

Residential Soil Sampling

Chromium 6 in the City of Paramount



September 5, 2017

Soil Sampling Results

Residential Areas Near Anaplex and Aerocraft Heat Treating

As part of ongoing efforts to control public health risks from industrial emissions of chromium 6 impacting residents in the City of Paramount, the Los Angeles County Department of Public Health (DPH) partnered with the Fire Department Health Hazardous Materials Division (Health Hazmat) and the City of Paramount to assess chromium 6 and other metals in surface soils. In May 2017, DPH selected ten locations in residential areas to sample surface soil downwind of Anaplex Corporation (Anaplex) and Aerocraft Heat Treating (Aerocraft), two facilities identified by the South Coast Air Quality Management District (SCAQMD) as contributing to air emissions of the chromium 6.

Background

Since October 2016, SCAQMD, in partnership with state and local agencies, has been conducting an investigation of chromium 6 emissions from industrial facilities in the City of Paramount, where concentrations of chromium 6 in the air were found to be up to 400 times greater than concentrations elsewhere in Los Angeles County. SCAQMD issued an Order of Abatement to Anaplex and Aerocraft to implement air pollution controls to reduce chromium 6 emissions.

Emissions from industrial facilities could have resulted in deposition of chromium onto nearby soils, possibility representing a hazard to residents. Dust accumulation indoors could contain soil that migrated from the outdoors. Young children are more susceptible to exposures to soil or dust.

Given the proximity of the nearest residential property (300 feet) to the Anaplex and Aerocraft facilities, DPH and Health HazMat initiated surface soil sampling in residential areas adjacent to the Anaplex and Aerocraft facilities.

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In November 2016, Health HazMat collected surface soil samples from public right-of-way areas around several industrial facilities in Paramount, including Anaplex and Aerocraft. Total chromium detected in soils near the Anaplex and Aerocraft facilities ranged from 51 to 4,670 mg/kg, which exceed typical background soil levels in the area of 21 to 64 mg/kg.¹ Preliminary sampling using X-ray fluorescence (XRF) technology showed a sharp decline of total chromium in soil in the closest residential area (300 feet away).

Measurement of total chromium does not tell the full story. Total chromium consists of several forms of chromium found in the environment, including chromium 3 and chromium 6. While chromium 3 naturally occurs and is an essential nutrient for humans, chromium 6 is produced from industrial processes and is a known cause of human cancer. DPH determined that it was necessary to test not only for chromium 6 in soil, but also for other important metals, to examine the extent of metals deposited on nearby soils and their potential public health impacts.

Methods

On May 20, 2017, ten surface soil samples were collected by Health HazMat from public right-of-way areas near residences (see Figure 1). Health HazMat collected the top 1-inch of soil for each sample. Vegetative matter was removed from the surface sample, and soil sampling equipment was decontaminated prior to sampling and in between samples.

At the request of the City of Paramount, split soil samples were collected from each of the ten sampling locations. A split sample means that a sample is divided into two equivalent portions to be analyzed separately, typically by two different laboratories. The soil samples collected for DPH were analyzed by American Environmental Testing Laboratory, Inc. (AETL) in Burbank, California and the split soil samples were delivered to the City of Paramount's contractor, Tetra Tech, for analysis by Eurofins CalScience.

Each soil samples were analyzed for 21 metals: antimony, arsenic, barium, beryllium, cadmium, chromium (total), chromium 6, cobalt, copper, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, tin, titanium, vanadium and zinc (EPA Methods 6020B/7470A, 6010B and 3060A/7199).

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A summary result for each location was determined by selecting the maximum concentration reported from the two split soil samples taken at each of the ten locations. In the case where there were non-detected concentrations for both split samples, the value for the lowest laboratory reporting limit was selected.

In order to assess the potential for health impacts from metals in soil, the summary results for the surface soil sampling were compared to standards established by federal and state agencies, including the *Residential Soil Regional Screening Levels* (U.S. Environmental Protection Agency) and the *California Human Health Screening Levels* (California Environmental Protection Agency).^{2,3} These screening levels are designed to protect the most sensitive populations, including children, from long-term cancer and non-cancer health risks. Additionally, summary results were compared to local background reference levels previously established by soil sampling conducted in the City of Paramount and overseen by the Department of Toxic Substances Control.¹ Note that these background soil samples were collected upwind and away from industrial sources.

Results

For each of the 21 metals, the minimum, maximum, and average concentrations are presented in Table 1, as well as the summary results for the split soil samples taken at each of the ten locations. Four metals were detected at a concentration above state or federal health screening levels, namely, arsenic, cadmium, chromium 6 and lead. Arsenic, cadmium and lead were found to be within typical local background levels. A background reference value was not established for chromium 6, however, because it was not detected in any of the background samples. Since chromium 6 does not occur naturally in soils, any detectable level of chromium 6 would be in excess of background levels. Ten other metals (antimony, beryllium, cobalt, copper, manganese, molybdenum, nickel, titanium, vanadium and zinc) were detected at concentrations above local background levels, but below all available health screening levels.

Out of the ten sampling locations, only one soil sample had a detectable concentration of chromium 6 at 0.4 mg/kg, which exceeds the EPA's Regional Screening Level of 0.3 mg/kg but is below the California Human Health Screening Level of 17.0 mg/kg for residential soil. Summary results for chromium 6 at the other nine locations were either below or estimated to be below the laboratory reporting limit of 0.4 mg/kg.

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Conclusion

Out of ten sampling locations, one surface soil sample detected chromium 6 at a concentration above the EPA Regional Screening Level but below the California Human Health Screening Level. This soil sample was taken at a location that was downwind and closest to one of the metal facilities, Aircraft, at a distance of approximately 300 feet.

The low detection of chromium 6 at the ten soil sampling locations suggest that the majority of air emissions of chromium 6 from Anaplex and Aircraft have either not settled or not persisted on the surface soils of nearby residential areas. In addition, historical deposits of chromium 6 may have converted to chromium 3, the non-toxic form of chromium, by organic matter in the soil environment.⁴ At this time, direct contact with or accidental ingestion of these surface soils would not appear to represent an exposure pathway of public health concern for chromium 6. Inhaling chromium 6 poses the most significant threat to public health, and efforts to reduce health risks should continue to focus on reducing air emissions from facilities emitting chromium 6.

It is important to note that these surface soil samples were limited to a specific area downwind of Anaplex and Aircraft. As the interagency investigation continues, additional soil sampling may be warranted to evaluate soil near other industrial sources of chromium 6 in the City of Paramount.

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1. ToxStrategies, 2015. Summary Results for Soil and Dust Samples Collected in the Vicinity of Carlton Forge Works. Retrieved from http://www.envirostor.dtsc.ca.gov/public/deliverable_documents/5807800114/CFW%20Sampling%20Report%20%202015%20%2003-31.pdf
 2. United States Environmental Protection Agency (USEPA). Regional Screening Levels – Residential Soil Table (June 2017). Retrieved from <https://www.epa.gov/risk/regional-screening-levels-rsl-generic-tables-june-2017>.
 3. California Environmental Protection Agency (Cal/EPA). California Human Health Screening Levels – Residential Soil. Office of Environmental Health Hazard Assessment. Retrieved from <https://oehha.ca.gov/chhsltable>, accessed on June 2017.
 4. Xiao, W., Zhang, Y., Li, T., Chen, B., Wang, H., He, Z., & Yang, X. (2012). Reduction kinetics of hexavalent chromium in soils and its correlation with soil properties. *Journal of Environmental Quality*, 41(5), 1452-8. <http://doi.org/10.2134/jeq2012.0061>

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Figure 1: Locations of surface soil sampling near Aerocraft and Anaplex, Paramount, California.



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Table 1: Summary of 21 metals from surface soil sampling, Paramount, California.

Metals	EPA Screening Level ^a	CA Health Screening Level ^b	Background Level ^c	Min ^d	-	Max ^d	Avg ^e	Spilt Soil Samples (1 – 10) ^f									
								1A/1B	2A/2B	3A/3B	4A/4B	5A/5B	6A/6B	7A/7B	8A/8B	9A/9B	10A/10B
Antimony	31	30	1.04	0.32	-	1.25	0.59	0.52 [^]	1.25 [^]	0.41 [^]	0.60 [^]	0.49 [^]	0.32 [^]	0.47 [^]	0.84 [^]	0.60 [^]	0.45 [^]
Arsenic	0.68 [†]	0.07	5.50	1.74	-	4.16	3.0	3.41	3.51	3.83	2.76	4.16	2.88	2.61	1.74	2.63	2.89
Barium	15,000	5,200	200	87	-	176	130	132	176	139	145	172	103	87	103	118	130
Beryllium	160	16	0.29	0.21	-	0.33	0.27	0.28 [^]	0.33	0.30 [^]	0.24 [^]	0.31 [^]	0.21 [^]	<1.0	<1.0	0.25 [^]	0.27 [^]
Cadmium	71	1.7	4.3	0.32	-	2.26	0.98	2.26	1.09	0.73 [^]	1.22	2.08	0.32 [^]	0.45 [^]	0.41 [^]	0.45 [^]	0.81 [^]
Chromium	120,000	100,000	64	21	-	57	34	49	45	27	30	41	23	21	24	57	23
Chromium 6	0.3 [†]	17	NA [‡]	0.12	-	0.41	0.23	0.41	0.13 [^]	<0.4	<0.4	0.25 [^]	<0.4	0.12 [^]	0.22 [^]	<0.4	0.14 [^]
Cobalt	23	660	12	8	-	22	12	16	15	10	11	10	9	8	11	22	9
Copper	3,100	3,000	140	57	-	151	93	102	85	151	74	80	67	68	138	113	57
Lead	400	80	465	29	-	106	62	35	83	106	74	72	29	31	45	64	79
Manganese	1,800	NA [§]	340	233	-	442	349	354	442	424	327	391	327	262	233	303	423
Mercury	11	18	0.69	0.02	-	0.11	0.06	0.03 [^]	0.04 [^]	0.03 [^]	0.06 [^]	0.09	0.02	0.02 [^]	0.11	0.102 [^]	0.10 [^]
Molybdenum	390	380	6.3	1.6	-	11.1	3.7	4.8	7.0	2.0	2.6	1.7	1.6	1.8	2.8	11.1	1.9
Nickel	1,500	1,600	65	33	-	166	71	132	85	33	48	35	39	51	85	166	36
Selenium	390	380	NA [‡]	0.27	-	0.68	0.44	0.68 [^]	0.59 [^]	0.31 [^]	0.34 [^]	0.56 [^]	<1.0	0.27 [^]	0.44 [^]	<1.0	0.37 [^]
Silver	390	380	NA [‡]	0.26	-	0.80	0.46	<1.0	0.26 [^]	<1.0	0.34 [^]	0.80 [^]	<1.0	<1.0	<1.0	<1.0	<1.0
Thallium	0.78	5	NA [‡]	NA	-	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tin	47,000	NA [§]	NA [‡]	12	-	18	15	14	14	18	16	16	15	12	13	14	14
Titanium	NA [§]	NA [§]	1002	612	-	1040	882	961	836	1020	797	986	1040	878	612	843	845
Vanadium	390	530	33	19	-	36	28	30	31	36	26	31	29	25	19	28	25
Zinc	23,000	23,000	500	186	-	1650	467	399	654	231	524	1650	186	250	260	260	255



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Table 1: Continued

Notes:

- a Regional Screening Levels published by the US EPA for residential soils with target non-cancer risk of 1 in one million²
 - b California Human Health Screening Levels (Residential Soil) published by the Office of Environmental Health Hazard Assessment³
 - c Upper bound background levels calculated by using U.S. EPA's ProUCL software based upon ten background samples collected in 2014¹
 - d Minimum and maximum values take into account detected values and "J-flagged" estimated values
 - e Average takes into account detected values and "J-flagged" estimated values
 - f The highest value for each split sample at the same location is presented
 - ^ Result is a "J-flagged" estimated value that is less than the reporting limit but greater than or equal to the method detection limit
 - † Screening level risk is based on target cancer risk of 1 in one million
 - < Not detected, value below the laboratory reporting limit
 - ‡ Not applicable (NA) because the metal was not detected in enough samples to calculate a background value
 - § Not applicable (NA) because no Regional Screening Level or California Human Health Screening Level was developed for this compound
-  Orange shading indicates result exceeds the health screening level
-  Blue shading indicates result exceeds the background level