Bay Area Air Quality Management District

939 Ellis Street
San Francisco, CA 94109

Staff Report

Proposed Amendments
to
Regulation 12, Miscellaneous Standards of Performance
Rule 12, Flares at Petroleum Refineries

March 3, 2006

Prepared by:

Alex Ezersky
Principal Air Quality Specialist
Planning and Research Division

Reviewed by:

Kathleen Walsh
Assistant Counsel

Table of Contents

I. EXECUTIVE SUMMARY

On July 20, 2005, the Bay Area Air Quality Management District (District) adopted a ground breaking refinery flare control rule (Regulation 12: Miscellaneous Standards of Performance, Rule 12: Flares at Petroleum Refineries). The new rule is intended to reduce emissions from flares at petroleum refineries by reducing the magnitude and duration of flaring events.

The new rule requires each Bay Area refinery to develop and implement a Flare Minimization Plan (FMP) for each flare subject to the rule and to update the plan annually. In addition, the refiners must conduct a causal analysis when significant flaring occurs and develop and submit an annual report to provide information about the cause of flaring at lower flow rates. Refiners must operate their flares in accordance with the FMP except for flaring in emergency situations. The initial FMP for each refinery must be submitted to the District by August 1, 2006.

The rule embodies a continuous improvement process focused on reducing all air pollutants from all flaring. A fundamental requirement of the regulation is the investigation to determine primary cause and contributing factors for flaring (causal analysis) in order to develop prevention measures to avoid or minimize flaring. The rule includes two requirements for submitting an analysis of the cause(s) of flaring depending on the amount of vent gas flared.

The first reporting requirement calls for submission of a causal analysis report to the District within 60 days following the end of the month in which a reportable flaring event occurs. A reportable flaring event is currently defined as any flaring where more than 500,000 standard cubic feet per day (scfd) of vent gas is flared. The second reporting provision requires an annual report to the Air Pollution Control Officer (APCO) that summarizes the use of a flare at rates less than 500,000 scfd where sulfur dioxide emissions are greater than 500 pounds per day. The summary must include the reasons for the flaring and prevention measures considered or implemented. Reporting of flaring resulting in sulfur dioxide emissions in excess of 500 pounds (regardless of the flow rate) is required twelve months after approval of the initial FMP and annually thereafter. Both provisions require determination of cause, identification of prevention measures and incorporation of prevention measures into the FMP.

These provisions are the subject of the proposed rule amendments. The proposal is to change the annual reporting requirement for lower-volume flaring (less than 500,000 scfd) where emissions of sulfur dioxide exceed 500 pounds per day. The change would require the analysis and reporting of this lower-volume flaring to occur on the same schedule specified for flaring events greater than 500,000 scfd, i.e., within 60 days following the end of the month in which a reportable flaring event occurs. The proposed change would take effect upon adoption by the District Board of Directors. There have been 49 of these lower-

volume flaring events over the past two years; 28 in 2004 and 21 in 2005.

The reason for the proposed amendment is to ensure that the prevention measures developed from the investigations into lower-volume flaring with sulfur dioxide emissions greater than 500 pounds per day are incorporated into the initial FMPs.

In addition, the proposal would specify that the report of causal analysis for a reportable flaring event must include the volume of vent gas flared and the calculated emissions (methane, non-methane hydrocarbon and sulfur dioxide). This information is necessary to provide the context necessary for a comprehensive report. The proposal would also clarify the application of the causal analysis provision for refineries with cascade and backup systems.

II. BACKGROUND

The District's flare control rule, Regulation 12, Rule 12, recognizes that a flare is first and foremost a safety device. Specifically, the rule allows flaring in an emergency if necessary to prevent an accident, hazard or release of vent gas directly to the atmosphere. All other flaring must be consistent with the FMP developed by each refinery.

The FMP includes information about the flare system or systems at the refinery and a list of feasible prevention measures to be implemented on an expedited schedule. The prevention measures are to be developed in conjunction with the causal analysis of reportable flaring events and the annual reports of the analysis of lower-volume flaring with sulfur dioxide emissions in excess of 500 pounds per day.

The current regulation includes a requirement to conduct an investigation to evaluate any reportable flaring event, i.e., flaring where more than 500,000 scfd of vent gas is combusted. The purpose of the investigation is to identify the cause (or causes) of the flaring and the means to avoid flaring from that cause in the future if feasible. In addition to the causal analyses for reportable flaring events, beginning 12 months after approval of the initial FMP, each facility is required to submit an annual report to the District that includes an evaluation of flaring at volumes less than 500,000 scfd where the calculated sulfur dioxide emissions are greater than 500 pounds per day. These formal evaluation processes will ensure that each refinery makes continuous improvement and progress toward minimizing flaring from any cause.

All feasible prevention measures identified through either of the reporting methods described above are to be incorporated in the FMP with a schedule for expeditious implementation of those measures. The FMP must be updated annually to incorporate the prevention measures identified during the previous year as well as any significant changes in process equipment or operational procedures related to flares. Any flaring that occurs after submission of the initial

FMP must be consistent with the current plan.

The requirement to conduct an investigation into the reasons for flaring was originally proposed in Regulation 12, Rule 11: Flare Monitoring at Petroleum Refineries. Under that regulation, for any 24-hour period during which more than 1 million standard cubic feet (scf) of vent gas is flared, a description of the flaring including the cause, time of occurrence and duration, the source or equipment from which the vent gas originated, and any measures taken to reduce or eliminate flaring must be submitted to the District in a monthly report. This provision was effective on the date of rule adoption, June 4, 2003. The data included in the monthly report became more encompassing as other provisions in the rule became effective; specifically the requirements to continuously monitor vent gas flow and to sample vent gas and analyze for composition. These data were used to consider various thresholds of a causal analysis in the development of the flare control rule.

A lower threshold to conduct a causal analysis was proposed for the new flare control rule, Regulation 12, Rule 12: Flares at Petroleum Refineries. Two reporting requirements were developed to cover all significant flaring events in an efficient and thorough manner. The first reporting requirement calls for a causal analysis to be completed where more than 500,000 scfd of vent gas is flared. This report is due 60 days following the end of the month in which the flaring event occurs. The second reporting provision requires a summary of the use of a flare at rates less than 500,000 scfd of vent gas where sulfur dioxide (SO_2) emissions are greater than 500 pounds per day. This report is due annually effective 12 months after approval of the original FMP.

A breakdown of the number of flaring events for 2004 and 2005 is shown in Table 1. This data was obtained from the monthly reports required by the flare monitoring rule. The 2005 data incorporates January through November 2005. Also, the Tesoro data excludes the Ammonia Plant flare, because of an ongoing verification audit.

Table 1. Summary of Flaring Events at Bay Area Refineries

Facility	Events Less than 500,000 scfd and Greater than 500 lbs SO2 per day		Events Greater than 500,000 scfd	
	2004	2005[a]	2004	2005[a]
Chevron	0	2	38	21
ConocoPhillips	8	9	12	38
Shell	0	1	89	30
Tesoro[b]	4	2	72	64
Valero	16	7	90	21
Total	28	21	301	174

[a] Data through November 2005

[b] Excludes Ammonia Plant Flare

The data in the table shows that most flaring would require a causal analysis under the existing threshold for causal analysis (greater than 500,000 scfd vent gas). The lower threshold represents a small portion of all flaring, but these lower-flow events with sulfur dioxide emissions at levels of concern may have different causes than the greater than 500,000 scfd events. Staff has concluded that requiring analysis of certain lower-volume flaring (greater than 500 pounds per day SO_2) for inclusion in the initial FMP will insure that each refinery is creating a flare minimization strategy that will best address the causes of all flaring of concern at each refinery.

III. PROPOSED AMENDMENTS

The proposed amendments will change the annual reporting provision for the flaring events of less than 500,000 scfd but greater than 500 lbs SO_2 per day. The change would require the analysis and reporting of this lower-volume flaring to occur on the same schedule specified for reportable flaring events, i.e., within 60 days following the end of the month in which the flaring occurs. The proposed change would take effect upon adoption by the District Board of Directors.

Specifically, the proposal would amend the current definition of "reportable flaring event" for which a causal analysis is required within 60 days of the end of the month in which the flaring occurs, i.e., any flaring of more than 500,000 scfd vent gas, to include any flaring at rates below 500,000 scfd where the calculated SO_2 emissions are greater than 500 pounds per day. The current rule requires the owner or operator of a flare subject to the rule to submit an annual report covering such lower-volume flaring beginning 12 months after approval of a refinery's initial FMP. By moving up the schedule for analysis of lower-volume flaring with emissions of SO_2 in excess of 500 pounds per day, the District will insure that the initial FMPs will account for and address the causes of all significant flaring.

The proposal also includes an amendment specifying that the causal analysis must include the calculated methane, non-methane and sulfur dioxide emissions. The reports currently submitted include this information or the data necessary to calculate this information. This amendment will insure that all refineries submit this information a manner most efficient for staff use.

Finally, the definition of a reportable flaring event has been amended to clarify that the total volume is calculated on a cumulative basis for flare systems. This clarification is necessary to identify when a reportable flaring event begins and ends for systems that are operated as a backup or staged flares or flares in a cascade (common piping configured either in series or parallel where the flare vent gas may be distributed to more than one flare).

IV. Emissions

Flares produce air pollutants through two primary mechanisms. The first mechanism is incomplete combustion of a gas stream, because like all combustion devices, flares do not combust all of the fuel directed to them. The second mechanism of pollutant generation is the oxidation of flare gases to form other pollutants. As an example, the gases that are burned in flares typically contain sulfur in varying amounts. Combustion oxidizes these sulfur compounds to form sulfur dioxide, a criteria pollutant. In addition, combustion also produces relatively minor amounts of nitrogen oxides through oxidation of the nitrogen in flare gas or atmospheric nitrogen in combustion air. The flare control rule adopted by the District last year will reduce emissions from flaring as described in the staff report for Regulation 12, Rule 12: Flares at Petroleum Refineries.

The proposed amendments are administrative in nature and will not have a significant emissions impact. The amendments will require a causal analysis for the lower-volume events with SO_2 emissions in excess of 500 pounds per day on the same schedule as the higher volume events. This will insure that prevention measures for these lower-volume events are incorporated into the initial FMPs. In addition, the proposed amendments include a clarification of the application of the requirements to cascade, staged or backup flare systems and a provision to ensure that the report to the District providing the causal analysis for a flaring event includes calculated emissions for that event. No change in the amount of emission reductions from implementation of the flare control rule as adopted July 20, 2005 are expected as a result of the proposed amendments; however, some reductions may occur earlier than under the current rule if prevention measures for these lower-volume flaring events are identified and implemented through the initial FMPs.

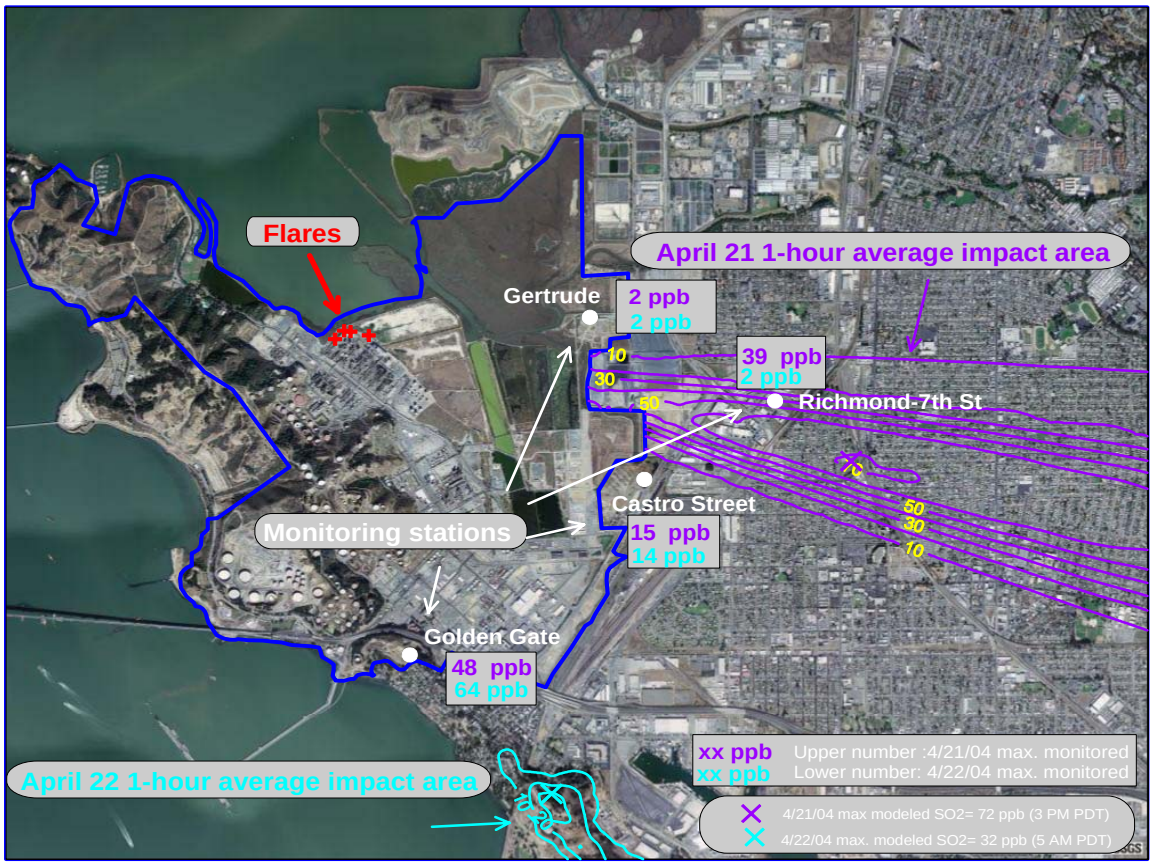
Current Flare Emission Estimate

The estimated emissions from flares, on an average daily basis for all facilities in 2004, are approximately 2 tons/day of total organic compounds (approximately 1.5 tons/day of non-methane organic compounds and 0.5 tons/day methane). The daily emissions range from 0 to 12 tons/day of total organic compounds. For sulfur dioxide, the average daily emission rate is approximately 4 tons/day and ranges from 0 to 61 tons/day.

To illustrate the offsite impact of emissions associated with lower-volume flaring, staff modeled two days (April 21 and 22, 2004) of flaring at the Chevron refinery where the volume of vent gas flared was less than one-million standard cubic feet per calendar day and the calculated sulfur dioxide emissions were greater than 500 pounds per day. The results of the modeling are illustrated in the Figure 1.

Figure 1. Modeled Lower-Volume Flaring Event

April 21 and 22, 2004 Chevron Flaring Event
Maximum 1-hour SO2 Air Concentration (ppb)



SO2 Ambient Air Quality Standard
California 1-hour: 250 ppb

In Figure 1, above, Richmond area monitoring stations (Gertrude, Richmond - 7th Street, Castro Street, and Golden Gate) are indicated by the white dots. The boxes next to each station contain the recorded concentration of SO_2 in parts per billion (ppb) at that station for April 21 (upper, purple) and April 22 (lower, blue). The areas within the 10 ppb isopleths (April 21 near the Richmond - 7th Street Station in purple and April 22 southeast of the Golden Gate Station in blue) show the modeled ground level concentration of SO_2 in ppb. Chevron's flares are located directly west of the Gertrude Station (in red).

On each of the two days several flares were in operation at rates less than one-million standard cubic feet per day with calculated SO_2 emissions of over 7500 and 2500 pounds per day, respectively. The isopleths show that the modeling estimates concentrations consistent with data from nearby ambient air quality monitors. The modeling shows a one-hour maximum concentration of 72 ppb for April 21 and 32 ppb for April 22. The ambient air quality standard for a one-hour concentration of SO_2 is 250 ppb. Nevertheless, these isopleths show an impact on the nearby community. For this reason, the inclusion of prevention measures

directed at lower-volume flaring with SO_2 emissions greater than 500 pounds per day in the initial FMP will lessen the emissions impact of flaring on those who live and work within affected areas.

V. ECONOMIC IMPACTS

A. Introduction

This section discusses the estimated costs associated with the proposed amendments. The California Health & Safety Code states, in part, that districts shall endeavor to achieve and maintain State ambient air quality standards for ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide by the earliest practicable date. In developing regulations to achieve this objective, districts shall consider the cost-effectiveness of their air quality programs, rules, regulations, and enforcement practices in addition to other relevant factors, and shall strive to achieve the most efficient methods of air pollution control. However, priority shall be placed upon expeditious progress toward the goal of healthful air.[1]

Regulation 12-12 requires refineries to develop the prevention measures they will implement to reduce flaring. The regulation by design ensures that the most cost effective means for achieving this goal will be implemented. That is, it is reasonable to expect that each refinery, given the flexibility provided by the structure of the rule, will include the most cost-effective prevention measures available for each iteration of the flare minimization plan, thus insuring the continuous improvement at the least cost.

This was the determination of the District in adopting the current flare control rule. The conclusion is equally applicable to the proposed amendments.

B. Discussion

Determination and Reporting of Cause

The cost for the determining and reporting of cause is dependant on the number of reportable flaring events and the complexity of each event. The data from the flare monitoring monthly reports, which was used in the cost analysis for Regulation 12-12, shows 243 occurrences where the volume of vent gas flared was greater than 500,000 scfd in 2004 for all facilities. In the development of Regulation 12-12, staff estimated costs of determining and reporting cause at an hourly rate of $50.00 per hour for 12 hours per event. The total was approximately $145,800 for all facilities per year. The cost for an individual refinery will be much less. Moreover, staff expected this cost to drop in time as

[1] California Health and Safety Code section 40910

facilities minimize the number of events and become more proficient in investigations.

The initial cost analysis was based on a hypothetical 67 events per facility. A review of Table 1 shows that, even including lower-volume flaring where sulfur dioxide emissions exceed 500 pounds per day, no facility would have had reportable flaring events in excess of 67 events in 2005. Staff anticipates the downward trend in the number of reportable flaring events to continue, with a concomitant drop in these costs. Therefore, although there may be additional causal analyses required in the first year (or two) of implementation of the flare control rule under this proposal, the additional causal analyses required by these amendments will create no significant increase in the costs assumed for the current version of Regulation 12, Rule 12: Flares at Petroleum Refineries when adopted in July of 2005.

Prevention Measures

The cost effectiveness analysis for Regulation 12, Rule 12 was estimated for two scenarios selected to represent the range of options among prevention measures. The first estimate, representing a costly prevention measure, considered an example of a refinery that had performed a hazard analysis for Contra Costa County and had upgraded the flare gas recovery system. A less costly prevention measure was also considered where startup and shutdown schedule adjustments resulted in a reduction of flaring, which included cost of lost production. The costs of these prevention measures were estimated to vary from $1,603 to $1,527 per ton of all pollutants for the first year and from $800 to $1500 per ton thereafter.

Currently, Regulation 12, Rule 12 requires the prevention measures developed for the lower-volume events to be included in the FMPs following inclusion in an annual report. While the proposed amendments may result in earlier implementation of one or more prevention measures, the costs of those measures would not exceed those identified when Regulation 12-12 was originally proposed and adopted.

Annual Reports and Updates

The proposed administrative amendments merely change the scheduling of the analysis and reporting of lower-volume flaring. Under the current rule, all flaring with sulfur dioxide emissions in excess of 500 pounds per day per day is addressed in a report to be submitted 12 months after approval of the initial FMP and annually thereafter. As amended, these events will have to be analyzed in a report submitted within 60 days following the end of the month in which the flaring occurs, consistent with the high volume events. Although, as discussed above, there may be more causal analyses required in the first year (or two) under the program, and prevention measures associated with these events may be scheduled for implementation earlier, the costs will not exceed the costs

estimated for implementation of the current rule. Refineries will not, however, incur the costs of preparing the annual report.

C. Socioeconomic Impacts

Section 40728.5 of the Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment, or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations." Applied Economic Development of Berkeley, California, prepared a socioeconomic analysis for the initial proposed Regulation 12, Rule 12: Flares at Petroleum Refineries. The analysis concludes that the affected refineries should be able to absorb the costs of compliance with the proposed rule without significant economic dislocation or loss of jobs.

The proposed amendments are administrative changes; they expedite reporting of lower-volume events so that any prevention measures specifically developed for this type of flaring can be incorporated into the initial FMP. The affect on air quality and emissions will result from the various measures refineries put into place to reduce flaring, not from these administrative requirements. In any event, the proposed amendments would not change the conclusion of the socioeconomic analysis for the initial proposed Regulation 12, Rule 12: Flares at Petroleum Refineries.

D. District Staff Impacts

In the staff report for the adopted Regulation 12-12, staff identified that it will take a total of 1.5 FTE at an average staff level of a Senior Engineer to implement the rule. The total cost was estimated to exceed $250,000. The proposed amendments do not add significantly to staff impacts, and in some cases may reduce those impacts. By specifying that the refinery must provide the volume of vent gas and calculated emission data, staff resources necessary to perform the calculations from raw data will not be needed. In addition, staff time will no longer be required to review annual reports.

VI. ENVIRONMENTAL IMPACTS

Pursuant to the California Environmental Quality Act, the District prepared an Initial Study during the development of the original flare control rule (Regulation 12, Rule 12) to determine whether it would result in any significant environmental impacts. The study and subsequent Environmental Impact Report discussed certain potential significant environmental impacts, but ultimately concluded that the proposed rule would not have any significant adverse environmental impacts. Based on this determination (and others), the District adopted the flare control rule in July of 2005.

The amendments now proposed are administrative changes to the original flare control rule; they expedite reporting and development of prevention measures

and incorporation of lower-volume events into the initial FMP. The District has determined that there is no possibility the proposed amendments could cause any significant environmental effect; therefore, they are exempt from the provisions of CEQA in accordance with State CEQA Guidelines section 15061(b)(3). In fact, the amendments would not constitute a "project" under CEQA because they do not have the potential to result in either a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment. (Public Resource Code section 21065; State CEQA Guidelines section 15378.)

VII. REGULATORY IMPACTS

Section 40727.2 of the Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and district air pollution control requirements for the equipment or source type affected by the proposed change in district rules. The district must then note any differences between these existing requirements and the requirements imposed by the proposed change. Table 2 is a matrix of the thresholds and reporting requirements, including the responsible agency.

Table 2. Reporting Thresholds and Requirements

Agency	Regulation	Requirement	Threshold	Responsible Agency
BAAQMD	Reg. 12-12	Causal Analysis	> 500,000 scfd	BAAQMD
EPA	Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act	Notification to Local Emergency Response Committee/Agency	500 lbs SO_2 100 lbs Hydrogen Sulfide	Local Emergency Response Committee/Agency
BAAQMD	Reg. 12-12 Proposed Amendments	Causal Analysis	Any flaring greater than 500 lbs/day of SO_2	BAAQMD

Federal Requirements

Federal Title 3 requirements include reporting and planning provisions at specified thresholds. The focus of these requirements is emergency response and community right to know. Adequate release response plans and timely notification to responsible agencies are required.

EPA has entered into consent decrees with all Bay Area refineries. These

decrees, among other requirements, contain increments of progress for the application of New Source Performance Standards (NSPS) to all flares. NSPS limit sulfur oxides in vent gases combusted in a flare installed after June 11, 1973 (40 CFR Part 60, Subpart J, Section 60.104). Flaring caused by upset gases or fuel gas from relief valve leakage or other emergency malfunctions is exempt from the standard.

VIII. RULE DEVELOPMENT PROCESS

A. Introduction

Staff posted a request for comments on the proposed amendments to Regulation 12-12 on December 23, 2005. Three written comments were received in support of the proposed amendments.

As part of the development of the original regulation staff had undertaken an extensive rule development process in order to receive input from all affected parties. These efforts included the formation of a technical working group, public meetings, workshops and presentations to the District Board of Directors Stationary Source Committee. This process is described in the staff report for Regulation 12, Rule 12: Flares at Petroleum Refineries.

Staff has formed an implementation team to ensure thorough review of and compliance with the causal analyses and prevention measures submitted to the District by each facility. The team consists of District staff from the Engineering, Enforcement, Planning and Legal Divisions. The team meets regularly to evaluate submittals and make recommendations, which have been incorporated into the proposed amendments. In addition, the team meets with refinery staff as questions and the need for clarification and consistency arise.

B. Stationary Source Committee Reports

At the flare control rule adoption hearing on July 20, 2005, staff was directed to provide an update to the Stationary Source Committee on the cumulative impacts of a lower threshold for causal analysis. The minutes of that meeting can be found at on the District's web site at the following address, (http://www.baaqmd.gov/brd/brddirectors/agendas_minutes.htm).

Staff has reported to the Stationary Source Committee at each meeting since rule adoption. At the meeting of November 28, 2005 the Committee recommended consideration of amendments to include a causal analysis of lower-volume flaring where 500 pounds per day of SO_2 is emitted on the same schedule as for events involving flaring of vent gas at flow rates in excess of 500,000 scfd. The agenda of that meeting can be found on the District's web site at the same address.

C. Public Comment

The proposed rule amendments were made available for public comment and posted on the District's web site. Two comments expressed concern over proposed language in the definition of a reportable flaring event. The proposed language, which was intended to define the end of a reportable flaring event by specifying a volume of vent gas as the endpoint, was deemed confusing. As suggested, it has been deleted. The definition as proposed identifies the end of an event as either a specified rate or when water seal integrity is established and explains that for certain systems where more than one flare may burn vent gas, the total volume is calculated on a cumulative basis.

IX. CONCLUSION

The proposed amendments to Regulation 12, Rule 12: Flares at Petroleum Refineries, are intended to ensure that information about lower-volume flaring where sulfur dioxide emissions are greater than 500 pounds per day is available for inclusion in the initial Flare Minimization Plans. Pursuant to Health and Safety Code Section 40727, new regulations must meet standards of necessity, authority, clarity, consistency, non-duplicity and reference. The proposed amended regulation is:

- Necessary to protect public health by reducing ozone precursor emissions, and to reduce exposures to toxic air contaminants, sulfur dioxide and particulate matter by insuring that feasible prevention measures to reduce or avoid use of flares at petroleum refineries are identified and scheduled for implementation on an expedited schedule;
- Authorized by California Health and Safety Code section 40702;
- Clear, in that the new regulation specifically delineates the affected industry, compliance options and administrative requirements for industry subject to this rule;
- Consistent with other District rules, and not in conflict with State or federal law;
- Non-duplicative of other statutes, rules or regulations; and
- The proposed regulation properly references the applicable District rules and test methods and does not reference other existing law.

The proposed amendments are not subject to CEQA because they do not constitute a "project" as defined in State law and the CEQA Guidelines and because it can be determined with certainty that the amendments have no possibility of causing any significant environmental effects.

The proposed amendments will not increase the costs of implementing Regulation 12, Rule 12: Flares at Petroleum Refineries. Staff has analyzed the cost of the additional causal analysis and found them to be within the total number of analysis projected in the original adoption of Regulation 12, Rule 12 and the potential for early implementation of one or more prevention measures would not increase the costs estimated for the adoption of the current rule.

Staff recommends the adoption of the proposed amendments to Regulation 12: Miscellaneous Standards of Performance, Rule 12: Flares at Petroleum Refineries, and approval of the filing of a CEQA Notice of Exemption.