

BOARD OF DIRECTORS AD HOC REFINERY OVERSIGHT COMMITTEE

COMMITTEE MEMBERS

BAY AREA AIR QUALITY MANAGEMENT DISTRICT CINDY CHAVEZ - CHAIR MARGARET ABE-KOGA CAROLE GROOM MARK ROSS ROD SINKS SHIRLEE ZANE

NATE MILEY - VICE-CHAIR PAULINE RUSSO CUTTER HILLARY RONEN PETE SANCHEZ JIM SPERING

MONDAY APRIL 9, 2018 9:30 A.M.

1ST FLOOR BOARD ROOM 375 BEALE STREET SAN FRANCISCO, CA 94105

AGENDA

1. CALL TO ORDER - ROLL CALL – PLEDGE OF ALLEGIANCE – PUBLIC MEETING PROCEDURE

The Committee Chair shall call the meeting to order and the Clerk of the Boards shall take roll of the Committee members. The Committee Chair shall lead the Pledge of Allegiance.

This meeting will be webcast. To see the webcast, please visit <u>www.baaqmd.gov/BODagendas</u> at the time of the meeting. Closed captioning may contain errors and omissions, and are not certified for their content or form.

Public Comment on Agenda Items: The public may comment on each item on the agenda as the item is taken up. Public Comment Cards for items on the agenda must be submitted in person to the Clerk of the Boards at the location of the meeting and prior to the Board taking up the particular item. Where an item was moved from the Consent Calendar to an Action item, no speaker who has already spoken on that item will be entitled to speak to that item again.

Speakers may speak for up to three minutes on each item on the Agenda. However, the Chairperson or other Board Member presiding at the meeting may limit the public comment for all speakers to fewer than three minutes per speaker, or make other rules to ensure that all speakers have an equal opportunity to be heard. The Chairperson or other Board Member presiding at the meeting may, with the consent of persons representing both sides of an issue, allocate a block of time (not to exceed six minutes) to each side to present their issue.

2. UPDATE ON THE ROLE OF THE AD HOC REFINERY COMMITTEE, BACKGROUND ON REFINERY OPERATIONS AND APPLICABLE REGULATIONS IN THE BAY AREA J. Broadbent/5052 jbroadbent@baaqmd.gov

The Committee will receive an update of the role of the Ad Hoc Refinery Committee, background on refinery operations and applicable regulations in the Bay Area.

3. PROJECT OVERVIEW AND PERMIT STATUS OF BAY AREA REFINERY PROJECTS J. Broadbent/5052 jbroadbent@baaqmd.gov

The Committee will receive a presentation on the permitting process followed by an overview and status update of refinery projects in the Bay Area.

4. PUBLIC COMMENT ON NON-AGENDA MATTERS

Pursuant to Government Code Section 54954.3 Speakers wishing to address the Board on non-agenda matters will be heard at the end of the agenda, and each will be allowed up to three minutes to address the Board at that time.

Members of the Board may engage only in very brief dialogue regarding non-agenda matters, and may refer issues raised to District staff for handling. In addition, the Chairperson may refer issues raised to appropriate Board Committees to be placed on a future agenda for discussion.

5. COMMITTEE MEMBER COMMENTS/OTHER BUSINESS

Any member of the Committee, or its staff, on his or her own initiative or in response to questions posed by the public, may ask a question for clarification, make a brief announcement or report on his or her own activities, provide a reference to staff regarding factual information, request staff to report back at a subsequent meeting concerning any matter or take action to direct staff to place a matter of business on a future agenda. (Gov't Code § 54954.2).

6. TIME AND PLACE OF NEXT MEETING

At the Call of the Committee Chair.

7. **ADJOURNMENT**

The Committee meeting shall be adjourned by the Committee Chair.

CONTACT: ACTING MANAGER, EXECUTIVE OPERATIONS 375 BEALE STREET, SAN FRANCISCO, CA 94105 vjohnson@baaqmd.gov

(415) 749-4941 FAX: (415) 928-8560 BAAQMD homepage: www.baaqmd.gov

- To submit written comments on an agenda item in advance of the meeting. Please note that all correspondence must be addressed to the "Members of the Ad Hoc Refinery Oversight Committee" and received at least 24 hours prior, excluding weekends and holidays, in order to be presented at that Board meeting. Any correspondence received after that time will be presented to the Board at the following meeting.
- To request, in advance of the meeting, to be placed on the list to testify on an agenda item.
- Any writing relating to an open session item on this Agenda that is distributed to all, or a majority of all, members of the body to which this Agenda relates shall be made available at the District's offices at 375 Beale Street, Suite 600, San Francisco, CA 94105, at the time such writing is made available to all, or a majority of all, members of that body.

Accessibility and Non-Discrimination Policy

The Bay Area Air Quality Management District (Air District) does not discriminate on the basis of race, national origin, ethnic group identification, ancestry, religion, age, sex, sexual orientation, gender identity, gender expression, color, genetic information, medical condition, or mental or physical disability, or any other attribute or belief protected by law.

It is the Air District's policy to provide fair and equal access to the benefits of a program or activity administered by Air District. The Air District will not tolerate discrimination against any person(s) seeking to participate in, or receive the benefits of, any program or activity offered or conducted by the Air District. Members of the public who believe they or others were unlawfully denied full and equal access to an Air District program or activity may file a discrimination complaint under this policy. This non-discrimination policy also applies to other people or entities affiliated with Air District, including contractors or grantees that the Air District utilizes to provide benefits and services to members of the public.

Auxiliary aids and services including, for example, qualified interpreters and/or listening devices, to individuals who are deaf or hard of hearing, and to other individuals as necessary to ensure effective communication or an equal opportunity to participate fully in the benefits, activities, programs and services will be provided by the Air District in a timely manner and in such a way as to protect the privacy and independence of the individual. Please contact the Non-Discrimination Coordinator identified below at least three days in advance of a meeting so that arrangements can be made accordingly.

If you believe discrimination has occurred with respect to an Air District program or activity, you may contact the Non-Discrimination Coordinator identified below or visit our website at www.baaqmd.gov/accessibility to learn how and where to file a complaint of discrimination.

Questions regarding this Policy should be directed to the Air District's Non-Discrimination Coordinator, Rex Sanders, at (415) 749-4951 or by email at <u>rsanders@baaqmd.gov</u>.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT 375 Beale Street, San Francisco, California 94105 FOR QUESTIONS PLEASE CALL (415) 749-4941

EXECUTIVE OFFICE: MONTHLY CALENDAR OF AIR DISTRICT MEETINGS

APRIL 2018

TYPE OF MEETING	DAY	DATE	TIME	ROOM
Board of Directors Ad Hoc Refinery Oversight Committee (At the Call of the Chair)	Monday	9	9:30 a.m.	1 st Floor Board Room
Board of Directors Executive Committee (Meets on the 3 rd Monday of each Month)	Monday	16	9:30 a.m.	1 st Floor Board Room
Board of Directors Regular Meeting (Meets on the 1 st & 3 rd Wednesday of each Month)	Wednesday	18	9:30 a.m.	1 st Floor Board Room
Board of Directors Budget & Finance Committee (Meets on the 4 th Wednesday of each Month)	Wednesday	25	9:30 a.m.	1st Floor, Yerba Buena Room #109
Board of Directors Mobile Source Committee (Meets on the 4 th Thursday of each Month)	Thursday	26	9:30 a.m.	1 st Floor Board Room
	MAY	<u>Y 2018</u>		
TYPE OF MEETING	DAY	DATE	TIME	ROOM
Board of Directors Regular Meeting (Meets on the 1 st & 3 rd Wednesday of each Month)	Wednesday	2	9:30 a.m.	1 st Floor Board Room
Board of Directors Personnel Committee (At the Call of the Chair)	Monday	7	9:30 a.m.	1 st Floor Board Room
Board of Directors Regular Meeting (Meets on the 1 st & 3 rd Wednesday of each Month)	Wednesday	16	9:30 a.m.	1 st Floor Board Room
Board of Directors Climate Protection Committee (Meets on the 3 rd Thursday of every other Month)	Thursday	17	9:30 a.m.	1 st Floor Board Room
Board of Directors Executive Committee (Meets on the 3 rd Monday of each Month)	Monday	21	9:30 a.m.	1 st Floor Board Room

21

23

24

Monday

10:30 a.m.

9:30 a.m.

9:30 a.m.

1st Floor Board Room

1st Floor, Yerba Buena

Room #109

1st Floor Board Room

Board of Directors Budget & Finance
Committee (Meets on the 4th Wednesday of each Month)WednesdayBoard of Directors Mobile SourceThursday

Committee (Meets on the 4th Thursday of each Month)

Board of Directors Stationary Source

Month)

Committee (Meets on the 3rd Monday of every other

JUNE 2018

TYPE OF MEETING	DAY	DATE	TIME	ROOM
Board of Directors Regular Meeting (Meets on the 1 st & 3 rd Wednesday of each Month)	Wednesday	6	9:30 a.m.	1 st Floor Board Room
Board of Directors Executive Committee (Meets on the 3 rd Monday of each Month)	Monday	18	9:30 a.m.	1 st Floor Board Room
Board of Directors Regular Meeting (Meets on the 1 st & 3 rd Wednesday of each Month)	Wednesday	20	9:30 a.m.	1 st Floor Board Room
Board of Directors Technology Implementation Office Steering Committee (At the Call of the Chair)	Thursday	21	1:00 p.m.	1st Floor, Ohlone Room #107
Board of Directors Budget & Finance Committee (Meets on the 4 th Wednesday of each Month)	Wednesday	27	9:30 a.m.	1st Floor, Yerba Buena Room #109
Board of Directors Mobile Source Committee (Meets on the 4 th Thursday of each Month)	Thursday	28	9:30 a.m.	1 st Floor Board Room

MV - 04/05/18 - 8:16 a.m.

G/Board/Executive Office/Moncal

BAY AREA AIR QUALITY MANAGEMENT DISTRICT Memorandum

- To: Chairperson Cindy Chavez and Members of the Ad Hoc Refinery Oversight Committee
- From: Jack P. Broadbent Executive Officer/APCO
- Date: April 2, 2018
- Re: Update on the Role of the Ad Hoc Refinery Committee, Background on Refinery Operations and Applicable Regulations in the Bay Area

RECOMMENDED ACTION

None; receive and file.

BACKGROUND

Petroleum refineries are significant sources of 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 climate, environment and public health. Though Bay Area refinery emissions have declined over time, it is possible that, as refinery operations change in the future, emissions could increase.

In recognition of the concerns of the public and non-governmental organizations (NGOs) regarding refinery matters; the complexity of the facilities and their operations; and the need for a broader range of Board of Directors (Board) members to understand these topics in depth; the Board formed the Ad-Hoc Refinery Committee in 2018.

DISCUSSION

Currently, there are five petroleum refineries located in the Bay Area within the jurisdiction of the Air District:

- 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)

These facilities process crude oil into a variety of products such as gasoline, aviation fuel, diesel and other fuel oils, lubricating oils, and feedstocks for the petrochemical industry.

As part of this agenda item, staff will discuss the role of the Ad-Hoc Refinery Committee; provide a background on how refinery facilities operate and how they are permitted; and discuss the Air District regulations that apply to these facilities. Attachment 2A to the staff report contains an overview of refinery processes, emissions and regulations.

BUDGET CONSIDERATION/FINANCIAL IMPACT

None.

Respectfully submitted,

Jack P. Broadbent Executive Officer/APCO

Prepared by:Pamela LeongReviewed by:Damian Breen

Attachment 2A: Refinery Process Overview, Emissions and Regulations

PETROLEUM REFINERY PROCESS DESCRIPTION

Petroleum refineries process crude oil into a variety of products such as gasoline, aviation fuel, diesel and other fuel oils, lubricating oils, and feedstocks for the petrochemical industry. The diagram in Figure 1 illustrates how various process units at petroleum refineries convert raw crude oil (petroleum) into fuels and other products.



Figure 1: Refinery Flow Diagram

Legend: LSR = light straight-run naphtha; HSR = heavy straight-run naphtha; Kero = kerosene; LAGO = light atmospheric gas oil; HAGO = heavy atmospheric gas oil; LVGO = light vacuum gas oil; MVGO = medium vacuum gas oil; HVGO = heavy vacuum gas oil.

The processing of crude oil occurs in various process units or plants; some of the primary process units include:

- <u>Crude Desalter</u>: Crude oil is mixed with water to separate the salt and sediments from the crude oil.
- <u>Crude Unit</u>: The incoming desalted crude oil is heated and distilled into various fractions for further processing in other units.
- <u>Gas Concentration Unit</u>: Light hydrocarbons from the top of the crude unit are separated and distributed in the refinery fuel gas (RFG) system for use as fuel for heaters and boilers.
- <u>Vacuum Distillation Unit</u>: The residue oil from the bottom of the crude oil distillation unit is further distilled under heavy vacuum.
- <u>Hydrotreater</u>: Naphtha, kerosene, and gas oil from the crude unit have sulfur and nitrogen removed by using hydrogen and converting the organically bound sulfur

into hydrogen sulfide (a toxic compound) and nitrogen into ammonia (a toxic compound).

- <u>Fluidized Catalytic Cracker Unit</u>: Longer chain, higher boiling hydrocarbons such as heavy oils are broken (or "cracked") into lighter, shorter molecules at high temperatures and moderate pressure in the presence of a catalyst. This process is so named because the catalyst is so fine that it behaves like a fluid.
- <u>Butane Isomerization Unit</u>: Polymers of butane are reformed into isobutane for use in the alkylation process. Alkylates are used in blending gasoline to boost the octane rating. Alkylates are considered one of the highest quality refinery products.
- <u>Light Naphtha Isomerization Unit</u>: Benzene is saturated and short, straight-chain hydrocarbons are isomerized into branched-chain hydrocarbons.
- <u>Heavy Naphtha Reformer and Hydrotreater</u>: Low-octane linear hydrocarbons (paraffins) are converted into aromatics using a catalyst. The process also forms hydrogen used in the refinery's hydrocracking and hydrotreating units and benzene, toluene, and xylene (BTX) feedstocks, used in other process units.
- <u>Hydrocracker Unit</u>: Hydrogen is used to upgrade heavier fractions into lighter, more valuable products, such as diesel and jet fuel, in a high-pressure system.
- <u>Alkylation Unit</u>: Butene and propene are reacted with isobutane into alkylate, a high-octane gasoline component.
- <u>Delayed Coker</u>: Very heavy residual oils are converted into end-product petroleum coke as well as naphtha and diesel oil byproducts. There are two other types of cokers: a fluid coker and flexicoker. A fluid coker differs from a delayed coker in that a fluid coker is a continuous process while a delayed coker is a batch process. A flexicoker differs from both a delayed coker and fluid coker in that it produces fuel for a refinery to use.
- <u>Claus Sulfur Plant</u>: A two-step (thermal and catalytic) process for recovering sulfur from gaseous hydrogen sulfide (H₂S) derived from refining crude oil. In the thermal step, H₂S laden gas is combusted to form elemental sulfur and sulfur dioxide (SO₂). In the catalytic step, a catalyst is used to boost the sulfur yield. In this step, H₂S reacts with SO₂ to form elemental sulfur.

The typical processes performed at a refinery are described in greater detail 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. Emissions from Refinery Processing

These primary process units, minor process units, auxiliary equipment (boilers, turbines, heat exchangers, etc.), and other refinery activities (such as truck and loader traffic) emit a variety of criteria pollutants, toxic pollutants (toxic air contaminants), and climate pollutants (greenhouse gases). Other sources of emissions include waste water treatment, tanks, leaking equipment, pressure relief devices, flares, marine terminals, and product loading, which are collectively subject to at least ten different Air District regulations. (A more detailed discussion on refinery emissions is provided below.)

PETROLEUM CRUDE OIL

Petroleum 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 1215 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 (H₂S), 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.

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 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 H₂S 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.

To maximize production, refineries are designed to process crude oils within a certain range of compositions—often referred to as "crude window." 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 to accommodate different sources of crude oil with different compositions to maintain current production levels. Figure 2, shows the trends in crude sources for California refineries.



Figure 2: Crude Oil Supply Sources to California Refineries

Source: California Energy Commission

It is anticipated that refineries may 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 adopted to monitor the key data so that staff can determine if emissions changes are potentially driven by changes in crude slate.

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.

a. Criteria Pollutants

Criteria pollutants have regional or basin-wide impacts and are emissions for which ambient air quality standards (AAQS) have been established, or 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 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 (NO₂) and oxides of nitrogen (NO_x);
- Particulate matter (PM) in two size ranges—diameter of 10 micrometers or less (PM₁₀), 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 (SO₂).

Each of these criteria pollutants is emitted by petroleum refineries. Most of these criteria pollutants result from fossil fuel combustion. Typically, these emissions would increase when GHG emissions increase. However, most of the refinery equipment is subject to regulatory and permitting requirements that limit emissions of criteria pollutants. And, any significant equipment change that would lead to increased emissions is subject to the Air District's very strict permitting regulations. So, the extent to which criteria pollutant emissions would increase in tandem with GHG emissions would vary by project and refinery.

b. Toxic Pollutants

Toxic pollutants, also known as toxic air contaminants (TACs), have localized impacts and 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 address TAC emissions from refineries and other sources through Regulation 11, Rule 18: Reduction of Risk from Air Toxic Emissions at Existing Facilities. The TACs that drive health risk from refineries are usually associated with leaks from equipment and tanks, these high risk pollutants, such as benzene, are not correlated to GHG emissions.

c. Climate Pollutants

Climate pollutants (greenhouse gases or GHGs) are emissions that contribute to global anthropogenic climate change. Carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and three groups of fluorinated compounds (hydrofluorocarbons, or HFCs; perfluorocarbons, or PFCs; and sulfur hexafluoride, or SF₆) are the major anthropogenic GHGs, and are regulated under the federal Clean Air Act and the California Global Warming Solutions Act (AB 32). The climate pollutants emitted from petroleum refineries include CO₂, CH₄, and N₂O.

d. Refinery Air Pollution in Context

Refineries are a significant source of air pollutants in general. In the counties where the refineries are located, their emissions can be more significant on a percentage basis, especially for SO₂ 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 17 percent. They also do not include the benefits of rules under development to reduce SO₂ 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.

	Emissions								
Source Category	PM _{2.5}		Anthropogenic ROG		NO _x		SO ₂		
	(tons/yr.)	%	(tons/yr.)	%	(tons/yr.)	%	(tons/yr.)	%	
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 1: Bay Area Emissions of Relevant Pollutants by Source Category

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

	Emissions								
Source Category	PM _{2.5}		Anthropogenic ROG		NO _x		SO ₂		
	(tons/yr.)	%	(tons/y.r)	%	(tons/yr.)	%	(tons/yr.)	%	
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 2: 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.
- 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.

Regulation of Air Pollutants from Petroleum Refineries

1. CRITERIA POLLUTANTS

Bay Area refineries are subject to various air quality regulations that have been adopted by the Air District, CARB, and the EPA. These regulations contain standards that ensure emissions are effectively controlled, including:

• Requiring the use of specific emission control strategies or equipment (e.g., the use of floating roofs on tanks for limiting VOC emissions);

- Requiring that emissions generated by a source be controlled by at least a specified percentage (e.g., 95 percent control of VOC emissions from pressure relief devices);
- Requiring that emissions from a source not exceed specific concentration levels (e.g., 100 parts per million [ppm] by volume of VOC for equipment leaks unless those leaks are repaired within a specific timeframe; 250 ppm by volume SO₂ in exhaust gases from sulfur recovery units; 1,000 ppm by volume SO₂ in exhaust gases from catalytic cracking units);
- Requiring that emissions not exceed certain quantities for a given amount of material processed or fuel used at a source (e.g., 0.033 pounds NO_X per million BTU of heat input, on a refinery-wide basis, for boilers, process heaters, and steam generators);
- Requiring that emissions be controlled sufficiently so that concentrations beyond the facility's property are below specified levels (e.g., 0.03 ppm by volume of hydrogen sulfide [H₂S] in the ambient air);
- Requiring that emissions from a source not exceed specified opacity levels based on visible emissions observations (e.g., no more than 3 minutes in any hour in which emissions are as dark or darker than No. 1 on the Ringelmann Smoke Chart); and
- Requiring that emissions be minimized by the use of all feasible prevention measures (e.g., flaring prohibited unless it is in accordance with an approved Flare Minimization Plan).

Air quality rules generally do not expressly limit mass emissions (e.g., pounds per year of any specific air pollutant) from affected equipment unless that equipment was constructed or modified after March 7, 1979, and was subject to the Air District's New Source Review (NSR) rule. All Bay Area refineries have "grandfathered" emission sources that were not subject to NSR but are generally regulated by equipment-specific Air District regulations or operational conditions contained in Air District permits. As a result, none of the Bay Area refineries have overall mass emission limits that apply to the entire refinery. Nonetheless, mass emissions of regulated air pollutants from Bay Area refineries are tracked at the source level, and these mass emissions generally have been substantially reduced over the past several decades.

Air pollutant emissions from Bay Area petroleum refineries have been regulated for more than 50 years, with most of the rules and regulations adopted following enactment of the 1970 Clean Air Act amendments. The Air District has the primary responsibility to regulate "stationary sources" of air pollution in the Bay Area, and the Air District has adopted many rules and regulations that apply to petroleum refineries (see below).

2. TOXIC POLLUTANTS

The Air District uses three approaches to reduce TAC emissions and to reduce the health impacts resulting from TAC emissions: (1) Specific rules and regulations, including federal, state, and Air District regulations such as Regulation 11, Rule 18; (2) Preconstruction review; and (3) the AB 2588 Air Toxics "Hot Spots" Program. 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).

3. ACCIDENTAL RELEASE REGULATION

In addition to Air District regulations, petroleum refineries are also subject to regulatory programs that are intended to prevent accidental releases of regulated substances. Accidental release prevention programs in California are implemented and enforced by local administering agencies, which, in the case of the Bay Area refineries, are Solano County (for the Valero Refining Company) and Contra Costa County (for Chevron Products Company, Phillips 66 Company, Shell Martinez Refinery, and Tesoro Refining and Marketing Company).

The primary regulatory programs of this type are based on requirements in the amendments to the 1990 Clean Air Act as follows: (1) the Process Safety Management (PSM) program, which focuses on protecting workers, and which is administered by the U.S. Occupational Safety & Health Administration (OSHA); and (2) the Accidental Release Prevention program (commonly referred to as the Risk Management Program, or RMP), which focuses on protecting the public and the environment, and which is administered by EPA. Bay Area refineries are subject to Cal/OSHA's PSM program, which is very similar to the federal OSHA program focusing on worker safety, but with certain more stringent state provisions. Bay Area refineries are subject to the California Accidental Release Prevention (CalARP) Program, which is very similar to EPA's RMP program to limit exposure of the public, but with certain more stringent State provisions. In addition, Contra Costa County and the City of Richmond have both adopted an Industrial Safety Ordinance (ISO). These ISOs are very similar to CalARP requirements, but with certain more stringent local provisions.

4. AIR DISTRICT RULES AFFECTING REFINERIES

The following is a partial list of the air pollution rules and regulations that the Air District implements and enforces at Bay Area refineries:

- Regulation 1: General Provisions and Definitions
- Regulation 2, Rule 1: Permits, General Requirements
- Regulation 2, Rule 2: New Source Review
- Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants
- Regulation 2, Rule 6: Major Facility Review (Title
- Regulation 6, Rule 5: Particulate Emissions from Refinery Fluidized Catalytic Cracking Units
- Regulation 8, Rule 1: Organic Compounds, General Provisions
- Regulation 8, Rule 2: Organic Compounds, Miscellaneous Operations
- Regulation 8, Rule 5: Storage of Organic Liquids
- Regulation 8, Rule 6: Terminals and Bulk Plants
- Regulation 8, Rule 8: Wastewater (Oil-Water) Separators
- Regulation 8, Rule 9: Vacuum Producing Systems
- Regulation 8, Rule 10: Process Vessel Depressurization
- Regulation 8, Rule 18: Equipment Leaks
- Regulation 8, Rule 28: Episodic Releases from Pressure Relief Devices at Petroleum Refineries and Chemical Plants
- Regulation 8, Rule 44: Marine Vessel Loading Terminals
- Regulation 9, Rule 1: Sulfur Dioxide
- Regulation 9, Rule 2: Hydrogen Sulfide
- Regulation 9, Rule 8: Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines
- Regulation 9, Rule 9: Nitrogen Oxides and Carbon Monoxide from Stationary Gas Turbines
- Regulation 9, Rule 10: Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries
- Regulation 9, Rule 14: Petroleum Coke Calcining Operations
- Regulation 11, Rule 10: Cooling Towers
- Regulation 11, Rule 18: Reduction of Risk from Air Toxic Emissions at Existing Facilities
- Regulation 12, Rule 11: Flare Monitoring at Petroleum Refineries
- Regulation 12, Rule 12: Flares at Petroleum Refineries
- Regulation 12, Rule 15: Petroleum Refinery Emissions Tracking
- 40 CFR Part 60, Subpart J: Standards of Performance for Petroleum Refineries (NSPS)
- 40 CFR Part 61, Subpart FF: Benzene Waste Operations (NESHAP)
- 40 CFR Part 63, Subpart CC: Petroleum Refineries (NESHAP)
- 40 CFR Part 63, Subpart UUU: Petroleum Refineries: Catalytic Cracking, Catalytic Reforming, and Sulfur Plant Units (NESHAP)

State Airborne Toxic Control Measure for Stationary Compression Ignition (Diesel) Engines (ATCM).

5. Air District Permitting

In addition to enforcing federal, state, and District source-specific rules, the Air District issues permits which contain conditions limiting air emissions. Under California law, the authority to issue permits is vested in the Air Pollution Control Officer and is thus a staff function. The Air District issues essentially two types of permits: preconstruction permits and permits to operate. There are both Air District and federal programs for preconstruction and operating permits.

A preconstruction permit, or "Authority to Construct" in Air District parlance, grants permission to a facility to construct a new, or modify an existing, piece of equipment or source. Based on a careful review and analysis of an applicant's proposal for a new or modified source, these permits ensure that all applicable requirements are met and in certain circumstances impose stringent conditions limiting emissions of criteria and toxic pollutants through a variety of approaches (e.g., limiting throughput or capacity, and/or requiring use of state-of-the-art emission control technology). Preconstruction permits also specify emissions monitoring to ensure that permit conditions are met over time. Under certain circumstances, the Air District's decision on an application for a preconstruction permit can be appealed to the Air District's Hearing Board.

An operating permit, or "Permit to Operate" in Air District parlance, allows a facility to operate an individual piece of equipment or collection of pieces of equipment. Operating permits are typically issued after a source has properly constructed a new or modified source in accordance with a preconstruction permit. These permits contain conditions limiting emissions and specifying monitoring to ensure compliance. These permits are typically renewed annually. A special type of operating permit is issued to certain facilities with large emissions, or in defined categories, under a federal operating permit program mandated by Title V of the Clean Air Act Amendments of 1990. These Title V permits, or "Major Facility Review" permits in Air District parlance, consolidate in one document all applicable federal, state and local requirements, including the conditions imposed through preconstruction and operating permits. The purpose of Title V permits is to provide a single point of reference for all air emission requirements applicable to a facility subject to the program. Title V permits cannot contain new emission limits or operating requirements, but under certain circumstances may contain additional monitoring requirements (known as "compliance assurance monitoring"). Title V permits are nominally renewed every five years after initial issuance.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT Memorandum

- To: Chairperson Cindy Chavez and Members of the Ad Hoc Refinery Oversight Committee
- From: Jack P. Broadbent Executive Officer/APCO
- Date: April 2, 2018

Re: <u>Project Overview and Permit Status of Bay Area Refinery Projects</u>

RECOMMENDED ACTION

None; receive and file.

BACKGROUND

Currently, there are five petroleum refineries located in the Bay Area within the jurisdiction of the Air District:

- 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)

These facilities process crude oil into a variety of products such as gasoline, aviation fuel, diesel and other fuel oils, lubricating oils, and feedstocks for the petrochemical industry. These facilities are subject to Air District and federal preconstruction permitting requirements, and operate under Air District Permits to Operate, which together with federal requirements, such as those contained in the National Emissions Standards for Hazardous Air Pollutants and Maximum Achievable Control Technology standards, are consolidated in Major Facility Review (or Title V) permits mandated by the federal Clean Air Act.

DISCUSSION

Staff will provide a presentation on the following major projects at the five Bay Area refineries, including requests for modification projects that are under consideration by the Air District and upcoming Title V permitting actions:

- Low-carbon Intensity Fluid Catalytic Cracking Unit Feed Project at Tesoro
- Phillips 66 Refinery Unicracker Project and the Marine Terminal Project
- Title V Renewals for Chevron, Shell, Valero and Tesoro

BUDGET CONSIDERATION/FINANCIAL IMPACT

None.

Respectfully submitted,

Jack P. Broadbent Executive Officer/APCO

Prepared by:Pamela LeongReviewed by:Damian Breen