuumed-out condition may assume that 20% of the sludge is volatile. This limit is expressed as follows: (4-13)

where:

F_e = the fraction of the sludge with potential to evaporate (= 0.20 if unknown)

d_s = the average depth of sludge, inches

the constant, 0.49, has units of gal/(in. ft^2), and the other terms are defined as shown above.

7.1.3.5 Flashing Loss[25]

The equations in Section 7.1.3.1 for estimating routine emissions from fixed roof tanks do not address the scenario of a tank storing a liquid which contains gases that have the potential to flash out of solution. This scenario occurs when a gas-liquid mixture has been under sufficient pressure to maintain the entrained gases in solution, but the mixture is then subjected to a drop in system pressure such that the pressure is no longer sufficient to maintain the gases in solution. The gases will then rapidly migrate out of the liquid, similar to carbon dioxide fizzing out of solution when a carbonated beverage container is opened. This escape of gases from the mixture is referred to as flashing.

The most common scenario for flashing in the petroleum industry is the storage of crude oil or condensate in the production field. Even though the produced well stream has typically been processed by one or more separators prior to produced liquids being deposited into a storage tank, the exit pressure from the last stage separator may be significantly greater than the pressure in the first storage tank. Thus the produced liquid stream will experience a pressure drop upon entering the storage tank, and remaining gases will have the potential to flash out of solution in the tank. This scenario, then, has the potential for flashing losses in addition to routine standing and working losses.

There are numerous methodologies available for estimating flashing losses and specific guidance regarding their application and use. However, discussion of such methodologies is beyond the scope of this section. The accuracy of methods that rely on a site-specific sample is dependent on how representative the sample is of production from that site, and the accuracy of methods that rely on process simulation is dependent on how representative the modeling assumptions are of the actual conditions at the site. The conditions to be determined by sampling or modeling are of the crude oil or condensate properties at the last stage separator, in the oil compartment before the dump valve.

In addition to evaluating a tank with the potential for flashing losses , the tank must also be evaluated for routine standing and working losses as described in Section 7.1.3.1. If vapors are routed to a control device, the control efficiency of the device should be applied to the flashing loss as well as to the standing and working losses. If vapors are routed to a compressor for injection into a gas line or process, the control efficiency would be assumed to be 100% whenever the compressor is on-line.

7.1.3.6 Variable Vapor Space Tanks[18]

Variable vapor space filling losses result when vapor is displaced by liquid during filling operations. Since the variable vapor space tank has an expandable vapor storage capacity, this loss is not as large as the filling loss associated with fixed roof tanks. Loss of vapor occurs when the tank's vapor storage capacity is exceeded. Equation 6-1 assumes that one-fourth of the expansion capacity is available at the beginning of each transfer.

Variable vapor space system filling losses can be estimated from:

$$L_V = (2.40 \times 10^{-2}) \left(\frac{M_V \; P_{VA}}{V_1} \right) \left[(V_1) - (0.25 \; V_2 \, N_2) \right] \qquad \textbf{(6-1)}$$

where:

L_V = variable vapor space filling loss, lb/1,000 gal throughput

M_V = molecular weight of vapor in storage tank, lb/lb-mole; see Note 1 to Equation 1-22

P_{VA} = true vapor pressure at the average daily liquid surface temperature, psia; see Notes 1 and 2 to Equation 1-22

V_1 = volume of liquid pumped into system, throughput, bbl/yr

V_2 = volume expansion capacity of system, bbl; see Note 1

N_2 = number of transfers into system, dimensionless; see Note 2

Notes:

1. V_2 is the volume expansion capacity of the variable vapor space achieved by roof lifting or diaphragm flexing.

2. N_2 is the number of transfers into the system during the time period that corresponds to a throughput of V_1.

The accuracy of Equation 6-1 is not documented. Special tank operating conditions may result in actual losses significantly different from the estimates provided by Equation 6-1. For example, if one or more tanks with interconnected vapor spaces are filled while others are emptied simultaneously, all or part of the expelled vapors will be transferred to the tank, or tanks, being emptied. This is called balanced pumping or vapor balancing. Equation 6-1 does not account for balanced pumping and will overestimate losses under this condition. It should also be noted that, although not developed for use with heavier petroleum liquids such as kerosenes and fuel oils, the equation is recommended for use with heavier petroleum liquids in the absence of better data.

Variable vapor space tanks that rely on either a flexible diaphragm or a flexible coated fabric seal will have additional losses to the extent that vapors leak through or past the membrane used for the diaphragm or seal. The leakage rate through the membrane is a function of the permeability of the fabric material from which the membrane is manufactured, and a leakage rate past the membrane is a function of the leak tightness of the seam or seams where the membrane is attached to the tank wall. These leakage rates depend upon the type of fabric used for the membrane and the manner in which the membrane is attached to the tank wall.

7.1.3.7 Pressure Tanks

Losses occur during routine operations in low-pressure (2.5 to 15 psig) tanks to the extent that atmospheric venting occurs. These losses are a function of the vent set pressure and are accounted for in the equations for routine fixed roof tank standing and working losses in Section 7.1.3.1. High-pressure tanks are considered closed systems, with virtually no emissions. Fugitive losses from high-pressure tanks are estimated as equipment leaks and are not addressed in the methodology for estimating storage tank emissions.

A blanket of nitrogen gas is sometimes maintained in a storage tank for either safety or product purity purposes, but the presence of the nitrogen gas does not reduce emissions. This is because hydrocarbons readily evaporate into a nitrogen atmosphere, as evidenced by the fact that ambient air is approximately 79% nitrogen. However, a nitrogen blanket is sometimes maintained in a closed or pressurized system. In such a case, while evaporation rates would not be affected by the presence of the nitrogen blanket, emissions may be reduced as result of the vapor space in the tank being tied to a closed or pressurized system.

7.1.3.8 Variations Of Emission Estimation Procedures

7.1.3.8.1 Time Periods Shorter Than One Year[26]

All of the emission estimation procedures presented in Section 7.1.3 can be used to estimate emissions for shorter time periods by manipulating the inputs to the equations for the time period in question, with an associated increase in uncertainty when applying the equations to fewer tanks or shorter time periods. Using actual data, such as the measured liquid temperature and true vapor pressure of the stored liquid, can reduce the uncertainty in the emissions estimate.

For all of the emission estimation procedures, the true vapor pressure should be calculated from an average daily liquid surface temperature based on the appropriate temperature and insolation data for the time period over which the estimate is to be evaluated. For example, emission calculations for the month of June would be based only on the meteorological data for June. It is important to note that a 1-month time frame is recommended as the shortest time period for which emissions should be estimated using these methodologies.

In addition to the temperature and vapor pressure corrections, the constant in the standing loss equation for fixed roof tanks would need to be revised based on the actual time frame used. The constant, 365, is based on the number of days in a year. To change the equation for a different time period, the constant should be changed to the appropriate number of days in the time period for which emissions are being estimated.

The turnover factor in the working loss equation for fixed roof tanks would need to be extrapolated to an annual rate when estimating emissions for a time period other than one year. This would be a matter of dividing the number of turnovers during the given time period by the number of days in the time period and then multiplying by 365. Also, the throughput would need to be changed from the throughput per year to the throughput during the time period for which emissions are estimated.

Other than changing the meteorological data and the vapor pressure data, the only changes needed for the floating roof rim seal, deck fitting, and deck seam losses would be to modify the time frame by dividing the individual losses by the appropriate number of days or months. The only change to the withdrawal losses would be to change the throughput to the throughput for the time period for which emissions are being estimated.

The issues that render the equations for routine emissions inappropriate for time periods shorter than one month include, but are not limited to, the following:

a) Temperature calculations are simplified. There are many parameters involved in a thermal balance model for a storage tank, some of which are listed below. It has been deemed suitable to assign default values to several of these parameters when the calculations are applied to a large population of storage tanks located over a wide geographical area for emissions that occur over the course of a year. However, actual values for these parameters for an individual storage tank configuration or location, or for a particular day of the year, may deviate significantly from the default values. Section 7.1.3.8.3 presents a more detailed discussion of parameters affecting thermal balance in a storage tank.

    1. The angle of incident solar radiation (i.e., the solar declination).

2. Reflectivity of surrounding surfaces.
3. Height to diameter ratio of the tank.
4. Liquid level.
5. Ambient wind speed.
6. Thermal conductance of the floating roof.
7. Presence of a fixed roof (versus an open top).

b) Changes in the liquid bulk temperature. The parameters which are accounted for as variables in the equations for routine emissions are evaluated in a manner that does not account for short-term phenomena. For example, calculations of temperature variables in the equations for routine emissions are based on the liquid and vapor phases within the tank having achieved a state of thermal equilibrium. The calculations do not, however, account for how long it may take for thermal equilibrium to be achieved after there has been a change in the thermal balance, such as the receipt of a batch of liquid. It is demonstrated in the reference cited in Section 7.1.3.8.3 that a typical time period for approaching thermal equilibrium may be approximately nine days, and thus a tank that has received liquid within the prior nine days would be expected to not be in thermal equilibrium. If measured bulk temperature is used instead of the estimated bulk temperature when estimating emissions, the time for the liquid to reach thermal equilibrium becomes unimportant when estimating emissions on a shorter time-scale.

c) Changes in ambient temperature. As ambient temperature changes, there would be an associated change in the vapor space temperature and subsequently in the liquid surface temperature. There would, however, be a time lag between a change in the ambient temperature and the associated change in the liquid surface temperature. This time lag is deemed inconsequential for the estimation of annual or monthly emissions but would be expected to be more significant for shorter periods of time. Shorter time periods would also be more significantly influenced by abrupt short-term meteorological phenomena, such as cooling due to cloud cover or precipitation.

d) Saturation factors. The saturation level of vapors in the headspace of a fixed roof tank is a similarly time-dependent phenomenon. The equations for routine emissions do not fully account for the time lag required to achieve saturation equilibrium in response to short-term fluctuations in the values of applicable parameters.

e) Vapor expansion rate. The calculation of standing loss for a fixed roof tank is based on the total amount of vapor expansion that is expected to occur between the coolest night time temperature and the warmest day time temperature. The equation does not, however, calculate the hourly rate at which the vapor expansion takes place or the distribution of vapor expansion over the course of a day. This hourly rate would be dependent on several of the variables noted in (a) above, as well as on whether the tank shell is insulated. As discussed above in Note 1 following Equation 1-5, a fixed roof tank with an insulated shell but an uninsulated roof would be expected to have sufficient capacity for heat exchange through the roof such that vapor space expansion would occur. However, the insulated shell may cause the vapor space expansion to have a different hourly pattern than would be expected in the case of an uninsulated tank shell.

f) Vent flow capacity. In addition to not calculating the hourly rate of vapor expansion, as noted above, the calculation of standing loss for a fixed roof tank does not take into account whether the flow capacity of the tank vents will further limit the hourly rate at which vapors will be expelled from the tank as a result of daytime vapor expansion.

g) Changes in barometric pressure. The equations for routine emissions consider the barometric pressure to be a constant for a given location, in that it has been deemed reasonable to use the average barometric pressure when estimating emissions over the course of a year. However, short-term changes in barometric pressure could impact short-term vapor expansion rates.

h) Fill rate. The calculation of working loss for a fixed roof tank is based on the total volume of vapor expelled over the course of a year, which can be thought of as the total number of tankfuls of vapor displaced. However, the equation does not account for the hourly rate at which a tank is filled.

i) Standing loss for floating roof tanks. The equations for calculating routine standing losses from floating roof tanks are based on the rate at which vapors migrate from the liquid below the floating roof to the tank headspace above the floating roof, and do not account for the rate at which these vapors may be eventually expelled from the tank.

j) Working loss for floating roof tanks. The calculation of working loss for a floating roof tank is based on the evaporation of the wetted surface that is left on the inside wall of the tank after lowering the liquid level. The calculation assumes that the entire film of liquid evaporates, but it does not account for the hourly rate at which the film of liquid evaporates or when the vapors are actually expelled from the tank.

k) Vapor space outage. The calculation of standing loss for a fixed roof tank is based on an assumed vapor space outage corresponding to the average liquid height. However, at any given point in time the tank may be nearly empty or nearly full, thus resulting in very different scenarios of vapor space outage. For example, if the vapor space expansion factor is 0.15, that indicates 15% of the vapor space will be expelled by daytime warming and expelling 15% of the vapor space when the tank is nearly empty would constitute a far greater volume than 15% of the vapor space when the tank is nearly full.

l) Vented vapor saturation factor. The saturation factor used in the calculation of standing loss for a fixed roof tank is similarly dependent on the vapor space outage. Annual emission estimates are based on the average liquid height, but the calculation would indicate a lower vapor saturation when the tank is nearly empty and a higher vapor saturation when the tank is nearly full.

7.1.3.8.2 Internal Floating Roof Tanks with Closed Vent Systems[27]

The equations for routine emissions from internal floating roof tanks assume the tank has open vents in the fixed roof. Estimation of emissions when an internal floating roof tank has closed pressure/vacuum vents is presented in API Technical Report 2569.

The adjustment to account for the closed pressure/vacuum vents in the estimate of emissions was found to be significant only for small diameter tanks storing relatively high volatility liquids with infrequent turnovers. When the volatility of the stored liquid is no greater than that of diesel, then the adjustment is generally less than 10% regardless of the tank diameter or the number of turnovers. When the tank diameter is 60 feet or greater and the number of turnovers per year is greater than 18, then the adjustment is generally less than 10% regardless of the volatility of the stored liquid. Given the high degree of uncertainty associated with these calculations, and the burden of performing them, it would be reasonable to apply a default reduction of 5% on the total estimated emissions to account for the use of closed vents on a floating roof tank in lieu of calculating a reduction specific to the given situation.

7.1.3.8.3 Case-Specific Liquid Surface Temperature Determinations[22]

Several parameters pertaining to liquid surface temperature are assigned default values for incorporation into the equations for routine emissions. Methodology to account for selected parameters as variables in the estimation of emissions from a particular storage tank at a particular location is presented in API Manual of Petroleum Measurement Standards Chapter 19.4, Annex I.

7.1.3.8.4 Heating Cycles in Fully Insulated Fixed Roof Tanks[8]

The equations in Section 7.1.3.1.1 for standing loss from fixed roof tanks are based on the daily cycle of warming and cooling of the vapor space due to heat exchange between the vapor space and ambient air through the shell and roof of the tank. This heat exchange results in daytime expansion and nighttime contraction of vapors in the vapor space, with each expansion cycle causing some portion of the vapors to be expelled from the vapor space. The resulting emissions are referred to as breathing losses.

A similar cycle of expansion and contraction of vapors in the vapor space may be driven by cyclic heating of the bulk liquid. Even in a fully insulated storage tank, in which there is minimal heat exchange with ambient air, the temperature in the tank vapor space will cycle through a range if the bulk liquid is heated periodically. This could occur by occasionally receiving hot stock, which then cools over time prior to the next receipt of hot stock, or as a result of the tank being heated by some means that is periodically turned on and off.

For uninsulated tanks or for tanks with an insulated shell but an uninsulated roof, the effect of bulk liquid heating cycles on standing loss may be neglected because it may be random as to whether cycles of heating the bulk liquid add to or subtract from the vapor space temperature variation driven by the diurnal ambient temperature cycle.

For fully insulated storage tanks, however, standing loss may be driven by cyclic heating of the bulk liquid. The equations for routine fixed roof tank breathing loss may be adapted to the case of cyclic heating of the bulk liquid, as shown below.

The annual breathing loss is calculated from Equation 1-4:

$$L_S = 365 K_E \left(\frac{\pi}{4} D^2 \right) H_{VO} K_S W_V \tag{1-4}$$

The variables in this equation should be evaluated for calculating heating cycle breathing losses in the same manner as described in Section 7.1.3.1.1 for routine breathing losses, except as noted below.

The constant 365 is the number of days in a year. In that heating cycle breathing is an event that is a function of the frequency of the heating cycle, rather than being a daily phenomenon, replace the constant 365 with the number of heating cycles in the given time period.

The vapor space expansion factor K_E is calculated from Equation 1-5:

$$K_E = \frac{\Delta T_V}{T_{LA}} + \frac{\Delta P_V - \Delta P_B}{P_A - P_{VA}} > 0 \qquad \textbf{(1-5)}$$

In a fully insulated tank, the vapor space temperature and the liquid surface temperature are both assumed to be equal to the liquid bulk temperature. Thus the vapor temperature range ΔT_V should be calculated from the actual range of liquid bulk temperature in the tank, rather than using Equation 1-6 or Equation 1-7. The actual range of liquid bulk temperature may be determined from direct measurements or estimated from process knowledge.

$$\Delta T_V = T_{BX} - T_{BN} \qquad (8\text{-}1)$$

where:

T_{BX} = typical maximum liquid bulk temperature in the heating cycle, °R

T_{BN} = typical minimum liquid bulk temperature in the heating cycle, °R

The vapor pressure range ΔP_V is calculated from Equation 1-9.

$$\Delta P_V = P_{VX} - P_{VN} \qquad (1\text{-}9)$$

where:

P_{VX} and P_{VN} are the vapor pressures at T_{LX} and T_{LN}, respectively, and:

T_{LX} = T_{BX}

T_{LN} = T_{BN}

Similarly, the average liquid surface temperature T_{LA} should be taken as being equal to actual average liquid bulk temperature, rather than being calculated from Equation 1-27 or Equation 1-28.

$$T_{LA} = T_B \qquad (8\text{-}2)$$

7.1.4 Speciation Methodology[22]

In some cases it may be important to know the annual emission rate for a component (e. g., HAP) of a stored liquid mixture. There are two basic approaches that can be used to estimate emissions for a single component of a stored liquid mixture. One approach involves calculating the total losses based upon the known physical properties of the mixture (i. e., gasoline) in the vapor phase and then determining the individual component losses by multiplying the total loss by the vapor weight fraction of the desired component. However, the weight fraction of a given component in the vapor phase will vary with temperature, and thus this approach is valid only at the temperature for which the vapor weight fraction was determined.

The second approach is similar to the first approach except that the mixture properties in the vapor phase are unknown; therefore, the vapor phase mixture properties are first determined based on the composition of the liquid mixture. This involves application of Raoult's Law, which assumes ideal behavior on the part of each of the components in the mixture. An assumption of ideal behavior has been found to be reasonable for most hydrocarbon mixtures. The two approaches outlined above are illustrated in Case 1 below.

An assumption of ideal behavior may not be appropriate for aqueous mixtures or mixtures containing alcohols. The molecules of water and alcohols are polar, meaning that the individual molecules of these substances have an attraction for one another, resulting in behavior that deviates significantly from ideal assumptions. An illustration of speciation for a dilute aqueous mixture is presented in Case 2 below. Tanks containing aqueous mixtures in which phase separation has occurred, resulting in a free layer of oil or other volatile materials floating on top of the water, should have emissions estimated on the basis of the properties of the free top layer.

Raoult's Law is also not applied to speciate working (withdrawal) loss from floating roof tanks. The application of Raoult's Law outlined in this section assumes the fraction of the available liquid that evaporates is very small compared to the total mass of liquid available, and thus the properties of the remaining liquid can be assumed to be unaffected by the loss of the evaporated fraction. Floating roof withdrawal loss, however, involves evaporation of a thin film of liquid from the wetted tank shell as the liquid level descends. It is typically assumed that the entire film of liquid evaporates, and thus relative fractions of individual components in the vapors would be the same as for the liquid. It would be appropriate, however, to adjust this assumption to recognize that substances which are non-subliming solids at the storage temperature (such as most polycyclic aromatic hydrocarbons at ambient temperatures) are not going to evaporate.

<u>Case 1</u> – If the physical properties of the mixture are known (P_{VA}, M_V, M_L and W_L), the total losses from the tank should be estimated using the procedures described previously for the particular tank type. The component losses are then determined from either Equation 40-1 or 40-2. For fixed roof tanks, the emission rate for each individual component can be estimated by:

$$L_{T_i} = (Z_{V_i})(L_T) \qquad \textbf{(40-1)}$$

where:

L_{T_i} = emission rate of component i, lb/yr

Z_{V_i} = weight fraction of component i in the vapor, lb/lb

L_T = total losses, lb/yr

For floating roof tanks, the emission rate for each individual component can be estimated by:

$$L_{T_i} = (Z_{V_i})(L_R + L_F + L_D) + (Z_{L_i})(L_W) \tag{40-2}$$

where:

L_{T_i} = emission rate of component i, lb/yr

Z_{V_i} = weight fraction of component i in the vapor, lb/lb

L_R = rim seal losses, lb/yr

L_F = deck fitting losses, lb/yr

L_D = deck seam losses, lb/yr

Z_{L_i} = weight fraction of component i in the liquid, lb/lb

L_W = working (withdrawal) losses, lb/yr

If Equation 40-1 is used in place of Equation 40-2 for floating roof tanks, the value obtained will be approximately the same value as that achieved with Equation 40-2 because withdrawal losses are typically minimal for floating roof tanks.

In order to use Equations 40-1 and 40-2, the weight fraction of the desired component in the liquid and vapor phase is needed. The liquid weight fraction of the desired component is typically known or can be readily calculated or determined by analysis for most mixtures. In order to calculate the weight fraction in the vapor phase, Raoult's Law must first be used to determine the partial pressure of the component. The partial pressure of the component can then be divided by the total vapor pressure of the mixture to determine the mole fraction of the component in the vapor phase. Raoult's Law states that the mole fraction of the component in the liquid (x_i) multiplied by the vapor pressure of the pure component (at the average daily liquid surface temperature) (P) is equal to the partial pressure (P_i) of that component:

$$P_i = (P)(x_i) \tag{40-3}$$

where:

P_i = partial pressure of component i, psia

P = vapor pressure of pure component i at the average daily liquid surface temperature, psia

x_i = liquid mole fraction, lb-mole/lb-mole

The vapor pressure of each component can be calculated from Antoine's equation or found in standard references, as shown in Section 7.1.3.1. In order to use Equation 40-3, the liquid mole fraction must be determined from the liquid weight fraction by:

$$x_i = \left(\frac{Z_{Li} M_L}{M_i} \right) \tag{40-4}$$

where:

x_i = liquid mole fraction of component i, lb-mole/lb-mole

Z_{L_i} = weight fraction of component i in the liquid, lb/lb
M_L = molecular weight of liquid stock, lb/lb-mole
M_i = molecular weight of component i, lb/lb-mole

The liquid mole fraction and the vapor pressure of the component at the average daily liquid surface temperature can then be substituted into Equation 40-3 to obtain the partial pressure of the component. The vapor mole fraction of the component can be determined from the following equation:

$$y_i = \frac{P_i}{P_{VA}} \qquad \textbf{(40-5)}$$

where:

y_i = vapor mole fraction of component i, lb-mole/lb-mole
P_i = partial pressure of component i, psia
P_{VA} = total vapor pressure of liquid mixture, psia

The weight fractions in the vapor phase are calculated from the mole fractions in the vapor phase.

$$Z_{V_i} = \frac{y_i M_i}{M_V} \qquad \textbf{(40-6)}$$

where:

Z_{V_i} = vapor weight fraction of component i, lb/lb
y_i = vapor mole fraction of component i, lb-mole/lb-mole
M_i = molecular weight of component i, lb/lb-mole
M_V = molecular weight of vapor stock, lb/lb-mole

The liquid and vapor weight fractions of each desired component and the total losses can be substituted into either Equations 40-1 or 40-2 to estimate the individual component losses.

Case 2 –For special cases, such as wastewater, where the liquid mixture is a dilute aqueous solution, Henry's Law should be used instead of Raoult's Law in calculating total losses. Henry's Law states that the mole fraction of the component in the liquid phase multiplied by the Henry's Law constant for the component in the mixture is equal to the partial pressure (P_i) for that component. For wastewater, Henry's Law constants are typically provided in the form of atm•m^3/g-mole.

Therefore, the appropriate form of Henry's Law equation is:

$$P_i = (H_A)\,(C_i) \qquad (40\text{-}7)$$

where:

P_i = partial pressure of component i, atm
H_A = Henry's Law constant for component i, atm•m^3/g-mole
C_i = concentration of component i in the wastewater, g-mole/m^3; see Note

Section 4.3 of AP-42 presents Henry's Law constants for selected organic liquids in water at 25 °C. The partial pressure calculated from Equation 40-7 will need to be converted from atmospheres to psia (1 atm = 14.7 psia).

Note: Typically wastewater concentrations are given in mg/liter, which is equivalent to g/m^3. To convert the concentrations to g-mole/m^3 divide the concentration by the molecular weight of the component.

The total vapor pressure of the mixture can be calculated from the sum of the partial pressures:

$$P_{VA} = \Sigma P_i \tag{40-8}$$

where:

P_{VA} = vapor pressure at average daily liquid surface temperature, psia

P_i = partial pressure of component i, psia

This procedure can be used to determine the vapor pressure at any temperature. After computing the total vapor pressure, the mole fractions in the vapor phase are calculated using Equation 40-5. The vapor mole fractions are used to calculate the molecular weight of the vapor, M_V. The molecular weight of the vapor can be calculated by:

$$M_V = \Sigma M_i y_i \tag{40-9}$$

where:

M_V = molecular weight of the vapor, lb/lb-mole

M_i = molecular weight of component i, lb/lb-mole

y_i = vapor mole fraction of component i, lb-mole/lb-mole

Another variable that may need to be calculated before estimating the total losses, if it is not available in a standard reference, is the density of the liquid, W_L. If the density of the liquid is unknown, it can be estimated based on the liquid weight fractions of each component (see Section 7.1.5, Example 3).

All of the mixture properties are now known (P_{VA}, M_V, and W_L). These values can now be used with the emission estimation procedures outlined in Section 7.1.3 to estimate total losses. After calculating the total losses, the component losses can be calculated by using either Equations 40-1 or 40-2. Prior to calculating component losses, Equation 40-6 must be used to determine the vapor weight fractions of each component.

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Table 7.1-1. LIST OF ABBREVIATIONS USED IN THE TANK EQUATIONS

Variable	Description
α	tank surface solar absorptance, dimensionless
π	constant, (3.14159)
A	constant in vapor pressure equation, dimensionless
A_{deck}	area of deck, ft^2
A_{fi}	liquid surface area within a particular type of deck fitting, in^2
B	constant in vapor pressure equation, °R or °C
C	constant in vapor pressure equation, °R or °C
C_S	shell clingage factor, bbl/1,000 ft^2
C_{sf}	filling saturation correction factor for wind, dimensionless
C_V	average vapor concentration by volume during continued forced ventilation, dimensionless
D	tank diameter, ft
D_E	effective tank diameter, ft
d_s	average depth of sludge, in.
F_C	effective column diameter, ft
F_E	fraction of sludge with potential to evaporate, dimensionless
F_F	total deck fitting loss factor, lb-mole/yr
h_d	deck leg height at the tank shell, ftH_L liquid height, ft
h_{le}	effective liquid height during roof landing, ft
H_{LN}	minimum liquid height, ft
H_{LX}	maximum liquid height, ft
ΣH_{QD}	the annual sum of the decreases in liquid level, ft/yr
ΣH_{QI}	the annual sum of the increases in liquid level, ft/yr
H_R	tank roof height, ft
H_{RO}	roof outage, ft
H_S	tank shell height, ft
h_v	vapor space height under landed floating roof, ft
H_{VO}	vapor space outage, ft
i	1,2,.....n, dimensionless
I	average daily total insolation factor, Btu/ft^2•d
K_C	product factor for floating roof tanks, dimensionless
K_D	deck seam loss per unit seam length factor, lb-mole/ft-yr
K_E	vapor space expansion factor, per day
K_{Fai}	zero wind speed loss factor for a particular type of deck fitting, lb-mole/yr
K_{Fbi}	wind speed dependent loss factor for a particular type of deck fitting, lb-mole/$(mph)^m$yr
K_{F_i}	loss factor for a particular type of deck fitting, lb-mole/yr
K_N	turnover factor, dimensionless
K_P	working loss product factor for fixed roof tanks, dimensionless
K_{Ra}	zero wind speed rim seal loss factor, lb-mole/ft•yr
K_{Rb}	wind speed dependent rim seal loss factor, lb-mole/$(mph)^n$ft•yr
K_S	vented vapor saturation factor, dimensionless
K_v	fitting wind speed correction factor, dimensionless
L	length of tank, ft
L_C	clingage factor for drain dry tanks, lb
L_{CV}	continued forced ventilation emissions, lb/cleaning event
L_D	deck seam loss, lb/yr
L_F	deck fitting loss, lb/yr
L_{FV}	total tank cleaning emissions due to forced ventilation, lb/cleaning event
L_{FL}	filling loss during roof landing, lb/landing event
L_P	vapor space purge emissions due to first air change from forced ventilation, lb/cleaning event
L_R	rim seal loss, lb/yr
L_{RL}	rim seal loss during roof landing, lb/landing event
L_S	standing losses, lb/yr
L_{seam}	total length of deck seam, ft
L_{SL}	standing loss during roof landing, lb/landing event
L_T	total routine losses, lb/yr
L_{T_i}	emission rate of component i, lb/yr
L_{TL}	total loss during roof landing, lb/landing event
L_V	variable vapor space filling loss, lb/1,000 gal throughput
L_W	working losses, lb/yr
M_{CG}	molecular weight of calibration gas, lb/lb-mole
m_i	loss factor for a particular type of deck fitting, dimensionless
M_i	molecular weight of component i, lb/lb-mole
M_L	molecular weight of liquid mixture, lb/lb-mole
M_V	vapor molecular weight, lb/lb-mole
N	number of turnovers per year, dimensionless
n	seal-related wind speed exponent, dimensionless
n_d	number of days standing idle during roof landing or prior to forced ventilation, days
N_2	number of transfers into system, dimensionless
N_C	number of columns, dimensionless
n_{CV}	duration of continued forced ventilation, days
N_d	number of drains
n_f	total number of different types of fittings, dimensionless

Table 7.1-1 (cont.).

Variable	Description		Variable	Description
N_{Fa_i}	zero wind speed loss factor for a particular type of deck fitting, lb-mole/yr		T_B	liquid bulk temperature, °R
N_{Fb_i}	wind speed dependent loss factor for a particular type of fitting, lb-mole/ mph^m•yr		T_{BN}	typical minimum liquid bulk temperature in heating cycles, °R
N_{F_i}	number of deck fittings of a particular type, dimensionless		T_{BX}	typical maximum liquid bulk temperature in heating cycles, °R
N_l	number of deck legs		T_{LA}	average daily liquid surface temperature, °R
N_{TOTAL}	total number of moles in mixture, lb-mole		T_V	average vapor temperature, °R
N_{vb}	number of vacuum breakers		t_v	daily period of forced ventilation during tank cleaning, hr/day
P	true vapor pressure of component i, psia		ΔT_V	average daily vapor temperature range, °R
P^*	vapor pressure function, dimensionless		v	average wind speed, mph
P_A	atmospheric pressure, psi		V_1	volume of liquid pumped into system, bbl/yr
ΔP_B	breather vent pressure setting range, psig		V_2	volume expansion capacity, bbl
P_{BP}	breather vent pressure setting, psig		V_Q	net working loss throughput, ft^3/yr
P_{BV}	breather vent vacuum setting, psig		V_{LX}	tank maximum liquid volume, ft^3
P_I	gauge pressure within the vapor space, psig		V_V	vapor space volume, ft^3
P_i	partial pressure of component i, psia		W_i	liquid density of component i, lb/ft^3
ΔP_V	average daily vapor pressure range, psi		W_L	average organic liquid density, lb/gal
P_{VA}	vapor pressure at average daily liquid surface temperature, psia		W_V	vapor density, lb/ft^3
P_{VN}	vapor pressure at the average daily minimum liquid surface temperature, psia		x_i	liquid mole fraction of component i, lb-mole/lb-mole
P_{VX}	vapor pressure at the average daily maximum liquid surface temperature, psia		y_i	vapor mole fraction of component i, lb-mole/lb-mole
Q	annual net throughput, bbl/yr		Z_{L_i}	liquid weight fraction of component i, lb/lb
Q_V	average ventilation rate during tank cleaning, ft^3/min		Z_{V_i}	vapor weight fraction of component i, lb/lb
R	ideal gas constant, (10.731 psia•ft^3/lb-mole•°R)			
R_R	tank dome roof radius, ft			
R_S	tank shell radius, ft			
S	filling saturation factor, dimensionless			
s	tank cone bottom slope, ft/ft			
S_D	deck seam length factor, ft/ft^2			
S_R	tank cone roof slope, ft/ft			
ΔT_A	average daily ambient temperature range, °R			
T_{AA}	average daily ambient temperature, °R			
T_{AN}	average daily minimum ambient temperature, °R			
T_{AX}	average daily maximum ambient temperature, °R			

Table 7.1-2. PROPERTIES (M_V, M_L, P_{VA}, W_L) OF SELECTED PETROLEUM LIQUIDS[a, e]

Petroleum Liquid Mixture	Vapor Molecular Weight[a]	Liquid Molecular Weight[b]	Liquid Density [a]	ASTM D86 Distillation Slope[c]	Vapor Pressure Equation Constant[d]	Vapor Pressure Equation Constant[d]	True Vapor Pressure (at 60 °F)
	M_V	M_L	W_L	S	A	B	P_{VA}
	lb/lb-mole	lb/lb-mole	lb/gal	ºF/vol %	dimensionless	ºR	psia
Midcontinent Crude Oil	50	207	7.1	–	Figure 7.1-16	Figure 7.1-16	–
Refined Petroleum Stocks	–	–	–	–	Figure 7.1-15	Figure 7.1-15	–
Motor Gasoline RVP 13	62	92	5.6	3.0	11.644	5043.6	7.0
Motor Gasoline RVP 10	66 [e]	92	5.6	3.0	11.724	5237.3	5.2
Motor Gasoline RVP 7	68	92	5.6	3.0	11.833	5500.6	3.5
Light Naphtha RVP 9-14	–	–	–	3.5	–	–	–
Naphtha RVP 2-8	–	–	–	2.5	–	–	–
Aviation Gasoline	–	–	–	2.0	–	–	–
Jet Naphtha (JP-4)	80	120	6.4	–	11.368	5784.3	1.3
Jet Kerosene (Jet A)	130	162	7.0	–	12.390	8933.0	0.008
No. 2 Fuel Oil (Diesel)	130	188	7.1	–	12.101	8907.0	0.006
No. 6 Fuel Oil [f]	130	387	7.9	–	10.781	8933.0	0.002
Vacuum Residual Oil[g]	190	387	7.9	–	10.104	10,475.5	0.00004

[a] References 10 and 11

[b] Liquid molecular weights from “Memorandum from Patrick B. Murphy, Radian/RTP to James F. Durham, EPA/CPB Concerning Petroleum Refinery Liquid HAP and Properties Data, August 10, 1993,” as adopted in versions 3.1 and 4.0 of EPA’s TANKS software.

[c] Reference 4.

[d] For motor gasolines, see Figure 7.1-15;

for crude oil, see Figure 7.1-16;

for Jet Naphtha, Jet Kerosene, and No. 2 Fuel Oil, see Barnett and Hibbard[10];

for No. 6 Fuel Oil.[22]

[e] Alternatively, in the absence of measured data, a value of 66 lb/lb-mole may be assumed for all gasolines, in that the variability shown as a function of RVP is speculative.

[f] This is for a blend of Vacuum Residual Oil with a light distillate cutter stock, or similar mixture. Vapor pressure constants given will result in higher vapor pressure values than shown previously in AP-42 for Residual Oil No. 6.

[g] This is the straight residue from the bottom of the vacuum distillation column, prior to any further processing or blending. Properties given for Vacuum Residual Oil are those given for Residual Oil No. 6 previously in AP-42.

Table 7.1-3. PHYSICAL PROPERTIES OF SELECTED PETROCHEMICALS[a]

Chemical Name	CAS Registry No.	Molecular Weight	Liquid Density[d] (lb/gal)	True Vapor Pressure at 60 °F (psia)	Antoine's Equation[b]					Normal Boiling Point (°F)
					Constants			Temperature Range[c]		
					A dimensionless	*B* (°C)	*C* (°C)	Minimum (°F)	Maximum (°F)	
Acetaldehyde	00075-07-0	44.05	6.54[64]	12.19	8.063	1,637.1	295.47	32	94	69
Acetic acid	00064-19-7	60.05	8.72[77]	0.176	7.557	1,642.5	233.39	63	244	244
Acetic anhydride {acetic acid anhydride}	00108-24-7	102.09	9.03	0.053	7.122	1,427.8	198.04	145	283	282
Acetone	00067-64-1	58.08	6.55[77]	2.921	7.300	1,312.3	240.71	7	454	133
Acetonitrile	00075-05-8	41.05	6.56	1.090	7.154	1,355.4	235.30	59	192	179
Acrylamide	00079-06-1	71.08	9.36	8.57E-05	11.293	3,939.9	273.16			379
Acrylic acid {2-propenoic acid}	00079-10-7	72.06	8.77	1.344	5.652	648.6	154.68	68	158	282
Acrylonitrile {2-propenenitrile}	00107-13-1	53.06	6.73	1.383	6.942	1,255.9	231.30	–60	172	172
Allyl alcohol	00107-18-6	58.08	7.13	0.326	11.658	4,510.2	416.80	70	207	206
Allyl chloride {3-chloro-1-propene}	00107-05-1	76.52	7.83	4.702	5.297	418.4	128.68	55	111	113
Aniline	00062-53-3	93.13	8.53	0.0058	7.221	1,661.9	199.10	88	363	363
Benzene	00071-43-2	78.11	7.32	1.171	6.906	1,211.0	220.79	46	217	176
Benz[a]anthracene	00056-55-3	228.29		7.92E-10	11.528	5,461	273.15	219	260	820
Benzo[a]pyrene	00050-32-8	252.31		2.29E-11	12.482	6,181	273.15	185	316	923
Benzo[ghi]perylene	00191-24-2	276.33		2.07E-13	11.820	6,580	273.15	391	513	
Biphenyl	00092-52-4	154.21	8.68	2.37E-04	7.245	1,998.7	202.73	156	520	489
Butadiene (1,3) {divinyl}	00106-99-0	54.09	5.13[77]	30.22	6.873	941.7	240.40	–104	29	24
Butane (n)	00106-97-8	58.12	4.78[77]	25.67	6.725	909.7	237.00	–108	31	32
Butene (1)	00106-98-9	56.11	4.91[77]	30.83	7.122	1,099.2	264.89	–108	25	21
Butene (cis-2)	00590-18-1	56.11	5.14[77]	22.62	6.863	957.1	236.65	–94	73	39
Butene (2-methyl-1)	00563-46-2	70.13	5.43	8.257	6.862	1,047.8	232.06	34	145	88
Butene (trans-2)	00624-64-6	56.11	5.00[77]	24.97	6.919	982.2	242.38	–97	34	34
Butyl alcohol (*n*) {butanol (1)}	00071-36-3	74.12	6.76	0.062	7.421	1,351.6	179.81	73	244	243
Butyl alcohol (tert) {1,1-dimethyl ethanol}	00075-65-0	74.12	6.58	0.424	7.373	1,174.9	179.23	103	180	180
Butyl chloride (-n) {1-chloro-butane}	00109-69-3	92.57	7.40	1.255	6.871	1,182.9	218.27	2	173	170

Butyl ether (di-tert)	06163-66-2	130.23	6.39	0.381	6.590	1,157.7	203.05	39	228	224
Carbon disulfide	00075-15-0	76.14	10.54	4.817	6.942	1,168.6	241.53	38	176	115
Carbon tetrachloride	00056-23-5	153.82	13.31	1.431	6.898	1,221.8	227.41	68	172	170
Chlorobenzene	00108-90-7	112.56	9.23	0.134	6.986	1,435.7	218.03	144	269	269
Chlorobutane (2)	00078-86-4	92.57	7.27	1.255	6.871	1,182.9	218.27	2	173	170
Chloroform	00067-66-3	119.38	12.38	2.468	7.083	1,233.1	232.20	–73	142	142
Chloroprene {2-chloro-1,3-butadiene}	00126-99-8	88.54	7.98	2.736	6.291	841.9	187.79	68	140	140
Chlorotoluene (o) {1-chloro-2methylbenzene}	00095-49-8	126.58	9.04	0.039	7.363	1,768.1	234.76	42	319	318
Chrysene {benzo[a]phenanthrene}	00218-01-9	228.29	10.63	1.86E-11	12.320	6,160	273.15	185	374	838
Cresol (m) {3-methyl-phenol}	00108-39-4	108.14	8.63	0.0013	7.477	1,833.1	196.74	301	394	396
Cresol (o) {2-methyl-phenol}	00095-48-7	108.14	9.47[77]	0.0016	6.843	1,391.3	160.18	248	376	376
Cresol (p) {4-methyl-phenol}	00106-44-5	108.14	8.50[104]	0.00062	7.016	1,498.6	160.55	262	395	395
Cyclohexane	00110-82-7	84.16	6.46[77]	1.212	6.845	1,203.5	222.86	68	179	177
Cyclohexanol	00108-93-0	100.16	8.03	0.00090	5.956	777.4	91.11	201	321	320
Cyclohexanone	00108-94-1	98.14	7.91	0.0042	5.978	1,495.5	209.55	193	330	311
Cyclohexene	00110-83-8	82.14	6.77	0.110	5.872	1,221.9	223.17	98	196	181
Cyclopentane	00287-92-3	70.13	6.22	4.171	6.878	1,119.2	230.74	60	122	121
Cyclopentanone	00120-92-3	84.12	7.92	0.130	3.958	376.4	104.65	32	78	266
Cyclopentene	00142-29-0	68.12	6.44	3.264	6.921	1,121.8	223.45			111
Decane (-*n*)	00124-18-5	142.28	6.09	0.011	3.085	440.6	116.25	–21	99	345
Dibromopropane (1,2)	00078-75-1	201.89	16.13	0.088	7.314	1,667.0	234.85	19	287	286
Dibromopropane (1,3)	00109-64-8	201.89	16.55	0.029	7.309	1,776.7	233.46	49	333	314
Dichloroethane (1,1)	00075-34-3	98.96	9.81	2.863	7.097	1,229.2	233.95	–77	135	135
Dichloroethane (1,2)	00107-06-2	98.96	10.40[77]	0.961	7.460	1,521.8	248.48	–23	211	182
Dichloroethylene (1,2) {1,2 dichloroethene}	00540-59-0	96.94	10.76	2.579	7.022	1,205.4	230.60	32	183	141
Dichloroethylene (trans-1,2)	00156-60-5	96.94	10.49	4.333	6.965	1,141.9	231.90	–36	185	118
Dichlorotoluene (3,4)	00095-75-0	161.03	10.49	0.0029	7.344	1,882.5	215.00	32	221	408
Diethoxyethane (1,1)	00105-57-7	118.17	6.89	0.307	7.625	1,574.0	229.47	–10	216	212
Diethoxymethane	00462-95-3	104.15	6.94	0.810	6.986	1,270.2	221.26	32	167	191
Diethyl (n,n) aniline {N,N–diethylbenzenamine}	00091-66-7	149.23	7.77	0.0031	8.258	2,652.8	277.32	122	425	422
Diethyl ketone										

{3-pentanone}	00096-22-0	86.13	6.76[77]	0.423	5.741	716.2	147.17	97	215	215
Diethyl sulfide	00352-93-2	90.19	6.98	0.749	7.541	1,560.5	246.59	–39	190	197
Diethylamine {N-ethyl ethanamine}	00109-89-7	73.14	5.89	2.712	5.737	559.1	140.18	89	141	132
Diethylbenzene (1,2)	00135-01-3	134.22	7.34	0.0094	6.990	1,577.9	200.55	206	364	361
Diethylbenzene (1,3)	00141-93-5	134.22	7.18	0.010	7.006	1,576.3	201.00	203	360	358
Diethylbenzene (1,4)	00105-05-5	134.22	7.20	0.010	7.001	1,589.3	202.02	206	365	363
Di-isopropyl ether	00108-20-3	102.17	6.04	1.877	6.842	1,135.0	218.23	74	153	155
Dimethoxyethane (1,2)	00110-71-4	90.12	7.25	0.966	6.713	1,260.5	235.83	–55	199	185
Dimethyl formamide (n,n)	00068-12-2	73.09	7.88[77]	0.040	6.806	1,337.7	190.50	86	194	307
Dimethyl hydrazine (1,1)	00057-14-7	60.10	6.60[72]	1.896	7.588	1,388.5	232.54	–32	68	146
Dimethyl phthalate	00131-11-3	194.18	9.94	2.25E-08	4.522	700.3	51.42	180	304	540
Dimethylbutane (2,3)	00079-29-8	86.18	5.52	3.064	6.810	1,127.2	228.95	58	138	136
Dimethylcyclopentane (1,1)	01638-26-2	98.19	6.26[77]	0.932	6.830	1,226.6	222.76	60	192	190
Dimethylpentane (2,2)	00590-35-2	100.20	5.63	1.315	6.815	1,190.3	223.34	60	176	174
Dimethylpentane (2,3)	00565-59-3	100.20	5.80	0.842	6.862	1,242.6	222.34	64	195	194
Dimethylpentane (2,4)	00108-08-7	100.20	5.62	1.221	6.836	1,197.6	222.27	57	178	177
Dimethylpentane (3,3)	00562-49-2	100.20	5.79	1.029	6.831	1,231.0	225.58	56	189	187
Dioxane (1,4)	00123-91-1	88.11	8.63	0.439	7.456	1,570.1	241.85	68	221	214
Dipropyl ether {di-*n*-propyl ether}	00111-43-3	102.17	6.23	0.754	6.945	1,254.8	218.82	80	192	194
Dodecane (*n*)	00112-40-3	170.33	6.25	0.00093	6.981	1,625.9	180.31	259	423	421
Epichlorohydrin {chloromethyl oxirane}	00106-89-8	92.52	9.85	0.194	8.229	2,086.8	273.16			241
Ethane	00074-84-0	30.07		472	6.813	659.7	256.431	–215	–100	–127
Ethanolamine (mono)	00141-43-5	61.08	8.50	0.002	7.168	1,408.9	157.06	150	340	339
Ethyl acetate	00141-78-6	88.11	7.51	1.135	7.103	1,245.7	217.96	60	168	171
Ethyl acrylate {ethyl ester 2-propenoic acid}	00140-88-5	100.12	7.71	0.445	7.150	1,366.1	220.47	–21	211	211
Ethyl alcohol {ethanol}	00064-17-5	46.07	6.59	0.648	8.247	1,670.4	232.96	32	173	173
Ethyl chloride	00075-00-3	64.51	7.43[77]	16.63	7.037	1,052.8	241.07	–69	55	61
Ethyl ether {diethyl ether}	00060-29-7	74.12	5.96	6.675	6.897	1,062.6	228.22	–10	132	94
Ethylamine	00075-04-7	45.08	5.65[77]	14.08	7.405	1,203.8	249.43	62	349	64
Ethylbenzene	00100-41-4	106.17	7.24	0.104	6.950	1,419.3	212.61	134	279	277
Ethylcyclopentane	01640-89-7	98.19	6.40	0.475	6.898	1,305.0	221.40	84	220	218
Ethylene										
{ethene}	00074-85-1	28.05	4.74[-155]	749	6.748	584.1	254.84	–191	–120	–155
Ethyleneoxide	00075-21-8	44.05	7.3650	17.84	8.722	2,022.8	335.81	32	89	53
Ethylpentane (3)	00617-78-7	100.20	5.83	0.701	6.880	1,254.1	220.15	70	202	200

Fluoranthene	00206-44-0	202.25	10.45	3.96E-08	12.836	5,348.1	273.15	77	230	723
Fluorobenzene	00462-06-6	96.10	8.53	0.936	7.237	1,409.8	238.36	0	183	185
Formic acid	00064-18-6	46.03	10.18	0.516	4.876	515.0	133.74	33	93	213
Freon 11										
{trichlorofluoromethane}	00075-69-4	137.37	12.48	10.93	6.884	1,043.0	236.88			75
Furan	00110-00-9	68.07	7.94	7.963	6.975	1,060.8	227.73	37	143	89
Furfural										
{2-furancarboxaldehyde}	00098-01-1	96.09	9.68	0.018	6.969	1,430.1	188.70	133	321	323
Heneicosane (*n*)	00629-94-7	296.57	6.61	6.23E-07	8.796	3,571.2	253.20	307	663	679
Heptane (*n*)	00142-82-5	100.20	5.71	0.541	6.903	1,268.6	216.95	79	211	209
Heptene (1)	00592-76-7	98.19	5.82	0.752	7.093	1,400.7	238.96	32	192	201
Hexadiene (1,5)	00592-42-7	82.14	5.74[77]	2.890	6.563	1,008.1	214.16	32	138	140
Hexane (*n*)	00110-54-3	86.18	5.47[77]	1.913	6.878	1,171.5	224.37	55	157	156
Hexanol (1)	00111-27-3	102.17	6.79	0.005	7.288	1,422.0	165.44	126	315	314
Hexene (1)	00592-41-6	84.16	5.62	2.378	6.866	1,153.0	225.85	61	148	147
Hydrogen cyanide										
{hydrocyanic acid}	00074-90-8	27.03	5.74	9.931	7.549	1,340.8	261.56	2	115	79
Isobutane										
{methylpropane (2)}	00075-28-5	58.12	4.60[77]	38.22	6.819	912.1	243.34	–121	11	12
Isobutene										
{methylpropene (2)}	00115-11-7	56.11	4.92[77]	32.18	6.522	799.1	226.54	–70	32	20
Isobutyl alcohol										
{2-methyl 1-propanol}	00078-83-1	74.12	6.69	0.096	7.306	1,237.0	171.62	176	240	226
Isooctane										
{2,2,4-trimethylpentane}	00540-84-1	114.23	5.74[77]	0.596	6.812	1,257.8	220.74	76	212	211
Isopentane										
{2-methyl butane}	00078-78-4	72.15	5.18	9.426	6.790	1,020.0	233.10	61	83	82
Isopentene										
{2-methyl 2-butene}	00513-35-9	70.13	5.53	6.210	6.922	1,098.6	233.26	37	159	100
Isoprene										
{2-methyl 1,3-butadiene}	00078-79-5	68.12	5.67	7.446	6.091	706.9	186.10	62	93	93
Isopropyl alcohol										
{isopropanol}	00067-63-0	60.10	6.52[77]	0.443	7.736	1,357.4	197.34	134	193	180
Isopropyl benzene										
{cumene}	00098-82-8	120.19	7.19	0.048	6.929	1,455.8	207.20	158	308	305
Isopropylbenzene (1-methyl-2)	00527-84-4	134.22	7.32	0.017	7.417	1,880.5	236.27	178	355	350
Methacrylonitrile										
{2-methyl 2-propenenitrile}	00126-98-7	67.09	6.68	0.886	6.999	1,353.6	238.03	–48	194	194

Methane	00074-82-8	16.04	3.53^{-260}	4567	7.096	516.7	284.37	–262	–117	–260
Methyl acetate										
{methyl ester acetic acid}	00079-20-9	74.08	7.80	2.703	7.079	1,164.4	220.46	35	133	134
Methyl acrylate										
{methyl ester 2-propenoic acid}	00096-33-3	86.09	7.96	1.058	7.198	1,338.7	229.63	–47	176	177
Methyl alcohol										
{methanol}	00067-56-1	32.04	6.61	1.476	8.079	1,581.3	239.65	59	183	148
Methyl ethyl ketone										
{2-butanone}	00078-93-3	72.11	6.68^{77}	1.081	6.864	1,150.2	209.25	106	207	176
Methyl isobutyl ketone	00108-10-1	100.16	6.65^{77}	0.219	6.828	1,254.1	201.61	71	241	241
Methyl methacrylate	00080-62-6	100.12	7.88	0.416	8.253	1,945.6	265.58	102	192	213
Methyl propyl ether	00557-17-5	74.12	6.14^{55}	6.017	6.563	903.6	206.46	31	103	102
Methyl styrene (alpha)	00098-83-9	118.18	7.60	0.024	6.924	1,486.9	202.40			329
Methylcyclohexane	00108-87-2	98.19	6.42	0.558	6.823	1,270.8	221.42	27	261	214
Methylcyclopentane	00096-37-7	84.16	6.25	1.738	6.863	1,186.1	226.04	59	163	161
Methyldichlorosilane	20156-50-7	115.03	8.91	5.718	7.028	1,167.8	240.70	34	106	
Methylene chloride	00075-09-2	84.93	11.07	5.640	7.412	1,327.0	252.68	–40	104	104
Methylhexane (2)	00591-76-4	100.20	5.66	0.799	6.882	1,240.9	220.10	65	196	194
Methylhexane (3)	00589-34-4	100.20	5.72	0.744	6.874	1,243.8	219.63	68	199	197
Methylpentane (2)	00107-83-5	86.18	5.43^{77}	2.730	6.839	1,135.4	226.57	55	142	142
Methyl-tert-butyl ether										
{MTBE}	01634-04-4	88.15	6.18	3.226	6.867	1,116.1	224.74	125	431	131
Morpholine	00110-91-8	87.12	8.35	0.109	7.718	1,745.8	235.00	32	111	263
Naphthalene	00091-20-3	128.17	8.56	0.0024	7.146	1,831.6	211.82	177	354	422
Nitrobenzene	00098-95-3	123.11	10.05	0.0022	7.091	1,727.6	199.71	273	411	412
Nitromethane	00075-52-5	61.04	9.49	0.415	7.281	1,446.2	227.52	132	277	214
Nonadecane (*n*)	00629-92-5	268.52	6.56	3.64E-07	33.303	28,197	725.94	91	131	624
Nonane (*n*)	00111-84-2	128.26	5.99	0.037	6.700	1,492.9	217.26	–64	94	303
Octadecane (*n*)	00593-45-3	254.49	6.4882	6.16E-07	7.207	2,069.0	161.22	346	602	592
Octane (*n*)	00111-65-9	114.23	5.8377	0.142	8.076	1,936.3	253.01	–70	75	258
Octanol (1)	00111-87-5	130.23	6.9077	0.00061	9.352	2,603.4	224.35	68	176	383
Octene (1)	00111-66-0	112.21	5.97	0.196	6.933	1,353.5	212.76	113	252	251
Pentachloroethane	00076-01-7	202.29	14.02	0.040	6.643	1,342.3	196.51	77	324	324
Pentadiene (1,2)	00591-95-7	68.12	5.78	4.718	6.936	1,125.5	231.88	–76	–19	113
Pentadiene (1,4)	00591-93-5	68.12	5.52	10.06	7.035	1,108.2	241.05	–110	65	79
Pentadiene (2,3)	00591-96-8	68.12	5.80	4.223	7.263	1,256.2	239.57	–76	–15	119
Pentane (n)	00109-66-0	72.15	5.23	6.884	6.864	1,070.6	232.70	24	155	97
Pentene (1)	00109-67-1	70.13	5.35	8.671	6.786	1,014.3	229.78	55	87	88
Pentyne (1)	00627-19-0	68.12	5.76	5.657	6.967	1,092.5	227.18	–47	142	104

Phenanthrene	00085-01-8	178.23	8.18	3.37E-06	7.394	2,428.5	202.19	212	302	635
Phenol	00108-95-2	94.11	8.80[113]	0.003	7.122	1,509.7	174.20	225	359	359
Phosgene	00075-44-5	98.92	11.45[77]	19.43	7.146	1,072.7	243.30	47	345	46
Picoline (3)										
{3-methyl pyridine}	00108-99-6	93.13	7.98	0.064	7.054	1,484.3	211.54	165	364	291
Propane	00074-98-6	44.10	4.12[77]	111	6.858	819.3	248.73	–45	117	–44
Propanethiol (1)	00107-03-9	76.16	7.02	1.943	6.929	1,183.4	224.63	76	216	154
Propanethiol (2)	00075-33-2	76.16	6.80	3.590	6.877	1,113.9	226.16	51	186	131
Propyl alcohol (*n*)										
{propanol (1)}	00071-23-8	60.10	6.67[77]	0.218	8.189	1,690.9	221.35	67	207	207
Propyl nitrate (*n*)										
{propyl ester nitric acid}	00627-13-4	105.09	8.80	0.261	6.955	1,294.4	206.70	32	158	231
Propylamine (*n*)										
{1-propanamine}	00107-10-8	59.11	5.99	3.990	6.926	1,044.0	210.84	73	172	120
Propylene										
{propene}	00115-07-1	42.08	4.22	132	6.850	795.8	248.27	–161	–53	–54
Propylene glycol (1,2)										
{1,2 propanediol}	00057-55-6	76.09	8.65	0.00094	8.208	2,085.9	203.54			368
Propylene oxide	00075-56-9	58.08	7.17[32]	7.101	6.970	1,065.3	226.28	–100	94	95
Pyridine	00110-86-1	79.10	8.20	0.233	7.038	1,371.4	214.65	153	307	240
Resorcinol	00108-46-3	110.11	10.61[77]	6.65E-06	8.398	2,687.2	210.99	305	530	532
Styrene	00100-42-5	104.15	7.56	0.066	7.095	1,525.1	216.77	86	293	295
Tetrachloroethane (1,1,1,2)	00630-20-6	167.85	12.86	0.133	6.906	1,370.4	210.25	139	266	271
Tetrachloroethane (1,1,2,2)	00079-34-5	167.85	13.32	0.037	6.091	959.6	149.78	77	266	295
Tetrachloroethylene	00127-18-4	165.83	13.54	0.213	7.056	1,440.8	223.98	82	226	250
Tetrahydrofuran	00109-99-9	72.11	7.42	2.039	6.996	1,202.9	226.33	74	211	151
Toluene	00108-88-3	92.14	7.24	0.331	7.017	1,377.6	222.64	32	122	231
Trichloroethane (1,1,1)	00071-55-6	133.40	11.18	1.650	8.761	2,210.2	308.05	22	62	165
Trichloroethane (1,1,2)	00079-00-5	133.40	12.02	0.245	6.945	1,310.3	208.74	122	237	237
Trichloroethylene	00079-01-6	131.39	12.22	0.817	6.429	974.5	187.34	64	188	189
Trichloropropane (1,2,3)	00096-18-4	147.43	11.59	0.031	7.532	1,818.9	232.52	48	316	313
Tridecane (*n*)	00629-50-5	184.36	6.31	2.46E-04	7.003	1,689.1	174.28	283	457	453
Trifluoroethane										
(1,1,2-trichloro-1,2,2)	00076-13-1	187.37	13.05[77]	4.376	6.880	1,099.9	227.50	–13	181	118
Trimethylbenzene (1,2,4)	00095-63-6	120.19	7.31	0.020	7.044	1,573.3	208.56	126	388	337
Trimethylchlorosilane										
{chlorotrimethylsilane}	00075-77-4	108.64	7.15[77]	3.068	6.951	1,191.0	235.15	37	132	136
Trimethylpentane (2,2,3)	00564-02-3	114.23	5.74[77]	0.378	6.825	1,294.9	218.42			230

Trimethylpentane (2,3,3)	00560-21-4	114.23	6.06	0.317	6.844	1,328.1	220.38			238
Trimethylpentane (2,3,4)	00565-75-3	114.23	6.00	0.314	7.031	1,420.7	228.53	–59	308	237
Undecane (*n*)	01120-21-4	156.31	6.18	0.0035	6.977	1,572.5	188.02	220	387	383
Vinyl acetate										
{acetic acid ethenyl ester}	00108-05-4	86.09	7.78	1.396	7.215	1,299.1	226.97	71	162	163
Vinylidene chloride										
{1,1-dichloro ethene}	00075-35-4	96.94	10.13	8.096	6.983	1,104.7	237.75	–19	90	88
Xylene (*m*)										
{1,3-dimethyl benzene}	00108-38-3	106.17	7.21	0.090	7.009	1,462.3	215.11	82	331	283
Xylene (*o*)										
{1,2-dimethyl benzene}	00095-47-6	106.17	7.35^{50}	0.071	6.999	1,474.7	213.69	90	342	291
Xylene (*p*)										
{1,4-dimethyl benzene}	00106-42-3	106.17	7.19	0.097	7.021	1,474.4	217.77	56	355	281

NOTE: Synonyms are shown in braces { }. Prefixes are shown in parentheses ( ).

[a] Reference 22.

[b] Vapor pressure P_{VA} in psia = $(0.019337)10^{\left[A-\frac{B}{\frac{(T_{LA}-32)5}{9}+C}\right]}$ where T_{LA} is the temperature in ºF.

[c] Use of this equation for temperature outside the indicated temperature range may result in loss of accuracy.

[d] The superscript denotes the temperature in ºF; if no superscript is given the density is for 68ºF.

Table 7.1-6. PAINT SOLAR ABSORPTANCE[a]

Surface Color	Shade or Type	Reflective Condition (see Note 1)		
		New	Average	Aged
White		0.17	0.25	0.34
Aluminum	Specular	0.39	0.44	0.49
Aluminum	Diffuse	0.60	0.64	0.68
Beige/Cream		0.35	0.42	0.49
Black		0.97	0.97	0.97
Brown		0.58	0.62	0.67
Gray	Light	0.54	0.58	0.63
Gray	Medium	0.68	0.71	0.74
Green	Dark	0.89	0.90	0.91
Red	Primer	0.89	0.90	0.91
Rust	red iron oxide	0.38	0.44	0.50
Tan		0.43	0.49	0.55
Aluminum (see Note 2)	mill finish, unpainted	0.10	0.12	0.15

NOTE 1 Reflective condition definitions:

New: For paint, paint still retains the fresh shine of having been recently applied; for mill-finish aluminum, surface is shiny. This was previously labeled "Good."

Average: For paint, paint is in good condition, but the initial shine has faded; for mill-finish aluminum, surface is oxidized but still bright. The value given in each case is the average of the New and the Aged values for that case, and does not represent new data.

Aged: For paint, paint is noticeably faded and dull; for mill-finish aluminum, surface is dull. This was previously labeled "Poor."

NOTE 2 This refers to aluminum as the base metal, rather than aluminum-colored paint.

Notes:

[a] Reference 22. If specific information is not available, a white shell and roof, with the paint in average condition, can be assumed to represent the most common or typical tank surface in use. If the tank roof and shell are painted a different color, α is determined from $\alpha = (\alpha_R + \alpha_S)/2$; where α_R is the tank roof paint solar absorptance and α_S is the tank shell paint solar absorptance.

Table 7.1-7. METEOROLOGICAL DATA (T_{AX}, T_{AN}, V, I, P_A) FOR SELECTED U.S. LOCATIONS[a]

Location	Symbol	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Birmingham, AL	T_{AN}	°F	35.0	37.5	44.1	51.7	60.6	68.1	71.7	71.1	64.7	53.3	43.3	36.7	53.2
	T_{AX}	°F	53.7	57.8	65.9	73.9	80.9	86.8	90.0	89.8	84.5	74.7	64.2	55.3	73.1
	V	mi/hr	7.2	7.4	7.8	7.4	6.3	5.4	5.1	4.7	5.4	5.4	6.0	6.7	6.3
	I	Btu/ft^2/day	769	1013	1382	1720	1884	1928	1889	1760	1504	1212	890	699	1388
	P_A	lb/in^2													14.37
Huntsville, AL	T_{AN}	°F	32.7	35.2	42.1	50.6	59.6	67.2	70.3	69.2	62.6	51.1	41.2	34.5	51.4
	T_{AX}	°F	50.3	54.4	63.1	72.3	79.9	86.3	88.9	89.2	83.7	73.4	61.6	52.1	71.3
	V	mi/hr	8.3	8.3	8.9	8.5	7.4	5.8	4.9	4.9	5.8	6.3	7.2	7.8	7.2
	I	Btu/ft^2/day	714	949	1314	1690	1868	1973	1948	1823	1508	1191	835	656	1372
	P_A	lb/in^2													14.36
Mobile, AL	T_{AN}	°F	41.4	43.8	49.7	56.3	64.7	71.0	73.3	73.1	68.9	58.4	48.3	42.4	57.6
	T_{AX}	°F	60.8	64.2	70.4	76.7	84.0	88.3	90.1	89.9	86.4	78.5	69.5	62.1	76.7
	V	mi/hr	8.5	8.5	8.7	8.3	7.4	6.0	5.4	5.4	6.7	6.9	7.2	7.8	7.2
	I	Btu/ft^2/day	865	1114	1446	1774	1955	1925	1876	1767	1557	1304	1024	818	1452
	P_A	lb/in^2													14.58
Montgomery, AL	T_{AN}	°F	37.1	39.9	46.1	52.6	61.8	68.9	72.2	71.7	66.2	54.4	44.0	38.0	54.4
	T_{AX}	°F	57.7	62.0	69.4	76.6	83.9	89.4	91.8	91.5	86.9	77.7	67.9	59.1	76.2
	V	mi/hr	7.2	7.4	7.6	6.5	5.8	4.9	4.7	4.7	5.6	5.4	5.8	6.7	6.0
	I	Btu/ft^2/day	823	1076	1421	1766	1952	1951	1943	1781	1530	1223	950	749	1430
	P_A	lb/in^2													14.59
Phoenix, AZ	T_{AN}	°F	46.5	49.5	54.0	60.1	69.8	78.1	84.3	83.4	78.1	65.4	53.3	45.6	64.0
	T_{AX}	°F	66.7	69.8	76.1	83.6	93.8	102.6	105.4	103.6	99.6	87.8	75.1	65.6	85.8
	V	mi/hr	4.9	5.6	6.3	6.9	6.9	6.7	6.9	6.7	6.0	5.6	4.9	4.7	6.0
	I	Btu/ft^2/day	1058	1335	1774	2248	2495	2606	2379	2144	1910	1542	1172	967	1802
	P_A	lb/in^2													14.11
Prescott, AZ	T_{AN}	°F	26.8	29.5	33.5	38.9	48.0	55.9	63.3	61.9	54.9	42.7	32.3	26.2	42.8
	T_{AX}	°F	51.4	54.4	60.0	66.4	76.5	85.6	89.2	86.5	82.2	71.4	60.1	51.1	69.6
	V	mi/hr	6.5	7.2	8.1	8.9	8.7	8.7	7.4	6.7	6.9	6.9	6.5	6.3	7.4
	I	Btu/ft^2/day	982	1245	1694	2156	2415	2571	2171	1903	1805	1493	1130	901	1705
	P_A	lb/in^2													12.24
Tucson, AZ	T_{AN}	°F	40.7	43.1	47.0	52.4	61.6	70.4	75.7	74.4	70.1	58.4	47.0	40.0	56.8

Location	Symbol	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	T_{AX}	°F	39.6	42.1	50.5	62.0	72.0	81.3	85.7	84.2	76.7	65.2	54.6	43.8	63.1
	V	mi/hr	11.0	11.2	11.2	10.5	9.6	9.2	8.9	8.5	8.9	9.4	9.8	10.7	9.8
	I	Btu/ft^2/day	602	887	1195	1502	1748	1854	1838	1629	1324	975	638	521	1226
	P_A	lb/in^2													14.69
Albuquerque, NM	T_{AN}	°F	27.6	31.4	36.4	43.7	53.8	62.3	67.1	65.4	58.6	46.7	35.0	27.5	46.3
	T_{AX}	°F	48.1	53.7	61.2	69.4	79.8	88.8	90.5	87.8	81.4	69.9	56.6	47.1	69.5
	V	mi/hr	7.2	7.8	8.7	9.8	9.4	8.9	7.8	7.4	7.4	7.4	7.2	6.7	8.1
	I	Btu/ft^2/day	1003	1270	1699	2126	2356	2479	2312	2082	1846	1469	1114	904	1722
	P_A	lb/in^2													12.13
Gallup, NM	T_{AN}	°F	14.9	19.5	22.7	28.4	37.5	45.1	54.3	53.3	43.8	30.9	19.9	13.8	32.0
	T_{AX}	°F	44.1	48.7	56.4	64.0	74.3	83.9	87.5	84.3	78.5	67.0	54.2	44.0	65.6
	V	mi/hr	5.4	6.5	7.8	9.4	8.7	8.1	6.7	5.8	5.8	6.0	5.6	5.1	6.7
	I	Btu/ft^2/day	930	1194	1654	2095	2350	2507	2187	1943	1806	1466	1072	825	1669
	P_A	lb/in^2													11.63
Roswell, NM	T_{AN}	°F	27.8	32.5	38.5	46.1	56.4	64.5	68.5	67.0	59.5	47.9	35.2	27.7	47.6
	T_{AX}	°F	55.6	61.3	68.4	77.0	86.1	93.7	93.9	91.9	86.0	76.0	64.0	55.3	75.8
	V	mi/hr	7.6	8.7	9.6	10.5	10.1	10.1	8.5	7.6	7.8	7.8	7.6	7.4	8.7
	I	Btu/ft^2/day	1013	1323	1744	2125	2301	2434	2302	2085	1822	1452	1127	939	1722
	P_A	lb/in^2													12.88
Albany, NY	T_{AN}	°F	16.1	18.1	26.4	37.7	47.7	57.9	62.0	60.9	52.7	40.8	32.5	22.4	39.6
	T_{AX}	°F	31.0	34.1	43.8	57.8	68.7	77.6	81.3	80.0	72.0	59.3	47.7	35.9	57.4
	V	mi/hr	8.5	8.9	9.4	9.2	7.8	6.9	6.7	5.8	6.3	7.2	7.8	8.5	7.8
	I	Btu/ft^2/day	532	789	1096	1496	1739	1853	1872	1640	1300	882	534	422	1180
	P_A	lb/in^2													14.55
Binghamton, NY	T_{AN}	°F	16.6	17.6	25.1	36.3	46.5	56.1	59.9	59.1	51.3	40.9	32.0	22.0	38.6
	T_{AX}	°F	29.2	31.7	40.5	54.1	65.2	73.6	77.1	76.2	68.4	56.4	44.8	33.5	54.2
	V	mi/hr	9.8	9.8	9.8	9.6	8.5	7.8	7.4	6.9	7.8	8.5	8.9	9.6	8.7
	I	Btu/ft^2/day	500	745	1056	1449	1722	1839	1818	1614	1224	833	498	406	1142
	P_A	lb/in^2													13.87
Buffalo, NY	T_{AN}	°F	19.3	19.7	26.5	37.2	47.9	58.4	62.6	61.7	54.2	43.7	34.7	24.9	40.9
	T_{AX}	°F	31.5	32.9	41.3	54.7	66.1	75.3	78.9	78.1	71.1	58.7	47.4	36.1	56.0
	V	mi/hr	12.1	11.6	10.7	10.5	9.8	8.9	8.9	8.1	8.7	9.6	10.5	11.4	10.1
	I	Btu/ft^2/day	447	730	1070	1453	1793	1939	1865	1643	1273	808	478	382	1157

Location	Symbol	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	T_{AX}	°F	35.1	38.5	47.8	55.6	66.5	77.7	87.6	85.6	74.2	59.0	44.7	35.1	58.9
	V	mi/hr	14.8	13.4	12.5	11.6	10.5	10.3	9.2	9.4	9.8	11.0	13.4	15.0	11.6
	I	Btu/ft^2/day	601	877	1259	1631	1980	2243	2292	1988	1552	1046	650	505	1385
	P_A	lb/in^2													12.13
Cheyenne, WY	T_{AN}	°F	18.8	19.8	25.1	31.3	40.7	49.2	56.1	54.6	45.4	34.4	25.1	19.1	35.0
	T_{AX}	°F	38.8	40.4	47.3	53.7	63.9	74.3	82.6	80.2	71.3	58.0	45.8	38.6	57.9
	V	mi/hr	14.1	13.6	13.6	13.2	12.1	11.0	9.8	9.8	10.5	11.9	13.2	13.9	12.3
	I	Btu/ft^2/day	712	975	1360	1668	1919	2196	2163	1883	1588	1131	761	609	1414
	P_A	lb/in^2													11.78
Lander, WY	T_{AN}	°F	12.5	16.2	24.9	32.5	41.6	49.6	57.5	56.1	46.4	34.2	21.8	13.2	33.9
	T_{AX}	°F	32.0	36.2	46.9	55.1	65.7	76.0	86.2	84.3	73.0	57.8	42.6	32.3	57.3
	V	mi/hr	4.9	4.9	6.7	7.4	7.4	7.4	7.2	6.9	6.5	5.6	5.1	4.9	6.3
	I	Btu/ft^2/day	640	920	1320	1658	2026	2242	2256	1966	1564	1086	696	551	1411
	P_A	lb/in^2													12.02
Rock Springs, WY	T_{AN}	°F	13.6	15.5	23.8	29.7	38.6	46.8	55.0	53.3	43.6	33.2	22.1	14.2	32.5
	T_{AX}	°F	29.2	32.3	42.8	51.9	62.7	73.0	82.9	80.2	69.4	55.5	39.9	29.6	54.1
	V	mi/hr	12.1	11.2	12.1	12.3	11.2	10.7	9.4	8.9	9.4	11.0	11.2	11.4	11.0
	I	Btu/ft^2/day	654	928	1342	1738	2044	2307	2301	2019	1673	1186	716	564	1456
	P_A	lb/in^2													13.05
Sheridan, WY	T_{AN}	°F	13.0	16.8	23.4	31.4	39.8	47.9	54.8	53.2	43.5	32.5	21.5	13.6	32.6
	T_{AX}	°F	34.4	38.5	47.5	55.7	65.4	74.8	85.9	85.2	74.0	58.8	45.5	35.4	58.4
	V	mi/hr	6.5	6.9	7.8	8.9	8.3	7.2	6.5	6.0	6.3	6.7	6.5	6.5	6.9
	I	Btu/ft^2/day	482	767	1145	1509	1850	2030	2152	1860	1419	909	569	429	1260
	P_A	lb/in^2													12.73

[a] Reference 14. Data for this table are 20-year averages for the years 1991 through 2010, prepared by the National Renewable Energy Laboratory and compiled in the National Solar Radiation Database. Only Class I sites are summarized in this table, but similar meteorological data for several hundred Class II sites may be obtained from this reference. Similar historical averages of meteorological data from nearby National Weather Service sites or site-specific data may also be used. *NOTE: The current table reflects the hourly average minimum and maximum ambient temperatures while this table in the previous version of Chapter 7 contained the average daily minimum and maximum ambient temperatures.*

T_{AX} = hourly average maximum ambient temperature
T_{AN} = hourly average minimum ambient temperature
V = average wind speed
I = average daily total insolation factor
P_A = average atmospheric pressure

Table 7.1-8. RIM-SEAL LOSS FACTORS, K_{Ra}, K_{Rb}, and n, FOR FLOATING ROOF TANKS[a]

Tank Construction And Rim-Seal System	Average-Fitting Seals		
	K_{Ra} (lb-mole/ft-yr)	K_{Rb} [lb-mole/(mph)^n-ft-yr]	n (dimensionless)
Welded Tanks			
Mechanical-shoe seal			
Primary only[b]	5.8	0.3	2.1
Shoe-mounted secondary	1.6	0.3	1.6
Rim-mounted secondary	0.6	0.4	1.0
Liquid-mounted seal			
Primary only	1.6	0.3	1.5
Weather shield	0.7	0.3	1.2
Rim-mounted secondary	0.3	0.6	0.3
Vapor-mounted seal			
Primary only	6.7[c]	0.2	3.0
Weather shield	3.3	0.1	3.0
Rim-mounted secondary	2.2	0.003	4.3
Riveted Tanks			
Mechanical-shoe seal			
Primary only	10.8	0.4	2.0
Shoe-mounted secondary	9.2	0.2	1.9
Rim-mounted secondary	1.1	0.3	1.5

Tank Construction And Rim-Seal System	Tight-Fitting[d] Seals		
	K_{Ra} (lb-mole/ft-yr)	K_{Rb} [lb-mole/(mph)^n-ft-yr]	n (dimensionless)
Welded Tanks			
Mechanical-shoe seal			
Primary only	1.5	0.4	1.9
Shoe-mounted secondary	1.0	0.4	1.5
Rim-mounted secondary	0.4	0.4	1.0
Liquid-mounted seal			
Primary only	1.0	0.08	1.8
Weather shield	0.4	0.2	1.3
Rim-mounted secondary	0.2	0.4	0.4
Vapor-mounted seal			
Primary only	5.6	0.2	2.4
Weather shield	2.8	0.1	2.3
Rim-mounted secondary	2.2	0.02	2.6

Note: The rim-seal loss factors K_{Ra}, K_{Rb}, and n may only be used for wind speeds below 15 miles per hour.

[a] References 5 and 15.
[b] If no specific information is available, a welded tank with an average-fitting mechanical-shoe primary seal can be used to represent the most common or typical construction and rim-seal system in use for external and domed external floating roof tanks.
[c] If no specific information is available, this value can be assumed to represent the most common or typical rim-seal system currently in use for internal floating roof tanks.

[d] "Tight-fitting" means that the rim seal is maintained with no gaps greater than 1/8 in. wide between the rim seal and the tank shell. It is not appropriate to use the values for tight-fitting seals unless the seal is known to be maintained with gaps no greater than 1/8 in. through the full range of liquid level in the tank.

Table 7.1-9. RESERVED

Table 7.1-10. AVERAGE CLINGAGE FACTORS, C_S[a]
($bbl/10^3\ ft^2$)

Product Stored	Shell Condition		
	Light Rust	Dense Rust	Gunite Lining
Gasoline	0.0015	0.0075	0.15
Single-component stocks	0.0015	0.0075	0.15
Crude oil	0.0060	0.030	0.60

[a] Reference 5. If no specific information is available, the values in this table can be assumed to represent the most common or typical condition of tanks currently in use.

Table 7.1-11. TYPICAL NUMBER OF COLUMNS AS A FUNCTION OF TANK DIAMETER FOR INTERNAL FLOATING ROOF TANKS WITH COLUMN-SUPPORTED FIXED ROOFS[a]

Tank Diameter Range D, (ft)	Typical Number Of Columns, N_C
$0 < D \leq 85$	1
$85 < D \leq 100$	6
$100 < D \leq 120$	7
$120 < D \leq 135$	8
$135 < D \leq 150$	9
$150 < D \leq 170$	16
$170 < D \leq 190$	19
$190 < D \leq 220$	22
$220 < D \leq 235$	31
$235 < D \leq 270$	37
$270 < D \leq 275$	43
$275 < D \leq 290$	49
$290 < D \leq 330$	61
$330 < D \leq 360$	71
$360 < D \leq 400$	81

[a] Reference 5. This table was derived from a survey of users and manufacturers. The actual number of columns in a particular tank may vary greatly with age, fixed roof style, loading specifications, and manufacturing prerogatives. Data in this table should not be used when actual tank data are available.

Table 7.1-12. DECK-FITTING LOSS FACTORS, K_{Fa}, K_{Fb}, AND m, AND TYPICAL NUMBER OF DECK FITTINGS, N_F[a]

Fitting Type And Construction Details[q]	Loss Factors			Typical Number Of Fittings, N_F
	K_{Fa} (lb-mole/yr)	K_{Fb} (lb-mole/(mph)^m-yr)	m (dimensionless)	
Access hatch				1
Bolted cover, gasketed[b]	1.6	0	0	
Unbolted cover, ungasketed	36[c]	5.9	1.2	
Unbolted cover, gasketed	31	5.2	1.3	
Fixed roof support column well[d]				N_C
Round pipe, ungasketed sliding cover	31	p		(Table 7.1-11)
Round pipe, gasketed sliding cover	25	p		
Round pipe, flexible fabric sleeve seal	10	p		
Built-up column, ungasketed sliding cover[c]	51	p		
Built-up column, gasketed sliding cover	33	p		
Unslotted guidepole and well				f
Ungasketed sliding cover	31	150	1.4	
Ungasketed sliding cover w/pole sleeve	25	2.2	2.1	
Gasketed sliding cover	25	13	2.2	
Gasketed sliding cover w/pole wiper	14	3.7	0.78	
Gasketed sliding cover w/pole sleeve	8.6	12	0.81	
Slotted guidepole/sample well[e]				f
Ungasketed or gasketed sliding cover	43	270	1.4	
Ungasketed or gasketed sliding cover, with float[g]	31	36	2.0	
Gasketed sliding cover, with pole wiper	41	48	1.4	
Gasketed sliding cover, with pole sleeve	11	46	1.4	
Gasketed sliding cover, with pole sleeve and pole wiper	8.3	4.4	1.6	
Gasketed sliding cover, with float and pole wiper[g]	21	7.9	1.8	
Gasketed sliding cover, with float, pole sleeve, and pole wiper[h]	11	9.9	0.89	
Flexible enclosure[i]	21	7.9	1.8	
Gauge-float well (automatic gauge)				1
Unbolted cover, ungasketed[b]	14[c]	5.4	1.1	
Unbolted cover, gasketed	4.3	17	0.38	
Bolted cover, gasketed	2.8	0	0	
Gauge-hatch/sample port				1
Weighted mechanical actuation, gasketed[b]	0.47	0.02	0.97	
Weighted mechanical actuation, ungasketed	2.3	0	0	
Slit fabric seal, 10% open area[c]	12	p		
Vacuum breaker				N_{vb} (Table 7.1-13)[j]
Weighted mechanical actuation, ungasketed	7.8	0.01	4.0	
Weighted mechanical actuation, gasketed[b]	6.2[c]	1.2	0.94	

Fitting Type And Construction Details[q]	Loss Factors K_{Fa} (lb-mole/yr)	K_{Fb} (lb-mole/(mph)^m-yr)	m (dimensionless)	Typical Number Of Fittings, N_F
Deck drain (3-inch diameter)				
Open[b]	1.5	0.21	1.7	N_d (Table 7.1-13),
90% closed	1.8	0.14	1.1	
Stub drain (1-inch diameter)[k]	1.2	p		N_d (Table 7.1-15)
Deck leg, IFR-type (total sleeve length approx. 12 inches) [m]				N_l (Table 7.1-15)
Adjustable[c]	7.9	p		
Deck leg, EFR-type (pontoon area of pontoon roofs; total sleeve length approx. 30 inches)				N_l (Table 7.1-14)
Adjustable - ungasketed[b]	2.0	0.37	0.91	
Adjustable - gasketed	1.3	0.08	0.65	
Adjustable - sock	1.2	0.14	0.65	
Deck leg, EFR-type (double-deck roofs and center area of pontoon roofs, total sleeve length approx. 48 inches)				N_l (Table 7.1-14)
Adjustable - ungasketed[b]	0.82	0.53	0.14	
Adjustable - gasketed	0.53	0.11	0.13	
Adjustable - sock	0.49	0.16	0.14	
Deck leg or hanger (no opening through deck)				N_l may be set as 0
Fixed	0	0	0	(no openings)
Rim vent[n]				1
Weighted mechanical actuation, ungasketed	0.68	1.8	1.0	
Weighted mechanical actuation, gasketed[b]	0.71	0.10	1.0	
Ladder well				1[d]
Sliding cover, ungasketed[c]	98	p		
Sliding cover, gasketed	56	p		
Ladder-slotted guidepole combination well				1[d]
Sliding cover, ungasketed	98	p		
Ladder sleeve, ungasketed sliding cover	65	p		
Ladder sleeve, gasketed sliding cover	60	p		

Note: The deck-fitting loss factors, K_{Fa}, K_{Fb}, and m, may only be used for wind speeds below 15 miles per hour.

[a] Reference 5, unless otherwise indicated.
[b] If no specific information is available, this value can be assumed to represent the most common or typical deck fitting currently in use for external and domed external floating roof tanks.
[c] If no specific information is available, this value can be assumed to represent the most common or typical deck fitting currently in use for internal floating roof tanks.
[d] Column wells and ladder wells are not typically used with self-supported fixed roofs.
[e] References 16,19.
[f] There is no typical quantity or configuration of unslotted or slotted guidepoles, and thus tank specific data should be obtained.
[g] Tests were conducted with floats positioned with the float wiper at and 1 inch above the sliding cover. The user is cautioned against applying these factors to floats that are positioned with the wiper or top of

the float below the sliding cover ("short floats"). The emission factor for such a float is expected to be between the factors for a guidepole without a float and with a float, depending upon the position of the float top and/or wiper within the guidepole.

[h] Tests were conducted with floats positioned with the float wiper at varying heights with respect to the sliding cover. This fitting configuration also includes a pole sleeve which restricts the airflow from the well vapor space into the slotted guidepole. Consequently, the float position within the guidepole (at, above, or below the sliding cover) is not expected to significantly affect emission levels for this fitting configuration, since the function of the pole sleeve is to restrict the flow of vapor from the vapor space below the deck into the guidepole.

[i] A flexible enclosure surrounds the guidepole from the gasketed cover at the deck opening up to an elevation on the guidepole above all slots or holes through the guidepole. EPA's Storage Tank Emission Reduction Partnership Program granted the flexible enclosure system equivalency to the pole float system. [65 FR 19891(04/13/00)]

[j] N_{vb} = 1 for internal floating roof tanks.

[k] Stub drains are not used on welded contact internal floating decks.

[m] Loss factors for EFR-type deck legs may be used for an IFR if the total height of the leg sleeves, including the portion extending down into the liquid, is similar to that of the EFR-type deck leg.

[n] Rim vents are used only with mechanical-shoe primary seals.

[p] Deck fittings with only a K_{Fa} factor and no K_{Fb} or m factor should not be applied to external floating roof tanks because the emission factor for such deck fittings does not account for wind effects.

[q] Emission factors for IFR deck fittings that are not listed in this table may be calculated using equation 2-17.