San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

2007 Area Source Emissions Inventory Methodology
310 – OIL PRODUCTION FUGITIVE LOSSES

I. Purpose

This document describes the Area Source Methodology used to estimate fugitive emissions of volatile organic compounds (VOCs) from oil sumps and well cellars in the San Joaquin Valley Air Basin. An area source category is a collection of similar emission units within a geographic area (i.e., a County). An area source category collectively represents individual sources that are small and numerous, and that may not have been inventoried as specific point, mobile, or biogenic sources. The California Air Resources Board (CARB) has grouped these individual sources with other like sources into area source categories. These source categories are grouped in such a way that they can be estimated collectively using one methodology.

II. Applicability

The emission calculations from this Area Source Methodology apply to facilities that are identified by the following Category of Emission Source (CES) codes and Reconciliation Emission Inventory Codes (REIC):

Table 1. Emission inventory codes.

CES	REIC	Description
81950	310-300-1600-0000	Oil Production Fugitive Losses – Sumps and Pits
82016	310-312-1600-0000	Oil Production Fugitive Losses – Well Cellars

III. Point Source Reconciliation

Emissions from the area source inventory and point source inventory are reconciled against each other to prevent double counting. This is done using relationships created by the California Air Resources Board (ARB) between the area source REIC and the point sources' Standard Industry Classification (SIC) code and emissions process Source Category Code (SCC) combinations. The area sources in this methodology are not represented within our point source inventory; therefore, reconciliation is not necessary.

IV. Methodology Description

SUMPS:

After petroleum is pumped from the ground, the crude oil must be separated from the water, sand and other fluids present. In most cases, this process occurs in tanks or a combination of tanks and sumps. A sump is defined as an excavated lined or unlined pit (excavated depression) in the ground that is used to separate oil, water, and sand from oil production operations. For the purpose of estimating emissions, sumps can be separated into the following three classes based upon the stage within the treatment process:

- First stage (primary) production sump: A sump that receives a stream of crude oil and produced water directly from one or more oil production wells or field gathering systems.

- Second stage (secondary) production sump: A sump that receives waste water streams (water/oil) from one or more first stage separators (including first stage sumps and/or tanks).

- Third stage (tertiary) production sump: A sump that receives waste water streams (water/oil) from one or more second stage separators (including second stage sumps and/or tanks). In most cases, there are only small amounts of oil present in the waste streams.

Sumps are also classified based upon the type of petroleum they receive:

- Light oil service sumps: Sumps which contain crude oil having an American Petroleum Institute's (API) gravity of 30º or greater.

- Heavy oil service sumps: Sumps which contain crude oil having an API gravity less than 30º.

WELL CELLARS:

A well cellar is a lined or unlined containment surrounding one or more wellheads, allowing access to the wellhead components for servicing and/or installation of blowout prevention equipment. A well cellar is designed to catch any liquid that may leak or spill from wellhead maintenance operations or faulty well equipment. As with sumps, well cellars are also classified based upon the type of petroleum they receive.

This methodology estimates fugitive emissions of VOCs from sumps and well cellars. For this emissions inventory, the District surveyed the oil and gas production industry to determine the total surface area of first, second and third stage heavy and light oil sumps; as well as, the total surface area of heavy and light oil well cellars in the District. The total surface area of each sump and well cellar was then multiplied by an emission factor to estimate VOC emissions.

V. Activity Data

Oil production facilities within the District were surveyed to determine the number and surface area of active sumps and well cellars. A copy of the survey form is included in Appendix A. Industry response to the survey is presented in the following table:

Table 2. Oil production facility response to the District's sump and well cellar survey (2007).

Facility Type	Surveys		
	Mailed (no.)	Returned (no.)	Returned (%)
Large Operations[1]	39	37	94.9
Small Operations	228	173	75.9
TOTAL	267	210	78.7

[1]Large Operations: Operations subject to District Rule 2520 (Federally Mandated Operating Permits)

The number of active sumps and well cellars by facility size and oil specific gravity are presented in the following table:

Table 3. Survey results of the number of sumps and well cellars in the District by facility size and oil specific gravity (2007).

Classification	First Stage Sumps (no.)	Second Stage Sumps (no.)	Third State Sumps (no.)	Well Cellars (no.)
Large Operations				
Light Oil	0	0	0	1,907
Heavy Oil	0	0	1	2,643
Small Operations				
Light Oil	0	6	10	972
Heavy Oil	0	34	44	1,275
TOTAL				
Light Oil	0	6	10	2,879
Heavy Oil	0	34	45	3,918

The surface area of active sumps and well cellars by facility size and oil specific gravity are presented in the following table:

Table 4. Survey results of the surface area of sumps and well cellars in the District by facility size and oil specific gravity (2007).

Classification	First Stage Sumps (ft^2)	Second Stage Sumps (ft^2)	Third Stage Sumps (ft^2)	Well Cellars (ft^2)
Large Operations				
Light Oil	0	0	0	113,761
Heavy Oil	0	0	4,800	135,281
Small Operations				
Light Oil	0	4,266	35,206	61,254
Heavy Oil	0	68,372	103,829	38,763
TOTAL	0			
Light Oil	0	4,266	35,206	175,015
Heavy Oil	0	68,372	108,629	174,044

The average facility sump and well cellar surface area was then calculated for large and small, heavy and light oil operations.

For example: average surface area of large operations heavy oil third stage sumps

$$\text{Ave surface area}_{3^\circ \text{ sumps ft2}} = \sum \text{surface area}_{3^\circ \text{ sumps ft2}} \div \sum \text{facilities}_{\text{reporting } 3^\circ \text{ sumps}}$$

Table 5. Facility average surface area of sumps and well cellars in the District by facility size and oil specific gravity (2007).

Classification	First Stage Sumps (ft^2)	Second Stage Sumps (ft^2)	Third Stage Sumps (ft^2)	Well Cellars (ft^2)
Large Operations				
Light Oil	0	0	0	8,125.81
Heavy Oil	0	0	320.0	9,018.75
Small Operations				
Light Oil	0	101.57	838.24	1,458.42
Heavy Oil	0	876.56	1,331.14	496.96

Sump and well cellar surface area was then adjusted to account for facilities that did not respond to the survey. For facilities that did not respond to the survey, an average value (see Table 5) was assumed based on the non-responding facility's size and oil specific gravity (Large: 2 heavy oil; Small: 33 heavy and 20 light oil).

Table 6. Adjusted surface area of sumps and well cellars in the District by facility size and oil specific gravity. Results adjusted to account for facilities that did not respond to the survey (2007).

Classification	First Stage Sumps (ft^2)	Second Stage Sumps (ft^2)	Third Stage Sumps (ft^2)	Well Cellars (ft^2)
Large Operations				
Light Oil	0	0	0	113,761
Heavy Oil	0	0	5,440	153,319
Small Operations				
Light Oil	0	6,297	51,971	77,654
Heavy Oil	0	97,298	147,757	55,163
TOTAL				
Light Oil	0	6,297	51,971	191,415
Heavy Oil	0	97,298	153,197	208,481

VI. Emission Factors

Emission factors for crude oil production sumps and cellars are from a correction made to the Technical Guidance Document for the Emission Inventory Criteria and Guidelines Regulation for AB 2588 (Air Toxics "Hot Spots" Information and Assessment Act of 1987) by the Kern County Air Pollution Control District (see the memo presented in Appendix B) These emission factors are summarized in the following table:

Table 7. Uncontrolled emission factors for oil sumps.

Sump Classification	Total Organic Gas (lb/ft^2-day)	Fractional Reactive Organic Gas*	Reactive Organic Gas (lb/ft^2-day)
Heavy Oil (API <30°)			
First Stage	0.10459	0.80	0.0837
Second Stage	0.05149	0.80	0.0412
Third Stage	0.00641	0.80	0.0051
Light Oil (API > 30°)			
First Stage	0.143	0.80	0.1144
Second Stage	0.02	0.80	0.016
Third Stage	0.01	0.80	0.008

* See Appendix B: "Revised Technical Guidance Document" (ROG = 80% of TOG)

The emission factors for first stage sumps were used for well cellars.

VII. Emissions Calculations

A. Assumptions

1. "Active" sumps are first, second, and third stage sumps used exclusively for the separation of crude petroleum from water produced during production.
2. Total sump and well cellar area and classification (heavy/light oil, first/second/third stage sumps) as reported through the District's survey are accurate.
3. Emissions from active sumps are uncontrolled.
4. The method used to account for facilities that did not respond to the District's survey accurately represents their sump and well cellar area.
5. Second and third stage sumps contain fluid 365 days per year.
6. The emission factors for oil sumps are independent of temperature, and emissions activity is assumed to be uniform throughout the year.
7. Well cellars receive fluid 1 day per year (letter from Chevron dated October 17, 2000).

B. Sample Calculations

VOC emissions from light oil sumps in Kern County:

Step 1. Multiply the total area (ft^2) of each stage sump by the appropriate emission factor for light oil (API > 30º) times 365 days/year.

$$\text{VOC}_{\text{First-stage sumps, lbs}} = \sum \textit{First-stage sump area } (ft^2)\ x\ \frac{0.0837\ \text{lbs VOC}}{\text{ft}^2 - \text{day}}\ x\ \frac{365\ \textit{days}}{\textit{year}}$$

$$\text{VOC}_{\text{Second-stage sumps, lbs}} = \sum \text{Second stage sump area } (\text{ft}^2)\ x\ \frac{0.0412\ \text{lbs VOC}}{\text{ft}^2 - \text{day}}\ x\ \frac{365\ \textit{days}}{\textit{year}}$$

$$\text{VOC}_{\text{Third-stage sumps, lbs}} = \sum \text{Third stage sump area } (\text{ft}^2)\ x\ \frac{0.0051\ \text{lbs VOC}}{\text{ft}^2 - \text{day}} \times \frac{365\ \textit{days}}{\textit{year}}$$

Example:

$$\text{VOC}_{\text{First-stage sumps, lbs}} = 0\ ft^2\ x\ \frac{0.0837\ \text{lbs VOC}}{\text{ft}^2 - \text{day}}\ x\ \frac{365\ \textit{days}}{\textit{year}} = \frac{0\ \textit{lbs VOC}}{\textit{year}}$$

$$\text{VOC}_{\text{Second-stage sumps, lbs}} = 5{,}993 \ ft^2 \ x \ \frac{0.016 \ \text{lbs VOC}}{\text{ft}^2 - \text{day}} \ x \ \frac{365 \ days}{year} = \frac{34{,}999 \ lbs \ VOC}{year}$$

$$\text{VOC}_{\text{Third-stage sumps, lbs}} = 38{,}206 \ ft^2 \ x \ \frac{0.008 \ \text{lbs VOC}}{\text{ft}^2 - \text{day}} \ x \ \frac{365 \ days}{year} = \frac{111{,}562 \ lbs \ VOC}{year}$$

Step 2. Add the annual VOC emissions for each sump stage and multiply by 1 ton over 2,000 lbs to obtain the annual VOC emissions in tons of VOC per year.

$$VOC_{Sumptotal,tons} = \left[lbs VOC_{First\text{-}stage sumps} + lbs VOC_{Second\text{-}stage sumps} + lbs VOC_{Third\text{-}stage sumps}\right] * \frac{1 ton}{2{,}000 lbs}$$

Example:

$$VOC_{Sump\ total,\ tons} = \left[\frac{0 \ \text{lbs VOC}}{\text{year}} + \frac{34{,}999 \ \text{lbs VOC}}{\text{year}} + \frac{111{,}562 \ \text{lbs VOC}}{year}\right] * \frac{1 \ ton}{2{,}000 \ lbs} = \frac{73.28 \ tons \ VOC}{year}$$

VIII. Temporal Variation

We assume sump emissions are independent of temperature, and emissions activity is uniform throughout the year.

A. Daily

CARB Code 24. 24 hours per day - uniform activity during the day.

B. Weekly

CARB Code 7. 7 days per week - uniform activity every day of the week

C. Monthly

Uniform monthly activity. 8.33% per month

We assume well cellars receive fluid one day per year.

IX. Spatial Variation

Oil production facilities are located in the Central and Southern Regions of the District, with the heaviest concentration in Kern County.

X. Growth Factor

Growth factors are developed by either the District's Planning Department or CARB for each EIC. These factors are used to estimate emissions in future years. The growth factors associated with this emissions category may be obtained from the Air Quality Analysis Section of the District's Planning Department.

XI. Control Level

Control levels are developed by either the District's Planning Department or CARB for each EIC. Control levels are used to estimate emissions reductions in future years due to implementation of District rules. These control levels take into account the effect of control technology, compliance and exemptions at full implementation of the rules.

Oil sumps are subject to District Rule 4402 (Crude Oil Production Sumps). Control levels associated with this emissions category may be obtained from the Air Quality Analysis Section of the District's Planning Department.

XII. ARB Chemical Speciation

CARB has developed organic gas profiles in order to calculate reactive organic gasses (ROG), volatile organic compounds (VOC) or total organic gas (TOG) given any one of the three values. For each speciation profile, the fraction of TOG that is ROG and VOC is given. The organic gas profile codes can also be used to lookup associated toxics. CARB's speciation profiles for fugitive emissions from oil sumps and well cellars is presented in Table 8.

Table 8. CARB organic gas speciation profiles for oil sumps (profile 537) and well cellars (profile 532).

Profile Description	CARB Organic Gas Profile#	Fractions	
		ROG	VOC
Crude Oil – Sumps, Wells, HOTS, Kern Co	537	0.912*	0.912*
Oil & Gas Extraction – Well Heads & Cellars/Oil & Water Separators	532	0.606	0.606

*These values differ from what the District uses. See Revised Technical Guidance document (ROG = 80% of TOG)

XIII. Assessment Of Methodology

The accuracy of this estimate is dependent upon data provided to the District by the oil production industry (SIC 1311) through our survey. Our estimate excludes any pits, ponds or sumps not used for separating crude oil such as those used to for clean produced water; the EPA's *Spill Prevention, Control, and Countermeasure Rule* (SPCC); inactive units, etc.

When ARB calculated oil sump emissions in 1993, they used an emission factor (EF) of 0.0515 lbs ROG/ft^2-day for second stage heavy oil sumps. In this methodology, the District uses an emission factor of 0.0412 lbs ROG/ft^2-day for second stage heavy oil sumps. This emission factor represents a 3.6 fold decrease in lbs ROG/ft^2-day compared to the one used in the previous estimate. The impact of this change is demonstrated below for Kern County's 78,798 ft^2 of second stage heavy oil sumps:

$$ARB\ EF = \frac{78{,}798\ ft^2}{year}\ x\ \frac{0.0515\ lbs\ VOC}{ft^2 - day}\ x\ \frac{365\ days}{year}\ x\ \frac{1\ ton}{2{,}000\ lbs} = \frac{742.29\ tons}{year}$$

$$District\ EF = \frac{78{,}978\ ft^2}{year}\ x\ \frac{0.0412\ lbs\ VOC}{ft^2 - day}\ x\ \frac{365\ days}{year}\ x\ \frac{1\ ton}{2{,}000\ lbs} = \frac{593.84\ tons}{year}$$

As demonstrated above, this change results in an decrease of 148 tons per year of VOC in Kern County due to the use of the new emission factor for second stage heavy oil sumps.

XIV. Emissions

Since oil sumps and well cellars are not represented in the Districts point source inventory, the total unreconciled emissions are equal to the area source emissions. Following is the 2007 total unreconciled (point source plus area source) emissions inventory for oil sumps and well cellars. Emissions are reported for each county in the District.

Table 9. Total emissions for oil sumps and well cellars (2007).

County	Emissions (tons/year)					
	NOx	CO	SOx	VOC[(1)]	PM_{10}	$PM_{2.5}$[(2)]
Oil Production Fugitive losses – Sumps and Pits (310-300-1600-0000)						
Fresno	N/A	N/A	N/A	9.75	N/A	N/A
Kern	N/A	N/A	N/A	761.35	N/A	N/A
Kings	N/A	N/A	N/A	0.00	N/A	N/A
Madera	N/A	N/A	N/A	0.00	N/A	N/A
Merced	N/A	N/A	N/A	0.00	N/A	N/A
San Joaquin	N/A	N/A	N/A	0.00	N/A	N/A
Stanislaus	N/A	N/A	N/A	0.00	N/A	N/A
Tulare	N/A	N/A	N/A	197.34	N/A	N/A
TOTAL	N/A	N/A	N/A	968.44	N/A	N/A
Oil Production Fugitive losses – Well Cellars (310-312-1600-0000)						
Fresno	N/A	N/A	N/A	1.11	N/A	N/A
Kern	N/A	N/A	N/A	19.01	N/A	N/A
Kings	N/A	N/A	N/A	0.12	N/A	N/A
Madera	N/A	N/A	N/A	0.00	N/A	N/A
Merced	N/A	N/A	N/A	0.00	N/A	N/A
San Joaquin	N/A	N/A	N/A	0.00	N/A	N/A
Stanislaus	N/A	N/A	N/A	0.00	N/A	N/A
Tulare	N/A	N/A	N/A	0.17	N/A	N/A
TOTAL	N/A	N/A	N/A	20.41	N/A	N/A

(1) The District only reports ROG to CARB. As noted in Section XII, ROG is the same as VOC.

Following is the net change in total unreconciled emissions between this update (2007 inventory year) and CEIDARS data for the previous year (2006 inventory year) for oil sumps and well cellars. The changes in emissions are reported for each county in the District.

Table 10. Net emissions change for oil sumps and well cellars (2007).

County	Emissions (tons/year)					
	NOx	CO	SOx	VOC[1]	PM_{10}	$PM_{2.5}$[2]
Oil Production Fugitive losses – Sumps and Pits (310-300-1600-0000)						
Fresno	N/A	N/A	N/A	-9.13	N/A	N/A
Kern	N/A	N/A	N/A	645.17	N/A	N/A
Kings	N/A	N/A	N/A	-20.16	N/A	N/A
Madera	N/A	N/A	N/A	0	N/A	N/A
Merced	N/A	N/A	N/A	0	N/A	N/A
San Joaquin	N/A	N/A	N/A	0	N/A	N/A
Stanislaus	N/A	N/A	N/A	0	N/A	N/A
Tulare	N/A	N/A	N/A	197.34	N/A	N/A
TOTAL	N/A	N/A	N/A	813.22	N/A	N/A
Oil Production Fugitive losses – Well Cellars (310-312-1600-0000)						
Fresno	N/A	N/A	N/A	-0.73	N/A	N/A
Kern	N/A	N/A	N/A	-23.42	N/A	N/A
Kings	N/A	N/A	N/A	0.04	N/A	N/A
Madera	N/A	N/A	N/A	0	N/A	N/A
Merced	N/A	N/A	N/A	0	N/A	N/A
San Joaquin	N/A	N/A	N/A	0	N/A	N/A
Stanislaus	N/A	N/A	N/A	0	N/A	N/A
Tulare	N/A	N/A	N/A	0.11	N/A	N/A
TOTAL	N/A	N/A	N/A	-24.04	N/A	N/A

(1) The District only reports ROG to CARB. As noted in Section XII, ROG is the same as VOC.

XV. Revision History

2007. This is a new District methodology based on a survey of oil producers.

XVI. Update Schedule

The area source categories within this methodology have update authority "B" codes. This means that ARB develops default emissions for these sources, but Districts may overwrite them subject to ARB review and approval. Since the District is not directly responsible for maintaining these area source categories, they will only be updated as needed.

XVII. References

1. Kern County Air Pollution Control District. 1990. Corrections to CARB's AB 2588 Air "Hot Spots" technical guidance document, Table D-1, Page 118.

2. California Air Resources Board. 2004. Definitions of VOC and ROG http://www.arb.ca.gov/ei/speciate/definitions.htm

3. California Air Resources Board Technical Review Group. 1988. Technical support document for suggested control measure for the control of organic compound emissions from sumps used in oil production operations.

4. Clark, L. 2007. Independent Oil Producers Agency. Personal Communication via e-mail and visit.

5. Eaton, W.S. 1980. Fugitive hydrocarbon emissions from petroleum production operations.

6. Funk, T.H. 2003. Emission inventory methodology – Oil and gas sumps. Somona Technology, Inc., Petaluma, CA.

7. Gunderson, D. 2007. Aera Energy. Personal Communication via e-mail.

8. San Joaquin Valley Air Pollution Control District. 2000. Rule 4441 (Draft): Well cellars and sumps.

9. San Joaquin Valley Air Pollution Control District. 1991. Rule 4402: Crude oil production sumps. http://www.valleyair.org/rules/currntrules/r4401.pdf

10. United States Environmental Protection Agency. 1993. Supplement D to Compilation of Emission Factors (AP-42), U.S. GPO, Washington D.C., 1993. http://www.epa.gov/ttn/chief/ap42/

XVIII. Appendices

Appendix A. District Sump and Well Cellar Survey

Appendix B. Memo from Kern Co. APCD: Revised Technical Guidance Document

Appendix A. District Sump and Well Cellar Survey

Active Sump and Well Cellar Data For Calendar Year 2007

Please complete this Emissions Inventory survey and return to any of the District offices. The data will be used to improve the District's area-wide emission inventory. This information is vital to ensure that future air pollution control plans and rules reflect actual emissions and do not overestimate your industry's emissions. Thank you for your assistance. If you have any questions please call Maya Hildebrand-Garcia at (559) 230-5934.

The questions below refer only to active sumps used as first, second, and third-stage production sumps. It does not refer to sumps used to for clean produced water, the EPA's (Spill Prevention, Control, and Countermeasure Rule (SPCC), evaporation, precipitation, percolation, or any pits and ponds not used for separating crude oil.

1. Light Crude Oil (>30º API Gravity)

Production Sumps	**Total number**	**Total area (square feet)**
First Stage	_____	_____
Second Stage	_____	_____
Third Stage	_____	_____
Well cellars	_____	_____

2. Heavy Crude Oil (<30º API Gravity)

Production Sumps	**Total number**	**Total area (square feet)**
First Stage	_____	_____
Second Stage	_____	_____
Third Stage	_____	_____
Well cellars	_____	_____

3. Comments:

_____
_____
_____
_____

4. Contact Information

Facility name: _____
Contact person: _____
Address: _____
Telephone:_____FAX: _____E-mail _____

Appendix B. Revised Technical Guidance Document

Current Emis Factors

KERN COUNTY AIR POLLUTION CONTROL DISTRICT

2700 "M" Street, Suite 27
Bakersfield, California 93301
Telephone: (805) 861-3682

WILLIAM J. RO
Air Pollution Control

April 25, 1990

AB 2588 AIR TOXIC "HOT SPOTS"

Subject: Corrections to CARB's AB 2588 Air Toxics "Hot Spots" Technical Guidanc
Document Table D-1, Page 118:

The District received several questions regarding possible emission factor error
in Table D-1 of *CARB's Technical Guidance Document for the Emission Inventor
Criteria and Guidelines Regulation for AB 2588 (Air Toxics "Hot Spots" Informatio
and Assessment Act of 1987).* The District consulted with CARB regarding th
possible errors, and the following corrections were noted in Table D-1, page 11
of CARB's Technical Guidance Document:

TABLE D-1

CATEGORY		EMISSION FACTORS
Well Cellars		Same as Sump
Oil/Water Separators ..... (Source: BAAQMD TEST RESULTS)		925 lbs VOC (TOG)/MM Gallon Wastewater (uncontrolled) (85% control efficiency with cover)
SUMPS		
	Light Crude[a]	
	Primary Sumps	0.143 lbs TOG/sq ft-day
	Secondary	0.02 lbs TOG/sq ft-day
	Tertiary	0.01 lbs TOG/sq ft-day
	Heavy Crude[b]	
	Primary Sumps	0.10459 lbs TOG/sq ft-day
	Secondary	0.05149 lbs TOG/sq ft-day
	Tertiary	0.00641 lbs TOG/sq ft-day
Pumps		0.004 lb TOG/well-day *
Compressors		0.07 lb TOG/well-day *
Well Heads		0.01 lb TOG/well-day *

Steam Drive Wells (controlled)	2.75 lbs TOG/well-day (controlled)
Steam Drive Wells (uncontrolled)	275 lbs TOG/well-day (uncontrolled)
Cyclic Steam Wells (uncontrolled)	3.6 lbs TOG/well-day or:
Cyclic Wells (controlled)	3.315 lb TOG/well-day
"Pseudocyclic" wells (tertiary)	110 lb/day-well

a Extrapolated from API/Rockwell and ARB test results
b Results obtained from ARB testing between 1983 - 1986

NOTE:

1. The emission factors marked with asterisks (pumps, compressors, and well heads) should be used for primary oil production only.

2. The District estimates that "ROG" comprises of approximately 80 % of "TOG". Emission factors expressed in ROG units, must be converted to TOG units prior to using for AB 2588 purposes. The conversion is accomplished by dividing the ROG emission factor by 0.8, and the result will be in "TOG" units.

3. According to CARB, generally speaking, VOC can be interpreted to mean the same as TOG.

Should you have any questions or concerns please contact Steve Arita at (805) 861-3682.