Health Consultation

LANE PLATING WORKS, INC. SUPERFUND SITE

DALLAS, DALLAS COUNTY, TEXAS

EPA FACILITY ID: TXN000605240

Prepared by the
Texas Department of State Health Services

JANUARY 23, 2023

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Office of Capacity Development and Applied Prevention Science
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from the Agency for Toxic Substances and Disease Registry (ATSDR) or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. To prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR Toll Free at

1-800-CDC-INFO or

Visit our Home Page at: https://www.atsdr.cdc.gov

The Texas Department of State Health Services (DSHS) prepared this health consultation for the Lane Plating LLC, site, located in Dallas, Dallas County, Texas under a cooperative agreement (program #TS20-2001) with the federal Agency for Toxic Substances and Disease Registry (ATSDR). DSHS evaluated data of known quality using approved methods, policies, and procedures existing at the date of publication. ATSDR reviewed this document and concurs with its findings based on the information presented by DSHS.

HEALTH CONSULTATION

LANE PLATING WORKS, INC. SUPERFUND SITE

DALLAS, DALLAS COUNTY, TEXAS

EPA FACILITY ID: TXN000605240

Prepared By:

Texas Department of State Health Services
Under a Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Office of Capacity Development and Applied Prevention Science
Atlanta, Georgia 30333

Table of Contents

List of Figures

List of Tables

Summary

Introduction

The Lane Plating Works, Inc. is located in Dallas, Dallas County, Texas. In May 2018, the United States Environmental Protection Agency (EPA) added the site to its National Priority List (NPL) because of soil and surface water contamination with metals including hexavalent chromium, lead, and mercury.

Environmental sampling was first conducted by Texas Commission on Environmental Quality (TCEQ) in 2015 in the area surrounding a grinding grit pile and then again in 2016. The sampling results indicated multiple contaminants in the soil surrounding the site facility buildings. Results also indicated evidence of contaminants moving off-site in the surface water runoff.

The Agency for Toxic Substances and Disease Registry (ATSDR) was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the Superfund law. Since 1986, ATSDR has been required by law to conduct a public health assessment at each site on the NPL. The Texas Department of State Health Services (DSHS) has a cooperative agreement with ATSDR to perform public health assessment activities for each site proposed to or listed on the NPL in the state of Texas.

DSHS evaluated available environmental data including groundwater, soil, surface water, and sediment to determine if past, present, and future exposures to chemicals may harm people’s health. This health consultation was developed based on this evaluation. DSHS will review and evaluate additional data as it becomes available.

Conclusions

Based on the available information, DSHS reached eight conclusions in this health consultation.

Conclusion 1

Cadmium and hexavalent chromium were detected in on-site soils within the fence line at levels that could cause harm to people trespassing on-site either in the past (2016 to 2020) or currently.

Basis for Conclusion

DSHS estimated noncancer health effects using health-protective exposure assumptions, including a higher-than-average (reasonable maximum) exposure point concentration of cadmium in soil. Trespassers (children 6 to 11 years) who were exposed to cadmium at least 3 days a week for many years may experience early signs of kidney damage, such as increased urinary levels of protein (proteinuria). Exposure doses for children older than 11 years and adults were less than health guidelines and no harmful health effects are expected for these age groups.

DSHS evaluated the potential for cancer effects following long-term exposure to hexavalent chromium in soil using health-protective site-specific exposure assumptions. Based on a higher-than-average (reasonable maximum) exposure scenario, DSHS concluded that the estimated cancer risks for trespassing adults and children (6 to 11 years) within the fenced area are a health concern. However, there is some uncertainty with the cancer risk estimates because of the assumption of exposure of 3 days per week over many years.

Conclusion 2

It's possible that the site property could be developed as a residential development. Should the site become residential, hypothetical residential exposure to on-site surface soils could harm people's health based on current conditions at some locations on the site.

Basis for Conclusion

To evaluate hypothetical future use of the site property as a residential development, DSHS divided the site into 63 separate quarter-acre size lots and evaluated contaminants detected in surface soils on each lot. Some of these lots were found to contain harmful soil levels of cadmium, hexavalent chromium, mercury, and lead.

- Long-term exposure to cadmium in soil at eight hypothetical lots (lots 18, 24, 30, 31, 37, 38, 39 and 44) could cause kidney damage, such as increased urinary levels of protein (proteinuria), in young children (less than 6 years).

- Long-term exposure to hexavalent chromium in soil in three hypothetical lots (lots 24, 30 and 38) could cause mild cellular changes to the cells lining the intestines and liver inflammation in children (less than 21 years).
- The estimated cancer risks from long-term exposure to hexavalent chromium in soil in 14 hypothetical lots (lots 5, 12, 24, 28, 29, 30, 31, 32, 37, 38, 39, 43, 44 and 45) is a health concern for children and adults. For these lots, DSHS estimated lifetime cancer risk for children and adults to be greater than 1 in 10,000 (1E-4).
- There are 6 hypothetical lots (lots 24, 30, 31, 37, 38 and 44) with high levels of lead in surface soil. Long-term exposure to lead has the potential for elevating blood lead levels of children who may live at or visit these properties.
- Long-term exposure to mercury in soil in three hypothetical lots (lots 30, 44 and 38) could decrease renal function and cause renal histopathological changes in young children (less than 6 years).

Conclusion 3

Exposure to arsenic and hexavalent chromium found in off-site surface soil in a nearby residential area west of Bonnie View Road is not expected to harm people’s health.

Basis for Conclusion

Residents, including adults and children, living in the nearby residential neighborhood west of Bonnie View Road, may have come into contact with low levels of metals, including arsenic and hexavalent chromium, in surface soil through incidental ingestion and skin contact while spending time outdoors. However, the calculated exposure doses for arsenic and hexavalent chromium did not exceed health guidelines and harmful noncancer effects are not expected.

To evaluate the potential for cancer effects, DSHS used health-protective exposure assumptions. When considering a higher-than-average exposure (reasonable maximum), DSHS concluded that the estimated cancer risks for both adults and children are not a heath concern. However, there is uncertainty with this conclusion because of the limited samples collected and the assumption of long-term exposure over several decades.

Conclusion 4

Incidental ingestion or skin contact with surface soil while recreating on the baseball field located south of the site is not expected to harm people's health.

Basis for Conclusion

Nearby residents and visitors, including adults and children (2 years and older), may have come into contact with metals, arsenic, and hexavalent chromium, in the surface soil through incidental ingestion and skin contact while recreating at the baseball field. However, the calculated exposure doses among potential recreational users did not exceed health guidelines and harmful noncancer effects are not expected.

DSHS used health protective site-specific exposure assumptions to evaluate the potential for cancer effects. When considering a higher-than-average (reasonable maximum) exposure scenario, DSHS concluded that the estimated cancer risks to adults and children while recreating on the baseball field are not a health concern. However, there is some uncertainty with the cancer risk estimates because of the limited number of soil samples collected and the assumption of exposure for many years.

Conclusion 5

Incidental ingestion or skin contact with surface soil while recreating in outdoor areas on Barack Obama Male Leadership Academy property and the area located northeast of the site is not expected to harm people's health.

Basis for Conclusion

Nearby residents, students, teachers, and workers, including adults and children (6 years and older), may have come into contact with metals, such as arsenic, hexavalent chromium, lead, and mercury, in the surface soil through incidental ingestion and skin contact while recreating on Barack Obama Male Leadership Academy outdoor areas or the area northeast of the site and adjacent to the academy. However, contaminants (arsenic, mercury, and hexavalent chromium) were not detected on the academy property above health-based screening values. Additionally, calculated exposure doses for hexavalent chromium among potential recreational users of the area northeast of the site did not exceed health guidelines. Lead was detected in soils at background levels. Given the low levels and intermittent exposure to soil, elevated blood lead levels in children are not expected. These results suggest harmful noncancer effects are not expected for adults and children recreating in the area.

DSHS used health-protective site-specific exposure assumptions to evaluate the potential for cancer effects for exposure to hexavalent chromium. When considering a higher-than-average (reasonable maximum) exposure scenario, DSHS concluded that the estimated cancer risks are not a health concern for students, teachers, and workers at Barack Obama Male Leadership Academy from exposure to hexavalent chromium in soil. However, there is some uncertainty with the cancer risk estimates because of the limited number of samples collected and the assumption of exposure for several decades.

Conclusion 6

Swimming in the large pond either in the past (2016-2020) or currently is not expected to harm people's health. Similarly, wading in the creeks surrounding the site either in the past (2016-2020) or currently is not expected to harm people's health.

Basis for Conclusion

Children (6 years and older) and adults may have come into contact with metals in water and sediment through incidental ingestion and dermal absorption while swimming in the large pond or wading in the creeks. However, the calculated exposure doses for contaminants did not exceed health guidelines and harmful noncancer health effects are not expected.

To evaluate the potential for cancer effects associated with arsenic and hexavalent chromium, DSHS used site-specific health-protective exposure assumptions. These assumptions likely overestimated exposure frequency and excess cancer risk given that the terrain is densely vegetated and difficult to access. DSHS calculated higher-than-average (reasonable maximum) exposures to arsenic and hexavalent chromium in surface water and sediment and concluded that the estimated cancer risks are not a health concern for children and adults. However, there is some uncertainty with the cancer risk estimates because of the assumption of exposure for many years.

Conclusion 7

Residential exposure to groundwater from private water wells is not occurring and water from the public water supply is not expected to harm people's health.

Basis for Conclusion

Groundwater is not used a source of drinking water for surrounding communities. There are no known private wells within a one-mile radius of the site (TWDB 2020). Residents near the site get drinking water from the Dallas Public Water Utility public water system (PWS), which is supplied from surface water reservoirs and rivers located at least 13 miles from the facility.

Conclusion 8

DSHS cannot currently conclude whether eating fish from the nearby creeks and the large pond could harm people's health.

Basis for Conclusion

Although EPA has observed fish of edible size, due to the small size of the pond the number of edible fish would be limited. This exposure pathway could not be evaluated because no fish samples were collected.

Next Steps

DSHS recommends that

1. EPA properly plug and abandon all on-site water wells to eliminate the risk of cross-contamination between groundwater aquifers and ensure no future usage.

2. An updated evaluation may be needed if site conditions change as a result of construction to a residential development, so that health recommendations can reflect current site conditions.

3. EPA continue their investigation of the extent of the shallow groundwater contamination and, if needed, ensure appropriate groundwater use restrictions are placed.

4. EPA perform remediation as quickly as possible due to the site being in a flood plain and to prevent the potential spreading of contaminants to offsite areas from flooding.

5. Nearby residents, including children and the transient population, do not go onto the site within the fenced area. The site is currently fenced and has signage to warn people not to trespass.

6. EPA test fish tissue from unnamed and 5A2 creeks and the large pond northeast of the site for possible contamination.

7. EPA collect additional soil samples in the baseball field south of the site to make sure additional surface water runoff from the site has not distributed contamination to the area. To date, only two soil samples have been collected from this area.

8. Some residents living near the site may have non-site related arsenic in their yards. Arsenic is naturally occurring or can be used in products like fertilizers

and pesticides. For yards with elevated arsenic levels, residents can reduce and prevent exposure to arsenic in the soil by

- Removing soil or cover the soil with mulch and/or grass.
- Washing hands regularly after being outside and before eating.
- Taking shoes off at door.
- Regularly wet mopping, wetting dust, and vacuuming with High Efficiency Particulate Air (HEPA) filter vacuum.
- Placing door mats to reduce soil inside and outside the home.
- Not letting children play in bare soil.

9. Lead was detected in on-site soils at levels that may be harmful should the property become residential. Public officials and medical providers are encouraged to raise awareness and make sure community members know how to reduce lead exposures. The following are ways to reduce exposure to lead

- Wash hands and toys often with soap and water. Wash hands before eating, after handing soil, or after playing outside in dirt.
- Take off shoes at the door.
- Change out of dirt covered clothes and wash separately if coming in contact with lead contaminated soil or if working with lead.
- Have home tested for lead-based paint if house was built before 1978 and paint is deteriorating or chipping. If lead-based paint is chipping
    - ◊ Use wet paper towels to clean up lead dust.
    - ◊ Clean around windows, play areas, and floors.
    - ◊ Do not renovate your home until your home has been inspected for lead.
    - ◊ Use a high efficiency particulate air (HEPA) filter vacuum to minimize lead-paint dust inside home.

If you live in a home with copper pipes and fixtures, consider

- Running water for 30 seconds before using water for cooking, drinking, and preparing infant formula.
- Using cold water for cooking, drinking, and preparing infant formula.
- Removing brass and old copper fixtures and plumbing in houses that could contain lead.
- Regularly cleaning faucet strainers to remove lead particles and sediment.

Children ages six months to six years of age should be tested for lead per current DSHS Childhood Lead Poisoning Prevention Program (CLPPP) blood lead screening recommendations. Recommendations include

- Blood lead screenings for all children enrolled in Medicaid/TX Health Steps programs at their 12- and 24-month well child exams and then continued screening until six years of age.
- If a child is not enrolled in Medicaid/TX Health Steps, medical providers should determine if the child is at risk for lead exposure by finding out if they live in a targeted zip code[1],[2].
- If a child does not reside in a targeted zip code, medical providers can identify children who need to be tested for lead exposure by using the DSHS CLPPP's PB 110 Lead Risk Questionnaire[3].
- If parents or guardians ask for testing or there is clinical presentation of lead poisoning, medical providers are encouraged to test blood for lead, preferably using a venous blood sample.
- Women who are pregnant or may become pregnant also consider having their blood lead tested if they believe they have come in contact with lead.
- For more information about ways to prevent lead poisoning please visit the DSHS Texas Childhood Lead Poisoning Prevention Program website for guidance at https://www.dshs.texas.gov/lead/child.shtm.

DSHS will

- Provide the final version of this document to community members, city officials, the TCEQ, the EPA, and other interested parties.
- Continue to work with EPA and TCEQ to evaluate additional data as they become available.

For More Information

For more information about this health consultation, contact the DSHS, Health Assessment and Toxicology Program at 1-888-681-0927.

[1] DSHS targeted zip codes have one or more associated census tract in which: (a) The percentage of children 1-2 years old with a blood lead level ≥ 5 μg/dL is ≥ 3% among those tested in 2016 (Prevalence), or (b) The percentage of residential structures built before 1950 is ≥ 27% (Housing). To determine if a child resides in a targeted zip code see: https://dshs.texas.gov/sites/default/files/lead/pdf_files/child_screening_2019_revised-june-20.pdf

[2] DSHS CLPPP guidance and recommendations are currently based on CDC's blood lead reference level of 5 μg/dL. DSHS CLPPP plans on adopting the new CDC blood lead reference level of 3.5 μg/dL in January 2023. At that time, recommendations may be revised.

[3] https://www.dshs.texas.gov/sites/default/files/pb110.pdf

Purpose and Statement of Issues

This health consultation was prepared for the Lane Plating Inc., Superfund site in accordance with an interagency cooperative agreement between the Agency for Toxic Substances and Disease Registry (ATSDR) and the Texas Department of State Health Services (DSHS). Located in Dallas, Dallas County, Texas, the site was a metal plating facility from 1925 until it was abandoned in 2015.

The Texas Commission on Environmental Quality (TCEQ) and United States Environmental Protection Agency (EPA) conducted an environmental investigation and proposed the Lane Plating Inc., Superfund site to the National Priorities List (NPL) in January 2018. EPA listed the site as final on the NPL on May 17, 2018 (USEPA 2018).

During several environmental investigations conducted in 2016, 2019, and 2020, EPA and TCEQ collected on-site soil and off-site sediment, soil, groundwater, and surface water samples. Off-site samples were collected from facility runoff pathways and nearby creeks and ponds. The samples were analyzed for contaminants such as metals, semi-volatile organic compounds (SVOCs), including per- and polyfluoroalkyl substances (PFAS), and volatile organic compounds (VOCs) (USEPA 2020). DSHS reviewed the environmental data to evaluate potential human exposures to the contaminants and to determine whether the exposures are of public health concern.

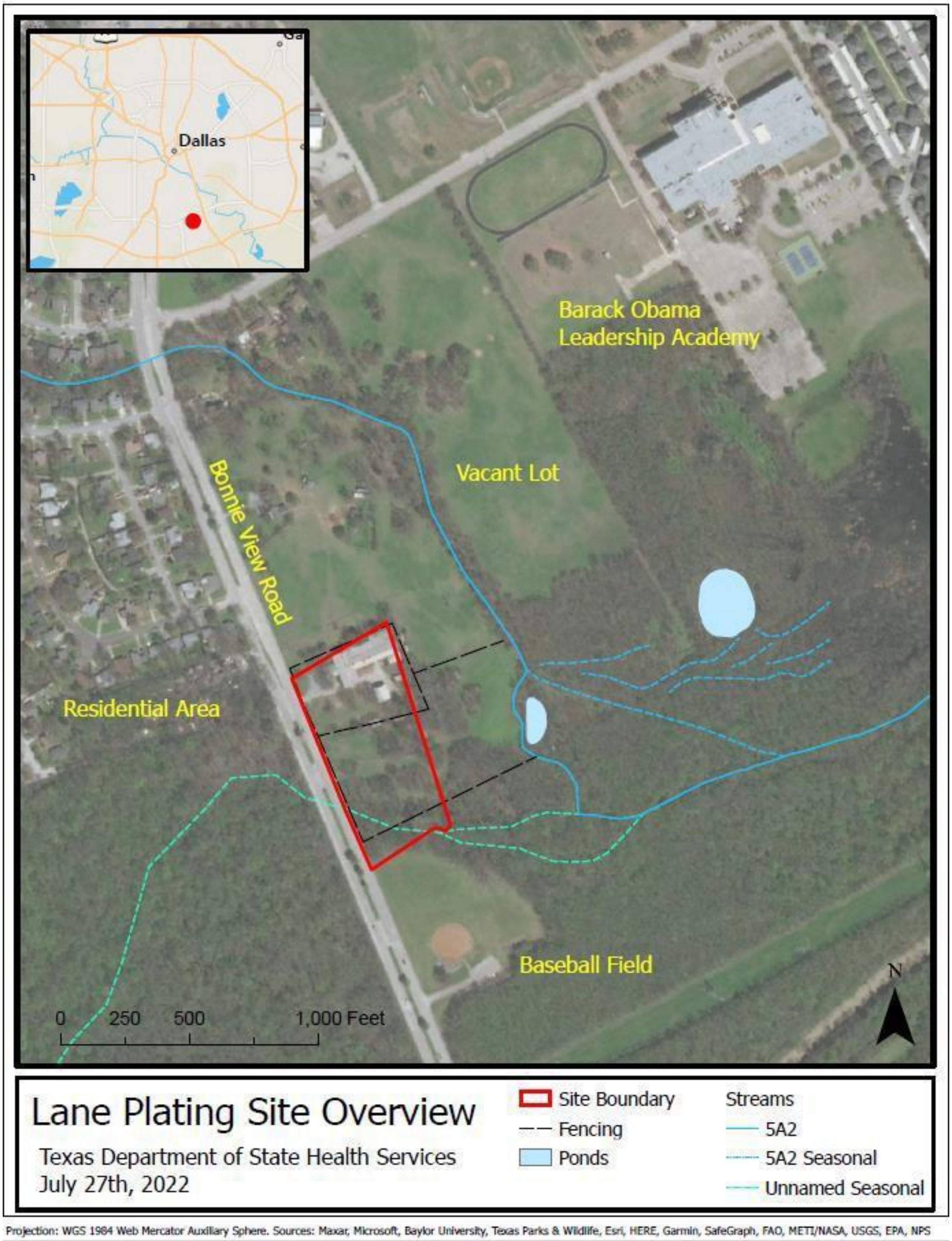
Background

Site Description

The Lane Plating Works, Inc. (the site) is located at 5322 Bonnie View Road, approximately five miles south of downtown Dallas, Texas. The site is a former electroplating shop that primarily performed hard chromium and cadmium plating for about 90 years (1925 to 2015). The site facility consists of 4.6 acres and is surrounded by wooded vegetation. The land use for the site is residential and commercial (USEPA 2020). The closest residence is 300 feet (ft) west of the Bonnie View Road. There is a baseball diamond located approximately 650 ft south of the site (Figure 1).

There is a barbed wire fence and a locked chain-link fence surrounding the site, which limits public access. In 2019, EPA installed a new fence around the western and southern perimeter of the site.

Figure 1. Site features and location of the Lane Plating Works, Inc. Superfund site



Site History

The site was in operation for 90 years (1925 to 2015) primarily as an electroplating facility. Operational processes included chromate dips, chromic acid anodizing, and copper, zinc, nickel, and aluminum plating. Lane Plating, Inc. also used a lead melting pot to repair anodes during the years of operation. Collectively, these procedures created large amounts of hazardous wastes that were at times not properly removed, stored, or labeled. Improper handling and storage of waste led to the multiple inspections and violations from various regulatory agencies including TCEQ, EPA, and Occupational Safety and Health Administration (OSHA) (OSHA 2015).

In 2010, TCEQ conducted an unannounced industrial hazardous waste compliance investigation and identified violations with improper storage of chemicals. In 2011, TCEQ conducted another investigation and identified lead in soil above TCEQ's toxicity characteristic leaching procedure regulatory value. In 2014, OSHA issued multiple citations, including a citation for an indoor air concentration of hexavalent chromium over the 8-hour time-weighted average and for not having proper access to respirators for employees. In late 2015, TCEQ conducted a site investigation to determine if grinding grit had generated metal contaminated dust that could have migrated off-site. A total of 18 surface samples from the southern boundary of the property were collected and evaluated for metals, including chromium, antinomy, cadmium, mercury, arsenic, and lead (TCEQ 2017).

In 2016, EPA performed an emergency removal action at the facility, which included removal and disposal of chromic acid sludge and six containers of cyanide materials. All on-site containers were identified, securely stored, and labeled. On February 24, 2016, EPA and TCEQ conducted a Superfund preliminary assessment. During the investigation groundwater samples from two on-site wells, WW-1, and WW-2, were collected. Contaminants, such as chromium and hexavalent chromium, were detected above EPA Superfund chemical data matrix levels (SCDM) and the maximum contaminant level. Shortly after this investigation, EPA performed a removal assessment phase I and collected 36 composite soil samples (0-6 ft below ground surface; bgs) from the north, south, and east of the facility building. EPA identified several metals in soils, including hexavalent chromium, arsenic, mercury, and lead. In July 2016 TCEQ conducted an EPA-approved site inspection, which included the collection of multiple sediment, soil, and surface waters samples. Metals, including aluminum, copper, iron, lead, and zinc, were detected above EPA SCDM surface water pathway environmental benchmark levels. In September 2016, EPA removed and disposed of containerized chromic acid waste from the main facility building and adjacent shed. Also, in September 2016, EPA conducted a phase II sampling event, which included the collection of a total of 216 on-site soil samples from 64 grids locations at several depth intervals (0-6, 6-16, and 12-18 inches bgs). In October 2016, EPA conducted hazardous material identification and disposed of 153 containers of hazardous materials to an off-site location. To date, all solid and liquid waste have been removed from the site facilities. After the site was listed to the NPL, EPA began the remedial investigation, which was conducted in two phases. EPA collected additional soil, groundwater, surface soil and sediment samples during the remedial investigations from 2019 to 2020 (USEPA 2020). In May 2021 and at the request of community members, EPA sampled residential yards located west of the site and across Bonnie View Road (Figure 1) and soils on the Barack Obama Male Leadership Academy, which is approximately 2,000 feet northeast of the site (USEPA 2021b). Soil samples at both locations were evaluated for metals.

Site Visits

DSHS staff conducted a site visit with TCEQ Superfund section staff and EPA emergency coordinator and remedial projects manager staff on November 13, 2018. DSHS staff inspected the outside of the main building, and the small pond southeast of the site. Conditions were muddy due to recent rain and the small pond had water but not enough for swimming conditions. Staff did not see evidence of any fish.

Demographics

The 2010 United States Census Bureau reported the total population for Dallas County and the City of Dallas as 2,368,139 and 1,197,816, respectively (USCB 2010). The Census Bureau reported 8,164 people residing in 3,515 housing units within a 1-mile radius of the site in 2010. At the time of the census, 1,055 children under the age of six and 1,868 women of child-bearing age (15-44 years old) resided in this area (Figure 2).

Figure 2. Demographic information within 1-mile area of the Lane Plating Works, Inc. Superfund site, Dallas, Texas

EPA FACILITY ID TXN000605240

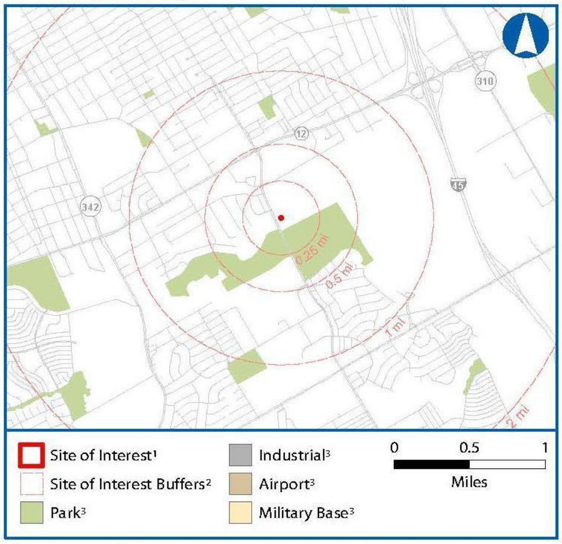
INTRODUCTORY MAP SERIES

Lane Plating Works, Inc.

Dallas, Dallas County, TX

GENERAL SITE PROFILE

Site Vicinity Map



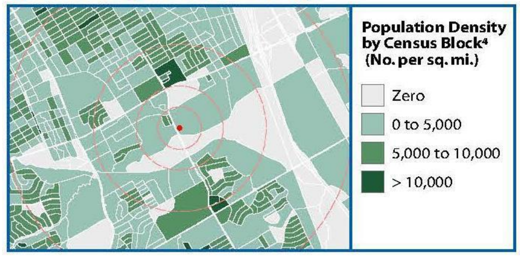
The **General Site Profile Map** depicts the hazardous waste site of interest, along with any airport, industrial, military, or park land uses. It also provides community demographic and housing statistics.

Demographic Statistics[4,5]

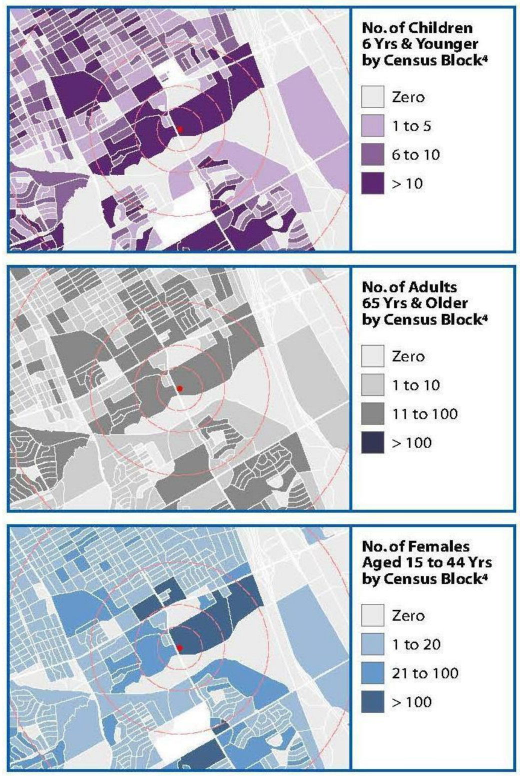
Within 1 Miles buffer of site boundary

Measure	2000	2010	Change
Total Population	8,664	8,164	-5%
White Alone	199	351	+76%
Black Alone	8,115	7,356	-9%
Am. Indian & Alaska Native Alone	13	20	+53%
Asian Alone	6	3	-50%
Native Hawaiian & Other Pacific Islander Alone	4	3	-25%
Some Other Race Alone	281	321	+14%
Two or More Races	47	111	+136%
Hispanic or Latino[6]	444	666	+50%
Children Aged 6 and Younger	1,083	1,055	-2%
Adults Aged 65 and Older	1,005	1,046	+4%
Females Aged 15 to 44	2,067	1,868	-9%
Housing Units	3,559	3,515	-1%
Housing Units Pre 1950	498	396	-20%

General Population Density



Sensitive Populations



Data Sources: [1]ATSDR GRASP Hazardous Waste Site Boundary Database. [2]ATSDR GRASP. [3]TomTom International BV (2012). [4]US Census 2010. **Notes:** [5]Calculated using area-proportion spatial analysis method. [6]Individuals identifying origin as Hispanic or Latino may be of any race.
Projection: Projection used for all map panels is NAD 1983 StatePlane Texas North Central FIPS 4202 Feet.

PRJ 05279 JXA0 5/10/18

GRASP

Agency for Toxic Substances and Disease Registry

Division of Toxicology and Human Health Sciences

ATSDR

FINAL - FOR PUBLIC RELEASE

Land and Natural Resource Use

There are many creeks surrounding the site. Two of the nearest include unnamed creek and 5A2 Creek (Figure 1). The unnamed creek is 500 to 1,000 ft southwest of the site and flows under Bonnie View Road. The 5A2 Creek is about 500 ft northeast of the site and flows south to east. The creeks merge about two miles east of the site and eventually flow into the Trinity River. Runoff from the facility has been observed to flow south towards the 5A2 and unnamed creeks (TCEQ 2017).

Approximately 0.3 miles south of the site is the Five Mile Creek, which discharges to the Trinity River. There is no evidence of contamination in Five Mile Creek nor has surface water overflow from the site to the creek been observed. However, it is possible that Five Mile Creek could flood and reach the site. In the event of such a flooding event, Five Mile Creek could connect to the unnamed and 5A2 creeks (Figure 3) (USEPA 2020).

There is also a small and a large pond approximately 550 ft southwest and 1,200 ft, southeast of the site, respectively.

The City of Dallas owns the land directly east of the site. Across Interstate 45 includes Dallas County Joppa Preserve/Lemmon Lake Park, which is two miles east of the site. The park is a popular preserve for people who fish and contains a section of the merged unnamed and 5A2 creeks before it enters the Trinity River (TCEQ 2017).

In 2010 DSHS issued a fish consumption advisory for the Trinity River for contamination unrelated to site activities. The advisory states that the public should not consume any species of fish from Trinity River water from Clear Forks of the Benbrook Reservoir Dam to US Highway 287 Bridge. The advisory is based on the detection of polychlorinated biphenyls and polychlorinated dibenzofurans and dibenzo-p-dioxins in fish samples collected from the river (DSHS 2010).

As for hydrogeology in the area, the site overlays the Quaternary alluvium and Pleistocene fluviatile terrace deposits and Austin Chalk. Water beneath the site has been detected at 3 to 10 ft bgs. Underlying the Austin Chalk is the 200- to 300-foot-thick Eagle Ford Group, which overlies the deeper Woodbine (700 to 1,000 ft bgs) and Twin Mountain (2,000 to 2,300 ft bgs) aquifers and acts as a confining unit (USEPA 2020).

Discussion

Environmental Data

DSHS evaluated data collected from groundwater, surface water, sediment, and soil. These samples were collected during multiple events including a site inspection by TCEQ in 2016, an EPA emergency removal action in 2016, an EPA remedial investigation phase I in 2019, an EPA phase II investigation in 2020, and an EPA community sampling event in 2021.

Environmental samples were analyzed for VOCs, SVOCs, cyanide, and total metals, including mercury and hexavalent chromium. During remedial investigation activities, EPA also evaluated surface water and groundwater samples, which were collected from monitoring wells, for 13 different types of PFAS.

EPA reviewed all data that were collected by TCEQ and EPA for quality assurance/quality control with regards to data collection, chain of custody, laboratory procedures, and data reporting. Therefore, DSHS assumed adequate quality assurance/quality control procedures were followed.

Groundwater

While monitoring wells were sampled during the sampling events, DSHS did not evaluate these sampling results. These wells are not used for drinking or household water use. There are two private wells located on-site that were used during the years of operation of the facility. However, DSHS is not aware of how these wells were used while the facility was in operation and therefore did not evaluate the on-site well water. Groundwater is not used a source of drinking water for surrounding communities. Residents near the site get drinking water from the Dallas Public Water Utility public water system (PWS), which is supplied from reservoirs and rivers located at least 13 miles from the facility.

Soil and Sediments

There have been multiple soil and sediment samples taken during many sampling events. DSHS evaluated soil samples collected on-site within the fence line and outside the fence line, from the nearby by baseball field, from the residential neighborhood west of Bonnie View Road, from a nearby school, and from an area northeast of site. DSHS also evaluated sediment samples. Sediment samples were collected in the creeks and ponds surrounding the site to determine the extent of contamination.

Surface Water

Surface water samples were collected from a few water bodies surrounding the site, including an unnamed creek, 5A2 Creek, a merged section of the creeks, and a small and a large pond to determine the extent of contamination. DSHS evaluated surface water samples collected from these water bodies.

Process to Evaluate Environmental Contamination

DSHS conducted a three-step process to evaluate the public health implications using available environmental data. First, DSHS conducted an exposure pathway analysis to identify how people may be exposed. Second, DSHS conducted a screening analysis by comparing the sampling data to health-based screening levels. Third, DSHS conducted a more detailed public health evaluation of contaminants of concern identified in the screening analysis (ATSDR 2022).

Exposures Pathway Analysis

An exposure pathway describes how a chemical moves from its source and comes into physical contact with people. Identifying exposure pathways is important in a health consultation because adverse health impacts from contaminants can only happen if people are exposed to contaminants. The presence of a contaminant in the environment does not necessarily mean that people are coming into contact with it. DSHS divided exposure pathways into three categories: completed, potential, and eliminated.

There are five elements considered in the evaluation of exposure pathways. These include

1. A source of contamination.
2. An environmental media that could absorb or transport the contamination.
3. A point of exposure where people could contact the contaminated media.
4. A route of exposure, such as inhalation, ingestion, or dermal contact.
5. An identifiable exposed population.

A completed exposure pathway occurs when all five elements are present, and exposure has occurred, is occurring, or will occur in the future. A potential exposure pathway occurs when one or more of the five elements cannot be identified but may be identified at some point in the future. Eliminated exposure pathways are missing one or more elements and exposure cannot occur.

The exposure pathway analysis identifies the different ways people could be or might have been exposed to the contaminants in soil, sediment, air, groundwater, and surface water in the past, present, and future. DSHS identified the following exposure pathways for people living near or visiting the site based on available environmental data and knowledge of accessibility to contaminated areas.

Completed Exposure Pathways

<u>Past (2016 to 2020), current, and future incidental ingestion and skin contact to contaminated surface water and sediments while wading in the nearby creeks and the small pond for trespassers 6 years and older.</u>

Incidental ingestion of sediment and skin contact from surface and sediment from wading in the creeks east and south of the site and the small pond south of site is a completed exposure pathway (Figure 3). Access by the public to these bodies of water is mostly limited due to dense vegetation; however, DSHS was informed by community members that there are people experiencing unsheltered homelessness that tend to gather near these creeks. The community also expressed concern for children and adolescents playing in the creeks. DSHS did not evaluate swimming in the creeks and small pond because of low water levels.

Past (2016 to 2020), current, and future incidental ingestion of water and skin contact to contaminated surface water while swimming in the large pond for trespassers 6 years and older.

Incidental water ingestion and skin contact to site-related contaminants while swimming in the large pond located northeast of the site is a completed exposure pathway. Public access to this pond is mostly limited due to dense vegetation and the pond being located on private land; however, DSHS was informed by community members that there are trespassers and recreational users who swim in this pond periodically.

Past (2016 to 2020), current, and future incidental soil ingestion and skin contact from on-site contaminated soil for trespassers 6 years and older.

Incidental soil ingestion and skin contact with contaminated on-site soil in areas near the buildings is a completed exposure pathway for trespassers. During outreach with community members and the property owner, DSHS was informed of trespassing occurring at the site. Current and future trespassing are limited due to EPA's installation of a locked fence around the site in 2019.

Past (2016 to 2020), current, and future incidental ingestion of soil and skin contact from off-site contaminated soil near the site for trespassers 6 years and older.

Incidental soil ingestion and skin contact with off-site contaminated soil in areas near the site is a completed exposure pathway for trespassers. This area is outside the boundaries of the chain-link fence and accessible to the public.

Past (2020 to 2021), current, and future incidental ingestion of soil and skin contact from contaminated soil on nearby baseball field for recreational users 2 years and older.

There is a baseball field approximately 650 feet south of the site. Incidental soil ingestion and skin contact with off-site contaminated soil in this area by recreational users is a completed exposure pathway.

Past (2021), current, and future incidental soil ingestion and skin contact from contaminated soil on the Barack Obama Male Leadership Academy property for recreational users 6 years and older.

Incidental soil ingestion and skin contact with off-site contaminated soil in this area by recreational users, such as teenagers who attend the school, is a completed exposure pathway.

Past (2021), current, and future incidental soil ingestion and skin contact from contaminated soil in residential yards to the west of Bonnie View Road for residents of all ages.

Incidental soil ingestion and skin contact from contaminants in soil in residential yards is a completed exposure pathway. Residents may come across contamination in residential yards while participating in outdoor activities, such as gardening.

Past (2020), current, and future incidental soil ingestion and skin contact from contaminated soil in an area northeast of the site for trespassers and recreational users 6 years and older.

Incidental soil ingestion and skin contact of off-site contaminated soil in this area by recreational users and trespassers is a completed exposure pathway. This area is a vacant field that is accessible from a road and adjacent to Barack Obama Male Leadership Academy property.

Potential Exposure Pathways

Hypothetical future incidental soil ingestion and skin contact from contaminated soil for potential usage of the site for residential purposes.

Although the site was used industrially in the past, it is possible it can be used for residential purposes, such as a housing development, in the future. Therefore, if the site contamination is not cleaned up, there is potential for future residents living on the site to come into contact with contaminated soil by incidental ingestion and skin contact while spending time outside.

Past, current, and future ingestion of fish caught from the nearby ponds and creeks.

People may have come in contact with the contaminants while eating fish caught from the nearby ponds and creeks, including the unnamed creek, 5A2 Creek, large pond, small pond, and the merged section of the creeks. Although no fish were analyzed for site-related compounds, some of the contaminants detected in sediment and surface water have the potential to bioaccumulate, and the community has expressed concern for people who eat fish from these water bodies. EPA has documented seeing fish at some of these locations during site investigations. Given the small size of the ponds, the number of fish is limited and frequent fish consumption by people is unlikely. However, this pathway could not be evaluated as part of this health consultation because no fish tissue data are available.

Eliminated Exposure Pathways

Past, current, and future ingestion of contaminated groundwater by nearby residents.

Ingestion of contaminated groundwater by nearby residents is an eliminated exposure pathway. Nearby residents do not use the contaminated groundwater beneath the site for drinking water purposes. Residents near the site get drinking water from the Dallas Public Water Utility public water system (PWS). The groundwater contaminated by the site is not a source of water for the Dallas Public Water Utility PWS. The Dallas Public Water Utility PWS is supplied by surface water from reservoirs and rivers. The closest PWS surface water intakes are located upstream around 13 miles northwest and 16 miles northeast of the site. The nearest intake downstream of the site is over 54 miles south of the site.

There are no known private wells within a one-mile radius of the site (TWDB 2020). Currently, ingestion of water from the on-site wells is an eliminated exposure pathway because

- No one is using these on-site wells.
- The facility is no longer in operation.
- The facility is secured from public access.

DSHS cannot evaluate past exposure to groundwater from on-site wells because there is no information available regarding the past use of the wells.

Past, current, and future inhalation of soil vapors from groundwater contamination in nearby buildings and site facilities.

Inhalation of soil vapors from groundwater contamination in nearby buildings and site facilities is an eliminated exposure pathway. Results from groundwater samples taken from the on-site wells and the monitoring wells did not detect any chemicals likely to volatilize, including metals and PFAS compounds known to volatilize. Based on this information, it is not likely that vapor intrusion is occurring at the site facilities or nearby buildings.

Table 1 Human Exposure Pathway Evaluation

Source	Medium	Point of Exposure	Route of Exposure	Potentially Exposed Population	Time Frame & Type of Exposure Pathway
Site contamination surface water run-off	Sediment and surface water	Creeks surrounding site	Incidental ingestion, dermal contact	Recreational users; Transient users (6 years and older)	Past: complete Current: complete Future: potential
Site contamination surface water run-off	Surface water	Pond northeast of site	Incidental ingestion, dermal contact	Recreational users; Transient users; Trespassers (6 years and older)	Past: complete Current: complete Future: potential
Site contamination from spills and surface water run-off	Surface soil	On-site soils surrounding facility building	Incidental ingestion, dermal contact	Recreational users; Transient users; Trespassers (6 years and older)	Past: complete Current: complete Future: potential Future (hypothetical): potential
Site contamination from spills, releases, and surface water run-off	Surface soil	Off-site soils surrounding the chain linked fence on site property	Incidental ingestion, dermal contact	Trespassers, Future residents (6 years and older)	Past: complete Current: complete Future: potential
Unknown	Surface soil	Off-site soils in an area northeast of site	Incidental ingestion, dermal contact	Trespassers (6 years and older)	Past: complete Current: complete Future: potential
Unknown	Surface soil	Residential soils across Bonnie View Road	Incidental ingestion, dermal contact	Residents living west of Bonnie View Road (all ages)	Past: complete Current: complete Future: potential

Source	Medium	Point of Exposure	Route of Exposure	Potentially Exposed Population	Time Frame & Type of Exposure Pathway
Unknown	Surface soil	Soils at the baseball field south of site	Incidental ingestion, dermal contact	Recreational users (2 years and older)	Past: complete Current: complete Future: potential
Unknown	Surface soil	Soils at the Barack Obama Male Leadership Academy outdoor areas	Incidental ingestion, dermal contact	Recreational users, such as teenagers from the school (6 years and older)	Past: complete Current: eliminated Future: eliminated
Site contamination in shallow groundwater	Soil vapor intrusion	Indoor air	Inhalation	Residents nearby, workers and trespassers onsite (all ages)	Past: potential Current: eliminated Future: eliminated
Site contamination in shallow groundwater	Groundwater	On-site and Off-site Residential Private Water Wells	Incidental ingestion, dermal contact	Residents nearby, workers and trespassers onsite (all ages)	Past: potential Current: eliminated Future: eliminated
Public Water Supply	Residential Drinking Water	Residential Tap	Incidental ingestion, dermal contact	Residents nearby	Past: eliminated Current: eliminated Future: eliminated
Site contamination surface water run-off into ponds and creeks	Food	Fish	Ingestion	Recreational users (6 years and older)	Past: potential Current: potential Future: potential

Screening Analysis

Following identification of completed and potential exposure pathways, DSHS conducted a screening analysis to identify contaminants of concern. The maximum concentration for each contaminant was compared to health-based comparison values published by ATSDR. When comparison values were not available from ATSDR, values from EPA including regional screening levels (RSLs), action levels and health advisory levels, and TCEQ, including protective concentration levels (PCLs), were used (Appendix B). Comparison values (CVs) and other screening criteria are media-specific (e.g., air, soil, and water) levels below which no adverse health effects are expected to occur. It is important to note that if a chemical concentration exceeds a CV, it does not necessarily mean there is a health concern. It means the chemical- and site-specific exposure scenario warrants further public health evaluation based on site-specific exposure conditions. Chemicals without CVs, such as lead, were further analyzed.

Sediment and surface water – creeks and small pond

DSHS evaluated a total of 29 surface water and sediment samples collected from the creeks and small pond (Figure 3) from multiple sampling events. In sediment, hexavalent chromium was detected above the CV (Appendix B Table 22). In surface water, arsenic, cyanide, iron, manganese, sodium, and vanadium were detected above CVs (Appendix B Table 23). Lead was also detected in the sediment.

Sediment and surface water - large pond to the northeast of the site

DSHS evaluated three surface water and three sediment samples collected from the pond northeast of site (Figures 3 and 4). Hexavalent chromium was detected in the sediment and surface water above the CV (Appendix B Tables 24 and 25). Lead was also detected in the sediment.

Soil - nearby baseball field

DSHS evaluated two surface (0 to 0.5 ft bgs) soil samples collected in January 2020 from a baseball field located approximately 650 feet south of the site (Figure 4, Appendix B Table 26). Arsenic and hexavalent chromium were detected above CVs. Lead was also detected in soil.

Figure 3. Surface water sampling locations in creeks (Unnamed Creek and 5A2 Creek) and ponds surrounding the Lane Plating Works Superfund site, Dallas, Texas (USEPA 2020)

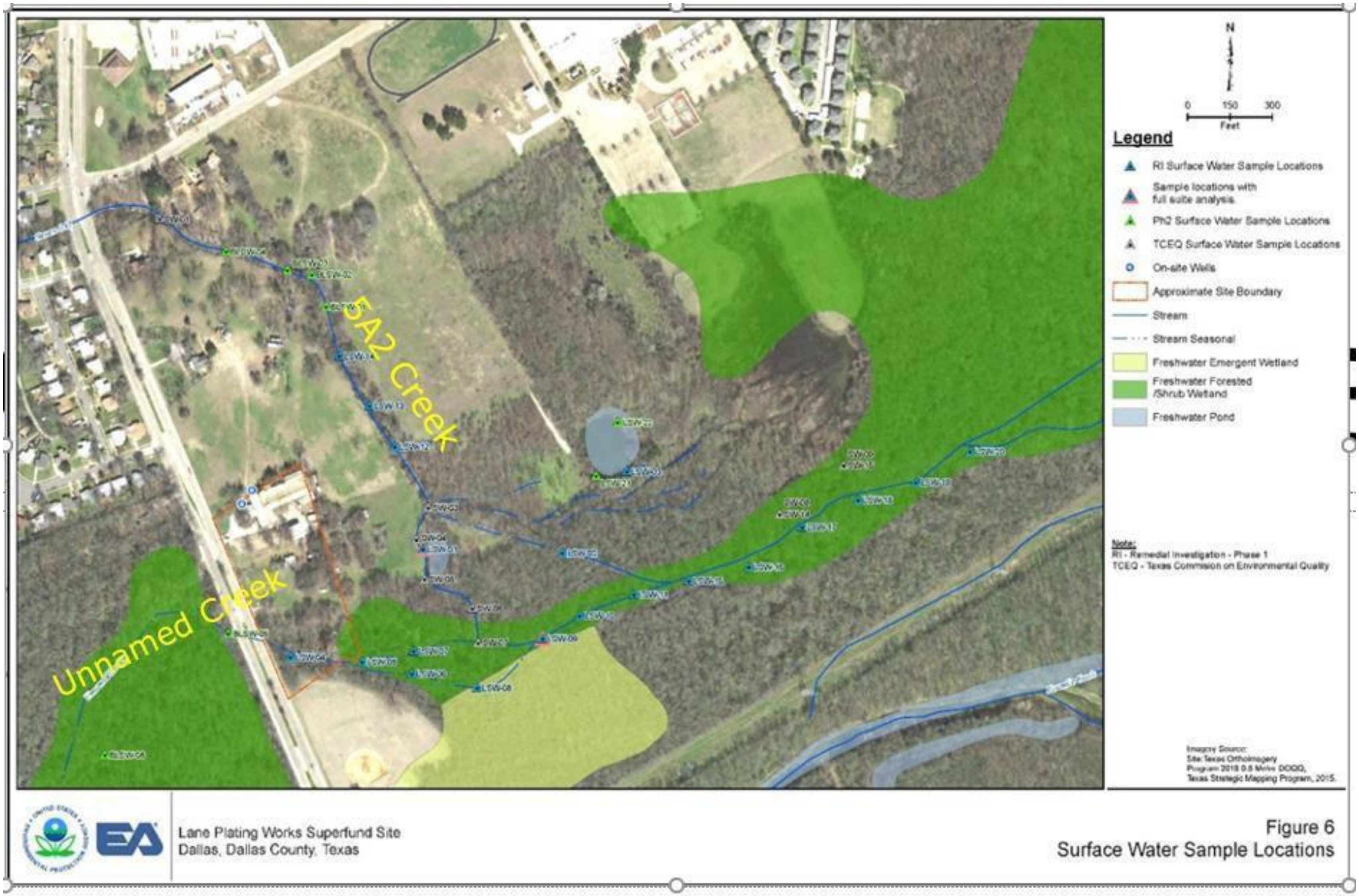
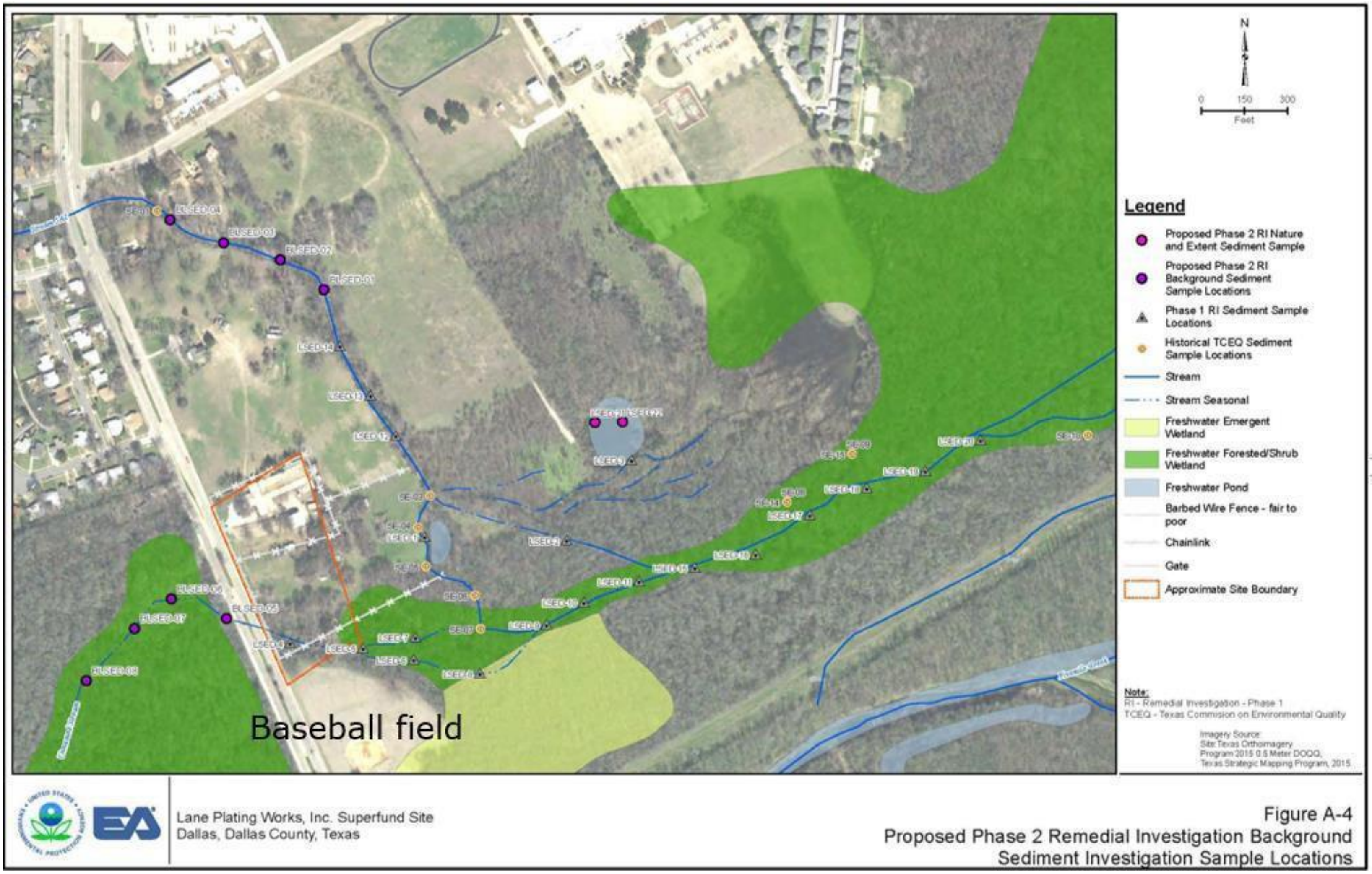


Figure 4. Sampling locations of sediment samples in the creeks and ponds surrounding the Lane Plating Works Superfund site, Dallas, Texas (USEPA 2019)



Soil – on-site

DSHS evaluated on-site soil samples taken at 0 to 3 inches bgs and 0 to 6 inches bgs intervals because these soil intervals represent the likely exposure scenarios of trespassing, recreational usage, and future residential usage (Figure 5). Antimony, cadmium, hexavalent chromium, copper, mercury, and nickel were detected above CVs. Lead was also detected in soil (Appendix B Table 27).

To evaluate hypothetical future usage of the site property as a residential development based on current site conditions, DSHS divided the current parcel of the site's property (about 4.6 acres) and the adjacent contaminated property to the west and north (about 8.3 acres) into 63 individual quarter-acre lots (Figure 5). Contamination identified at each lot from composite and grab samples were evaluated separately (Appendix B Table 28). However, samples (grab or composite) were not collected from each lot.

Soil - off-site and near the site

Trespassers might not only go directly to the facility buildings but may also spend time outside the site perimeter or fence. Therefore, DSHS evaluated 20 off-site grab surface (0 to 6 inches bgs) soil samples collected during various sampling events from 2016 to 2020 (Figure 5). Hexavalent chromium was detected above the CV. Lead was also detected in soil (Appendix B Table 29).

Soil – Barack Obama Male Leadership Academy

DSHS evaluated three surface (0 to 6 inches bgs) soil samples collected in 2021 on the Barack Obama Male Leadership Academy's outdoor property (Figure 7, Appendix B Table 30). Metals were either not detected or detected (arsenic and mercury) but below CVs. Lead was detected.

Soil – northeast of the site

DSHS evaluated eight surface (0 to 6 inches bgs) soil samples collected northeast of the site from a vacant field (Figure 6, Appendix B Table 31). Hexavalent chromium was detected above the CV.

Soil – residential neighborhood

DSHS evaluated a total of nine composite surface (0 to 6 inches bgs) soil samples taken from nine residential yards in the neighborhood located west of Bonnie View Road. Arsenic and hexavalent chromium were detected above CVs (Figure 1, Appendix B Table 32). Lead was detected.

Figure 5. Hypothetical future residential lots at the Lane Plating Works Superfund site, Dallas, Texas

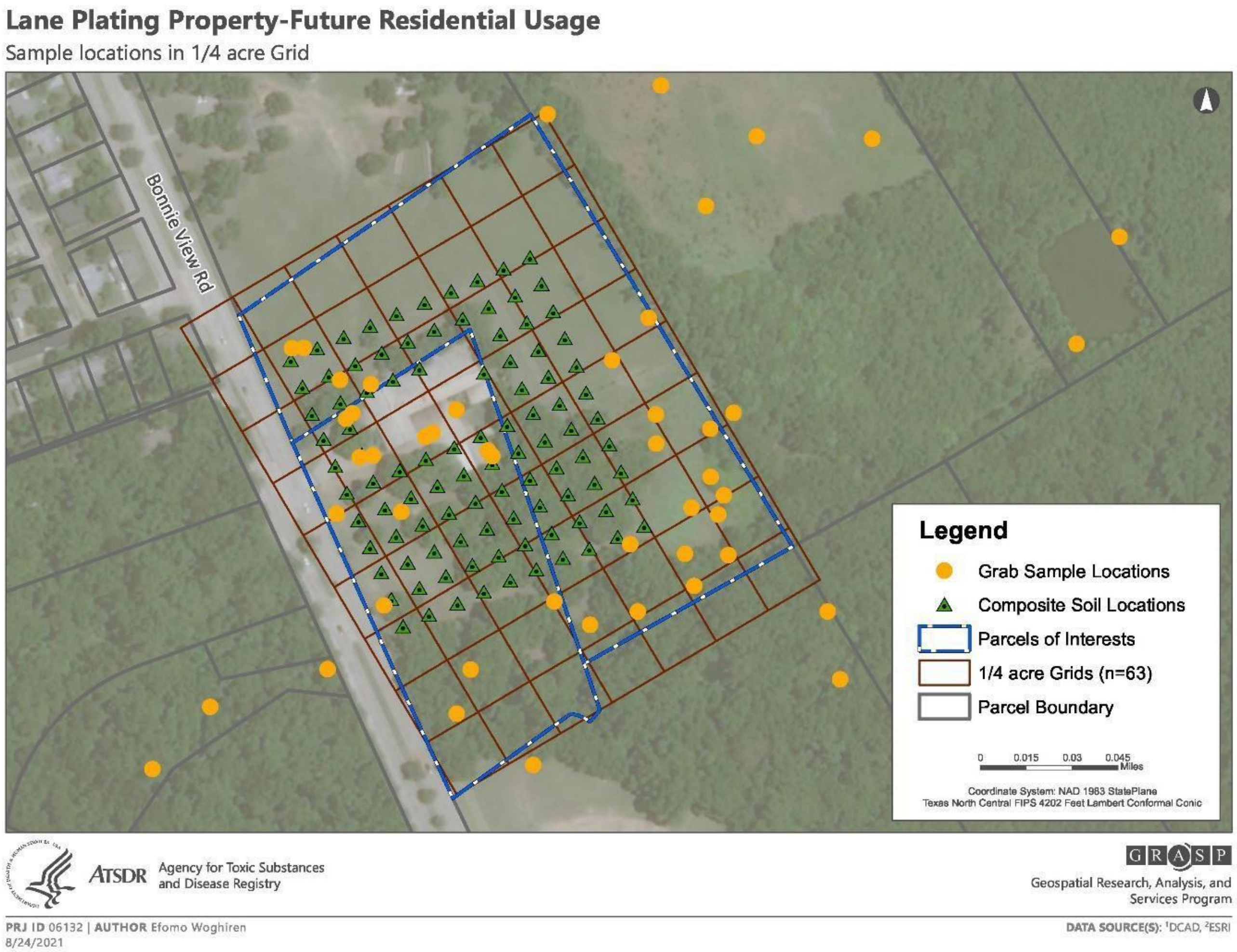


Figure 6. Soil sampling locations on-site and around site at the Lane Plating Works Superfund site, Dallas, Texas (USEPA 2020)

Figure 7. Surface soil sampling locations collected on the Barack Obama Male Leadership Academy property and northeast of the Lane Plating Works Superfund site, Dallas, Texas (USEPA 2021)

Health Effects Evaluations

The selected contaminants of concern were further evaluated by calculating exposure point concentrations (EPCs) and exposure doses based on site-specific exposure conditions. An EPC is an estimate of the concentration of a contaminant at the point of human exposure. DSHS calculated EPCs using EPA's ProUCL® to calculate the 95% Upper Confidence Limit (UCL) of the arithmetic mean as the EPC if more than eight samples were collected. The maximum concentration was used as the EPC if less than eight samples were collected. For lead, DSHS used the average concentration as the EPC if four or more samples were collected and the maximum concentration if less than four samples were collected.

An exposure dose is an estimate of the amount of a contaminant that gets into a person's body over a specific period (ATSDR 2022). DSHS calculated exposure doses and estimated noncancer and cancer risks. No site-specific exposure information was available, so DSHS calculated the exposure doses using health protective exposure assumptions for two exposure scenarios (i.e., typical or Central Tendency Exposure (CTE); and high or Reasonable Maximum Exposure (RME)) as recommended by ATSDR (Appendix D). The RME is referring to individuals who are at the upper end of the exposure distribution (about the 95%). The CTE is referring to individuals who have an average or typical exposure distribution. The equations used to calculate exposure doses and exposure assumptions are in Appendix D.

Noncancer Health Effects

To evaluate noncancer health effects, DSHS compared estimated total exposure doses to appropriate health guidelines, such as ATSDR'S chronic minimal risk level (MRL) and EPA's reference dose (RfD). To facilitate this comparison, the estimated dose was divided by the health-based guideline to calculate a hazard quotient (HQ). HQs greater than one require further evaluation because the health-based guideline for the contaminant has been exceeded, while HQs less than one were no longer evaluated. A health guideline is an estimate of daily exposure to a substance over a specified duration that is unlikely to cause harmful, noncancer health effects in humans. If an estimated exposure dose is below the health guideline, adverse noncancer health effects are not expected to happen. If the calculated exposure dose exceeds the health guideline, additional in-depth evaluation is conducted to determine the likelihood of harmful health effects. This is done by comparing the dose to known noncarcinogenic health effect levels found in the scientific literature and are described in the Public Health Implications section of this document.

To help with this comparison, DSHS calculated the margin of exposure (MOE). The MOE is a measure of how many times lower the exposure dose is when compared to the exposure dose that has been shown to cause noncancer health effects. The higher the MOE, the greater the difference (and margin of protection) between the estimated soil exposure and the human effect level. An MOE equal to one means that the estimated soil exposure is the same as the human health effect level, and an MOE less than one means that the estimated exposure in soil is higher than the exposure that has caused health effects.

Cancer Health Effects

To estimate cancer risk for potential cancer-causing contaminants, the total estimated exposure dose was multiplied by the cancer slope factor (CSF). The cancer risk is an excess lifetime cancer risk, which estimates the proportion of a population that may be affected by a carcinogen during their lifetime (365 days/year for 78 years) (Appendix E). An excess lifetime cancer risk represents the additional risk above the existing background cancer risk. For example, an estimated cancer risk of 2 per million (or 2E-6) potentially represents two excess cancer cases in a population of one million over their lifetime. In the United States, the background cancer risk (or the probability of developing cancer at some point during a person’s lifetime) is about 2 in 5 for men and women (ACS 2020). Note, cancer risk estimates are not a measure of the actual cancer cases in a community; rather, they are a tool used by DSHS for making public health recommendations. A detailed discussion of cancer risk calculations is found in Appendix E.

Past (2016 to 2020), current, and future incidental ingestion and skin contact to contaminated surface water and sediment while wading in nearby creeks and small pond for trespassers 6 years and older

DSHS assessed contact with contaminants in surface water and sediment that would likely occur when wading in the nearby creeks and small pond. To estimate site-specific exposure doses, DSHS considered a scenario in which an adult and a child (6 years and older) wade on average for two hours each day, three times a week. DSHS assumed this would occur for 28 weeks (only included warmer months – April to October) each year for 33 (adult) or 15 years (child).

Noncancer effects

DSHS calculated incidental ingestion and dermal absorption exposure doses for hexavalent chromium in sediment and only calculated dermal absorption exposure doses for arsenic, cyanide, and vanadium in surface water. Estimated exposure doses were well below health guidelines (Table 2). Therefore, harmful noncancer effects while wading in creeks and the small pond near the site are unlikely.

Cancer

DSHS calculated cancer risk for incidental ingestion and dermal absorption exposure to hexavalent chromium in creek sediment and dermal absorption exposure to arsenic in surface water. For hexavalent chromium, DSHS estimated excess lifetime cancer risk to be 1 in 1,000,000 (1E-6) among children and 4 in

10,000,000 (4E-7) among adults (Table 3). For arsenic, DSHS estimated excess lifetime cancer risk to be 7 in 100,000,000 (7E-8) among children and 2 in 10,000,000 (2E-7) among adults (Table 3) and concluded that these estimated cancer risks are not a health concern. Additionally, this is likely an overestimate of excess cancer risk. Given that the off-site terrain is densely vegetated and difficult to access, adults and children are probably exposed less frequently than three times a week for 33 and 15 years, respectively.

Lead and other elements

Lead (maximum level of 120 mg/kg) was detected in creek sediments above area background levels (7.9 mg/kg to 77 mg/kg) (Appendix F, Table 38). Lead levels in the sediment at this level are not expected to result in an elevated blood lead level for children or adults because exposure is intermittent. For more information, see the Public Health Implications Section.

Manganese, sodium, potassium, and iron are all essential minerals that were detected in the surface water. Although these minerals are necessary for good health, ingestion of high levels of an essential mineral can sometimes harm health. However, based on the small amounts of water that might be swallowed while swimming and wading, DSHS does not expect harm from these essential minerals (Table B-24).

Table 2 Total doses and noncancer hazard quotients for chronic exposure to hexavalent chromium in creek and pond sediment and exposure to arsenic, cyanide, and vanadium in creek and pond surface water while wading [1,2]

Contaminant	Exposure Pathway	EPC	Health Guideline (mg/kg/day)	Type of Health Guideline	RME Total Dose (mg/kg/day)	RME Noncancer Hazard Quotient
Hexavalent Chromium	Sediment Ingestion and Dermal Uptake	1.97 mg/kg	0.0009	Chronic Oral MRL	1.7E-6 - 7.2E-6	0.002 - 0.008
Arsenic	Surface Water Dermal Uptake while Wading	5.47 µg/L	0.0003	Chronic MRL	2.1E-7 – 3.0E-7	0.0007 – 0.001
Cyanide	Surface Water Dermal Uptake while Wading	32.9 µg/L	0.00063	Chronic RfD	1.3E-6 - 1.8E-6	0.002 – 0.003
Vanadium[3]	Sediment Ingestion and Dermal Uptake	15.6 µg/L	0.01	Intermediate MRL	4.4E-05 – 6.2E-05	0.004 – 0.006

Abbreviations: mg/kg/day = milligram chemical per kilogram body weight per day;
mg/L = milligram chemical per liter water; µg/L = microgram chemical per liter water;
EPC = exposure point concentration; RME = reasonable maximum exposure;
MRL = minimal risk level; RfD = oral reference dose. All default assumptions were used.

[1] Conservatively assumed child/adult wades in a creek 1 time/day; for 2 hours/event (for surface water); 3 times/week; 28 weeks (warmer months - April to October); 33 years.

[2] Default exposure parameters were used except for including the surface area for adult feet for calculating dermal exposure to sediment.

[3] In absence of a chronic MRL for vanadium, the intermediate MRL was used to calculate chronic exposure.

Table 3 Cancer risk from combined ingestion and dermal exposure to hexavalent chromium (1.97 mg/kg) in sediment and cancer risk from dermal exposure to arsenic (5.47 µg/L) in surface water for trespassers 6 years and older [1,2]

Exposure Group	Arsenic in Surface Water CTE and RME Cancer Risk	Hexavalent Chromium in Sediment CTE Cancer Risk	Hexavalent Chromium in Sediment RME Cancer Risk	Exposure Duration for Cancer (yrs)
6 to < 11 years	-	-	-	5
11 to < 16 years	-	-	-	5
16 to < 21 years	-	-	-	5
Total Child	7E-8	1E-6	1E-6	15
Adult	2E-7	3E-7	4E-7	33

Abbreviations: CTE = central tendency exposure (typical); RME = reasonable maximum exposure (higher); yrs = years; mg/kg = milligrams per kilogram; µg/L = micrograms per liter.

[1] The calculations in this table were generated using ATSDR's PHAST v1.7.1.0. The cancer risks were calculated using the cancer slope factor of 0.5 $(mg/kg/day)^{-1}$ for hexavalent chromium and 1.5 $(mg/kg/day)^{-1}$ for arsenic and age-dependent adjustment factors.

[2] Default exposure parameters were used except for including the surface area for adult feet for calculating dermal exposure to sediment.

Past (2016 to 2020), current, and future incidental soil ingestion and skin contact to contaminated surface water while swimming in the large pond for trespassers 6 years and older.

DSHS assessed exposure to contaminants in surface water and sediment that would likely occur when swimming in the large pond. To estimate site-specific exposure doses, DSHS assumed an adult and a child (6 years and older) swim on average for two hours each day, three times a week. DSHS assumed this would occur for 28 weeks (only included warmer months – April to October) each year for 33 (adult) or 15 years (child). While swimming, DSHS assumed an adult and child would swallow up to 71 milliliters (ml) and 120 ml of water each hour, respectively.

<u>Noncancer effects</u>

DSHS calculated incidental ingestion and dermal absorption exposure doses for hexavalent chromium in sediments and surface water. The calculated exposure doses for hexavalent chromium were below the health guideline and harmful noncancer health effects while swimming in the large pond are unlikely (Table 4) (ATSDR 2012).

<u>Cancer</u>

DSHS calculated cancer risk for incidental and dermal exposure to hexavalent chromium while swimming in the large pond. DSHS found the cancer risk to be less than 1 in 1,000,000 (1E-6) for both children and adults (Tables 4 and 5) and concluded that the cancer risks are not a health concern. While hexavalent chromium is associated with site source releases, concentrations of the contaminant away from the site, such as in the pond, are within the range of background levels (Appendix F, Table 37).

<u>Lead</u>

Lead was detected in sediments of the large pond. The maximum level (31 mg/kg) detected in pond sediment is consistent with background levels (7.9 mg/kg to 77 mg/kg). Given the low levels and intermittent exposure to soil, elevated blood lead levels in children and adults are not expected. For more information, see Public Health Implications Section.

Table 4 Swimming: Site-specific combined ingestion and dermal exposure doses for chronic exposure to hexavalent chromium (0.20 µg/L) in surface water from swimming in the large pond along with noncancer hazard quotients and cancer risk estimates for trespassers 6 years and older[1]

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration for Cancer (yrs)
6 to < 11 years	2.6E-06	0.003	-	2.8E-06	0.003	-	5
11 to < 16 years	2.1E-06	0.002	-	2.3E-06	0.003	-	5
16 to < 21 years	2.0E-06	0.002	-	2.0E-06	0.002	-	5
Total Child	-	-	5E-7	-	-	6E-7	15
Adult	1.8E-06	0.002	4E-7	1.9E-06	0.002	4E-7	33

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years; µg/L = micrograms per liter.

[1] The calculations in this table were generated using ATSDR's PHAST v1.7.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0009 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.5 $(mg/kg/day)^{-1}$ and age-dependent adjustment factors.

Table 5 Wading: Combined ingestion and dermal exposure doses for chronic exposure to hexavalent chromium (0.56 mg/kg) in sediments along with noncancer hazard quotients and cancer risk estimates for trespassers 6 years and older[1]

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration for Cancer (yrs)
6 to < 11 years	1.5E-06	0.002	-	2.1E-06	0.002	-	5
11 to < 16 years	1.1E-06	0.001	-	1.2E-06	0.001	-	5
16 to < 21 years	9.3E-07	0.001	-	1.1E-06	0.001	-	5
Total Child	-	-	3E-7	-	-	4E-7	15
Adult	3.2E-07	0.0004	7E-8	4.3E-07	0.0005	9E-8	33

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; mg/kg = milligram chemical per kilogram soil; RME = reasonable maximum exposure (higher); yrs = years

[1] The calculations in this table were generated using ATSDR's PHAST v1.7.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0009 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.5 $(mg/kg/day)^{-1}$ and age-dependent adjustment factors.

Past (2016 to 2020), current, and future incidental soil ingestion and skin contact from the on-site contaminated soil while trespassing for trespassers 6 years and older.

On-site composite soil samples were collected using a grid sampling method. DSHS calculated the EPC for lead and for contaminants with concentrations above CVs. These contaminants included antinomy, cadmium, copper, hexavalent chromium, mercury, nickel, and thallium.

DSHS assessed incidental ingestion and skin contact from on-site soil contaminants that would likely occur when trespassing on the site. In this scenario, DSHS considered an adult and a child (6 years and older) trespassing on the site, three days a week for 52.14 weeks a year for 33 or 15 years, respectively. Default exposure parameters were used except for the inclusion of surface area for adult feet. This was to consider transient populations that may not wear shoes while trespassing on site.

Noncancer effects

The calculated exposure doses for antimony, copper, chromium, mercury, nickel, and thallium were below health guidelines and harmful noncancer effects while trespassing is unlikely (Table 6). However, the calculated exposure doses for cadmium and hexavalent chromium were above health guidelines (Table 6). Further evaluation of cadmium and hexavalent chromium exposure from trespassing on-site is discussed in the Public Health Implications Section.

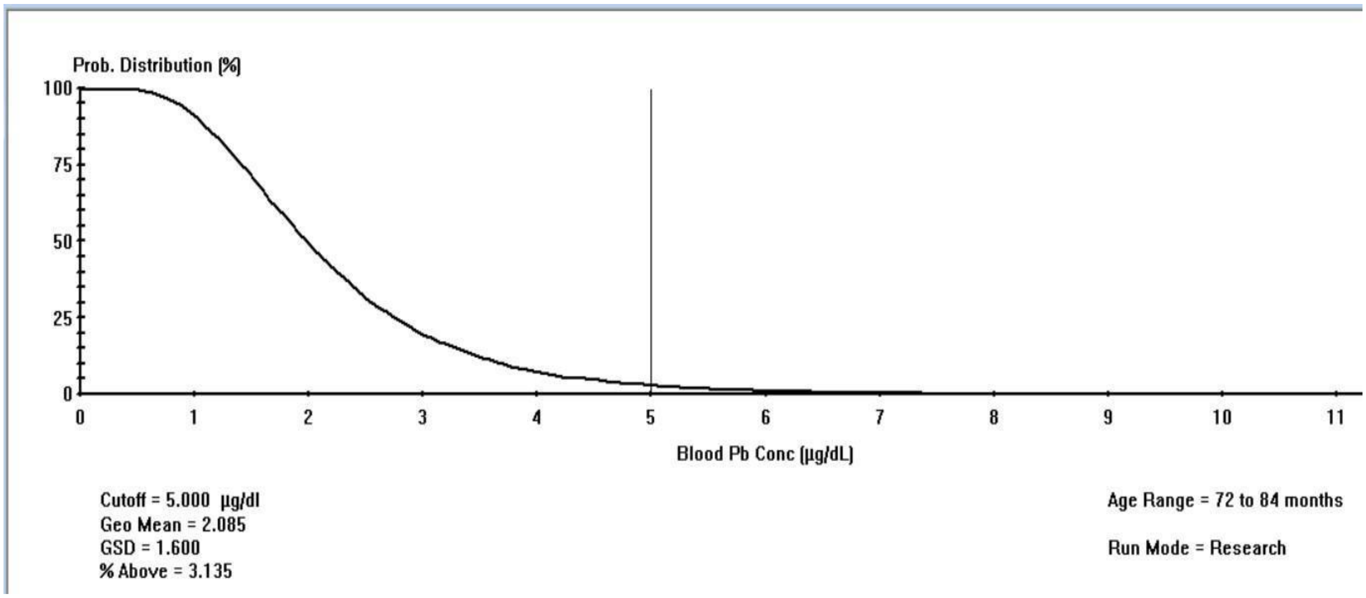
Cancer

Cancer risk from exposure to hexavalent chromium in on-site soil was determined to be greater than 1 in 10,000 (1E-4) cancer risk (Table 7). Further health implications from exposure to hexavalent chromium from trespassing on-site is discussed in the Public Health Implications Section.

Lead

DSHS used EPA's Integrated Exposure Uptake Biokinetic (IEUBK) model (USEPA 2021a) and adjusted the average lead level detected in on-site soil (686 mg/kg) to 294 mg/kg based on three days per week trespassing. DSHS also assumed that the youngest child who would trespass is 6 years old. Based on these assumptions, DSHS estimated that 6-year-old children trespassing on the site would have a geometric mean blood lead level of 2 µg/dL and that a small percentage (about 3 percent) might have a blood lead level above 5.0 µg/dL (Figure 8).[4]

Figure 8. EPA's Integrated Exposure Uptake Biokinetic (IEUBK) modeling results. The figure shows that 6-year-old children have a small risk of exceeding 5.0 µg/dL blood lead level. The geometric mean blood lead level in this population of children would be 2 µg/dL.



[4] In October 2021, CDC updated the blood lead reference value (BLRV) from 5 µg/dL to 3.5 µg/dL. However, lead models are not currently validated for levels below 5 µg/dL. Therefore, ATSDR uses 5 µg/dL in our health evaluations until the updated BLRV of 3.5 µg/dL can be verified by EPA in their models. CDC's BLRV is a screening tool to identify children who have higher levels of lead in their blood compared with most children. The reference value is not health-based and is not a regulatory standard. States independently determine action thresholds based on state laws, regulations, and resource availability.

Table 6 Combined ingestion and dermal exposure doses for chronic exposure to contaminants in on-site soil above comparison values and noncancer hazard quotients for trespassers 6 years and older[1]

Contaminant	EPC (mg/kg)	Health Guideline Value (mg/kg/day)	Type of Health Guideline	RME Dose Range (mg/kg/day)	Hazard Quotient Range
Antimony	2.2	0.0004	Chronic MRL	1.6E-06 – 7.4E-06	0.004 - 0.02
Cadmium	64.3	0.0001	Chronic MRL	4.2E-05 - **0.0002**	0.4 – **2.0**
Hexavalent Chromium	255.8	0.0009	Chronic MRL	0.00042 – **0.0017**	0.5 – **1.9**
Copper[2]	525.8	0.01	Intermediate MRL	0.00031 – 0.0015	0.03 – 0.15
Mercury[2,3]	12.2	1E-05	Intermediate MRL	**1.1E-05 - 5.1E-05**	**1.1 – 5.1**
Nickel	9.87	0.02	Chronic oral RfD	1.2E-05 – 5.2E-05	0.0006 – 0.003
Thallium	0.176	0.00001	EPA chronic oral PPRTV	9.9E-08 – 4.9E-07	0.001 – 0.05

Abbreviations: EPC = exposure point concentration; mg/kg/day = milligram chemical per kilogram body weight per day; mg/kg = milligram chemical per kilogram soil; RME = reasonable maximum exposure (higher); yrs = years; MRL=minimal risk level; RfD = reference dose; PPRTV = provisional peer-reviewed toxicity value

[1] Default exposure parameters were used except for including the surface area for adult feet for calculating dermal exposure to soil.

[2] In absence of a chronic MRL for both copper and mercury, an intermediate MRL was used to evaluate chronic exposure doses.

[3] Mercury was assumed to be inorganic mercury.

Bold values are over the health guideline or hazard quotient is greater than one

Table 7 Trespasser: Site-specific combined ingestion and dermal exposure doses for chronic exposure to hexavalent chromium in soil (255.8 mg/kg) along with cancer risk estimates for trespassers 6 years and older[1,2]

Exposure Group	CTE Dose (mg/kg/day)	CTE Cancer Risk	RME Cancer Risk	Exposure Duration for Cancer (yrs)
6 to < 11 years	0.0013	-	-	5
11 to < 16 years	0.00090	-	-	5
16 to < 21 years	0.00079	-	-	5
Total Child	-	**2E-4**	**3E-4**	15
Adult	0.00032	**7E-5**	**9E-5**	33

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; mg/kg = milligram chemical per kilogram soil; RME = reasonable maximum exposure (higher); yrs = years.
[1]The calculations in this table were generated using ATSDR's PHAST v1.8.0.0. The cancer risks were calculated using the cancer slope factor of 0.5 $(mg/kg/day)^{-1}$ and age-dependent adjustment factors.
[2] Default exposure parameters were used except for including the surface area for adult feet for calculating dermal exposure to soil.
Bold values indicate cancer risk above one in 100,000.

Hypothetical future incidental ingestion and skin contact from contaminated soil for potential usage of the site for residential purposes.

To evaluate hypothetical future residential use of the site property as a residential development, DSHS divided the site into 63 separate quarter-acre residential size lots. DSHS evaluated the soil contamination identified from composite and grab samples at each lot and used the average concentration as the EPC if four or more samples were collected. The maximum concentration was used if less than four samples were collected.

Noncancer effects

The EPCs for antinomy, copper, chromium, nickel, and magnesium were below health guidelines and harmful effects from exposure to these metals is not likely. The calculated exposure doses for cadmium, hexavalent chromium, mercury, and thallium were above health guidelines in 29 hypothetical residential lots (Figures 9 - 11). Further evaluation of exposure to these metals is discussed in the Public Health Implications Section.

Cancer

DSHS also evaluated cancer risk should the site be developed as residences. The estimated increased RME lifetime cancer risk from long-term exposure to hexavalent chromium in soil on the hypothetical residential lots was greater than 1 in 1,000,000 (1E-6) for both children and adults in 38 lots (Table 8, Figures 12 and 13). Further health implications from hexavalent chromium exposure from future residential usage of impacted properties is discussed in the Public Health Implications Section.

Figure 9 Noncancer risk for children from hypothetical future residential exposure to cadmium in soil

Figure 10 Noncancer risk for adults and children from hypothetical future residential exposure to mercury in soil

Figure 11 Noncancer risk for children and adults from hypothetical future residential exposure to hexavalent chromium in soil

Figure 12 Cancer risk for children from hypothetical future residential exposure to hexavalent chromium in soil

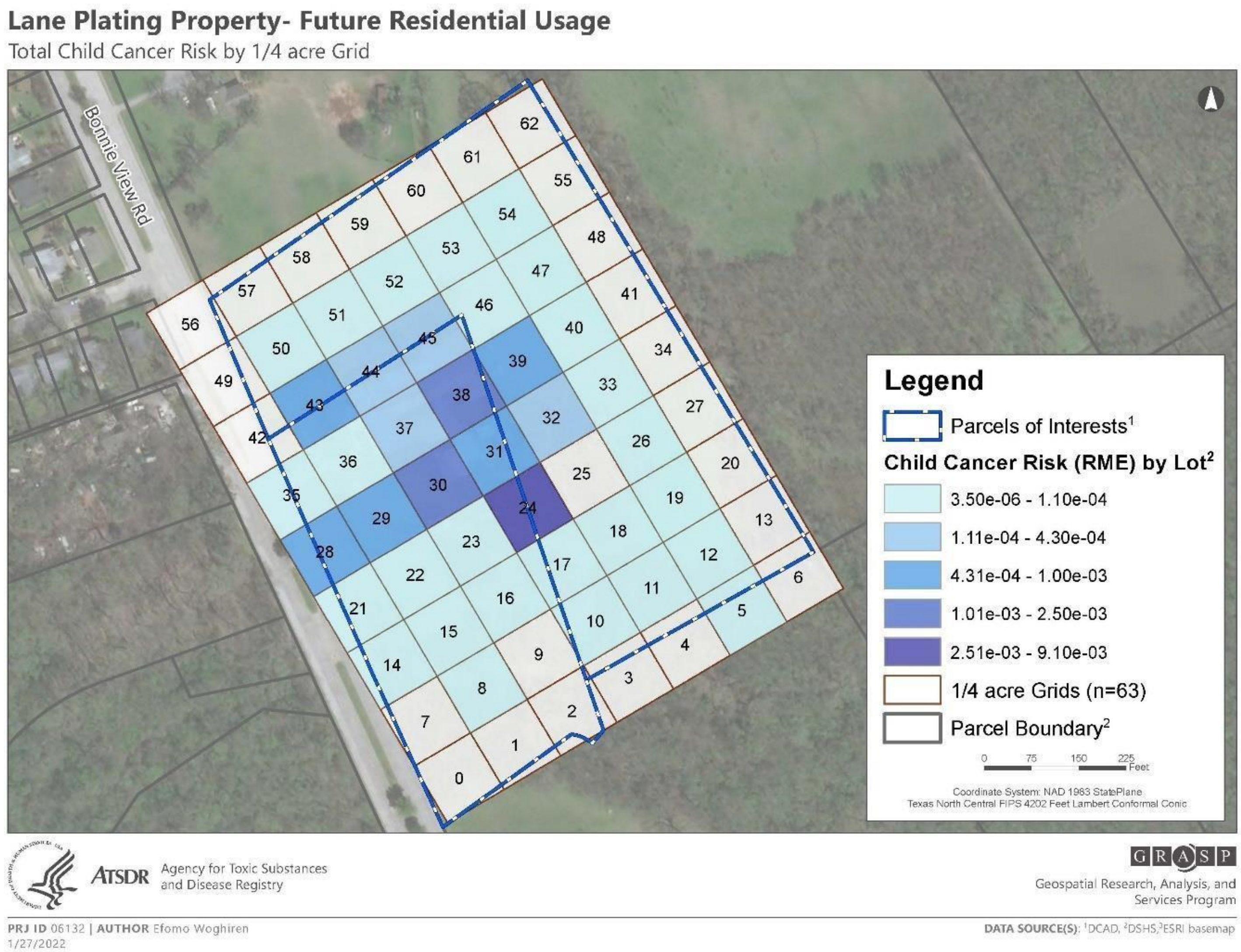


Figure 13 Cancer risk for adults from hypothetical future residential exposure to hexavalent chromium in soil

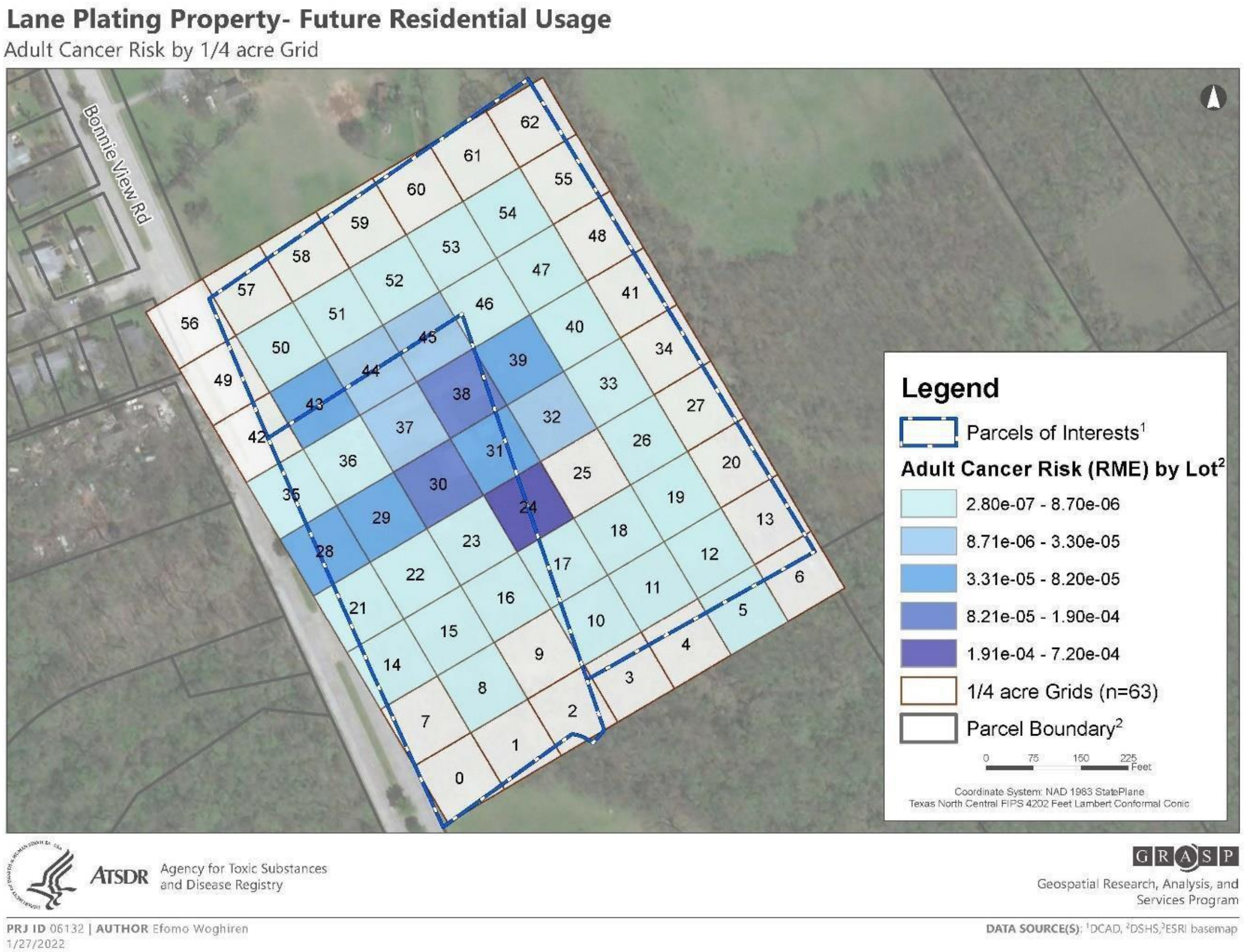


Table 8 Hypothetical residential: RME cancer risk estimates to hexavalent chromium for children and adults in soil at residential lots

Lot Number	RME Cancer Risk Child	RME Cancer Risk Adult
5	**1E-4**	9E-6
8	4E-6	3E-7
10	3E-5	3E-6
11	8E-5	6E-6
12	**1E-4**	9E-6
14	2E-5	2E-6
15	2E-5	2E-6
16	2E-5	2E-6
17	3E-5	2E-6
18	2E-5	2E-6
19	2E-5	2E-6
21	3E-5	3E-6
22	2E-5	1E-6
23	2E-5	2E-6
24	**9E-3**	**7E-4**
26	2E-5	1E-6
28	**1E-3**	8E-5
29	**5E-4**	4E-5
30	**2E-3**	**2E-4**
31	**7E-4**	5E-5
32	**4E-4**	3E-5
33	2E-5	2E-6
35	2E-5	1E-6

Lot Number	RME Cancer Risk Child	RME Cancer Risk Adult
36	4E-5	3E-6
37	**2E-4**	2E-5
38	**3E-3**	**2E-4**
39	**6E-4**	5E-5
40	2E-5	2E-6
43	**6E-4**	5E-5
44	**4E-4**	3E-5
45	**4E-4**	3E-5
46	2E-5	2E-6
47	2E-5	2E-6
50	2E-5	2E-6
51	2E-5	2E-6
52	2E-5	2E-6
53	2E-5	2E-6
54	2E-5	2E-6

Abbreviations: RME = reasonable maximum exposure (higher).
Bold values indicate cancer risk of 1 in 10,000 (1E-4) or greater.

Lead

Lead was detected in 41 lots, however in six lots (lots 24, 30, 31, 37, 38 and 44) the soil EPCs ranged between 213 mg/kg to 2,675 mg/kg; lead at these six lots would be a health concern if residential properties are built on them (Table 9).

Using the IEUBK model (USEPA 2021a) and the EPC, DSHS estimated the blood lead level (geometric mean) of children (birth to 5 years) living at lots 24, 30, 31, 37, 38 and 44 to range from 3.4 µg/dL to 14.7 µg/dL. Based on the estimated distribution, these children have a 21 to 99 percent risk of exceeding a blood lead level of 5.0 µg/dL (Table 9).[5] Further health implications from lead exposure are discussed in the Public Health Implications Section.

Table 9 Hypothetical residential: Concentrations of lead in soil, estimated percent (%) of children exceeding a 5 µg/dL blood lead level, and estimated geometric mean blood lead level should the site become residential[1]

Lot Number	Concentration Range (mg/kg)	EPC / EPC Type	Estimated Probability (%) of Exceeding 5.0 ug/dL	Estimated Geometric Mean Blood Lead Level µg/dL
24	28.8 – 5,400	1,710 / Average	95	10.8
30	17 – 24,500	2,676 / Average	99	14.7
31	21.5 – 2,890	1,032 / Average	81	7.5
37	26.3 - 973	335 / Average	21	3.4
38	854 -1,340	1,340 / Maximum	90	9.1
44	10.8 – 1,250	213 / Average	8	2.6

Abbreviations: mg/kg = milligram chemical per kilogram soil; µg/dL = micrograms per deciliter blood; EPC = exposure point concentration.
[1]The expected precent of children with elevated blood lead levels was determined using a blood lead level of 5.0 µg/dL, an age range of birth to 5 years, and the exposure point concentration for lead in soil at each lot.[6]

[5] In October 2021, CDC updated the blood lead reference value (BLRV) from 5 µg/dL to 3.5 µg/dL. However, lead models are not currently validated for levels below 5 µg/dL. Therefore, ATSDR uses 5 µg/dL in our health evaluations until the updated BLRV of 3.5 µg/dL can be verified by EPA in their models. CDC's BLRV is a screening tool to identify children who have higher levels of lead in their blood compared with most children. The reference value is not health-based and is not a regulatory standard. States independently determine action thresholds based on state laws, regulations, and resource availability.
[6] In October 2021, CDC updated the blood lead reference value (BLRV) from 5 µg/dL to 3.5 µg/dL. However, lead models are not currently validated for levels below 5 µg/dL. Therefore, ATSDR uses 5 µg/dL in our health evaluations until the updated BLRV of 3.5 µg/dL can be verified by EPA in their models. CDC's BLRV is a screening tool to identify children who have higher levels of lead in their blood compared with most children. The reference value is not health-based and is not a regulatory standard. States independently determine action thresholds based on state laws, regulations, and resource availability.

Past (2016 to 2020), current, and future incidental ingestion of soil and skin contact from the off-site contaminated soil near the site for trespassers 6 years and older.

DSHS assessed incidental ingestion and skin contact from off-site soil contaminants that would likely occur when trespassing near the site. DSHS assumed an adult and a child (older than 6 years) trespass near the site one time a day, three times week for 52.14 weeks a year for 33 or 15 years, respectively. DSHS calculated incidental ingestion and dermal absorption exposure doses for hexavalent chromium. Default exposure parameters were used except for the inclusion of surface area for adult feet. This was to consider transient populations that may not wear shoes while trespassing on site.

Noncancer effects

The calculated exposure doses for hexavalent chromium were below the health guideline and noncancer harmful effects are unlikely (Table 10).

Cancer

DSHS determined the RME cancer risk for children to be 1 in 100,000 (1E-5) and for adults to be 2 in 1,000,000 (2E-6) (Table 10). These estimated cancer risks are not of health concern for children and adults.

Lead

Lead was detected in soil near the site. The average level (58 mg/kg) was similar to background levels (7.9 mg/kg - 77.3 mg/kg). Given the low levels and intermittent exposure to soil, elevated blood lead levels in children and adults are not expected. For more information, see Public Health Implications Section.

Past (2020 to 2021), current, and future incidental ingestion and skin contact exposure from contaminated soil on the baseball field while recreating for recreational users 2 years and older.

DSHS assessed incidental ingestion and skin contact from off-site soil contaminants when nearby residents use the baseball field for recreational purposes. DSHS assumed a scenario in which an adult and a child (older than 2 years) recreate on the baseball field three times a week. DSHS assumed this occurred 28 weeks (only included warmer months – April to October) of the year for 33 or 19 years, respectively. DSHS calculated incidental ingestion and dermal absorption exposure doses for hexavalent chromium and arsenic in soil.

Table 10 Combined ingestion and dermal exposure doses for chronic exposure to hexavalent chromium (5.79 mg/kg) in off-site soil near the site along with noncancer hazard quotients and cancer risk estimates [1,2]

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration for Cancer (yrs)
2 to < 6 years	3.8E-05	0.04	-	5.8E-05	0.06	-	4
6 to < 11 years	2.9E-05	0.03	-	4.0E-05	0.04	-	5
11 to < 16 years	2.0E-05	0.02	-	2.3E-05	0.03	-	5
16 to < 21 years	1.8E-05	0.02	-	2.0E-05	0.02	-	5
Total Child	-	-	8E-6	-	-	1E-5	19
Adult	7.3E-06	0.008	2E-6	9.5E-06	0.01	2E-6	33

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years

[1]Default exposure parameters were used except for including the surface area for adult feet for calculating dermal exposure to soil.

[2]The calculations in this table were generated using ATSDR's PHAST v1.7.0.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0009 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.5 $(mg/kg/day)^{-1}$ and age-dependent adjustment factor.

Cancer effects

The calculated exposure doses for hexavalent chromium and arsenic were below corresponding health guidelines and harmful effects are not expected (Tables 11 and 12).

Cancer

DSHS determined the arsenic cancer risk for children to be 6 in 1,000,000 (6E-6) and adults to be 3 in 1,000,000 (3E-6) (Table 11). These estimated cancer risks are not of health concern for children and adults.

DSHS determined the hexavalent chromium cancer risk for children to be 5 in 10,000,000 (5E-7) and adults to be 7 in 100,000,000 (7E-8) (Table 12). These estimated cancer risks are not a health concern. There is uncertainty with this estimate because of the limited number of samples collected and the assumption of long-term exposure.

Lead

Lead was detected in soil at the baseball field. The maximum level (24.9 mg/kg) was similar to background levels (7.9 mg/kg - 77.3 mg/kg). Given the low levels and intermittent exposure to soil, elevated blood lead levels in children and adults are not expected. For more information, see the Public Health Implications Section.

Noncancer effects

The calculated exposure doses for hexavalent chromium were below health guidelines and noncancer harmful effects are not expected (Tables 13 and 14). For arsenic, the estimated exposure doses exceed the health guideline. These results are further discussed in the Public Health Implications Section.

Cancer

DSHS determined the arsenic cancer risk for children and adults to be 7 in 100,000 (7E-5) and 2 in 100,000 (2E-5), respectively (Table 13). These estimated cancer risks are not of health concern for children and adults.

DSHS determined the hexavalent chromium cancer risk for children to be 2 in 100,000 (2E-5) and adults to be 2 in 1,000,000 (2E-6) (Table 14). These estimated cancer risks are not of health concern for children and adults.

However, there is uncertainty to these cancer risk estimates because of limited sampling and the assumption of long-term exposure.

Table 11 Exposure to arsenic (19.1 mg/kg) in soil along with noncancer hazard quotients and cancer risk estimates for baseball field south of site[1]

Exposure Group (yrs)	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration for Cancer (yrs)
2 to < 6 years	1.3E-05	0.04	-	3.4E-05	0.1	-	4
6 to < 11 years	8.1E-06	0.03	-	2.0E-05	0.07	-	5
11 to < 16 years	3.9E-06	0.01	-	7.2E-06	0.02	-	5
16 to < 21 years	3.3E-06	0.01	-	5.9E-06	0.02	-	5
Total Child	-	-	3E-6	-	-	6E-6	19
Adult	1.7E-06	0.006	1E-6	4.0E-06	0.01	3E-6	33

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years

[1]The calculations in this table were generated using ATSDR's PHAST v1.6.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0003 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 1.5 $(mg/kg/day)^{-1}$.

Table 12 Combined ingestion and dermal exposure doses for chronic exposure to hexavalent chromium (0.45 mg/kg) in soil along with noncancer hazard quotients and cancer risk estimates* for the baseball field south of the site[1]

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration for Cancer (yrs)
2 to < 6 years	1.6E-06	0.002	-	2.4E-06	0.003	-	4
6 to < 11 years	1.2E-06	0.001	-	1.6E-06	0.002	-	5
11 to < 16 years	8.5E-07	0.0009	-	9.8E-07	0.001	-	5
16 to < 21 years	7.5E-07	0.0008	-	8.5E-07	0.0009	-	5
Total Child	-	-	3E-7	-	-	5E-7	19
Adult	2.6E-07	0.0003	5E-8	3.5E-07	0.0004	7E-8	33

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years

[1] The calculations in this table were generated using ATSDR's PHAST v1.6.1.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0009 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.5 $(mg/kg/day)^{-1}$ and age-dependent adjustment factors.

Lead

Lead was detected in soil at all residential yards. The maximum level (59 mg/kg) was similar to background levels (7.9 mg/kg - 77.3 mg/kg). Exposure to these levels is not likely to result in an elevated blood lead level for children or adults. For more information, see the Public Health Implications Section

Table 13 Combined ingestion and dermal exposure doses for chronic exposure to arsenic (37 mg/kg) in soil along with noncancer hazard quotients and cancer risk estimates[1]

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration for Cancer (yrs)	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration for Cancer (yrs)
Birth to < 1 year	0.00021	0.7	-	1	0.00048	**1.6**	-	1
1 to < 2 years	0.00022	0.7	-	1	0.00043	**1.4**	-	1
2 to < 6 years	0.00011	0.4	-	4	0.00029	1.0	-	4
6 to < 11 years	6.9E-05	0.2	-	5	0.00017	0.6	-	5
11 to < 16 years	3.3E-05	0.1	-	1	6.0E-05	0.2	-	5
16 to < 21 years	2.8E-05	0.09	-	0	5.0E-05	0.2	-	5
Total Child	-	-	**3E-5**	12	-	-	**7E-5**	21
Adult	1.4E-05	0.05	9E-6	12	3.4E-05	0.1	**2E-5**	33

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years

Bold values indicate cancer risk above one in 100,000 or hazard quotient greater than one.

[1] The calculations in this table were generated using ATSDR's PHAST v1.8.0.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0003 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 1.5 $(mg/kg/day)^{-1}$.

Table 14 Combined ingestion and dermal exposure doses for chronic exposure to hexavalent chromium (2.2 mg/kg) in soil along with noncancer hazard quotients and cancer risk estimates[1]

Exposure Group	CTE Dose (mg/kg/ day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	CTE Exposure Duration for Cancer (yrs)	RME Dose (mg/kg/ day)	RME Noncancer Hazard Quotient	RME Cancer Risk	RME Exposure Duration for Cancer (yrs)
Birth to < 1 year	5.5E-05	0.06	-	1	8.2E-05	0.09	-	1
1 to < 2 years	5.3E-05	0.06	-	1	7.4E-05	0.08	-	1
2 to < 6 years	3.4E-05	0.04	-	4	5.2E-05	0.06	-	4
6 to < 11 years	2.5E-05	0.03	-	5	3.5E-05	0.04	-	5
11 to < 16 years	1.8E-05	0.02	-	1	2.1E-05	0.02	-	5
16 to < 21 years	1.6E-05	0.02	-	0	1.8E-05	0.02	-	5
Total Child	-	-	**1E-5**	12	-	-	**2E-5**	21
Adult	5.5E-06	0.006	4E-7	12	7.4E-06	0.008	2E-6	33

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years
Bold values indicate cancer risk of one in 100,000 or greater.
[1] The calculations in this table were generated using ATSDR's PHAST v1.8.0.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0009 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.5 $(mg/kg/day)^{-1}$ and age-dependent adjustment factors.

Past (2021), current, and future incidental soil ingestion and skin contact from the contaminated soil on Barack Obama Male Leadership Academy for recreational users 6 years and older

Lead

Lead was detected in soil at all three sampling locations at the school. The maximum level (18 mg/kg) was similar to background levels (7.9 mg/kg - 77.3 mg/kg). Given the low levels and intermittent exposure to soil, elevated blood lead levels in children are not expected. For more information, see the Public Health Implications Section.

Past (2020), current, and future incidental soil ingestion and skin contact from contaminated soil northeast of the site for trespasser and recreational users 6 years and older.

In this scenario, DSHS assessed incidental soil ingestion and skin contact from soil contaminants on a property northeast of the site at Barack Obama Male Leadership Academy (Figure 7). DSHS assessed four exposure groups.

- First, to represent children younger than high school age using the field recreationally, DSHS assumed a scenario in which children aged 6 to less than 11 years of age used the field 3 times per week, 40 weeks a year, for 5 years.
- Second, to represent high school students 14 to less than 18 years old attending Barack Obama Male Leadership Academy, DSHS assumed a scenario in which students used the field 5 times per week, for 39 weeks (CTE) or 47 weeks (RME) per year, for 4 years.
- Third, to represent adult full-time educators working at Barack Obama Male Leadership Academy, DSHS assumed a scenario in which adults used the field 5 days a week, for 29 weeks (CTE) or 47 weeks (RME) per year, for 5 years (CTE) or 20 years (RME).
- Fourth, to represent adult full-time educators and other workers at Barack Obama Male Leadership Academy, DSHS assumed a scenario in which adults used the field 5 days per week, for 50 weeks a year, for 5 years (CTE) or 20 years (RME).

DSHS calculated incidental ingestion and dermal absorption exposure doses for hexavalent chromium in soil.

Noncancer effects

For noncancer health effects, the calculated exposure doses for hexavalent chromium were below health guidelines for all four groups and noncancer harmful effects are unlikely (Table 15).

Cancer

For cancer risk, DSHS determined the cancer risk

- for children 6 to less than 11 years to be 1 in 1,000,000 (1E-6),
- for high school students to be 3 in 10,000,000 (3E-7),
- for teachers to be 7 in 10,000,000 (7E-7), and
- for workers to be 7 in 10,000,000 (7E-7) (Table 15).

Given the conservative nature of the cancer risk evaluation for hexavalent chromium, the estimated cancer risks are not a health concern for students, teachers, and workers at the Barack Obama Male Leadership Academy. There is uncertainty to these cancer risk estimates because of limited sampling and the assumption of long-term exposure.

Lead

Lead was detected in soil at these locations. The maximum level (77.3 mg/kg) was similar to background levels (7.9 mg/kg - 77.3 mg/kg). Given the low levels and intermittent exposure to soil, elevated blood lead levels in children are not expected. For more information, see the Public Health Implications Section.

Public Health Implications

Several contaminants, including arsenic, cadmium, hexavalent chromium, mercury, thallium, and lead, were further evaluated for noncancer and cancer health effects. These contaminants were further evaluated because either an estimated exposure dose exceeded the noncancer health guideline for that chemical, or the cancer risk was one in 100,000 or greater.

Arsenic

Arsenic is a naturally occurring element widely distributed in the earth's crust and found in air, water, and soil. In Texas, the median background soil concentration for arsenic is 5.9 mg/kg (USGS 2013). Arsenic can be found in the wood preservative called copper chromated arsenic, which was discontinued for residential usage in 2003. Arsenic can also be found in some pesticides and fertilizers (ATSDR 2007).

Noncancer health effects

DSHS used the ATSDR chronic MRL of 0.0003 mg/day/kg as the health guideline. The MRL is based on study by Tseng *et al*. (2004) in which Taiwanese farmers were exposed to high levels of arsenic in well water over long periods of time. Dermal effects such as hyperpigmentation (skin darkening) and hyperkeratosis (localized overgrowth of skin) were reported in farmers exposed to 0.014 mg/day/kg (lowest observed adverse effect level; LOAEL). A no observed adverse health effects (NOAEL) was reported among farmers exposed to 0.008 mg/day/kg. The MRL was derived by dividing the NOAEL by an uncertainty factor of 3 (ATSDR 2007). Other health effects at these exposure levels included an enlarged liver, bronchitis, gastrointestinal effects, and peripheral vascular effects, such as cyanosis, gangrene, and the condition known in China as blackfoot disease (ATSDR 2007). However, the overall database for dermal effects is considerably stronger than for effects for other end points and was used to derive the MRL.

Cancer

The Department of Health and Human Services and EPA determined arsenic to be a human carcinogen (ATSDR 2007). The cancer slope factor used to determine cancer risk was the EPA CSF of 1.5 $(mg/kg/day)^{-1}$, which is based on dermal skin cancer. There is evidence from multiple epidemiological studies that suggest ingestion of arsenic increases the risk of developing skin cancer. A growing number of studies also suggest the development of tumors in internal organs such as the liver, kidney, and lungs following long-term arsenic exposure (ATSDR 2007).

Past (2021), current, and future incidental ingestion and skin contact exposure from the contaminated soil in residential yards.

The highest estimated RME doses from combined incidental ingestion and dermal exposure to soil with the highest detected arsenic concentration (37 mg/kg) are 0.00048 mg/kg/day and 0.00043 mg/kg/day for children in the birth to less than 1 year and 1 to less than 2 years age groups, respectively (Table 13). These estimated exposure doses are above the MRL of 0.0003 mg/kg/day but below the NOAEL identified in the Taiwanese study. The estimated doses in children birth to 2 years were 29 to 32 times lower than the LOAEL of 0.014 mg/kg/day. Estimated doses for all other exposure groups were less than the MRL. Based on this comparison, it is unlikely that children and adults would experience noncancer health effects from exposure to arsenic in soil.

Table 15 Combined ingestion and dermal exposure doses for chronic exposure to hexavalent chromium (2.4 mg/kg) in soil along with noncancer hazard quotients and cancer risk estimates[1]

Exposure Group	CTE Dose (mg/kg /day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/ day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration for Cancer (yrs)
6 to < 11 years[2]	9.1E-06	0.01	9E-7	1.3E-05	0.01	1E-6	5
Student 14 to < 18 years	9.6E-06	0.01	3E-7	1.3E-05	0.02	3E-7	4

Exposure Group	CTE Dose (mg/kg/day)	CTE Noncancer Hazard Quotient	CTE Cancer Risk	RME Dose (mg/kg/day)	RME Noncancer Hazard Quotient	RME Cancer Risk	Exposure Duration for Cancer (yrs)
Adult Full-Time Educator	3.2E-06	0.004	1E-7	5.2E-06	0.006	7E-7	5(CTE) 20(RME)
Adult Full-Time Worker	4.1E-06	0.005	1E-7	5.5E-06	0.006	7E-7	5(CTE) 20(RME)

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years
[1] The calculations in this table were generated using ATSDR's PHAST v1.8.0.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0009 mg/kg/day and the cancer risks were calculated using the cancer slope factor of 0.5 (mg/kg/day)-1 and age-dependent adjustment factors.
[2] The 6 to < 11 years exposure group is separate from the school exposure scenario and represents a recreational use of the high school field for children younger than high school age. This scenario makes the assumption that children use the field 3 times a week, 40 weeks a year, for 5 years with default exposure factors.

Past (2021), current, and future incidental ingestion and skin contact exposure from outdoor activities on the contaminated soil in residential yards.

DSHS estimated cancer risks for children and adults from exposure to arsenic in soil in residential yards west of Bonnie View Road. The total cancer risk for children and adults was determined to be 7 additional cancer cases in a population of 100,000 (7E-5) and 2 additional cancer cases in a population of 100,000 (2E-5), respectively (Table 13). The estimated cancer risks are not a health concern. Additionally, the cancer risk is likely to be overestimated because the maximum soil concentration was used. The maximum concentration (37 mg/kg) was four-times higher than the next highest arsenic concentration (9.6 mg/kg), which is close to background arsenic levels in soil of 6 mg/kg (USGS 2013). The estimated cancer risk for children and adults at the next highest level was determined to be 2 additional cancer cases in a population of 100,000 (2E-5) and 6 additional cancer cases in a population of 1,000,000 (6E-6), respectively.

Cadmium

Cadmium is a naturally occurring element found in water and soil. Potential sources of cadmium include car batteries, pigments, coatings, and plating processes. While there is evidence that prolonged inhalation of cadmium increases the risk of developing lung cancer, available evidence is inconclusive regarding potential cancer risks from long-term exposure to cadmium by ingestion. Therefore, cancer risk for ingestion of cadmium, the pathway relevant in this health consultation, was not evaluated.

Noncancer health effects

ATSDR has derived a chronic-duration oral MRL of 0.0001 mg/kg/day based on a database that examines the relationship between urinary cadmium levels and adverse health effects, including skeletal defects, kidney dysfunction, and hormonal changes (ATSDR 2012a). A urinary cadmium level (0.00033 mg/kg/day) corresponding to a probability of 10 percent ($UCDL_{10}$) excessive proteinuria (increased levels of protein in urine) was determined. The MRL was calculated by dividing the $UCDL_{10}$ by an uncertainty factor of 3 to account for human variability (ATSDR 2012a).

Past (2016 to 2020), current, and future incidental soil ingestion and skin contact from on-site contaminated soil for trespassers 6 years and older.

Assuming residents would trespass onto the property 3 days a week, the highest estimated cadmium RME dose from combined incidental ingestion and dermal exposure to soil with the cadmium EPC (64.3 mg/kg) was 0.0002 mg/kg/day for children (6 to 11 years). The estimated dose for adults was 4.2E-05 mg/kg/day (Table 16). The estimated child cadmium doses for the youngest age groups (6 to less than 11 years) exceed the MRL (0.0001 mg/kg/day) and are around the $UCDL_{10}$ (0.00033 mg/kg/day).

The difference between the cadmium exposure from soil and the cadmium effect level in humans is very small, which suggests inadequate protection may exist against noncancer health effects. Therefore, some children (6 to 11 years old) who trespass frequently onto the site could experience noncancer health effects, such as proteinuria, following long-term exposure to cadmium.

Estimated exposure doses for the older age groups are less than the MRL. Therefore, it is unlikely that older children (greater than 11 years) and adults would experience noncancer health effects from incidental ingestion and dermal contact with cadmium in soil while trespassing on the site.

Table 16 Trespasser: Site-specific combined ingestion and dermal exposure doses for chronic exposure to cadmium (64.3 mg/kg) in soil along with noncancer hazard quotients[1]

Exposure Group	CTE Dose (mg/kg/ day)	CTE Noncancer Hazard Quotient	RME Dose (mg/kg /day)	RME Noncancer Hazard Quotient	Exposure Duration for Cancer (yrs)
6 to < 11 years	7.9E-05	0.8	0.00020	**2.0**	5
11 to < 16 years	3.6E-05	0.4	7.0E-05	0.7	5
16 to < 21 years	3.0E-05	0.3	5.7E-05	0.6	5
Total Child	-	-	-	-	19
Adult	1.7E-05	0.2	4.2E-05	0.4	33

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; RME = reasonable maximum exposure (higher); yrs = years

[1] The calculations in this table were generated using ATSDR's PHAST v1.8.0.0. The noncancer hazard quotients were calculated using the chronic (greater than 1 year) minimal risk level of 0.0001 mg/kg/day.

Bold value indicates hazard quotient of greater than 1.

Hypothetical future incidental soil ingestion and skin contact from contaminated soil from potential use of the site for residential purposes.

The cadmium RME dose from combined incidental ingestion and dermal exposure to soil was determined at each hypothetical residential lot. The estimated exposure doses exceeded the MRL of 0.0001 mg/kg/day at eight hypothetical residential lots (lots 18, 24, 30, 31, 37, 38, 39 and 44) (Table 17). Because the cadmium concentration exceeded the MRL (HQ greater than 1), DSHS further evaluated exposure and calculated MOEs.

The estimated long-term exposure to cadmium in soil on four lots is greater than the cadmium exposure level that causes proteinuria (MOE less than 1; lots 24, 30, 31 and 38) (Table 18). Therefore, long-term exposure to cadmium in soil on these lots poses an elevated risk for noncancer health effects, such as proteinuria, for children 16 years and younger. For lots 18, 37, 39 and 44, the MOE ranges from 1 to 3 (Table 17). For these lots, the difference between the cadmium exposure from soil and the cadmium effect level in humans is small. Therefore, children (less than 6 years) living at these hypothetical residential lots could experience noncancer health effects, such as proteinuria, following long-term exposure. All other estimated doses for other exposure groups are less than the MRL and adverse effects are not expected for these groups.

Table 17 Hypothetical residential: Site-specific combined ingestion and dermal RME exposure doses for chronic exposure to cadmium in soil along with noncancer hazard quotients and margin of exposure[1]

Lot Number	Range (mg/kg)	EPC (Mean) (mg/kg)	Exposure Group	RME Dose (mg/kg/day)	HQ	MOE
18	0.211 to 30.5	5.7	Birth to < 1 year	0.00012	1.2	3
-	-	-	1 to < 2 years	0.00011	1.1	3
24	1.01 to 172	38.9	Birth to < 1 year	0.00082	8.2	<1
-	-	-	1 to < 2 years	0.00075	7.5	<1
-	-	-	2 to < 6 years	0.00049	4.9	<1
-	-	-	6 to < 11 years	0.00028	2.8	1
30	0.441 to 80.3	20.7	Birth to < 1 year	0.00044	4.4	<1
-	-	-	1 to < 2 years	0.0004	4.0	<1
-	-	-	2 to < 6 years	0.00027	2.7	1
-	-	-	6 to < 11 years	0.00015	1.5	2
31	2.1 to 86.5	25.7	Birth to < 1 year	0.00055	5.5	<1
-	-	-	1 to < 2 years	0.0005	5.0	<1
-	-	-	2 to < 6 years	0.00033	3.3	1
-	-	-	6 to < 11 years	0.00019	1.9	2
37	0.566 to 48.8	12.7	Birth to < 1 year	0.00027	2.7	1
-	-	-	1 to < 2 years	0.00024	2.4	1
-	-	-	2 to < 6 years	0.00016	1.6	2
38	53.1 to 176	114.6	Birth to < 1 year	0.0024	24	<1
-	-	-	1 to < 2 years	0.0022	22	<1
-	-	-	2 to < 6 years	0.0015	15	<1

Lot Number	Range (mg/kg)	EPC (Mean) (mg/kg)	Exposure Group	RME Dose (mg/kg/day)	HQ	MOE
-	-	-	6 to < 11 years	0.00083	8.3	<1
-	-	-	11 to < 16 years	0.00029	2.9	<1
-	-	-	16 to < 21 years	0.00024	2.4	<1
-	-	-	Adult	0.00017	1.7	2
39	0.241 to 32.4	5.5	Birth to < 1 year	0.00011	1.1	3
-	-	-	1 to < 2 years	0.00010	1.0	3
44	0.233 to 30.7	5.2	Birth to < 1 year	0.00011	1.1	3

Abbreviations: EPC= exposure point concentration; RME = reasonable maximum exposure (higher); mg/kg/day = milligram chemical per kilogram body weight per day; mg/kg = milligram chemical per kilogram soil; HQ=hazard quotient; MOE = margin of exposure.
[1]Data not shown when the HQ was less than 1.

Hexavalent chromium

Hexavalent chromium and metal chromium are rare in nature and are generally produced by industrial processes or man-made sources (NTP 2008). Additionally, hexavalent chromium can be reduced to other forms of chromium through reactions with organic materials (ATSDR 2012b). DSHS evaluated both noncancer and cancer health effects.

Cancer

The effects of chromium exposure on the human body vary according to the exposure route (i.e., inhalation, ingestion, or skin contact) and the chemical form of chromium. For example, inhaling high levels of hexavalent chromium aerosols can damage the nasal and respiratory tract. Breathing water droplets or steam with low concentrations of hexavalent chromium does not present a health risk. EPA has classified hexavalent chromium as a known human carcinogen through inhalation (USEPA 2005). Similarly, the National Toxicology Program (NTP) has classified hexavalent chromium as a known human carcinogen based on occupational studies where workers exposed by inhalation developed lung cancer (ATSDR 2012).

However, mixed results on the occurrence of cancer have been found in studies of people living in areas with high levels of hexavalent chromium in the drinking water. Some human studies have reported an association with several cancer types, while other studies have not. In laboratory animals, hexavalent chromium compounds have been shown to cause cancer of the stomach, intestinal tract, and lungs. No cancer effects in animal studies have been identified from dermal exposures to hexavalent chromium (ATSDR 2012). Additionally, hexavalent chromium has been shown to be mutagenic and cytotoxic in several in vitro studies (ATSDR 2012b; NTP 2008; McCarroll, et al., 2010).

The NTP reported that ingestion of high levels of sodium dichromate dihydrate, a compound containing hexavalent chromium, was associated with an increase in oral and small intestine tumors in laboratory animals (NTP 2008). The California Environmental Protection Agency (CalEPA) derived a cancer slope factor of 0.5 $(mg/kg/day)^{-1}$ based on NTP's animal study. The final release of EPA's Integrated Risk Information System (IRIS) reassessment of the carcinogenic effects of hexavalent chromium through oral ingestion is pending. EPA is evaluating the carcinogenic mode of action of hexavalent chromium. Some scientists hypothesize that ingestion of high concentrations of hexavalent chromium causes intestinal cell damage (cytotoxicity) and regenerative cell growth (cell proliferation). Health Canada states that this points to the occurrence of a threshold for hexavalent chromium carcinogenesis (Health Canada 2018). Upon completion of the IRIS reassessment, EPA will determine whether the MCL for total chromium needs to be revised (USEPA 2019).

Past (2016 to 2020), current, and future incidental soil ingestion and skin contact from on-site contaminated soil for trespassers 6 years and older.

For on-site trespassers within the fenced area, DSHS determined an increased RME cancer risk of 3 additional cancers per 10,000 (3E-4) children and 9 additional cancers per 100,000 (9E-5) adults (Table 7). The estimated cancer risks are a health concern for children and adults. There is uncertainty with these cancer risk estimates because it assumes exposure of 3 days per week over many years.

Hypothetical future incidental soil ingestion and skin contact from contaminated soil from potential use of the site for residential purposes.

The estimated increased RME lifetime cancer risk from long-term exposure to hexavalent chromium in soil on the hypothetical residential lots

- was less than 1 in 1,000,000 (1E-6) for both children and adults in 38 lots (Figures 12 and 13; Table 8),
- for 14 of these lots (lots 5, 12, 24, 28, 29, 30, 31, 32, 27, 28, 29, 43, 44 and 45), the estimated lifetime cancer risk for children and adults was greater than 1 in 10,000 (1E-4), and
- for three of these lots, the estimated lifetime cancer risk for children is 1 in 1,000 (1E-3) or higher.

For the 14 lots, the estimated cancer risks are a health concern for children and adults.

Past (2021), current, and future incidental soil ingestion and skin contact from the contaminated soil in residential yards.

DSHS determined potential cancer risk from exposure to the highest detected hexavalent chromium concentration (2.2 mg/kg) found in residential yards to be 2 additional cancers in 100,000 (2E-5) children and 2 additional cancer cases in 1,000,000 (2E-6) adults (Table 13). The estimated cancer risks are not a health concern for children and adults. Additionally, the cancer risks are no greater than the cancer risk expected from exposure to background levels of hexavalent chromium.

<u>*Noncancer health effects*</u>

DSHS used the chronic MRL for hexavalent chromium of 0.0009 mg/kg/day as the health-based guideline. Studies show that ingestion of high levels of hexavalent chromium has effects on the liver, intestines, lymph nodes, and the pancreas in mice and rats (NTP 2008). The most sensitive study showed an increase of lesions in the lining of the small intestines and additional tissue growth (epithelial hyperplasia) in the lesions in female mice. Rats showed lesions, but no tissue growth. The LOAEL that may cause liver (chronic inflammation) and intestinal effects was 0.38 mg/kg/day (NTP 2008). ATSDR used information from these animal studies and estimated the lower confidence limit of the benchmark dose ($BMDL_{10}$) that is expected to show a response in 10 percent of the animals tested. The $BMDL_{10}$ for intestinal effects was 0.09 mg/kg/day. ATSDR calculated the chronic MRL (0.0009 mg/kg/day) using the lowest $BMDL_{10}$ and an uncertainty factor of 100 (ATSDR 2012).

Past (2016 to 2020), current, and future incidental soil ingestion and skin contact from on-site contaminated soil while trespassing for trespassers 6 years and older.

The highest estimated RME exposure doses from combined incidental ingestion and dermal exposure to on-site soil with the hexavalent chromium EPC (255.8 mg/kg) was 0.0017 mg/kg/day for children (6 to less than 11 years) and 0.00042 mg/kg/day for adults (Table 7). The estimated highest child dose exceeds the MRL (0.0009 mg/kg/day) but is well below the level shown to cause adverse effects in animal studies (MOE is 53 times less than the $BMDL_{10}$). All other estimated exposure doses are less than the MRL. Based on this comparison, it is unlikely that children and adults would experience noncancer health effects from incidental ingestion and dermal contact with hexavalent chromium in soil while trespassing on the site.

Hypothetical future incidental soil ingestion and skin contact from contaminated soil from potential use of the site for residential purposes

The exposure RME doses from combined incidental ingestion and dermal exposure to hexavalent chromium in residential soil was determined at each hypothetical residential lot should the site become residential. The estimated exposure doses exceeded the MRL of 0.0009 mg/kg/day at 10 hypothetical residential lots (lots 24, 28, 29, 30, 31, 32, 37, 38 and 39) (Table 18). For these lots, the MOEs ranged from 2 to 99. Based on the scientific literature, DSHS determined that hexavalent chromium noncancer effects are more likely to occur when the MOE is less than 18 than when the MOE is 18 and higher. For seven lots (lots 28, 29, 30, 31, 32, 37 and 39), the MOEs ranged from 21 to 99 when compared to the $BMDL_{10}$ for all groups; therefore, harmful effects are not likely. For lots 24, 30 and 38, the MOEs for at least one age group was less than 18. Residents living at these lots could be at risk of mild cellular changes to the cells lining the intestines and inflammation of the liver following long-term exposure.

Table 18 Hypothetical residential: Site-specific combined ingestion and dermal exposure doses for chronic exposure to hexavalent chromium in soil along with noncancer hazard quotients and margin of exposure should the site become residential

Lot Number	EPC (Mean) (mg/kg)	Exposure Group	RME Dose (mg/kg/ day)	HQ	MOE
24	1008.3	Birth to < 1 year	0.038	42	2
-	-	1 to < 2 years	0.034	38	3
-	-	2 to < 6 years	0.024	26	4
-	-	6 to < 11 years	0.016	18	6
-	-	11 to < 16 years	0.0095	11	9
-	-	16 to < 21 years	0.0083	9.2	11
-	-	Adult	0.0034	3.8	26
28	114.7	Birth to < 1 year	0.0043	4.8	21
-	-	1 to < 2 years	0.0039	4.3	21
-	-	2 to < 6 years	0.0027	3.0	33
-	-	6 to < 11 years	0.0018	2.0	50
-	-	11 to < 16 years	0.0011	1.2	81
-	-	16 to < 21 years	0.00094	1.0	96
29	59.8	Birth to < 1 year	0.0022	2.5	41

Lot Number	EPC (Mean) (mg/kg)	Exposure Group	RME Dose (mg/kg/ day)	HQ	MOE
-	-	1 to < 2 years	0.002	2.2	45
-	-	2 to < 6 years	0.0014	1.6	64
-	-	6 to < 11 years	0.00095	1.1	95
30	249.5	Birth to < 1 year	0.0094	10	10
-	-	1 to < 2 years	0.0084	9.4	11
-	-	2 to < 6 years	0.0059	6.5	15
-	-	6 to < 11 years	0.0040	4.4	23
-	-	11 to < 16 years	0.0024	2.6	38
-	-	16 to < 21 years	0.0020	2.3	45
31	73.4	Birth to < 1 year	0.0027	3.0	33
-	-	1 to < 2 years	0.0025	2.7	36
-	-	2 to < 6 years	0.0017	1.9	53
-	-	6 to < 11 years	0.0012	1.3	75
32	47.4	Birth to < 1 year	0.0018	2.0	50
-	-	1 to < 2 years	0.0016	1.8	56
-	-	2 to < 6 years	0.0011	1.2	81
37	24.3	Birth to < 1 year	0.00091	1.0	99
38	270.5	Birth to < 1 year	0.01	11	9
-	-	1 to < 2 years	0.0091	10	10
-	-	2 to < 6 years	0.0063	7.0	14
-	-	6 to < 11 years	0.0043	4.8	21
-	-	11 to < 16 years	0.0026	2.8	35

Lot Number	EPC (Mean) (mg/kg)	Exposure Group	RME Dose (mg/kg/ day)	HQ	MOE
-	-	16 to < 21 years	0.0022	2.8	41
-	-	Adult	0.00091	1.0	99
39	62.7	Birth to < 1 year	0.0023	2.6	39
-	-	1 to < 2 years	0.0021	2.3	43
-	-	2 to < 6 years	0.0015	1.6	60
-	-	6 to < 11 years	0.0010	1.1	90
43	62.7	Birth to < 1 year	0.0023	2.6	39
-	-	1 to < 2 years	0.0021	2.3	43
-	-	2 to < 6 years	0.0015	1.6	60
-	-	6 to < 11 years	0.0010	1.1	90
44	39.9	Birth to < 1 year	0.0015	1.7	60
-	-	1 to < 2 years	0.0013	1.5	69
-	-	2 to < 6 years	0.00093	1.0	97
45	43.2	Birth to < 1 year	0.0016	1.8	56
-	-	1 to < 2 years	0.0015	1.6	60
-	-	2 to < 6 years	0.0010	1.1	90

Abbreviations: EPC = exposure point concentration; RME = reasonable maximum exposure (higher); mg/kg/day = milligram chemical per kilogram body weight per day; mg/kg = milligram chemical per kilogram soil; HQ=hazard quotient; MOE = margin of exposure.

Lead

The best-available science indicates there is no safe level of lead in blood. As a result, ATSDR and CDC recommend reducing lead exposure as much as possible when lead sources in and around the home are identified. Negative health effects associated with lead are many and include renal, cardiovascular, hematologic, and developmental. Exposure to lead in young children can cause damage to the brain and nervous system, slowed growth, and developmental and learning problems

(ATSDR 2020). Lead was found in on-site soils at levels that could result in elevated blood lead levels.

Health Outcome Data

Using information from the DSHS Texas Childhood Lead Prevention Program, the percentage of children with elevated blood levels residing within a 1-mile radius of the site (Figure 6), which includes portions of 5 census tracts, was compared to the percentage of children with elevated blood lead levels for Dallas County, as a whole. The data included blood lead test results of children under 16 years of age from 2013 to 2019.

A review of the data showed that 5.06 percent of children tested and living in the combined census tracts area near the site had blood lead levels greater than or equal to the Centers for Disease Control and Prevention (CDC) blood lead reference value of 3.5 µg/dL (CDC 2021).[7] The percentage of children with elevated blood lead levels (5.06 percent) for the combined census tracts area was statistically significantly higher than the percentage of children with elevated blood lead levels (4.04 percent) tested and living in Dallas County.

When looking at each census tract separately, the percentage of children with elevated blood lead levels (6.93 percent) in only one census tract (census tract 87.01) was statistically significantly higher compared to the percentage of children with elevated blood lead levels (4.04 percent) tested and living in Dallas County.

These results show that from 2013 to 2019 some children living near the site have elevated blood lead levels (higher than 3.5 µg/dL). While the site may be a potential source for lead exposure, it is likely other sources of lead contribute to elevated blood levels.

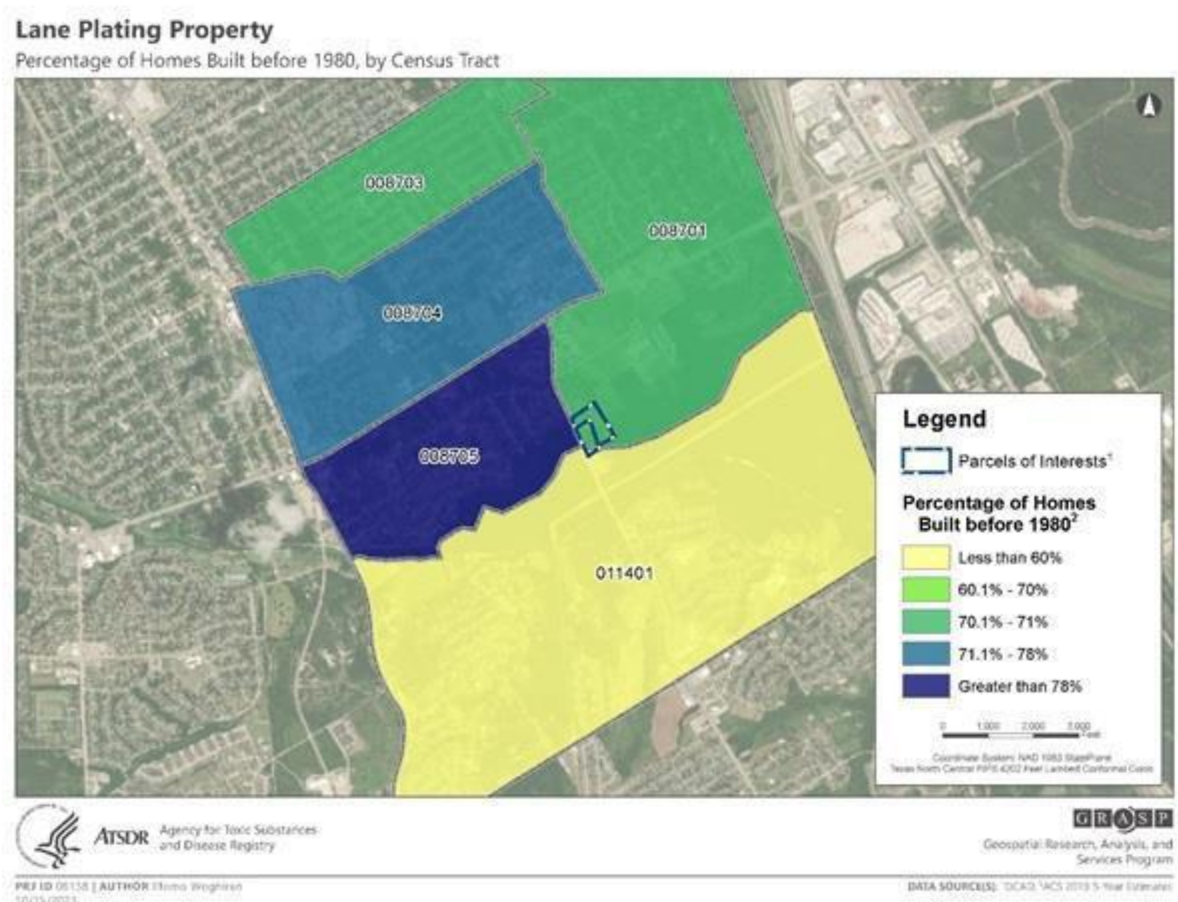
Other Sources of Lead Exposure

Lead-based paint can be a significant source of lead exposure in older houses. According to CDC, children (under the age of 6 years) are most often exposed to lead by breathing or swallowing dust and paint in homes built before 1978 (ATSDR 2020). Prior to 1955 there were no limits on lead in paint, and it is estimated that most paint contained between 2.5 and 5 percent lead, but some may have contained as much as 40 percent lead (ATSDR 2020). After 1978, the limit was lowered to less than 0.06 percent lead in paint. According to 2015-2019 American Community Survey 5-year estimates, approximately 10 percent of homes located in the selected census tracts within a 1-mile radius of the site were built before 1950

[7] The CDC level is based on the 97.5th percentile of blood lead values among U.S children ages 1-5 years from 2015-2016 and 2017-2018 National Health and Nutrition Examination Survey (NHANES). Children with blood lead levels at or above the blood lead reference value represent those at the top 2.5 percent with the highest blood lead levels (CDC 2021).

and over 70 percent were built before 1980 (Figure 14) (USCB ACS 2020). Plumbing and plumbing fixtures in homes can also contain lead. Other sources of lead include pottery, home remedies, spices, paint on toys, and candy.

Figure 14 Percentage of Homes Built before 1980, by Census Tract



Mercury

Mercury can be in several different forms such as elemental mercury, inorganic mercury, and organic mercury. Inorganic mercury can form when mercury combines with elements like chlorine or oxygen. Different forms of mercury can be found in different settings and have different toxicological impact on humans. There is uncertainty on the type of mercury in site and nearby soil. The analytical results of the soil samples were analyzed for total mercury. So, DSHS assumed that the mercury was inorganic, the most likely form in soil.

Noncancer health effects

DSHS used ATSDR's intermediate-duration oral MRL of 1E-05 mg/kg/day for inorganic mercury as a health guideline. The intermediate MRL was derived based on renal effects (decreased renal function and histopathological changes) in rats exposed to mercuric chloride for 28 days. The intermediate MRL is based on a LOAEL of 0.0015 mg/kg/day and a total uncertainty factor of 1,000 (ATSDR 2021).

Past (2016 to 2020), current, and future incidental soil ingestion and skin contact from on-site contaminated soil for trespassers 6 years and older.

The estimated RME exposure doses from combined incidental ingestion and dermal exposure for trespassers (6 years and older) from mercury in on-site soils (EPC of 12.2 mg/kg) ranged from 5.1E-05 mg/kg/day for children (6 to less than 11 years) to 1.1E-05 mg/kg/day for adults (Table 19). The estimated doses exceed the intermediate MRL (1E-05 mg/kg/day). However, the MOEs were 294 and higher when compared to the LOAEL for all exposure groups; therefore, harmful effects from incidental ingestion and dermal contact with mercury in soil while trespassing on the site are not likely.

Table 19 Site-specific combined ingestion and dermal exposure doses for chronic exposure to mercury in soil along with noncancer hazard quotients and margin of exposure

Contaminant	EPC (mg/kg)	Exposure Group	RME Dose (mg/kg/day)	HQ	MOE
Mercury	12.2	6 to < 11 years	5.1E-05	5.1	294
-	-	11 to < 16 years	2.4E-05	1.7	625
-	-	16 to < 21 years	2.0E-05	1.5	750
-	-	Adult	1.1E-05	1.1	1364

Abbreviations: EPC = exposure point concentration; RME = reasonable maximum exposure (higher); mg/kg/day = milligram chemical per kilogram body weight per day; mg/kg = milligram chemical per kilogram soil; HQ=hazard quotient; MOE = margin of exposure

Hypothetical future incidental soil ingestion and skin contact from contaminated soil from potential use of the site for residential purposes.

The exposure RME doses from combined incidental ingestion and dermal exposure to inorganic mercury in residential soil was determined at each hypothetical residential lot. The estimated exposure doses exceeded the intermediate MRL of 1E-05 mg/kg/day at 3 hypothetical residential lots (lots 30, 38 and 44) (Table 20). For these lots, the MOEs ranged from 15 to 385 when compared to the LOAEL for all age groups. Based on the scientific literature and estimated doses for exposure to inorganic mercury, DSHS determined that noncancer health effects are more likely to occur when the MOE is less than 40 than when the MOE is 40 and higher. The MOE was less than 40 for children less than 6 years in lot 38 and for children less than 2 years in lots 30 and 44 compared to the LOAEL. Children living at these lots could be at risk of decreased renal function and histopathological changes following long-term exposure. The MOEs for older children and adults were more than 40; therefore, harmful effects are not likely.

Table 20 Hypothetical residential: Site-specific combined ingestion and dermal exposure doses for chronic exposure to mercury in soil along with noncancer hazard quotients and margin of exposure

Lot Number	EPC Mean (mg/kg)	Exposure Group	RME Dose (mg/kg/day)	HQ	MOE
30	20.2	Birth to < 1 year	0.00052	52	29
-	-	1 to < 2 years	0.00047	47	32
-	-	2 to < 6 years	0.00032	32	47
-	-	6 to < 11 years	0.00020	20	75
-	-	11 to < 16 years	9.1E-05	9.1	165
-	-	16 to < 21 years	7.7E-05	7.7	195
-	-	Adult	4.0E-05	4.0	375
38	38.4	Birth to < 1 year	0.00099	99	15
-	-	1 to < 2 years	0.00089	89	17
-	-	2 to < 6 years	0.00060	60	25
-	-	6 to < 11 years	0.00037	37	41
-	-	11 to < 16 years	0.00017	17	88
-	-	16 to < 21 years	0.00015	15	100
-	-	Adult	7.7E-05	7.7	195
44	19.3	Birth to < 1 year	0.00050	50	30
-	-	1 to < 2 years	0.00045	45	33
-	-	2 to < 6 years	0.00030	30	50
-	-	6 to < 11 years	0.00019	19	79
-	-	11 to < 16 years	8.7E-05	8.7	172
-	-	16 to < 21 years	7.4E-05	7.4	203

Lot Number	EPC Mean (mg/kg)	Exposure Group	RME Dose (mg/kg/day)	HQ	MOE
-	-	Adult	3.9E-05	3.9	385

Abbreviations: EPC = exposure point concentration; RME = reasonable maximum exposure (higher); mg/kg/day = milligram chemical per kilogram body weight per day; mg/kg = milligram chemical per kilogram soil; HQ=hazard quotient; MOE = margin of exposure

Thallium

Thallium in a naturally occurring metal that can be found in the earth's crust. Thallium is used to manufacture electronics, thermometers, optical lenses, and plating processes. Production of thallium was banned in the United States in 1984 and is now solely imported from other counties. While thallium is highly toxic, it has not been extensively studied. There is a lack of supporting evidence that thallium is a carcinogen, therefore, DSHS only evaluated the noncancer health effects.

From 2007-2010, the United States Geological Survey conducted a low-density (1 site per 1,600 square kilometers) geochemical and mineralogical survey of soils across US states, including Texas. For urban sites, surface samples of soil (0-5 centimeters) were collected, and results indicated a background median thallium soil level of 7.6 mg/kg in the U.S. (USGS 2013). The thallium levels detected in on-site soil samples are below the background level of thallium in soil in the U.S. (Appendix F, Table 36).

Noncancer health effects

ATSDR has not derived any MRLs for thallium (ATSDR 1992) nor has EPA published an RfD. However, EPA has proposed candidate oral RfDs ranging from 1E-5 mg/kg/day to 3E-6 mg/kg/day for soluble thallium salts that can be used for screening purposes. It should be noted, however, that these are considered provisional RfDs based on very limited data. The candidate RfD (1E-5 mg/kg/day) is based on a NOAEL and a benchmark dose ($BMDL_{10}$) value (0.01 mg/kg/day) for female rats based on alopecia (hair loss) (USEPA 2012). DSHS compared doses to the $BMDL_{10}$ levels to determine the MOE.

Hypothetical future incidental ingestion and skin contact from contaminated soil from potential use of the site for residential purposes.

The exposure RME doses from combined incidental ingestion and dermal exposure to thallium in residential soil were determined at each hypothetical residential lot. The estimated exposure doses exceeded the provisional value of 1E-5 mg/kg/day at 24 hypothetical residential lots (Table 21). The MOEs were 145 and greater when compared to the $BMDL_{10}$ for all exposure groups; therefore, harmful effects are not likely.

Table 21 Hypothetical residential: Site-specific combined ingestion and dermal exposure doses for chronic exposure to thallium in soil along with noncancer hazard quotients and margin of exposure

Lot Number	EPC (Mean) (mg/kg)	Exposure Group	RME Dose (mg/kg/day)	HQ	MOE
14	0.63	Birth to < 1 year	1.2E-05	1.2	833
-	-	1 to < 2 years	1.1E-05	1.1	909
15	1.06	Birth to < 1 year	2.1E-05	2.1	476
-	-	1 to < 2 years	1.9E-05	1.9	526
-	-	2 to < 6 years	1.2E-05	1.2	833
16	0.83	Birth to < 1 year	1.6E-05	1.6	625
-	-	1 to < 2 years	1.5E-05	1.5	667
17	0.68	Birth to < 1 year	1.3E-05	1.3	769
-	-	1 to < 2 years	1.2E-05	1.2	833
18	0.85	Birth to < 1 year	1.7E-05	1.7	588
-	-	1 to < 2 years	1.5E-05	1.5	667
-	-	2 to < 6 years	1.0E-05	1.0	1000
19	0.65	Birth to < 1 year	1.3E-05	1.3	769
-	-	1 to < 2 years	1.2E-05	1.2	833
21	0.94	Birth to < 1 year	1.9E-05	1.9	526
-	-	1 to < 2 years	1.7E-05	1.7	588
-	-	2 to < 6 years	1.1E-05	1.1	909
22	0.92	Birth to < 1 year	1.8E-05	1.8	556
-	-	1 to < 2 years	1.7E-05	1.7	588
-	-	2 to < 6 years	1.1E-05	1.1	909
24	2.8	Birth to < 1 year	5.5E-05	5.5	182
-	-	1 to < 2 years	5.0E-05	5.0	200

Lot Number	EPC (Mean) (mg/kg)	Exposure Group	RME Dose (mg/kg/day)	HQ	MOE
-	-	2 to < 6 years	3.3E-05	3.3	303
-	-	6 to < 11 years	1.8E-05	1.8	556
26	0.91	Birth to < 1 year	1.8E-05	1.8	556
-	-	1 to < 2 years	1.6E-05	1.6	625
-	-	2 to < 6 years	1.1E-05	1.1	909
28	1.3	Birth to < 1 year	2.6E-05	2.6	385
-	-	1 to < 2 years	2.4E-05	2.4	417
-	-	2 to < 6 years	1.6E-05	1.6	625
29	1.9	Birth to < 1 year	3.7E-05	3.7	270
-	-	1 to < 2 years	3.4E-05	3.4	294
-	-	2 to < 6 years	2.2E-05	2.2	455
-	-	6 to < 11 years	1.2E-05	1.2	833
30	2.4	Birth to < 1 year	4.7E-05	4.7	213
-	-	1 to < 2 years	4.3E-05	4.3	232
-	-	2 to < 6 years	2.8E-05	2.8	357
-	-	6 to < 11 years	1.6E-05	1.6	625
31	1.8	Birth to < 1 year	3.5E-05	3.5	285
-	-	1 to < 2 years	3.2E-05	3.2	313
-	-	2 to < 6 years	2.1E-05	2.1	476
-	-	6 to < 11 years	1.2E-05	1.2	833
32	1.0	Birth to < 1 year	2.0E-05	2.0	500
-	-	1 to < 2 years	1.8E-05	1.8	556
-	-	2 to < 6 years	1.2E-05	1.2	833

Lot Number	EPC (Mean) (mg/kg)	Exposure Group	RME Dose (mg/kg/day)	HQ	MOE
33	0.80	Birth to < 1 year	1.6E-05	1.6	625
-	-	1 to < 2 years	1.4E-05	1.4	714
35	0.55	Birth to < 1 year	1.1E-05	1.1	909
36	0.64	Birth to < 1 year	1.3E-05	1.3	769
-	-	1 to < 2 years	1.1E-05	1.1	909
37	1.4	Birth to < 1 year	2.7E-05	2.7	370
-	-	1 to < 2 years	2.4E-05	2.4	416
-	-	2 to < 6 years	1.6E-05	1.6	625
38	3.5	Birth to < 1 year	6.9E-05	6.9	145
-	-	1 to < 2 years	6.3E-05	6.3	159
-	-	2 to < 6 years	4.1E-05	4.1	244
-	-	6 to < 11 years	2.3E-05	2.3	435
39	0.88	Birth to < 1 year	1.7E-05	1.7	588
-	-	1 to < 2 years	1.6E-05	1.6	625
-	-	2 to < 6 years	1.0E-05	1.0	1000
40	1.1	Birth to < 1 year	2.1E-05	2.1	476
-	-	1 to < 2 years	1.9E-05	1.9	526
-	-	2 to < 6 years	1.3E-05	1.3	769
43	1.1	Birth to < 1 year	2.1E-05	2.1	476
-	-	1 to < 2 years	1.9E-05	1.9	526
-	-	2 to < 6 years	1.2E-05	1.2	833
44	0.65	Birth to < 1 year	1.3E-05	1.3	769
-	-	1 to < 2 years	1.2E-05	1.2	833

Lot Number	EPC (Mean) (mg/kg)	Exposure Group	RME Dose (mg/kg/day)	HQ	MOE
45	1.4	Birth to < 1 year	2.8E-05	2.8	357
-	-	1 to < 2 years	2.5E-05	2.5	400
-	-	2 to < 6 years	1.7E-05	1.7	588
46	0.6	Birth to < 1 year	1E-05	1.2	1667
-	-	1 to < 2 years	1E-05	1.1	1818
50	1.5	Birth to < 1 year	3.0E-05	3.0	333
-	-	1 to < 2 years	2.7E-05	2.7	370
-	-	2 to < 6 years	1.8E-05	1.8	556

Abbreviations: EPC = exposure point concentration; RME = reasonable maximum exposure (higher); mg/kg = milligram chemical per kilogram soil; HQ=hazard quotient; MOE = margin of exposure; mg/kg/day = milligram chemical per kilogram body weight per day

Children's Health Considerations

In communities faced with air, water, or soil contamination, children could be at greater risk than adults from certain kinds of exposure to hazardous substances. A child's lower body weight and higher intake rate result in a greater dose of hazardous substance per unit of body weight. Sufficient exposure levels during critical growth stages can result in permanent damage to the developing body systems of children. Children are dependent on adults for access to housing and medical care, and for risk identification and exposure prevention. Consequently, adults need as much information as possible to make informed decisions regarding their children's health. DSHS took this into account, and specifically evaluated exposures among young children, nursing women, and pregnant women.

Community Health Concerns

1) Concern for those who fish and consume their catches from polluted streams.

DSHS has heard from the community that there is fishing occurring in streams and ponds near the site. Because contaminants that can bioaccumulate in fish were detected in surface water and sediment from the nearby creeks and ponds, DSHS recommends that EPA collect fish from the large pond located northeast of the site, 5A2 creek, and merged areas of creeks to determine if fish are contaminated with metals.

2) Concern for the health and wellness of the facility workers.

During operations of the Lane Plating facility, workers could have been exposed to harmful levels of hexavalent chromium based on a 2015 OSHA violation for elevated levels of hexavalent chromium in indoor air. For anyone who worked at the facility in the past and is concerned for their health, DSHS recommends that you talk with your physician about these concerns and your possible exposures.

3) Concern for the safety of drinking water.

Nearby residents obtain water for drinking and household uses from the Dallas Water Utility public water system (PWS). The Dallas Water Utility PWS obtains water from surface water reservoirs that are not impacted from Lane Plating Works, Inc. site. The Dallas PWS water is regulated by TCEQ under the federal Safe Drinking Water Act. To see the sampling results for the Dallas Water Utility please visit the TCEQ Drinking Water Watch website at:

https://dww2.tceq.texas.gov/DWW/.

4) Concern about a swamp located behind Barack Obama Male Leadership Academy.

Community members mentioned that children access the area behind the Barack Obama Male Leadership Academy. There is also concern that contaminated runoff is leaving the site and discharging into the creek, swamp, and storm drains near the school. The creeks and swamp near the school are uphill from the contaminated creeks. This means the elevation is higher in this area compared to the contaminated creeks which would make it difficult for contaminants to migrate toward the creeks and swamp near the school. EPA took a soil sample in the wetland area near the Barack Obama Male Leadership Academy (Sample ID: SS-20, Figure 7). Although lead, chromium, and arsenic were detected, levels were low and within background levels.

5) Concern about Five-Mile Creek passing through several parks and trails where the creek is accessible to the public. Concern about 100-year and 500-year flood events moving more contamination off the site.

Based on field observations, EPA does not anticipate contamination to migrate into the Five Mile Creek because Five Mile Creek does not connect to the unnamed stream, 5A2 Creek, or the merged areas of the creek. However, it is possible that site contamination can move off the site during a flooding event. DSHS recommends that the clean-up activities be completed before the next flooding event.

6) Concern with exposure to site-related contaminants for residents using the sidewalk and bus stop on the east side of Bonnie View Road, adjacent to the site.

It is unlikely that these residents would come in contact with the soil on the site because there is now a fence. For inhalation of contaminants from dust migration, the grass covering the soil on site property would likely lead to minimal or negligible dust levels.

Limitations

- Lack of fish tissue sampling to evaluate fish consumption risk in the creeks and large pond near the site.
- Lack of data to the northeast of the site in the residential areas to ensure contaminants have not deposited in this area.
- Limited amount of data (only two samples with field duplicates) to evaluate contamination in the baseball field.

Conclusions

Based on the available information, DSHS reached eight conclusions in this health consultation.

Conclusion 1

Cadmium and hexavalent chromium were detected in on-site soils within the fence line at levels that could cause harm to people trespassing on-site either in the past (2016 to 2020) or currently.

Basis for Conclusion

DSHS estimated noncancer health effects using health-protective exposure assumptions, including a higher-than-average (reasonable maximum) exposure point concentration of cadmium in soil. Trespassers (children 6 to 11 years) who were exposed to cadmium at least 3 days a week for many years may experience early signs of kidney damage, such as increased urinary levels of protein (proteinuria). Exposure doses for children older than 11 years and adults were less than health guidelines and no harmful health effects are expected for these age groups.

DSHS evaluated the potential for cancer effects following long-term exposure to hexavalent chromium in soil using health-protective site-specific exposure assumptions. Based on a higher-than-average (reasonable maximum) exposure scenario, DSHS concluded that the estimated cancer risks for trespassing adults and children (6 to 11 years) within the fenced area are a health concern. However, there is some uncertainty with the cancer risk estimates because of the assumption of exposure of 3 days per week over many years.

Conclusion 2

It’s possible that the site property could be developed as a residential development. Should the site become residential, hypothetical residential exposure to on-site surface soils could harm people’s health based on current conditions at some locations on the site.

Basis for Conclusion

To evaluate hypothetical future use of the site property as a residential development, DSHS divided the site into 63 separate quarter-acre size lots and evaluated contaminants detected in surface soils on each lot. Some of these lots were found to contain harmful soil levels of cadmium, hexavalent chromium, mercury, and lead.

- Long-term exposure to cadmium in soil at eight hypothetical lots (lots 18, 24, 30, 31, 37, 38, 39 and 44) could cause kidney damage, such as increased urinary levels of protein (proteinuria), in young children (less than 6 years).
- Long-term exposure to hexavalent chromium in soil in three hypothetical lots (lots 24, 30 and 38) could cause mild cellular changes to the cells lining the intestines and liver inflammation in children (less than 21 years).
- The estimated cancer risks from long-term exposure to hexavalent chromium in soil in 14 hypothetical lots (lots 5, 12, 24, 28, 29, 30, 31, 32, 37, 38, 39, 43, 44 and 45) is a health concern for children and adults. For these lots, DSHS estimated lifetime cancer risk for children and adults to be greater than 1 in 10,000 (1E-4).
- There are 6 hypothetical lots (lots 24, 30, 31, 37, 38 and 44) with high levels of lead in surface soil. Long-term exposure to lead has the potential for elevating blood lead levels of children who may live at or visit these properties.
- Long-term exposure to mercury in soil in three hypothetical lots (lots 30, 44 and 38) could decrease renal function and cause renal histopathological changes in young children (less than 6 years).

Conclusion 3

Exposure to arsenic and hexavalent chromium found in off-site surface soil in a nearby residential area west of Bonnie View Road is not expected to harm people's health.

Basis for Conclusion

Residents, including adults and children, living in the nearby residential neighborhood west of Bonnie View Road, may have come into contact with low levels of metals, including arsenic and hexavalent chromium, in surface soil through incidental ingestion and skin contact while spending time outdoors. However, the calculated exposure doses for arsenic and hexavalent chromium did not exceed health guidelines and harmful noncancer effects are not expected.

To evaluate the potential for cancer effects, DSHS used health-protective exposure assumptions. When considering a higher-than-average exposure (reasonable maximum), DSHS concluded that the estimated cancer risks for both adults and children are not a heath concern. However, there is uncertainty with this conclusion because of the limited samples collected and the assumption of long-term exposure over several decades.

Conclusion 4

Incidental ingestion or skin contact with surface soil while recreating on the baseball field located south of the site is not expected to harm people's health.

Basis for Conclusion

Nearby residents and visitors, including adults and children (2 years and older), may have come into contact with metals, arsenic, and hexavalent chromium, in the surface soil through incidental ingestion and skin contact while recreating at the baseball field. However, the calculated exposure doses among potential recreational users did not exceed health guidelines and harmful noncancer effects are not expected.

DSHS used health protective site-specific exposure assumptions to evaluate the potential for cancer effects. When considering a higher-than-average (reasonable maximum) exposure scenario, DSHS concluded that the estimated cancer risks to adults and children while recreating on the baseball field are not a health concern. However, there is some uncertainty with the cancer risk estimates because of the limited number of soil samples collected and the assumption of exposure for many years.

Conclusion 5

Incidental ingestion or skin contact with surface soil while recreating in outdoor areas on Barack Obama Male Leadership Academy property and the area located northeast of the site is not expected to harm people's health.

Basis for Conclusion

Nearby residents, students, teachers, and workers, including adults and children (6 years and older), may have come into contact with metals, such as arsenic, hexavalent chromium, lead, and mercury, in the surface soil through incidental ingestion and skin contact while recreating on Barack Obama Male Leadership Academy outdoor areas or the area northeast of the site and adjacent to the academy. However, contaminants (arsenic, mercury, and hexavalent chromium) were not detected on the academy property above health-based screening values. Additionally, calculated exposure doses for hexavalent chromium among potential recreational users of the area northeast of the site did not exceed health guidelines. Lead was detected in soils at background levels. Given the low levels and intermittent exposure to soil, elevated blood lead levels in children are not expected. These results suggest harmful noncancer effects are not expected for adults and children recreating in the area.

DSHS used health-protective site-specific exposure assumptions to evaluate the potential for cancer effects for exposure to hexavalent chromium. When considering a higher-than-average (reasonable maximum) exposure scenario, DSHS concluded that the estimated cancer risks are not a health concern for students, teachers, and workers at Barack Obama Male Leadership Academy from exposure to hexavalent chromium in soil. However, there is some uncertainty with the cancer risk estimates because of the limited number of samples collected and the assumption of exposure for several decades.

Conclusion 6

Swimming in the large pond either in the past (2016-2020) or currently is not expected to harm people's health. Similarly, wading in the creeks surrounding the site either in the past (2016-2020) or currently is not expected to harm people's health.

Basis for Conclusion

Children (6 years and older) and adults may have come into contact with metals in water and sediment through incidental ingestion and dermal absorption while swimming in the large pond or wading in the creeks. However, the calculated exposure doses for contaminants did not exceed health guidelines and harmful noncancer health effects are not expected.

To evaluate the potential for cancer effects associated with arsenic and hexavalent chromium, DSHS used site-specific health-protective exposure assumptions. These assumptions likely overestimated exposure frequency and excess cancer risk given that the terrain is densely vegetated and difficult to access. DSHS calculated higher-than-average (reasonable maximum) exposures to arsenic and hexavalent chromium in surface water and sediment and concluded that the estimated cancer risks are not a health concern for children and adults. However, there is some uncertainty with the cancer risk estimates because of the assumption of exposure for many years.

Conclusion 7

Residential exposure to groundwater from nearby private water wells is not occurring and water from the public water supply is not expected to harm people's health.

Basis for Conclusion

Groundwater is not used a source of drinking water for surrounding communities. There are no known private wells within a one-mile radius of the site (TWDB 2020). Residents near the site get drinking water from the Dallas Public Water Utility public water system (PWS), which is supplied from surface water reservoirs and rivers located at least 13 miles from the facility.

Conclusion 8

DSHS cannot currently conclude whether eating fish from the nearby creeks and the large pond could harm people's health.

Basis for Conclusion

Although EPA has observed fish of edible size, due to the small size of the pond the number of edible fish would be limited. This exposure pathway could not be evaluated because no fish samples were collected.

Next Steps

DSHS recommends that

1. EPA properly plug and abandon all on-site water wells to eliminate the risk of cross-contamination between groundwater aquifers and ensure no future usage.

2. An updated evaluation may be needed if site conditions change as a result of construction to a residential development, so that health recommendations can reflect current site conditions.

3. EPA continue their investigation of the extent of the shallow groundwater contamination and, if needed, ensure appropriate groundwater use restrictions are placed.

4. EPA perform remediation as quickly as possible due to the site being in a flood plain and to prevent the potential spreading of contaminants to offsite areas from flooding.

5. Nearby residents, including children and the transient population, do not go onto the site within the fenced area. The site is currently fenced and has signage to warn people not to trespass.

6. EPA test fish tissue from unnamed and 5A2 creeks and the large pond northeast of the site for possible contamination.

7. EPA collect additional soil samples in the baseball field south of the site to make sure additional surface water runoff from the site has not distributed contamination to the area. To date, only two soil samples have been collected from this area.

8. Some residents living near the site may have non-site related arsenic in their yards. Arsenic is naturally occurring or can be used in products like fertilizers and pesticides. For yards with elevated arsenic levels, residents can reduce and prevent exposure to arsenic in the soil by

   - Removing soil or cover the soil with mulch and/or grass.
   - Washing hands regularly after being outside and before eating.

- Taking shoes off at door.
- Regularly wet mopping, wetting dust, and vacuuming with High Efficiency Particulate Air (HEPA) filter vacuum.
- Placing door mats to reduce soil inside and outside the home.
- Not letting children play in bare soil.

9. Lead was detected in on-site soils at levels that may be harmful should the property become residential. Public officials and medical providers are encouraged to raise awareness and make sure community members know how to reduce lead exposures. The following are ways to reduce exposure to lead

   - Wash hands and toys often with soap and water. Wash hands before eating, after handing soil, or after playing outside in dirt.
   - Take off shoes at the door.
   - Change out of dirt covered clothes and wash separately if coming in contact with lead contaminated soil or if working with lead.
   - Have home tested for lead-based paint if house was built before 1978 and paint is deteriorating or chipping. If lead-based paint is chipping
   - Use wet paper towels to clean up lead dust.
   - Clean around windows, play areas, and floors.
   - Do not renovate your home until your home has been inspected for lead.
   - Use a high efficiency particulate air (HEPA) filter vacuum to minimize lead-paint dust inside home.

   If you live in a home with copper pipes and fixtures, consider

   - Running water for 30 seconds before using water for cooking, drinking, and preparing infant formula.
   - Using cold water for cooking, drinking, and preparing infant formula.
   - Removing brass and old copper fixtures and plumbing in houses that could contain lead.
   - Regularly cleaning faucet strainers to remove lead particles and sediment.

   Children ages six months to six years of age should be tested for lead per current DSHS Childhood Lead Poisoning Prevention Program (CLPPP) blood lead screening recommendations. Recommendations include

   - Blood lead screenings for all children enrolled in Medicaid/TX Health Steps programs at their 12- and 24-month well child exams and then continued screening until six years of age.

- If a child is not enrolled in Medicaid/TX Health Steps, medical providers should determine if the child is at risk for lead exposure by finding out if they live in a targeted zip code[8,9].
- If a child does not reside in a targeted zip code, medical providers can identify children who need to be tested for lead exposure by using the DSHS CLPPP's PB 110 Lead Risk Questionnaire[10].
- If parents or guardians ask for testing or there is clinical presentation of lead poisoning, medical providers are encouraged to test blood for lead, preferably using a venous blood sample.
- Women who are pregnant or may become pregnant may also consider having their blood lead tested if they believe they have come in contact with lead.

For more information about ways to prevent lead poisoning please visit the DSHS Texas Childhood Lead Poisoning Prevention Program website for guidance at https://www.dshs.texas.gov/lead/child.shtm.

DSHS will

- Provide the final version of this document to community members, city officials, the TCEQ, the EPA, and other interested parties.
- Continue to work with EPA and TCEQ to evaluate additional data as they become available.

Public Health Action Plan

The public health action plan for the site contains a description of actions that have been or will be taken by DSHS, ATSDR, and other government agencies at the site. The purpose of the public health action plan is to ensure that this health consultation both identifies public health hazards and provides a plan of action designed to mitigate and prevent harmful human health effects resulting from breathing, ingesting, or skin contact with hazardous substances found in the environment. Included is a commitment on the part of DSHS and ATSDR to follow up on this plan to ensure that it is implemented.

---

[8] DSHS targeted zip codes have one or more associated census tract in which: (a) The percentage of children 1-2 years old with a blood lead level ≥ 5 μg/dL is ≥ 3% among those tested in 2016 (Prevalence), or (b) The percentage of residential structures built before 1950 is ≥ 27% (Housing). To determine if a child resides in a targeted zip code see: https://dshs.texas.gov/sites/default/files/lead/pdf_files/child_screening_2019_revised-june-20.pdf

[9] DSHS CLPPP guidance and recommendations are currently based on CDC's blood lead reference level of 5 μg/dL. DSHS CLPPP plans on adopting the new CDC blood lead reference level of 3.5 μg/dL in January 2023. At that time, recommendations may be revised.

[10] https://www.dshs.texas.gov/sites/default/files/pb110.pdf

Actions Completed

EPA established a more secure fence around the perimeter in 2019 to prevent trespassing.

EPA removed 187,868 pounds of on-site waste in 2019.

EPA has established a Community Advisory Group (CAG). The CAG is made up of representatives from the community and city officials, and involves participation from local, state, and federal agencies involved in the cleanup of the site.

DSHS staff conducted a site visit with TCEQ Superfund section staff and EPA emergency coordinator and remedial projects manager staff on November 13, 2018. DSHS staff inspected the outside of the main building, and the small pond southeast of the site.

DSHS staff participated in EPA CAG meetings for Lane Plating Superfund Site on September 20, 2019, November 8, 2019, and January 20, 2020.

DSHS provided technical assistance to EPA and participated in EPA-hosted public meetings on November 13, 2018, January 30, 2020, and January 28, 2021. DSHS responded to health-related questions from the community during the meetings.

Actions Planned

This document will be made available to community members, city officials, the Texas Commission on Environmental Quality (TCEQ), the EPA, and other interested parties.

DSHS Health Assessment and Toxicology Program will continue to work with EPA and TCEQ and other interested parties to ensure safety of the public.

DSHS Health Assessment and Toxicology Program will also continue to engage with the community through community meetings and addressing community concerns.

DSHS Health Assessment and Toxicology Program will partner with the DSHS Childhood Blood Lead Poisoning Prevention Program to help with targeted outreach to families and health care providers in the area to help bring awareness and prevention to lead poisoning in the community.

Preparers of Report

The Texas Department of State Health Services (DSHS) prepared this health consultation for the Lane Plating LLC, site, located in Dallas, Dallas County, Texas under a cooperative agreement (#TS20-2001) with the federal Agency for Toxic Substances and Disease Registry (ATSDR). DSHS evaluated data of known quality using approved methods, policies, and procedures existing at the date of publication. ATSDR reviewed this document and concurs with its findings based on the information presented by DSHS.

Author:

Jessica Kessinger, MPH, CHES
Lead Health Assessor, Health Assessment and Toxicology Program
Texas Department of State Health Services – Austin, Texas

State Reviewers:

Heidi Bojes, PhD, MPH
Director, Environmental Epidemiology and Disease Registries Section
Texas Department of State Health Services – Austin, Texas

Eric Lawrence, MS
Toxicologist, Health Assessment and Toxicology Program
Texas Department of State Health Services – Austin, Texas

Kiet Ly, MPH
Health Assessor, Health Assessment and Toxicology Program
Texas Department of State Health Services- Austin, Texas

ATSDR Cooperative Agreement Coordinator and Technical Project Officer

Audra Henry, MS
Cooperative Agreement Coordinator
Office of Capacity Development and Applied Prevention Science (OCDAPS)

John Truhe, MPH
Technical Project Officer
Office of Capacity Development and Applied Prevention Science (OCDAPS)

ATSDR Regional Representative

Jennifer L. Lyke
Regional Representative
Office of Community Health and Hazard Assessment (OCHHA)

For questions about this report, please contact:

Health Assessment and Toxicology Program
Environmental Surveillance and Toxicology Branch

Environmental Epidemiology and Disease Registries Section
Texas Department of State Health Services
PO Box 149347, Mail Code 1964
Austin, Texas 78714-9347

Phone Line: 1-888--681-0927

References

[ACS 2020] American Cancer Society. Cancer Facts & Figures 2020. Available at: https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/cancer-facts-figures-2020.html.

[ATSDR 2018a] Agency for Toxic Substances and Disease Registry. 2018. Exposure Dose Guidance for Dermal and Ingestion Exposure to Surface Water. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, Sept 25.

[ATSDR 2018b] Agency for Toxic Substances and Disease Registry. 2018. Exposure Dose Guidance for Soil and Sediment Ingestion. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, July 31.

[ATSDR 2005] Agency for Toxic Substances and Disease Registry. 2022. Public Health Assessment Guidance Manual. Available at: https://www.atsdr.cdc.gov/pha-guidance/index.html.

[ATSDR 2007] Agency for Toxic Substances and Disease Registry (ATSDR). August 2007. Toxicological profile for Arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. Available at: https://www.atsdr.cdc.gov/toxprofiles/tp2.pdf

[ATSDR 2022] Agency for Toxic Substance and Disease Registry. April 2022. Toxicological Profile for Mercury- Draft for Public Comment. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. Available at: https://www.atsdr.cdc.gov/ToxProfiles/tp46.pdf.

[ATSDR 2012a] Agency for Toxic Substances and Disease Registry (ATSDR). September 2012. Toxicological profile for Cadmium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. Available at: https://www.atsdr.cdc.gov/toxprofiles/tp5.pdf.

[ATSDR 2012b] Agency for Toxic Substances and Disease Registry. September 2012. Toxicological Profile for Chromium. U.S. Department of Health and Human Services. Available at: https://www.atsdr.cdc.gov/toxprofiles/tp7.pdf.

[ATSDR 2019] Agency for Toxic Substances and Disease Registry. 2019. Exposure Point Concentration Guidance for Discrete Sampling. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, July 12.

[ATSDR 2020] Agency for Toxic Substances and Disease Registry (ATSDR). 2020. Toxicological profile for Lead. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. Available at: https://www.atsdr.cdc.gov/toxprofiles/tp13.pdf.

[CDC 2021] Centers for Disease Control and Prevention (CDC). "Blood Lead Reference Value" Accessed on December 2, 2021, at: https://www.cdc.gov/nceh/lead/data/blood-lead-reference-value.htm.

[CDC 2020] Centers for Disease Control and Prevention (CDC). Lead Poisoning, Know the Facts. Available at: https://www.cdc.gov/nceh/lead/docs/know-the-facts.html. Accessed November 2020.

[DSHS 2015] Texas Department of State Health Services (DSHS). Childhood Blood Lead Screening Guidelines (form Pb-120). June 2020. Available at: https://dshs.texas.gov/sites/default/files/lead/pdf_files/child_screening_2019_revised-june-20.pdf

[DSHS 2010] Texas Department of State Health Services (DSHS). Fish and Seafood Consumption Advisory ADV 43, Issued July 7, 2010. Available at: https://dshs.texas.gov/sites/default/files/seafood/PDF2/Rescinded/ADV-43-Fish-and-Shellfish-Consumption-Advisory-for-Trinity-River.pdf.

[Health Canada] Guidelines for Canadian Drinking Water Quality: Guideline Technical Document Chromium. 2018. Available at: https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-chromium.html#a93.

McCarroll N, Keshava N, Chen J, et al. 2010. An evaluation of the mode of action framework for mutagenic carcinogens case study II: Chromium (VI). Environ Mol Mutagen. 51:89-111.

[NTP 2008] National Toxicology Program (NTP), 2008. Technical Report on the Toxicology and Carcinogenesis Studies of Sodium Dichromate Dihydrate in F344/N Rats and B6C3F1 Mice. NTP TR 546. NIH Publication No. 07-5887, National Toxicology Program, Research Triangle Park, North Carolina. Available at: https://ntp.niehs.nih.gov/ntp/htdocs/LT_rpts/tr546.pdf.

[US OSHA 2015] U.S. Department of Labor Occupational Safety and Health (OSHA) Administration. Citation and Notification of Penalty to Lane Plating Works, Inc., Inspection Site: 5322 Bonnie View Road, Dallas, TX 75241, Inspection Number: 989172. January 28, 2015. 38 pages. Available at: https://www.osha.gov/ooc/citations/Lane_Plating_Works_Inc_989172_128_15.pdf.

[TCEQ 2017] Texas Commission on Environmental Quality (TCEQ). "Site Inspection Report, Lane Plating Works, Inc." January 2017. 151 pages.

[TCEQ 2021] Texas Commission on Environmental Quality (TCEQ). *Texas Risk Reduction Program, Protective Concentration Levels*. January. Available at: https://www.tceq.texas.gov/remediation/trrp/trrppcls.html.

Tseng, WP, Chu HM, How SW, et al. 1968. Prevalence of skin cancer in an endemic area of chronic arsenicism in Taiwan. J Natl Cancer Inst 40:453-463. Tseng, WP. 1977. Effects and dose-response relationships of cancer and Blackfoot disease with arsenic. Environ Health Perspect 19:109-119

[TWDB 2021] Texas Water Development Board. Groundwater Data Viewer, Output of Wells Within a 1-Mile Radius of the Lane Plating Works, Inc. Site. Accessed on

January 8, 2021, Available at: http://www2.twdb.texas.gov/apps/waterdatainteractive/groundwaterdataviewer.

[USCB 2010] United States. Census Bureau. Dallas city, Texas. 2010 Demographic Profile. Accessed: July 21, 2020.

[USCB ACS 2019] U.S. Census Bureau's (USCB) American Community Survey (ACS) 2015-2019 5-year estimates, Table(s) B25034, B25036, B25035, B2503. Accessed: July 21, 2020.

[USEPA 2018] United States Environmental Protection Agency (USEPA), National Priorities List Final Rule, Vol. 83 Federal Register No. 96, Thursday, May 17, 2018. Rules and Regulations. Available at: https://www.govinfo.gov/content/pkg/FR-2018-05-17/pdf/2018-10464.pdf.

[USEPA 2020] United States Environmental Protection Agency. "Remedial Investigation Report, Revision 02 Lane Plating Works, Inc. Superfund Site" Remedial Investigation Dallas, Dallas County Texas.

[USEPA 2021a] United States Environmental Protection Agency. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwin v2)(May 2021) 32/64-bit version. Available at: https://www.epa.gov/superfund/lead-superfund-sites-software-and-users-manuals

[USEPA 2021b] United States Environmental Protection Agency. Lane Plating Superfund Site Dallas, Dallas County, Texas Soil Sampling Technical Memorandum June 2021.

[USEPA 2011] United States Environmental Protection Agency (US EPA), Exposure Factors Handbook: 2011 Edition (Final). 2011. U.S. Environmental Protection Agency, Washington, D.C. Available at: https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236252.

[USEPA 2012] Provisional Peer-Reviewed Toxicity Values for Thallium and Compounds: Metallic Thallium (7440-28-0), Thallium (I) acetate (563-68-8), Thallium (I) carbonate (6533-73-9), Thallium (I) chloride (7791-12-0), Thallium (I) nitrate (10102-45-1), and Thallium (I) sulfate (7446-18-6) (ornl.gov) Superfund Health Risk Technical Support Center National Center for Environmental Assessment Office of Research and Development U.S. Environmental Protection Agency. Available at: https://cfpub.epa.gov/ncea/pprtv/documents/ThalliumCarbonate.pdf.

[USEPA 1999] U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS) on Nickel, Soluble Salts. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999 Available at: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0271_summary.pdf.

[USGS 2013] Smith, D.B., Cannon, W.F., Woodruff, L.G., Solano, Federico, Kilburn, J.E., and Fey, D.L., 2013, Geochemical and mineralogical data for soils of the conterminous United States: U.S. Geological Survey Data Series 801, 19 p., 574-F. Available at: http://pubs.usgs.gov/ds/801/.

Appendix A. Acronyms and Abbreviations

µg/L Micrograms per liter

mg/kg Milligrams per kilogram

mg/kg/day Milligrams per kilogram per day

ADAF Age Dependent Adjustment Factors

ATSDR Agency for Toxic Substances and Disease Registry

BMDL10 Benchmark Dose

CALEPA California Environmental Protection Agency

CV Comparison Value

CREG Cancer Risk Evaluation Guide

CSF Cancer Slope Factors

CTE Central Tendency Exposure

DSHS Texas Department of State Health Services

EPA Environmental Protection Agency

EPC Exposure Point Concentration

EMEG Environmental Media

MOE Margin of Exposure

MRL Minimum Risk Level

LOAEL Lowest Observed Adverse Effect Level

LTHA Lifetime Health Advisory

ND Not Detected

NPL National Priority List

NOAEL No Observed Adverse Effects Level

OSHA Occupational Safety and Health Administration

PCL Protective Contaminant Level

PFAS Per- and Polyfluoroalkyl substances

PFBA Perfluorobutanoic acid

PFOS Perfluorooctanesulfonic acid

PFBuS Perfluorobutane sulfonic acid

PFHpA Perfluoroheptanoic acid

PFHxS Perfluorohexane sulfonic acid

PFHxA Perfluorohexanoic acid

PFOA Perfluorooctanoic acid

PFPeA Perfluoropentanoic acid

PPRTV Provisional Peer-Reviewed Toxicity Value

PWS Public Water System

RMEG Reference Dose Media Evaluation Guide

RfD Reference Dose

RME Reasonable Maximum Exposure

RSL Regional Screening Levels

TCEQ Texas Commission on Environmental Quality

SVOCs Semi-Volatile Organic Compounds

VOCs Volatile Organic Compounds

UCL Upper Confidence Limit

Appendix B. Screening Analysis

Table 22 Detected contaminants in sediment samples from creeks surrounding the site.

Contaminant	Concentration range (mg/kg)	CV or other screening value (mg/kg)	Soil CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Perfluorobutanoic acid (PFBA)	0.00041	160	TCEQ Total Residential Combined Soil PCL	1/2	0
Perfluorooctane sulfonic acid (PFOS)	0.0011 - 0.0024	1.5	TCEQ Residential Total Combination Soil PCL	2/2	0
Aluminum	2,850 – 14,400	52,000	ATSDR Chronic EMEG child	30/30	0
Arsenic	0.5 - 8	16	ATSDR Chronic EMEG child	29/30	0
Barium	41.4 - 123	10,000	ATSDR Chronic EMEG child	30/30	0
Benzo(b)fluoranthene[1]	ND - 0.971	0.11	ATSDR Benzo(a)pyrene Equivalent CREG	1/2	0
Beryllium	0.5 - 0.96	100	ATSDR Chronic EMEG child	9/30	0
Cadmium	0.00287 - 1	5.2	ATSDR Chronic EMEG child	30/30	0
Chromium (Total)	3.5 - 87.3	NA	NA	30/30	0
Chromium (Hexavalent)	**0.25 - 5.1**	0.22	ATSDR Interim CREG	14/18	14

Contaminant	Concentration range (mg/kg)	CV or other screening value (mg/kg)	Soil CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Cobalt	2.4 - 10.4	520	ATSDR Intermediate EMEG child	29/30	0
Copper	0.262 - 30.9	520	ATSDR Intermediate EMEG child	32/32	0
Cyanide	0.043 - 6.7	33	ATSDR RMEG child	20/30	0
Fluoranthene	ND - 0.637	2,100	ATSDR RMEG child	1/2	0
Iron	3,040 – 15,500	55,000	EPA Residential Soil RSL	30/30	0
Lead	**0.134 - 120**	NA	NA	32/32	NA
Manganese	68.1 – 1,530	1,900	EPA Residential Soil RSL	30/30	0
Mercury[2]	0.02 - 0.271	5.2	ATSDR Chronic EMEG	26/30	0
Nickel	0.496 - 55.9	1,000	ATSDR Chronic RMEG child	32/32	0
Pyrene	ND - 0.710	1,600	ATSDR RMEG child	1/2	0
Selenium	0.34 - 0.86	260	ATSDR RMEG child	17/30	0
Sodium	71 - 170	3,800,000	EPA Residential Soil RSL	7/30	0
Vanadium	10.3 - 38	520	ATSDR Intermediate EMEG child	30/30	0

Contaminant	Concentration range (mg/kg)	CV or other screening value (mg/kg)	Soil CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Zinc	0.618 - 151	1,600	ATSDR Chronic EMEG child	32/32	0

Abbreviations: mg/kg = microgram per kilogram; CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; RMEG = reference dose media equivalent; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; NA= not available; TCEQ = Texas Commission on Environmental Quality; PCL = protective concentration level. Bolded values indicate concentration exceeds a CV/other screening value.

[1]Benzo(b)fluoranthene does not have an ATSDR CV. DSHS compared it to the benzo(a)pyrene ATSDR CV. DSHS applied a Toxic Equivalency Factor of 0.1 before screening against the ATSDR CV.

[2] Mercury in sediment was assumed to be methylmercury.

Table 23 Detected contaminants in surface water samples from creeks surrounding the site

Contaminant	Concentration Range (µg/L)	CV or other screening value (µg/L)	CV or other screening Value Source	Number of detected samples/Total numbers of samples	Number of Samples Exceeding Comparison Value
Perfluorobutane sulfonic acid (PFBuS)	0.0034	34.00	TCEQ Groundwater Ingestion PCL	1/1	0
Perfluorobutanoic acid (PFBA)	0.008	71.00	TCEQ Groundwater Ingestion PCL	1/1	0
Perfluoroheptanoic acid (PFHpA)	0.0017	0.56	TCEQ Groundwater Ingestion PCL	1/1	0
Perfluorohexane sulfonic acid (PFHxS)	0.0029	0.14	Intermediate EMEG child	1/1	0
Perfluorohexanoic acid (PFHxA)	0.013	0.29	TCEQ Groundwater Ingestion PCL	1/1	0
Perfluorooctane sulfonic acid (PFOS)	0.0043	0.014	Intermediate EMEG child	1/1	0
Perfluorooctanoic acid (PFOA)	0.00068	0.021	Intermediate EMEG child	1/1	0
Perfluoropentanoic acid (PFPeA)	0.024	0.09	TCEQ Groundwater Ingestion PCL	1/1	0
PFOS + PFOA	0.00498	0.014	Intermediate EMEG child (PFOA)	1/1	0
Aluminum	70 - 4,380	7,000	Chronic EMEG child	17/29	0

Contaminant	Concentration Range (µg/L)	CV or other screening value (µg/L)	CV or other screening Value Source	Number of detected samples/Total numbers of samples	Number of Samples Exceeding Comparison Value
Arsenic	**1.2 - 17.6**	0.016	CREG	28/28	28
Barium	57.7 - 127	1,400	Chronic EMEG child	25/27	0
Chromium (Total)	ND - 51.3	NA	NA	1/29	0
Cobalt	0.42 – 3.7	70	Intermediate EMEG child	6/29	0
Copper	0.42 - 120	1,300	EPA Copper Action Level	22/29	0
Cyanide	ND – **32.9**	4.4	RMEG Child	1/29	1
Iron	159 -**25,400**	14,000	EPA Residential Tap Water RSL	29/29	3
Lead	**0.03 – 6.2**	15	EPA Lead Action Level	13/29	0
Magnesium	2,510 – 9,200	NA	NA	29/29	NA
Manganese	71.9 – **2,730**	300	EPA LTHA	29/29	7
Nickel	2.9 – 42.6	140	Chronic RMEG child	20/29	0
Selenium	0.58 - 2.4	35	Chronic EMEG Child	19/29	0
Sodium	2,060 - **79,000**	20,000	EPA Drinking Water Advisory Health Level	29/29	12
Vanadium	0.29 **- 75.9**	70	Intermediate EMEG child	20/29	1

Contaminant	Concentration Range (µg/L)	CV or other screening value (µg/L)	CV or other screening Value Source	Number of detected samples/Total numbers of samples	Number of Samples Exceeding Comparison Value
Zinc	1.6 - 239	2,100	Chronic RMEG child	21/29	0

Abbreviations: mg/kg = microgram per kilogram; CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; RMEG = reference dose media equivalent; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; LTHA = lifetime health advisory; NA= not available; TCEQ = Texas Commission on Environmental Quality; PCL = protective concentration level. Bolded values indicate concentration exceeds a comparison value/other screening value.

Table 24 Detected contaminants in sediment samples from the pond northeast of site

Contaminant	Concentration range (mg/kg)	CV or other screening level (mg/kg)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Aluminum	6,150 – 18,100	52,000	ATSDR Chronic EMEG Child / Intermediate EMEG Child	3/3	0
Arsenic	4 – 6.4	16	ATSDR Chronic EMEG Child	3/3	0
Barium	83.9 - 108	10,000	ATSDR Chronic EMEG Child / RMEG Child	3/3	0
Beryllium	ND – 0.99	100	ATSDR Chronic EMEG Child /RMEG Child	1/3	0
Chromium	10.9 - 13	NA	NA	3/3	NA
Cobalt	6.4 – 7.5	520	ATSDR Intermediate EMEG Child	3/3	0
Copper	16.5 - 17.5	520	ATSDR Intermediate EMEG Child	3/3	0
Chromium (Hexavalent)	ND - **0.56**	**0.24**	ATSDR Interim CREG	1/3	1
Iron	8,200 – 16,300	50,000	EPA Residential Soil RSL	3/3	0
Lead	**28.7 - 31.1**	NA	NA	3/3	NA
Magnesium	1,650 – 3,370	NA	NA	3/3	NA
Manganese	640 - 670	1,900	EPA Residential Soil RSL	3/3	0
Mercury*	ND - 0.047	5.2	ATSDR RMEG	1/3	0

Nickel	14.7 – 20.9	1,000	ATSDR Chronic EMEG Child / RMEG Child	3/3	0
Vanadium	29.1 - 40	520	ATSDR Chronic EMEG Child / RMEG Child	3/3	0
Zinc	59.4 – 64.6	1,600	ATSDR Chronic EMEG	3/3	0

Abbreviations: mg/kg = microgram per kilogram; CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; RMEG = reference dose media equivalent; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; NA= not available. Bolded values indicate concentration exceeds a comparison value/other screening value.

Table 25 Detected contaminants in surface water samples from the pond northeast of site.

Contaminant	Concentration range (ug/L)	CV or other screening value (ug/L)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Aluminum	113 – 249	7,000	ATSDR Chronic EMEG child	3/3	0
Arsenic	ND -2.1	70	ATSDR Intermediate EMEG Child	1/3	0
Barium	45.7 – 72.2	1,400	ATSDR Chronic EMEG child	3/3	0
Hexavalent Chromium	ND - **0.2**	0.024	ATSDR Interim CREG	1/3	1
Copper	ND -1.1	1,300	EPA Copper Action Level	1/3	0
Iron	189- 210	1,400	EPA Residential Soil RSL	3/3	0
Lead	ND - 0.034	15	EPA Lead Action Level	1/3	0
Manganese	47.6 - 113	300	EPA LTHA	3/3	0

Contaminant	Concentration range (ug/L)	CV or other screening value (ug/L)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Nickel	ND – 3.1	140	ATSDR Chronic RMEG	1/3	0
Vanadium	ND -2.7	70	ATSDR Intermediate EMEG Child	1/3	0
Zinc	ND – 1.8	70	ATSDR Intermediate	1/3	0

Abbreviations: µg/L = microgram per liter; CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; RMEG = reference dose media equivalent; LTHA = lifetime health advisory; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; ND = not detected. Bolded values indicate concentration exceeds a comparison value or other screening value.

Table 26 Detected contaminants in soil samples taken from baseball field south of the site.

Contaminant	Concentration Range (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Aluminum	10,500 – 11,400	52,000	ATSDR Chronic EMEG Child / Intermediate EMEG Child	2/2	0
Arsenic	**12.3 - 19.1**	16	ASTDR Chronic EMEG Child	2/2	1
Barium	87.9 - 104	10,000	ASDTR Chronic EMEG Child / RMEG Child	2/2	0
Beryllium	0.57 - 0.66	100	ATSDR Chronic EMEG Child / RMEG Child	2/2	0

Contaminant	Concentration Range (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Cadmium	0.2 - 0.29	5.2	ATSDR Chronic EMEG Child	2/2	0
Total Chromium	9.2 - 10.5	NA	NA	2/2	NA
Hexavalent Chromium	0.36 - **0.45**	0.22	ATSDR CREG	2/2	2
Cobalt	6.7 - 8.1	520	ATSDR Intermediate EMEG Child	2/2	0
Copper	10.3 - 11.7	520	ATSDR Intermediate EMEG Child	2/2	0
Iron	12,600 – 12,900	50,000	EPA Residential Soil RSL	2/2	0
Lead	**23.5 - 24.9**	NA	NA	2/2	2
Manganese	744 - 961	1,900	EPA Residential Soil RSL	2/2	0
Nickel	16.6 - 20.1	1,000	ATSDR RMEG Child	2/2	0
Vanadium	27.8 - 32.3	520	ATSDR Chronic EMEG Child / RMEG Child	2/2	0
Zinc	37.5 - 40	1,600	ATSDR Chronic EMEG	2/2	0

Abbreviations: CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; RMEG = reference dose media equivalent; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; NA = not available. Bolded value indicates concentration exceeds comparison value/other screening value.

Table 27 Detected on-site soil contaminants from 2016 composite grid sampling

Contaminant	Concentration Range (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Aluminum	2,050 – 16,300	52,000	ATSDR Chronic EMEG Child	77/77	0
Antimony	0.236 - **102**	21	ATSDR RMEG Child	11/77	3
Arsenic	3.62 - 14.9	16	ATSDR Chronic EMEG Child	74/77	0
Barium	32.5 - 558	10,000	ATSDR Chronic EMEG Child RMEG Child	77/77	0
Beryllium	0.195 – 1.17	100	ATSDR Chronic EMEG Child/REMG Child	77/77	0
Cadmium	0.245 - **172**	5.2	ATSDR Chronic EMEG Child	77/77	19
Chromium	9.18 – **13,000**	NA	NA	77/77	0
Trivalent Chromium*	0 – 11,400	78,000	ATSDR Chronic RMEG Child	NA/77	0
Hexavalent Chromium	**0.964 – 5,620**	0.22	ATSDR CREG	77/77	77
Cobalt	3.15 – 13.4	520	ATSDR Intermediate EMEG Child	77/77	0
Copper	6.66 – **1,930**	520	ATSDR Intermediate EMEG Child	77/77	4
Iron	5,800 – 48,800	50,000	EPA Residential Soil RSL	77/77	0

Contaminant	Concentration Range (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Lead	**14.6 – 24,500**	NA	NA	77/77	NA
Manganese	345 – 1,590	1,900	EPA Residential Soil RSL	77/77	0
Mercury	0.0848 – **113**	16	ATSDR RMEG Child	76/77	15
Nickel	11.6 – **1,040**	1,000	ATSDR Chronic RMEG	77/77	2
Selenium	0.195 – 8.08	260	ATSDR Chronic EMEG	36/77	0
Silver	0.106 – 7.33	260	ATSDR Chronic RMEG	13/77	0
Thallium	0.098 – 7.53	0.78	EPA Residential Soil RSL	19/77	19
Vanadium	13.2 – 43.2	520	ATSDR Intermediate EMEG	77/77	0
Zinc	24.3 – 1,550	1,600	ATSDR Chronic EMEG	77/77	0

*Trivalent chromium was estimated by subtracting the hexavalent chromium concentrations from the total chromium concentrations.
Abbreviations: CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; RMEG = reference dose media equivalent; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; ND = not detected; NA = not available.
Bolded value indicates concentration exceeds a comparison value/other screening value.

Table 28 Soil contaminant concentrations above comparison values or other screening values and summary statistics for each hypothetical future residential lot

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
5	SS-3-0.0-0.5	Hexavalent Chromium	11.9	11.9	0.22	ATSDR CREG	1/1
		Lead	50.6	50.6	NA	NA	1 / 1
		Mercury	7.6	7.6	5.2	RMEG	1 / 1
8	MW-6-0.0-0.5	Hexavalent Chromium	0.39	0.39	0.22	ATSDR CREG	1 / 1
		Lead	13.4	13.4	NA	NA	1 / 1
10	MW-5-0.0-0.5, SS-1-0.0-0.5	Hexavalent Chromium	1.6 - 5.8	**3.7**	0.22	ATSDR CREG	2 / 2
		Lead	13.4 - 41.8	27.6	NA	NA	2 / 2
11	SS-2-0.0-0.5	Hexavalent Chromium	8.6	8.6	0.22	ATSDR CREG	1 / 1
		Lead	49.7	49.7	NA	NA	1 / 1
12	JSB-8-0.0-0.5	Hexavalent Chromium	12.3	**12.3**	0.22	ATSDR CREG	1 / 1
		Lead	61.7	61.7	NA	NA	1 / 1
13	SS-4-0.0-0.5	Hexavalent Chromium	0.86	0.86	0.22	ATSDR CREG	1 / 1
		Lead	54	54	NA	NA	1 / 1
14	A10-160921-SS-	Hexavalent Chromium	2.22 - 2.26	**2.24**	0.22	ATDSR CREG	2* / 2
		Lead	21.3 - 75.4	48.35	NA	NA	2 / 2

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
		Thallium	0.169 - 1.09	0.63	0.78	EPA Residential Soil RSL	2* / 2
15	B10-160921-SS-06-01, B10-160921-SS-18-01, C10-160921-SS-06-01, C10-160921-SS-18-01	Hexavalent Chromium	2.14 - 2.34	**2.2**	0.22	ATSDR CREG	4*/ 4
		Lead	8.94 - 65.7	39.34	NA	NA	4 / 4
		Thallium	1.03 - 1.11	**1.06**	0.78	EPA Residential Soil RSL	4* / 4
16	D10-160921-SS-06-01, D10-160921-SS-18-01, E10-160923-SS-06-01, E10-160923-SS-18-01	Hexavalent Chromium	2.13 - 2.88	**2.35**	0.22	ATSDR CREG	4* / 4
		Lead	5.81 - 62.5	31.7	NA	NA	4 / 4
		Thallium	0.158 - 1.11	**0.83**	0.78	EPA Residential Soil RSL	4* / 4
17	F9-160923-SS-06-01, F9-160923-SS-18-01	Cadmium	0.639 - 6.95	3.79	5.2	ATSDR Chronic EMEG Child	2 / 2

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
		Hexavalent Chromium	2.34 - 3.4	**2.87**	0.22	ATSDR CREG	2* / 2
		Lead	25.9 - 86.4	56.15	NA	NA	2 / 2
		Thallium	0.196 - 1.16	0.68	0.78	EPA Residential Soil RSL	2* / 2
18	I10-160921-SS-06-01, I10-160921-SS-18-02, I10-160921-SS-12-01, J10-160921-SS-06-01, J10-160921-SS-18-01, MW-4-0.0-0.5	Cadmium	0.211 - 30.5	**5.72**	5.2	ATSDR Chronic EMEG Child	6/ 6
		Hexavalent Chromium	0.63 - 5.89	**2.29**	0.22	ATSDR CREG	4 / 6
		Lead	13.9 - 339	85.25	NA	NA	6 / 6
		Mercury	0.033 - 46.2	8.34	16	ATSDR RMEG Child	6 / 6
		Thallium	0.154 - 1.15	**0.85**	0.78	EPA Residential Soil RSL	6* / 6
19	J9-160921-SS-06-01, J9-160921-SS-18-01	Hexavalent Chromium	2.37 - 2.4	**2.39**	0.22	ATSDR CREG	2* / 2
		Lead	12.4 - 29.2	20.8	NA	NA	2 / 2

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
		Thallium	0.2 - 1.09	0.65	0.78	EPA Residential Soil SL	1 / 2
21	A8-160921-SS-06-01, A8-160921-SS-18-01, A9-160921-SS-06-01, A9-160921-SS-18-02, MW-7-0.0-0.5	Cadmium	0.253 - 5.98	1.47	5.2	ATSDR Chronic EMEG Child	5 / 5
		Hexavalent Chromium	0.95 - 10.4	**3.6**	0.22	ATSDR CREG	2/ 5
		Lead	23.1 - 60.4	35.24	NA	NA	5 / 5
		Thallium	0.45 - 1.16	**0.94**	0.78	EPA RSL	5* / 5
22	B8-160921-SS-06-01, B8-160921-SS-18-01, B9-160921-SS-06-01, B9-160921-SS-18-01, C8-160921-SS-06-01, C8-160921-SS-18-01, C9-160921-SS-06-01, C9-160921-SS-18-01	Hexavalent Chromium	0.799 - 2.23	**2**	0.22	ATSDR CREG	1 / 8
		Lead	4.7 - 194	64.69	NA	NA	8 / 8

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
		Thallium	0.159 - 1.09	**0.92**	0.78	EPA Residential RSL	8* / 8
23	E9-160923-SS-06-01, E9-160923-SS-18-01	Hexavalent Chromium	2.43 - 2.43	**2.43**	0.22	ATSDR CREG	2* / 2
		Lead	89.8 - 157	123.4	NA	NA	2 / 2
24	F7-160412-SS-03-01, F7-160922-SS-18-02, F7-160922-SS-12-01, G7-160412-SS-03-01, G7-160923-SS-18-01, G7-160923-SS-12-01	Antimony	0.292 - 30.9	8.05	21	ATSDR RMEG Child	4 / 6
		Cadmium	1.01 - 172	**38.91**	5.2	ATSDR Chronic EMEG Child	6 / 6
		Copper	11.3 - 545	165	520	Intermediate EMEG Child	6 / 6
		Hexavalent Chromium	1.34 – 5,620	**1,008.27**	0.22	ATSDR CREG	6 / 6
		Lead	28.8 – 5,400	1,710.25	NA	NA	6 / 6
		Mercury	0.921 – 36.4	**13.2**	16	ATSDR RMEG Child	6 / 6
		Nickel	25.5 – 1,470	555.17	1000	ATSDR RMEG Child	6 / 6

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
		Thallium	0.143 - 7.53	**2.8**	0.78	EPA Residential Soil RSL	6* / 6
26	J8-160921-SS-06-01, J8-160921-SS-18-01, JSB-7-0.0-0.5	Hexavalent Chromium	1.1 - 2.38	**1.95**	0.22	ATSDR CREG	1 / 3
		Lead	12.1 - 84	43.4	NA	NA	3 / 3
		Thallium	0.5 - 1.15	**0.91**	0.78	EPA Residential Soil RSL	3* / 3
27	SS-5-0.0-0.5, SS-6-0.0-0.5	Hexavalent Chromium	1.5 - 2.6	**2.05**	0.22	ATSDR CREG	2 / 2
		Lead	47.2 - 95.4	71.3	NA	None	2 / 2
28	A6-160412-SS-03-01, A6-160922-SS-18-01, A7-160412-SS-03-01, A7-160921-SS-18-01	Hexavalent Chromium	2.35 - 235	**114.69**	0.22	ATSDR CREG	4* / 4
		Lead	25.1 - 149	76.13	NA	NA	4 / 4
		Thallium	1.11 - 1.59	**1.33**	0.78	EPA Residential Soil RSL	4* / 4
29	B6-160412-SS-03-01, B6-160922-SS-18-01, B7-160412-	Cadmium	0.309 - 5.53	2.05	5.2	ATSDR Chronic EMEG Child	9 / 9

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
	SS-03-01, B7-160921-SS-18-01, C6-160412-SS-03-01, C6-160922-SS-18-01, C7-160412-SS-03-01, C7-160921-SS-18-01, JSB-10-0.0-0.5						
		Hexavalent Chromium	1.3 - 269	**59.75**	0.22	ATSDR CREG	2 / 9
		Lead	18.1 - 446	121.72	NA	NA	9 / 9
		Thallium	0.192 - 7.47	**1.9**	0.78	EPA Residential Soil RSL	9* / 9
30	D6-160412-SS-03-01, D6-160922-SS-18-01, D6-160922-SS-12-01, D7-160412-SS-03-01, D7-160921-SS-18-01, LPW01-E6-SS-160413-02, E6-160922-SS-06-01, E6-160922-SS-18-01, E6-160922-SS-12-01, E7-160412-	Antimony	0.431 -102	12.03	21	ATSDR RMEG Child	3 / 12

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
	SS-03-01, E7-160922-SS-18-01, E7-160922-SS-12-01						
		Cadmium	0.441 - 80.3	**20.66**	5.2	ATSDR Chronic EMEG Child	12 /12
		Copper	12- 533	165.79	520	ATSDR Intermediate EMEG Child	12 / 12
		Hexavalent Chromium	1.33 – 2,130	**249.45**	0.22	ATSDR CREG	6 / 12
		Lead	17 – 4,500	2,675.77	NA	NA	12/ 12
		Mercury	0.062 – 97,800	**13,432**	16	ATSDR RMEG Child	12 / 12
		Thallium	0.162 - 7.14	**2.37**	0.78	EPA Residential Soil RSL	12* / 12
31	ACMW-1-0.0-0.5, G5-160412-SS-03-01, G5-160922-SS-18-01, G5-160922-SS-12-01, G6-160923-SS-18-01	Cadmium	2.1 - 86.5	**25.74**	5.2	ATSDR Chronic EMEG Child	5 / 5
		Hexavalent Chromium	2.31 - 274	**73.43**	0.22	ATSDR CREG	3 / 5
		Lead	21.5 – 2,890	1,032.1	NA	NA	5 / 5

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
		Mercury	1.01 – 41.7	8.35	16	ATSDR RMEG Child	5 / 5
		Nickel	39.3 – 1,040	354.44	1,000	ATSDR RMEG Child	5 / 5
		Thallium	0.11 - 6.18	**1.77**	0.78	EPA Residential Soil RSL	5* / 5
32	H5-160412-SS-03-01, H5-160921-SS-18-01, I5-160921-SS-06-02, I5-160921-SS-18-01, I6-160921-SS-06-01, I6-160921-SS-18-01	Cadmium	0.199 - 16	2.99	5.2	ATSDR Chronic EMEG Child	6 / 6
		Hexavalent Chromium	2.28 - 273	**47.44**	0.22	ATSDR CREG	6* / 6
		Lead	11.9 - 325	71.7	NA	NA	6 / 6
		Mercury	0.02 – 44.2	7.7	16	ATSDR RMEG Child	6 / 6
		Thallium	0.692 - 1.15	**1.04**	0.78	EPA Residential Soil RSL	6* / 6
33	J5-160921-SS-06-01, J5-160921-SS-18-01, J6-160921-SS-06-01, J6-	Hexavalent Chromium	1.6 - 2.39	**2.17**	0.22	ATSDR CREG	5* / 5

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
	160921-SS-18-01, SS-7-0.0-0.5						
		Lead	10.6 - 34.7	22.12	NA	NA	5 / 5
		Thallium	0.191 - 1.11	**0.79**	0.78	EPA Residential Soil RSL	5* / 5
35	A5-160922-SS-06-01, A5-160922-SS-18-01, JSB-9-0.0-0.5	Hexavalent Chromium	1.2 - 2.54	**1.95**	0.22	ATSDR CREG	3* / 3
		Lead	17.2 - 70.2	40.47	NA	NA	3 / 3
		Thallium	0.221 – 1.0	0.55	0.78	EPA Residential Soil RSL	3* / 3
36	ACMW-4-0.0-0.5, B5-160922-SS-06-01, B5-160922-SS-18-01, C5-160922-SS-06-01, C5-160922-SS-18-01, MW-10-0.0-0.5	Cadmium	0.194 – 9.0	2.08	5.2	ATSDR Chronic EMEG Child	6 / 6
		Hexavalent Chromium	2.06 - 11	**4.5**	0.22	ATSDR CREG	2 / 6
		Lead	15.9 - 172	49.75	NA	NA	6 / 6
		Thallium	0.231 - 1.2	0.64	0.78	EPA Residential Soil RSL	6* / 6

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
37	ACMW-2-0.0-0.5, LPW03-D5-SS-160413-01, D5-160922-SS-06-01, D5-160922-SS-18-01, MW-9-0.0-0.5	Cadmium	0.566 - 48.8	**12.67**	5.2	ATSDR Chronic EMEG Child	5 / 5
		Copper	12.7 – 1,930	467.6	520	ATSDR Intermediate EMEG Child	5 / 5
		Hexavalent Chromium	2.54 - 54.5	**24.26**	0.22	ATSDR CREG	4 / 5
		Lead	26.3 - 973	335.08	NA	NA	5 / 5
		Manganese	283 – 2,210	964	1,900	EPA Residential Soil RSL	5 / 5
		Nickel	24.4 – 1,570	510.98	1,000	ATSDR RMEG Child	5 / 5
		Thallium	0.101 - 5.51	**1.36**	0.78	EPA Residential Soil RSL	5* / 5
38	LPW05-G3-SS-160413-01, JSB-11-0.0-0.5	Cadmium	53.1 - 176	**114.55**	5.2	ATSDR Chronic EMEG Child	2 / 2
		Hexavalent Chromium	267 - 274	**270.5**	0.22	ATSDR CREG	2 / 2
		Lead	854 – 1,340	1,097	NA	NA	2 / 2

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
		Mercury	35 - 41.8	**17.52**	16	ATSDR RMEG Child	2 / 2
		Nickel	873 – 1,040	956.5	1,000	ATSDR RMEG Child	2 / 2
		Thallium	0.53 - 6.47	**3.5**	0.78	EPA Residential Soil RSL	2* / 2
39	H3-160412-SS-03-01, H3-160920-SS-18-01, H4-160412-SS-03-01, H4-160921-SS-18-01, I3-160921-SS-06-01, I3-160921-SS-18-01, I4-160921-SS-06-01, I4-160921-SS-18-01	Cadmium	0.241 - 32.4	**5.46**	5.2	ATSDR Chronic EMEG Child	8 / 8
		Hexavalent Chromium	2.26 - 242	**62.65**	0.22	ATSDR CREG	8* / 8
		Lead	15 - 97	145.13	NA	None	8 / 8
		Mercury	0.076 – 25.7	4.75	16	ATSDR RMEG	8 / 8
		Thallium	0.159 - 1.12	0.87	0.78	EPA Residential Soil RSL	8* / 8
40	J3-160921-SS-06-01, J3-160921-SS-18-	Hexavalent Chromium	2.26 - 2.31	**2.29**	0.22	ATSDR CREG	4* / 4

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
	01, J4-160921-SS-06-01, J4-160921-SS-18-01						
		Lead	14.5 - 293	88.53	NA	NA	4 / 4
		Thallium	1.06 - 1.1	**1.08**	0.78	EPA Residential Soil RSL	4* / 4
43	A2-160412-SS-03-02, A2-160922-SS-18-01, A3-160412-SS-03-01, A3-160922-SS-18-01, B2-160412-SS-03-01, B2-160922-SS-18-01, JSB-5-0.0-0.5, JSB-6-0.0-0.5	Hexavalent Chromium	1.8 - 243	**62.67**	0.22	ATSDR CREG	2 / 8
		Lead	13.6 - 209	52.91	NA	NA	8 / 8
		Thallium	0.164 - 1.63	**1.06**	0.78	EPA Residential Soil RSL	8*/ 8
44	C2-160412-SS-03-01, C2-160922-SS-18-01, C2-160922-SS-12-01, D1-160412-SS-03-01, D1-160920-	Antimony	0.51 - 33.1	4.82	21	ATSDR RMEG Child	2 / 8

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
	SS-18-01, D2-160412-SS-03-01, D2-160922-SS-18-01, D2-160922-SS-12-01						
		Cadmium	0.233 - 30.7	5.16	5.2	ATSDR Chronic EMEG Child	8 / 8
		Copper	7.7 - 736	116.74	520	ATDSR Intermediate EMEG Child	8 / 8
		Hexavalent Chromium	2.14 - 302	**39.86**	0.22	ATSDR CREG	2 / 8
		Lead	10.8 - 1,250	213.58	NA	None	8 / 8
		Mercury	0.166 – 113[1]	**19.3**	16	ATSDR RMEG Child	8 / 8
		Thallium	0.141 - 1.46	0.65	0.78	EPA Residential Soil RSL	8* / 8
45	E1-160412-SS-03-01, E1-160920-SS-18-01, LPW04-E2-SS-160413-01, F1-160412-SS-03-01, F1-160920-SS-18-	Cadmium	0.322 - 8.51	3.05	5.2	ATSDR Chronic EMEG Child	6 / 6

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
	01, F1-160920-SS-12-01						
		Hexavalent Chromium	2.35 - 247	**43.2**	0.22	ATSDR CREG	6* / 6
		Lead	12.9 - 219	78.45	NA	NA	6 / 6
		Mercury	0.272 – 36.5	11.08	16	ATSDR RMEG Child	6 / 6
		Thallium	0.161 - 6.84	**1.42**	0.78	EPA Residential Soil RSL	6* / 6
46	G1-160412-SS-03-01, G1-160920-SS-18-01, H1-160412-SS-03-01, H1-160920-SS-18-01, H2-160412-SS-03-01, H2-160920-SS-18-01, I2-160921-SS-06-01, I2-160921-SS-18-01	Hexavalent Chromium	2.27 - 2.48	**2.36**	0.22	ATDSR CREG	8* / 8
		Lead	12.8 - 72.6	28.33	NA	NA	8 / 8
		Thallium	0.146 - 1.11	0.59	0.78	EPA Residential Soil RSL	8* / 8
47	I1-160920-SS-06-02, I1-160920-SS-18-01, J1-160920-	Hexavalent Chromium	2.25 - 2.31	**2.28**	0.22	ATSDR CREG	6* / 6

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
	SS-06-01, J1-160920-SS-18-01, J2-160921-SS-06-01, J2-160921-SS-18-01						
		Lead	10.2 - 22.5	15.7	NA	NA	6 / 6
		Thallium	0.099 - 1.12	0.44	0.78	EPA Residential Soil RSL	6* / 6
50	A0-160920-SS-06-01, A0-160920-SS-18-01, A1-160412-SS-03-01, A1-160920-SS-18-01, ACMW-3-0.0-0.5, B0-160920-SS-06-01, B0-160920-SS-18-01, B1-160412-SS-03-01, B1-160920-SS-18-01, MW-8-0.0-0.5	Hexavalent Chromium	1.2 - 4.1	**2.29**	0.22	ATSDR CREG	2 / 10
		Lead	8.36 - 36.8	19.14	NA	NA	10/10
		Thallium	0.119 - 2.65	**1.51**	0.78	EPA Residential Soil RSL	10* / 10

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
51	C0-160920-SS-06-01, C0-160920-SS-18-01, C1-160412-SS-03-01, C1-160920-SS-18-01, D0-160920-SS-06-01, D0-160920-SS-18-01	Hexavalent Chromium	2.24 - 2.5	**2.3**	0.22	ATSDR CREG	6* / 6
		Lead	12.3 - 32.9	18.95	NA	NA	6 / 6
52	E0-160920-SS-06-01, E0-160920-SS-18-01, G0-160920-SS-06-01, F0-160920-SS-18-02	Hexavalent Chromium	2.22 - 2.92	**2.58**	0.22	ATSDR CREG	4* / 4
		Lead	13 - 32	17.9	NA	NA	4 / 4
53	G0-160920-SS-18-01, H0-160920-SS-06-01, H0-160920-SS-18-01	Hexavalent Chromium	2.3 - 2.33	**2.32**	0.22	ATSDR CREG	3* / 3
		Lead	13.5 - 16.8	15.53	NA	NA	3 / 3
54	I0-160920-SS-06-01, I0-160920-SS-18-01, J0-160920-SS-06-01, J0-	Hexavalent Chromium	2.27 - 2.32	**2.29**	0.22	ATSDR CREG	4* / 4

Lot Number	Sample IDs in the Lot	Contaminant	Concentration Range (mg/kg)	Average concentration for the lot (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value	Number of detected samples/ Total number of samples
	160920-SS-18-01						
		Lead	13.8 - 22.4	18.1	NA	NA	4 / 4

Abbreviations: CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; RMEG = reference dose media equivalent; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; ND = not detected; NA = not analyzed. Bolded values indicate the average concentration exceeds the CV/other screening level.

*The detection level for thallium (all samples) and hexavalent chromium (in some samples) exceeded the CV. In these cases, the detection values were included in determining average concentrations. For thallium (all samples) and hexavalent chromium (in some samples) the number of detected samples was the same as the total number of samples collected.

1. The highest mercury value was flagged "B" because mercury was also detected in the blank sample. This value was included in determining average concentration.

Table 29 Detected contaminants in off-site surface soil samples

Contaminant	Concentration Range (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Aluminum	3,170 – 20,300	52,000	ATSDR Chronic EMEG Child	20/20	0
Antimony	ND - 0.9	21	ATSDR RMEG Child	1/20	0
Arsenic	ND - 8.1	16	ATSDR Chronic EMEG Child	18/20	0
Barium	48.8 - **117**	100	ATSDR Chronic EMEG Child/REMG Child	20/20	4

Contaminant	Concentration Range (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Beryllium	ND - 0.84	10,000	ATSDR Chronic EMEG Child RMEG Child	14/20	0
Cadmium	ND - **7.3**	5.2	ATSDR Chronic EMEG Child	13/20	1
Chromium (Total)	8 – 1,440	NA	NA	20/20	NA
Chromium (Hexavalent)	**0.39 - 12.3**	0.22	ATSDR CREG	17/17	17
Cobalt	3.9 - 10.5	520	ATSDR Intermediate EMEG Child	20/20	0
Copper	4.4 - 61.7	520	ATSDR Intermediate EMEG Child	20/20	0
Cyanide	ND - 3.7	33	ATSDR RMEG Child	20/20	0
Iron	3,130 – 17,000	50,000	EPA Residential Soil RSL	20/20	0
Lead	**13.4 - 171**	NA	NA	20/20	20
Manganese	591 – 1,480	1,900	EPA Residential Soil RSL	20/20	0
Mercury	ND - 7.6	16	ATSDR RMEG Child	20/20	0
Nickel	8.5 - 78.5	1,000	ATSDR Chronic RMEG	18/20	0
Selenium	ND - 0.59	260	ATSDR Chronic EMEG	20/20	0

Contaminant	Concentration Range (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Thallium	ND - 0.1	0.78	EPA Residential Soil RSL	3/20	NA
Vanadium	14.2 - 42.5	520	ATSDR Intermediate EMEG	20/20	0
Zinc	11.9 - 108	1,600	ATSDR Chronic EMEG	20/20	0

Abbreviations: CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; RMEG = reference dose media equivalent; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; ND = not detected; NA = not available.
Bolded values indicate concentration exceeds the CV/other screening level.

Table 30 Detected contaminants in surface soil samples from the Barack Obama Male Leadership Academy

Contaminant	Concentration Range (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Arsenic	6.9 – 8.8	16	ATSDR EMEG ATSDR	3/3	0
Chromium	25 - 35	12,000	EPA Residential Soil RSL	3/3	0
Hexavalent Chromium	ND	0.22	ATSDR CREG	0/3	0
Lead	13 - 18	NA	NA	3/3	NA
Mercury	ND - 0.059	16	ATSDR RMEG Child	1/3	0

Abbreviations: CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; RMEG = reference dose media equivalent; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; ND = not detected; NA = not available.

Table 31 Detected contaminants in soil samples collected northeast of the site

Contaminant	**Concentration Range (mg/kg)**	**CV or other screening value (mg/kg)**	**CV or other screening value source**	**Number of detected samples/ Total number of samples**	**Number of Samples Exceeding Comparison Value**
Aluminum	3,800 – 7,800	52,000	ATSDR Chronic EMEG Child	8/8	0
Antimony	1.1 -1 .6	21	ATSDR RMEG Child	8/8	0
Arsenic	3 - 4.7	16	ATSR EMEG	8/8	0
Barium	57.3 – 114	10,000	ATSDR Chronic EMEG Child/REMG Child	8/8	0
Beryllium	0.6-0.8	100	ATSDR Chronic EMEG Child / RMEG Child	8/8	0
Cadmium	0.6-0.8	5.2	ATSDR Chronic EMEG Child	8/8	0
Chromium	4.6 -10.9	NA	NA	8/8	0
Hexavalent Chromium	0.18 – **2.4**	0.22	ATSDR CREG	8/8	4
Cobalt	5.1 - 9.7	520	ATSDR Intermediate EMEG Child	8/8	0

Contaminant	**Concentration Range (mg/kg)**	**CV or other screening value (mg/kg)**	**CV or other screening value source**	**Number of detected samples/ Total number of samples**	**Number of Samples Exceeding Comparison Value**
Copper	5.9 - 11.1	520	ATSDR Intermediate EMEG Child	8/8	0
Iron	5,940 – 8,390	50,000	EPA Residential Soil RSL	8/8	0
Lead	14.3 – 77.3	NA	NA	8/8	NA
Manganese	745 -1,240	1,900	EPA Residential Soil RSL	8/8	0
Mercury	0.076 - 0.101	16	ATSDR RMEG Child	8/8	0
Nickel	11.1 – 18.1	1,000	ATSDR Chronic RMEG	8/8	0/8

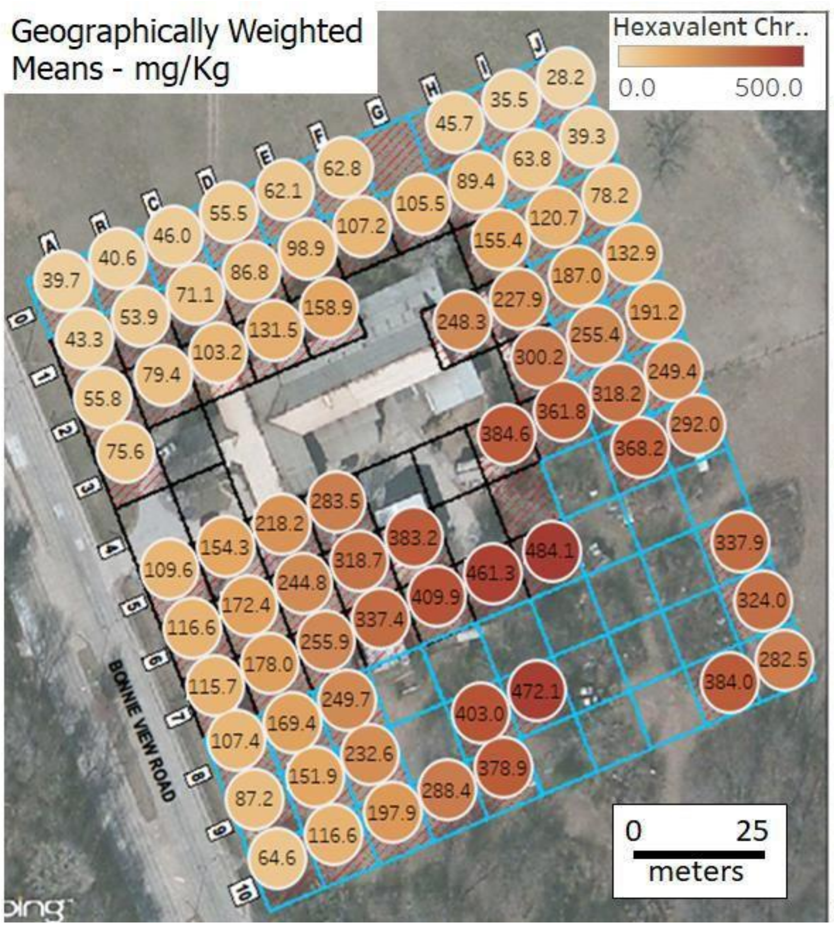
Abbreviations: CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; RMEG = reference dose media equivalent; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; ND = not detected; NA = not available. Bolded value indicates concentration exceeds the CV/other screening level.

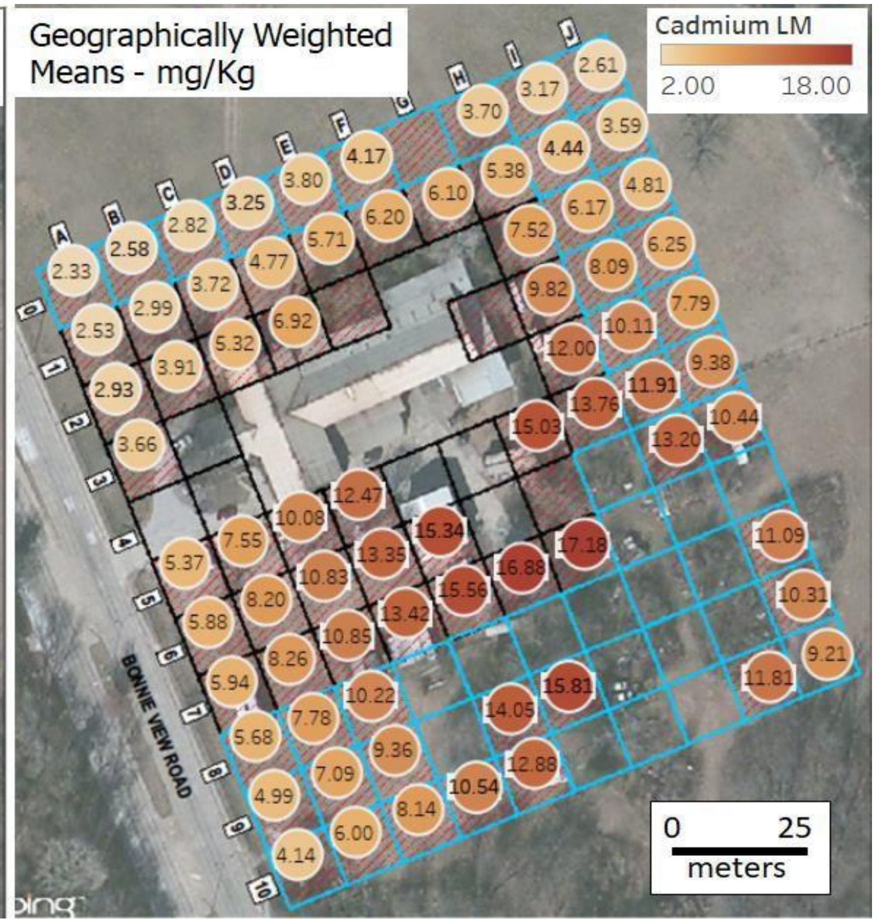
Table 32 Detected contaminants in residential yards soil samples

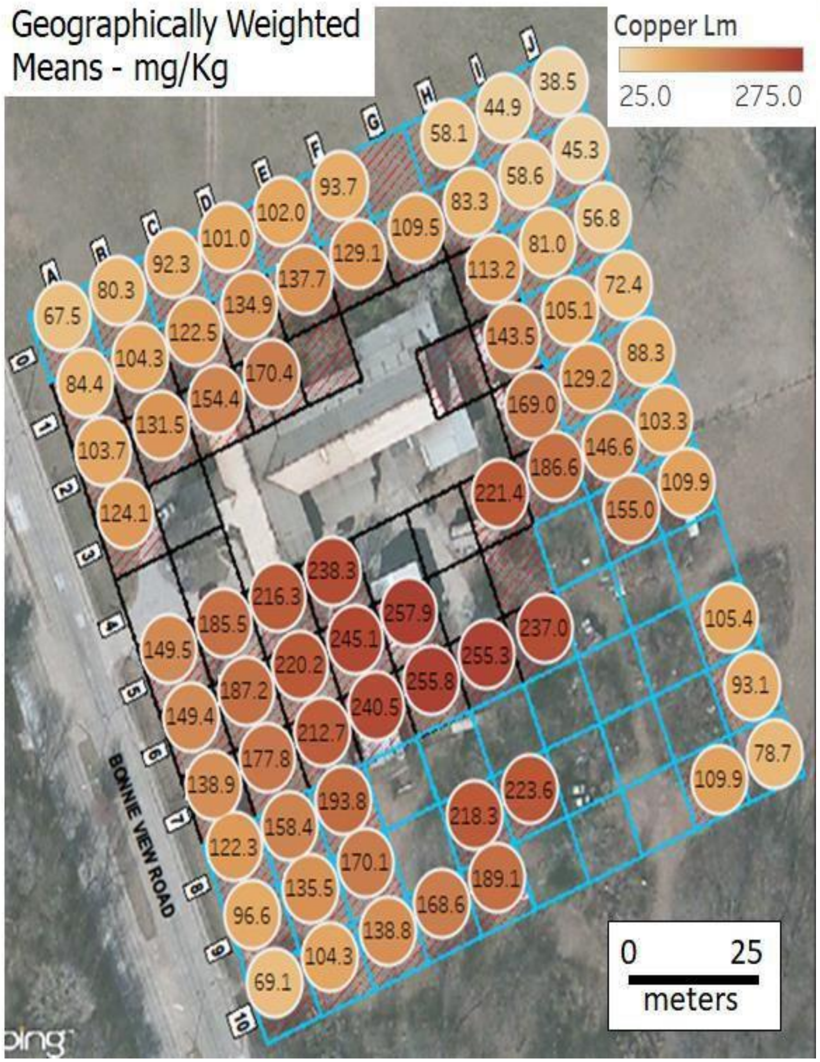
Contaminant	Concentration Range (mg/kg)	CV or other screening value (mg/kg)	CV or other screening value source	Number of detected samples/ Total number of samples	Number of Samples Exceeding Comparison Value
Arsenic	6.3 - **37**	16	ATSDR EMEG	8/8	1
Chromium	13.0 – 35	NA	NA	8/8	0
Hexavalent Chromium	ND - **2.2**	0.22	ATSDR CREG	2/8	2
Lead	18 – 59	NA	NA	8/8	NA
Mercury	ND – 0.036	16	ATSDR RMEG Child	1/2	0

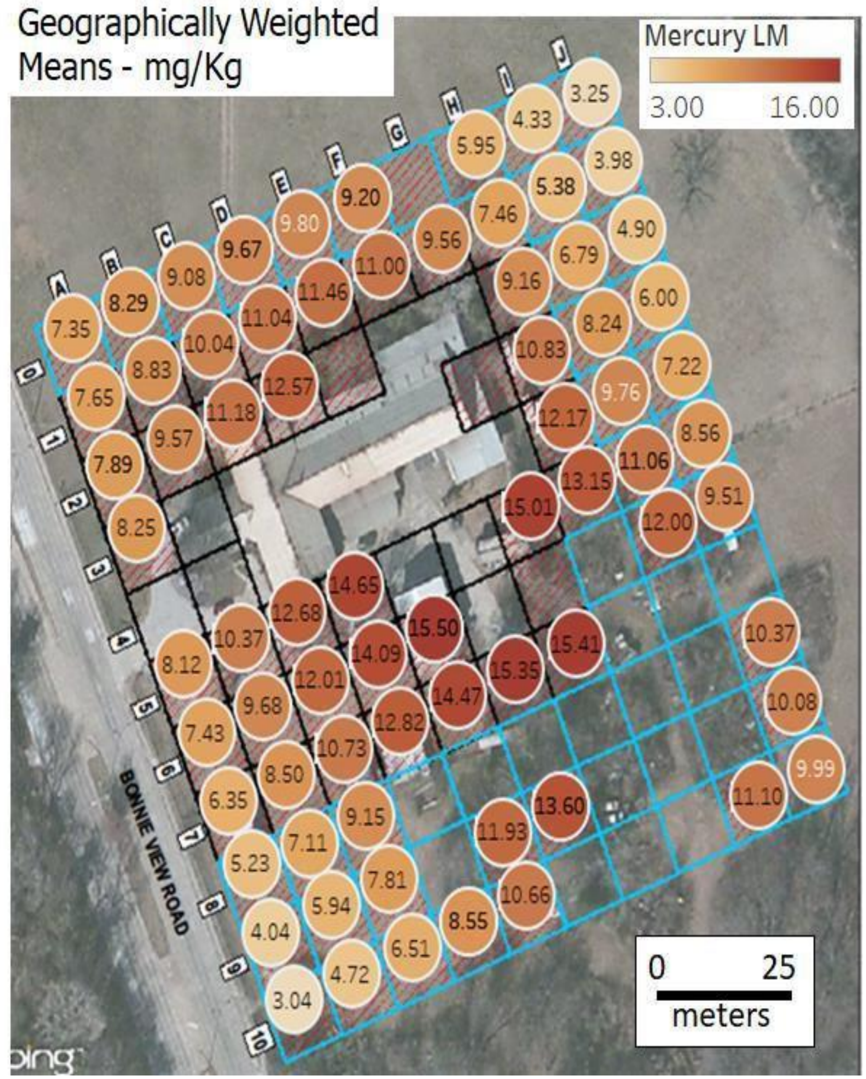
Abbreviations: CV = comparison value; ATSDR = Agency for Toxic Substances and Disease Registry; EMEG = environmental media evaluation guides; EPA = Environmental Protection Agency; RSL = regional screening levels; CREG = cancer risk evaluation guides; ND = not detected; NA = not available. Bolded value indicates concentration exceeds the CV/other screening level.

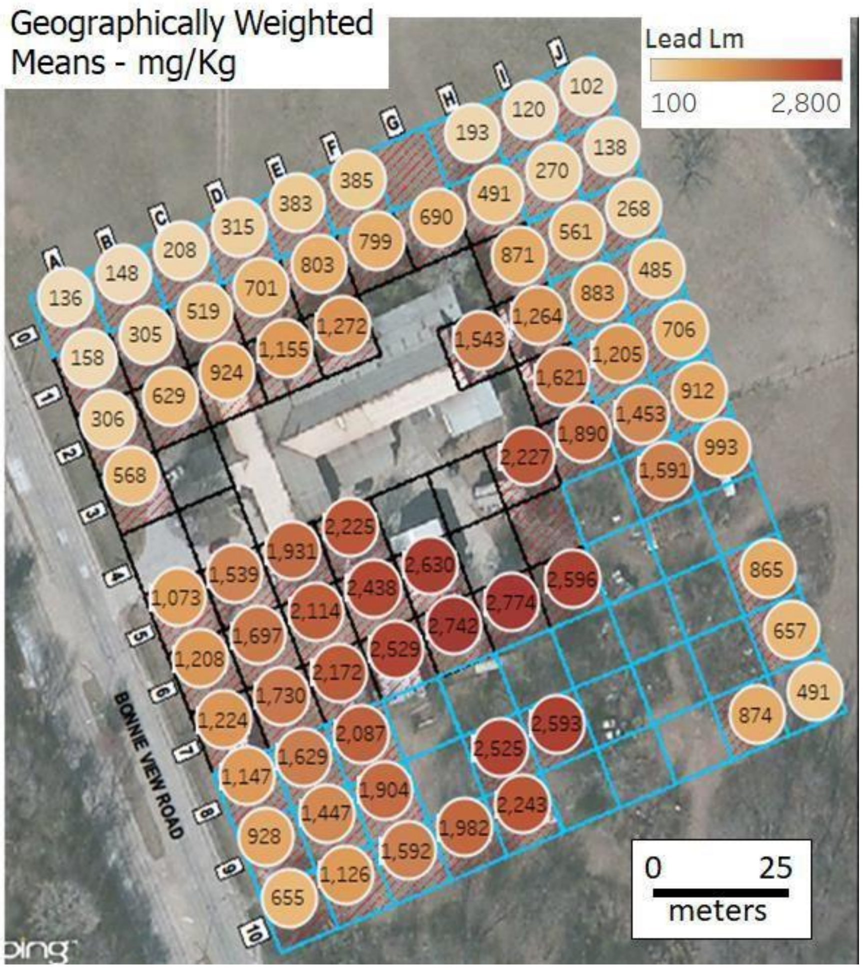
Appendix C. Geographically weighed means distribution of soil concentrations on-site soils samples






Geographically Weighted
Means - mg/Kg
Copper Lm
25.0
275.0
0
25
meters
BONNIE VIEW ROAD


Geographically Weighted
Means - mg/Kg
Mercury LM
3.00
16.00
0
25
meters
BONNIE VIEW ROAD


Geographically Weighted
Means - mg/Kg
Lead Lm
100
2,800
0
25
meters
BONNIE VIEW ROAD
A
B
C
D
E
F
G
H
I
J
0
1
2
3
4
5
6
7
8
9
10
136
148
208
315
383
385
193
120
102
158
305
519
701
803
799
690
491
270
138
306
629
924
1,155
1,272
871
561
268
568
1,543
1,264
883
485
1,621
1,205
706
2,227
1,890
1,453
912
1,591
993
1,073
1,539
1,931
2,225
2,630
2,438
2,114
2,774
2,596
865
1,208
1,697
2,529
2,742
657
1,224
1,730
2,172
2,087
2,525
2,593
874
491
1,147
1,629
1,904
2,243
928
1,447
1,592
1,982
655
1,126

Appendix D: Exposure Dose Equation Analysis

Estimated exposure doses are calculated to determine the amount of a chemical that could get into the body. These estimated exposure doses are calculated using the chemical concentration (ex. exposure point concentrations) and default exposure parameters from ATSDR's Public Health Assessment Guidance Manual[1] EPA's Exposure Factors Handbook[2], and ATSDR's Exposure Dose Guidance documents[3,4,5] when site specific information is unknown. In the health consultation, DSHS estimated the surface water incidental ingestion and dermal absorption while swimming, dermal absorption and incidental sediment ingestion while wading, dermal absorption and incidental ingestion from surface soil.

Incidental Surface Water Ingestion Dose Equation

$$D = (C \; x \; IR \; x \; Tevent \; x \; EV \; x \; EF) / \; BW$$

D = Exposure Dose (mg/kg-day)
C = Contaminant Concentration (mg/L)
IR = Ingestion Rate (L/day)
T_{event}=Event Duration (hr/event)
EV= Event Frequency (events/day)
EF= Exposure Factor (Unitless)* default of 1, assuming person daily exposure.
BW = Body Weight (kg)

Soil and Sediment Incidental Ingestion Dose Equation

$$D = (C * IR * EF * CF) / BW$$

D = Exposure Dose (mg/kg-day)
C = Contaminant Concentration (mg/kg)
IR = Intake Rate (mg/day)
EF = Exposure Factor (unitless)
CF = Conversion Factor (10-6 kg/mg)

---

[1]Agency for Toxic Substances and Disease Registry, Public Health Assessment Guidance Manual (PHAGM), U.S. Department of Health and Human Services. Public Health Service, 2021: Atlanta, Georgia. https://www.atsdr.cdc.gov/pha-guidance/

[2] U.S. Environmental Protection Agency (EPA). (2011) Exposure Factors Handbook: 2011 Edition. National Center for Environmental Assessment, Washington, DC; EPA/600/R-09/052F. Available online at: https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236252

[3] Agency for Toxic Substances and Disease Registry. 2018. Exposure Dose Guidance for Dermal and Ingestion Exposure to Surface Water. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, Sept 25.

[4]Agency for Toxic Substances and Disease Registry. 2018. Exposure Dose Guidance for Soil and Sediment Ingestion. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, July 31.

[5] Agency for Toxic Substances and Disease Registry. 2016. Exposure Dose Guidance for Soil/Sediment Dermal Absorption. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, October 31.

BW = Body Weight (kg) Soil Administered Dermal Dose Equation

Administered Dermal Dose Equation

$$ADD = (C * EF * CF * AF * ABSd * SA) / (BW * ABSgi)$$

AAD = Administered Dermal Dose (mg/kg-day)
C = Contaminant Concentration (mg/kg)
EF = Exposure Factor (unitless)
CF = Conversion Factor (10^{-6} kg/mg)
AF = Adherence Factor to Skin (mg/cm^2-event)
ABS_d = Dermal Absorption Fraction to Skin (unitless)
SA = Skin Surface Area Available for Contact (cm^2)
BW = Body Weight (kg)
ABS_{GI} = Gastrointestinal Absorption Factor (unitless)

Exposure Factor Equation

$$EF = (F * ED)\ AT$$

EF= Exposure factor (unitless)

F = Exposure frequency (d/wk x wk/yr)
ED = Exposure duration (yr)
AT = Averaging time
Noncancer = ED (yr) x F (d/wk x wk/yr)
Cancer = 78 yr x F (7d/wk x 52.14 wk/yr)

Table 33 Parameters used in the dermal absorbed dose calculations from skin contact to soil, sediment, and surface water

Exposure Group	Body Weight (kg)	Age-Specific Exposure Duration (years) CTE	Age-Specific Exposure Duration (years) RME	Adherence Factor to Skin (mg/cm^2-event)	Combined Skin Surface Area (cm^2) for wading and contact to surface water	Combined Skin Surface Area (cm^2) for swimming and contact to surface water	Combined Skin Surface Area (cm^2) for contact with sediment or soil
Birth to < 1 year	7.8	1	1	0.2	NC	NC	NC
2 to < 6 years	17.4	4	4	0.2	NC	NC	NC
6 to < 11	31.8	5	5	0.2	3,824	10,800	3,824
11 to < 16	56.8	1	5	0.2	5,454	15,900	5,454
16 to < 21	71.6	0	5	0.2	6,083	18,400	6,083
Adult	80	12	33	0.07	7,325	19,811	6,030

Abbreviations: kg = kilogram; CTE = central tendency exposure; mg/cm^2 = milligram per square centimeter; cm^2 = square centimeter; NC = Not Calculated

Table 34 Parameters used for dermal contact dose calculations

Contaminant Name	Entered Concentration (mg/kg)	EPC Type	Converted Concentration* (mg/kg)	Dermal Absorption Fraction	ABS_{GI}	Bioavailability Factor
Arsenic	37	Maximum	37	0.03	1	0.6
Hexavalent Chromium	2.2	Maximum	2.2	0.01	0.025	1

Abbreviations: ABS_{GI} = gastrointestinal absorption factor; EPC = exposure point concentration; mg/kg = milligram chemical per kilogram soil
* Contaminant concentration converted to standard unit for calculating exposure.

Table 35 Parameters used in the incidental surface water ingestion and incidental ingestion of soil and sediment dose calculations

Exposure Group	Body Weight (kg)	Age-Specific Exposure Duration (years) CTE	Age-Specific Exposure Duration (years) RME	Surface water Intake Rate (L/hr)) CTE	Surface water Intake Rate (L/hr) RME	Soil And Sediment Intake Rate (mg/day) CTE	Soil And Sediment Intake Rate (mg/day) RME
Birth to < 1 year	7.8	1	1	NC	NC	NC	NC
2 to < 6 years	17.4	4	4	NC	NC	60	200
6 to < 11	31.8	5	5	0.0490	0.120	60	200
11 to < 16	56.8	1	5	0.0490	0.120	30	100
16 to < 21	71.6	0	5	0.0490	0.120	30	100
Adult	80	12	33	0.0210	0.0710	30	100

Abbreviations: ABS_{GI} = gastrointestinal absorption factor; EPC = exposure point concentration; mg/kg = milligram chemical per kilogram soil; mg/kg = milligrams per kilogram NC= Not Calculated
* Contaminant concentration converted to standard unit for calculating exposure.

Appendix E: Noncancer and Cancer Risk Evaluation

Noncancer Evaluation

$$Hazard\ Quotient = \frac{Dose}{MRL}$$

or

$$Hazard\ Quotient = \frac{Dose}{RfD}$$

Cancer Risk Equations

$$Cancer\ Risk = Dose\ x\ Cancer\ Slope\ Factor\ x\ \frac{ED}{Lifetime\ in\ years}$$

These exposures were averaged over a lifetime of 78 years.

$$ADAF\ Adjusted\ Cancer\ Risk = Dose\ x\ Cancer\ Slope\ Factor\ x\ \frac{ED}{Lifetime\ in\ years}\ x\ ADAF$$

Appendix F: Background Concentrations

Table 36 Concentrations of metals in soil collected from nearby background locations surrounding the site

Contaminant	Background Range Concentrations (mg/kg)	On-Site Maximum Concentration (mg/kg)
Aluminum	3,141 – 7,800	16,300
Antimony	ND	30.9
Arsenic	ND - 8.8	14.9
Barium	17.2 - 152	210
Beryllium	ND - 0.8	0.977
Cadmium	ND - 0.8	86.5
Calcium	104,000 – 222,001	215,000
Chromium	3.9 - 10.9	11,400
Chromium (hexavalent)	ND - 2.4	5,620
Cobalt	ND - 11.9	13.4
Copper	4.9 - 12.8	736
Iron	3,901 – 13,300	48,800
Lead	7.9 - 77.3	5,400
Magnesium	1,311 – 2,100	3,010
Manganese	317 – 1,360	1,590
Mercury	ND	1,130
Nickel	7.1 - 21.2	1,040
Potassium	447 – 1,130	3,310
Selenium	ND – 1,130	1.25
Silver	ND	3.03
Sodium	75.1 - 442	158
Thallium	ND	0.205
Vanadium	12 - 54.3	42
Zinc	11.5 - 47.5	1,550

Abbreviations: mg/kg = microgram per kilogram; ND = not detected

Table 37 Concentrations of metals in surface water collected from nearby background locations from creeks surrounding the site

Contaminant	Background Range Concentrations (ug/L)	Maximum Concentration Near the site (ug/L)
Aluminum	ND - 785	4,380
Arsenic	ND	17.6
Barium	36.1 - 95.3	127
Calcium	52,600 – 124,000	135,000
Chromium	ND	51.3
Copper	ND	13.9
Iron	ND - 992	254,000
Lead	ND - 6.9	6.2
Magnesium	1,570 – 3,120	8240
Manganese	25.6 - 384	2730
Nickel	ND	42.6
Potassium	1,670 – 5,990	5340
Sodium	2,020 – 19,200	79,000
Vanadium	ND	75.9
Zinc	ND - 29	239

Abbreviations: µg/L = microgram per liter; ND = not detected

Table 38 Concentrations of metals and cyanide in sediment collected from nearby background locations from creeks surrounding the site

Contaminant	Background Range Concentrations (mg/kg)	Maximum concentration near the site (mg/kg)
Aluminum	1,740 – 6,950	8,050
Arsenic	2.7 - 5.5	8
Barium	36.6 - 95.7	120
Beryllium	ND	0.7
Cadmium	ND	0.7
Calcium	117,000 – 188,000	188,000
Chromium	3.7 - 15.7	87.3
Cobalt	4.3 - 9	10.4
Copper	0.119 - 21.6	30.9
Cyanide	ND	6.7
Iron	4,860 – 8,640	16,300
Lead	0.0317 - 42.7	120
Magnesium	1,510 – 3,250	3,330
Manganese	365 – 1,270	1,530
Mercury	ND	9.1
Nickel	0.0594 - 17.9	22.3
Potassium	262 – 1,640	1,370
Sodium	90.6 - 544	170
Thallium	ND	0.4
Vanadium	17.9 - 28.3	38
Zinc	0.249 - 89.6	111

Abbreviations: mg/kg = milligrams per kilogram; ND = not detected.