Evaluation of C&R Battery 2018 5-Year Review for Public Health Impact

C&R BATTERY CO., INC.
CHESTERFIELD COUNTY, VIRGINIA

Letter Health Consultation

January 28, 2022

Virginia Department of Health
Office of Environmental Health Services
109 Governor Street
Richmond, Virginia 23219

COMMONWEALTH of VIRGINIA

Department of Health

Colin M. Greene, MD, MPH
Acting State Health Commissioner

P O BOX 2448
RICHMOND, VA 23218

TTY 7-1-1 OR
1-800-828-1120

January 28, 2022

Mr. Christian W. Matta (3SD23)
Remedial Project Manager
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Matta:

The Department of Environmental Quality (DEQ) asked The Virginia Department of Health (VDH) Office of Environmental Health Services (OEHS) to evaluate the C&R Battery Company site (2018 Five-year Review) for public health implications. Through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), VDH has completed reviewing the U.S. Environmental Protection Agency's (EPA's) fifth Five-year review of the site, dated September 2018, along with other historical documents.

SUMMARY

The Virginia Department of Health concludes:

- Drinking groundwater from private wells is not expected to harm people's health. Lead is not migrating from soil to groundwater because of the soil's high clay content and the closure of a former acidic pond (following Resource Conservation and Recovery Act [RCRA] closure requirements). However, because of the low pH of the groundwater, leaching of lead and other contaminants from old water distribution private well pipes is possible.
- Exposure to residual onsite soil lead contamination will not harm the health of people in Chesterfield County because the soil will be managed according to the approved *Soil Management Plan (USEPA 2020).* There is no known offsite soil lead contamination as all lead contamination remained onsite at the 1306 and 1320 Bellwood Street property parcels.
- Breathing in fugitive dust from the site will not harm people's health because contaminated shallow onsite soils have been excavated and clean fill has been added to the site.

In support of the EPA's planned action, the Virginia Department of Health recommends that DEQ:

- Implement institutional controls executed pursuant to the Virginia Uniform Environmental Covenants Act, §§ 10.1-1238 et seq. of the Code of Virginia ("UECA") and 9VAC15-90. These covenants will enforce the implementation of the *Soil Management Plan*.
- Implement a soil management plan to direct how to properly manage any surface or subsurface soil that in the future needs to be excavated or removed on the site.
- Re-evaluate site conditions and subsurface soil with EPA and DEQ standards of protectiveness if any soil removal or demolition of buildings/structures is required, or if land use restrictions change in the future to permit residential use.

BACKGROUND

Removal Action

C&R Battery Company is located next to the James River in Chesterfield County south of Richmond, Virginia. Land use surrounding the site is primarily commercial and light industrial, with no residences nearby. A map of the site can be found in *Attachment A. Site Map*. The C&R Battery Company operated a battery recycling operation at the site from 1973-1985. The operation used a mobile crusher in multiple locations across the site, resulting in widespread contamination. In addition, the company conducted the following activities at the site:

- Breaking open batteries from cars and trucks
- Pouring battery acid into unlined pits
- Extracting and recycling lead from batteries
- Shredding and stockpiling empty battery casings.
- Burying whole batteries in the ground (in some places)
- Crushing casings, which were found across the site

The Virginia State Water Control Board became concerned about groundwater contamination and began monitoring the site in the late 1970s, finding lead in soil, surface water, and groundwater.

- In 1983, the Virginia Occupational Safety and Health Administration inspected the site and found airborne lead concentrations that exceeded the permissible exposure limit of 50 micrograms per cubic meter of air.
- In 1986, EPA investigated the site and collected samples of soil, surface water, and groundwater. Onsite soil was contaminated, and laboratory analysis indicated that concentrations were sufficient to warrant a removal action under Section 104 of CERCLA (42 USC Section 9604) during the summer of 1986.
- The following year, the site was placed on the National Priorities List (NPL).

Contaminants of Concern

EPA found the primary contaminant of concern at the site was lead, which was present onsite in surface soil at an average concentration of 17,890 milligrams per kilogram (mg/kg). The average

lead concentration in eastern United States soil is 17 mg/kg (NUS Corporation, 1990a; NUS Corporation, 1990b). Because of the extremely high lead concentration and the potential occupational health risk for exposed workers, an action level of 1,000 mg/kg lead in soil was set for the site to be protective for industrial/commercial workers. EPA has remediated contaminated surface and subsurface soil so that on-site surface soils are below the action level of 1,000 mg/kg for lead.

The 1990 Record of Decision (ROD) determined that groundwater migration of lead was not a hazard (US Environmental Protection Agency, 1990). Monitoring wells showed lead concentrations above background, but below the EPA standard at that time, which was set at 50 parts per billion (ppb). The current EPA action level for lead of 15 ppb for municipal water systems was not established until 1991 (US Code of Federal Regulations, 1991). A layer of clay underlying lead-contaminated soils prevents migration of lead into deeper soil and groundwater.

Site Remediation Measures

The 1990 Record of Decision called for the following:

1) excavating surface and subsurface soils containing lead above the 1,000 mg/kg action level,
2) closing a former acidic pond following RCRA closure requirements,
3) backfilling all excavated areas with six inches of clean topsoil, and
4) planting vegetation over all areas with lead levels above 120 mg/kg (US Environmental Protection Agency, 1990)

The *first Five-year Review* noted that the soil cleanup standard used was for industrial sites (1,000 mg/kg) and would not be protective in the event of residential use (US Environmental Protection Agency, Region III, 1998).

EPA recommended the following:

- A residential standard of 500 mg/kg for residential use
- A follow-up evaluation if land use changes to determine any further actions needed
- Continued groundwater monitoring for low pH

The *second Five-year Review* recommended

- Institutional controls to restrict land use to industrial
- Additional investigation of groundwater pH and manganese

The *third and fourth Five-year Reviews* reported land use restrictions and low groundwater pH as continuing issues.

The *fifth Five-year Review, which EPA released in September 2018*

- Concluded the low groundwater pH was typical for the area and not a result of the acid waste pond and
- Recommended requiring land use restrictions before repurposing the land.

Site Visit

The site encompasses two land parcels that EPA determined require land use restrictions.

- One parcel of land (1306 Bellwood Road) is owned by Capitol Oil, which is currently operating a business.
- The second parcel (1320 Bellwood Road) is owned by a real estate developer and is not currently used.

On October 18, 2018, The Virginia Office of Environmental Health Services (OEHS) visited the site and observed the following:

- The gate at the entrance to the parcel located at 1320 Bellwood Road was secured with a new chain and padlock (see *Attachment C. Site Photos, October 18, 2018*);
- The 1320 Bellwood Road parcel was heavily overgrown with grass, shrubs, and small trees.
- The 1320 Bellwood Road parcel appeared enclosed in a chain link fence, but tree cover limited most visibility from neighboring businesses (Capitol Oil Services Propane and C.D. Hall Construction).
- A faint trail at the gate and litter inside the gate of the 1320 Bellwood Road parcel appeared to indicate that trespassers had access at some time, but the gate shows no signs of being opened recently and the lock is secure.

DISCUSSION

Groundwater Evaluation

During the initial evaluation from August 1988 to January 1990, monitoring wells around the site and nearby private wells were sampled and tested for lead (NUS Corporation, 1990a). Compared to an up-gradient well, concentrations were not above background levels.

However, low groundwater pH raised the possibility that the acid pool clean closure was not effective. Drinking water has no health-based standard for pH, but a pH below 6.5 can give water a bitter, metallic flavor and corrode fixtures. In addition, acidic groundwater could allow lead and other contaminants to leach from soil. A reservoir of acid-contaminated soil could also be hazardous to people excavating the area if the pH is very low.

Early groundwater studies found an elevated concentration of manganese that decreased over time. While metal concentrations in groundwater were not found to be a human health hazard, EPA was concerned about a future health hazard if the low groundwater pH was caused by site activity.

To address the groundwater pH concerns, in 2015 and 2016 groundwater was sampled on 4 background wells in the vicinity of the site to establish background pH (Arcadis Design and Consultancy, 2016).

- Three wells, BG-01, BG-02, and BG-03, were located within approximately 250 feet east of the site.
- The last well, BG-04, was located approximately 700 feet west of the site.

- All background wells were located upgradient of the site along Bellwood Road to obtain groundwater quality data.

Groundwater samples were previously collected from Defense Supply Center Richmond (DSCR) monitoring wells as background data. DSCR is a 640-acre active federal facility and Superfund Site in Chesterfield County, Virginia, about eight miles south of Richmond, Virginia. The pH of the DSCR samples was similar to the samples from the C&R Battery background wells, but EPA had concerns about whether DSCR monitoring wells groundwater samples were representative of background conditions. All DSCR monitoring wells are located within approximately two miles of the site.

Table 1. Groundwater pH Measurements

Location	Number of Wells	Samples	pH Measurement		
			Minimum	Median	Maximum
C&R background	4	16	3.7	4.7	5.8
DSCR background*	10	24	3.8	4.8	5.9
Site wells	6	60	4.0	4.9	5.8

* Defense Supply Center Richmond (nearby surficial aquifer)
Arcadis Design and Consultancy. Former C&R Battery Site—September 2016 Background Water Quality Sampling Results. November 15, 2016.

The pH of the six wells on the site was in the same range as both the background groundwater pH near the site and the pH in the more distant DSCR background wells. EPA concluded that the pH of groundwater on the site was naturally low and not caused by persisting acid in site soil. EPA notified Verizon that groundwater sampling could be discontinued (US Environmental Protection Agency, Region III, 2017).

Soil Sampling Discrepancies

In the 1990 Remedial Investigation report, lead was reported to exceed the action level of 1,000 mg/kg at depths 6–15 feet below ground surface, primarily in the south-central portion of the site (see *Attachment B. Soil Lead Concentrations (mg/kg)* from Final *Remedial Investigation*).

- The 1991 Treatability and Site Characterization Report (Woodward-Clyde, 1991) did not corroborate these findings, but only two deep soil samples were taken, and they were not in areas examined in the remedial investigation.
- To address these discrepancies, the fifth five-year review conducted in 2018 concluded that areas of soil contamination above the action level of 1,000 mg/kg were not likely to remain at depths 6–15 feet below ground surface at the original depth.
- To delineate these areas of soil contamination above the action level of 1,000 mg/kg, EPA recommended additional sampling as part of its fifth five-year review (US Environmental Protection Agency, 2018).

Potential for Lead in Soil

The 2018 fifth five-year review by EPA investigated the likelihood of remaining areas of subsurface lead soil contamination (US Environmental Protection Agency, 2018).

- EPA reports that soil with elevated lead remains in place beneath and immediately adjacent to structures, including an office building and tank farm on the portion of the site occupied by Capitol Oil Company.
- Therefore, EPA suggests institutional controls to mitigate the hazards of excavating soil with lead concentrations greater than the action level.
- EPA concluded that restricting the disturbance of soil deeper than 1 foot below the existing grade would eliminate the potential for exposure to lead from subsurface soil (US Environmental Protection Agency, Region III, 2018).

In 2020, EPA Approved a *Soil Management Plan* for both properties associated with the C&R Battery Superfund Site (US Environmental Protection Agency, 2020). The plan specifies how to properly manage soil where lead concentration may exceed 1,000 mg/kg. The requirement to follow the *Soil Management Plan* will be mentioned in the Uniform Environmental Covenant in the land records for 1306 Bellwood and 1320 Bellwood properties. The environmental covenants executed pursuant to the Virginia Uniform Environmental Covenants Act, §§ 10.1-1238 et seq. of the Code of Virginia ("UECA") and 9VAC15-90, are currently under development by the landowner, EPA, and DEQ and projected to be finalized by early 2022. The environmental covenant will prevent residential use of both properties, will restrict excavation of soil except in accordance with the *Soil Management Plan*, and require suitable wear surface be installed for vehicular traffic and parking to prevent disturbance of subsurface soil and erosion.

Exposure Pathways

VDH's health evaluations are exposure driven. Exposure might occur by eating food, drinking water, breathing air, or having skin contact with a substance containing the contaminant. However, a release does not always result in exposure. An exposure pathway has the following five elements (US Department of Health and Human Services, 2005):

- a source of contamination (*e.g.*, spill or release);
- an environmental media and transport mechanism (*e.g.*, groundwater);
- a point of exposure (*e.g.*, tap water);
- a route of exposure (*e.g.*, drinking); and
- a receptor population (*e.g.*, people potentially or actually exposed).

When all five elements are present, the exposure pathway is considered complete. When evaluating exposure pathways, VDH identifies whether exposure to contaminated media (such as drinking water) has occurred, is occurring, or might occur (or past, present, and future scenarios). VDH may also identify an exposure pathway as "potential" or "eliminated." A potential pathway occurs when one or more pathway elements cannot be proved or disproved. A pathway is eliminated if at least one element is missing. In either case, the pathway would not be considered for further evaluation.

In 1993, ATSDR completed a public health assessment of the site and determined that potential routes of exposure included ingestion of contaminants in soil and groundwater and inhalation of fugitive dust (Agency for Toxic Substances and Disease Registry, 1993). These pathways have been eliminated (see *Table 2. Exposure Pathways*).

Table 2. Exposure Pathways

Source	Media and transport mechanism	Point of exposure	Route of exposure	Receptor population	Time range (1973 – Present)	Determination
Lead from battery casings	Groundwater	Tap water	Ingestion	Nearby residents with private wells	Eliminated (1993 - Present)	EPA determined lead is not migrating from soil to groundwater because of high clay content in soil and low concentrations of lead in groundwater sampling. Therefore, no exposure has occurred through drinking well water.
	Soil	Fugitive dust	Ingestion, dermal contact, inhalation	Past visitors to the site and neighboring businesses	Past potential (1973–1993); Current and future eliminated	Pathway was eliminated by excavating contaminated shallow soils and covering with clean fill soil.
		Soil	Ingestion, dermal contact	Visitors or workers	Potential future	If restrictions and procedures found in environmental covenants and the Soil Management Plan are not followed, unsafe excavation could result in future exposure.

Site remediation was completed in 1993, and an evaluation of the past five-year reviews indicates no evidence that anyone has been exposed to lead from this site since that time.

A remaining potential pathway is exposure to lead through contact with contaminated subsurface soil near an office building and tank farm on the portion of the site occupied by Capitol Oil Company. Institutional controls to prevent lead-contaminated soil from being exposed during future land development have not yet been implemented but are under development by the landowner, EPA, and DEQ.

LIMITATIONS AND UNCERTAINTIES

No known limitations or uncertainties hamper the assessment of current exposure conditions at the site. However, the institutional controls for property use restrictions are currently under development and not yet finalized. If future activities occur at the site that disturb lead-contaminated subsurface soils, a follow-up health evaluation will need to be conducted.

Letter Health Consultation: A Note of Explanation

The Virginia Department of Health (VDH) prepared this Letter Health Consultation for the C&R Battery Company site, located next to the James River in Chesterfield County south of Richmond, Virginia. This publication was made possible by Grant Number CDC-RFA-TS17-

1701 under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). VDH 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 VDH.

Authors

Amy Hayes, Ph.D.
Health Assessor
Office of Environmental Health Services
Virginia Department of Health
101 North 14th Street
Richmond, VA 23219

Dwight Flammia, Ph.D.
State Public Health Toxicologist
Office of Environmental Health Services
Virginia Department of Health
101 North 14th Street
Richmond, VA 23219

REFERENCES

Agency for Toxic Substances and Disease Registry. (1993). *Public Health Assessment, C&R Battery Company, Inc.*

Agency for Toxic Substances and Disease Registry. (1993). *Public Health Assessment, C&R Battery Company, Inc.*

Agency for Toxic Substances and Disease Registry. (2005). *Public Health Assessment Guidance Manual.*

Arcadis Design and Consultancy. (2016). *Former C&R Battery Site--September 2016 Background Water Quality Sampling Results.*

NUS Corporation. (1990a). *Final Feasibility Study, C&R Battery Site, Chesterfield County, Virginia.*

NU.S. Corporation. (1990b). *Final Remedial Investigation Report, Part I, C&R Battery Site, Chesterfield County, Virginia.*

U.S. Code of Federal Regulations. (1991). 40 CFR Part 141 Subpart I.

U.S. Department of Health and Human Services. (2005). *Public Health Assessment Guidance Manual.*

U.S. Environmental Protection Agency. (1990). *Record of Decision, C&R Battery Company, Inc. Site.*

U.S. Environmental Protection Agency. (2018). *C&R Battery Site, Chesterfield County, Virginia.* Site Characterization and Monitoring Technical Support Center.

U.S. Environmental Protection Agency, Region III. (1998). *Five-Year Review Report, C&R Battery Superfund Site.*

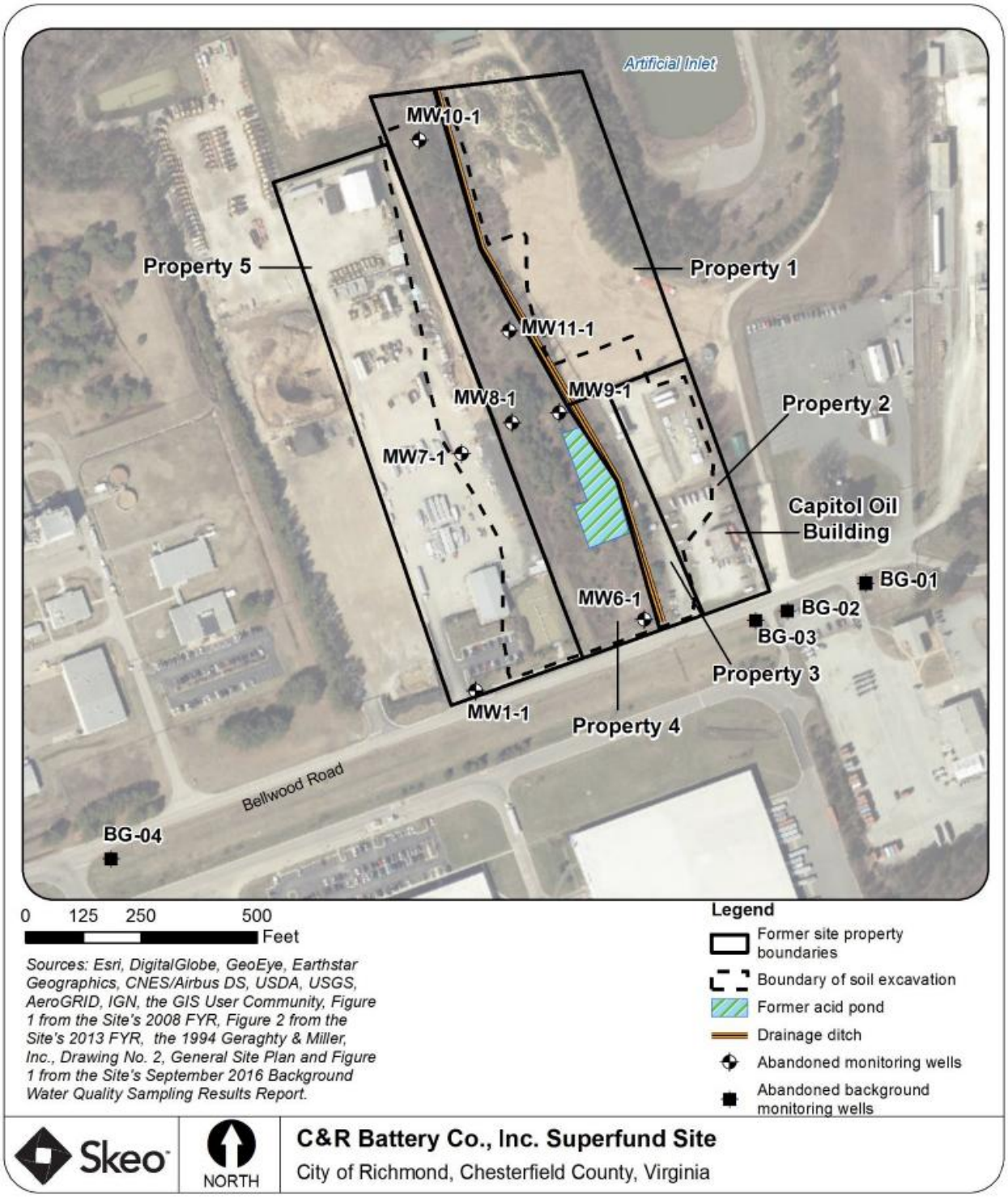
U.S. Environmental Protection Agency, Region III. (2017). *Letter to Randolph S. Moore, P.E., Environmental Manager Verizon Virginia LLC.*

U.S. Environmental Protection Agency, Region III. (2018). *Fifth Five-Year Review Report for C&R Battery Co., Inc. Superfund Site.*

U.S. Environmental Protection Agency, Region III (2020). *Soil Management Plan for 1306 and 1320 Bellwood Road, North Chesterfield, Virginia*. September 1, 2020.

Woodward-Clyde. (1991). *Treatability Study and Site Characterization Report, C & R Battery Co., Inc. Superfund Site, Richmond, VA*. Prepared by Woodward-Clyde for the U.S. Department of the Army Corp of Engineers, Omaha District. September 1991.

ATTACHMENT A. SITE MAP



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

U.S. Environmental Protection Agency, Region III. Fifth Five-Year Review Report for C&R Battery Superfund Site. September 6, 2018.

ATTACHMENT B. SOIL LEAD CONCENTRATIONS (MG/KG) FROM FINAL REMEDIAL INVESTIGATION

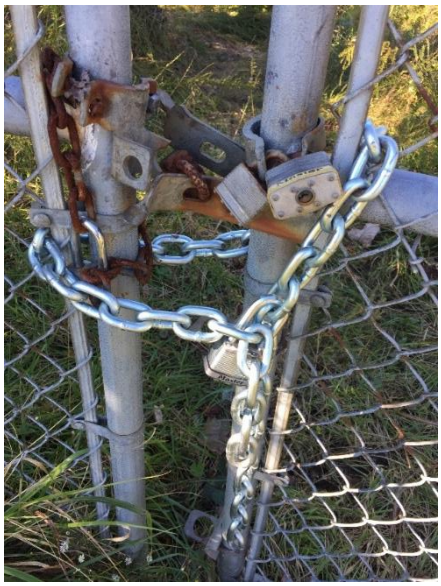
Depth (feet)	SO-25 (MW-4)		SO-05		SO-28 (MW-02)		SO-13		SO-22		SO-17		SO-26 (MW-01)		SO-29		SO-30	
	Observed	Saturation	Observed	Saturation	Observed	Saturation	Observed	Saturation	Observed	Saturation	Observed	Saturation	Observed	Saturation	Observed	Saturation	Observed	Saturation
0-2	**2,620**	7,332	320	5,379	**2,090**	7,078	**50,200***	6,812	938	10,940	**17,400***	9,986	101	NA	75	20,590	54	8,830
3-5	**4,220**	12,034	**7,200**	16,517	**41,400***	9,626	**16,400***	14,076	**3,700**	9,240	43	8,975	NA	8,772	NA	NC	NA	NC
6-8	91	9,481	383	12,987	28	7,069	**5,420**	14,748	26	9,199	NA	12,987	NA	7,492	NA	NC	NA	NC
9-11	<120	9,324	23	17,487	NA	7,869	77	13,310	NA	19,289	NA	13,434	NA	9,502	NA	NC	NA	NC
13-15	<120	7,687	NA	14,810	NA	8,934	NA	13,310	NA	12,522	15	11,615	NA	7,931	NA	NC	NA	NC
20-22	70	11,226	NA	2,536	56	6,746	NA	9,021	NA	5,126	NA	7,136	NA	9,220	NA	NC	NA	NC
25-27	263	10,368	67	NC	NA	2,817	56	10,372	NA	NA	157	NC	39	NC	NA	NC	NA	NC
30-32	96	9,622	19	3,286	20	5,781	NA	10,405	NC	5,200	23	10,989	41	9,920	NA	NC	NA	NC
35-37	<120	7,666	NA	3,286	NA	13,194	20	9,013	NA	7,351	NA	8,404	NA	10,790	NA	NC	NA	NC
40-42	<120	10,111	NA	3,349	NA	11,681	NA	1,939	NA	3,771	NA	3,725	NA	7,956	NA	NC	NA	NC

NA: Not analyzed
NC: Not calculated
All concentrations in mg/kg
* Exceeds calculated saturation concentration
Calculated saturation based upon a site-specific standard pH and cation exchange capacity of the soil
Values in bold exceed the site-specific action level (1,000 mg/kg).

NUS Corp. Final Remedial Investigation Report, Volume I. Table 5-1: Observed TAL Lead Concentrations in Soil and Predicted Soil/Lead Saturation Levels (mg/kg). January 1990.

ATTACHMENT C. SITE PHOTOS, OCTOBER 18, 2018

Front gate



Chain on front gate

Inside front gate