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**Petroleum Refinery Emissions Reduction
Strategy:
Initial Report**

Prepared by the staff of the
Bay Area Air Quality Management District

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Petroleum Refinery Emissions Reduction Strategy: Initial Report

Summary

The Petroleum Refinery Emissions Reduction Strategy (or “Refinery Strategy”) is intended to reduce emissions of criteria pollutants and their precursors (including sulfur dioxide (SO₂), oxides of nitrogen (NO_x), particulate matter, including fine particulates (PM_{2.5}¹), organic gases, and toxic compounds) from the five Bay Area refineries and associated facilities. The Bay Area Air Quality Management District (Air District) plans to accomplish these refinery emissions reductions by amending several Air District rules affecting petroleum refineries and developing additional rules aimed at specific refinery processes.

The Air District is moving these individual actions through the rulemaking process as a package. This enables the Air District to use its staff resources more efficiently and streamlines coordination and consultation with the public and the regulated community. There should be no inference that this approach results in dependencies between these rule actions. Each rulemaking action is independent from the others and will be individually evaluated according to the requirements of the California Health and Safety Code (H&SC).

The purpose of this concept paper and appendices (individual concept papers and draft rule language) is to inform the public and the regulated community of the Air District’s plans for implementing the Refinery Strategy through rulemaking. In order to develop the best possible rules, Air District staff is soliciting feedback on our preliminary findings. Staff will consider input received in drafting the next iteration of the draft rules and accompanying workshop report. Those revised versions of the rules and associated documentation will then be published and discussed in public workshops. Staff will take the input from this workshop process and further revise the rules, as appropriate. The Air District will again publish the rules along with a detailed staff report prior to the public hearing where the Board of Directors considers whether to adopt the rules.

Goals

On December 17, 2014, the Air District’s Board of Directors approved the following overall goals for the Refinery Strategy:

1. Strive to achieve a 20 percent reduction in emissions of criteria pollutants and precursors in the next five years.
2. Strive to achieve an additional 20 percent reduction in health risk from the emission of toxic compounds.

Criteria pollutants are pollutants for which air quality standards have been set, such as SO₂, ozone and PM_{2.5}. Precursors are pollutants that interact in the atmosphere to form criteria pollutants. For example, NO_x and reactive organic gases (ROG) form ozone.

Regulatory Context and Background

The Air District is currently engaged in developing regulatory measures to reduce emissions of air pollutants from a wide variety of stationary and area sources. In developing the 2016 Clean Air Plan, staff evaluated many of these sources and determined that some of the largest stationary sources of air

¹ PM_{2.5} is the portion of particulate matter with an aerodynamic diameter of less than 2.5 micrometers.

pollutants include landfills, refineries, chemical manufacturers, and publically owned treatment works (POTW).

The 2011 Bay Area Emissions Inventory for stationary sources indicates that although landfills are the largest sources of total organic gases (TOG), refineries are the largest individual stationary source emitters of reactive organic gases (ROG).²

Table 1: Criteria Pollutant and Precursor Emissions by Industrial Sector

Industrial Sector	TOG (tpd)	ROG (tpd)	PM_{2.5} (tpd)	NO_x (tpd)	SO₂ (tpd)	CO (tpd)
Petroleum Refining and Related Facilities	12.1	10.0	2.7	10.0	8.8	5.6
Landfills	191.2	1.7	0.33	0.5	0.3	1.6
POTWs	3.0	0.4	0	0	0	0
Chemical Manufacturing Facilities	1.6	1.6	0.4	0.1	0	0.1

Further, the five Bay Area refineries rank among the top ten facilities in the Bay Area for risk-weighted emissions of toxic air contaminants (TAC), based on an evaluation of emissions from stationary sources in 2012 and using risk factors for cancer and chronic hazard index.

Based on assessments of refinery emissions of criteria pollutants and TAC, the Air District has made emissions reductions from these facilities a high priority and is moving expeditiously to reduce refinery emissions from their current levels. To this end, staff is engaged in several rulemaking efforts to further reduce emissions of all air pollutants (including criteria and toxic pollutants) from the five Bay Area refineries, plus five associated facilities that either support refinery operation (two sulfuric acid plants and two hydrogen plants), or that process a refinery by-product (one coke calcining plant).

Draft Rules 12-15 and 12-16

Air District staff is currently developing two new draft rules: Regulation 12, Rule 15: Petroleum Refining Emissions Tracking and Regulation 12, Rule 16: Petroleum Refining Emissions Analysis, Thresholds and Mitigation. The first of the two new draft rules, draft Regulation 12, Rule 15: Petroleum Refining Emissions Tracking, would gather emissions inventory and crude oil composition information from Bay Area refineries, increase air monitoring activities at the refinery fence lines and in nearby communities, and require updated site-wide health risk assessments from the refineries. The second proposal, which builds upon Rule 12-15, draft Regulation 12, Rule 16: Petroleum Refining Emissions Analysis, Thresholds and Mitigation, would require refiners to mitigate emissions increases of criteria and toxic pollutants.

Draft Rule 12-15 is intended to enable the Air District to have a holistic understanding of refinery emissions and their impact on the community. Rule 12-16 is intended to address and mitigate significant increases in emissions or risk that arise from changes in refinery operation. The Refinery Strategy complements these efforts by identifying rulemaking opportunities intended to reduce emissions from the refineries and associated facilities.

² TOG includes methane, while ROG does not.

Petroleum Refinery Emissions Reduction Strategy

On October 15, 2014, the Air District Board of Directors adopted Resolution Number 2014-07, instructing staff to develop a strategy based on an evaluation of approaches that would further reduce emissions from petroleum refineries, including:

- The “community-worker” approach outlined in a September 26, 2014 letter;
- Approach(es) proposed by industry;
- Approach(es) to require each refinery to develop a refinery emissions improvement plan to implement a suite of measures to demonstrate compliance with all applicable requirements of the strategy to further reduce emissions from petroleum refineries and to identify any additional feasible measures to achieve best practices with respect to minimizing emission and to assure continuous improvement in minimizing emissions; and
- Other approaches deemed appropriate by Air District staff.

The resolution also instructed Air District staff to prepare and present to the Board of Directors by December 2014 a strategy to achieve further emissions reductions from petroleum refineries that would include as a goal, a 20 percent reduction in refinery emissions, or as much emissions reductions as are feasible. The resolution also provided that the strategy must include a schedule to implement the strategy through regulations or other enforceable mechanisms as expeditiously as possible.

On December 17, 2014, the Board of Directors approved the staff-proposed approach that would blend the best of the evaluated approaches. The approach would:

- Identify specific source categories with opportunities for cost-effective controls (this is also known as a Best Available Retrofit Control Technology review or BARCT review);
- Adopt requirements identified in the U.S. Environmental Protection Agency (EPA) Refinery Risk and Technology Review;
- Include the quantitative goals from the Community-Worker proposal;
- Include continuous improvement;
- Retain compliance with the Health and Safety Code and the process transparency advocated by industry.

The Board of Directors approved the following overall goals for the Refinery Strategy:

1. Strive to achieve a 20 percent reduction in criteria pollutants and precursors in the next five years.
2. Strive to achieve an additional 20 percent reduction in health risk from toxics.

Targeted Pollutants

The Refinery Strategy is intended to reduce emissions from the five Bay Area refineries and five associated facilities of the following pollutants:

- Particulate Matter (PM), including directly-emitted filterable PM and condensable PM, as well as precursor compounds that form fine PM (PM_{2.5}) as a result of chemical reactions in the atmosphere. Condensable PM is particulate matter which forms after the hot emissions from the stack cool to ambient temperatures. These emissions are not quantified by traditional particulate testing

methodologies because the sampling system does not operate at atmospheric temperatures and the condensable PM is a vapor at higher temperatures.

- ROG, a precursor in the formation of ground-level ozone.³
- NO_x, an ozone precursor which also contributes to fine PM formation.
- SO₂, which contributes to fine PM formation.
- Ammonia (NH₃), also a contributor to fine PM formation.

Each of these ten facilities has high emissions of one or more of the targeted pollutants.

Phased Approach

Staff recommends a three-phase approach to complete the rulemaking for the Refinery Strategy:

- 1) Phase 1 would be completed in the third quarter of 2015;
- 2) Phase 2 – the fourth quarter 2015; and
- 3) Phase 3 – 2016.

The first phase, Phase 1, would focus on regulatory efforts for which staff has developed enough background information, such as emissions inventory, emissions reductions, control technology evaluation and cost estimates, cost effectiveness, and preliminary environmental impact review, to draft regulatory language in anticipation of a workshop and schedule a public hearing. Phase 1 includes the effort to develop a new draft rule, Rule 9-14: Petroleum Coke Calcining to address emissions of SO₂ and the formation of PM_{2.5}.

Phase 2 would focus on regulatory development for which staff has developed initial information, such as emissions inventory and cost estimates, and is currently in the process of gathering additional information needed for the regulatory development process, including environmental and socioeconomic information. Phase 2 would cover the following regulatory development:

- New draft rule, Rule 6-5: Fluidized Catalytic Cracking Unit (FCCU) to address emissions of ammonia and also to address condensable PM formation;
- Draft amendments to Rule 8-18: Equipment Leaks to address fugitive emissions of ROG and toxic compounds from equipment in heavy liquid service⁴;
- Draft amendments to Rule 9-1: Sulfur Dioxide to further reduce emissions of SO₂ and the formation of PM_{2.5} from refinery fuel gas combustion and from sulfuric acid plants; and
- Draft amendments to Rule 11-10: Toxic and ROG emissions from Cooling Towers to address reactive organic gases (ROG) and toxic compounds from cooling towers.

Phase 3 would cover longer term regulatory development for efforts that require additional time and resources to gather and confirm requisite information to finalize a draft rule. This phase would include:

- Draft amendments to new Rule 6-5: FCCU to address emissions of SO₂ and condensable PM;
- Draft amendments to Rule 9-1 to address emissions of SO₂ from sulfur plants;
- Draft amendments to Rule 9-9: Stationary Gas Turbines to address emissions of NO_x.

³ Methane is not part of ROG because has a low reactivity for ozone formation, although it is a potent greenhouse gas (GHG). The Air District expects some methane reductions as a co-benefit of ROG reductions. However, methane is not currently a targeted pollutant in this Refinery Strategy. It will be addressed through other measures in the Clean Air Plan.

⁴ Staff also expects methane reductions from this rule change.

The appendices to this document provide our preliminary findings for all of the Phase 2 rulemaking projects and for the draft amendments to Rule 9-9. The Air District is soliciting feedback on this set of rulemaking projects. There is a separate workshop report for the Phase 1 rule, which is also available from the Air District's web site.⁵

Affected Facilities

There are five petroleum refineries in the Bay Area that may be affected:

1. Chevron Products Company (Richmond);
2. Phillips 66 Company – San Francisco Refinery (Rodeo);
3. Shell Martinez Refinery (Martinez);
4. Tesoro Refining and Marketing Company (Martinez);
5. Valero Refining Company – California (Benicia).

There are five associated support facilities that may be affected:

1. Chemtrade West (Sulfuric Acid Plant that supports Chevron);
2. Eco Services (formerly called Solvay – Sulfuric Acid Plant that supports Shell and Valero regularly, and Tesoro as needed when its acid plant is down for maintenance);
3. Air Products (Hydrogen Plant that supports Tesoro)⁶;
4. Phillips 66 Carbon Plant;
5. Air Liquide (Hydrogen Plant that supports Phillips 66).

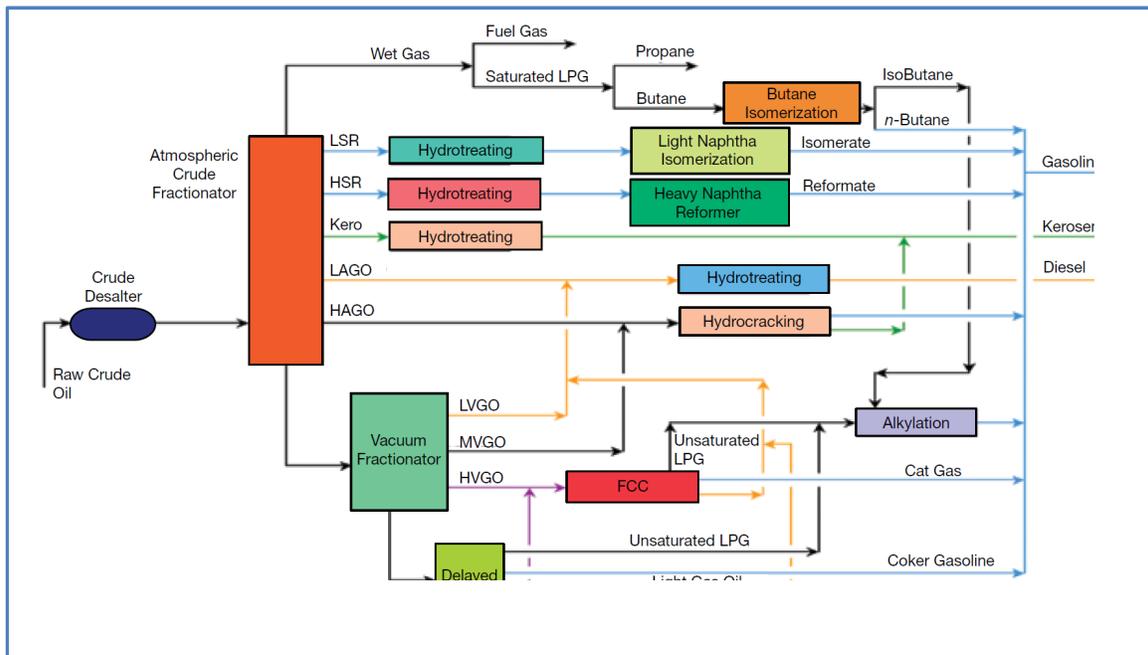
Petroleum Refining Processes

These facilities process crude oil into a variety product 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.

⁵ See “2015 Rules Workshops” at the following URL: <http://www.baaqmd.gov/Divisions/Planning-and-Research/Rule-Development/Rule-Workshops.aspx>

⁶ There is also an Air Products plant that supports only the Shell Refinery. The emissions from that plant were included in the baseline inventory.

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:

- **Crude Desalter:** Crude oil is mixed with water to separate the salt and sediments from the crude.
- **Crude Unit:** Heats and distills the incoming desalted crude oil into various fractions for further processing in other units.
- **Gas Concentration Unit:** 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.
- **Vacuum Distillation Unit:** Further distills the residue oil from the bottom of the crude oil distillation unit under heavy vacuum.
- **Hydrotreater:** Uses hydrogen to desulfurize naphtha, kerosene, and gas oil from the crude unit by converting the organically bound sulfur into hydrogen sulfide (a toxic compound).
- **Fluidized Catalytic Cracker Unit:** Breaks (or “cracks”) longer chain, higher boiling hydrocarbons such as heavy oils into lighter, shorter molecules at high temperatures and moderate pressure in the presence of a catalyst. This process gets its name because the catalyst is so fine that it behaves like a fluid.
- **Butane Isomerization Unit:** Combines isobutene (a lighter hydrocarbon) with olefins (heavier hydrocarbons) to form larger molecules known as alkylates, which are used in blending gasoline to boost the octane rating. Alkylates are considered one of the highest quality refinery products.
- **Light Naphtha Isomerization Unit:** Saturates benzene and isomerizes short, straight-chain hydrocarbons into branched-chain hydrocarbons.
- **Heavy Naphtha Reformer and Hydrotreater:** Converts low-octane linear hydrocarbons (paraffins) 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.

- **Hydrocracker Unit:** Uses hydrogen to upgrade heavier fractions into lighter, more valuable products, such as diesel and jet fuel in a high pressure system.
- **Alkylation Unit:** Reacts butene and propene with isobutane into alkylate, a high octane gasoline component.
- **Delayed Coker:** Converts very heavy residual oils into end-product petroleum coke as well as naphtha and diesel oil byproducts.
- **Claus Sulfur Plant:** 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.

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 air contaminants, and greenhouse gases. Other sources of emissions include waste water treatment, tanks, leaking equipment, pressure release devices, flares, marine terminals, and product loading, which are collectively subject to at least ten different Air District regulations.

Rule Changes Descriptions

Air District staff has begun developing the following control measures that would comprise the Refinery Strategy. The following table lists these individual control measures and rule development efforts.

Table 2: Description of Rule Changes

Title	Proposal Description
PHASE ONE	
Rule 9-14: Petroleum Coke Calcining	Reduce SO ₂ emissions from the coke calcining facility through improvements to the emission control system.
PHASE TWO	
Rule 6-5: FCCU (Part 1)	Consider emission limits on fluid catalytic cracking units in oil refineries for ammonia, which is a PM _{2.5} precursor. It is expected that limiting ammonia from the FCCU would also reduce emissions of condensable PM.
Rule 8-18: Equipment Leaks	Reduce fugitive emission of organic gases and toxic compounds through the following: <ul style="list-style-type: none"> • Include identification and monitoring of heavy liquid service equipment; • Amend the non-repairable equipment standard to reduce the allowable amount of equipment placed on non-repairable list; • Require quantification of leaks for all equipment placed on the non-repairable list; • Add a maximum leak concentration (10,000 ppm) that would apply to all equipment placed on the non-repairable list ; and • Add a maximum mass emissions rate (five pounds per day) that would apply to any individual piece of equipment subject to monitoring by Rule 8-18. Administrative changes to rule language will be drafted to clarify and enforceability of the rule.
Rule 9-1: Sulfur Dioxide (Part 1)	Reduce SO ₂ emissions by the following changes to the rule: <ol style="list-style-type: none"> 1. Limit the sulfur content of refinery fuel gas to no more than 40 ppm; 2. Limit SO₂ emissions from sulfuric acid plants to no more than 0.20 lb. SO₂ per ton of acid produced.
Rule 11-10: Toxic and	Reduce emissions of toxic organic gases and ROG from cooling towers in refineries and

Title	Proposal Description
ROG Emissions from Cooling Towers	chemical plants by testing for and repairing heat exchanger leaks.
PHASE THREE	
6-5: FCCU (Part 2)	Reduce SO ₂ and condensable PM emissions.
Rule 9-1: Sulfur Dioxide (Part 2)	Reduce SO ₂ emissions from refinery sulfur plants to the extent that it is feasible.
9-9: Stationary Gas Turbines	Require the installation of selective catalytic reduction control on turbines with heat input greater than 100 MM BTU/hr.
FURTHER STUDY MEASURES	
Rule 8-8: Industrial Wastewater	Review industrial wastewater collection, separation and treatment system operations to develop an overall strategy to reduce air toxics and TOCs.
8-44: Marine Vessel Operations	Reduce organic gas emissions from marine loading operations that are within the Air District's authority in consideration of overlapping authority of the Coast Guard and other agencies.
9-10: Refinery Boilers, Steam Generators and Process Heaters	The majority of NO _x emissions at the refineries come from these sources. Recent updates to 9-10 have tightened standards, but those reductions have not yet shown up in the emissions inventory. Substantial work will be required to determine whether there are opportunities for additional controls.

Baseline Emissions and Estimated Reduction from Proposed Rules

The Air District has established a baseline emissions inventory for the purpose of estimating emissions reductions from the new rules and draft amendments to current rules in the Refinery Strategy. This inventory shows baseline emissions for pollutants targeted by the proposed regulations: PM (including directly-emitted filterable PM and condensable PM), TOG⁷, NO_x, and SO₂. It includes emissions from petroleum refinery processes (e.g., feedstock and product handling, petroleum separation, conversion and treating processes) as well as from auxiliary facilities such as hydrogen production, sulfur recovery and power plants. Reporting year 2013⁸ was chosen as the baseline year since it is the most recent for which the Air District has complete emissions data. However, fugitive TOG emissions are based on reporting year 2014 since the calculation methodology has been significantly improved.

⁷ The Air District's emissions reporting system does not consistently differentiate between TOG and ROG emissions. This will be improved in the development of the PREP as defined in draft rule 12-15. Since TOG is the more inclusive category, it is being used for the development of the baseline.

⁸ 2013 reporting year emissions correspond to emissions from calendar year 2012.

Table 3: Baseline Emissions from the Refineries and Associated Facilities

Facility Name	Average Annual Emissions (tons/year)				
	PM (filterable)	PM (Condensable) ⁹	TOG	NO _x	SO ₂
Chevron	173	255	2,122	910	339
Phillips 66	53		338	266	409
Shell	409	98	1,812	971	1,084
Tesoro	80	91	887	763	572
Valero	123		420	1,205	111
Chemtrade West	4		55	2	127
Eco Services	18		1	13	362
Air Products	10		9	3	2
Phillips 66 (Carbon Plant)	29		0	239	1,242
Air Liquide	16		29	2	2
Total Emissions	915	444	5,675	4,375	4,250

The baseline emissions inventory shown in Table 3 will be replaced with the Petroleum Refinery Emissions Profile (PREP), an emissions inventory required from relevant facilities by draft Rule 12-15. The PREP will be used as a reference with which to compare ongoing emissions inventories to monitor emissions changes. It will have a breadth similar to the baseline inventory since it will include emissions from both refineries and their auxiliary facilities. However, it will not include emissions that exceeded regulatory or permitted limits, or emissions from accidental air releases. The Air District will start using the PREP as a baseline inventory sometime after the required submission date of July 2016.

At this point, the Air District has estimated the following emission reductions and costs for the regulatory actions under consideration. More details may be found in the appendices to this document. The Air District seeks comments on the accuracy of these estimates.

Table 4: Estimated Emissions Reductions and Costs for Rule Changes

Title	PM (tons/year)	TOG (tons/year)	NO _x (tons/year)	SO ₂ (tons/year)	Costs (million \$/yr)
PHASE ONE					
Rule 9-14: Petroleum Coke Calcining				894	\$6.0
PHASE TWO					
Rule 6-5: FCCU (Part 1) ¹⁰	TBD				\$0
Rule 8-18: Equipment Leaks		1,227			\$6.8
Rule 9-1: Sulfur Dioxide (Part 1)				926	\$4.7
Rule 11-10: Toxic and		514			\$0.3

⁹ Condensable PM emissions are estimated based on a very small number of non-standard tests on FCCUs. These numbers will change as more testing is completed at the refineries.

¹⁰ Part 1 of this rule change would reduce ammonia emissions. There is reason to believe that this would also reduce emissions of condensable PM, but it is not possible to quantify that at this time. So, the estimated PM reduction is listed as to be determined or TBD.

Title	PM (tons/year)	TOG (tons/year)	NO _x (tons/year)	SO ₂ (tons/year)	Costs (million \$/yr)
VOC Emissions from Cooling Towers					
Totals for Phases One and Two	TBD	1,741	0	1,820	\$17.8
PHASE THREE					
Rule 9-1: Sulfur Dioxide (Part 2)				TBD	TBD
9-9: Stationary Gas Turbines			280		TBD
6-5: FCCU (Part 2)	TBD			TBD	TBD

The table above shows that the Air District has identified significant opportunities for SO₂ and TOG reductions. There are limited opportunities for NO_x reductions because the key NO_x sources at the refineries, such as boilers and heaters, were reviewed in 2013 for the update of Air District Rule 9-10 Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries. Similarly, sources of filterable PM are typically cost-effectively controlled. The key opportunity for emissions reductions is from condensable PM. The Air District plans to address this pollutant through our actions impacting FCCUs.

The baseline emissions from the refineries are 15,659 tons per year. The emissions reductions from Phases One and Two of the Refinery Strategy are estimated to be 3,561 tons each year, which means these phases are projected to reduce emissions from these sources by 23 percent.

Twenty Percent Reduction in Risk from Toxic Emissions

Another of the goal of the Refinery Strategy is to reduce the risk from emissions of toxic compounds by at least 20 percent. Several of the rule development efforts undertaken in the strategy would reduce toxic emissions and risk – specifically amendments to Rule 8-18 would reduce VOCs, including toxic compounds, from leaking component and amendments to Rule 11-10 would expand the scope of this airborne toxic control measure to included toxic organic gases from refinery cooling towers (see Table 2).

Draft Rule 12-15: Petroleum Refining Emissions Tracking would require refiners to conduct an updated health risk assessment (HRA) using the most up-to-date protocols, assessment methodologies, and health risk values. From these updated HRAs, the primary sources of toxic emissions at each refinery can be identified and the risk posed quantified. From this information, additional control strategies can be developed to address these toxic emissions and in turn, further reduce risks.

Other Regulatory Development – Further Study Measures

Staff is also engaged in developing information that would assist in the potential development of additional rulemaking. This information development would take the form of further study measures for two refinery processes: industrial wastewater collection, separation and treatment, which is currently addressed by Air District Rule 8-8: Waste Water Collection and Separations Systems; and marine operations, addressed by Rule 8-44: Marine Tank Vessel Operations. Staff will determine whether there are cost effective opportunities for TOG and NO_x reductions from these sources.

Rule Development / Public Consultation Process

During this multi-phased rule development effort staff will strive to engage all interested stakeholders, including affected industry, nearby community members, environmental organizations, other governmental agencies, the media, and other interested parties. There are several aspects to this public engagement, including:

- Development of conceptual versions of draft rules with discussions of those concepts;
- Scheduling and siting of public workshops (which will be held in and around communities impacted by refinery emissions) with the timely release of associated draft regulatory language, preliminary reports, and support documents;
- Meetings and consultations (community meetings, phone conversations, emails, letters) with interested stakeholders in less formal settings to discuss concerns and issues;
- Preparation of a regulatory package for the consideration of the Air District Board of Directors, including:
 - Proposed regulatory language;
 - A Staff Report presenting the staff’s findings, such as descriptions of the refining industry, regulatory history, summary and explanation of the proposal, emissions and emission reductions estimates, costs, cost effectiveness and incremental cost effectiveness, environmental and socioeconomic impacts, a schedule of implementation (when the provisions of the rule become effective if adopted), and staff recommendations to the Board of Directors;
 - An environmental analysis report;
 - A socioeconomic analysis report;
 - A discussion of and responses to comments received on the proposed rule, staff report, and environmental and socioeconomic analyses;
- Public Hearing, where the staff’s presentation is made and stakeholders may provide testimony to the Board of Directors on the staff proposal and at which the Board would consider the adoption of the proposal.

Schedule of Refinery Strategy Regulatory Development

The following table provides a preliminary schedule for the development of each of the three phases of the regulatory effort. It should be noted that these are only rough estimates of the schedule and the dates may change as the effort proceeds.

Milestone	Phase 1	Phase 2	Phase 3
Concepts	April 2015	April 2015	3 rd Quarter 2015
Workshops	2 nd Quarter 2015	2 nd Quarter 2015	2 nd Half 2016
Public Hearing	3 rd Quarter 2015	4 th Quarter 2015	2016

Appendices

Appendix A: Concept Paper for Rule 6-5: Fluidized Catalytic Cracking Units (FCCU)

Appendix B: Concept Paper for Changes to Rule 8-18: Equipment Leaks

Appendix C: Concept Paper for Changes to Rule 9-1: Refinery Fuel Gas Sulfur Limits

Appendix D: Concept Paper for Changes to Rule 9-1: Limiting SO₂ Emissions from Acid Plants

Appendix E: Concept Paper for Changes to Rule 11-10: Toxic and ROG emissions from Cooling Towers

Appendix F: Initial Proposal for Changes to Rule 9-9: Stationary Gas Turbines