BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Draft Regulation 12, Rule 16: Petroleum Refining Facility-Wide Emissions Limits

AND

Draft Regulation 11, Rule 18: Reduction of Risk from Air Toxic Emissions at Existing Facilities

DRAFT STAFF REPORT
October 2016

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EXECUTIVE SUMMARY

Petroleum refineries are significant sources of harmful pollutants on both the global (greenhouse gases) and regional/local scale (toxic air contaminants and criteria pollutants). Many Bay Area residents have expressed concern about the impact of this pollution on the environment and public health. Though refinery emissions have declined over time, it is possible that, as refinery operations change in the future, emissions of these pollutants could increase.

In response to these concerns, the Board of Directors of the Bay Area Air Quality Management District (Air District) has directed staff to bring forward two draft rules for their consideration, one that reflects policy recommended by environmental advocacy organizations, and a second that follows an approach recommended by Air District staff.

Communities for a Better Environment and several associated organizations (CBE) have developed a concept and the Board of Directors have directed Air District staff to develop regulatory language reflecting that concept into new Regulation 12, Rule 16: Petroleum Refining Facility-Wide Emissions Limits (Rule 12-16 or "Refining Caps Rule"). This rule would set numeric limits on specific refinery emissions. Rule 12-16 would apply only to the Bay Area's five petroleum refineries and three facilities associated with the refineries.

Air District Staff has analyzed Rule 12-16 and found the limits in the rule to have been set at a level consistent with the current production capacity of the refineries as a group. Compliance would be demonstrated through the annual emissions inventory process. The economic impacts of the rule are uncertain and depend on whether the consumption of transportation fuels declines, as predicted by the Air Resources Board (ARB), or increases as it has been doing since 2012. Air District staff believes CBE's proposed concept for Rule 12-16 would likely be found to be beyond the Air District's authority and/or arbitrary and capricious by a Court. Staff's analysis also indicates that CBE's concept will not improve air quality in refinery communities.

The staff of the Air District has developed a different approach that directly addresses concerns about health risks to the refinery communities. The staff recommendation is that the Air District adopt new Regulation 11, Rule 18: Reduction of Risk from Air Toxic Emissions at Existing Facilities (Rule 11-18 or "Toxic Risk Reduction Rule"). Rule 11-18 would apply to all facilities whose emissions of toxic air contaminants may result in a significant risk to nearby residents and workers – this would include petroleum refineries. The purpose of Rule 11-18 is to focus on those facilities causing the highest health impacts across the Bay Area and to require these facilities to reduce that health risk.

Rule 11-18 is the next step in the Air District's efforts to protect public health from toxic air pollution. The rule is expected to substantially reduce health risks posed by various facilities by requiring the implementation of all technically and economically feasible risk reduction measures to significant sources of toxic air contaminants (TACs). The draft

rule would potentially affect hundreds of facilities, including data centers, petroleum refineries, a cement kiln, gasoline dispensing facilities, etc. These facilities emit a variety of TACs that can adversely impact public health. These pollutants include compounds such as diesel particulate matter (DPM), benzene, polycyclic aromatic hydrocarbons (PAHs), and 1,3-butadiene. These toxic emissions are disproportionately impacting vulnerable communities in the Bay Area. Therefore, any risk reduction from existing facilities achieved by this rule is expected to provide greater benefit to these communities.

This draft staff report is a summary and explanation of the draft rules, how the Air District staff would expect to implement these rules, and staff's initial assessment of the rules. The report will be published along with the draft rules and the Notice of Preparation for the Environmental Impact Report required under the California Environmental Quality Act. Staff seeks input from all impacted stakeholders on the rules and our initial assessment. The Air District will also be conducting a series of meetings around the Bay Area to discuss these draft rules directly with the public and industry stakeholders.

I. Regulation 12, Rule 16: Petroleum Refinery Emissions Limits

A. Introduction

Air District staff has developed regulatory language at the direction of its Board of Directors based on a concept by CBE to cap refinery combustion emissions at a level consistent with the refineries' recent operations. Air District staff has developed draft Regulation 12, Miscellaneous Standards of Performance; Rule 16, Petroleum Refinery Emissions Limits (Rule 12-16) working with CBE to ensure the regulatory language meets the goals of the concept. The draft rule would establish emissions limits for greenhouse gases (GHG's), nitrogen oxides (NO_x), sulfur dioxide (SO_2), and particulate matter 10 microns and smaller (PM_{10}) and particulate matter 2.5 microns and smaller ($PM_{2.5}$).

At the direction of the Board, the staff of the Air District has prepared this section of the staff report to describe the draft Rule 12-16, how the rule would work in practice if it were adopted by the Board of Directors of the Air District, and to provide an initial assessment of the rule's consistency with the Air District's statutory authority.

B. Background on Petroleum Refinery Emissions

Currently, the five petroleum refineries located in the Bay Area within the jurisdiction of the Air District that would be affected by the draft rule are:

1. Chevron Products Company, Richmond (BAAQMD Plant #10)
2. Phillips 66 Company—San Francisco Refinery, Rodeo (BAAQMD Plant #21359)
3. Shell Martinez Refinery, Martinez (BAAQMD Plant #11)
4. Tesoro Refining and Marketing Company, Martinez (BAAQMD Plant #14628)
5. Valero Refining Company—California, Benicia (BAAQMD Plant #12626) and associated Asphalt Plant (BAAQMD Plant #13193)

The three affected, refinery-related facilities are:

1. Air Products and Chemicals hydrogen plant, Martinez (BAAQMD Plant #10295)
2. Air Liquide hydrogen plant, Rodeo (BAAQMD Plant #17419)
3. Martinez Cogen, L.P. (BAAQMD Plant #1820)

These three support facilities are subject to provisions of the rule because each is closely linked to the operations of a refinery.

Petroleum Crude Oil

Petroleum refineries convert crude oil into a wide variety of refined products, including gasoline, aviation fuel, diesel and other fuel oils, lubricating oils, and feed stocks for the petrochemical industry. Crude oil consists of a complex mixture of hydrocarbon compounds with smaller amounts of impurities, including sulfur, nitrogen, oxygen, a

variety of toxic compounds, organic acids, and metals (e.g., iron, copper, nickel, and vanadium). Crude oil is most often characterized by the oil's density (light to heavy) and sulfur content (sweet to sour). A more detailed explanation of these terms and others used to describe crude oil follows below.

Each of the properties described below is required to be included in the periodic monthly Crude Slate Report described in Regulation 12, Rule 15 (Rule 12-15) because each relates to emissions of air pollutants. The purpose of the crude slate reporting in Rule 12-15 is to establish a baseline crude slate for each of the refineries and then to track changes in that crude slate, along with improved emissions data, to monitor the relationship between crude slate and emissions from the refineries.

a. API Gravity

The industry standard measure for crude oil density is American Petroleum Institute (API) gravity, which is expressed in units of degrees, and which is inversely related to density (i.e., a lower API gravity indicates higher density; a higher API gravity indicates lower density). Refineries convert crude oils to gaseous products (propane gas for sale and "fuel gas" that is consumed at the refinery), high-value transportation fuels (gasoline, diesel and jet fuel) and lower-value heavy oils (such as "bunker fuel" that is used by ocean-going vessels). Crude oils with higher API gravity can theoretically be converted to higher-value light products with less processing than crude oils with lower API gravity. Refinery operators have asserted that, although this may suggest that a refinery operator would prefer to use high API gravity crudes exclusively, this is not the case because each refinery is designed and equipped to process crude oil with API gravity in a certain range. Processing crude oil outside of the design range—even if it is "light" crude—will result in processing bottlenecks that reduce the overall efficiency of the refinery.

b. Sulfur Content ("Sweet" and "Sour" Crude)

Sulfur is an impurity that occurs in crude oil and arrives in various forms including: elemental sulfur (S), hydrogen sulfide (H_2S), carbonyl sulfide (COS), inorganic forms, and most importantly, organic forms that include: mercaptans, sulfides, and polycyclic sulfides. "Sweet crude" is commonly defined as crude oil with sulfur content less than 0.5 percent, while "sour crude" has sulfur content greater than 0.5 percent. Sweet crude is more desirable because sulfur must be removed from the crude oil to produce more valuable refined products such as gasoline, diesel and aviation fuels.

c. Vapor Pressure

Vapor pressure is a measure of crude oil volatility. Higher vapor pressure crude oil contains greater amounts of light Volatile Organic Carbon (VOC) compounds.

d. BTEX (Benzene, Toluene, Ethylbenzene, Xylene) Content

BTEX content is a measure of the benzene, toluene, ethylbenzene, and xylene content in crude oil.

e. Metals (Iron, Nickel and Vanadium) Content

The metals content of crude oil indicates both the solids contamination of crude oil and the potential for organic metals compounds in the heavy gas oil component of crude oil.

Petroleum Refining Processes

Refineries are composed of the general processes and associated operations discussed below.

a. Separation Processes

Crude oil consists of a complex mixture of hydrocarbon compounds with small amounts of impurities such as sulfur, nitrogen, and metals. The first phase in petroleum refining is the separation of crude oil into its major constituents using distillation and "light ends" recovery (i.e., gas processing) that splits crude oil constituents into component parts known as "boiling-point fractions."

b. Conversion Processes

Crude oil components such as residual oils, fuel oils, and other light fractions are converted to high-octane gasoline, jet fuel, and diesel fuel, gasoline by various processes. These processes, such as cracking, coking, and visbreaking (a form of thermal cracking that breaks the viscosity), are used to break large petroleum molecules into smaller ones. Polymerization and alkylation processes are used to combine small petroleum molecules into larger ones. Isomerization and reforming processes are applied to rearrange the structure of petroleum molecules to produce higher-value molecules using the same atoms.

c. Treating Processes

Petroleum treating processes stabilize and upgrade petroleum products by separating them from less desirable products, and by removing other elements. Treating processes, employed primarily for the separation of petroleum products, include processes such as de-asphalting. Elements such as sulfur, nitrogen, and oxygen are removed by hydrodesulfurization, hydrotreating, chemical sweetening, and acid gas removal.

d. Feedstock and Product Handling

Refinery feedstock and product handling operations consist of unloading, storage, blending, and loading activities.

e. Auxiliary Facilities

A wide assortment of processes and equipment not directly involved in the processing of crude oil are used in functions vital to the operation of the refinery. Examples include steam boilers, wastewater treatment facilities, hydrogen plants, cooling towers, and sulfur recovery units. Products from auxiliary facilities (e.g., clean water, steam, and process heat) are required by most process units throughout a refinery.

f. Possible Changes in Emissions Due to Changes in Crude Oil

In the past several years, new sources of crude oil—including American shale oil and Canadian tar sands-derived oil—have become available to petroleum refineries in North America, including the Bay Area refineries. The crude oil derived from shale, now accessible because of technological improvements in hydraulic fracturing ("fracking"), tends to be light and sweet. However, this crude oil has higher VOC and H_2S content than some other crude oils. Crude oil from tar sands, currently under development in the Canadian province of Alberta, tends to be heavy and sour.

In order to maximize production, refineries are designed to process crude oils within a certain range in compositions. For example, a refinery that is designed to process more sour crude must have the capacity to remove large amounts of sulfur from the crude oil, while a refinery designed to process sweet crude does not require as much sulfur processing capacity. Bay Area refineries traditionally process heavier and more sour crude oils because, for many years, much of the crude supply has been heavy sour crude from Kern County and medium sour crude from Alaska. The refineries would likely need to make changes to their facilities in order to accommodate different sources of crude oil with different compositions while maintaining current production levels.

It is anticipated that refineries will update and/or modify their equipment to meet stricter regulatory fuel requirements and potentially to process crude oil from different sources. Rule 12-15 was put in place to monitor the key data so that staff can determine if emissions changes are potentially driven by changes in crude slate. The intent of Rule 12-16 is to discourage or prevent refineries in the Bay Area from making changes that would lead to increases in emissions of certain pollutants.

Air Pollutants Emitted from Petroleum Refineries

Air pollutants are categorized and regulated based on their properties and there are three primary categories of regulated air pollutants: (1) criteria pollutants; (2) toxic pollutants (toxic air contaminants, which in federal programs are referred to as "hazardous air pollutants"); and (3) climate pollutants (e.g., greenhouse gases). Additional categories of air pollutants include odorous compounds and visible emissions, although these are most often also components of one or more of the three primary categories of regulated air pollutants listed above.

Criteria pollutants are emissions for which Ambient Air Quality Standards (AAQS) have been established, or they are atmospheric precursors to such air pollutants (i.e., they participate in photochemical reactions to form a criteria pollutant, such as ozone). The AAQS are air concentration–based standards that are established to protect public health and welfare. The U.S. Environmental Protection Agency (EPA) sets AAQS on a national basis (National Ambient Air Quality Standards, or NAAQS), and the California Air Resources Board (CARB) sets AAQS for the state of California (California Ambient Air Quality Standards, or CAAQS). Although there is some variation in the specific pollutants for which NAAQS and CAAQS have been set, the term "criteria pollutants" generally refers to the following:

- Carbon monoxide (CO);
- Nitrogen dioxide (NO_2) and oxides of nitrogen (NO_X);
- Particulate matter (PM) in two size ranges—diameter of 10 micrometers or less (PM_{10}), and diameter of 2.5 micrometers or less ($PM_{2.5}$);
- Precursor organic compounds (POCs) for the formation of ozone and $PM_{2.5}$; and
- Sulfur dioxide (SO_2).

Each of these criteria pollutants is emitted by petroleum refineries.

Toxic pollutants, also known as toxic air contaminants (TACs), are emissions for which AAQS generally have not been established, but that nonetheless may result in human health risks. TACs generally are emitted in much lower quantities than criteria pollutants, and may vary markedly in their relative toxicity (i.e., some TACs cause health impacts at lower concentrations than other TACs). The state list of TACs currently includes approximately 190 separate chemical compounds and groups of compounds. TACs emitted from petroleum refineries include volatile organic TACs (e.g., acetaldehyde, benzene, 1,3-butadiene, formaldehyde, and xylenes); semi-volatile and non-volatile organic TACs (e.g., benzo(a)pyrene, chlorinated dioxin/furans, cresols, and naphthalene); metallic TACs (e.g., compounds containing arsenic, cadmium, chromium, mercury, and nickel); and inorganic TACs (e.g., chlorine, hydrogen sulfide, and hydrogen chloride). The Air District is proposing to address TAC emissions from refineries and other sources through draft Regulation 11, Rule 18: Reduction of Risk from Air Toxic Emissions at Existing Facilities (Rule 11-18 or “Toxic Risk Reduction Rule”), also discussed in this document.

Climate pollutants (greenhouse gases or GHGs) are emissions that contribute to climate change. Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and three groups of fluorinated compounds (hydrofluorocarbons, or HFCs; perfluorocarbons, or PFCs; and sulfur hexafluoride, or SF_6) are the major anthropogenic GHGs, and are regulated under the federal Clean Air Act and the California Global Warming Solutions Act (AB32). The climate pollutants emitted from petroleum refineries include CO_2, CH_4, and N_2O.

C. Refinery Air Pollution in Context

Refineries are a significant source of air contaminants in general, but are not a dominant source in the Bay Area. If one focuses on the counties where the refineries are located, their emissions are more significant, especially for SO_2 and $PM_{2.5}$.

The tables below are based on 2012 emissions data and do not account for the benefits of recent Air District rulemaking that are projected to reduce refinery criteria pollutant emissions by approximately 15 percent. They also do not include the benefits of rules under development to reduce SO_2 emissions from refineries. The tables compare refinery emissions of key criteria pollutants to other emissions both in the Bay Area and in Contra Costa and Solano counties where the refineries are located.

Table 1: Bay Area Emissions of Relevant Pollutants by Source Category

Source Category	Emissions (in tons/yr and as % of Bay Area total)							
	$PM_{2.5}$	%	Anthropogenic ROG	%	NO_X	%	SO_2	%
Refineries	1,524	9%	5,399	6%	4,248	4%	2,890	41%
Coke Calcining	28	0.2%	0.2	< 0.1 %	239	0.2%	1,242	17%
Cement Plant	23	0.1%	40	< 0.1 %	2,170	2%	912	13%
Major Industrial	1,839	11%	17,639	18%	5,765	5%	581	8%
Residential/Commercial	5,519	34%	27,862	28%	5,531	5%	326	5%
Agricultural	471	3%	2,049	2%	0	0%	0	0%
Miscellaneous	986	6%	116	0.1%	10	< 0.1%	0	0%
Mobile Sources	5,945	36%	44,659	46%	91,473	83.6%	1,168	16%
Total Emissions	**16,335**	**100%**	**97,763**	**100%**	**109,436**	**100%**	**7,119**	**100%**

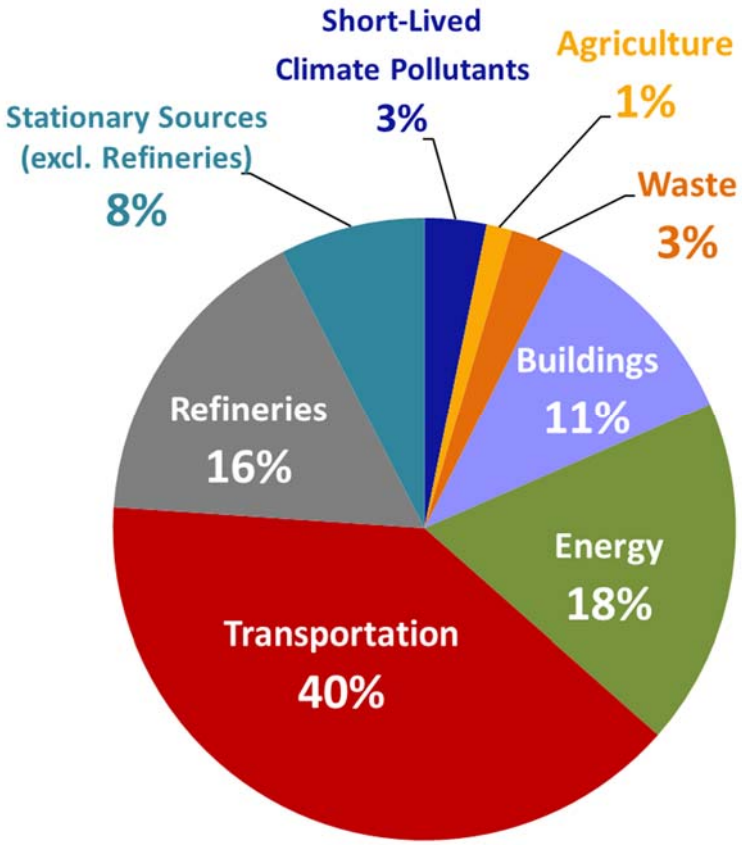
Table 2: Emissions of Relevant Pollutants by Source Category for Contra Costa and Solano Counties

Source Category	Emissions (in tons/yr and as % of Bay Area total)							
	$PM_{2.5}$	%	Anthropogenic ROG	%	NO_X	%	SO_2	%
Refineries	1,524	29%	5,399	23%	4,248	17%	2,890	63%
Coke Calcining	28	1%	0.2	0.001%	239	1%	1,242	27%
Cement Plant	0	0%	0	0%	0	0%	0	0%
Major Industrial	569	11%	3,383	14%	2,131	8%	85	2%
Residential/Commercial	1,548	29%	5,649	24%	1,122	4%	49	1%
Agricultural	97	2%	369	2%	0	0%	0	0%
Miscellaneous	294	6%	20	0.1%	2	0%	0	0%
Mobile Sources	1,212	23%	9,041	38%	17,703	70%	296	6%
Total	**5,272**	**100%**	**23,859**	**100%**	**25,445**	**100%**	**4,563**	**100%**

1. Emissions from biogenic sources and accidental fires are not included in this inventory. Mobile emissions include shipping emissions within 3 nautical miles of the Bay Area coastline.
2. $PM_{2.5}$ emissions for the Refineries category include condensable and filterable PM. Condensable PM data are not available for other source categories at this time.

Refineries are also a significant source of GHG emissions. They produce about two-thirds of the industrial GHG emissions in the Bay Area. Mobile sources are the largest source of GHG emissions overall. Refining and use of transportation fuels together account for 56 percent of GHG emissions in the Bay Area.

Figure 1: Bay Area GHG Emissions by Economic Sector for Year 2013



1. Emissions for the energy sector include electricity generation and co-generation for the Bay Area region, including imported electricity.
2. Emissions associated with fuel usage (solid, liquid and gas) are apportioned according to its use; residential and commercial fuel usage is attributed to the buildings sector while industrial fuel usage is accounted for in the stationary sources or refinery sectors.

D. Draft Rule Requirements

Explanations of the various provisions of draft Rule 12-16 are provided below.

Applicability and Exemptions

Draft Rule 12-16 applies to the five large refineries in the Bay Area:

1. Chevron Products Company, Richmond (BAAQMD Plant #10)
2. Phillips 66 Company—San Francisco Refinery, Rodeo (BAAQMD Plant #21359)
3. Shell Martinez Refinery, Martinez (BAAQMD Plant #11)
4. Tesoro Refining and Marketing Company, Martinez (BAAQMD Plant #14628)
5. Valero Refining Company—California, Benicia (BAAQMD Plant #12626) and associated Asphalt Plant (BAAQMD Plant #13193)

The three affected support facilities are:

1. Air Products and Chemicals hydrogen plant, Martinez (BAAQMD Plant #10295)
2. Air Liquide hydrogen plant, Rodeo (BAAQMD Plant #17419)
3. Martinez Cogen, L.P. (BAAQMD Plant #1820)

Small oil refineries less than 5,000 bpd capacity are exempt from the requirements of this rule.

Definitions
Draft Rule 12-16 definitions are identical to the definitions in related Rule 12-15.

Standards
Draft Rule 12-16 sets the emission limits for each affected facility. These emission limits were established by analyzing emissions for calendar years 2010, 2011, 2012, 2013, and 2014 to establish a baseline five-year period. The rule would then establish an emission limit which is 7 percent higher than the highest emission rate during the baseline period.

Greenhouse Gases

- Each facility must provide GHG emissions to ARB as part of ARB's Mandatory Reporting of Greenhouse Gas Emissions Requirements (MRR). GHG Emissions Inventory information for each year was obtained from an Excel spreadsheet available on the ARB website,[1] using the entries under "Calculated Covered Emissions, metric tons CO2e."
- The highest annual GHG emissions for the five-year baseline period is used to establish the 2010 – 2014 Baseline shown in Table 12-16-301 in the draft rule language, and repeated below for clarity. These limits may be adjusted prior to the issuance of the final rule, if 2015 GHG emissions justify an increase.
- Emissions limits are increased by 7 percent to provide what CBE contends is adequate operating flexibility and to account for normal year-to-year variations in emissions.
- Annual emission limits for each facility are shown below.

Table 12-16-301: GHG Emission Limits

Facility	**2010–2014 Baseline[1]** (metric tons CO2e)	**Operating Variation** (metric tons CO2e)	**Emissions Limits** (metric tons CO2e)
Chevron Refinery A-0010	4,462,015	7% = 312,341	4,774,356
Shell Refinery A-0011	4,261,252	7% = 298,288	4,559,540
Phillips 66 Refinery A-0016	1,502,734	7% = 105,191	1,607,925
Tesoro Refinery B-2758/2759	2,443,969	7% = 171,078	2,615,047
Valero Refinery, B-2626 & Asphalt	2,939,260	7% = 205,748	3,145,008

[1] https://www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/ghg-reports.htm

Facility	2010–2014 Baseline[1] (metric tons CO2e)	Operating Variation (metric tons CO2e)	Emissions Limits (metric tons CO2e)
Plant, B-3193			
Martinez Cogen LP A-1820	421,152	7% = 29,481	450,633
Air Liquide H2 Plant B7419	884,931	7% = 61,945	946,876
Air Products H2 Plant B-0295	270,753	7% = 18,953	289,706

[1]Maximum annual emissions from 2010 – 2014 baseline years, California Air Resources Board Emissions Inventory: Mandatory GHG Reporting - Reported Emissions, ARB Calculated Covered Emissions (metric tons CO_2e)

Particulate Matter - < 10 microns

- Air District criteria pollutant PM_{10}, $PM_{2.5}$, NO_x and SO_2 emissions inventories for each year during the baseline period were used as the basis for the emissions limits.
- PM_{10}, $PM_{2.5}$, NO_x and SO_2 emissions from flare and cooling towers were excluded from the emissions inventories at CBE's request. They were concerned that additional restrictions on flare emissions could pose a safety problem. They asked to exclude cooling tower emissions since these emissions are unrelated to combustion.
- The highest annual PM_{10} emissions for the five-year baseline period is used to establish the 2010 – 2014 Baseline shown in Table 12-16-302 in the draft rule language, and repeated in this report for clarity.
- Emissions limits are increased by 7 percent to provide what CBE contends is adequate operating flexibility.
- Annual emission limits for each facility are shown below.

Table 12-16-302: Particulate Matter (PM_{10}) Emission Limits

Facility	2010–2014 Baseline (Tons)	Operating Variation (Tons)	Emissions Limits (Tons)
Chevron Refinery A-0010	491.36	7% = 34.40	525.76
Shell Refinery A-0011	550.25	7% = 38.52	588.77
Phillips 66 Refinery A-0016	77.73	7% = 5.44	83.17
Tesoro Refinery B-2758/2759	90.67	7% = 6.35	97.02

Facility	2010–2014 Baseline (Tons)	Operating Variation (Tons)	Emissions Limits (Tons)
Valero Refinery, B-2626 & Asphalt Plant, B-3193	124.73	7% =8.73	133.46
Martinez Cogen LP A-1820	17.60	7% = 1.23	18.83
Air Liquide H2 Plant B7419	16.12	7% = 1.13	17.25
Air Products H2 Plant B-0295	9.71	7% = 0.68	10.39

Particulate Matter - < 2.5 microns

- The highest annual $PM_{2.5}$ emissions for the five-year baseline period is used to establish the 2010 – 2014 Baseline shown in Table 12-16-303 in the draft rule language, and repeated in this report for clarity.
- PM_{10}, $PM_{2.5}$, NO_x and SO_2 emissions from flare and cooling towers were excluded for reasons explained above.
- Emissions limits are increased by 7 percent to provide what CBE contends is adequate operating flexibility.
- Annual emission limits for each facility are shown below.

Table 12-16-303: Particulate Matter ($PM_{2.5}$) Emission Limits

Facility	2010–2014 Baseline (Tons)	Operating Variation (Tons)	Emissions Limits (Tons)
Chevron Refinery A-0010	468.85	7% = 32.82	501.67
Shell Refinery A-0011	462.55	7% = 32.38	494.93
Phillips 66 Refinery A-0016	70.08	7% = 4.91	74.99
Tesoro Refinery B-2758/2759	72.60	7% = 5.08	77.68
Valero Refinery, B-2626 & Asphalt Plant, B-3193	124.64	7% = 8.72	133.36
Martinez Cogen LP A-1820	17.57	7% = 1.23	18.80
Air Liquide H2 Plant B7419	15.05	7% = 1.05	16.10
Air Products H2 Plant B-0295	9.06	7% = 0.63	9.69

Nitrogen Oxides

- The highest annual NO_x emissions for the five-year baseline period is used to establish the 2010 – 2014 Baseline shown in Table 12-16-304 in the draft rule language, and repeated in this report for clarity.
- PM_{10}, $PM_{2.5}$, NO_x and SO_2 emissions from flare and cooling towers were excluded for reasons explained above.
- Emissions limits are increased by 7 percent to provide what CBE contends is adequate operating flexibility.
- Annual emission limits for each facility are shown below.

Table 12-16-304: Nitrogen Oxide (NO_x) Emission Limits

Facility	**2010–2014 Baseline** (Tons)	**Operating Variation** (Tons)	**Emissions Limits** (Tons)
Chevron Refinery A-0010	907.40	7% = 63.52	970.92
Shell Refinery A-0011	998.21	7% = 69.87	1068.08
Phillips 66 Refinery A-0016	312.65	7% = 21.89	334.54
Tesoro Refinery B-2758/2759	949.03	7% = 66.43	1015.46
Valero Refinery, B-2626 & Asphalt Plant, B-3193	1208.63	7% = 84.60	1293.23
Martinez Cogen LP A-1820	110.89	7% = 7.76	118.65
Air Liquide H2 Plant B7419	12.92	7% = 0.90	13.82
Air Products H2 Plant B-0295	3.21	7% = 0.22	3.43

Sulfur Dioxide

- The highest annual SO_2 emissions for the five-year baseline period is used to establish the 2010 – 2014 Baseline shown in Table 12-16-305 in the draft rule language, and repeated in this report for clarity.
- PM_{10}, $PM_{2.5}$, NO_x and SO_2 emissions from flare and cooling towers were excluded for reasons explained above.
- Emissions limits are increased by 7 percent to provide what CBE contends is adequate operating flexibility.
- Annual emission limits for each facility are shown below.

Table 12-16-305: Sulfur Dioxide (SO_2) Emission Limits

Facility	2010–2014 Baseline (Tons)	Operating Variation (Tons)	Emissions Limits (Tons)
Chevron Refinery A-0010	368.02	7% = 25.76	393.78
Shell Refinery A-0011	1359.86	7% = 95.19	1455.05
Phillips 66 Refinery A-0016	413.63	7% = 28.95	442.58
Tesoro Refinery B-2758/2759	601.50	7% = 42.11	643.61
Valero Refinery, B-2626 & Asphalt Plant, B-3193	65.06	7% = 4.55	69.61
Martinez Cogen LP A-1820	2.15	7% = 0.15	2.30
Air Liquide H2 Plant B7419	2.36	7% = 0.17	2.53
Air Products H2 Plant B-0295	2.18	7% = 0.15	2.33

Administrative Requirements

Draft Rule 12-16 has no administrative requirements. Each refinery and support facility will report emissions based on the requirements in Rule 12-15, Section 401. The APCO will review and approve the annual emissions inventory per Rule 12-15, Section 402. Air District staff will then take the steps needed to exclude flare and cooling tower emissions from the annual emissions inventory, where needed. Refinery and support facility emissions for each pollutant, after exclusions, will be compared to the emissions limits established in Rule 12-16, Section 300. Determination of Compliance is described in the next section of this report.

The emissions limits shown for each pollutant in Rule 12-16, Section 300 will need to be adjusted for a variety of reasons:

- as emissions measurement methods improve,
- as emissions estimates for various process operations, startups, shutdowns, and malfunctions improve,
- as information regarding condensable particulate matter improves,
- as new regulations establish more restrictive limits on specific emissions sources, any resulting emission reductions (or associated increases) will be subtracted from (or added to) the emissions limits,
- as emissions data from cargo carriers become available, and those emissions are incorporated into the total facility emissions limits, and
- to account for any other improvements in emissions inventory methods and reporting that are not yet anticipated.

Staff considered building an emissions limit adjustment process into the Administrative Requirements section of Rule 12-16, but, based on discussions with CBE to ensure the language represented their concept, decided that transparency required Board of Director's approval of any adjusted emissions limits. Staff anticipates that Rule 12-16 will need to be amended regularly to include a variety of adjustments in the emissions limits, as described above.

Facility emissions limits for each pollutant would not be adjusted to accommodate any new projects that have been permitted through the New Source Review process governed by Regulation 2, Rule 2: New Source Review. Under current rules that apply to all facilities, projects permitted through the New Source Review process that result in emissions increases can offset those emissions increases with reductions elsewhere in the region. Rule 12-16 would, in effect, eliminate that option for refineries and would require all emission increases to be offset within the individual facility. This is one of the intended consequences of CBE's policy recommendation.

Determination of Compliance

Compliance with Rule 12-16 is determined by comparing each facility's GHG, PM_{10}, $PM_{2.5}$, NO_x, and SO_2 emissions as set forth in the facility's inventory, after exclusions of flare and cooling tower emissions, with the emissions limits in Section 12-16-300. If the inventory emissions of each pollutant (after exclusions) are less than the limit, the facility is in compliance. If the inventory emissions of any pollutant (after exclusions) exceeds the limit, the facility is out of compliance for the entire year and would be liable for a violation for each pollutant limit exceeded for each day of the calendar year.

E. Staff Assessment of Draft Rule

Consistency with the Air District's Statutory Authority

Staff is concerned that a fixed numeric cap on refinery emissions may not be consistent with requirements of the Federal Clean Air Act (CAA) and the California Health and Safety Code (H&SC). Both laws require the Air District to develop permitting programs that allow for criteria pollutant emissions to increase at one location as long as those emissions are offset by an equal or greater amount of reductions of the same pollutant from a location within the region (CAA Sections 173(a) and 173(c)(1) and H&SC Sections 40918(a) and 40709(a)). The Air District has such a permitting program embodied in Regulation 2: Permits, Rule 2: New Source Review (Rule 2-2). This rule applies equally to all facilities in the Bay Area. Although state and local agencies may adopt more stringent rules than required by federal and state law, there is a significant argument that a fixed numeric cap conflicts with these federal and state provisions that allow facilities to increase emissions if certain conditions are met.- At the very least, it would be difficult to legally justify the necessity for such a measure, considering that jurisdictions with far worse air quality such as the South Coast and San Joaquin air basins have not adopted one.

Staff is also concerned that there is no support for imposing a particular regulatory approach on one sector of the regulated community without factual support for such

selective treatment. Setting a fixed cap on PM, NO_X and SO_2 emissions for refineries as proposed by CBE would mean that these particular facilities would be required to offset any emission increases above the cap within their individual fence-lines. In addition, the proposed cap may prevent the construction and operation of new equipment already permitted by the Air District. That means a different set of permitting rules would apply to these refineries and support facilities than to other sources in the Bay Area. The rule would address pollutants of primarily regional concern by limiting those pollutants from one Bay Area industrial sector through a mechanism unique to that industry and unlike the mechanism for all other industrial sectors, which relies on standards for the equipment operated by the industry and measures compliance through scientifically-tested methods rather than inventory approximations. This would likely be viewed by a court as arbitrary and capricious. This is particularly so, given that, as explained below, the Air District's current air quality monitoring data shows that the concentrations of the criteria pollutants covered under the cap in Rule 12-16 are roughly the same in refinery communities as in other urbanized areas of the region.

The Air District currently has multi-pollutant air monitoring stations located near refineries in San Pablo, Concord, Vallejo and San Rafael with multiple additional stations measuring sulfur compounds surrounding the refineries. The data from these monitoring stations show that air quality in refinery areas is comparable to other urbanized locations for $PM_{2.5}$, NO_x, and SO_2. Air District maximum readings for $PM_{2.5}$ or NO_x do not come from the refinery-area monitors. In addition, data show that concentrations of SO_2 in refinery communities are well below the National and California Ambient Air Quality Standards. It is important to note that $PM_{2.5}$ from refineries is produced predominantly from combustion, resulting in the $PM_{2.5}$ being sent aloft, more often contributing to regional $PM_{2.5}$ as opposed to producing localized impacts such as those associated with wood smoke or diesel engines.

Figure 2 below compares measured concentrations of $PM_{2.5}$ in refinery-area monitors with concentrations measured elsewhere in the Air District. Note that San Jose consistently has the highest $PM_{2.5}$ concentrations in the Bay Area. Concentrations of this pollutant measured in the refinery areas are similar to measured concentrations in Livermore and San Francisco. All the monitors show concentrations lower than the National Ambient Air Quality Standard (NAAQS) for $PM_{2.5}$. Data for other pollutants show similar results; the data for these are shown in Appendix A.

Figure 2: Ambient Measurements of $PM_{2.5}$

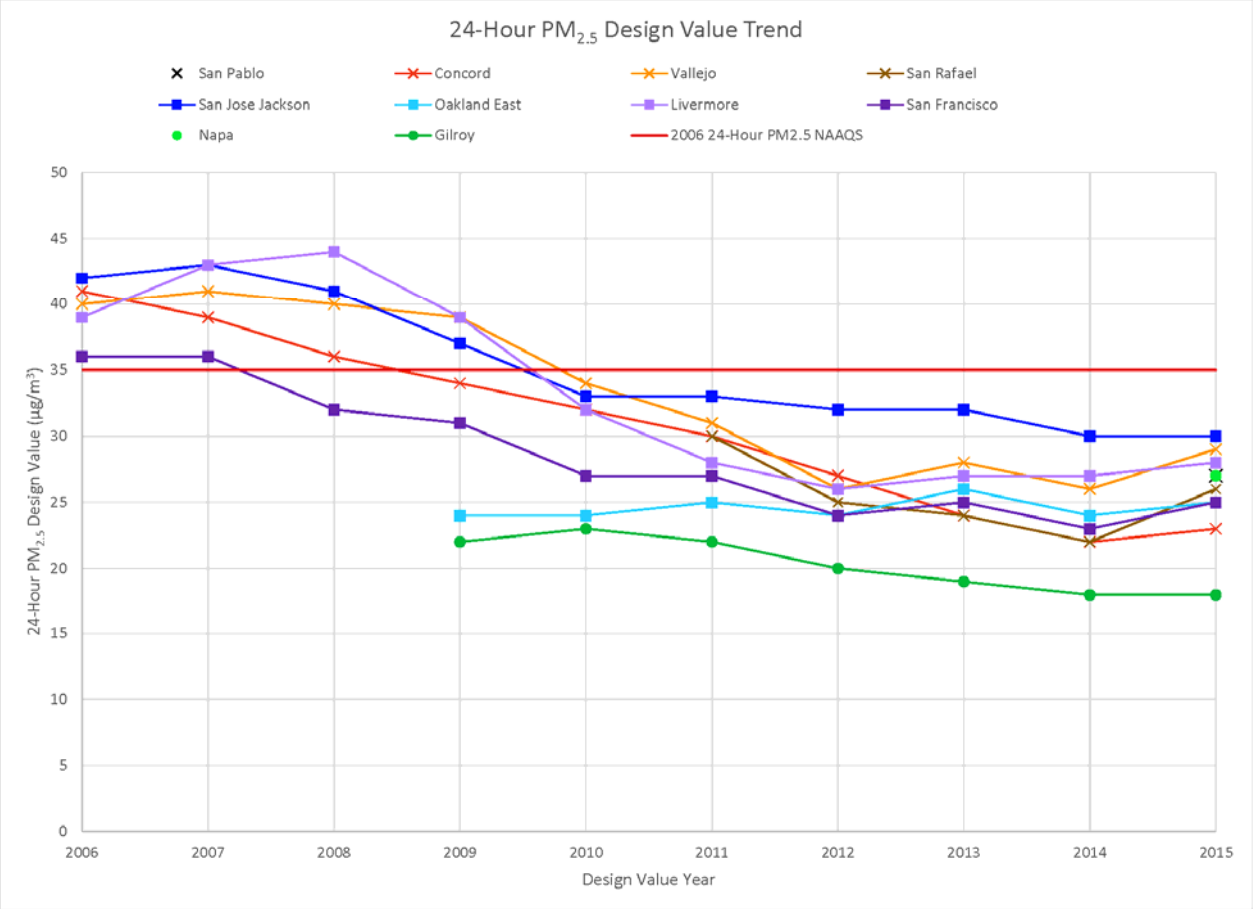


Figure 2: Ten years of 24-Hour $PM_{2.5}$ design values at Bay Area monitoring stations. The design value for 24-hour $PM_{2.5}$ is the three-year average of the 98th percentile of daily values. The Design Value Year is the last year of the three-year average. Source: US EPA's Air Quality Systems (AQS) database (October 7, 2016).

In addition to the concerns about criteria pollutant limitations (PM, NO_X and SO_2), there are also legal concerns with the proposal to cap greenhouse gas emissions at individual refineries. The Health and Safety Code requires the Air District to explain how a rule proposed for adoption is consistent and in harmony with existing state or federal requirements (H&SC §40727). There is a fundamental inconsistency between a "cap and trade" program that by its nature contemplates changeable caps versus one that fixes caps at one level, in that the latter has the potential to frustrate the efficiency goals of the former. For example, a Bay Area refinery would have no incentive to purchase allowances from a more easily controlled source under cap and trade if the refinery would still be capped by the Air District rule.

Even if the Health & Safety Code allowed the Air District to justify a certain degree of conflict based on local needs (and it is not at all clear that it does), it would be very difficult for the Air District to explain why such a benefit exists here because greenhouse gas emissions are not a localized health concern.

CBE has stated that limiting refinery combustion emissions (GHG, PM, NO_X and SO_2) will have the co-benefit of limiting refinery communities' exposure to harmful pollution, such as air toxics. This concept is not helpful as a legal justification since there is no authority to regulate for "co-benefits" if the supposed direct benefits are not themselves achieved through the application of a cap, which might never occur. In addition, "co-benefits" are a theoretical interest only until such co-benefits are documented. The Air District is not aware of any data on which such documentation could be based. As noted above, the impacts of the criteria pollutants are primarily regional in nature. The criteria pollutant with the greatest likelihood of impacting the health of local communities is $PM_{2.5}$. As Figure 2 shows, the Air District's current monitoring network provides no evidence of disproportionate impact on refinery communities from this pollutant. The Air District's evaluation of risk from toxic air contaminants indicates that the majority of the toxic risk from refineries is from benzene from leaks and particulate matter from diesel-fired engines (diesel PM). The proposed cap would have no effect on the risk from these toxic air contaminants. This is why Air District staff have drafted Rule 11-18, which will reduce the risk from air pollution in refinery communities and across the Bay Area in a manner that directly requires actions to reduce health risk from air pollution.

In conclusion, Air District staff believes CBE's proposed concept for Rule 12-16 would likely be found by a Court to be beyond the Air District's authority and/or arbitrary and capricious. Staff's analysis also indicates that the proposed rule is unlikely to improve air quality in refinery communities. These issues were discussed with CBE. Based on these discussions, staff's understanding is that CBE does not agree with the preceding legal analysis and does not wish to make any regulatory language changes to potentially address the issues.

Economic Impacts

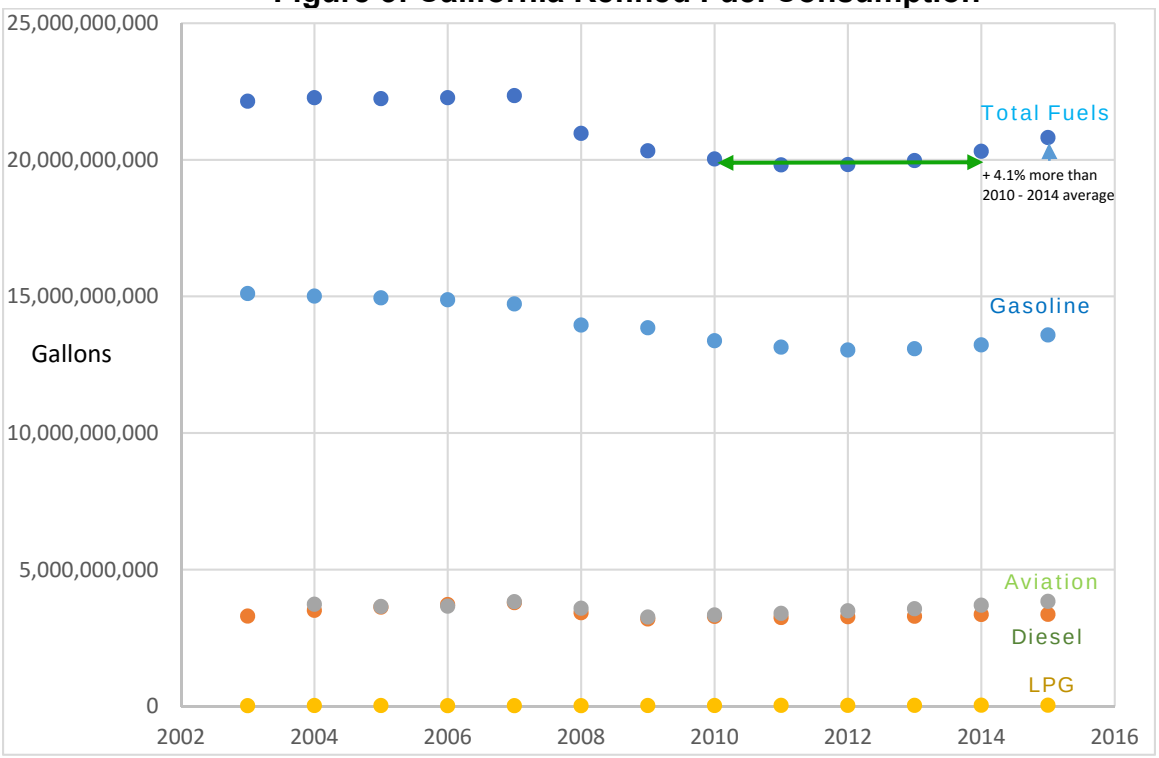
The California Health and Safety Code generally requires two different economic analyses for regulations planned and proposed by an air district. The first (H&S Code §40728.5) is a socioeconomic analysis of the adverse impacts of compliance with the proposed regulation on affected industries and business. The second analysis (H&S Code §40920.6) is an incremental cost effectiveness analysis when multiple compliance approaches have been identified by an Air District. Section 40920.6 applies only to rules requiring retrofit control technology. However, the Air District's practice is to interpret this section liberally to apply to rules such as 12-16 where retrofit control technology might result.

In the case of draft Rule 12-16, there are two general scenarios to consider when evaluating the impact of fixed capping refining emissions. In one general scenario, the refineries decide to make physical improvements in order to reduce emissions to allow for increases in refining capacity while staying below the cap. In the other general scenario, refineries elect to limit production to a level consistent with the cap. Air District staff will evaluate both scenarios, with assistance from outside experts.

In the first scenario, there will be economic and environmental impacts from the physical changes made at the refineries. For example, a refinery may elect to put in a wet scrubber to reduce PM and SO_2 emissions. This would have an impact on their profits which will be evaluated in the socioeconomic analysis. This would also have environmental impacts. A wet scrubber, for example, would have water supply and water quality impacts. Air District staff are developing a list of possible equipment changes that may be made in response to Rule 12-16 and will evaluate those as part of the socioeconomic analysis and as part of the Environmental Impact Report (EIR) required under the California Environmental Quality Act (CEQA).

In the second scenario, where the refineries limit their production to stay under the cap, there are potential costs to both the refineries and the larger economy. Whether these costs are realized depends on whether consumption of refinery products increases or decreases. Currently, consumption of refinery products is increasing, but it is still below peak demand. Figure 3, below, provides the relevant information.

Figure 3: California Refined Fuel Consumption



Source: http://www.energy.ca.gov/almanac/transportation_data/gasoline/, http://www.energy.ca.gov/almanac/petroleum_data/

Figure 3 shows trends in refined fuels consumption in California since 2003. Consumption peaked in 2008 at 22.3 billion gallons per year. CBE used the years 2010 through 2014 to determine the emission limits for Rule 12-16. The peak consumption in those years was 20.3 billion gallons per year. Fuel consumption increased to 20.8 billion gallons per year in 2015 and continues to increase.

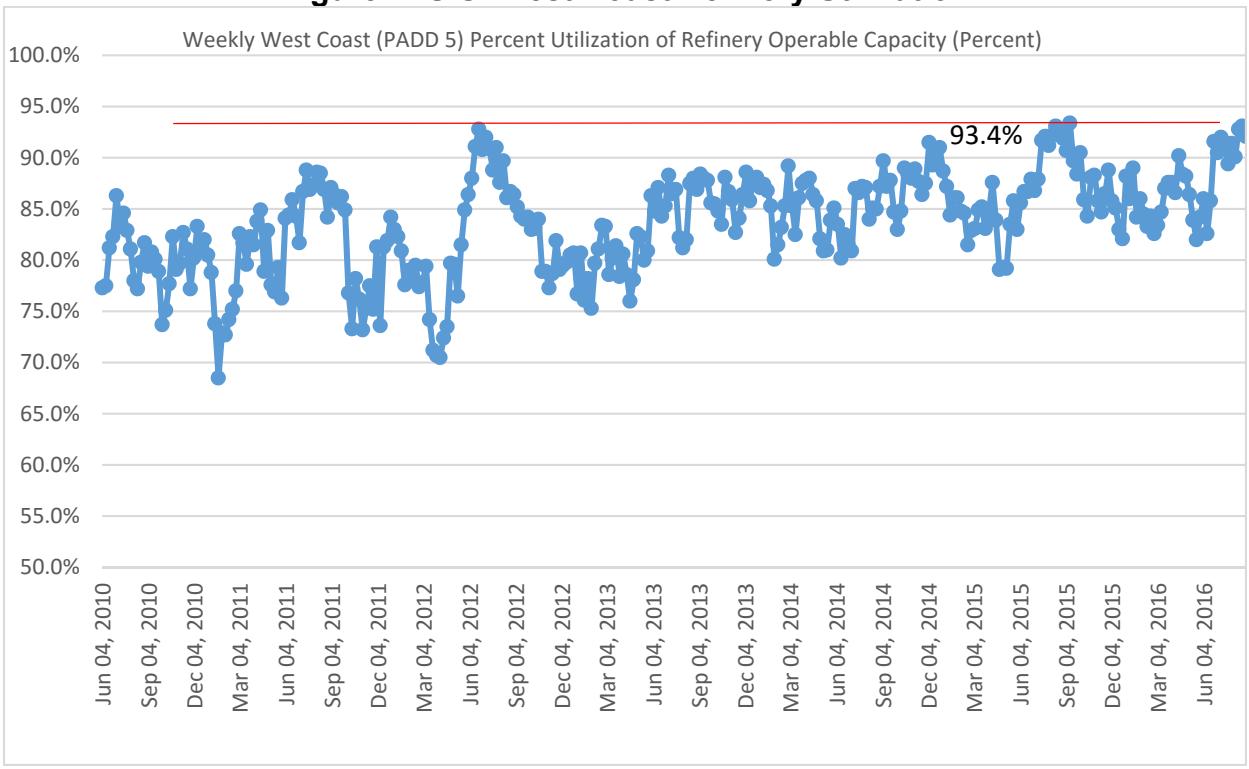
Staff also analyzed refinery operating utilization from the U.S. Energy Information Administration during the five-year baseline period from 2010 – 2014. This information is displayed on Figure 4, and is summarized in the table below:

Table 3: Average US West Coast Refinery Operating Utilization

Year	Average Utilization (%)	Peak Utilization (%)
2010 – 2014	82.6	93.4
2010	80.3	86.3
2011	80.7	88.8
2012	82.0	92.0
2013	83.4	88.6
2014	85.8	91.5
2015	86.5	93.4
2016 ytd	87.3	93.1

Note: Utilization data available for PADD 5 refineries, but not available for Bay Area refineries alone.

Figure 4: U.S. West Coast Refinery Utilization



Analysis of refinery utilization was performed in an effort to determine if the caps in Rule 12-16 would create a de facto production limitation for Bay Area refineries.

The data in Table 3 shows that the US West Coast refineries averaged 82.6 percent utilization during the 2010 – 2014 baseline period, ranging from an average utilization of 80.3 percent in 2010 to 85.8 percent in 2014. As shown in Figure 4, gasoline and total fuel consumption was relatively stable during this baseline period. Refinery utilization increased in 2015, driven by higher gasoline and total fuel consumption, and by a significant refinery outage.[2] Refining utilization continues to be high in 2016. Peak refining utilization appears to be about 93.5 percent. Given the few times when that peak was achieved, it's unlikely to be sustained over a long period due to unplanned outages and planned maintenance.

As described above, facility emissions limits were based on the highest annual emissions during the baseline period. During this period, refinery utilization averaged 82.6 percent, and the highest annual utilization during the baseline period was 85.8 percent. The facility emissions limits have been increased 7 percent to allow for normal year-to-year changes on an individual refinery basis. Assuming the Bay Area refineries are fairly represented by the overall PADD 5 refinery utilization, and that the refinery operators choose to comply with the cap by limiting production, the post-cap production capacity of Bay Area refineries will be limited to somewhere between (82.6 + 7 =) 89.6 percent to (85.8 + 7 =) 92.8 percent annual average utilization.

Assume Bay Area Refining Utilization ≈	PADD 5 Refinery Utilization				
Emission based limit – low	82.6%	+	7%	=	89.6%
Emission based limit – high	85.8%	+	7%	=	92.8%

2016 YTD has been the highest PADD 5 utilization observed 87.3 percent.

On average, the emissions limits do not appear to inhibit refining capacity, since typical annual average utilization is 80 – 87 percent, and the emissions limits appear to establish production capacity limits at approximately 89 – 93 percent utilization. That is, the caps in Rule 12-16 appear to be consistent with the current maximum production capability of the refineries.

Given that the emission limits are consistent with the current production capacity; Air District staff do not expect the cap in Rule 12-16 to have significant impacts on the market for refined fuels if fuel consumption does not significantly increase.

If the demand for refined fuels continues to increase, the cap may end up being a significant constraint on the market. When the supply for fuels is constrained, the impacts can be dramatic and felt statewide. In 2015, the ExxonMobil refinery in Torrance was offline for most of the year. This reduced refining production capacity in the state by roughly 10 percent. As a result of this moderate reduction in supply, gasoline prices increased 27.6 cents over the typical cost of gasoline in California. The direct cost the California economy was over $3 billion.[3] In addition, imports of refined products increased ten-fold, resulting in additional GHG emissions from shipping. ARB projects that gasoline consumption will decrease over time due to stricter fuel

[2] ExxonMobil's Torrance refinery was off-line from March 2015 – May 2016.
[3] This is from a California Energy Commission analysis.

consumption standards and other factors. However, the trend since 2012 has been toward increasing consumption. If this trend continues, and refineries respond to the cap by limiting production, Rule 12-16 may eventually have a significant economic impact on the Bay Area and the rest of California.

In conclusion, the Air District's economic analysis of Rule 12-16 will consider two possible responses to the proposed cap in emissions. In one scenario, refineries will make improvements in order to allow for production to increase above current capacity. These improvements will have both economic and environmental impacts. In the other scenario, refineries will limit production to keep under the cap. The economic and environmental impacts of this response depend upon future demand for transportation fuels. If demand decreases, as ARB projects, it is likely that there will be no impacts. If demand increases, as it has been since 2012, there could be significant economic impacts and potentially a net increase in GHG emissions due to Rule 12-16.

II. Regulation 11, Rule 18: Reduction of Risk from Air Toxic Emissions at Existing Facilities

A. Introduction

Draft Regulation 11, Rule 18: Reduction of Risk from Air Toxic Emissions at Existing Facilities (Rule 11-18) would be the next step in the Air Districts efforts to protect public health from toxic air pollution. Rule 11-18 is expected to substantially reduce health risks posed by various facilities through requiring the implementation of all technically and economically feasible risk reduction measures by significant sources of toxic air contaminants (TACs). The draft rule would potentially affect hundreds of facilities, including data centers, petroleum refineries, a cement kiln, gasoline dispensing facilities, etc. These facilities emit a variety of TACs that can adversely impact public health. These pollutants include compounds such as diesel particulate matter (DPM), benzene, polycyclic aromatic hydrocarbons (PAHs), and 1,3-butadiene.

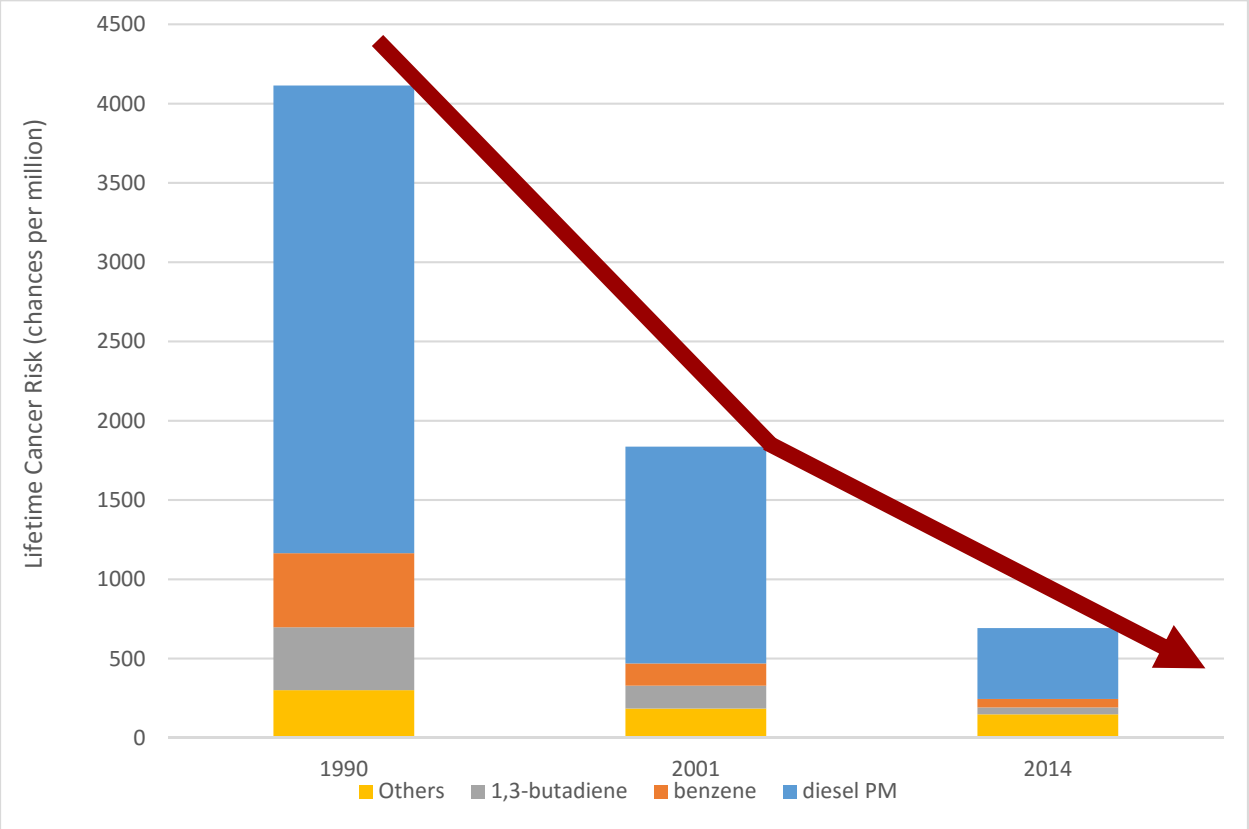
B. Background

Rule 11-18 is the next step to protect the public from toxic air contaminants (TACs). A pollutant is considered toxic if it has the potential to cause adverse health effects such as cancer, birth defects, respiratory ailments, or other serious illness.[4]

For almost 30 years, the Air District has implemented programs that are designed to identify and reduce the public's exposure to TACs. As shown in Figure 5, Air District and state toxic programs have reduced the average Bay Area cancer risk resulting from exposure to TACs in our air by 83 percent over the last two decades.

[4] The full list of TACs can be found in Air District Regulation 2, Rule 5 in Table 2-5-1.

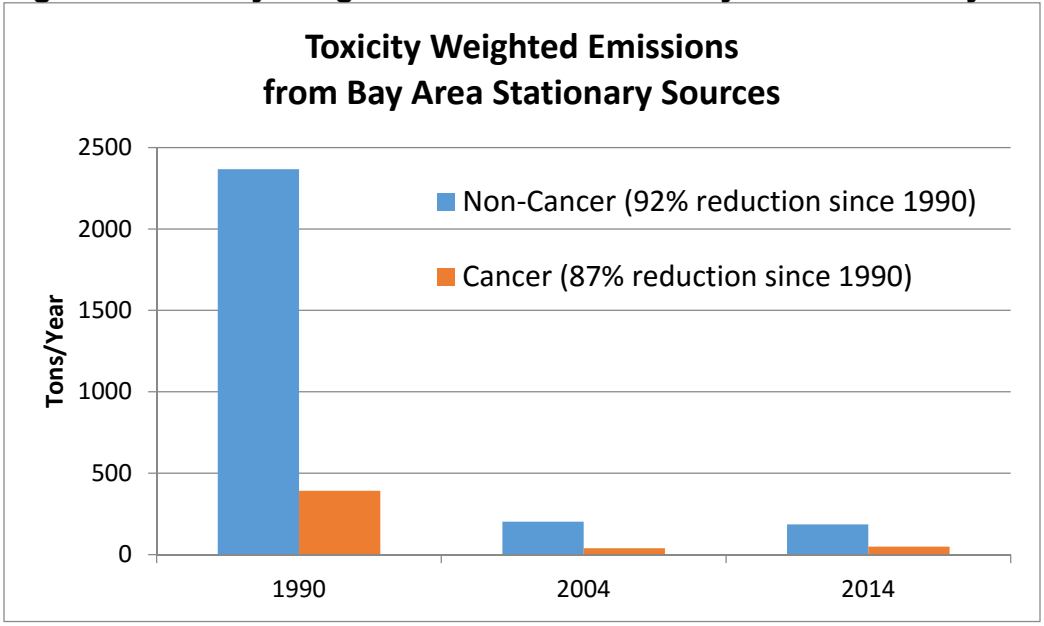
Figure 5: Bay Area Lifetime Residential Cancer Risk* from TAC Exposure



* Cancer risk is based on average ambient air monitoring data and the risk assessment methodology presented in the OEHHA's 2015 HRA Guidelines.

The Air District's long-standing Air Toxics Program is directed at reducing TAC emissions from stationary sources. Based on the Air District's TAC emissions inventories, toxicity weighted TAC emissions from Bay Area stationary sources have decreased by at least 87 percent since 1990 (see Figure 6).

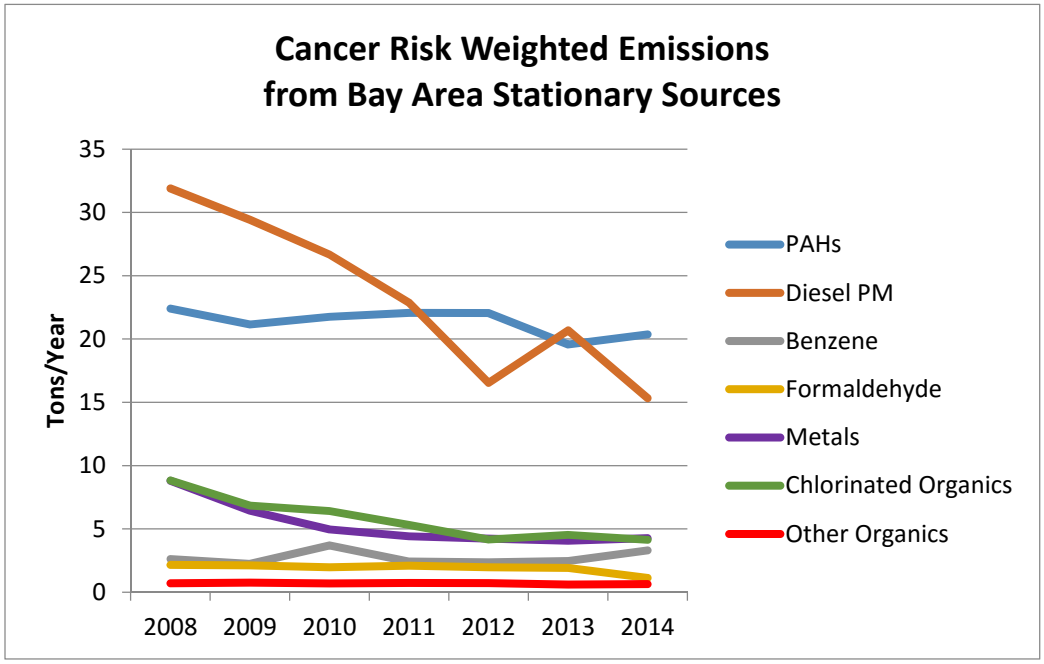
Figure 6: Toxicity Weighted Emissions from Bay Area Stationary Sources



* The emission rates for several common TACs (diesel engine exhaust particulate matter, ethyl benzene, and isopropyl alcohol) were not available for the 1990 emission inventory.

The Air District's Air Toxics Program is successfully continuing this downward trend in cancer risks posed by stationary sources of TAC emissions. As shown in Figure 7, emissions are declining for many of the major contributors to stationary source cancer risks.

Figure 7: Cancer Risk Weighted Emissions from Bay Area Stationary Sources



The Air District's existing Air Toxics Program currently includes three primary components.

1) The assessment and reduction of health risks from existing facilities (the Air Toxics "Hot Spots" program),
2) The preconstruction review of new and modified sources of TAC emissions (the Air Toxics New Source Review program or "Toxics NSR") and
3) The implementation of stationary source control measures, such as state-developed airborne toxic control measures (ATCM) for specific categories of TAC sources.

Draft Rule 11-18 would enhance the Air District's current program, known as the Toxics "Hot Spots" program, to address risk from existing facilities. The program implemented California's Air Toxics "Hot Spots" Information and Assessment Act of 1987. The program is often called the "AB 2588 program" after the enacted bill. The Hot Spots Act focused on addressing risk from sources of TACs that existed in the late 1980's. The act required a round of inventories, assessment of risk, and, in the case of facilities that exceeded risk levels established by local air districts, risk reduction plans. The act then required inventory updates every four years and the payment of fees by facilities to support district and ARB inventory efforts. Subsequent legislation amending the act provided a number of "off-ramps" for facilities that went through the initial round of review.

The Air District adopted its Air Toxics New Source Review program at about the same time it started its activities to assess existing facilities under the Hot Spots Act. As a result, sources that existed in the late 1980's have been reviewed under the Hot Sports program and sources that were constructed or modified after the late 1980s have been reviewed under the Toxics NSR program.

Draft Rule 11-18 would revisit existing facilities using current knowledge and procedures. The draft rule relies on estimates of health risk using the latest science. Its risk action thresholds are based on estimated health risks for the exposed population. To ensure the use of the best available understanding of health risk, the Air District follows updated state-wide guidance regarding health risk assessment methodologies to evaluate public exposures to toxic air contaminants and to calculate and manage the resulting health risks. Draft Rule 11-18 would rely on the same state-wide health risk assessment guidance (Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA) Health Risk Assessment Guidelines) that is used in the current Toxics NSR program.

OEHHA periodically updates its Health Risk Assessment (HRA) Guidelines to reflect advances in science. OEHHA recently adopted a major update to the HRA Guidelines that focused on children's health protection: OEHHA's 2015 HRA Guideline Revisions. Both Rule 11-18 and the Air District's Air Toxic NSR programs will use these 2015

Guideline Revisions. More details on these revisions can be found in the Staff Report for the Air District's revisions to the Air Toxic NSR program.[5]

C. Industry Description:

Draft Rule 11-18 would apply to a wide range of commercial, industrial and municipal facilities including data centers, petroleum refineries, chemical plants, waste water treatment facilities, foundries, forges, landfill operations, hospitals, crematoria, gasoline dispensing facilities (GDF) (i.e., gasoline stations), power plants, colleges and universities, military facilities and installations, and airline operations. These facilities operate a wide variety of sources of toxic emissions, including diesel-fueled internal combustion engines, waste water treatment, combustion sources, evaporative and fugitive emissions, etc. The Air District estimates that hundreds of facilities could potentially be impacted by this draft rule. Table 4 provides a general summary of the types of facilities that may be affected by this draft rule and the major sources of toxic emissions.

Table 4
Summary of Toxic Air Contaminant Emitting Facilities and Sources

Facility	Sources	Primary Risk Driver(s)
Refineries	Fugitive Emissions Stack Emissions Diesel Engines Cooling Towers Waste Water Treatment Operations	Benzene Diesel PM Formaldehyde 1,3-Butadiene Chromium VI Nickel
Data Centers	Stationary Diesel Engines	Diesel PM
Cement Manufacturing	Stack Emissions Fugitive Emissions	Chromium VI
Chemical Plants	Stack Emissions Fugitive Emissions	Formaldehyde Carbon Tetrachloride Sulfuric Acid Mist Diesel PM
Crematoria	Stack Emissions	Chromium VI Mercury
Landfills	Fugitive Emissions Diesel Engines	Vinyl Chloride Hydrogen Sulfide Benzene Diesel PM Acrylonitrile

[5] See the Staff Report for Amendments to Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants, September 2016.

Facility	Sources	Primary Risk Driver(s)
Foundries	Fugitive Emissions	Dioxin Manganese Lead Chromium VI Mercury Cadmium Nickel Arsenic PAHs Copper
Sewage Treatment Facilities	Fugitive Emission Stack Emissions	Diesel PM Hydrogen Sulfide Cadmium Mercury
Power Plants	Stack Emissions	Formaldehyde Ammonia Benzene Diesel PM
Gasoline Stations	Fugitive Emissions	Benzene Ethyl Benzene 1,3-Butadiene
Military Facilities	Diesel Engines	Diesel PM
Manufacturing	Diesel Engines	Diesel PM

D. Draft Rule Requirements

Major Definitions:

Best Available Retrofit Control Technology (TBARCT): This definition is modeled after the definition of "Best Available Control Technology" contained in Air District Rule 2-5: New Source Review of Toxic Air Contaminants. The Air District specifically seeks input on this definition.

Risk Action Level: This definition sets the cancer and non-cancer risk action levels as follows:

Cancer: 10 per million (10/M)
Chronic hazard index: 1.0
Acute hazard index: 1.0

These health risk levels were chosen because they reflect the most health protective levels achievable and correspond to the health risk levels that the Air District uses for the existing "Hot Spots" program.

Risk Reduction Plan: This is a detailed plan developed by the affected facility that identifies how the facility will reduce its risk below the risk action levels either through the implementation of various risk reduction measure such as the installation of control technology or changes in operation. The plan includes a schedule for implementation.

Once a plan is approved by the Air District, all of its elements (control measures, schedules, etc.) become enforceable.

Significant Risk Threshold: This definition sets the cancer and non-cancer risk action levels for individual sources of toxic emissions as follows:

Cancer: 1.0 per million (1.0/M)
Chronic hazard index: 0.2
Acute hazard index: 0.2

Major Provisions:

Section 11-18-301 – Risk Reduction Plan Requirement: Once a facility is notified by the Air District that the facility poses a health risk in excess of the risk action level (10 per million or a hazard index greater than 1) the facility must either:

1. Implement an Air District-approved risk reduction plan that details how the facility would reduce its health risk below the risk action level in the specified timeframe, or
2. Demonstrate to the Air District that all significant sources of risk are controlled with TBARCT.

Section 11-18-302 – Risk Reduction Plan Implementation Requirement: Once a Plan is approved by the Air District it becomes fully enforceable and the facility is required to implement it elements and maintain approval. Reasons for the Air District to withdraw approval include non-compliance with Plan elements or the Plan's inability to adequately reduce risk levels.

Section 11-18-402 – Risk Reduction Plan Submission Requirements: If a facility is unable to demonstrate that all significant sources of risk are controlled with TBARCT, the facility would have to develop and submit to the Air District for approval a risk reduction plan within 180 days of receipt of notice from the Air District that the facility health risk value exceeds one of the risk action levels. The facility would have up to three years to reduce the facility risk below the risk action level.

This provision allows the Air District to extend the implementation period up to three additional years if the facility can demonstrate that the initial three-year timeframe places an unreasonable economic burden on the facility. The Air District could shorten the implementation period to less than three years if the Air District finds that it is technically feasible and economically practicable to do so, or if the facility is located within the boundaries of a CARE designated area.[6]

The facility must annually report its progress on implementing the Plan until either the Plan is fully implemented or the facility can demonstrate that all significant sources of toxic emissions are controlled with TBARCT.

[6] The Air District's Community Air Risk Evaluation Program (CARE program) identifies vulnerable communities' by considering exposure to toxic air contaminants, exposure to $PM_{2.5}$ and ozone in outdoor air, and the documented health impacts related to air pollution.

Section 11-18-403 – Risk Reduction Plan Content Requirement: The Risk Reduction Plan must contain certain elements, such as:

- A characterization of each source of toxic emissions, including information from the toxic emissions inventory and the health risk assessment, and identification of the emissions points that contribute to the risk;
- An evaluation of risk reduction measures to be implemented, including a description of the measure, the anticipated toxic emissions reductions, and anticipated risk reductions associated with the measure;
- A schedule for implementing the risk reduction measures as expeditiously as feasible, including dates for filing permit applications, installation dates, completion of process changes, demonstrating the effectiveness of the risk reduction measures;
- An estimate of the remaining risk following the implementation of the risk reduction measures; and
- If the Plan cannot reduce the risk below the action level, a demonstration that either all sources of risk do not pose a health risk in excess of the significant risk level or that they are controlled with TBARCT; a demonstration of the technical infeasibility or unreasonable economic burden associated with reducing the facility risk below the risk action level or the installation of TBARCT within three years (if applicable).

Section 11-18-404 – Review and Approval of Risk Reduction Plans: The section details the process the Air District would use to review and approve the submitted Risk Reduction Plans, including:

- Conducting a completeness review to ensure the Plan contained all the elements required by the rule;
- Posting the Plans (without confidential information) for a 45-day public comment period;
- Approval or disapproval of the plans. If a plan is disapproved, the Air District would identify its deficiencies and the facility would have 45 days to revise and resubmit the plan. If the deficiencies are not corrected, the Air District would disapprove the Plan.

Section 11-18-405 – Updated Risk Reduction Plan: The section allows the Air District to require facilities to update the facility Risk Reduction Plan if information becomes available following approval of the Plan regarding the facility health risk or emission / risk reduction technology that may be used to significantly reduce the health risk to exposed people.

E. Draft Rule Implementation

The draft Toxic Risk Reduction Rule would use the annual toxic emissions inventories reported to the Air District by sources that emit toxic compounds. From the toxic emissions inventory data, the Air District[7] would conduct a site-specific Health Risk

[7] In order to complete the analyses in a timely manner. Some of the work may be completed by

Screening Analysis (HRSA). The HRSA assesses the potential for adverse health effects from public exposure to routine and predictable emissions of TACs. Procedures used for completing HRSAs are based on guidelines adopted by CARB/CAPCOA. From these HRSAs, the Air District would determine each facility's priority score (PS). In establishing the priority level for a facility, the Air District would consider:

(1) The amount of toxic pollutants emitted from the facility;
(2) The toxicity of these materials;
(3) The proximity of the facility to potential receptors; and
(4) Any other factors that the Air District deems to be important.

The Air District would conduct HRAs for all facilities with a cancer PS of ten or greater or a non-cancer PS of one or greater. The Air District would conduct HRAs for facilities in accordance with the OEHHA HRA Guidelines and the CARB/CAPCOA Risk Management Guidelines that were updated in 2015. These Guidelines were updated pursuant to the Children's Environmental Health Protection Act (Senate Bill 25), which required that OEHHA develop health risk assessment procedures that ensure infants and children are protected from the harmful effects of air pollution. The Air District would create a model that incorporated the latest health risk values and protocols. Once the model is created, the Air District would validate the model using site specific parameters, including but not limited to meteorological data, receptor type and location, toxic emission rates and stack location and heights, and topography. The facility owner or operator will be consulted in this validation step. Once the model is validated, the Air District would conduct HRAs to obtain preliminary results that would be shared with the interested public for review and comment before finalization.

Using the results of the HRAs, the Air District would determine whether a facility would be affected by Rule 11-18. The rule would affect facilities with health risk impact that exceeded any of the risk action level thresholds – ten per million (10/M) cancer risk or 1.0 hazard index for both chronic and acute risk. The Air District would notify facilities of their health risk score. Facilities that pose a health risk in excess of the risk action level threshold would be required to reduce that risk below the threshold through the implementation of a Risk Reduction Plan approved by the Air District within three years of approval of the plan or demonstrate that all significant sources of toxic emissions are controlled by TBARCT.

The rule would be implemented in four phases based on either a facility's PS or the toxic emissions source type as illustrated in the following table. (Determination of the priority scores for all potentially affected facilities are expected to be completed by the end of 2017).

independent contractors working for the Air District under direction of Air District staff.

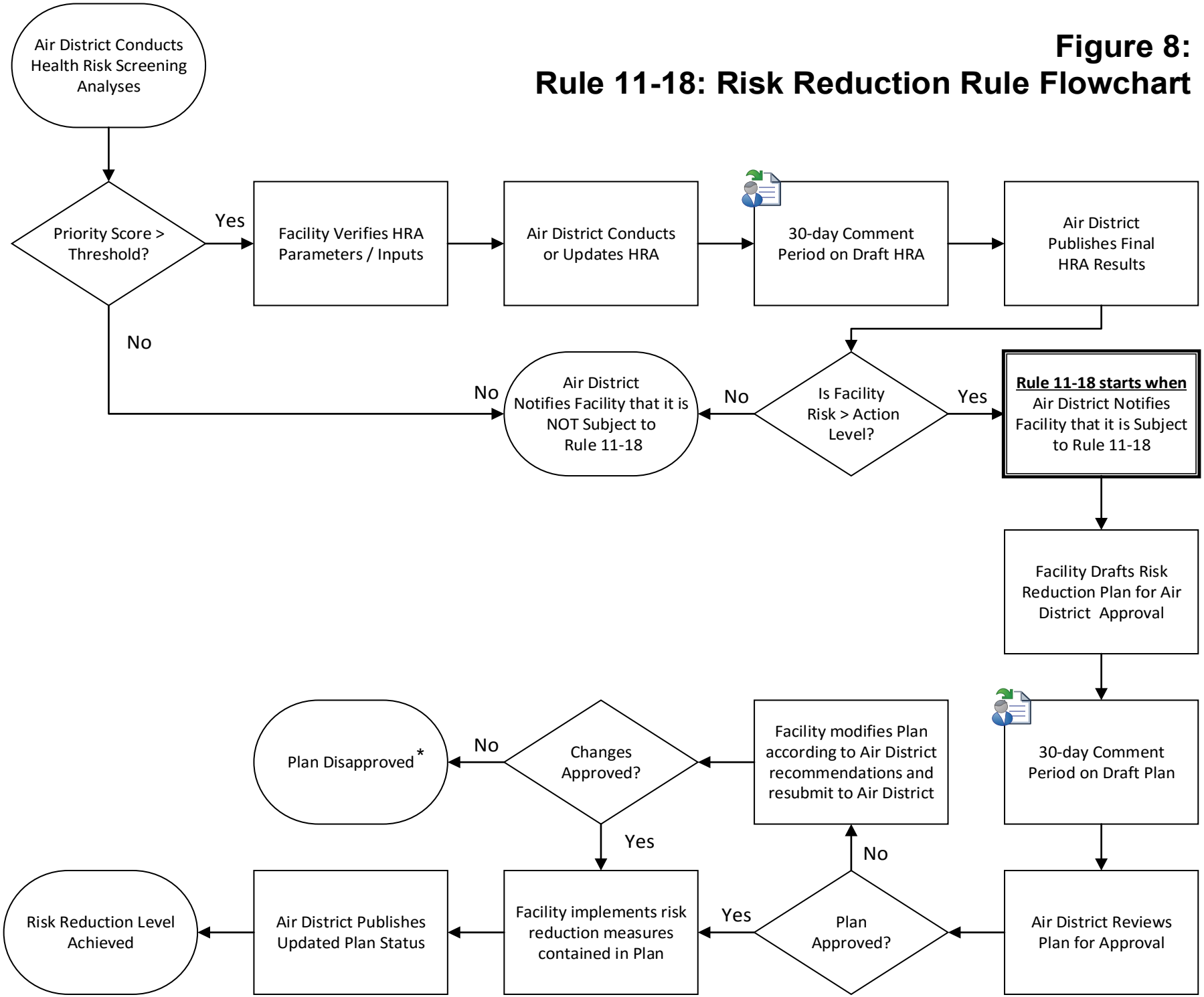
Table 5: Implementation Phases

Phase	Criterion	Number of Affected Facilities*	HRAs	Risk Reduction Plans	Plan Implemented
1	PS > 250 Cancer OR PS > 2.5 Non-Cancer	80	2017 – 2018	2018 – 2019	2019 – 2022
2	PS > 10 Cancer OR PS > 1.0 Non-Cancer	350	2019 – 2021	2021 – 2022	2022 – 2025
3	Diesel IC Engines	600	2021 – 2023	2023 – 2024	2024 – 2027
4	Retail Gas Stations	130	2023 – 2024	2024 – 2025	2025 – 2028

* These are preliminary estimates based on initial screenings and are subject to revision.

A flowchart summarizing the process of developing the health risk assessments and implementation of draft Rule 11-18 is shown in Figure 8.

Figure 8:
Rule 11-18: Risk Reduction Rule Flowchart



* A disapproved plan would result in a violation of the Rule.

F. Determining Best Available Retrofit Control Technology for Toxics (TBARCT)

In making any TBARCT determination, Air District staff would ensure any technology or measure met the definition in the draft rule:

11-18-204 **Best Available Retrofit Control Technology for Toxics, or TBARCT:** For any existing source of toxic air contaminants, except cargo carriers, the most stringent of the following retrofit emission controls, provided that under no circumstances shall the controls be less stringent than the emission control required by any applicable provision of federal, State or District laws, rules, regulations or requirements:

204.1 The most effective retrofit emission control device or technique that has been successfully utilized for the type of equipment comprising such a source; or

204.2 The most stringent emission limitation achieved by a retrofit emission control device or technique for the type of equipment comprising such a source; or

204.3 Any retrofit control device or technique or any emission limitation that the APCO has determined to be technologically feasible for the type of equipment comprising such a source, while taking into consideration the cost of achieving emission reductions, any non-air quality health and environmental impacts, and energy requirements; or

204.4 The most stringent emission control for a source type or category specified as MACT by U.S. EPA, or specified in an ATCM by CARB.

In general, the two major criteria that apply to both best available control technology (BACT) and best available control technology for toxics (TBACT) would also apply to TBARCT determinations, 1) technologically feasible, and 2) achieved in practice. The first category is a more stringent level of control and is technology forcing; it generally refers to advanced control devices or techniques. The second requires that control equipment or technology must be commercially available and demonstrated to be effective and reliable on a full scale unit. Air District staff in reviewing TBARCT performance information must make the engineering determination that the control would be reasonably expected to perform for a sufficient duration to make the option viable as technologically feasible. Often, considered control techniques are technology transfers from successful application on similar types of equipment or emissions streams. In this case, the control has been “achieved in practice” on a similar source or equipment category, but has not been used for the particular source or equipment in question. In this case, a feasibility and cost impact analyses would then be necessary.

In most cases, the application of TBARCT on all significant sources of toxic emissions will result in residual health risks that are within acceptable levels. In some cases, however, the residual risk may exceed the risk action levels. The need for risk reduction measures is generally related to a source's proximity to residential receptors or other areas where the public exposure may occur. For example, additional risk reduction measures are generally required to mitigate fugitive emissions from a perchloroethylene dry cleaning facility located in an apartment building. The need for, and extent of, additional risk reduction measures is determined on a case-by-case basis through site-specific health risk assessment. While TBARCT is driven by risk reduction and there are no specific cost effectiveness triggers, the economic impact of achieving the toxic emission reductions must be considered. Similarly, the criteria of commercial availability, reliability, and demonstrated full scale operation and performance apply to TBARCT and TBACT as well as BACT. The Air District would consider sources such as

the EPA's MACT Database and CARB's Air Toxic Control Measures (ATCMS) guidance documents.

There is a large variety of control technologies and measures that could be used to reduce the health risk posed by a facility. Table 6 provides a general listing of these control measures that could be considered by the Air District in determining BARCT for various sources of toxic emissions. This is not intended to be an exhaustive list.

Table 6: Example Risk Reduction Measures and Target Substances

Risk Reduction Measure	Substance Group	Control Efficiency
Enclosures	Particulates	Varied
Capture and Collection Systems	VOCs and Particulates	Varied
Diesel Particulate Filter	Particulates	85%
Baghouse	Particulates	99-99.9%
HEPA filter and pre-filter	Particulates	99.9-99.99%
Carbon Adsorption	VOCs	90-99%
Thermal and Catalytic Oxidizers	VOCs and Inorganic Gases	98-99.9%
Reduced Throughput or Operating Time	VOCS and Particulates	Varied
Alternative Technologies	Particulates	Up to 100%
Product Substitution	VOCs	Up to 100%
Relocate Source or Stack	All TAC Types	Not Applicable
Stack Modifications	All TAC Types	Not Applicable

In reviewing and approving risk reduction measures contained in required risk Reduction Plans, the Air District would consider on a case-by-case basis the economic impacts of any recommendation the Air District makes for the plans. This consideration would include the overall impacts on the profitability of the facility and the potential for job loss as a result of implementation of the plan.

G. Informing the Public

The Air District will use several methods to keep the public informed about risks from toxic facilities in their neighborhoods and on how and when those risks are being reduced. These methods include email notices, social media outreach, posting on the Air District website, opt in mailing via the U.S. Postal service, and community meetings. The Air District would develop and maintain a list of emails of individuals and organizations who have indicated they are interested in being notified of events and updates regarding facilities that pose a toxic risk. Notices received via email would direct the recipient on how to access updated information on the Air District website. Similar notices would be sent via social media sources such as Facebook or Twitter. Individuals who prefer to receive notices via letters sent through the U.S. Postal Service would have the opportunity to sign up for on a mailing list. The Air District would provide all public information on toxic risk facilities on the Air District website, including facility names and locations; draft health risk assessments; facility health risks levels; draft risk reduction plans; risk reduction plan approvals and final plans; plan updates, such as risk

reduction measure implementation and potential changes to plans; and completion of plan implementation and final facility health risk. The Air District is also planning community meetings to update people on the status of Rule 11-18 implementation in their area.

III. Comparing Rule 12-16 and Rule 11-18

In response to concerns about the impact of refinery emissions on surrounding communities, the Board of Directors of the Air District directed staff to bring forward the two draft rules discussed above for their consideration. CBE recommended a rule that would set numeric limits on specific refinery emissions: Rule 12-16. Air District staff are recommending Rule 11-18, which would reduce risk from toxic air pollution from refineries and other facilities throughout the Bay Area whose emissions of toxic air contaminants may result in a significant risk to nearby residents and workers.

The Board of Directors was motivated by several speakers who asked the Air District to do more to protect vulnerable communities from air pollution and to protect the climate. In addition to addressing these pressing concerns, staff must ensure that any rule developed by the Air District is within the Air District's statutory authority.

Protecting Vulnerable Communities:

The Air District's Community Air Risk Evaluation Program (CARE program) identifies vulnerable communities by evaluating the public's exposure to toxic air contaminants, $PM_{2.5}$ and ozone in ambient air, and the documented health impacts related to air pollution. Through this process, the following communities were identified as having the most significant health impacts from air pollution: Concord, eastern San Francisco (including Treasure Island), Pittsburg/Antioch, Richmond/San Pablo, San Jose, Vallejo and western Alameda County. Some of these communities are directly impacted by refinery pollution.

Rule 12-16: This rule would prevent increases in some criteria pollutants (PM, NO_X, and SO_2) above a certain level. This gives some certainty to neighboring communities that these pollutants will not increase more than 7 percent above current levels. However, with the exception of PM, these are typically pollutants with regional impacts (PM has both localized and regional impacts). That is, the impact is spread across the Bay Area. These pollutants are typically emitted from tall, high temperature stacks. As a result, the pollution is usually lifted above the immediately neighboring community and disperses into the air of the region. It may be that for some emission points, under some meteorological conditions, there are localized impacts of these pollutants.

Rule 12-16 does not address toxic air contaminants directly and the Air District's analysis indicates that the toxic pollutants from refining that cause the greatest risk to nearby communities (benzene and diesel PM) will not be addressed at all by the caps in Rule 12-16.

Rule 11-18: This rule would set a limit on health risk from toxic air contaminants from facilities across the Air District. It would require all of these facilities (including refineries)

to either lower their toxic health impacts below the action threshold or install the best feasible controls on significant sources of toxic pollutants. Rule 11-18 focuses on toxic air contaminants rather than criteria or climate pollutants because toxic pollutants tend to have the most localized impacts. Rule 11-18 would foster continuous improvement of air quality through periodic review of the health impacts posed by toxic-emitting facilities and Air District update on availability of control technologies for toxic emissions. Roughly 50 percent of toxicity-weighted toxic pollutants impact CARE areas. So, these areas are expected to experience a greater benefit from Rule 11-18.

Conclusion: Rule 11-18 has broader regional impacts, is specifically directed at pollutants that impact health of nearby communities, and would better protect vulnerable communities across the Bay Area from air pollution. Rule 12-16 has a more limited geographic scope and does not address risk from toxic air contaminants. However, Rule 12-16 does provide some protection against future significant increases in local risk from fine particulate matter ($PM_{2.5}$) which can have localized impacts under some circumstances. On balance, Air District staff find Rule 11-18 to be more effective at protecting vulnerable communities. The Air District is currently evaluating ways to expand the health risk assessments conducted under Rule 11-18 to include $PM_{2.5}$, but currently, there is no defined method for doing this analysis available using OEHHA methodologies.

Protecting the Climate:

The Air District and the State of California have set aggressive goals for reducing greenhouse gas emissions. Many regulatory and non-regulatory measures for achieving these goals are being evaluated as part of the Air District's Clean Air Plan/Regional Climate Protection Strategy. Many community members have expressed their support for Rule 12-16 (at least partly) out of concern for climate pollution.

Rule 12-16: CBE has put forth the policy concept behind Rule 12-16 as a response to concerns about the changing petroleum market. Oil refineries in the Bay Area are changing their sources of crude oil as production has decreased at their traditional sources in California and Alaska. There is a concern that these new sources of crude oil may cause more air pollution than the traditional sources. In particular, CBE has expressed concern about tar sands crude, which tends to be heavier and more sulfurous than most California crude oils. CBE has also expressed concerns about increased export of refined fuels from Bay Area refineries.

The Air District's authority is limited to air pollution emitted from stationary sources within the Bay Area. The Air District does not have the authority to directly address concerns about the sources of crude oil or the final destination of refined fuel products. The Air District can address concerns about increased emissions due to changes in crude oil refinery feedstock. Our analysis will be focused on how the GHG emission caps in Rule 12-16 are likely to help protect the climate.

Rule 12-16 would limit Bay Area refinery emissions to a level 7 percent higher than current operations. Based on the analysis detailed elsewhere in this report, Air District staff believes this cap to be consistent with the current full-production capacity of Bay Area refineries. Rule 12-16 is intended to prevent changes in refinery operations or

design that would lead to significant increases in GHG emissions. But, the policy does not account for the fact that GHG emissions from Bay Area refineries are already regulated under the statewide AB 32 Cap-and-Trade system. All significant stationary sources of GHG are included under a statewide cap created by ARB's Cap-and-Trade rule. The total GHG emissions from all these sources combined is required to decline over time to meet statewide GHG reduction goals. Since any local caps in the Bay Area would not reduce the total allowable GHG emissions under the statewide cap, it's unclear how local caps would significantly benefit the climate.

Rule 11-18: Diesel PM is a large portion of the toxic risk that would be reduced by Rule 11-18. This pollutant has a significant black carbon component. Black carbon is a potent short-lived climate pollutant and is of concern for climate protection. However, the emission reductions from black carbon are not expected to be significant from a climate change perspective because the overall mass reduced will be relatively small.

Conclusion: Neither Rule 12-16 nor Rule 11-18 are expected to have a significant climate benefit. Air District staff has recommended other climate protection measures that are discussed in the Clean Air Plan/Regional Climate Protection Strategy.

Consistency with the Air District's Statutory Authority

Rule 12-16: As detailed in Section I.E., Air District staff's initial analysis of Rule 12-16 indicates that there is a substantial risk that the courts will determine that the rule is beyond the Air District's authority. Staff is unaware of any evidence that would be sufficient to make the findings required by the California Health and Safety Code. Furthermore, the cap does not appear to be consistent with the requirements of the Federal Clean Air Act.

Rule 11-18: This rule builds on the Air District's longstanding program to address toxic emissions from existing facilities. It is similar to other programs being implemented elsewhere in California, although it is more stringent than most. The rule is grounded in the fundamental authority of air districts to control air pollution from stationary sources as set forth in California Health and Safety Code sections 39002 and 39013.

IV. Next Steps in the Rulemaking Process

The publication of this document is intended to support the initial public comment portion of the development of these two rules. Key milestones dates for the rest of the process are as follows:

November 9, 2016	Open House in Richmond
November 10, 2016	Open House in Oakland
November 14, 2016	Open House/Scoping Meeting in San Francisco
November 15, 2016	Open House in San Jose

November 16, 2016	Open House/Scoping Meeting in Martinez
November 17, 2016	Open House in Fremont
December 2, 2016	Comment deadline for draft rules and NOP/IS
March 2017	Final rules, staff report, draft EIR published for comment
April 2017	Comment deadline for final rules
May 2017	Board consideration of final rules

APPENDIX A

Air Monitoring Data Trends for $PM_{2.5}$, SO_2, and NO_2

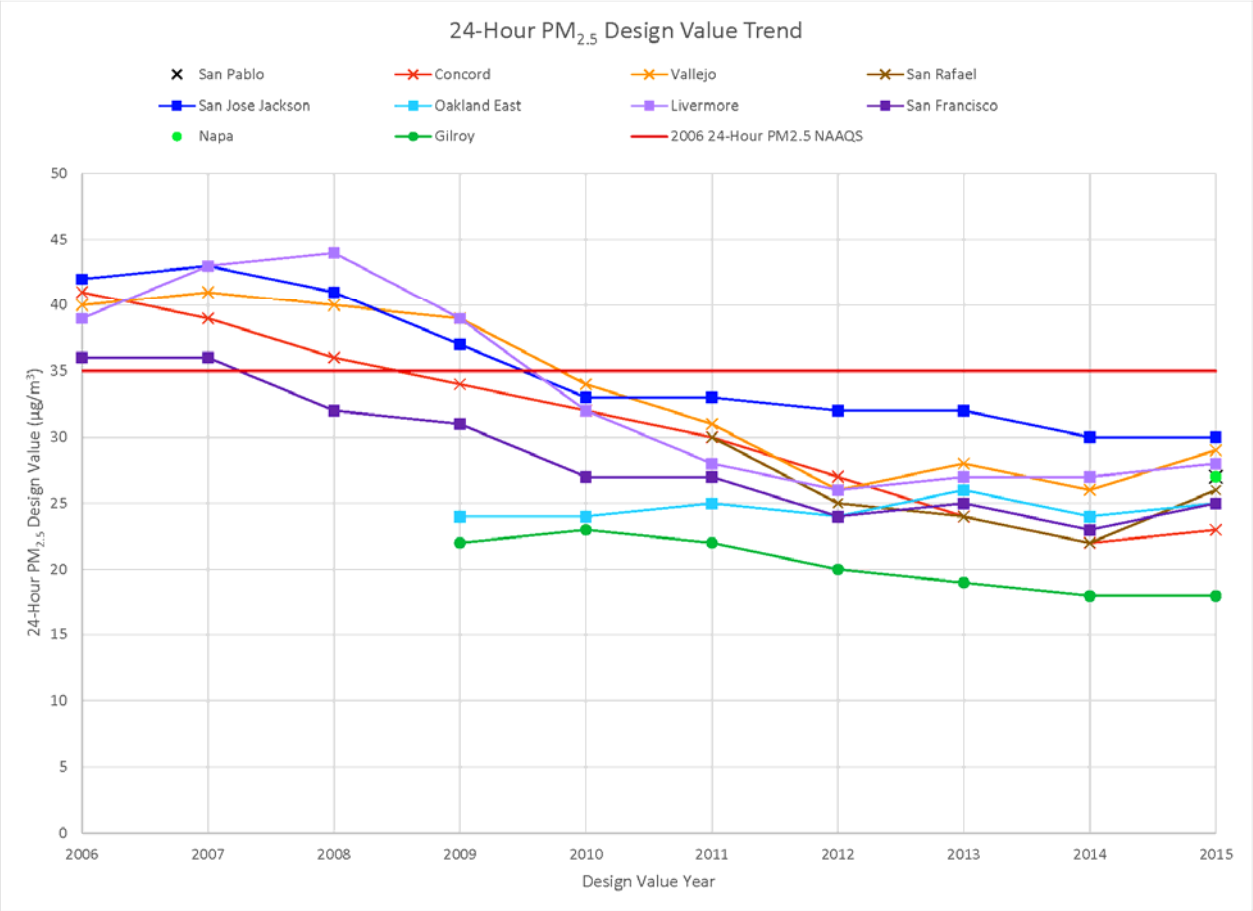


Figure A-1: Ten years of 24-Hour $PM_{2.5}$ design values at Bay Area monitoring stations. The design value for 24-hour $PM_{2.5}$ is the three-year average of the 98th percentile of daily values. The Design Value Year is the last year of the three-year average. Source: US EPA's Air Quality Systems (AQS) database (October 7, 2016).

Ten-year design Value Trends for Annual $PM_{2.5}$, 1-Hour SO_2 and 1-Hour NO_2 at Bay Area monitoring stations

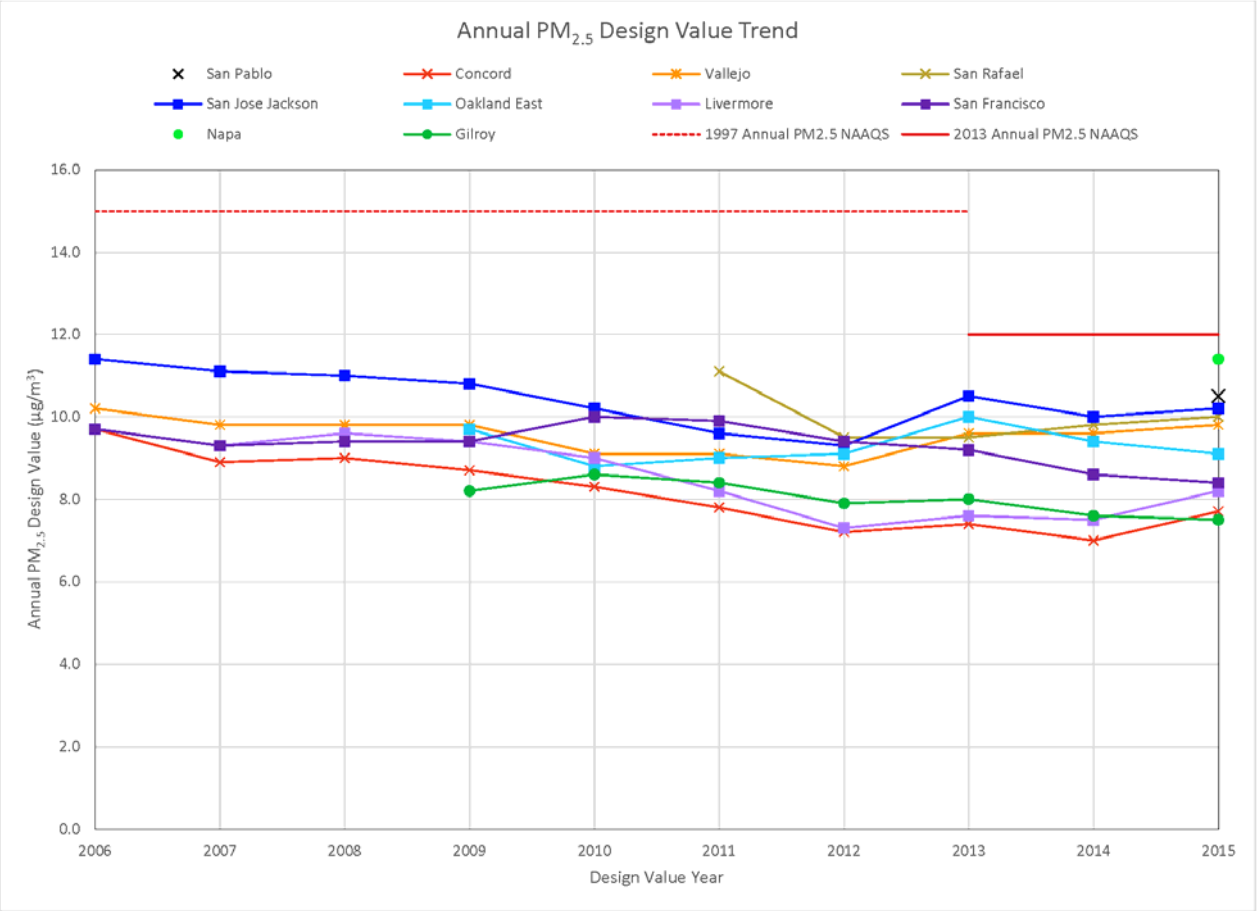


Figure A-2: Ten years of Annual $PM_{2.5}$ design values at Bay Area monitoring stations. The design value for annual $PM_{2.5}$ is the three-year average of annual mean values. The Design Value Year is the last year of the three-year average. Source: US EPA's Air Quality Systems (AQS) database (October 7, 2016).

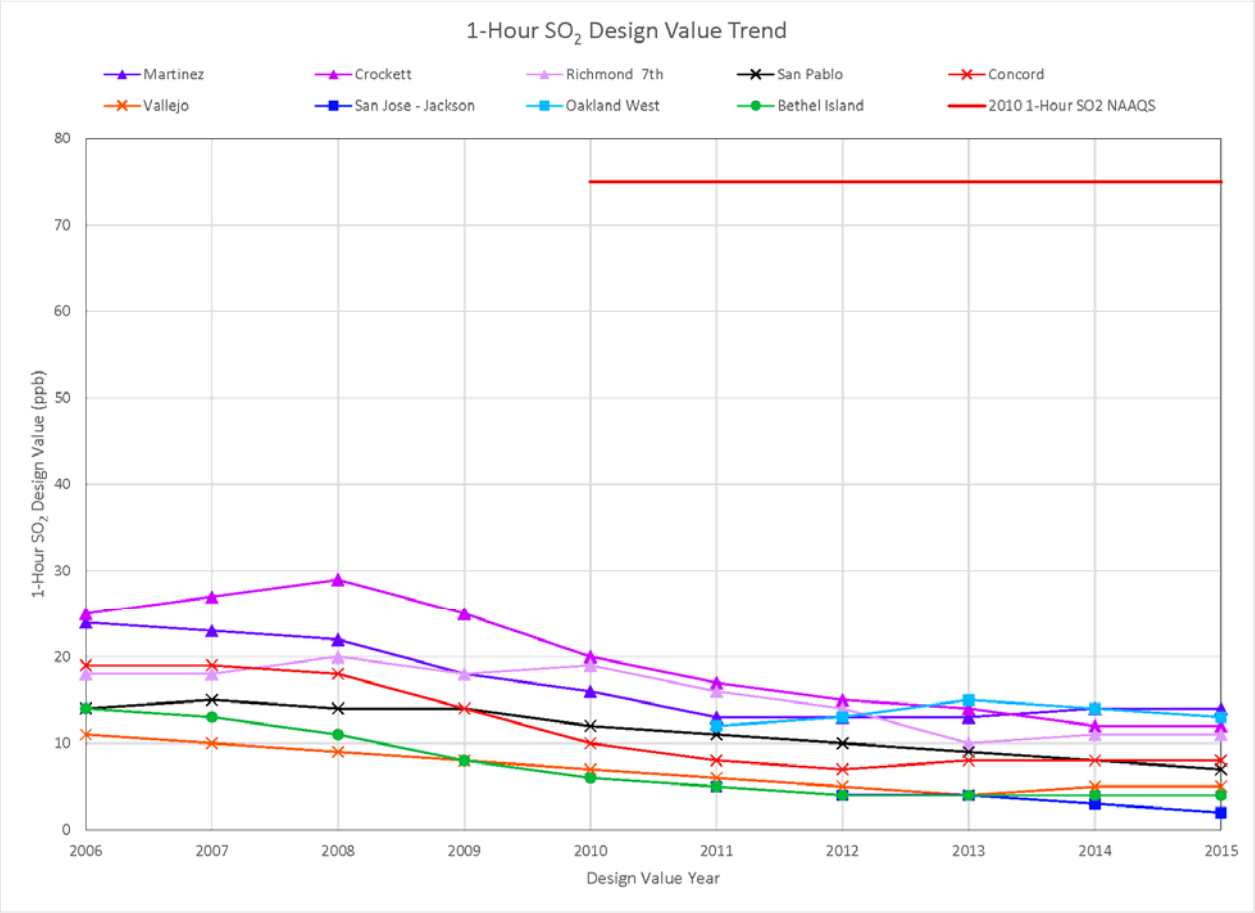


Figure A-3: Ten years of 1-Hour SO_2 design values at Bay Area monitoring stations. The design value for 1-Hour SO_2 is the three-year average of the 99th percentile of the daily maximum 1-hour concentrations. The Design Value Year is the last year of the three-year average. Source: US EPA's Air Quality Systems (AQS) database (October 7, 2016).

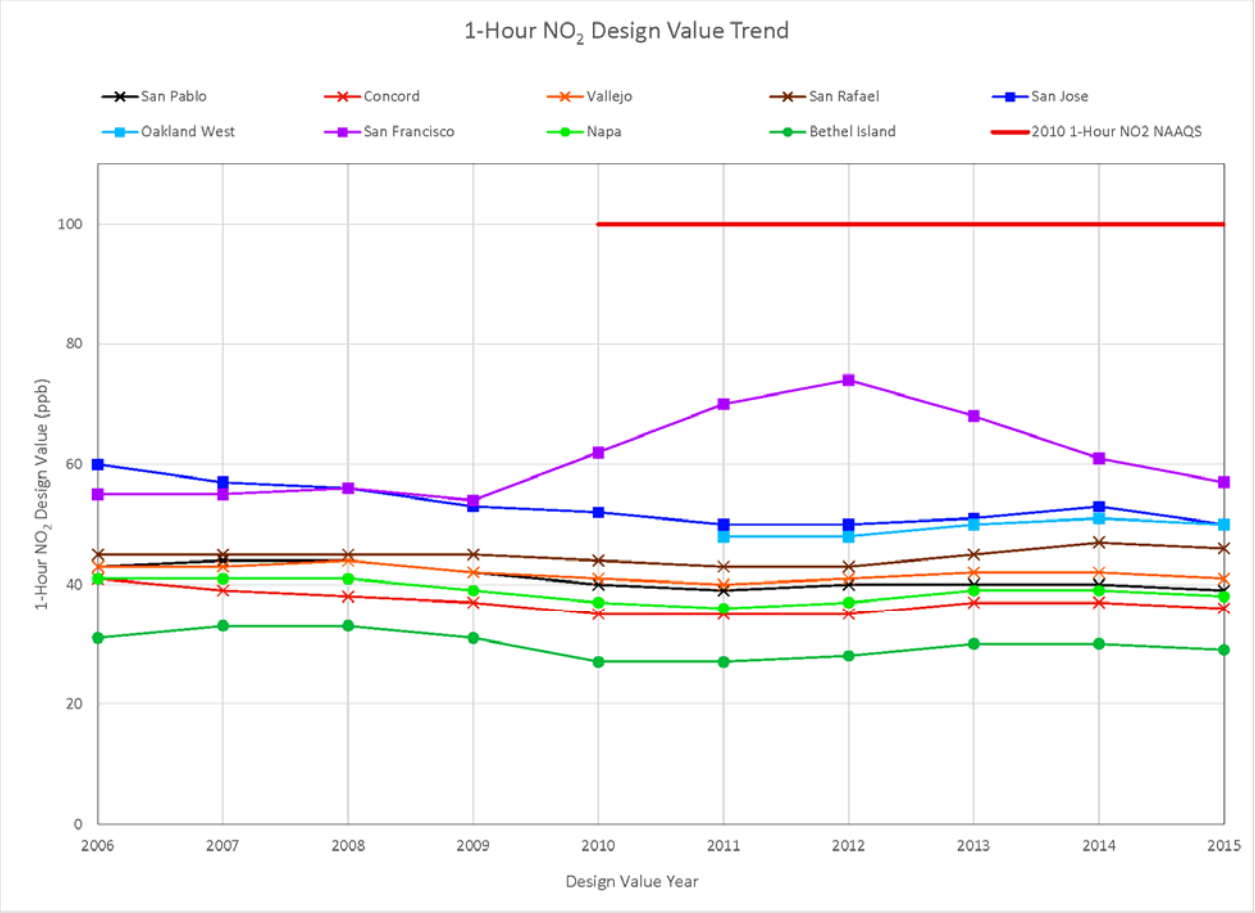


Figure A-4: Ten years of 1-Hour NO_2 design values at Bay Area monitoring stations. The elevated concentrations measured at the San Francisco monitoring station from 2010-2013 were due to emissions from idling vehicles at a nearby bus yard. The design value for 1-Hour NO_2 is the three-year average of the 98th percentile of the daily maximum 1-hour concentrations. The Design Value Year is the last year of the three-year average. Source: US EPA's Air Quality Systems (AQS) database (October 7, 2016).