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SCAQMD'S EVALUATION OF POTENTIAL AIR QUALITY AND HEALTH RISK IMPACTS FROM EXXONMOBIL REFINERY START-UP

SCAQMD staff conducted a careful screening evaluation of potential toxic health risks and fine particulate levels in the air around the refinery associated with the start-up activities at the ExxonMobil refinery. **All potential health risks due to increased air pollution exposures associated with this start-up activity are expected to be below health-based thresholds and air quality standards, as described in more details below.**

BACKGROUND ABOUT AIR TOXICS

There are many toxic compounds emitted into the air from industrial operations (e.g., refineries, factories, metal finishing, etc.), vehicle exhaust (e.g., cars, trucks, trains, etc.), and other common activities in daily life (e.g., filling vehicle gas tanks, hot water heaters, fire places, etc.). SCAQMD periodically conducts a comprehensive study of all toxic air emissions in our region ("air basin") and evaluates their impact on the population (Multiple Air Toxics Exposure Study (MATES)). The MATES study uses a calculation called a "Health Risk Assessment" that is consistent with guidelines from the state health experts, California Office of Environmental Health Hazard Assessment (OEHHA). This is the best method scientists currently have for estimating the chance that breathing or otherwise being exposed to a chemical could cause health effects. For cancer, because the odds are generally small, risks are described as the "number of chances in one million" of getting cancer.

The most recent update of MATES found that the average cancer risk in our region from air toxics exposures is about 900 chances per million. The MATES study estimated that about 90% of this cancer risk is from vehicle exhaust, e.g. cars, trucks, construction equipment, etc. While there has been a remarkable 57% reduction in toxic risks between 2005 and 2012, mainly due to additional controls on toxic emission sources, much work is still needed to reduce these risks even further.

Cancer risks vary throughout the region, and risks in the Torrance area based on air toxics from all sources are about 1,000 to 1,200 chances per million. While the MATES study provides insight into regional and neighborhood-scale health risks, it is not designed to evaluate risks caused by sources very close to a community, such as the case with the ExxonMobil Refinery and the adjacent residences. Facility-specific Health Risk Assessments (HRAs), described below, provide a more detailed picture of the ExxonMobil Refinery emissions impact on the surrounding community.

HEALTH RISK ASSESSMENT OF THE EXXONMOBIL REFINERY CONDUCTED IN 2011

Under SCAQMD's administration of the state Toxic 'Hot Spots' Act (AB2588), facilities such as the ExxonMobil Refinery must report their toxic emissions to SCAQMD every four years (available on the SCAQMD FIND website). If emissions are above certain levels as specified in SCAQMD Rule 1402, a facility must prepare a detailed HRA, using OEHHA guidelines, that evaluates how their emissions contribute to the surrounding community's health risk. If health risks are above SCAQMD Rule 1402 public notification thresholds, then the affected community within the specific area is notified about the

health risks and a public meeting is held in the community. If risks are above SCAQMD risk reduction thresholds, then the facility must reduce those risks as quickly as possible to levels below that threshold. Every four years emissions are re-evaluated, and if they substantially increase or if HRA guidelines are updated such that risks in the community are expected to increase above the levels found in the previous HRA, then a new HRA is required.

In 2011, SCAQMD approved ExxonMobil's HRA that was based on the year 2007 emissions profile of the entire facility (available here). As seen in the table below, the results of the HRA showed that the maximum potential health risks from the entire facility were below SCAQMD public notice and risk reduction thresholds.

Health Endpoint	2011 HRA Risk Estimate	Public Notification Threshold	Key Pollutants Contributing to Estimated Health Risks	Threshold Exceeded?
Cancer (Residential)	7.7/million	10/million	Diesel Particulate Matter, Arsenic, Benzene	No
Chronic (Long-Term) Hazard Index* (Worker)	0.47	1.0	Arsenic, Mercury, Manganese	No
Acute (Short-Term) Hazard Index* (Residential)	0.21	1.0	Mercury, Hydrogen Sulfide, Arsenic	No

**The Hazard Index (HI) is a measure of non-cancer health effects. An HI below 1.0 indicates that no adverse health impact is expected, even to sensitive populations such as children and the elderly.*

Air toxics exposure is an important concern, however it is not the only factor contributing to one's likelihood of developing cancer. The American Cancer Society estimates that in the United States people have about a 40% chance, or about a 400,000 per million chance, of developing cancer in their lifetime from all causes, including genetics, diet, environmental exposures, and other causes.

SCREENING HEALTH RISK ANALYSIS OF EXXONMOBIL START-UP ACTIVITIES

In February 2015 an explosion at an air pollution control unit called an Electro-Static Precipitator (ESP) which controls fine particulate emissions at ExxonMobil refinery made the ESP inoperable and caused a key gasoline production unit called a Fluid Catalytic Cracking Unit (FCCU) to be shut down. The FCCU has been idled since the February 2015 explosion at the plant. ExxonMobil has repaired the ESP and is now restarting the FCCU to resume gasoline production at the refinery.

SCAQMD staff investigated the potential health risks from toxic emissions during FCCU start-up activities at the refinery. Once the start-up is complete, the emissions from the FCCU should be the same as before the February 2015 explosion.

As stated during the April 2, 2016 SCAQMD Hearing Board proceedings, because the ESP that controls particulate emissions from the FCCU will be turned off for up to a six hour period during start-up, during this six hour period the particulate emissions will be higher than normal. The catalyst material that will be used in the FCCU during start-up and emitted as particulate matter was analyzed in the SCAQMD lab.

It contains trace levels of the toxic metals nickel, arsenic, selenium, vanadium, and copper. For particulates, as a conservative approach, SCAQMD staff calculated the potential health risks assuming that all particulate matter was composed of the catalyst that is used in the FCCU itself. **During this start-up period, the maximum potential short-term health risks from emissions of catalyst particulate matter are approximately 100 times lower than the health-based thresholds established and used by SCAQMD**. As is typical of airborne emissions, the modeled impact of these emissions to the community is highest at the fence line of the refinery, and decreases further away from the refinery. For example, concentrations are predicted to be at least 50% lower about a quarter-mile from the refinery fence line.

HYDROGEN CYANIDE

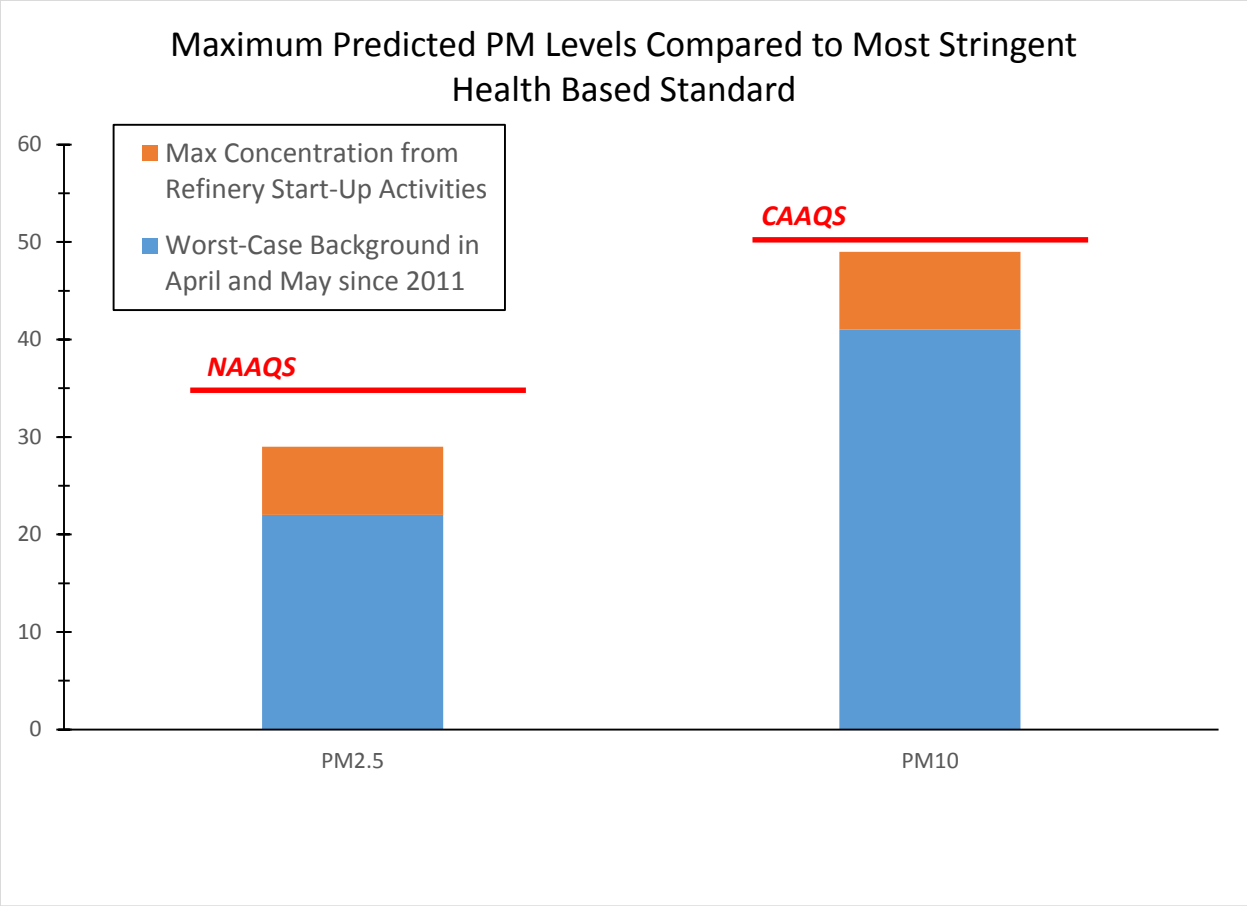
Hydrogen cyanide is a gas that forms as a byproduct of catalyst regeneration in the FCCU as coke is burned off the catalyst. Because hydrogen cyanide is a gas, its emission levels are unaffected and not controlled by operation of the ESP, and its level of emissions during start-up should be no greater than the level prior to February 2015. Based on community feedback, potential health risks due to emissions of hydrogen cyanide were re-evaluated. This re-evaluation follows recently updated emissions information made available by EPA that found emissions of hydrogen cyanide compounds are approximately 100 times higher than estimated in the 2011 AB2588 Health Risk Assessment. In addition, EPA determined that there are no data indicating that the operation of a CO Boiler -- a type of boiler that converts Carbon Monoxide (CO) to Carbon Dioxide (CO_2) -- downstream of the FCCU has any significant impact on hydrogen cyanide emissions. These higher reported emissions do not indicate a change in actual emission levels; rather, they indicate a change in how emissions are measured. However, even when evaluating the risks based on this higher emissions level (approximately 100,000 pounds per year), potential short-term and long-term health risks from emissions of hydrogen cyanide are well below health-based thresholds. OEHHA establishes Reference Exposure Levels (RELs) at the pollutant concentration below which adverse non-cancer health effects are not expected to occur. As shown in the table below, using the updated emissions and calculating the concentrations at the maximum receptor, the concentrations of hydrogen cyanide are still well below these thresholds. Specifically, the annual average hydrogen cyanide concentrations during normal operation are predicted to be no more than about 0.27 ug/m^3 (below the chronic REL of 9 ug/m^3), and the peak hour concentrations would be no more than about 0.68 ug/m^3 (below the acute REL of 340 ug/m^3). The concentrations of hydrogen cyanide during start-up activities are expected to be even lower as there will be no feed into the FCCU during the six hour period where the ESP is not used and overall less throughput in the FCCU during the start-up period. When combining these health risks from hydrogen cyanide with all other toxic emissions from the refinery, the conclusion of the 2011 AB2588 Health Risk Assessment would not have changed, and no SCAQMD health risk thresholds would have been exceeded.

	2011 AB2588 HRA	**Updated Emission Rate from EPA Study**	**Reference Exposure Level**	**Threshold Exceeded?**
Emission Rate	1,100 lb/year	100,000 lb/year	N/A	N/A
Annual Average Hydrogen Cyanide Concentration at Maximum Receptor	0.0027 ug/m^3	0.27 ug/m^3	9 ug/m^3	No
Peak Hour Hydrogen Cyanide Concentration at Maximum Receptor	0.0068 ug/m^3	0.68 ug/m^3	340 ug/m^3	No

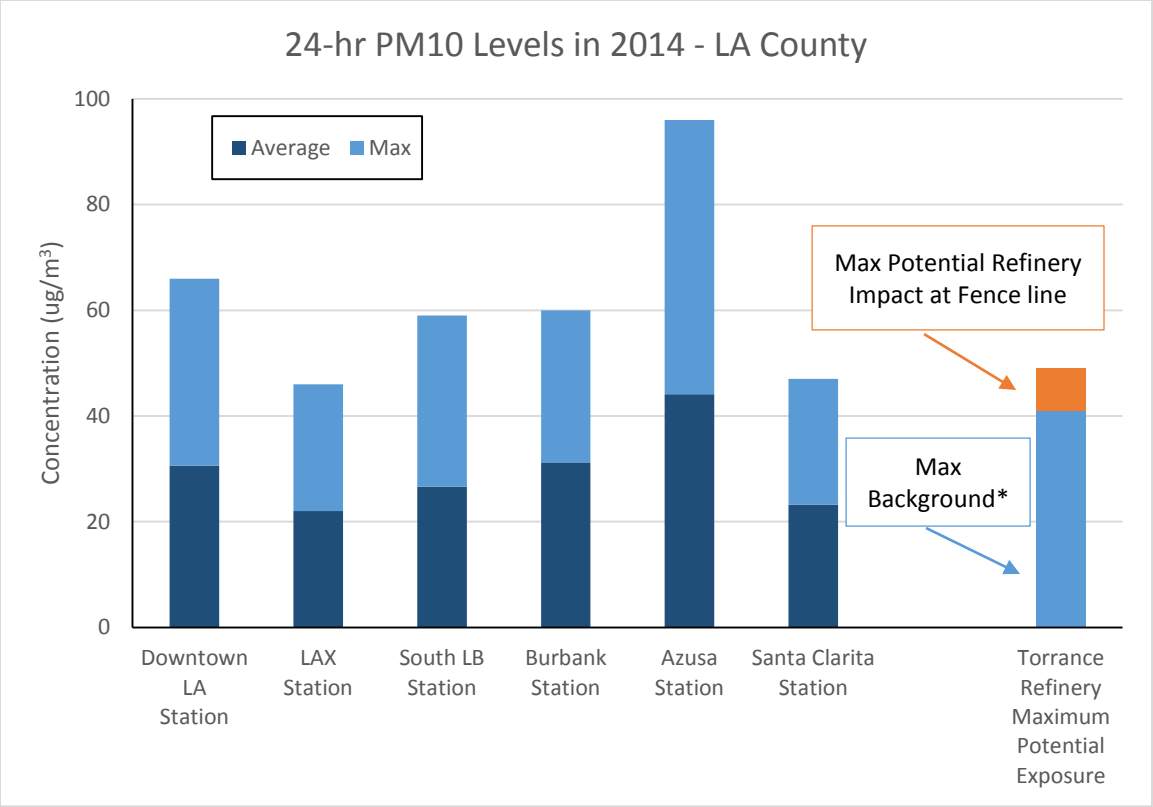
COMPARISON WITH PARTICULATE MATTER AMBIENT AIR QUALITY STANDARDS

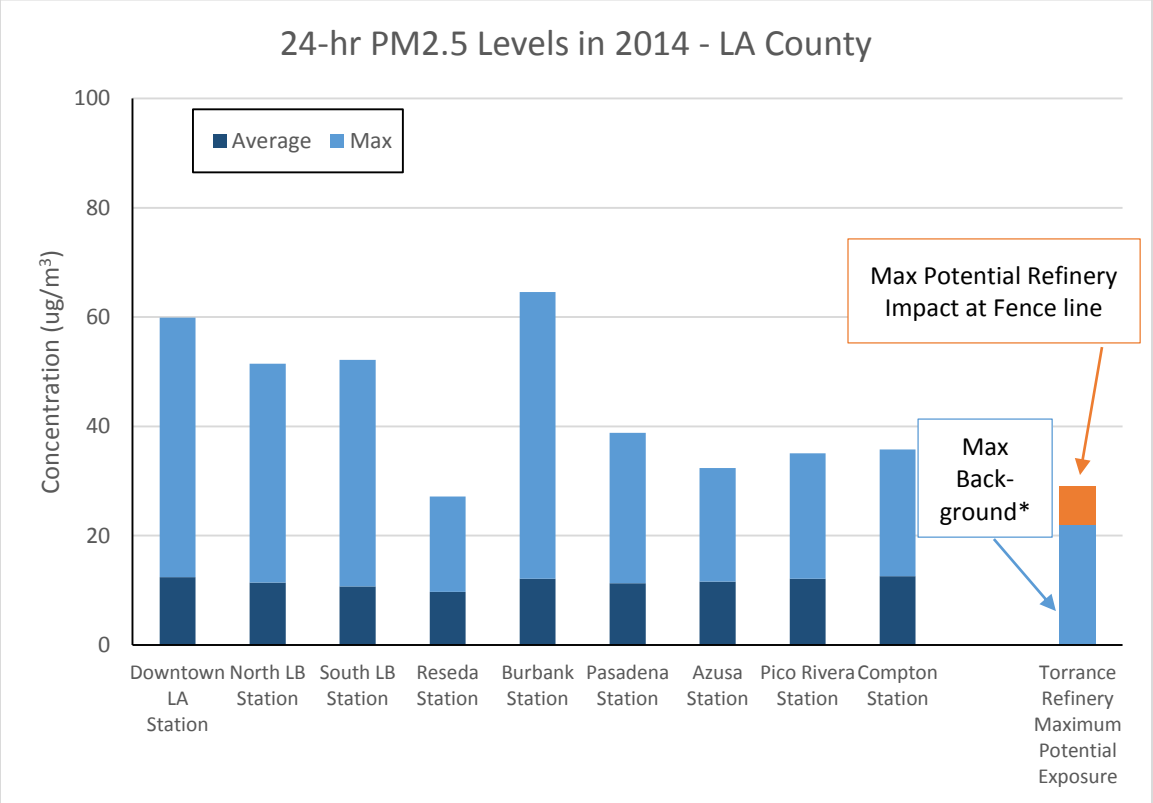
To assess the potential health impacts of particulate matter in the community due to the refinery start-up activity, SCAQMD staff compared the expected particulate matter levels to the National Ambient Air Quality Standards (NAAQS) and the California Ambient Air Quality Standards (CAAQS). These standards are developed by U.S. EPA and the California Air Resources Board for public health protection. In order to estimate worst-case potential impacts from particulate matter during the start-up of the refinery, the maximum "background" monitored concentration over the most recently available five year period at the monitoring stations closest to the refinery location was added to the predicted concentration from refinery start-up activities. Background PM2.5 and PM10 levels are monitored at several locations in our region as a part of the SCAQMD monitoring network. For analysis of the refinery start-up impact, data from SCAQMD's Compton station for PM2.5 and from the LAX station for PM10 were used in the evaluation. Because particulate matter concentrations in the LA Basin follow seasonal patterns (generally higher in the winter and lower during the spring and summer months), background levels during the proposed refinery start-up period were evaluated.

The maximum PM2.5 level recorded over a 24-hour period in either April or May since 2011 was approximately 22 ug/m^3 and the maximum 24-hour PM10 level over the same period was approximately 41 ug/m^3. Average PM2.5 and PM10 concentrations are substantially lower than these maximum concentrations. Refinery start-up activities are expected to contribute a maximum of about 7 ug/m^3 for PM2.5 and 8 ug/m^3 for PM10 at the facility's northern fence line. These increased localized PM levels do not account for the mitigating factors that will reduce PM levels during the start-up (some on a permanent basis), such as additional controls the facility has already placed on some of their equipment or limitations on how some equipment will operate during start-up. Regardless, even without considering these measures that will reduce PM, the modeled levels of PM2.5 and PM10 levels are estimated to be below the air quality standards. These expected particulate matter levels near the refinery including emissions due to the refinery start-up are within the range of concentrations normally observed in Los Angeles County in recent years. The analysis presented here assumes worst-case weather conditions. If weather conditions such as increased turbulence, winds, and/or rain are present during start-up activities, particulate matter concentrations would be lower than the levels described here.



**NAAQS = National Ambient Air Quality Standard, CAAQS=California Ambient Air Quality Standard*





**Max Background shown for refinery exposure is highest level from any day in April or May since 2011*