APPENDIX H

Estimated Emission Impacts and Costs of
Aboveground Storage Tanks (AST) Phase I Proposal

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California Environmental Protection Agency

Air Resources Board

Cost Effectiveness Report:

Estimated Emission Impacts and Costs of Aboveground Storage Tanks (AST) Phase I Proposal

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February 3, 2015

I) Introduction

In response to concerns raised by several local air districts, California Air Resources Board (ARB or Board) staff conducted a cost effectiveness analysis of the Phase I Enhanced Vapor Recovery (EVR) requirements for aboveground storage tanks (AST) that were approved by the Board in 2007 and adopted in 2008. Staff reviewed the methodologies and assumptions that were used during the 2007 AST EVR rulemaking. Staff also collected updated information on actual Phase I EVR equipment and installation costs in 2013. Staff determined that the cost of Phase I EVR for AST was higher in 2013 than anticipated during the 2007 rulemaking. In response to this finding, staff has proposed amendments to the AST EVR regulations that are intended to improve cost effectiveness while retaining necessary emission reductions.

Staff has determined that the proposed regulation will result in approximately 11,150 pounds per year (0.015 tons per day) fewer emission reductions in 2014-15 than would be achieved assuming full implementation of the current regulation. This loss of benefits will decrease over the following years, reaching zero after approximately five years as pre-EVR Phase I equipment wears out and is replaced with EVR equipment. The total excess emissions allowed under the proposal, as compared to full implementation of the current Phase I EVR regulation, are estimated to be 33,450 pounds statewide over the five years that existing pre-EVR systems are expected to remain in use.

Staff finds that the statewide saving associated with the proposed AST amendments would be about $3,558,359. This savings is achieved through the time value of money over the deferred compliance period (approximately $885,055) as well as the avoidance of capital losses that would occur by requiring replacement of pre-EVR equipment that still has some useful service life (approximately $2,691,486). Estimated savings also takes into account the value of fuel lost through forgone emissions reductions resulting from continued use of pre-EVR systems (approximately $-18,182). The total saving would be shared by the estimated 2,084 AST owners that would be allowed to continue operating with their current pre-EVR systems beyond July 1, 2014.

The cost effectiveness of the proposed AST amendments is approximately $106 saved per pound of forgone emissions reductions (excess emissions allowed). This is calculated by dividing the total savings provided by the proposed amendments by the total amount of excess emissions that would be allowed by the amendment. Note that this analysis reflects the savings and excess emissions associated with the proposed regulatory action.

II) Costs and Savings of Proposed AST Amendment

This section details all of the costs and savings associated with the proposed amendments that allow for the continued use of existing pre-EVR Phase I systems on certain AST. This scope of this document is limited to the effects of the proposed amendment that allows an estimated 2,084 ASTs to continue operating with their current pre-EVR systems beyond July 1, 2014, deferring the upgrade to EVR until such time as their current pre-EVR systems wear out and require replacement. .

The proposed AST amendments provide an overall savings, which is achieved through the time value of money over the deferred compliance period and the avoidance of capital losses that would occur by requiring replacement of pre-EVR equipment that still has some useful service life. Each element required to determine the total costs and savings of the proposed AST amendments is discussed in subsections a through j below.

a. Cost of AST Phase I EVR and pre-EVR Equipment

A Phase I vapor recovery system is comprised of several components, which are common to all EVR systems and most pre-EVR systems. Figure 1 shows the typical location and configuration of Phase I vapor recovery components that were included in this survey. This represents the most common configuration of AST Phase I vapor recovery components. However, there are other configurations in use. For example, some AST systems are designed to be filled from the side of the tank rather than the top. Also, some pre-EVR Phase I systems utilize a coaxial fill port where vapors and liquid are exchanged through a single opening in the tank top. Those configurations, and other configurations that vary from the typical layout shown in Figure 1, are not accounted for in staff's estimate of Phase I equipment costs.

To establish the cost of Phase I AST EVR equipment, ARB staff surveyed several vapor recovery equipment distributors in late 2013. At the time of the equipment cost survey there were two certified Phase I EVR systems for AST, so staff obtained price quotes for each system. To account for the possibility that equipment pricing might vary by region, price quotes were obtained from distributors in the northern, central, and southern part of the state. Three quotes were obtained for each certified Phase I EVR system, and ARB staff estimated the cost of Phase I EVR equipment by taking the average of those three quotes.

Manufacturers of equipment used at gasoline dispensing facilities generally assign each component a "list price," as well as a "suggested retail price" that is significantly lower than list pricing. Everyone contacted by ARB staff during this survey indicated that a typical GDF operator will generally pay significantly less than list pricing, and will often pay slightly less than the suggested retail price. The level of discount provided to the GDF operator depends on several factors such as the distributor (some distributors may provide a higher discount), the quantity of equipment purchased, and whether the equipment is re-sold by a service contractor or middleman. Staff asked each manufacturer and distributor contacted in this survey to

provide the typical cost that an AST owner/operator would likely pay for each component. Based on the survey, Table 1 shows the average price quotes for each component of the two certified Phase I EVR systems.

Figure 1 – Typical Phase I EVR Equipment Configuration

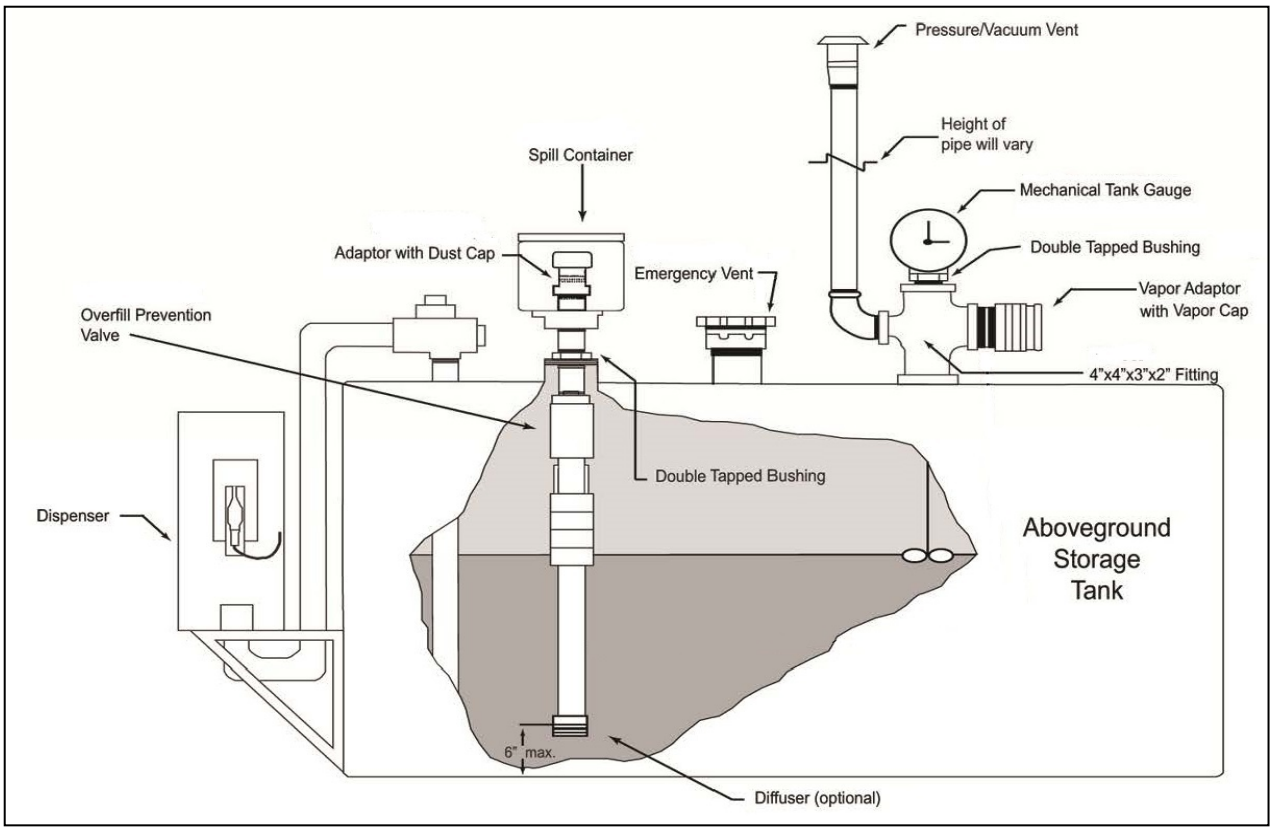


Table 1 –Cost of Phase I EVR Equipment

Component / Equipment	Phase I EVR System A				Phase I EVR System B			
	Quote 1	Quote 2	Quote 3	System A Average	System B Average	Quote 1	Quote 2	Quote 3
Overfill Prevention / Shutoff Valve	$ 740.14	$ 749.51	$ 866.58	$ 785.41	$ 1,081.88	$ 891.82	$ 1,328.00	$ 1,025.82
Product Adaptor	$162.60	$ 164.65	$ 188.18	$ 171.81				
Product Cap	$ 26.71	$ 17.86	$ 30.91	$ 25.16	$ 44.37	$ 34.00	$ 51.00	$ 48.10
Drop Tube	$ 62.18	$ 62.97	$ 71.96	$ 65.70	$ 30.30	$ 22.00	$ 25.40	$ 43.50
Spill Container	$ 649.50	$ 392.00	$ 488.00	$ 509.83	$ 522.04	$ 344.00	$ 308.52	$ 913.60
Drain Valve					NA	Not Part of This Phase I System		
Dry Disconnect Coupler	$ 534.04	$ 467.75	$ 618.04	$ 539.94	$ 231.68	$ -	$ 372.95	$322.10
Vapor Cap	$ 29.34	$ 29.72	$ 33.96	$ 31.01	$ 78.18	$ 34.00	$ 144.08	$ 56.46
Vapor Adaptor	$ 81.99	$ 83.02	$ 94.88	$ 86.63	$ 121.77	$ 110.00		$ 133.53
Emergency Vent (primary)	$ -	$ 117.66	$ -	$ 39.22	$ 193.63	$ 112.00	$ 191.65	$ 277.24
Emergency Vent (secondary)	$ 128.55	$ 130.17	$ 148.77	$ 135.83				
Gauging Port	$ -	$ 21.30	$ -	$ 7.10	$ 77.36	$ 85.00	$ 71.91	$ 75.18
Gauging Port Cap	$ 49.13	$ 17.86	$ 56.86	$ 41.28	$ 10.33	$ 31.00	$ -	$ -
Gauging Port Drop Tube	$ 62.18	$ 62.97	$ 71.96	$ 65.70	$ 30.30	$ 22.00	$ 25.40	$ 43.50
Gauge Port Cage	$ 137.33	$ 139.06	$ 134.00	$ 136.80	NA	Not Part of This Phase I System		
TOTAL	$ 2,663.69	$ 2,456.50	$ 2,804.10	**$2,641.43**	**$2,421.84**	$ 1,685.82	$ 2,518.91	$ 2,939.03
Average Phase I EVR Equipment Cost				**$ 2,532**				

To estimate the cost of AST Phase I pre-EVR equipment, staff referred to the Staff Report that was prepared for the original AST EVR rulemaking that was adopted in 2008. Table 2 shows estimated costs for AST Phase I pre-EVR equipment, based on that Staff Report

Table 2 - Cost of Phase I pre-EVR Equipment

Component	System A	System B	Average
drop tube	$ 65.00	$ 64.76	$ 64.88
overfill prevention	$ 840.00	$ 452.86	$ 646.43
product adaptor		$ 154.87	$ 154.87
product cap	$ 25.00	$ 21.16	$ 23.08
vapor adaptor	$ 155.00	$ 179.24	$ 167.12
vapor cap	$ 25.00	$ 23.07	$ 24.04
emergency vent	$ 82.50	$ 69.56	$ 76.03
gauging port	$ 392.50		$ 392.50
		TOTAL	**$ 1,549**

b. Average Life of Phase I EVR Equipment

Staff interviewed several GDF equipment manufacturers and determined the average life of AST Phase I EVR equipment is five years. It is understood that certain components may be expected to wear out in less than five years, while others may last much longer than five years. Components that include polymer seals can wear out after prolonged exposure to fuels and/or sunlight. Other components can be physically damaged by misuse, resulting in a shorter expected life. Five years is chosen to represent the average component life, and system costs are annualized based on an expected five year useful system life. Each individual tank owner's experience may differ from this estimated average, with higher actual annualized costs in cases of shorter system life and lower actual annualized costs in cases of longer system life.

c. Installation and Testing Costs of Replacing an Existing pre-EVR Phase I System with a Phase I EVR System

In addition to the equipment costs noted previously, the total cost of replacing an existing pre-EVR system with an EVR system includes labor costs for installation and initial post-installation testing of the Phase I EVR system. These costs must be accounted for when considering the overall cost of requiring a tank owner to replace their existing pre-EVR Phase I system with an EVR Phase I system. ARB staff surveyed several installation and testing contractors in early 2014. The results of this

survey are shown in Table 3. An average of all the installation and testing fees is used for statewide analysis.

Table 3 – Installation and Testing Costs for Phase I EVR

	Cost of Phase I EVR Installation and Testing
Contractor A	$2,000
Contractor B	$600
Contractor C	$2,000
Contractor D	$1,280
Contractor E	$1,280
Contractor F	$2,000
Average	**$1,527**

d. Permit Costs of Replacing an Existing Phase I pre-EVR System with a Phase I EVR System

Most local air districts require a tank owner to obtain a permit, or "authority to construct," before modifying or replacing their vapor recovery equipment. Districts usually charge a fee for this permit. This fee is associated with equipment replacement, and is not the same as the typical operating fees (permit fees) that are required for all tanks. The fees for "authority to construct" are part of the overall expense of upgrading from an existing pre-EVR Phase I system to an EVR Phase I system, and are accounted for in this analysis. ARB staff contacted districts to determine their current permit fees in August 2014. Fees vary amongst districts, as shown in Table 4. The districts shown in Table 4 include the largest number of tanks that would experience relief from Phase I EVR upgrade requirements under the proposed AST amendments. Since most affected ASTs are located in these districts, the average of these districts' fees is used for statewide analysis.

Table 4 – District Fees for Permit to Construct

	Fee for Permit to Construct
District A	$350*
District B	$441
Average	$395

* Permit fee for this district is based on the hours required for staff to process the permit, so this represents a typical Phase I EVR application.

e. Ongoing Maintenance and Testing Costs of Phase I pre-EVR System versus a Phase I EVR System

Pre-EVR Phase I and EVR Phase I systems generally consist of the same types of components, and are configured in generally the same way. Based on discussions with service contractors, staff determined that the maintenance and testing that is typically conducted on pre-EVR and EVR Phase I systems are similar. Accordingly, there is no significant difference in costs for ongoing periodic maintenance and testing of pre-EVR Phase I systems as compared to EVR Phase I systems. Because

the cost analysis for this rulemaking is concerned with a comparison of pre-EVR Phase I and EVR Phase I systems, there is no need to include ongoing maintenance and testing costs that are essentially equal in either case.

f. Total Cost of Replacing an Existing Phase I pre-EVR System with a Phase I EVR System

The total cost of replacing a pre-EVR Phase I system with an EVR Phase I system is the sum of the equipment costs, installation and initial testing costs, and permit costs that are described above, minus the value of fuel that will be saved by the Phase I EVR system as compared to the pre-EVR Phase I system.

Total Cost of Replacing a pre-EVR Phase I System with an EVR Phase I System

Equipment	$2,532
Installation and Testing	$1,527
Permit Fees	$395
Total	**$4,454**

g. Annualized Cost of Replacing an Existing Phase I pre-EVR System with a Phase I EVR System

The total cost of replacing a pre-EVR Phase I system with an EVR system can be annualized based on staff's estimate of the expected life of the system, which is five years. The total cost noted in the previous paragraph is annualized over a five year period using the following formula:

$$\frac{\text{Total Cost x Discount Rate}}{1-((1+\text{Discount Rate})^{(-\text{Lifetime})})}$$

Where the Discount Rate is 5% and the Lifetime is 5 years

$$\frac{\$4{,}454 \times 0.05}{1-((1+0.05)\,)^{(-5)})}$$

Following this formula yields an annualized cost of $1,029 per tank.

h. Cost Savings of Deferred Compliance

The proposed amendments would allow an estimated 2,084 ASTs to continue operating their currently installed pre-EVR Phase I systems beyond the July 1, 2014 upgrade deadline that is specified in current regulations. For these ASTs, the estimated $4,454 Phase I EVR upgrade cost would be delayed until some point in the future rather than on July 1, 2014. The longer an AST continues to operate with

its current pre-EVR system, the greater the cost savings of deferred compliance becomes.

Pre-EVR equipment must be replaced with EVR equipment when it reaches the end of its useful life. As discussed previously, staff estimates that both pre-EVR and EVR Phase I systems have an average useful life of five years. Accordingly, staff expects that approximately one fifth (20%) of all affected ASTs will replace their worn out pre-EVR systems in each of the five years following the July 1, 2014 upgrade deadline. Table 5 shows the number of tanks that are projected to replace their worn out pre-EVR systems in the coming years.

Table 5 – Projected Replacement of Aging Pre-EVR Phase I Systems

	Current Regulation		Proposed Amendments	
Year	**Tanks Upgrading**	**Upgrade Expenditures**	**Tanks Upgrading**	**Upgrade Expenditures**
2015	2,084	$ 9,282,136	417	$ 1,856,427
2016	0	0	417	$ 1,856,427
2017	0	0	417	$ 1,856,427
2018	0	0	417	$ 1,856,427
2019	0	0	417	$ 1,856,427
Total Upgrade Expenditures	$ 9,282,136		$ 9,282,136	
Total Annualized Upgrade Costs	$ 10,719,697		$ 10,719,697	
Present Value of Total Annualized Costs	$9,746,243		$8,861,187	

To calculate the total cost savings of deferred compliance, staff considered the total annualized statewide costs that would be experienced by these ASTs if they all upgraded on July 1, 2014 and compared it to the total annualized statewide costs if they upgraded as their current equipment wears out over five years as shown in Table 5. The difference between the total annualized costs of upgrading all 2,084 tanks in 2014-15 versus spreading that out over the following five years is $885,055 in present value (2014) dollars. Calculations for this are shown in Attachment 1.

i. Savings of Avoided Capital Loss

The proposed regulation would allow an estimated 2,084 ASTs to continue operating their currently installed pre-EVR Phase I systems beyond the July 1, 2014 upgrade deadline that is specified in current regulations. These ASTs benefit from realizing the full potential value of their currently installed pre-EVR equipment. For the purpose of this analysis, staff assumes that Phase I equipment has a useful service life of five years at which point it requires replacement. Based on this assumption,

we calculate that approximately one fifth (20%) of all affected ASTs installed their current pre-EVR systems in each of the five years preceding the July 1, 2014 deadline.

Installing a pre-EVR system would have cost each facility an average of $3,076, which includes the cost of pre-EVR equipment ($1,549) and installation ($1,527). When annualized as described in section g, above, this is equal to a cost of $710 per year over the five year expected life of the system. AST owners would expect to benefit from that investment over the five year useful life of the system, so staff calculates that 20% of the pre-EVR system's overall value is depreciated in each calendar year. Requiring the system to be replaced before the end of its useful life effectively deprives them from deriving the full expected use of their system. This is avoided by allowing continued use of pre-EVR equipment beyond July 1, 2014. Table 6 shows staff's projections of how the 2,084 affected facilities would benefit from this. Calculations for this are shown in Attachment 1.

Table 6 – Avoided Capital Loss

Install Date of pre-EVR System	**2010**	**2011**	**2012**	**2013**	**2014**
Affected Tanks	417	417	417	417	417
Present Value of pre-EVR system	$1,345,743	$1,345,743	$1,345,743	$1,345,743	$1,345,743
Projected Replacement Date	2015	2016	2017	2018	2019
% of Capital Loss if Required to Replace on the Current Regulatory Upgrade Deadline	0%	20%	40%	60%	80%
Present Value of Avoided Capital Loss	$0	$269,149	$538,297	$807,446	$1,076,594
TOTAL AVOIDED CAPITAL LOSS: $2,691,486					

j. Cost of Fuel Lost through Forgone Emissions Reductions

When compared to full implementation of Phase I EVR at all AST on July 1, 2014, as required under the current regulations, the AST proposal will result in a loss of potential emission reductions. AST owners who continue using their current pre-EVR systems are expected to experience a total statewide increase in emissions of 33,450 lbs. over the life of this regulation, as discussed in section III-f of this report (pg. 18). The forgone emission reductions resulting from continued use of pre-EVR Phase I systems results in less fuel remaining in the storage to be used by the AST operator, so it is appropriate to offset the savings of continued pre-EVR use with the value of fuel lost. Staff determined the annual value of statewide fuel lost due to continued use of pre-EVR systems by multiplying the total gallons lost by the average value per

gallon of the fuel lost over the lifetime of the regulation. Staff estimates that the value of fuel that will be lost in 2017 will be approximately $3.37 per gallon. This is based upon averaging the 2015-2019 "Low Price" case of the June, 2013, California Energy Commission forecast[1] and adjusting from inflation to determine the value of in 2014 (current) dollars. The "Low Price" was chosen in order to be consistent with the analysis done for savings associated with the ECO Nozzle requirements that are included in this proposal. By multiplying the $3.37 price per gallon by the total statewide emissions forgone as a result of the proposed AST amendments (33,450 pounds), and a conversion factor of 6.2 pounds per gallon of gasoline, staff estimates the value of the total statewide value of fuel lost due to continued use of pre-EVR systems allowed under the AST proposal to be $-18,182.

k. Total Savings of Proposed AST Phase I Amendments

The total savings of the proposed AST Phase I amendment is simply the sum of savings associated with deferred compliance (approximately $885,055) and avoided capital loss (approximately $2,691,486), minus the value of fuel lost due to forgone emissions reductions associated with continued use of pre-EVR systems (-$18,182). This results in an overall savings of approximately $3,558,359.

III) Emissions Benefits Delayed Under the Proposed AST Amendment

This section details the delayed emission benefits from Phase I AST systems resulting from the proposed amendments that will allow for the continued use of pre-EVR Phase I systems at certain AST. The scope of this document is limited to the effects of the proposed amendment that allows an estimated 2,084 ASTs to continue operating with their current pre-EVR systems beyond July 1, 2014, deferring the upgrade to EVR until such time as their current pre-EVR systems wear out and require replacement. .

The proposed amendment allows a slight delay in overall emission benefits as compared to full implementation of the current EVR regulation. This is due to the fact that an estimated 2,084 ASTs will continue operating with their current pre-EVR systems beyond July 1, 2014. Those pre-EVR systems achieve only 90% control of emissions associated with the transfer of fuel from the delivery truck into the AST, whereas EVR systems control 98% of those emissions. The proposed amendment requires replacement of pre-EVR equipment once it reaches the end of its useful service life, which staff estimates to be five years. Accordingly, emission reductions achieved by Phase I EVR for AST will be equal under the current and proposed regulations after five years. Each element required in determining the total emissions and emission reductions associated with the proposed regulation is discussed in subsections a through f below.

a. Emission Factors for Phase I Fuel Transfers

Staff estimates the emissions that occur when transferring fuel from a delivery truck into a tank with no Phase I vapor recovery controls will be an average of 8.4 pounds for every 1000 gallons transferred. This uncontrolled emission factor is derived from ARB's *Revised Emission Factors for Phase I Bulk Transfers at California Gasoline Dispensing Facilities*, which was published on December 23, 2013[1]. 8.4 pounds per 1000 gallons is slightly higher than the emission factor that was used during the 2001 EVR rulemaking for gasoline dispensing facilities with underground tanks, and during the 2007 AST EVR rulemaking (7.6 pounds for every 1000 gallons transferred.). It should be noted that 8.4 lb./1000 gallons represents an average value, and the actual value emitted during an uncontrolled fuel transfer will vary based primarily on temperature and fuel volatility.

Pre-EVR Phase I systems have been certified by ARB to control 90% of the emissions that would occur during an uncontrolled transfer, which was the required performance standard at the time of certification. EVR Phase I systems have been certified by ARB to control 98% of the emissions that would occur during an uncontrolled transfer, which is the performance standard specified in regulations adopted in 2008. Table 7 shows the control and emission factors for various Phase I systems.

Table 7 – Control and Emission Factors for Phase I Systems

	Phase I System Type		
	None	Pre-EVR	EVR
Control Factor (%)	0	90	98
Emission Factor (lbs. /1000 gal.)	8.4	0.84	0.168

b. Aboveground Storage Tank Population

In December 2013, ARB staff requested information from each air district about the population of permitted ASTs in their jurisdiction. The requested information was provided by 18 of the 19 districts that are not currently in attainment with the federal ozone standard. This data serves as the basis for staff's estimates of emission impacts and cost effectiveness of the proposed regulations. Data files provided by the districts have been compiled into a single spreadsheet that is available for review[2]. Two of the districts responded that they have no permitted ASTs located in

[1] Document is available at http://www.arb.ca.gov/vapor/gdf-emisfactor/Attachment_2%20-%2020%20NOV%202013.pdf

[2] An Excel file containing the raw AST population and throughput data provided by each district is available online at http://www.arb.ca.gov/regact/2014/vapor2014/vapor2014.htm

non-attainment areas. The single district that did not provide data is relatively small in terms of population, so staff does not believe that it is likely to contain enough permitted ASTs to significantly impact the statewide analysis. Table 8 shows the number of permitted ASTs for all districts that are not in attainment with the federal ozone standard, sorted alphabetically by district.

Based on information obtained during the 2007 AST EVR rulemaking and subsequent conversations with air district staff, it is understood that additional ASTs exist which are not permitted by their local air district. Those ASTs have been exempted from permitting under current district rules, and are therefore not subject to pre-EVR or EVR Phase I requirements. The proposed regulatory amendments allow current district exemptions to remain in place, so there would be no impact on ASTs that are currently exempted. Staff has therefore concluded that, for the purposes of this rulemaking, it is not necessary to attempt to quantify the number of unpermitted tanks.

Table 8 – Number of Permitted ASTs in Ozone Non-Attainment Areas by District

District	Number of ASTs	% of Total ASTs
Antelope Valley	40	1.1
Bay Area	652	17.9
Butte County	50	1.4
Calaveras	17	0.5
Eastern Kern	76	2.1
El Dorado County	21	0.6
Feather River	59	1.6
Imperial County	56	1.5
Mariposa County	No Data	No Data
Mojave Desert	134	3.7
Placer County	62	1.7
Sacramento Metro	124	3.4
San Diego	203	5.6
San Joaquin	1253	34.4
South Coast	790	21.7
Ventura	59	1.6
Yolo-Solano	47	1.3
TOTAL	**3,643**	**100**

c. Throughput of AST Fueling Facilities

Having accurate information on how much fuel is transferred into each permitted AST is critical in analyzing the cost savings and emission impacts of the proposed

regulatory amendments. Emissions reductions associated with Phase I EVR are directly proportional to gasoline throughput, so they cannot be estimated without accurate throughput information. The proposed amendments include exemptions from Phase I EVR July 1, 2014 upgrade requirements for certain ASTs with annual throughput under 18,000 gallons per year or under 60,000 year depending on the non-attainment classification of the district in which they are located. Therefore, throughput data is needed in order to estimate the number of tanks that will be required to upgrade to Phase I EVR, and the total statewide cost of required upgrades.

In December 2013, ARB staff requested information from each air district about the annual gasoline throughput of all ASTs permitted by the district, and the type of vapor recovery equipment that is currently installed on those ASTs. The requested information was provided by 18 of the 19 districts that are not currently in attainment with the federal ozone standard. Most of this information reflects 2012 gasoline throughput, although some districts were able to provide 2013 throughput information. Staff does not expect that AST facility population or throughput has changed significantly between 2012 and 2014, when Phase I EVR upgrades are required.

Some districts were unable to provide annual throughput data for some or all of their permitted tanks. To account for the throughputs of these tanks, staff has chosen to present two sets of estimates where appropriate: one based only on the tanks for which throughput data was provided, and a second that is extrapolated to estimate the impact on all permitted tanks that are located in areas that are not in attainment with the federal ozone standard (including those for which no annual throughput data was provided).

To estimate throughput for tanks where no throughput data was provided, staff applied two extrapolation techniques and averaged the results. The first extrapolation technique assumed that the tanks with unknown throughput would be substantially similar to the tanks with known throughput. In many districts, tanks are either subject to or exempt from EVR requirements based on throughput. The first extrapolation technique assumes that the percentage of tanks with unknown throughputs that are subject to or exempt from EVR requirements would be the same as the percentage of tanks with known throughput. The first extrapolation technique also assumed that, for tanks with unknown throughput, the average throughput of tanks subject to EVR would be the same as the average throughput of tanks with known throughput that are subject. Likewise, the average throughput of exempt tanks would be equal.

Staff believes that the first extrapolation technique may be biased towards overestimating the number and throughput of tanks that would be subject to EVR. To counteract this bias, the second extrapolation technique assumes that any tank with unknown throughput is actually under the throughput threshold that triggers the requirement to install Phase I EVR system in that district. For the second

extrapolation technique, the throughput of every unknown tank is assumed to be equal to the average throughput of EVR-exempt tanks in that district. Staff believes this extrapolation technique may be biased towards underestimating the number and throughput of tanks that would be subject to EVR, while overestimating the number of tanks that would be exempted from Phase I EVR requirements under the proposed regulation. Averaging results from the two techniques should serve to cancel out the potential biases.

See Table 9 for an example of how this extrapolation method was applied to tanks in an individual district. See Attachment 2 for tank population and throughput data for each district, including extrapolations for tanks where no throughput data was provided.

All districts were analyzed as shown in Table 9 except for South Coast AQMD. The AST data provided by South Coast AQMD did not include any actual throughput information. Instead, South Coast AQMD provided a maximum annual permitted throughput value for some (not all) ASTs. Because South Coast AQMD comprises such a large percentage of California's total AST population, staff decided that is was necessary to convert the provided maximum annual permitted throughput value into an estimated actual annual throughput value. To do this, staff looked at data from San Diego and Ventura districts, since these districts are close to South Coast AQMD and provided both the maximum permitted values and the actual annual throughput values for many of their ASTs. A ratio of the actual throughput to maximum permitted throughput was established at 0.57 gallons of actual throughput for every gallon of maximum permitted throughput. This ratio was used to estimate the actual throughput of ASTs in South Coast AQMD based on the maximum permitted throughput data provided by the district. The tanks for which no maximum permitted throughput value was provided were then analyzed as described in Table 6.

Because all tanks in South Coast AQMD will be required to upgrade to Phase I EVR under both the current regulations and the proposed amendments, this method of estimating throughput for South Coast AQMD has no effect on staff's calculations for the overall cost of the proposal. However, inaccuracies in estimating the actual throughput of South Coast AQMD's tanks will affect staff's statewide estimates of emission reductions and the overall statewide percentage of control that is achieved under the current regulation and the proposed amendment.

[1] California Energy Commission, Transportation Energy Office, Fuels and Transportation Division Crude Oil and Transportation Fuel Price Cases for the 2013 IEPR Inputs and Methods for the Transportation Energy Demand Forecast June 26, 2013 slide presentation by Ryan Eggers http://www.energy.ca.gov/2013_energypolicy/documents/2013-06-26_workshop/presentations/04_Price_Forecasts-Ryan_RAS_21Jun2013.pdf

Table 9 – Example of Extrapolation Technique Used for Tanks with Unknown Throughput

	Technique 1	Comments	Technique 2	Comments	Source
Total Number of ASTs in San Joaquin Valley APCD	1221		1221		District Data
Tank Count for ASTs with Known Throughput					
Number of ASTs	667	54.6% of all tanks	667	54.6% of all tanks	District Data
Number of ASTs that are Subject to EVR under the Proposal	234	35.1% of tanks with known throughput	234	35.1% of tanks with known throughput	District Data
Number of ASTs that are Exempt from EVR under the Proposal	433	64.9% of tanks with known throughput	433	64.9% of tanks with known throughput	District Data
Tank Count for ASTs with Unknown Throughput					
Number of ASTs	554	45.4% of all tanks	554	45.4% of all tanks	District Data
Number of ASTs that are Subject to EVR under the Proposal	194	554 tanks x 35.1%	0	Assume no tanks are above threshold	Extrapolated
Number of ASTs that are Exempt from EVR under the Proposal	359	554 tanks x 64.9%	554	Assume all tanks are below threshold	Extrapolated
Throughput for ASTs with Known Throughput					
Throughput of ASTs that are Subject to EVR under the Proposal	31,085,000	Gal. per yr.	31,085,000	Gal. per yr.	District Data
Average Throughput of ASTs that are Subject to EVR	132,278	Gal. per tank per yr.	132,278	Gal. per tank per yr.	District Data
Throughput of ASTs that are Exempt from EVR under the Proposal	2,613,000	Gal. per yr.	2,613,000	Gal. per yr.	District Data
Average Throughput of ASTs that are Exempt from EVR	6,049	Gal. per tank per yr.	6,049	Gal. per tank per yr.	District Data
Throughput for ASTs With Unknown Throughput					
Total throughput of ASTs that are Subject to EVR under the Proposal	25,662,000	194 tanks X 132,278 gal./ tank	0	Assume no tanks are above threshold	Extrapolated
Annual throughput of ASTs that are Exempt from EVR	2,175,000	359 tanks x 6,049 gal./ tank	3,351,000	554 tanks x 6,049 gal./ tank	Extrapolated
District Totals for All ASTs					
ASTs Subject to EVR	428	234 + 194	234		Extrapolated
ASTs Exempt from EVR	792	433 + 359	987	433 + 554	Extrapolated
Total Throughput of ASTs that are Subject to EVR	56,747,000	31,085,000 + 25,662,000	31,085,000		Extrapolated
Total Throughput of ASTs that are Exempt from EVR	4,788,000	2,613,000 + 2,175,000	5,964,000	2,613,000 + 3,351,000	Extrapolated
Final Result Based on Average of the Two Techniques					
ASTs Subject to EVR	**331**		**Total Throughput of ASTs that are Subject to EVR**		**43,916,000**
ASTs Exempt from EVR	**889**		**Total Throughput of ASTs that are Exempt from EVR**		**5,376,000**

d. Calculating Emissions from AST Phase I Fuel Transfers

In order to estimate emissions from Phase I fuel transfers for a given AST, staff simply applied the appropriate emission factor (based on the type of controls that are in place) to the annual throughput of the AST system. For example, consider a hypothetical AST with an annual throughput of 100,000 gallons per year. Depending on the type of Phase I system installed on that tank, its annual Phase I emissions would be as follows:

No Phase I System

$$\frac{100{,}000 \text{ gal}}{\text{year}} \times \frac{8.4 \text{ lbs.}}{1{,}000 \text{ gal.}} = 840 \text{ lbs./year}$$

Pre-EVR Phase I System

$$\frac{100{,}000 \text{ gal}}{\text{year}} \times \frac{8.4 \text{ lbs.}}{1{,}000 \text{ gal.}} \times 90\% \text{ Control Factor} = 84 \text{ lbs./year}$$

EVR Phase I System

$$\frac{100{,}000 \text{ gal}}{\text{year}} \times \frac{8.4 \text{ lbs.}}{1{,}000 \text{ gal.}} \times 98\% \text{ Control Factor} = 16.8 \text{ lbs./year}$$

e. Statewide Reductions from AST Phase I EVR under Current and Proposed Regulations

To calculate the total statewide reductions from Phase I vapor recovery systems under the current and proposed regulations, staff applied the methodology described above to each of the ASTs that are currently permitted by districts not in attainment with the federal 8-hour ozone standard. Under the current regulations all tanks would be required to install a Phase I EVR system, so a 98% control factor is used for all permitted tanks. Under the proposed regulation only certain tanks would be required to install a Phase I EVR system. A 98% control factor is used for those tanks, while a 90% control factor is used for the tanks that would be allowed to continue operating with their current pre-EVR Phase I system.

The results of this analysis are shown in Table 10. Table 10 includes columns showing only the tanks for which actual throughput was provided by the district, as well as columns showing the extrapolated results for all permitted tanks (even those where no throughput data was provided).

Table 10 – Statewide Phase I AST Emission Reductions under Current and Proposed Regulations

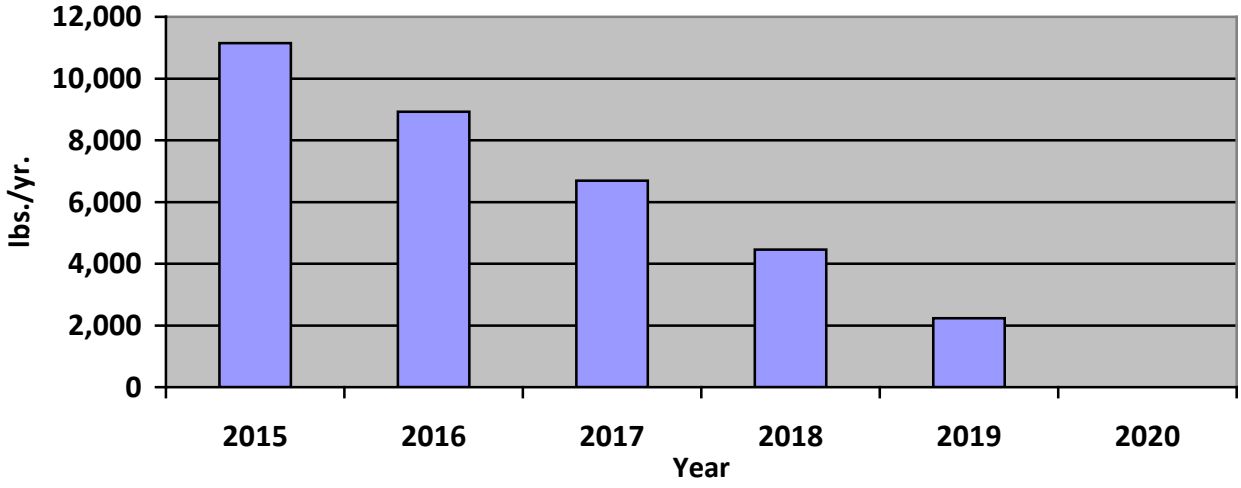
	Based only on Tanks with Known Throughput			Based on All Tanks (includes extrapolations)		
	Current Regulations	**Proposed Regulations**	**Difference**	**Current Regulations**	**Proposed Regulations**	**Difference**
# of ASTs	2018	2018		3,643	3,643	
# of ASTs with EVR	2018	1093		3,643	1,560	
# of ASTs with Pre-EVR	0	925	925	0	2,084	2,084
Total Throughput (gal/yr)	124,132,000	124,132,000		182,200,000	182,200,000	
EVR Throughput (gal/yr)	124,131,980	116,108,785	8,023,195	182,200,000	165,600,000	16,600,000
Uncontrolled Emissions (lb/yr)	1,042,700	1,042,700		1,530,480	1,530,480	
Remaining Emissions from EVR (lb/yr)	18,868	17,649	1,219	30,610	27,820	2,790
Remaining Emissions from pre-EVR (lb/yr)	0	6,098	-6098	0	13,940	-13,940
Total Remaining Emissions (lb/yr)	18,868	23,747	-4,879	30,610	41,760	-11,150
Total Emissions Reduced (lb/yr)	924,532	919,653	-4879	1,499,870	1,488,720	-11,150
Emission Reduced by Upgrading to EVR Phase I (lb/yr)	75,472	70,593	-4879	122,440	111,290	-11,150

f. Delay of Potential Emission Reductions

The proposed regulation reduces the number of ASTs that are required to install a Phase I EVR system by the current regulatory upgrade deadline of July 1, 2014. The proposal would result in a delay of potential emission reductions as compared to the current regulations, which envisions that all permitted ASTs in non-attainment areas would install a Phase I EVR system by July 1, 2014. Under full implementation of the current regulation, Phase I EVR controls would reduce ROG emissions by 122,440 pounds per year as compared to pre-EVR controls. Under the proposed regulation, Phase I EVR controls would reduce ROG emissions by 111,290 pounds per year as compared to pre-EVR controls. The difference in emission reductions achieved under full implementation of current regulations and proposed regulations would be 11,150 pounds per year.

The proposed regulation requires the 2,084 ASTs that can continue using their existing pre-EVR Phase I system to replace that equipment with EVR Phase I equipment as the current pre-EVR Phase I equipment wears out. Through this process, the emission reductions that would otherwise be achieved under the current regulations requiring all ASTs to upgrade by July 1, 2014 will occur at a later date through attrition and replacement of pre-EVR components. Staff estimates that the average useful life of a Phase I system is 5 years. Accordingly, it is estimated that one fifth of the 2,084 affected ASTs would replace their pre-EVR Phase I system in each of the five years following the July 1, 2014 upgrade deadline. The loss of potential emission reductions that would be allowed by pre-EVR systems as compared to EVR systems would decrease over the five-year replacement period, reaching zero in 2019-20 as shown in Figure 2. A total of approximately 33,450 pounds of potential emission reductions would be lost between 2014 and 2019 as compared to full implementation of Phase I EVR on all tanks by July 1, 2014.

Figure 2 - Loss of Potential Emission Reductions from Continued Use of pre-EVR Phase I



IV) Cost Effectiveness of Proposed AST Amendments

The proposal would result in a delay in the expected emission reductions as compared to full implementation of existing EVR requirements, with a loss of approximately 11,150 pounds of emission reductions per year in 2014-15, decreasing over the following five years. The proposal also results in an overall savings of approximately $3,558,359, which is the result of savings from deferred compliance (approximately $885,055), avoided capital loss (approximately $2,691,486), and value of fuel lost through forgone emissions reductions resulting from continued use of pre-EVR systems (approximately $-18,182).

To calculate the overall cost effectiveness, staff simply divided the total savings that would be realized by the total amount of increased emissions that would be allowed under the proposed regulation as compared to full implementation of the current AST EVR Phase I requirements.

Table 9 - Cost Effectiveness of Proposed Regulation

Total Savings ($)	$3,558,359
Total Loss of Emission Reductions (lbs.)	33,450
Savings per pound of Increased Emissions	$106/lb.

Note that this analysis reflects the savings and excess emissions associated with this proposed regulatory action. .

Attachment 1
Calculations for Cost Savings from Deferred Implementation

Cost Savings of Deferred Compliance										**Unit Annualized Cost of Compliant System:** $ 1,029	
Cost of EVR system : $2532 + $395 + $1527 = $4454										**# of ASTs:** 2,084	
Discount Rate: 5%		**5-yr CRF**= 0.230974798									
Baseline Scenario: All Systems Installed July 2014				**Policy Scenario:** **395 systems installed per year starting in 2014-15**:							
	Total Annualized cost of systems bought in:	***Present Value of annualized cost (2014$)***		Annualized cost of systems bought in:	Annualized cost of systems bought in:	Annualized cost of systems bought in:	Annualized cost of systems bought in:	Annualized cost of systems bought in:	***Total Annualized Cost***	***Present Value of annualized Cost (2014$)***
	2014-15			**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	***2014-2019***	
2014-15	$ 2,143,939	$ 2,143,939		$ 428,788					$ 428,788	$ 428,788
2015-16	$ 2,143,939	$ 2,041,847		$ 428,788	$ 428,788				$ 857,576	$ 816,739
2016-17	$ 2,143,939	$ 1,944,616		$ 428,788	$ 428,788	$ 428,788			$ 1,286,364	$ 1,166,770
2017-18	$ 2,143,939	$ 1,852,016		$ 428,788	$ 428,788	$ 428,788	$ 428,788		$ 1,715,152	$ 1,481,612
2018-19	$ 2,143,939	$ 1,763,824		$ 428,788	$ 428,788	$ 428,788	$ 428,788	$ 428,788	$ 2,143,939	$ 1,763,824
2019-20					$ 428,788	$ 428,788	$ 428,788	$ 428,788	$ 1,715,152	$ 1,343,866
2020-21						$ 428,788	$ 428,788	$ 428,788	$ 1,286,364	$ 959,904
2021-22							$ 428,788	$ 428,788	$ 857,576	$ 609,463
2022-23								$ 428,788	$ 428,788	$ 290,221
	Total:	**$ 9,746,243**							**Total:**	**$ 8,861,187**
		Total Cost Savings of Deferred Compliance:			**$ 885,055**					
		Annual Cost Savings when averaged over 2015-2019:			**$ 177,011**					

Attachment 1
Calculations for Cost Savings from Avoided Capital Loss

Avoided Capital Loss of Proposed AST Amendment

		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Baseline Scenario	# of EVR systems purchased	0	0	0	0	0	2084	0	0	0	0
	# of pre-EVR systems purchased	417	417	417	417	417	0	0	0	0	0
Policy Scenario	# of EVR compliant systems purchased	0	0	0	0	0	417	417	417	417	417
	# conventional systems purchased	417	417	417	417	417	0	0	0	0	0
% of capital loss for tank owners who replaced pre-EVR systems in each year		0%	20%	40%	60%	80%					
		2010	**2011**	**2012**	**2013**	**2014**					
Value of Capital Loss Avoided by proposed policy change		$0	$269,149	$538,297	$807,446	$1,076,594					

Annual Investment in Pre-EVR Systems (2010 -14): $1,345,743

Total Avoided Capital Loss: $2,691,486

Average per year (2015-19): $538,297

Assumptions

Cost of a pre-EVR system: *$3,075*
(includes equipment and installation)

Discount Rate: 5%

Life of pre-EVR system: 5 years

Annualized Cost of pre-EVR system: $710/yr.

Affected Tanks: 2,084

Present Value formula: PV=FV/(1+r)^n

Attachment 2
Tank Population and Throughput Data for Districts Not in Attainment with the Federal 8-Hour Ozone Standard

District	Total # of Tanks	Phase I Cut Point (gal/yr)	# of Tanks w/ Known TP	Total Throughput of Known Tanks (gal/yr)	# of Known Tanks Subject to EVR	# of Known Tanks Exempt from EVR	% of Known Tanks Subject to EVR	% of Known Tanks Exempt from EVR	EVR Throughput of Known Tanks (gal/yr)	Exempt Throughput Known (gal/yr)
Antelope Valley	40	60,000	36	1,279,993	4	32	11.1%	88.9%	816,191	463,802
Bay Area	652	18,000	76	1,894,679	19	57	25.0%	75.0%	1,513,079	381,600
Butte County	50	60,000	46	2,824,317	9	37	19.6%	80.4%	2,021,254	803,063
Calaveras	17	60,000	16	2,472,707	5	11	31.3%	68.8%	2,309,921	162,786
Eastern Kern	76	60,000	51	2,578,291	6	45	11.8%	88.2%	1,826,380	751,911
El Dorado County	21	60,000	20	249,259	1	19	5.0%	95.0%	66,227	183,032
Feather River	59	60,000	59	1,960,770	5	54	8.5%	91.5%	1,477,508	483,262
Imperial County	56	60,000	52	5,497,077	17	35	32.7%	67.3%	4,941,599	555,478
Mariposa County	No Data	60,000	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Mojave Desert*	134	60,000	0	0	0	0	0	0	0	0
Placer County	62	60,000	59	2,543,300	6	53	10.2%	89.8%	1,989,000	554,300
Sacramento Metro	124	18,000	103	5,056,516	35	68	34.0%	66.0%	4,605,000	451,516
San Diego	203	1	167	10,086,656	167	0	100.0%	0.0%	10,086,656	0
San Joaquin	1253	18,000	667	33,698,399	235	432	35.2%	64.8%	31,085,405	2,612,994
South Coast	790	1	564	52,068,265	564	0	100.0%	0.0%	52,068,265	0
Ventura	59	18,000	56	1,392,799	18	38	32.1%	67.9%	1,167,799	225,000
Yolo-Solano	47	60,000	46	528,953	2	44	4.3%	95.7%	134,501	394,452
STATEWIDE TOTALS	**3643**	**Various**	**2018**	**124,131,980**	**1093**	**925**	**54.2%**	**45.8%**	**116,108,785**	**8,023,195**

* No throughput data was provided for Mojave Desert, so throughput averages were assigned based on all other districts with 60,000 gallon cut point

Attachment 2
Tank Population and Throughput Data for Districts Not in Attainment with the Federal 8-Hour Ozone Standard
Extrapolation for Unknown Throughput Using Technique 1

District	# of Tanks w/ Unknown Throughput	# of Exempt Tanks w/ Unknown Throughput	Throughput of Exempt Tanks w/ Unknown Throughput (gal/yr)	# of Tanks w/ Unknown Throughput Subject EVR	Throughput of Unknown Tanks Subject to EVR (gal/yr)
Antelope Valley	4	4	51,534	0	90,688
Bay Area	576	432	2,892,123	144	11,467,546
Butte County	4	3	69,832	1	175,761
Calaveras	1	1	10,174	0	144,370
Eastern Kern	25	22	368,584	3	895,284
El Dorado County	1	1	9,152	0	3,311
Feather River	0	0	0	0	0
Imperial County	4	3	42,729	1	380,123
Mariposa County	No Data	No Data	No Data	No Data	No Data
Mojave Desert*	134	89	1,198,239	45	11,306,231
Placer County	3	3	28,185	0	101,136
Sacramento Metro	21	14	92,057	7	938,883
San Diego	36	0	0	36	2,174,369
San Joaquin	586	380	2,295,674	206	27,310,416
South Coast	226	0	0	226	20,864,234
Ventura	3	2	12,054	1	62,561
Yolo-Solano	1	1	8,575	0	2,924
STATEWIDE TOTALS	**1,625**	**953 (58.6%)**	**7,078,910 (8.5%)**	**672 (41.4%)**	**75,917,837 (91.5%)**

* No throughput data was provided for Mojave Desert, so throughput averages were assigned based on all other districts with 60,000 gallon cut point

Attachment 2
Tank Population and Throughput Data for Districts Not in Attainment with the Federal 8-Hour Ozone Standard
Extrapolation for Unknown Throughput Using Technique 2

District	# of Tanks w/ Unknown Throughput	# of Exempt Tanks w/ Unknown Throughput	Throughput of Exempt Tanks w/ Unknown Throughput (gal/yr)	# of Tanks w/ Unknown Throughput Subject EVR	Throughput of Unknown Tanks Subject to EVR (gal/yr)
Antelope Valley	4	4	57,975	0	0
Bay Area	576	576	3,856,164	0	0
Butte County	4	4	86,818	0	0
Calaveras	1	1	14,799	0	0
Eastern Kern	25	25	417,728	0	0
El Dorado County	1	1	9,633	0	0
Feather River	0	0	0	0	0
Imperial County	4	4	63,483	0	0
Mariposa County	No Data	No Data	No Data	No Data	No Data
Mojave Desert*	134	134	1,810,232	0	0
Placer County	3	3	31,375	0	0
Sacramento Metro	21	21	139,439	0	0
San Diego	36	0	0	36	2,174,369
San Joaquin	586	586	3,544,478	0	0
South Coast	226	0	0	226	20,864,234
Ventura	3	3	17,763	0	0
Yolo-Solano	1	1	8,965	0	0
STATEWIDE TOTALS	**1,625**	**1,363 (83.9%)**	**10,058,853 (30.4%)**	**262 (16.1%)**	**23,038,603 (69.6%)**

* No throughput data was provided for Mojave Desert, so throughput averages were assigned based on all other districts with 60,000 gallon cut point

Attachment 2
Tank Population and Throughput Data for Districts Not in Attainment with the Federal 8-Hour Ozone Standard
Extrapolation for Unknown Throughputs Taking the Average of Technique 1 and Technique 2

District	# of Tanks w/ Unknown Throughput	# of Exempt Tanks w/ Unknown Throughput	Throughput of Exempt Tanks w/ Unknown Throughput (gal/yr)	# of Tanks w/ Unknown Throughput Subject EVR	Throughput of Unknown Tanks Subject to EVR (gal/yr)
Antelope Valley	4	4	54,754	0	45,344
Bay Area	576	504	3,374,144	72	5,733,773
Butte County	4	4	78,325	0	87,881
Calaveras	1	1	12,486	0	72,185
Eastern Kern	25	24	393,156	1	447,642
El Dorado County	1	1	9,392	0	1,656
Feather River	0	0	0	0	0
Imperial County	4	3	53,106	1	190,062
Mariposa County	No Data	No Data	No Data	No Data	No Data
Mojave Desert*	134	111	1,504,235	23	5,653,115
Placer County	3	3	29,780	0	50,568
Sacramento Metro	21	17	115,748	4	469,442
San Diego	36	0	0	36	2,174,369
San Joaquin	586	483	2,920,076	103	13,655,208
South Coast	226	0	0	226	20,864,234
Ventura	3	3	14,908	0	31,280
Yolo-Solano	1	1	8,770	0	1,462
STATEWIDE TOTALS	**1,625**	**1,158 (71.3%)**	**8,568,881 (14.8%)**	**467 (28.7%)**	**49,478,220 (85.2%)**

* No throughput data was provided for Mojave Desert, so throughput averages were assigned based on all other districts with 60,000 gallon cut point

Attachment 2
Tank Population and Throughput Data for Districts Not in Attainment with the Federal 8-Hour Ozone Standard
Totals Including Tanks with Known Throughput and Extrapolation for Tanks with Unknown Throughput

District	Total # of Tanks	Total Throughput of All Tanks (gal/yr)	Total # of Exempt Tanks	Total Throughput of Exempt Tanks (gal/yr)	Total # of Tanks Subject to EVR	Total Throughput of Tanks Subject to EVR (gal/yr)
Antelope Valley	40	1,380,091	36	518,556	4	861,535
Bay Area	652	11,002,595	561	3,755,743	91	7,246,852
Butte County	50	2,990,522	41	881,388	9	2,109,135
Calaveras	17	2,557,378	12	175,272	5	2,382,106
Eastern Kern	76	3,419,089	69	1,145,067	7	2,274,022
El Dorado County	21	260,307	20	192,424	1	67,883
Feather River	59	1,960,770	54	483,262	5	1,477,508
Imperial County	56	5,740,245	38	608,584	18	5,131,661
Mariposa County	No Data	No Data	No Data	No Data	No Data	No Data
Mojave Desert*	134	7,157,351	111	1,504,235	23	5,653,115
Placer County	62	2,623,648	56	584,080	6	2,039,568
Sacramento Metro	124	5,641,705	85	567,264	39	5,074,442
San Diego	203	12,261,025	0	0	203	12,261,025
San Joaquin	1253	50,273,683	915	5,533,070	338	44,740,613
South Coast	790	72,932,499	0	0	790	72,932,499
Ventura	59	1,438,988	41	239,908	18	1,199,079
Yolo-Solano	47	539,185	45	403,222	2	135,963
STATEWIDE TOTALS	**3643**	**182,179,081**	**2,084 (57.2%)**	**16,592,077 (9.1%)**	**1,560 (42.8%)**	**165,587,005 (90.9%)**

* No throughput data was provided for Mojave Desert, so throughput averages were assigned based on all other districts with 60,000 gallon cut point