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Report on Updated Air Monitoring in Paramount Community and Preliminary Assessment of Health Impacts

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Overview

In 2013, the South Coast Air Quality Management District (SCAQMD) received a series of metallic odor complaints from local community members in the Paramount neighborhood. In response to these complaints, the SCAQMD staff began conducting an investigation into local sources of emissions, including initiating a local air sampling study. The purpose of these activities was to determine the source of emissions and potential air pollution control strategies. This report provides a summary of the work that SCAQMD staff has conducted to date in the Paramount area to address the community's odor complaints and concerns about air toxics as well as discuss current findings based on updated air sampling data. In addition, this report describes additional air monitoring efforts underway and current rulemaking efforts.

Background

The initial 2013 odor complaints from community representatives focused on Carlton Forge Works (CFW). Upon further investigation of the Paramount area, SCAQMD staff identified a number of other large metal forging facilities conducting similar activities as CFW in addition to other metal working facilities such as machine shops, metal plating, and metal heat treating. Materials used in these processes include metals such as nickel, titanium, aluminum, and chromium, as well as other metals. In 2013, investigations at CFW combined with monitoring data indicated that metal grinding activities were a source of odors and metal particulate pollution. Based on these findings, SCAQMD staff worked with the facility to implement measures to control the release of metals to the outside air from their grinding activities. The preliminary air sampling data assessment and description of CFW's air pollution control efforts were described in a January 2014 report.

In August 2013, SCAQMD staff began conducting more extensive air monitoring in the Paramount area, with three monitors in the community sampling for metals (see Figure 1). The purpose of this monitoring was to assess exposures to airborne toxic metals in the Paramount community near the metal processing facilities. This report includes an assessment of the data and an analysis of the potential health effects from the air toxics that were measured. In parallel to these monitoring efforts, SCAQMD staff has recently evaluated a health risk

assessment for CFW as part of the AB2588 Air Toxics Hot Spots program and is developing new rules to address emissions from metal grinding activities at all facilities with similar operations in the District. These efforts are also described briefly below.

Air Sampling Update

Since late 2013, ambient air samples of metal particulates have been collected at locations shown on the map below (Figure 1). These monitored levels are useful for evaluating potential offsite exposure to airborne toxic metal particulate pollutants from nearby sources. Sites #1 and #2 identified on Figure 1 are located on Vermont Avenue, and represent exposures immediately downwind of CFW. Site #1 was active from August 2, 2013, but was terminated on October 1, 2013, due to access limitations. Site #2 has been active since 8/8/2013 and is currently collecting ambient air data every third day (1-in-3 day sampling schedule). Site #3, located on California Avenue, has been active since October 31, 2013 and currently collects ambient air data on every sixth day (1-in-6 day sampling schedule), and represents exposures further downwind from CFW and other metal processing facilities. These sampling schedules are consistent with many of the toxics air monitoring programs conducted by SCAQMD. Importantly, ambient air monitors measure metals from all nearby sources, including CFW and other metal processing facilities, as well as regional background emissions. Because Site #1 had limited data, this report focuses on assessing data from Sites #2 and #3, where several years of data are now available. Table 1 summarizes for each of the monitors, the location, duration of monitoring, and sampling schedule.

Table 1
Summary of Ambient Air Monitors

Monitor	Location	Duration of Monitoring	Sampling Schedule
Site #1	Vermont Ave., Between Somerset Blvd and Jefferson Street (North of Site #2)	8/2/2013-10/1/2013	1-in-3 days
Site #2	Vermont Ave. Between Somerset Blvd. and Jefferson Street	8/8/2013-Ongoing	1-in-3 days
Site #3	California Street, Between Somerset Blvd. and Jefferson Street	10/31/2013-Ongoing	1-in-6 days

Concentrations of Metals in the Ambient Air Samples

Analysis conducted by SCAQMD staff shows that the concentrations of many of the air toxic metal pollutants (including cadmium, lead, arsenic and selenium) were below the lowest level detectable by the analysis methods. For those pollutants that could be measured, SCAQMD staff compared the Paramount measurements to those found at the monitoring station that was located closest to the Paramount community (Compton) from SCAQMD's Multiple Air Toxics Exposure Study IV (MATES IV). The MATES IV study provides a regional estimate of the

"background" or expected levels of air toxic pollution in 2012-2013 from 10 locations throughout the region. The purpose of these comparisons is to check whether the levels measured in the Paramount community were relatively consistent with air toxics monitoring data across the region. In this comparison, concentrations of nickel, total chromium, and hexavalent chromium were found to be higher at the Vermont Avenue site (Site #2) compared to MATES IV, and also higher compared to the California Avenue site (Site #3). Manganese levels in 2013 were higher compared to MATES IV, but decreased in subsequent years to levels similar to MATES IV levels. As a result, the following focuses on the air sampling results for nickel, total chromium, and hexavalent chromium.

Nickel

As shown in Figure 2, nickel levels at Site #2 were higher in 2013 and were substantially lower in 2014, 2015, and January through May 2016. These results are likely due to key changes at CFW, which voluntarily implemented controls for their grinding operations, which were identified as a key source of nickel emissions. Specifically, from September 2013 to December 2013, CFW implemented the following: grinding operations were moved so that they occur closer to proper dust collection devices (baghouses), airflow to the dust collection devices was increased by 35% to improve collection efficiency, infrastructure improvements were implemented (e.g., minimizing building gaps and installing plastic strip curtains in doorways), additional housekeeping practices were implemented, and the entire grinding operation was placed in a certified permanent total enclosure (i.e., consistent with EPA Method 204).

The 2014, 2015, and January-May 2016 levels of nickel at Site #2 still remained higher compared to Site #3, consistent with the expectation that levels will be higher in locations closer to likely emissions sources. An assessment of the health impacts of these emissions is detailed below in the Assessment of Potential Health Impacts section. Annual average levels of nickel in 2014 and 2015 at Site #3 were similar to what was measured in MATES IV; in other words, the concentrations of nickel at Site #3 were not higher than what is generally found on average in the Southern California region. Preliminary data from the first 5 months of 2016 show nickel levels at both Sites #2 and #3 are slightly higher than the 2015 levels. The SCAQMD staff is continuing to evaluate the air monitoring data to identify any significant changes occurring over time.

Total Chromium

Total chromium consists primarily of trivalent chromium ("Chrome III") but also includes small amounts of hexavalent chromium ("Chrome VI"). Similar to the trends observed with nickel levels, total chromium levels at Site #2 were higher in 2013, and declined in 2014, 2015, and the first 5 months of 2016 (see Figure 3). Total chromium levels at Site #2 were approximately 2-3 times higher than at Site #3, consistent with expectations that the chromium levels will be higher in locations closer to likely emissions sources in the industrial area, but are more dispersed in residential/commercial locations several blocks away. At Site #3, total chromium levels in the first 5 months of 2016 were slightly higher than in 2015, but very similar to levels in

2014 and 2013. Total chromium levels at both Sites #2 and #3 were higher than what was measured in MATES IV.

Hexavalent Chromium

Because hexavalent chromium is the most toxic form of chromium, it was also assessed separately from total chromium. As seen in Figure 4, the levels of hexavalent chromium at Site #2 did not change much from late 2013 to 2015, but increased during the first 5 months of 2016. At Site #3, hexavalent chromium levels in 2013 were similar to levels at Site #2, but in 2014 and 2015, the levels at Site #3 decreased substantially. However, the levels of hexavalent chromium at Site #3 increased somewhat during the first 5 months of 2016, although they are still lower than the 2013 levels. Hexavalent chromium levels at Sites #2 and #3 were higher than what was measured in MATES IV.

These data suggest that there is likely a local source of hexavalent chromium near Site #2, and SCAQMD staff is continuing to investigate potential sources, including CFW and other nearby metal processing facilities that use chromium. SCAQMD staff is continuing to work toward understanding why the levels of hexavalent chromium at these ambient monitors did not decrease between 2013 and 2015, and also increased in the first 5 months of 2016, despite notable decreases in total chromium and nickel during the same time period. One important part of the effort will involve continued air monitoring in the Paramount community, with an expanded focus on identifying the sources of hexavalent chromium.

Assessment of Potential Health Impacts

Definitions

Health risks from air toxics are typically assessed in three distinct categories: acute (short-term) effects, chronic (long-term) non-cancer effects, and (long-term) cancer risk. Acute effects generally apply to exposures averaged over one hour, while chronic and cancer effects are generally assessed using data averaged over longer periods (e.g., years). Both short-term and long-term effects are evaluated as part of the AB2588 Air Toxics “Hot Spots” program described further below. However, the focus of the current report is on potential long-term health effects, evaluating the long-term non-cancer and cancer risks based on the community monitoring data. Because the monitors measure pollutants from all sources, the risks calculated are interpreted as the health risks from all sources of these air toxics, including nearby sources such as CFW and other metal processing facilities, and regional background levels.

Chronic non-cancer health effects are assessed based on the Reference Exposure Levels (REL’s) established by the California Office of Environmental Health Hazard Assessment (OEHHA). Chronic REL’s are determined such that long-term average exposures at levels below the REL are not expected to result in adverse non-cancer health effects. It should be noted that if a REL is exceeded, that does not mean that health effects will occur, but that the odds of adverse health effects will increase the higher a pollutant concentration is above the REL.

Cancer risk is calculated based on cancer risk factors established by OEHHA. There are no health-based thresholds (e.g. REL's) for carcinogenic compounds; instead, calculated cancer risks are generally compared to regulatory thresholds (e.g., where SCAQMD rules apply) or cancer risk due to background levels of air toxics in the region. The MATES IV study assessed cancer risk due to all sources of air toxics in the region and provides a recent estimate of "background" cancer risk due to air toxics.

In 2015, OEHHA updated the calculation procedure to estimate cancer risks from air toxics exposures. In particular, the updated methodology takes into account recent scientific findings that show higher risks among children from cancer causing compounds than previously considered. Even at the same emissions level, these changes result in risk estimates that are about 2.5 times higher compared to the older methodology, and up to 6 times higher for air toxics that have multiple exposure pathways such as ingestion or skin exposures. All the cancer risk estimates presented below are calculated using the revised 2015 OEHHA methodology.

Assessment of health risks using monitoring data

Hexavalent chromium is a human carcinogen, and the cancer most closely associated with breathing hexavalent chromium is lung cancer. Assuming that the average levels measured at Site #2 persisted for 30 years, the estimated cancer risk is approximately 165 in a million. Estimated cancer risks since 2013 due to hexavalent chromium at Site #3 were lower than at Site #2, approximately 72 in a million. As noted previously, levels of hexavalent chromium detected at these two sites has increased in the first part of 2016. These estimated risks can be interpreted as risks due to hexavalent chromium exposures from all outdoor sources in the nearby area, including CFW and other facilities. Background cancer risk due to hexavalent chromium in the nearby area is approximately 61 per million, based on data from the Compton MATES IV station.

Although high levels of hexavalent chromium can also cause non-cancer health effects, the levels at Sites #2 and #3 have remained below the chronic REL (200 ng/m3). Therefore, these levels of hexavalent chromium are not expected to cause long-term non-cancer health effects.

The chronic REL for nickel is 14 ng/m^3, and the average nickel levels at Site #2 have been slightly above this chronic REL, with the data from the first 5 months of 2016 showing a level of approximately 16 ng/m^3. In other words, breathing these levels of nickel repeatedly for many years may increase the risk of certain non-cancer health effects. Studies conducted among workers exposed to very high levels of nickel have reported respiratory effects, such as asthma, pulmonary fibrosis, and decreased lung function. People with heart disease, asthma or allergy conditions may be more sensitive to the effects of nickel.[1]

Cancer risks due to nickel exposures were approximately 11 in a million at Site #2, and approximately 3 in a million at Site #3. The cancers most closely associated with breathing

[1] Office of Environmental Health Hazard Assessment. (2014). "Appendix D. Individual Acute, 8-Hour, and Chronic Reference Exposure Level Summaries". California Environmental Protection Agency.

nickel dust are lung, nasal and paranasal sinus cancers. Background cancer risk due to nickel in the nearby area is approximately 2.5 per million, based on data from the Compton MATES IV station.

The chronic REL for manganese is 90 ng/m3, and the average manganese levels were well below this level. In other words, these levels of manganese are not expected to cause long-term non-cancer health effects. Manganese is not known to cause cancer.

Metal air toxics were the focus of the monitoring in the Paramount community, consistent with the community complaints and with the emissions from metal processing facilities in the area. Because we did not measure other types of air toxics that were measured in the MATES IV study (e.g. diesel particulate matter and several others), we are not able to present a "total air toxics" risk estimate; this was not the purpose of the monitoring study, nor would it help address the community concerns about the metal emissions. However, as a point of comparison the total air toxics cancer risk found in MATES IV from all sources of emissions in the basin (e.g., cars, trucks, industries, etc.) is approximately 900 chances in a million. Additionally, the overall lifetime risk of cancer from all causes (including age, genetics, diet, health behaviors, and others) is about 400,000 chances in a million.[2]

Development of Proposed New Rule to Control Emissions from Grinding Operations at Forging Facilities

Based on ambient air monitoring efforts in the Paramount community and information gathered from several metal forging facilities related to fugitive emission potentials resulting from grinding operations, SCAQMD staff initiated rulemaking in 2014 by further investigating and researching the forging industry. In order to better understand the forging process and identify emission sources and available controls strategies, rulemaking staff has been gathering information through various activities including:

- Site visits to the forging facilities in the Basin
- Review of existing regulations relating to the forging industry
- Emissions evaluation using SCAQMD permitting and annual emission reporting databases
- Additional sampling (e.g., settling plates, wipe samples) at multiple forging facilities
- Further analysis of ambient air monitoring data in the Paramount community

Based on a review of information and the work at CFW to control emissions from their grinding operations, the SCAQMD staff believes that pollution controls and increased housekeeping are needed to address metal particulate emissions from grinding operations at other forging facilities throughout the Basin. In October 2015, the SCAQMD held the first working group meeting for Proposed Rule 1430.1 – *Control of Toxic Air Contaminants from Grinding Operations at Forging Facilities*. SCAQMD staff presented findings and observations made during site visits and general concepts upon which a proposed new rule may be based (click here for the presentation). Since

[2] http://www.cancer.org/cancer/cancerbasics/lifetime-probability-of-developing-or-dying-from-cancer

the first working group meeting, rule staff has finished conducting site visits to the remaining identified forging facilities in the Basin in addition to reviewing additional ambient air monitoring data near CFW. SCAQMD staff plans to hold the second working group meeting for Proposed Rule 1430.1 in the 3rd quarter of 2016. It should be noted that staff is continuing to investigate and monitor emissions and ambient levels at and near forging facilities and any additional information regarding air quality impacts learned will assist in the rulemaking process.

If you have questions about rulemaking efforts for Proposed Rule 1430.1, please contact Eugene Kang, Program Supervisor at (909) 396-3524.

AB2588 Air Toxics "Hot Spots" Program, and Health Risk Assessment

CFW and hundreds of other facilities in the SCAQMD are subject to the AB 2588 Air Toxics "Hot Spots" Act, and SCAQMD's regulation implementing this law, Rule 1402. Facilities in the AB2588 program must report a comprehensive list of toxic emissions to SCAQMD every four years. In addition, annual emission reports are required pursuant to SCAQMD Rule 301, including a shorter list of toxic compounds. All of the reported data is available online in SCAQMD's FIND database: http://www.aqmd.gov/home/tools/public/find. Based on its 2012 emissions data, CFW was required to conduct a Health Risk Assessment (HRA), which evaluates potential short-term and long-term health effects due to emissions from this facility. Once the HRA is approved by SCAQMD, a public meeting will be held to discuss the results. In addition, the HRA will be made available on the SCAQMD website here: http://www.aqmd.gov/home/regulations/compliance/toxic-hot-spots-ab-2588

Summary and Next Steps

In summary, monitoring of metal contaminants in the Paramount community found higher levels of nickel, total chromium, and hexavalent chromium in the area very close to the industrial areas, but lower levels in the Paramount neighborhoods just a few blocks downwind. Levels of nickel and total chromium at the air monitoring site on Vermont Avenue were higher in 2013, decreased in 2014 and 2015, and then increased slightly in the first 5 months of 2016. Levels of hexavalent chromium at the same air monitoring site remained approximately the same across 2013-2015, but increased in the first 5 months of 2016. All other metals assessed were either too low to be measured, or similar to typical levels seen elsewhere in the region. Levels of nickel, total chromium, and hexavalent chromium in the Paramount neighborhood further downwind from the industrial areas (as measured by the air monitor on California Avenue) were significantly lower than at the Vermont Avenue site, although still slightly higher than typical levels found elsewhere in the region.

If these levels of nickel and hexavalent chromium persisted for many decades, these exposures may increase the chances of cancer, primarily due to hexavalent chromium emissions, and the chances of non-cancer health effects due to nickel (respiratory and immune system effects). SCAQMD staff is continuing to work to identify the local sources of the hexavalent chromium emissions, and what industrial processes are generating these emissions. This information will

be critical in developing solutions to reduce these emissions and their impact on the community.

SCAQMD staff is working to expand its local air toxics monitoring in the Paramount industrial area near CFW, with an expanded focus on identifying hexavalent chromium sources that are contributing to the monitored levels. SCAQMD staff is working on an air monitoring plan with the city of Paramount and has received approval from CFW to place a monitor on their property to evaluate CFW's potential contribution to local hexavalent chromium levels. SCAQMD staff is also developing a new proposed rule to control toxic emissions from metal grinding operations. Finally, SCAQMD staff has scheduled a town hall meeting on August 16, 2016 in the Paramount community to report on all of its activities in the area. The time and location of the meeting are posted on the SCAQMD website.

Additional Figures and Tables

Figure 1. Map of monitoring locations in the Paramount community

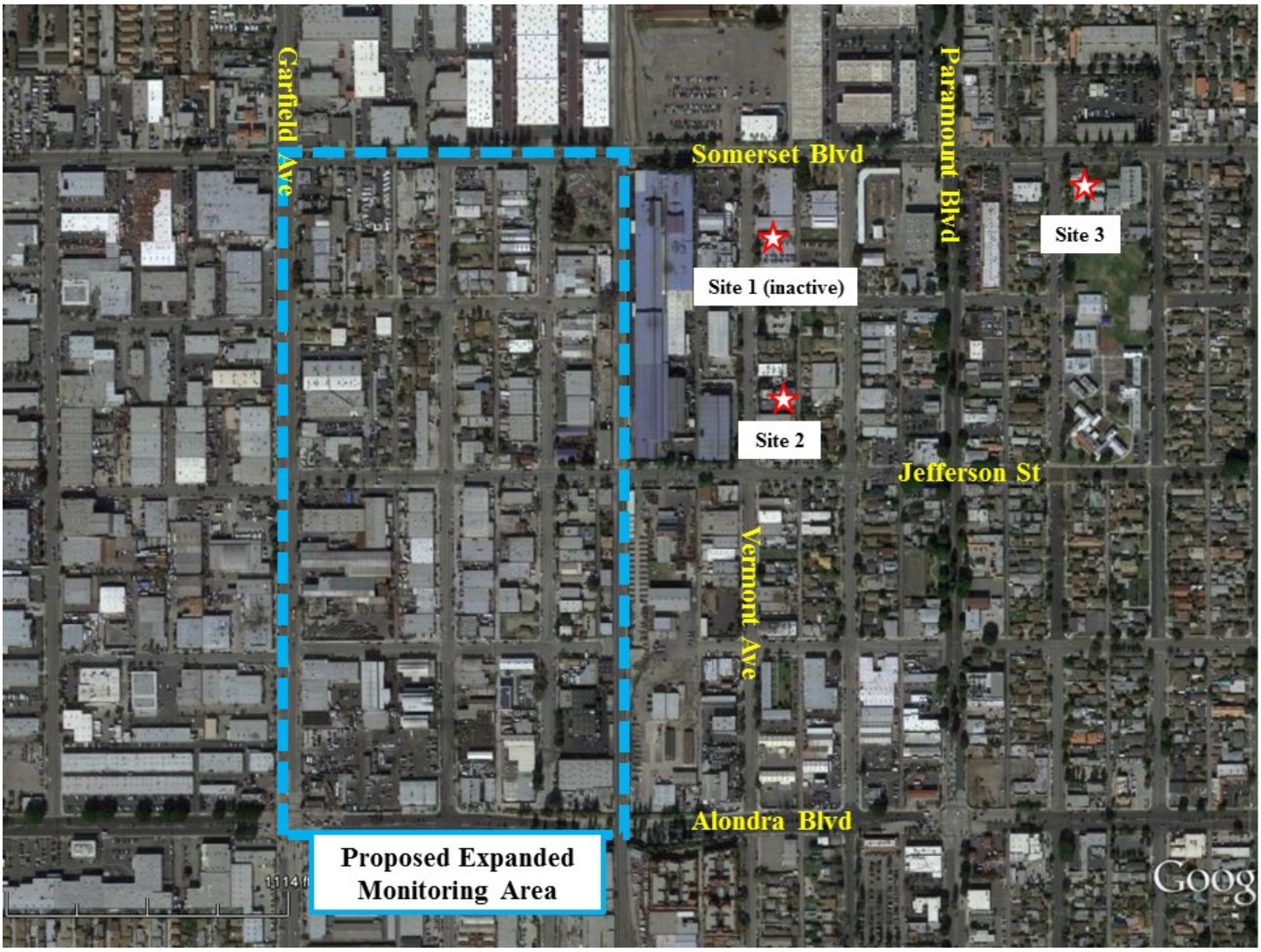
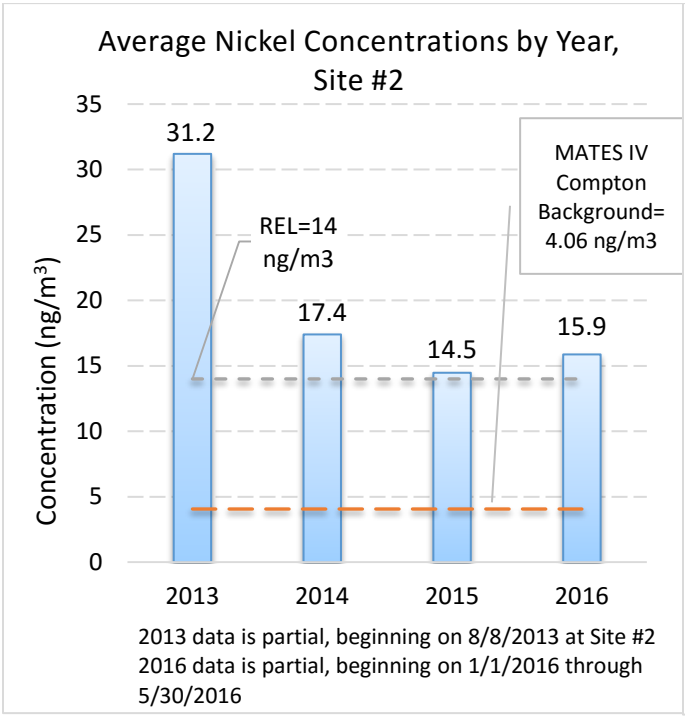


Figure 2. Nickel concentrations at Site #2 and Site #3, compared to MATES IV (Compton) and Chronic Reference Exposure Level



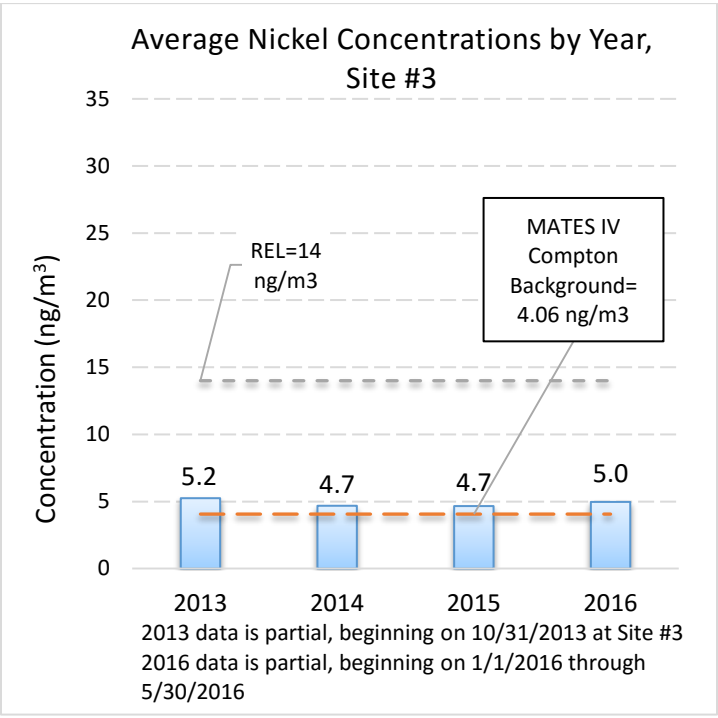
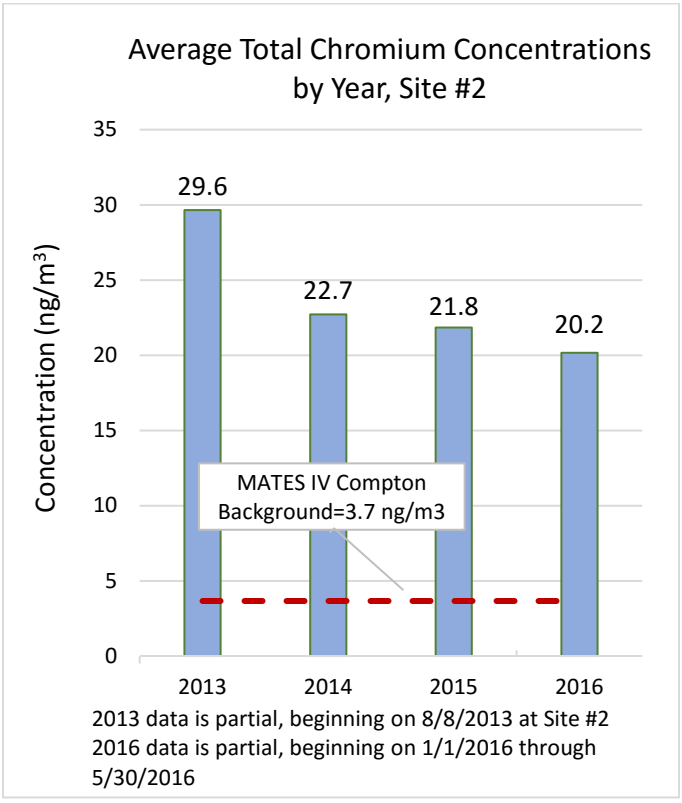


Figure 3. Total chromium concentrations at Site #2 and Site #3, compared to MATES IV (Compton)



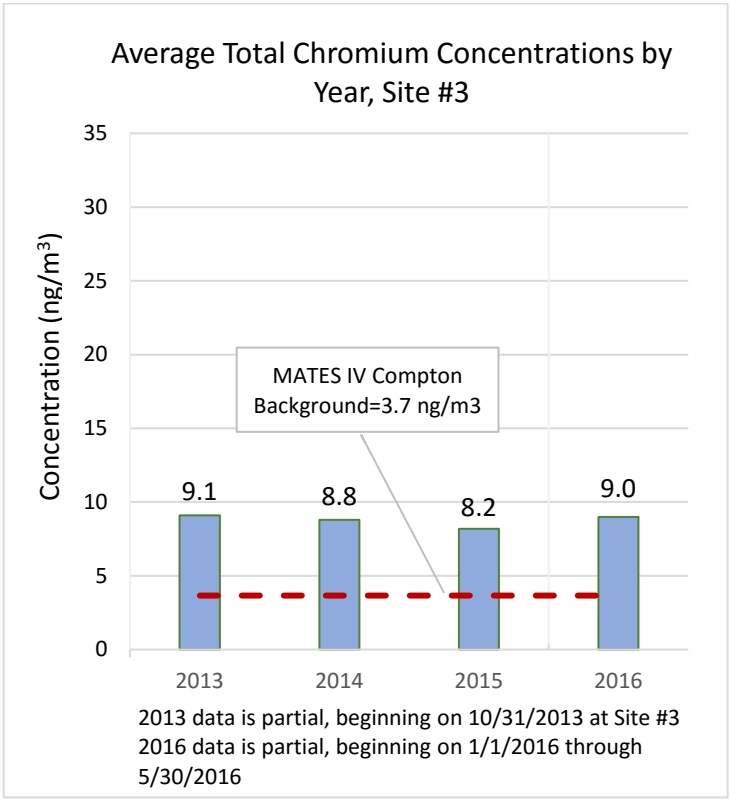
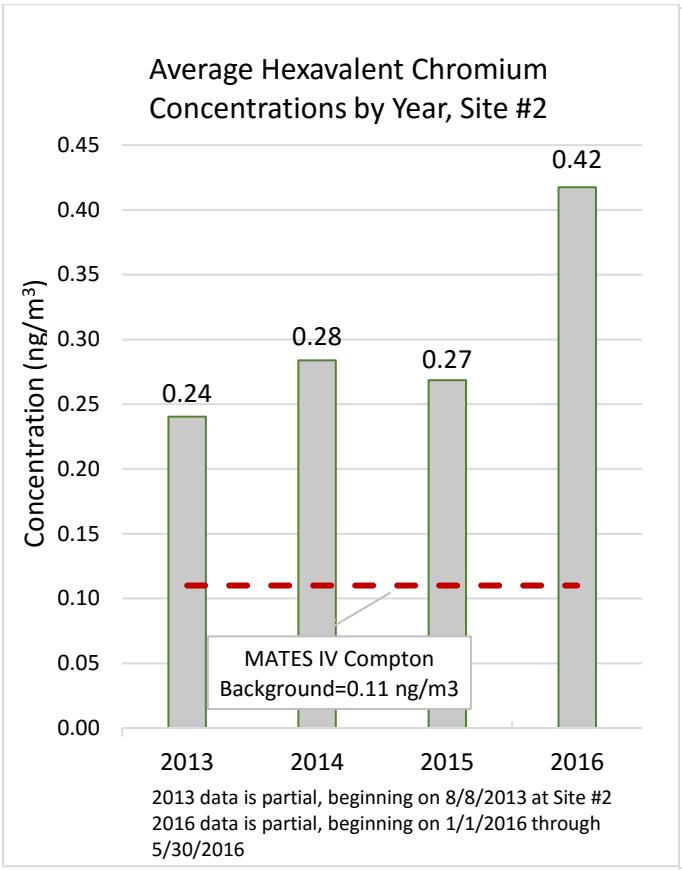


Figure 4. Hexavalent chromium concentrations at Site #2 and Site #3, compared to MATES IV (Compton)



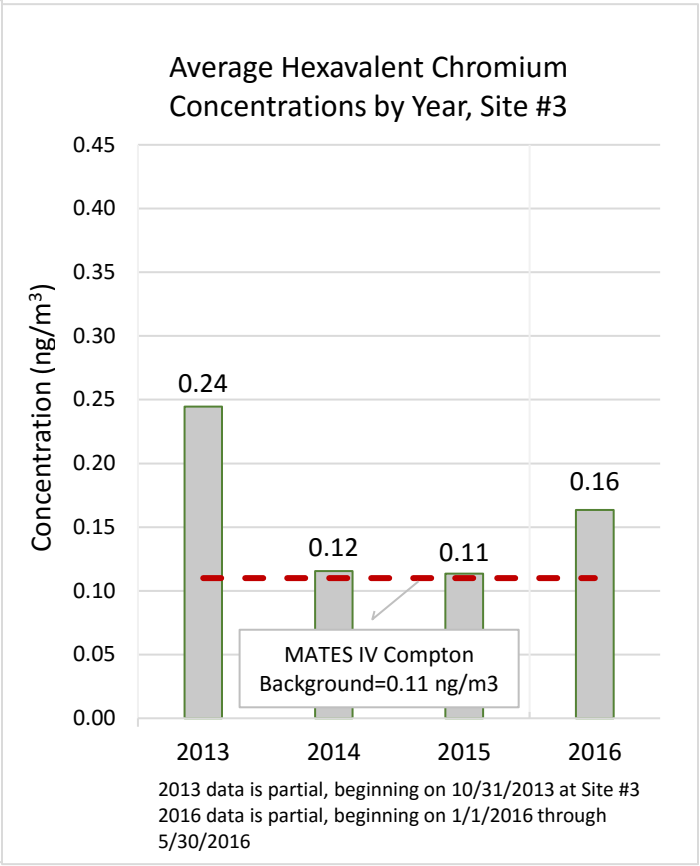


Table 2. Average metal concentrations at Site #2 (Vermont Ave.) and Site #3 (California Ave.)[a]

This table presents metals where OEHHA has an established chronic REL or cancer risk factor. Total chromium is included as a comparison point, but it does not have a chronic REL or cancer risk factor.

Pollutant	MDL	Site #2 (Vermont Ave.)					Site #3 (California Ave.)					Chronic REL	Has OEHHA Cancer Potency Factor	MATES IV Air Basin Average[e]	MATES IV Compton Average[e]
		2013[b]	2014	2015	2016[c]	Site #2 average	2013[b]	2014	2015	2016[c]	Site #3 average				
	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3	ng/m^3	(Y/N)	ng/m^3	ng/m^3
Nickel	4.3	31.2	17.4	14.5	15.9	18.2	5.2	4.7	4.7	5.0	4.8	14	Y	3.8	4.1
Total Chromium	5.4	29.6	22.7	21.8	20.2	23.1	9.1	8.8	8.2	9.0	8.6	-	N	3.8	3.7
Hexavalent Chromium	0.004	0.240	0.284	0.268	0.418	0.292	0.244	0.115	0.113	0.163	0.131	200	Y	0.1	0.1
Arsenic	6.7	Mostly Non-Detect					Mostly Non-Detect					15	Y	0.5	0.5
Cadmium	20	Mostly Non-Detect					Mostly Non-Detect					20	Y	0.2	0.1
Lead	13	Mostly Non-Detect					Mostly Non-Detect					Note (d)	Y	6.2	6.2
Manganese	7.2	35.7	24.2	24.6	24.7	26.1	50.6	25.2	21.8	27.4	26.1	90	N	22.4	18.6
Selenium	12	Mostly Non-Detect					Mostly Non-Detect					20000	N	0.8	0.8

[a] Non-detects (ND) in the monitoring data are replaced by 1/2 of the method detection limit (MDL)

[b] 2013 data is partial, beginning on 8/8/2013 at Site #2 and 10/31/2013 at Site #3

[c] 2016 data is partial, beginning on 1/1/2016 through 5/30/2016

[d] Lead has no Chronic REL, but the National Ambient Air Quality Standard is 150 ng/m3 on a 90-day rolling average

[e] Different laboratory methods were used in the Paramount community monitoring vs MATES IV