Bay Area Air District

Regulatory Concepts for Amendments to

Regulation 12: Miscellaneous Standards of Performance,

Rule 11: Flare Monitoring at Refineries and Rule 12: Flares at Refineries

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Table of Contents

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Acronyms and Abbreviations

A glossary is included in Appendix A.

Air Quality Management District – AQMD
Air Pollution Control District – APCD
Bay Area Air District – Air District
California Air Resources Board – CARB
Code of Federal Regulations – CFR
Community Emissions Reduction Plan – CERP
Flare Gas Recovery– FGR
Flare Minimization Plan – FMP
Hazardous Air Pollutant – HAP
Nitrogen Oxides – NOx
Non-methane Hydrocarbons – NMHC
New Source Performance Standards – NSPS
Particulate Matter – PM
Regulation 12, Rule 11: Flare Monitoring at Refineries – Rule 12-11
Regulation 12, Rule 12: Flares at Refineries – Rule 12-12
Sulfur Dioxide – SO_2
United States Environmental Protection Agency – U.S. EPA
Volatile Organic Compounds – VOC

I. EXECUTIVE SUMMARY

The Bay Area Air District (Air District) Board of Directors adopted Regulation 12: Miscellaneous Standards of Performance, Rule 11: Flare Monitoring at Refineries (Rule 12-11) in 2003 to require monitoring, recordkeeping, and measurement of the composition and volume of gases flared at refineries, and Regulation 12: Miscellaneous Standards of Performance, Rule 12: Flares at Refineries (Rule 12-12) in 2005 to reduce emissions from refinery flares by decreasing flaring frequency, magnitude, and duration. Prior to the adoption of these rules, the Air District did not have refinery-specific regulatory requirements addressing flare monitoring or flaring minimization, although federal requirements and other generally applicable Air District requirements were in place.

The concept paper presents regulatory concepts intended to reduce refinery flaring emissions and frequency, with an emphasis on minimizing preventable flaring and achieving meaningful emissions reductions. It also presents concepts to strengthen Flare Minimization Plans (FMPs), monitoring, and reporting, which are anticipated to improve transparency, accessibility, efficiency, and enforceability.

A. Background

Flares are devices used to control and safely combust (burn) excess gases from various industrial processes. Flares not only convert harmful organic compounds primarily into carbon dioxide and water but also prevent pressure buildup in equipment and piping that could otherwise lead to catastrophic events such as equipment rupture, explosions, or fires. At Bay Area refineries, flare gas recovery (FGR) systems are operated to capture process gases for use as reclaimed fuel. However, when process gas is generated in excess of the capacity of the recovery system or refinery fuel gas consumers, or when the gas composition is unsuitable for recovery, the excess gas is routed to a flare. Due to the non-routine operational nature of refinery flaring, emissions and associated impacts from flaring can vary significantly. Some flaring activity can be prevented with better planning, strengthened operational management practices, or equipment improvements. Although there are instances where flaring cannot be prevented, flaring emissions and duration may be minimized in these instances.

Flaring has long been a source of concern for refinery communities. Even with existing requirements to monitor and minimize flaring under Rules 12-11 and 12-12, refineries continue to report flaring that varies widely in magnitude and impact, ranging from negligible or short-term effects during planned flaring to significant air quality and public health impacts during unplanned flaring with poor combustion. Although some flaring activity results in minor emissions and community impact, certain instances of flaring are significant in nature and can produce large releases of multiple pollutants, including particulate matter (PM), dark visible smoke plumes, sulfur dioxide (SO_2), and toxic air contaminants.

B. Regulatory History

Over the past two decades since the adoption of Rules 12-11 and 12-12, more stringent requirements for refinery flaring have been adopted at the federal level and by other California air districts to further reduce emissions and minimize the impacts associated with flaring on air quality and the surrounding communities.

The Air District has made commitments to explore ways to minimize flaring in the Air District's 2024-2029 Strategic Plan[1] and in the Assembly Bill (AB) 617 Richmond–North Richmond–San Pablo Community Emissions Reduction Plan (CERP),[2] Path to Clean Air. Potential strategies in the plans include evaluating rule stringency and improving monitoring, reporting, and notification requirements related to flares.

C. Regulatory Concepts

Air District staff is considering evaluating and expanding the regulatory concepts in the next steps of the regulatory development process for Rules 12-11 and 12-12. These regulatory concepts are intended to achieve the following goals:

- Incentivize or require refineries to make investments and operational improvements required to minimize overall flaring, with particular focus on addressing the root causes of preventable flaring.
- To the extent feasible, ensure that flares burn efficiently to minimize harmful pollutants.
- Clearly differentiate between flaring that has a high potential for public health risk and flaring that does not.
- Enhance the availability of flaring information for past and future flaring activity to promote public transparency and accessibility, improve resource efficiency, and strengthen enforceability.

The regulatory concepts to reduce flaring emissions and frequency are:

- Incorporate key flare combustion efficiency requirements from the U.S. EPA Refinery Sector Rule;
- Establish new limits for non-hydrogen and hydrogen flares:
    - Emission limits,
    - Volumetric vent gas limits, and
    - Declining emission and/or volumetric vent gas limits over time;

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[1] Bay Area Air District, Strategic Plan, July 2024, https://media-strategicplan.baaqmd.gov/~/media/project/headless-microsites/strategic-plan-files/air-district-strategic-plan-070224-pdf.pdf?sc_lang=en

[2] Bay Area Air District, Path to Clean Air: Richmond, North Richmond, and San Pablo Community Emissions Reduction Plan, April 2024, https://www.baaqmd.gov/~/media/files/ab617-community-health/richmond/2024/042024-final-ptca-plan-files/ptca-plan_final_april-2024-pdf.pdf?rev=275660fc2f6c4eecaa35b13451b9985

- Require mitigation measures based on triggering criteria;
- Require submittal of causal reports based on additional triggering criteria; and
- Require third-party audits for facilities based on triggering criteria.

The regulatory concepts to improve FMP updates, monitoring, and reporting requirements are:

- Strengthen FMP updates;
- Standardize reporting requirements;
- Expand definitions and categories for reporting causes of flaring; and
- Strengthen monitoring and reporting requirements.

D. Next Steps

The Air District is releasing this concept paper to solicit public comments on the concepts for potential amendments to Rules 12-11 and 12-12. Following the public comment period, Air District staff intends to present an update to the Stationary Source Committee of the Air District Board of Directors in late 2026. Staff will consider input received from the Committee and the public and plans to release draft amendment language and a preliminary staff report.

II. BACKGROUND

A. Introduction

The purpose of this concept paper is to explore regulatory approaches that could improve flare monitoring and reporting requirements and reduce the frequency and emissions of refinery flaring, especially flaring due to preventable causes. Through the amendments of Rules 12-11 and 12-12, the primary goal is to achieve measurable and meaningful reductions in emissions from flares, while ensuring that the requirements are both enforceable by the Air District and feasible at affected facilities.

The Air District adopted refinery flare requirements in the early 2000s to improve oversight and reduce emissions associated with flaring operations. Rule 12-11 established comprehensive monitoring and reporting requirements to quantify the amount and characteristics of gases combusted in refinery flares, while Rule 12-12 established operational standards intended to minimize flaring by reducing flaring frequency, magnitude, and duration.

During refining operations, excess gases, primarily hydrocarbons, are typically directed to the FGR system, which captures these gases and returns them to the refinery's fuel gas network for use in processes, such as steam or heat generation. Flaring occurs when the FGR system cannot accommodate the volume or composition of vent gases due to planned activities (e.g., scheduled shutdown or maintenance), or unplanned events (e.g., external power curtailment or equipment failure). In these cases, vent gas is routed to the flare,

where it is combusted to prevent over-pressurization and to reduce the risk of hazardous gas buildup.

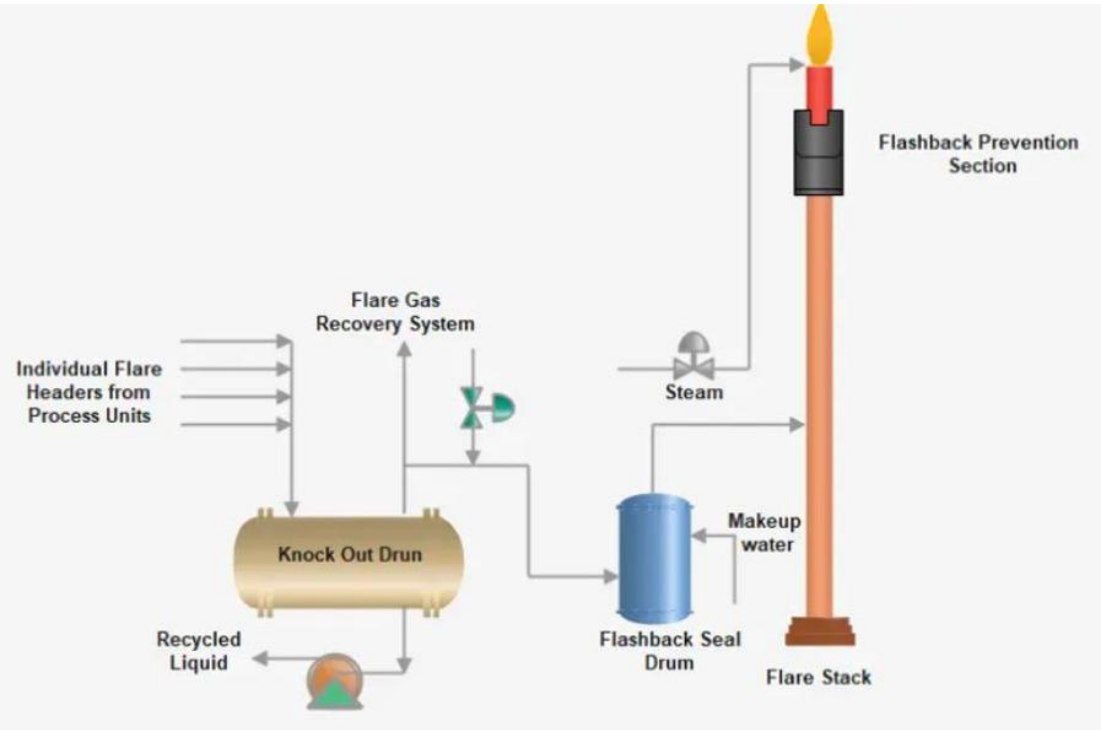

Figure 1 – Simplified Diagram of Flare Gas Recovery System[3]

Although the FGR system helps reduce flaring, flaring still occurs with widely varying emissions, vent gas volumes, and durations. Larger events, particularly those involving substantial gas volumes released over short periods of time, may contribute to significant localized air quality impacts and generate concern among nearby communities. As noted in the AB 617 Richmond–North Richmond–San Pablo CERP, Path to Clean Air, these high-visibility events can also cause alarm and uncertainty in the nearby communities due to their intensity and real and/or perceived health and safety risks.

The causes of flaring are wide-ranging and include causes beyond the refinery management's control, planned flaring during scheduled turnarounds, shutdowns for maintenance or repair, and unplanned flaring resulting from equipment malfunctions, operational errors, or other conditions that may be preventable. Because each refinery has

[3] Flare Gas Recovery System Diagram, from "How Refinery Flare Systems Improve Safety and Efficiency," Burnertec (August 21, 2025), accessed February 6, 2026, https://burnertec.com/how-refinery-flare-systems-improve-safety-and-efficiency

unique processes and operational constraints, the ability to prevent or manage vent gas during such events varies, making flaring a complex operational and regulatory issue.

A glossary of key terms used in this concept paper is provided in Appendix A.

B. Industry and Source Description

1. Industry Description

Refineries process crude oil or alternative feedstocks into a variety of products, such as gasoline, aviation fuel, diesel and other fuel oils, lubricating oils, and feedstocks for the petrochemical industry. Processing occurs in various units or plants throughout these facilities. All five refineries in the San Francisco Bay Area have and operate multiple flares onsite; these refineries are:

- Chevron Richmond Refinery – Richmond, California,
- Marathon Martinez Renewable Fuels Facility – Martinez, California,
- Martinez Refining Company (MRC) – Martinez, California,
- Phillips 66 Rodeo Renewable Energy Complex – Rodeo, California, and
- Valero Benicia Refinery – Benicia, California.

The Marathon Martinez Renewable Fuels Facility and the Phillips 66 Rodeo Renewable Energy Complex were formerly petroleum refineries, which processed crude oil as a feedstock, but have converted to processing alternative feedstocks to produce renewable fuels. Marathon Martinez and Phillips 66 Rodeo have fully converted to renewable operation as of 2022[4] and 2024,[5] respectively.

Valero announced that it completed idling of its process units at the Valero Benicia Refinery in April 2026. Valero has also communicated its current plans to maintain all required operating permits for the Valero Benicia Refinery.[6,7]

Refineries use hydrogen in the refining process. The Chevron Richmond Refinery and the Valero Benicia Refinery operate hydrogen production units onsite. Air Products – Martinez, California supplies hydrogen to the Marathon Martinez Renewable Fuels Facility and Martinez Refining Company. Air Liquide – Rodeo, CA supplies hydrogen to the Phillips 66

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[4] Marathon seeks permits for Martinez renewable diesel project (October 1, 2020), https://www.marathonpetroleum.com/Newsroom/Company-News/Marathon-seeks-permits-for-Martinez-renewable-diesel-project/

[5] Phillips 66 converts Rodeo refinery to diet of 100% renewable feedstocks (April 2, 2024), https://www.ogj.com/energy-transition/article/55001638/phillips-66-converts-rodeo-refinery-to-diet-of-100-renewable-feedstocks

[6] Governor Newsom's statement on Valero's Benicia refinery update (January 6, 2026), https://www.gov.ca.gov/2026/01/06/governor-newsoms-statement-on-valeros-benicia-refinery-update/

[7] Valero Benicia Refinery website, accessed July 21, 2026, https://www.beniciarefinery.com/

Rodeo Renewable Energy Complex.

2. Refinery Flares

Refinery flares are designed to combust excess hydrocarbon gases generated during routine operations, startups and shutdowns, and emergency conditions; thereby preventing the direct release of untreated process gases to the atmosphere. While flaring reduces the potential impacts of uncombusted releases by oxidizing hydrocarbons primarily to carbon dioxide and water, flare operation can also generate byproducts and other impacts, including PM, SO_2, nitrogen oxides (NOx), volatile organic carbons (VOCs), noise, smoke, and large visible flames.

Emission levels depend on operating conditions. When flares are properly operated, combustion efficiency is high, and criteria and toxic pollutant emissions are minimized. Under optimal conditions, hydrocarbons and methane are nearly completely oxidized, and the formation of smoke and soot is limited. Proper operation of flare control systems is important to maintain stable combustion and reduce emissions.

In contrast, improperly operated or overloaded flares may experience reduced combustion efficiency, resulting in elevated emissions of VOCs, methane, PM, and hazardous air pollutants (HAPs). This may occur during periods of rapid changes in vent gas flow rate or composition, as maintaining optimal levels of supplemental natural gas and steam injection in real time can be challenging, especially when attending to operational issues which may be causing the flaring. These conditions can produce large, dark smoke plumes and increase air quality and community impacts. Flaring may also generate noise, intense heat, and bright visible flames, which can contribute to community concerns.

C. Historical Flare Emissions Data

The five Bay Area refineries have been submitting monthly flare data reports as required under Rule 12-11,[8] as well as causal reports for reportable flaring events as required under Rule 12-12.[9] Air District staff has conducted a preliminary review of the flare data for this concept paper.

1. Flare Data by Refinery

Air District staff reviewed the flare data that has been reported by the five Bay Area refineries since the adoption of Rules 12-11 and 12-12. Appendix B contains tables of the data presented in the figures in this section. For further analysis, Air District staff selected the flare data reported by the five Bay Area refineries for the calendar years 2015 through

[8] Refinery flare vent gas volume, methane emissions, NMHC emissions, and SO_2 emissions data reported under Rule 12-11, https://www.baaqmd.gov/en/about-air-quality/research-and-data/flare-data

[9] Refinery flare causal reports reported under Rule 12-12, https://www.baaqmd.gov/en/about-air-quality/research-and-data/flare-data/flare-causal-reports

2024 as representative of the current operating conditions.

Figures 2 through 7 present annual vent gas volume, SO_2 emissions, and non-methane hydrocarbon (NMHC) emissions from the five Bay Area refineries' flares. The data for each parameter is first presented from 2004, the first full year of flare data after adoption of Rule 12-11, through 2024, and second from 2015 through 2024. These figures present data compiled from the monthly flare data reports required under Rule 12-11, which include all flaring activity from refineries.

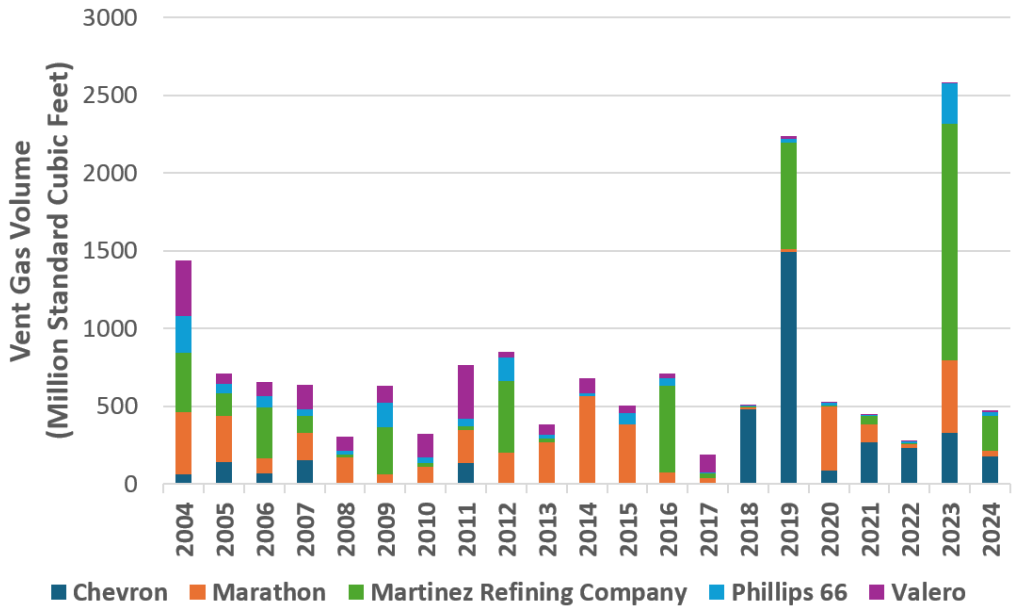

Figure 2 – Total Annual Vent Gas Volume Flared by Refinery from 2004 to 2024

As presented in Figure 2, annual vent gas volume flared across the five Bay Area refineries has remained largely similar since the adoption of Rule 12-12 in 2005 with exception of the peaks in 2019 and 2023. Comparing the average total vent gas volume for all refineries between 2004 through 2014 and 2015 through 2024, vent gas volume has increased by 26 percent due to the peaks in 2019 and 2023.

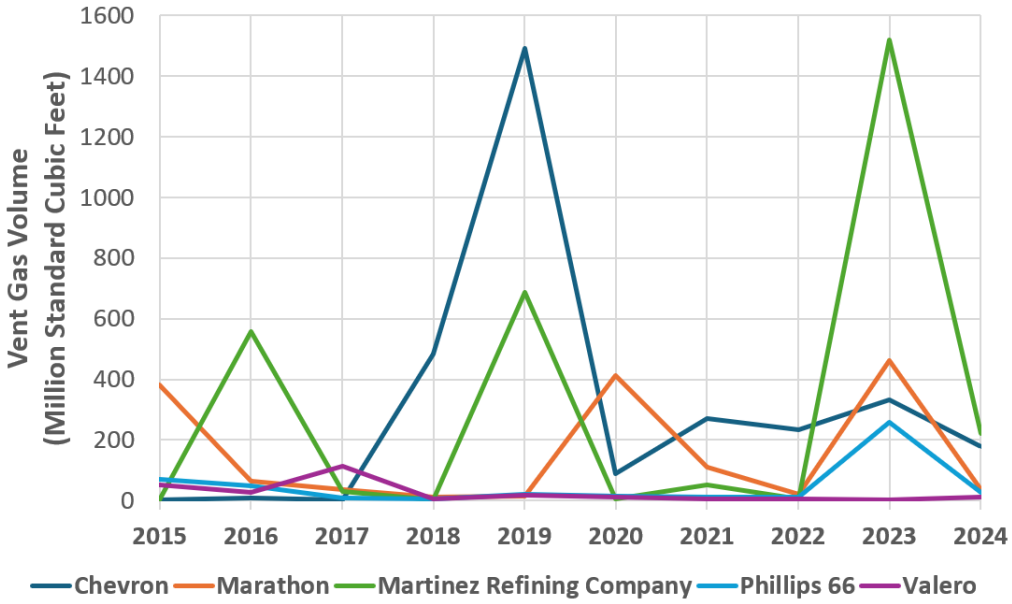

Figure 3 – Annual Vent Gas Volume Flared by Refinery from 2015 to 2024

Figure 3 shows the same vent gas volume data for the selected period of 2015 through 2024. There are two notable peaks in annual vent gas volume depicted in Figure 3, which occurred in 2019 at Chevron and 2023 at MRC. The 2019 peak at Chevron was primarily attributable to the commissioning of the Hydrogen Plant, including a 39-day reportable flaring event. The 2023 peak at MRC was primarily attributable to flaring of a low heat-value gas, including a 43-day reportable flaring event due to an unplanned equipment issue.

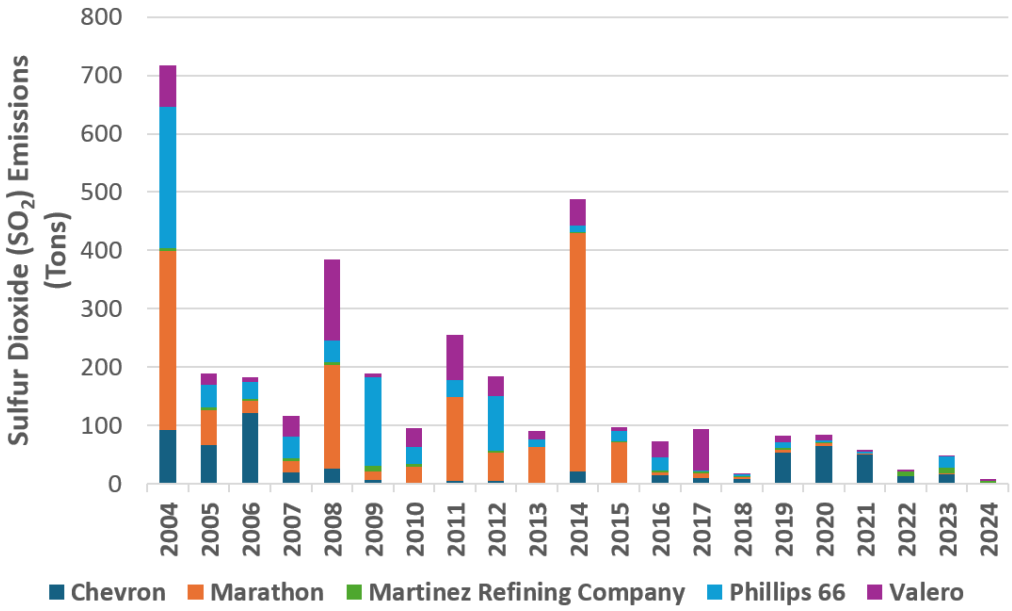

Figure 4 – Total Annual SO_2 Emissions from Flares by Refinery from 2004 to 2024

Figure 4 shows that SO_2 emissions from flares at Bay Area refineries have decreased since 2004 with consistently lower annual SO_2 emissions beginning with the year 2015. Comparing the average SO_2 emissions from flares between 2004 through 2014 and 2015 through 2024, SO_2 emissions overall have been reduced by 78 percent.

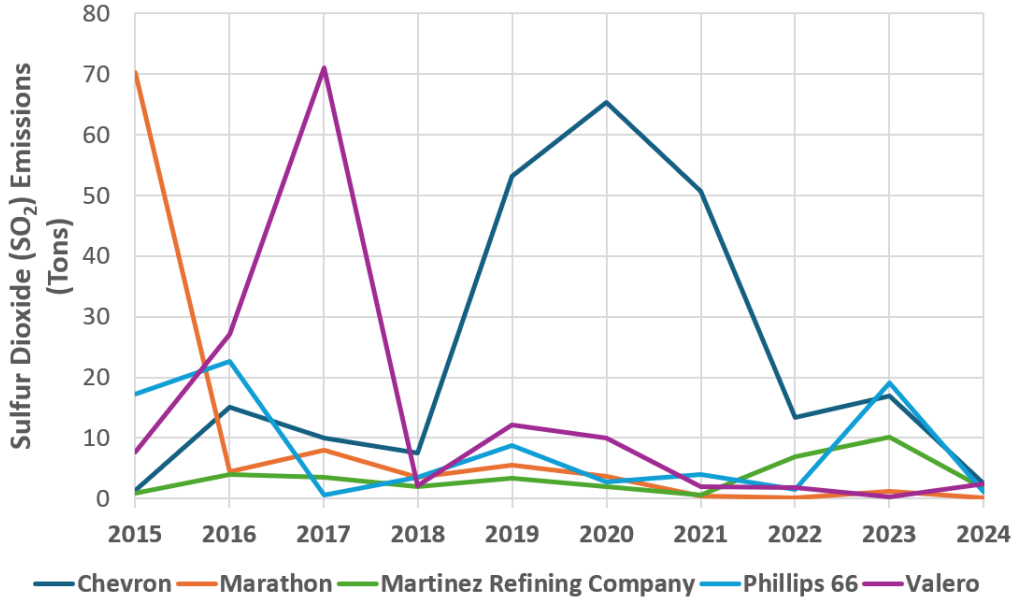

Figure 5 – Annual SO_2 Emissions from Flares by Refinery from 2015 to 2024

Further examining 2015 through 2024, Figure 5 shows three peaks in annual SO_2 emissions that occurred in 2015 at Marathon, in 2017 at Valero, and from 2019 to 2021 at Chevron. The reportable flaring event with the highest SO_2 emissions in 2015 at Marathon was due to the shutdown of refinery process units and subsequent operation as a terminal during a labor union strike, which was a 66-day reportable flaring event. The reportable flaring event with the highest SO_2 emissions in 2017 at Valero was due to an unplanned loss of external power supply. In 2019, 2020, and 2021, respectively, the reportable flaring events with the highest SO_2 emissions at Chevron were due to accumulated salts causing a false reading of high liquid level in a vessel, a trip of substation breakers due to an incorrectly labeled electrical drawing, and water intrusion into a breaker and substation during a severe rainstorm.

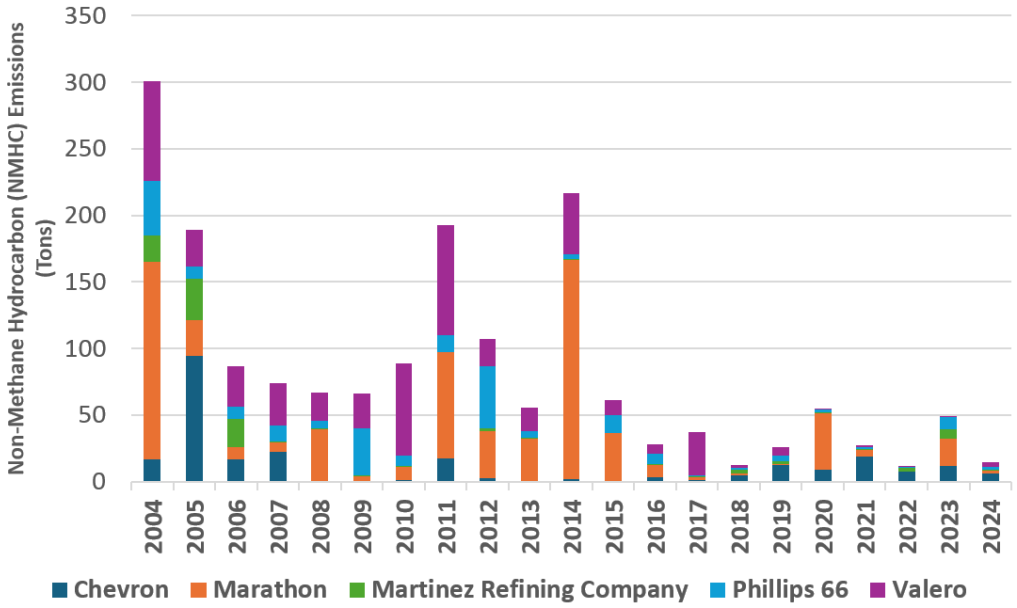

Figure 6 – Total Annual NMHC Emissions from Flares by Refinery from 2004 to 2024

Figure 6 depicts current estimates for NMHC emissions from flaring. Emissions estimates assume a uniform control efficiency in the flares. The emissions could be significantly higher if there was poor combustion during any of these instances of flaring. Since flaring emissions cannot be directly measured, the Air District must make assumptions about combustion efficiency. One of the goals of this rulemaking is to ensure proper combustion at flares to minimize NMHC emissions, many of which are toxic air contaminants.

Figure 6 presents the annual NMHC emissions from flares, and, similarly to Figure 4 depicting SO_2 emissions over the same period, lower overall annual NMHC emissions beginning in 2015. Comparing the average NMHC emissions from flares between 2004 through 2014 and 2015 through 2024, NMHC emissions overall have been reduced by 76 percent. Due to total SO_2 and NMHC emissions reductions beginning in 2015, Air District staff selected the 2015 through 2014 period as representative of the current operating conditions.

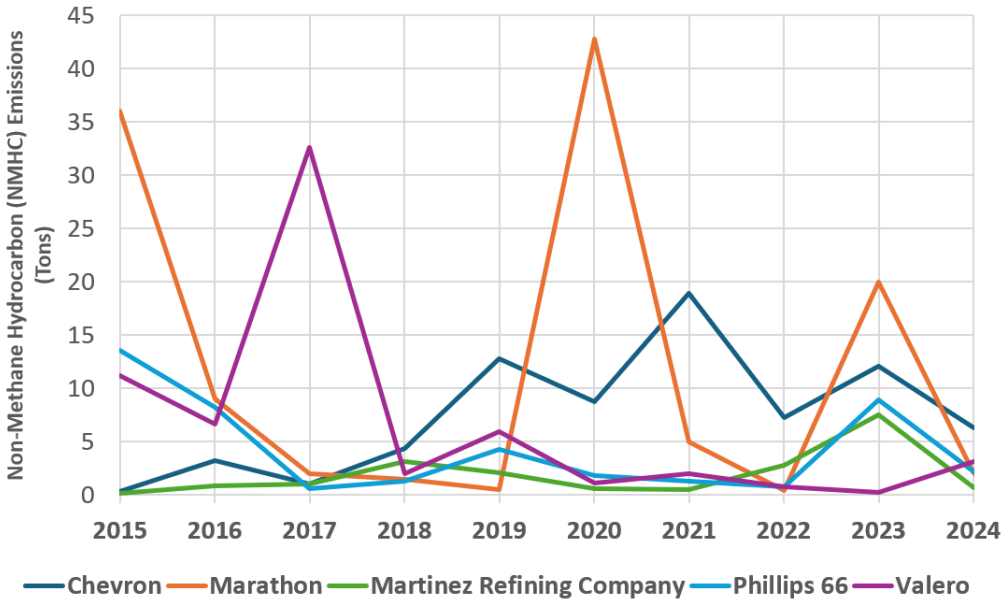

Figure 7 – Annual NMHC Emissions from Flares by Refinery from 2015 to 2024

Figure 7 shows three peaks in annual NMHC emissions in 2015 at Marathon, 2017 at Valero, and 2020 at Marathon. The reportable flaring events with the highest NMHC emissions in 2015 at Marathon and 2017 at Valero are attributable to the same reasons as the reportable flaring events with the highest SO_2 emissions for the same years. The peak in annual NMHC emissions in 2020 at Marathon is attributable to the idling of the refinery and operation as a terminal for 469 days during the COVID-19 outbreak.

Figures 3, 5, and 7 depicting the period 2015 through 2024 show that annual vent gas volume and emissions do not exhibit a consistent trend over time during the current operating conditions. Because flaring is episodic, fluctuations in these data are expected. The figures also show varying peaks, which are attributed to differences in vent gas composition among flaring activities. The annual data indicate that overall flaring did not decrease during the 10-year analysis period.

As defined in Rule 12-12, a reportable flaring event is defined as any flaring in a flare system in which more than 500,000 standard cubic feet of vent gas is flared or where SO_2 emissions exceed 500 pounds in a day. The number of reportable flaring events aligns with the number of causal reports that are required to be submitted to the Air District. Figures 8 and 9 show the number of reportable flaring events from the five Bay Area refineries' flares, first from 2006, the first full year of causal report data after adoption of Rule 12-12, through 2024, and second during the selected period of 2015 through 2024.

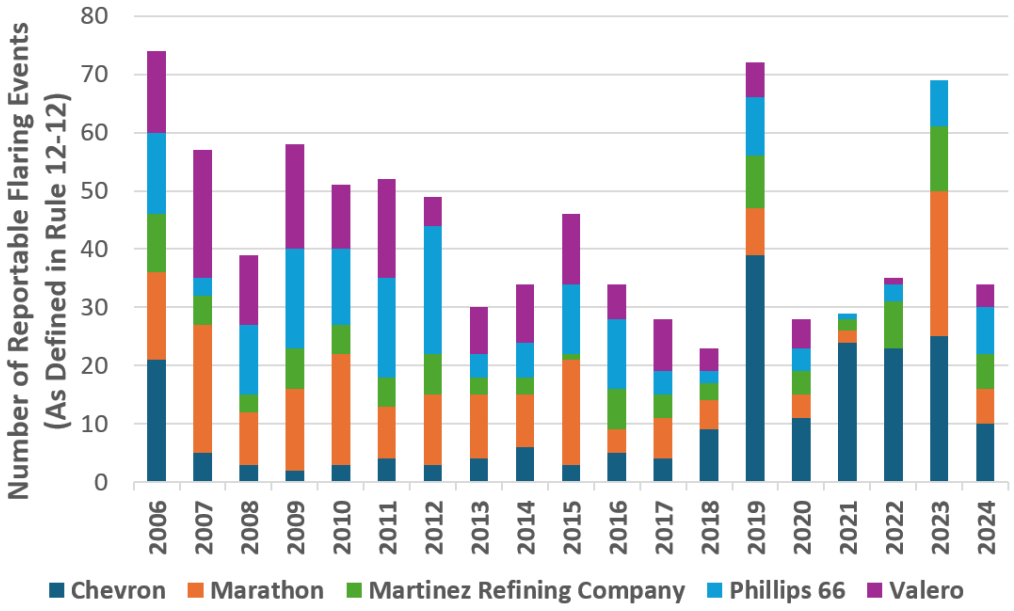

Figure 8 – Total Annual Reportable Flaring Events by Refinery from 2006 to 2024

Figure 8 shows the number of reportable flaring events, as defined in Rule 12-12, on an annual basis for each refinery. Overall, there is a reduction in reportable flaring events during the 2006 through 2024 period except for the peaks in 2019 and 2023. Comparing the average number of reportable flaring events between 2006 through 2014 and 2015 through 2024, the number of reportable flaring events overall decreased by 18 percent.

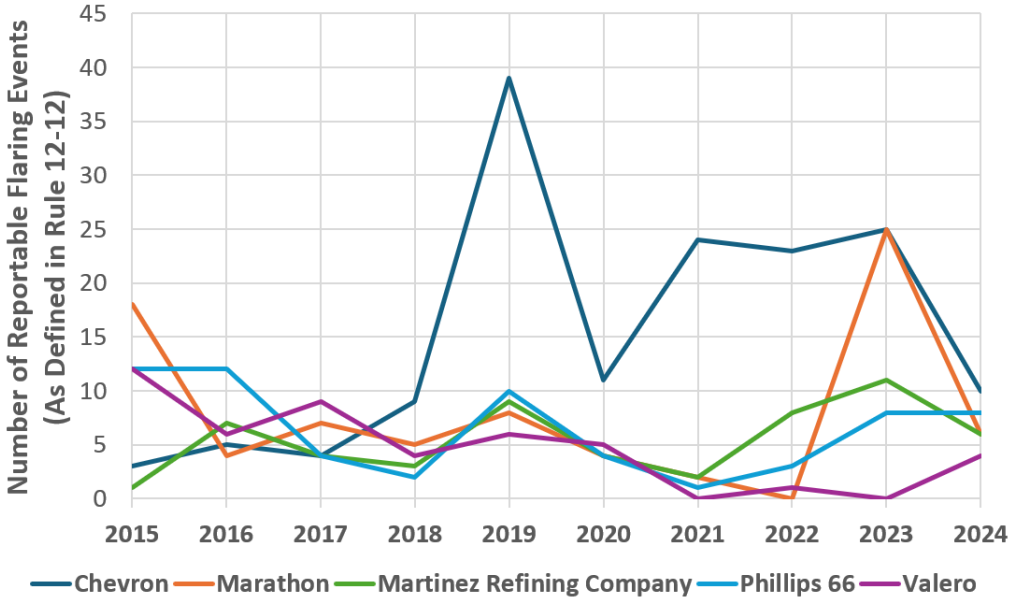

Figure 9 – Annual Reportable Flaring Events by Refinery from 2015 to 2024

Figure 9 illustrates that the annual number of reportable flaring events have not been reduced during the 10-year period. The Chevron Hydrogen Plant started up in 2018, and 60 percent of reportable flaring events from 2018 through 2024 were from the Hydrogen Plant flare. Reportable flaring events increased at Marathon in 2020 during the startup of processing alternative feedstocks following the idling of the refinery.

2. Cause Categories of Reportable Flaring Events

The following section examines historical flare data and causal reports from 2015 through 2024 to identify trends and relationships between the causes of reportable flaring events and the emissions they cause.

Figure 10 presents vent gas volume, SO_2 emissions, and NMHC emissions from flaring at the five refineries from 2015 through 2024, categorized as either reportable flaring events or other flaring activity. The data for reportable flaring events was obtained from the Rule 12-12 causal reports. Other flaring activity was determined by subtracting the Rule 12-12 causal report data from the data provided in the Rule 12-11 monthly flare data reports.

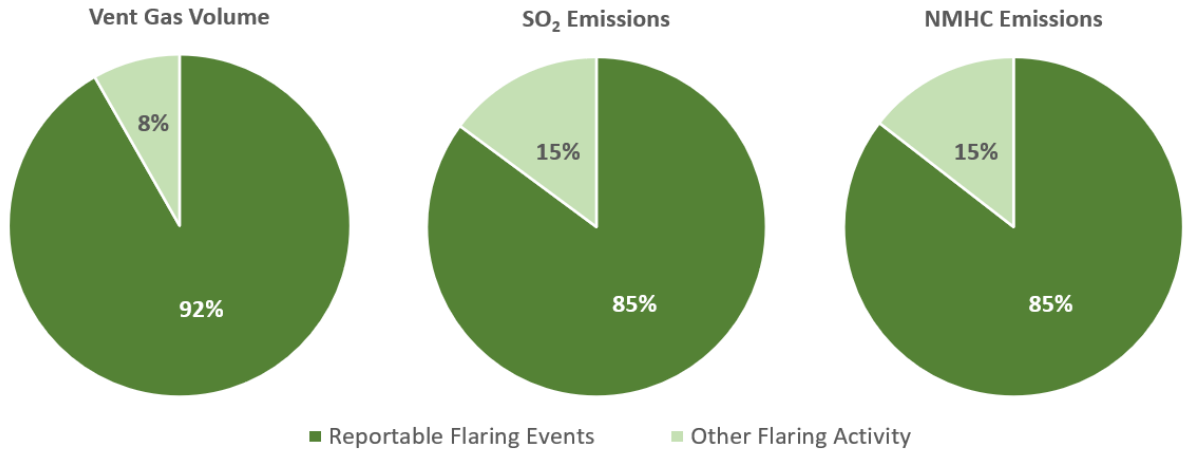

Figure 10 – Reportable Flaring Events and Other Flaring Activity Vent Gas Volume, SO_2 Emissions, and NMHC Emissions from 2015 to 2024

Figure 10 shows that 92 percent of vent gas volume, 85 percent of SO_2 emissions, and 85 percent of NMHC emissions from all flaring activity at the five refineries were from reportable flaring events from 2015 through 2024. The observation that approximately 85 percent of both SO_2 and NMHC emissions resulted from reportable flaring events is coincidental and is not indicative of an underlying trend or correlation. Since refineries are required to submit causal reports for reportable flaring events, further determination of cause and analysis can be done on the majority of vent gas volume and emissions during this period.

Air District staff conducted a preliminary review of cause categories of reportable flaring events from 2015 through 2024. The cause categories used during this preliminary review are below.

- Not preventable:[10] due to condition beyond reasonable control of the refinery management.
- Preventable:[10] due to condition within reasonable control of the refinery management.
- Planned:[11] due to condition from scheduled operational activities, such as scheduled startup, shutdown, maintenance, and turnarounds.
- Unplanned:[11] due to condition that is not planned, such as due to process upsets, unplanned shutdown, and unforeseen maintenance.

Not preventable flaring is always unplanned. Preventable flaring can be planned or unplanned, depending on the cause. Air District staff reviewed the reportable flaring events of the five Bay Area refineries from 2015 through 2024 and categorized each event as not preventable; planned, preventable; unplanned, preventable; or determination pending. Figure 11 presents these categories as vent gas volume, SO_2 emissions, and NMHC emissions. The preventable designation is based on the Air District's determination of each reportable flaring event.[12] The designations of planned and unplanned are based on Air District staff application of South Coast AQMD Rule 1118 definitions of "Planned Flare Event" and "Unplanned Flare Event," respectively. Determination pending consists of reportable flaring events under review due to the event being under an active investigation or enforcement matter. These are situations where Air District investigative or enforcement staff currently have an active and open case file.

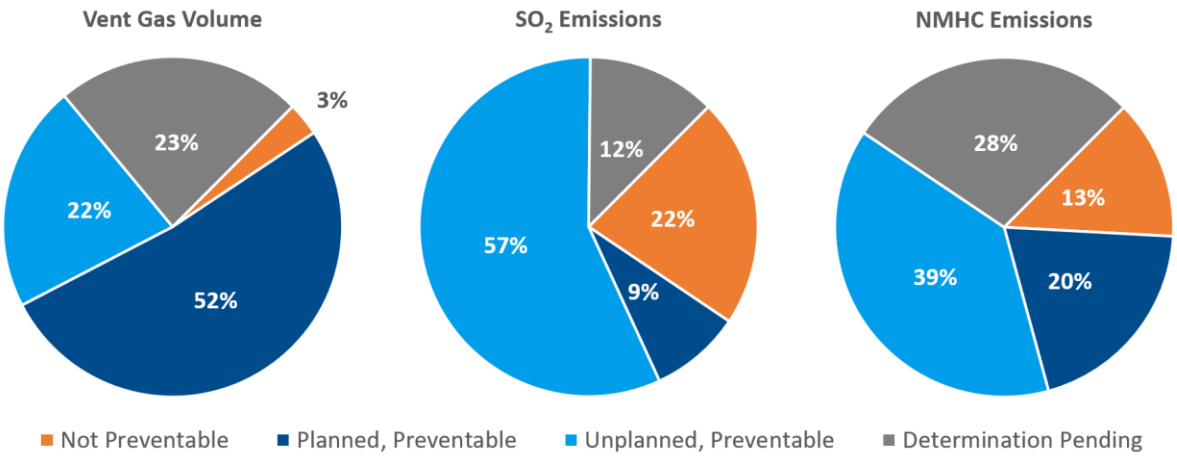

Figure 11 – Causes of Reportable Flaring Events Vent Gas Volume, SO_2 Emissions, and NMHC Emissions from 2015 to 2024

[10] For the purposes of this document, "not preventable" is equivalent to the Rule 12-12 definition of "emergency." "Preventable" is equivalent to the opposite of the Rule 12-12 definition of "emergency."
[11] Based on South Coast AQMD Rule 1118 Control of Emissions from Refinery Flares definitions of "Planned Flare Event" and "Unplanned Flare Event," since these definitions are not currently in Rules 12-11 or 12-12.
[12] The preventable designation may differ from the refinery-reported Rule 12-12 determination of "emergency" in the published causal report on the Air District website.

As shown in Figure 11, at least 74 percent of vent gas volume, 66 percent of SO_2 emissions, and 59 percent of NMHC emissions from 2015 through 2024 have been preliminarily categorized as preventable, meaning the majority of vent gas volume and emissions were due to causes that the Air District determined to be within the control of the refinery management.

Air District staff intends to conduct a more comprehensive analysis of flare data through further review of the monthly flare data reports and causal reports and discussions with individual refineries. The charts in this section may be updated throughout this rule development effort, to reflect updates to preventable determinations. The results of this analysis will be used to inform and support the decision-making process for potential amendments to Rules 12-11 and 12-12.

D. Measures to Minimize Flaring

Regardless of the cause, there is an opportunity to evaluate minimizing flaring emissions, frequency, and duration for all instances of flaring. While some flaring activity can be prevented, a significant portion of these activities can be avoided with better planning, strengthened operational management practices, or equipment improvements. Although there are instances where flaring cannot be prevented, flaring emissions and duration may be minimized in these instances. Below is a list[13] of some measures that refineries can implement to minimize flaring frequency, emissions, and duration. Many of these measures have been implemented or are currently being implemented at the refineries and documented in the refinery's FMP. [14] Although some measures may already be implemented, there may be an opportunity to improve the implementation of these measures. Due to each refinery's unique processes, refineries may be able to identify additional potential measures, and some listed measures may be determined to be not feasible after evaluation.

- **Source control management**:
    - **Maintenance and reliability**: plan and execute no or minimum flaring during planned turnarounds and maintenance, perform critical maintenance during planned turnarounds, prioritize and perform reactive and preventive maintenance activities, ensure spare equipment reliability, and replace equipment.
    - **Operations and procedures**: train and develop a mindset for minimum flaring, modify operating procedures for minimum flaring (including startup and shutdown), reduce plant feed rates to reduce the amount of vent gas flared, and develop and implement procedures to minimize flaring during unexpected events (including during external power loss).

[13] Some listed measures are adapted from Tables 2-5 and 2-6 in South Coast AQMD Rule 1118 Governing Board Package (April 5, 2024). Link to document: https://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2024/2024-Apr5-029.pdf?sfvrsn=10

[14] Bay Area Air District Flare Minimization Plans, https://www.baaqmd.gov/en/plans-and-climate/air-quality-plans/flare-minimization-plans

    - **Flare gas recovery systems**: improve management of flare gas sources, implement FGR compressors reliability modifications, increase FGR system capacity, and use temporary or rental gas recovery equipment.
- **Flaring monitoring and control**:
    - **Monitoring systems**: modify existing monitoring systems and install new monitoring systems.
    - **Automated technology to optimize flare combustion**: implement control technology to ensure good combustion and thereby reduce flare emissions.
- **Corrective actions**:
    - **Implementation of prevention measures after flaring**: investigate root cause of reportable flaring events and implement corrective actions to prevent flaring events due to a recurrent cause (causal reports), and capture lessons learned from flaring events with continuous improvement.

III. REGULATORY HISTORY

A. Air District

1. Rules 12-11 and 12-12

The Air District's 2001 Bay Area Ozone Attainment Plan included a control measure to require refinery flare monitoring, referencing the prior adoption of Rule 1118 by South Coast AQMD to require refinery flare monitoring. In 2003, Rule 12-11 was adopted by the Air District's Board of Directors and established requirements for petroleum refineries to monitor the volume and composition of gases sent to flares, more accurately calculate emissions from flaring, and report this information to the Air District. While these requirements did not directly require reductions in flaring itself, the required improvements in monitoring and reporting provided data needed to refine emissions inventories and identify opportunities for emissions reductions. These requirements reduced flaring in general by focusing the refiners' attention on the issue.

Using the information obtained from required monitoring under Rule 12-11, Rule 12-12 was developed and adopted in 2005 by the Air District's Board of Directors to reduce emissions from petroleum refinery flares by decreasing the frequency, magnitude, and duration of flaring events. Rule 12-12 established requirements for refineries to report the cause and corrective actions of reportable flaring events to prevent events due to a recurrent cause (causal report) and to develop and implement a comprehensive FMP. Because refineries differ significantly in configuration, operating conditions, and their ability to recover or beneficially use gases, Rule 12-12 was designed to provide flexibility so that each facility can implement the most effective flaring prevention and corrective measures for its operations.

In 2021, the Air District's Board of Directors adopted administrative amendments to several rules, including Rules 12-11 and 12-12, to ensure that rules applicable to petroleum refineries continue to apply to the same facilities following modifications to produce products from alternative feedstocks. Due to these amendments, Rules 12-11 and 12-12 have

continuously applied to all five Bay Area refineries.

2. Air District's 2024-2029 Strategic Plan

The Air District's 2024-2029 Strategic Plan[15] establishes the agency's long-term vision and priorities for improving air quality and protecting public health in the San Francisco Bay Area. The Strategic Plan was developed through public outreach and stakeholder engagement and was approved by the Air District's Board of Directors in September 2024 to guide the Air District's regulatory, enforcement, monitoring, and incentive programs. The Strategic Plan includes a commitment under Strategy 1.3: Minimize Flaring to explore ways to minimize flaring, including evaluating potential amendments to the Air District's flare rules.

As part of the implementation of the Strategic Plan action on minimizing flaring, the Air District initiated the Refinery Technical Working Group (RTWG).[16] The RTWG is composed of Air District staff, refinery representatives, community members, local government staff, advocacy group representatives, labor representatives, and other members to gather information and opinions from stakeholders on a variety of topics related to refinery rulemaking. The RTWG convened in June 2025, August 2025, February 2026, and July 2026 to discuss flare-related topics, including discussing potential concepts for this flare rule development effort in February 2026 and July 2026.

3. Assembly Bill 617 Path to Clean Air Community Emissions Reduction Plan for Richmond, North Richmond and San Pablo

AB 617 establishes the Community Air Protection Program, which requires the California Air Resources Board (CARB), with nomination by the air districts, to select communities to develop a Community Air Monitoring Plan (CAMP) and/or CERP. The Richmond, North Richmond and San Pablo community was one of the first communities selected by CARB: first in 2018 to develop a CAMP, and then in 2023 to develop a CERP.[17] AB 617 requires CERP development and implementation to be done in collaboration with community stakeholders, identification and implementation of enforceable actions to reduce emissions from key sources, and ongoing progress tracking and public reporting.

To meet the requirements of AB 617, the Air District Board of Directors adopted the Path to Clean Air: Richmond, North Richmond, and San Pablo CERP (PTCA Plan) in May 2024.

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[15] Bay Area Air District, 2024-2029 Strategic Plan, September 2024, https://www.baaqmd.gov/en/about-the-air-district/mission-statement/strategic-plan

[16] Bay Area Air District, Refinery Technical Working Group, https://www.baaqmd.gov/en/rules-and-compliance/rule-development/refinery-twg

[17] Bay Area Air District, Path to Clean Air: Richmond, North Richmond, and San Pablo Community Emissions Reduction Plan, April 2024, https://www.baaqmd.gov/en/Community-Health/Community-Health-Protection-Program/Richmond-Area-Community-Health-Protection-Program/Community-Emissions-Reduction-Work

CARB subsequently reviewed and approved the PTCA Plan later in November 2024, confirming consistency with AB 617 requirements.

Among its commitments, the PTCA Plan includes measures related to flaring reduction, regulatory evaluation, enhanced monitoring and transparency, strengthened enforcement, and improved community notification, with the goal of reducing emissions and community exposure from refinery flaring.

B. Federal Regulations

Promulgated in 1986, the U.S. Environmental Protection Agency (U.S. EPA) New Source Performance Standards (NSPS) include general flare requirements under 40 Code of Federal Regulations (CFR) 60.18 (General Control Device Requirements). These provisions establish operating criteria to ensure that flares function effectively as air pollution control devices.

Promulgated by U.S. EPA in 1974 and 2008 respectively, the NSPS rules 40 CFR 60, Subpart J (Standards of Performance for Petroleum Refineries) and Subpart Ja (Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007) include standards for petroleum refinery process units and ancillary equipment operations, including flare operations. These two federal regulations limit the emissions of sulfur-containing compounds with Subpart Ja adding additional provisions for monitoring and minimization of flaring. A provision in 40 CFR 60, Subpart Ja states that flares subject to the regulation located within the Bay Area Air District may elect to comply with Rules 12-11 and 12-12 as an alternative to complying with specific sections in the regulation, provided that the flares comply with Rules 12-11 and 12-12.[18]

In 2015, U.S. EPA finalized the Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards (“Refinery Sector Rule”), which finalized the Residual Risk and Technology Review for petroleum refinery National Emissions Standards for Hazardous Air Pollutants (NESHAP) standards and revised certain petroleum refinery NSPS requirements. The Refinery Sector Rule established and revised significant requirements for flares at petroleum refineries under both the NESHAP provisions (including 40 CFR Part 63, Subpart CC) and related NSPS provisions. U.S. EPA specifically identified flare monitoring and control requirements as key components of the rule. The Refinery Sector Rule includes provisions to implement corrective actions following significant flaring incidents and to establish monitoring and performance requirements to minimize flaring emissions.

[18] 40 CFR 60.103a(g), accessed on July 14, 2026. https://www.ecfr.gov/current/title-40/part-60/section-60.103a#p-60.103a(g)

C. Flare Rules in Other Jurisdictions

South Coast AQMD Rule 1118 Control of Emissions from Refinery Flares (Rule 1118) was adopted in 1998 to require petroleum refineries and related facilities to monitor, record, and report flaring activity. At the time of adoption, the South Coast AQMD Governing Board directed staff to evaluate the collected data to determine the significance of flare emissions and assess the need for additional controls. Since its adoption, Rule 1118 was amended in 2005, 2017, 2023, 2024, and 2026. The amendments increased the stringency of flare requirements and were designed to reduce flaring and associated emissions at refineries. Key provisions include:

- Incorporation of key federal Refinery Sector Rule requirements, including prohibitions on certain flaring events;
- Through multiple amendments, the establishment of a declining annual SO_2 performance target and associated mitigation fees;
- Establishment of requirements for clean service flares, including a new annual NOx performance target for Hydrogen Clean Service Flares;
- Standardized methodologies for flow determination, emission calculations, and missing data; and
- Enhanced notification, reporting, monitoring, emission target, and public communication requirements.

San Joaquin Valley APCD Rule 4311 Flares (Rule 4311) was adopted in 2002 to implement Reasonably Available Control Technology requirements for major sources of VOC and NOx emissions and to control emissions from flaring operations in several industries, including petroleum refineries. Since its adoption, Rule 4311 was amended in 2006, 2009, and 2020. Rule 4311 requires flare operators to prepare FMPs, conduct comprehensive monitoring and recordkeeping, report both planned and unplanned flaring events to the San Joaquin Valley APCD, and meet applicable SO_2 performance targets for petroleum refineries.

IV. REGULATORY CONCEPTS

This section summarizes regulatory concepts under consideration to reduce flaring emissions and frequency, with the objectives of achieving quantifiable and meaningful emission reductions from refinery flares, with particular focus on reducing flaring that is preventable. In addition, Air District staff is evaluating regulatory concepts intended to strengthen FMP updates, as well as enhance monitoring and reporting requirements. These regulatory concepts are intended to achieve the following goals:

- Incentivize or require refineries to make investments and operational improvements required to minimize overall flaring, with particular focus on addressing the root causes of preventable flaring.
- To the extent feasible, ensure that flares burn efficiently to minimize harmful pollutants.
- Clearly differentiate between flaring that has a high potential for public health risk

and flaring that does not.
- Enhance the availability of flaring information for past and future flaring activity to promote public transparency and accessibility, improve resource efficiency, and strengthen enforceability.

The concepts described herein are preliminary and remain at an early stage of rule development. They are intended to inform ongoing technical and rulemaking evaluations and are subject to further analysis, stakeholder input, environmental impact review, and consideration through the formal rulemaking process prior to potential adoption of rule amendments by the Air District's Board of Directors.

A. Reduce Emissions and Frequency of Flaring

The concepts in this section are intended to reduce emissions and the frequency of flaring with a focus on flaring that is preventable. The first two concepts in this section could establish limits and performance standards, while the latter three concepts could require measures to minimize emissions and frequency based on triggering criteria.

1. Incorporate Key Flare Combustion Efficiency Requirements from the U.S. EPA Refinery Sector Rule

This regulatory concept would incorporate key federal operating requirements from the U.S. EPA Refinery Sector Rule, specifically from 40 CFR Part 63, Subpart CC, including standards for combustion efficiency and smokeless operation. Standards under consideration include the net heating value of the combustion zone standard, flare tip velocity limit, and visible emissions limit, which are designed to ensure proper flare performance and effective pollutant destruction.

Although federal regulations already require monitoring of these parameters at petroleum refineries, Air District staff is evaluating whether to require that all refineries include this information in monthly flare data reports and causal reports. The refineries that were converted to process alternative feedstocks are not subject to the U.S. EPA Refinery Sector Rule, which only applies to petroleum refineries.

The primary anticipated benefit of this concept is to ensure the requirements are applicable to all refineries in the Bay Area, which would reduce emissions from flaring at the refineries that process alternative feedstocks. Another anticipated benefit is improved enforceability of flare operational requirements. Making key operating data more transparent and readily available would enhance the Air District's ability to assess compliance and would improve public access to information regarding flare performance.

In the 2017 amendments to South Coast AQMD Rule 1118, Refinery Sector Rule requirements were incorporated by reference to supplement the previously existing Rule 1118 monitoring requirements, including the net heating value of the combustion zone, flare tip velocity, and visible emission requirements.

2. Establish New Flare Limits

Air District staff is evaluating facility-level emission limits for flares, potentially with differing limits for non-hydrogen flares and for hydrogen flares.

In addition to mass-based emission limits, Air District staff is also evaluating alternative metrics, such as vent gas volume limits, as a potential approach to limit overall flaring activity.

The threshold and duration criteria for these limits will be established using flare data. In evaluating the applicability of limits, Air District staff will consider whether new or revised definitions are needed for different flare types (e.g., hydrogen and non-hydrogen flares) and how the limits would apply across flare types and various flaring scenarios, such as flaring due to a cause that is preventable versus a cause that is not preventable.

The benefit of this concept would be a reduction in flaring, vent gas volume, and emissions, and a corresponding decrease in the frequency and severity of flaring events over time. Air District staff anticipates that refineries would prevent exceeding the applicable limits through measures including more effective planning, strengthened operational management practices, and equipment improvements, as discussed in Section II.D. Measures to Minimize Flaring.

South Coast AQMD Rule 1118 and San Joaquin Valley APCD Rule 4311 include “performance targets” that are expressed as a mass of pollutant emitted per unit of facility processing capacity in a calendar year. These performance targets are discussed in this section because Air District staff anticipates evaluating a range of approaches for developing potential limits, including methodologies similar to the performance target frameworks adopted by other air districts.

In South Coast AQMD Rule 1118, SO_2 and nitrogen oxides NOx emissions performance targets are based on each facility’s design crude processing capacity for SO_2 and design hydrogen production capacity for NOx. In addition, the SO_2 performance targets adopted into Rule 1118 were structured as declining targets. Under the 2005 amendments, the SO_2 performance target declined from 1.5 tons in 2006 to 0.5 tons by 2012 per million barrels of crude processing capacity for each calendar year. Under the 2024 amendments, the SO_2 performance target declined to 0.35 tons from 2026 through 2028 and will decline to 0.25 tons by 2029 per million barrels of crude processing capacity for each calendar year. Similarly, San Joaquin Valley APCD Rule 4311 established a declining SO_2 performance target in the 2009 amendments, under which the target declined from 1.5 tons by 2011 to 0.5 tons by 2017 per million barrels of crude processing capacity for each calendar year.

3. Require Mitigation Measures Based on Triggering Criteria

Under this regulatory concept, mitigation measures would be required for facilities that do not meet limits or standards in Rules 12-11 or 12-12. Air District staff is evaluating the

following as mitigation measures triggers: exceeding emission or vent gas volume limits; and deviating from standards in the U.S. EPA Refinery Sector Rule. There are two types of mitigation measures under this concept:

- Evaluation and implementation of feasible emission reduction measures to prevent recurrence; and
- Payment of a mitigation fee.

Emission Reduction Measures

Under the emission reduction measures concept, facilities would be required to conduct a comprehensive evaluation of potential flaring emission reduction options appropriate to their operations. Feasible measures could include enhanced emissions monitoring, optimization of flare operation and control parameters, such as automated technology to optimize flare combustion, improved management of flare gas sources, and expansion of refinery flare gas recovery and reuse capacity. The specific measures implemented would vary by facility, depending on operational configuration, flare system design, and the underlying causes of the exceedance. Facilities would submit the comprehensive evaluation of potential flaring emission reduction options to the Air District for review and approval.

Air District staff is evaluating whether more stringent emission reduction measures should apply in cases involving larger exceedances, significant deviations, and/or repeated triggers in a specified time frame. Development of such requirements would require a detailed, facility-specific feasibility analysis, including a technical evaluation of available control strategies and operational improvements that could be implemented at affected facilities.

The anticipated outcome of this concept would be a reduction in overall flare-related emissions and a corresponding decrease in the frequency and severity of flaring activity over time. For example, improvements in flare gas recovery and reuse capacity management would reduce the amount of excess gas routed to the flare by returning more gases to refinery processes instead of the flare, which would decrease frequency and severity of flaring events. In addition, automated technology to optimize flare combustion would further reduce emissions when flaring occurs.

Mitigation Fee

Under this regulatory concept, facilities could choose to pay a mitigation fee in lieu of implementing emission reduction measures that allow the facilities to fully achieve compliance with limits or standards. The Air District would use the revenue from the mitigation fees solely to fund projects to minimize the community health impacts from the excess flaring emissions that result from the facilities' decision to pay the fee in lieu of implementing emission reduction measures to achieve the applicable limit or standard.

The goal of the mitigation fee concept is to offer facilities a choice between implementing emission reduction measures to fully achieve compliance with limits or standards and

paying a fee that would fund beneficial projects to minimize the community health impacts that would offset the emissions from compliance with limits or standards.

South Coast AQMD Rule 1118 includes a mitigation fee applicable to flaring emission exceedances. The mitigation fee is structured so that the fee rate increases with the magnitude of the exceedance. Mitigation fees collected may be expended only with approval from the South Coast AQMD Governing Board and historically have been directed toward emission reduction incentive programs. South Coast AQMD's experience with the fee may be instructive, but Air District staff does not anticipate using it as an exact model.

4. Require Submittal of Causal Reports Based on Additional Triggering Criteria

Under this regulatory concept, facilities would be required to submit causal reports when additional triggers occur. Currently, causal reports are only required when daily vent gas volume or SO_2 emission thresholds are exceeded under Rule 12-12. Expanding the triggers for causal reporting would allow the Air District to identify the underlying causes of flaring activity and implement measures to prevent recurrence. Potential triggers under consideration include exceedances of visible emission limits, flare tip velocity limits, and an NMHC emissions threshold.

The anticipated outcome of this concept is a reduction in the frequency of flaring associated with these additional triggers by requiring reporting and implementation of prevention measures to prevent events due to a recurrent cause. The concept would also expand existing reporting requirements to improve transparency, accountability, and regulatory oversight.

South Coast AQMD Rule 1118 includes Specific Cause Analysis reporting for flaring that exceeds 100 pounds of VOC emissions, 500 pounds of SO_2 emissions, or 500,000 standard cubic feet of vent gas, with exemptions for defined planned operational activities. Rule 1118 also includes requirements for Specific Cause Analysis reporting if Refinery Sector Rule violations occur, which are similar to the root cause analysis and corrective action analysis requirements in the Refinery Sector Rule.

5. Require Third-Party Audits for Facilities Based on Triggering Criteria

Under this regulatory concept, facilities would be required to retain independent auditors to verify compliance with operational and regulatory flare requirements.

Air District staff is currently evaluating potential triggers for when third-party audits would be required, recognizing that audits would need to be conducted under appropriate oversight. The Air District would need to develop clear criteria to ensure that auditors possess the necessary expertise, qualifications, and background to effectively conduct these compliance audits in accordance with Air District standards.

Potential audit triggers under consideration include:

- Recurrent flaring from the same source or process area within a defined period;
- Flaring due to a not preventable cause that exceeds specified emission or vent gas thresholds; and
- Instances where a facility's audits, performed to evaluate and implement prevention measures or corrective actions identified in causal reports or the facility's Flare Minimization Plan (FMP), are deemed insufficient to prevent future flaring by the Air District.

The anticipated outcomes of this concept include reduced emissions and a decrease in the frequency of flaring activity, supported by independent verification that facilities are managing their operations in compliance with rule requirements and the facility's FMP.

Third-party audits are a well-established compliance tool, having been routinely used under U.S. EPA consent decrees to ensure adherence to environmental regulations.[19,20,21]

B. Strengthen Flare Minimization Plan Updates, Monitoring, and Reporting

1. Strengthen Flare Minimization Plan Updates

This regulatory concept would evaluate amending requirements for FMP updates.

The Air District is considering streamlining FMP updates and is evaluating strategies, such as codifying that refineries submit redlined copies to clearly delineate changes between the previously approved version of the FMP with each FMP update.

To strengthen the FMP updates, the concept includes requiring an updated cost analysis of installing or implementing measures to reduce flaring with the annual FMP update. Cost analyses in the current FMPs for equipment upgrades, such as flare gas recovery capacity and storage, remain based on 2005 and 2006 data originally developed for the initial FMP submission in 2006.

The Air District is evaluating a requirement to include mitigation measures implemented based on triggering criteria, as described in Section IV.A.3. Require Mitigation Measures Based on Triggering Criteria.

Currently, FMPs are required to be updated annually and prior to installing or modifying equipment, as described in Sections 12-12-404.1 and 12-12-404.2, respectively. The Air

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[19] United States et. al. vs. Tesoro Refining & Marketing Company LLC et. al., Civ. No. SA-16-cv-00722 (W.D. Tex July 18, 2016) (Consent Decree), available at: https://www.epa.gov/sites/default/files/2016-07/documents/tesoro-cd.pdf

[20] United States v. MFA Inc., et al., Civil Action No. 2:18-cv-04133-WJE (W.D. Mo. July 2, 2018) (Consent Decree), available at: https://www.justice.gov/enrd/consent-decree/file/1077351/dl

[21] United States and State of Nebraska v. Clean Harbors Environmental Services, Inc., Civil Action No. 8:20-cv-00351 (D. Neb. Aug. 31, 2020) (Consent Decree), available at: https://www.justice.gov/enrd/consent-decree/file/1313156/dl?inline

District is evaluating the required frequency of the different elements of the FMP updates, including the elements described in this regulatory concept.

The primary anticipated benefits of this concept are improved enforceability and increased resource efficiency. By streamlining the FMP updates, the concept would reduce Air District staff review time of the FMP and increase alignment between the Air District and refineries on these efforts. By strengthening the FMP updates, the amendments would increase the robustness of the FMP to reduce flaring.

South Coast AQMD Rule 1118 only requires that FMPs be created or updated when there are certain triggers, including when an annual SO_2 or NOx performance target is exceeded.

2. Standardize Reporting Requirements

This regulatory concept would require evaluating amendments to reporting requirements to improve data consistency and accessibility. The intent is to update the format and content requirements for both causal reports required by Rule 12-12 and flare data reports required by Rule 12-11 so that submissions by facilities are more uniform, easier to review, and simpler to analyze.

Currently, facilities submit causal and flare data reports in varying formats, with differences in the level of detail and calculation methods. This inconsistency requires additional time and effort by the Air District to review, validate, and interpret the data. Under this concept, Air District staff is evaluating potential changes such as requiring standardized report templates for both causal and flare data reports, developing a uniform causal categorization system, and prescribing consistent emissions calculation methodologies.

The primary anticipated benefits of this concept are improved data integrity, greater accessibility, and increased resource efficiency. Standardized templates and calculation methods would minimize the need for follow-up communication, ensure consistency across submissions, and enable more efficient review and analysis. By enhancing the consistency and quality of submitted data, the Air District would be able to better assess compliance, streamline oversight, and support more effective regulatory enforcement. Causal reports, which are currently published on the Air District website, would be more accessible and transparent with a comprehensive causal categorization system and standardization across all reports.

South Coast AQMD Rule 1118 requires standardized report templates, a more comprehensive causal categorization system, and prescribed emission calculation methodologies.

3. Expand Definitions and Categories for Reporting Causes of Flaring

Under this regulatory concept, Air District staff is evaluating amendments to existing definitions related to the causes of flaring and the addition of new definitions to provide greater clarity. The intent is to ensure that the terminology used in the rule accurately

reflects different types of flaring activity and aligns with federal regulations.

Potential changes under consideration include amending the definition of “emergency” in Section 12-12-201 to explicitly state and clarify that flaring resulting from poor maintenance or operator error does not qualify as an “emergency” and renaming the term “emergency” to “not preventable.” This concept also includes adding definitions for “planned” and “unplanned” to better distinguish between different types of flaring.

The primary anticipated benefits of this concept are improved clarity, stronger enforceability, and more accurate reporting. By clearly defining each category of potential causes of flaring, the amendments would support consistent interpretation of requirements, enable uniform reporting by facilities, strengthen overall regulatory oversight, and minimize flaring that is preventable.

The definition of Emergency in South Coast AQMD Rule 1118 includes that “A Flare Event caused by poor maintenance, or a condition caused by operator error, shall not be deemed an Emergency.” NSPS Subpart A includes that a definition of Malfunction, which includes, “Failures that are caused in part by poor maintenance or careless operation are not malfunctions.”

South Coast AQMD Rule 1118 includes definitions of Planned Flare Event and Unplanned Flare Event. Rule 1118 also requires that the Relative Cause be reported for any flaring where more than 5,000 cubic feet of vent gas is combusted. The Relative Cause categories include Emergency, Shutdown, Startup, and Turnaround. The requirements were initially adopted in the 2005 amendments.

4. Strengthen Monitoring and Reporting Requirements

Air District staff is reviewing updates to monitoring and reporting requirements aimed at improving emissions tracking and enhancing the enforceability of key flare operational parameters under this concept.

Potential changes under consideration include requiring facilities to implement continuous measurement of composition, including hydrocarbon content by compound and total sulfur concentration as a surrogate for SO_2 emissions, and establishing a formal review and approval processes for causal reports and flare monitoring systems. These measures would ensure that monitoring equipment provides real-time data with minimal lag, enabling rapid response to changing vent gas composition and load conditions. South Coast AQMD Rule 1118 requires continuous or semi-continuous total sulfur and higher heating value monitoring of vent gas and a formal review and approval process for causal report corrective actions and flare monitoring systems.

Air District staff is considering requiring refineries to install and maintain optical flow monitors downstream of each water seal to verify flaring activity. Currently, flow monitoring upstream of the water seal is required by Air District and federal requirements, and refineries rely on visual observation and water seal, upstream pressure, and upstream flow

data to determine if flaring is occurring. This potential change could improve transparency and alignment between the refinery and the Air District to confirm flaring of vent gas.

Another potential change Air District staff is considering is a requirement to install data acquisition and handling systems (DAHS) for all flare compliance monitors and to have the DAHS be capable of providing all relevant compliance reports. DAHS would improve transparency and accessibility of flare data and substitution methodology for missing data, strengthening enforcement.

Air District staff is evaluating a requirement for facilities to provide the Air District access to the facility's continuous flare video streams. This would assist the Air District verify instances of flaring activity, as well as strengthen enforcement and Air District staff's response to flaring.

The concept includes evaluating requirements for online submittal of video monitoring data through cloud-based platforms to reduce turnaround time and staff workload. Currently, video monitoring data are submitted in formats that require significant processing time and bandwidth, limiting the timeliness and efficiency of data review. South Coast AQMD Rule 1118 requires online submittal of video monitoring data.

Air District staff is exploring a requirement to monitor flares using infrared cameras that detect VOCs. The infrared cameras would be paired with a notification system that would notify the community when flaring occurs, which could improve transparency and public accessibility of flaring information.

A potential change under this concept is requiring facilities to submit notifications and data in a new system to communicate flaring to the community. This could include requirements to notify the community of planned flaring in advance, as well as requirements to notify the community of unplanned flaring immediately. This potential change would provide transparency and public accessibility of flaring information, especially for planned flaring. South Coast AQMD Rule 1118 has required notifications for Planned Flare Events and Unplanned Flare Events since the 2005 amendments and amended the notifications to a web-based Flare Event Notification System adopted in the 2017 amendments. Refineries in Contra Costa County are currently required to notify the community of unplanned and planned flaring immediately when it occurs through the Community Warning System.[22] The Community Warning System is intended to alert residents about any potential health hazards and emergencies that may be occurring. The Air District plans to work with the Contra Costa County Fire Protection District when designing the potential Air District-required flaring notification requirements.

[22] Community Warning System webpage, Contra Costa County Fire Protection District, accessed on August 5, 2026, https://www.cccfpd.org/350/Community-Warning-System

V. ANTICIPATED RULE DEVELOPMENT SCHEDULE AND NEXT STEPS

The Air District is currently soliciting feedback on these regulatory concepts and will continue public outreach efforts through October 2026. After receiving and considering input on the regulatory concepts, the Air District anticipates commencing with the rulemaking process for Rules 12-11 and 12-12 amendments in late 2026. Further rule development activity is anticipated to include the preparation of draft amendments, a public comment period, and public engagement. Air District staff would then continue to further develop and evaluate the rule amendments in preparation for presenting final proposed rule amendments, additional analyses, and materials for consideration by the Air District Board of Directors.

Appendix A – Glossary

Flare Gas Recovery – FGR: The process by which a refinery captures excess gases, primarily hydrocarbons, and returns them to its fuel gas network for use in processes, such as steam or heat generation.

Flare Minimization Plan – FMP: A certified plan to minimize flaring, comprised of the following: Technical Data, Reductions Previously Realized, Planned Reductions, Prevention Measures, and any other information requested by the Air Pollution Control Officer as necessary to determine compliance with Rule 12-12. *(Rule 12-12)*

Flaring: A high-temperature combustion process used to burn vent gases. Also described as flaring activity. *(Rule 12-11)*

Hazardous Air Pollutant – HAP: Pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. Also known as toxic air pollutants or air toxics.[23]

Methane: A light hydrocarbon that acts as a powerful greenhouse gas.

Nitrogen Oxides – NOx: A group of gases that form when nitrogen reacts with oxygen during combustion, especially at high temperatures.

Non-methane Hydrocarbons – NMHC: A chemically reactive subset of volatile organic compounds.

Not Preventable:[24] Any flaring due to condition beyond reasonable control of the refinery management.

Particulate Matter – PM: Tiny airborne particles that vary in size and mass (ultrafine, fine, and coarse), physical state (solid or liquid), chemical composition, toxicity, and how they behave in the atmosphere.

Pilot Gas: The gas used to maintain the presence of a flame for ignition of vent gases. *(Rule 12-11)*

Planned flaring: Any flaring as a result of scheduled operational activity.

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[23] "What are Hazardous Air Pollutants?" on the U.S. EPA website, accessed on August 5, 2026, https://www.epa.gov/haps/what-are-hazardous-air-pollutants

[24] For the purposes of this concept paper, "not preventable" is equivalent to the Rule 12-12 definition of "emergency." "Preventable" is equivalent to the opposite of the Rule 12-12 definition of "emergency."

Preventable:[24] Any flaring due to condition within reasonable control of the refinery management.

Purge Gas: The gas used to prevent air backflow in the flare system when there is no vent gas. *(Rule 12-11)*

Reportable Flaring Event: Any flaring from a flare system where more than 500,000 standard cubic feet of vent gas is flared or sulfur dioxide (SO_2) emissions are greater than 500 pounds in a day due to the same cause. *(Rule 12-12)*

Shutdown: The intentional cessation of a refining process unit or a unit operation within a refining process unit due to lack of feedstock or the need to conduct periodic maintenance, replacement of equipment, repair or other operational requirements. A process unit includes subsets and components of the unit operation. Subsets and components includes but are not limited to reactors, heaters, vessels, columns, towers, pumps, compressors, exchangers, accumulators, valves, flanges, sample stations, pipelines or sections of pipelines. *(Rule 12-12)*

Startup: The setting into operation of a refining process unit for purposes of production. A process unit includes subsets and components of the unit operation. Subsets and components includes but are not limited to reactors, heaters, vessels, columns, towers, pumps, compressors, exchangers, accumulators, valves, flanges, sample stations, pipelines or sections of pipelines. *(Rule 12-12)*

Sulfur Dioxide – SO_2: A pungent gas that can be formed by heating and burning fossil fuels (such as coal and oil), releasing the sulfur present in these materials.

Unplanned flaring: Any flaring that is not planned flaring.

Vent Gas: Any gas directed to a flare excluding assisting air or steam, flare pilot gas, and any continuous purge gases. *(Rules 12-11 and 12-12)*

Volatile Organic Compounds – VOC: Organic compounds, such as hydrocarbons, that are released when fuels or organic waste material are burned.

Water Seal: A device which forces waste gases to bubble through a certain height of water before entering the flare stack. This allows a positive pressure to be maintained in the flare header.[25]

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[25] Definition of Liquid Seals, John Zink website, accessed on August 10, 2026, https://www.johnzink.com/resources-training/knowledge-hub/cold-weather-considerations-for-flare-operations

Appendix B – Flare Data by Refinery Tables

Tables 1 through 4 represent the vent gas volume, SO_2 emissions, NMHC emissions, and number of reportable flaring events by refinery represented in Figures 2 through 9 in Section II.C.1. Flare Data by Refinery.

Table 1 consists of the data represented in Figures 2 and 3.

Table 1 – Annual Vent Gas Volume Flared by Refinery from 2004 to 2024

Year	Vent Gas Volume Flared (Million Standard Cubic Feet)				
	Chevron	Marathon	Martinez Refining Company	Phillips 66	Valero
2004	60.1	400.1	383.2	234.4	361.0
2005	142.7	298.3	144.9	58.5	67.5
2006	67.0	97.7	330.4	70.7	91.6
2007	151.7	175.4	113.4	43.1	155.4
2008	1.6	168.6	18.7	24.9	90.7
2009	5.0	57.7	301.3	158.8	108.4
2010	3.3	106.7	28.0	36.5	150.9
2011	135.7	211.4	25.1	50.6	342.6
2012	10.2	189.8	464.3	150.0	37.5
2013	0.6	268.3	26.8	20.9	65.7
2014	6.4	559.1	2.9	13.7	98.3
2015	2.1	380.7	1.6	69.9	52.1
2016	9.1	65.6	558.9	49.5	25.7
2017	2.4	35.4	31.3	8.9	114.2
2018	482.3	12.8	2.5	6.4	6.9
2019	1493.2	15.4	688.0	22.1	19.2
2020	88.7	411.4	6.0	14.2	11.3
2021	271.5	110.8	53.4	11.2	6.2
2022	234.0	22.1	7.1	13.0	5.2
2023	331.6	463.1	1520.1	259.1	2.7
2024	179.5	35.3	222.6	26.8	13.0

Table 2 consists of the data represented in Figures 4 and 5.

Table 2 – Annual SO_2 Emissions from Flares by Refinery from 2004 to 2024

Year	SO_2 Emissions from Flares (Tons)				
	Chevron	Marathon	Martinez Refining Company	Phillips 66	Valero
2004	92.6	307.1	3.4	243.2	71.0
2005	66.4	59.0	4.8	40.3	19.1
2006	121.0	21.8	2.8	29.4	7.5
2007	19.0	20.6	4.6	36.5	35.2
2008	25.7	177.9	4.1	38.4	138.5
2009	5.9	15.7	9.1	151.9	6.7
2010	2.2	27.1	5.1	28.2	32.2
2011	4.7	144.0	0.5	28.4	77.2
2012	5.8	48.4	2.9	92.8	34.7
2013	0.5	62.0	1.1	12.5	14.5
2014	21.3	408.3	2.2	10.4	45.4
2015	1.4	70.3	0.9	17.3	7.7
2016	15.0	4.4	3.9	22.7	27.1
2017	10.0	8.0	3.5	0.7	71.1
2018	7.6	3.5	1.9	3.5	2.2
2019	53.2	5.6	3.4	8.8	12.2
2020	65.4	3.6	1.9	2.7	10.0
2021	50.7	0.4	0.5	3.9	1.9
2022	13.4	0.1	6.9	1.4	1.8
2023	16.9	1.3	10.1	19.1	0.3
2024	2.4	0.1	1.6	1.1	2.4

Table 3 consists of the data represented in Figures 6 and 7.

Table 3 – Annual NMHC Emissions from Flares by Refinery from 2004 to 2024

Year	NMHC Emissions from Flares (Tons)				
	Chevron	Marathon	Martinez Refining Company	Phillips 66	Valero
2004	16.5	148.9	19.2	41.0	75.1
2005	94.2	27.2	30.6	9.6	27.2
2006	16.5	9.4	21.4	8.8	30.9
2007	22.5	6.6	1.2	12.1	31.8
2008	0.8	38.7	0.5	5.7	20.9
2009	0.7	3.3	1.0	34.8	26.2
2010	1.2	9.9	0.6	7.6	69.4
2011	17.1	79.8	0.2	12.7	82.5
2012	2.4	35.6	2.2	46.4	21.0
2013	0.3	31.9	0.8	5.1	17.7
2014	2.0	164.7	0.4	3.5	46.3
2015	0.3	36.1	0.1	13.6	11.2
2016	3.2	9.0	0.8	8.2	6.6
2017	1.0	2.0	1.0	0.6	32.6
2018	4.3	1.4	3.1	1.3	2.0
2019	12.7	0.5	2.1	4.2	6.0
2020	8.7	42.8	0.6	1.8	1.1
2021	18.9	5.0	0.4	1.3	2.0
2022	7.3	0.4	2.8	0.7	0.8
2023	12.1	20.0	7.5	8.9	0.2
2024	6.3	1.9	0.7	2.1	3.1

Table 4 consists of the data represented in Figures 8 and 9.

Table 4 – Annual Reportable Flaring Events by Refinery from 2006 to 2024

Year	Number of Reportable Flaring Events				
	Chevron	Marathon	Martinez Refining Company	Phillips 66	Valero
2006	21	15	10	14	14
2007	5	22	5	3	22
2008	3	9	3	12	12
2009	2	14	7	17	18
2010	3	19	5	13	11
2011	4	9	5	17	17
2012	3	12	7	22	5
2013	0	11	3	4	8
2014	6	9	3	6	10
2015	3	18	1	12	12
2016	5	4	7	12	6
2017	4	7	4	4	9
2018	9	5	3	2	4
2019	39	8	9	10	6
2020	11	4	4	4	5
2021	24	2	2	1	0
2022	23	0	8	3	1
2023	25	25	11	8	0
2024	10	6	6	8	4