

Area Source Emission Inventory Methodology Bulk Plants (Gasoline, Jet Fuel, Av gas)

(Revised October 2017)

EMISSION INVENTORY SOURCE CATEGORIES:

SIC = 5171 Petroleum Bulk Stations and Terminals NAICS = 424710 Petroleum Bulk Stations and Terminals

EMISSION INVENTORY CODES AND DESCRIPTION:

EIC	CES	DESCRIPTION
330-382-1100-0000	46466	Bulk Plants/Terminals – Breathing Losses
330-384-1100-0000	46474	Bulk Plants/Terminals – Working Losses
330-390-1100-0000	46482	Tank Cars & Trucks – Working Losses
330-995-1100-0000	82248	Bulk Gasoline Storage & Transfer – Unspecified

METHODS AND SOURCES OF INFORMATION:

Annual fuel throughput totals are supplied to the APCD from dispensing facilities as required by permit through the annual reporting process. Once submitted and entered, an internally-generated report is used to separate the throughputs between Aboveground Storage Tanks (ASTs) and Underground Storage Tanks (USTs) as well as between three fuels: Gasoline, Jet Fuel, and Aviation Gasoline (Av gas).

Gasoline and Av gas emissions are calculated using the California Air Pollution Control Officers Association's (CAPCOA) gasoline dispensing facility (GDF) emission factor scenarios, with some District modifications. See the *Assumptions* section below for more details. The complete SBCAPCD GDF Scenarios table can be found in the *Appendix* section of this methodology. Jet fuel emissions are calculated using an equation for emissions from loading petroleum liquid from AP-42, Section 5.2, with jet fuel-specific variables from AP-42, Table 7.1-2¹. Emissions for the three fuels are calculated using the following equations:

Gasoline and Av gas

E = (EF / 1000) * TP / 2000

E = Emissions (ton/yr) EF = Emission Factor (lb ROG/kgal) TP = Throughput (gal/yr)

¹ USEPA, AP-42: Compilation of Air Emission Factors, Sections 5.2 (July 2008) and 7.1 (November 2006)

<u>Jet Fuel</u>

 $E = (L_{L} / 1000) * TP * N / 2000$

E = Emissions (ton/yr) L_L = Loading Loss (lb/kgal of liquid loaded) TP = Throughput of liquid loaded (gal/yr) N = Number of fuel transfers (into AST, into pony trucks, and into aircraft)

EMISSION FACTORS:

<u>Gasoline</u>

 $EF = [(3B_L + 3B_B) * AST\%] + [(6B_L + 6B_B) * UST\%] + R$

EF = Emission factor (lb/kgal) $3B_{L} = Scenario 3B loading loss (lb/kgal)$ $3B_{B} = Scenario 3B breathing loss (lb/kgal)$ AST% = % of gasoline stored in aboveground tanks $6B_{L} = Scenario 6B loading loss (lb/kgal)$ $6B_{B} = Scenario 6B breathing loss (lb/kgal)$ UST% = % of gasoline stored in underground tanksR = Refueling loss (assumed to be 0.5 lb/kgal)

<u>Av gas</u>

 $\mathsf{EF} = (2_{\mathsf{L}} + 2_{\mathsf{B}} + 2_{\mathsf{R}} + 2_{\mathsf{S}}) * 0.65$

EF = Emission factor (lb/kgal) $2_{L} = Scenario 2 loading loss (lb/kgal)$ $2_{B} = Scenario 2 breathing loss (lb/kgal)$ $2_{R} = Scenario 2 refueling loss (lb/kgal)$ $2_{S} = Scenario 2 spillage loss (lb/kgal)$

<u>Jet Fuel</u>

L_L = 12.46 * (SPM / T)

 L_L = Loading loss (lb/kgal liquid loaded)

S = Saturation factor

P = True vapor pressure of the liquid loaded (psia)

M = Molecular weight of vapors (lb/lb-mol)

T = Temperature of bulk liquid loaded (°R)

ASSUMPTIONS:

General assumptions

- 1. Data provided through the annual reporting process is accurate and complete.
- 2. Loading, refueling, and spillage emissions are all categorized under working losses.
- 3. 100% of total organic gases (TOG) is reactive; the fraction of reactive organic gases (FROG) is 1.0.

Gasoline Assumptions

- 1. Scenario 3B is used to estimate loading and breathing emissions from all ASTs in Santa Barbara County.
- 2. Scenario 6B is used to estimate loading and breathing emissions from all USTs in Santa Barbara County.
- 3. Loading and breathing loss emission factors are apportioned based on a ratio of AST to UST stored gasoline throughput.
- 4. Refueling loss emission factor is 0.5 lb/kgal based on District Rule 316² limits.
- 5. Spillage losses are negligible.

Av gas Assumptions

- 1. All Av gas tanks are ASTs with only Phase I Vapor Recovery.
- 2. Scenario 2 is used to estimate emissions from all av gas tanks in Santa Barbara County.
- Scenario 2 emission factors are adjusted downward to 65% of the original value to account for differences in vapor pressure (Av gas vapor pressure = 7 psia, gasoline vapor pressure = 11 psia; 7 divided by 11 is approximately 65%).

Jet Fuel Assumptions

- 1. Saturation factor (S), true vapor pressure (P), molecular weight (M) and temperature (T) are determined by a weighted average of factors from permitted bulk plants, apportioned based on annual jet fuel throughputs.
- 2. Three types of fuel transfers are quantified: into AST, into pony trucks, and into airplanes.
- 3. Breathing and spillage losses are negligible.

TEMPORAL ACTIVITY:

Activity is assumed to be uniform throughout the year, as shown in the table below.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3

² SBCAPCD Rule 316: Storage and Transfer of Gasoline

EMISSIONS EXAMPLE:

	Throughput (gal)	Working Loss (ton/yr)	Breathing Loss (ton/yr)
Gasoline	2,319,047	1.07	0.61
Av gas	411,289	1.26	0.28
Jet Fuel	8,843,519	0.44	0
Total	11,573,855	2.76	0.89

2016 Bulk Plant Process Rates and Emissions

APPENDIX:

SBCAPCD GDF Scenarios (lb ROG/kgal)³

Scenario	Scenario Description	Loading	Breathing	Refueling	Spillage	Total
1	AST: No Control	8.4	2.1	8.4	0.61	19.51
2	AST: Phase I only	0.42	2.1	8.4	0.61	11.53
3A	AST: Phase I and II w/o Vent Valve	0.42	2.1	0.42	0.42	3.36
3B	AST: Phase I and II w/Vent Valve	0.42	0.525	0.42	0.42	1.785
3C	AST: Phase I EVR and II w/Vent Valve	0.15	0.53	0.42	0.42	1.52
4	UST: No Control	8.4	1	8.4	0.61	18.41
5A	UST: Phase I only	0.42	1	8.4	0.61	10.43
5B	UST: Phase I with Vent Valve	0.42	0.25	8.4	0.61	9.68
6A	UST: Phase I and II w/o Vent Valve	0.42	1	0.42	0.42	2.26
6B	UST: Phase I and II w/Vent Valve	0.42	0.25	0.42	0.42	1.51
6C	UST: Phase I EVR and II w/Vent Valve	0.15	0.25	0.42	0.42	1.24
7	UST: Phase I & Phase II EVR	0.15	0	0.38	0.24	0.77

³ CAPCOA's Air Toxics "Hot Spots" Program: Gasoline Service Station Industrywide Risk Assessment Guidelines (1997), with updates from the SBCAPCD GDF EF Memo (2006)