ARCADIS Design & Consultancy for natural and built assets

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ENVIRONMENT

Subject:
Corrective Action Work Plan Revisions
Former Venator Americas LLC Facility
Beltsville, Maryland

Date:
February 23, 2022

Contact:
Matt McCaughey

Phone:
410-585-7334
Email:
Matthew.McCaughey@arcadis.com

Our ref:

Dear Ms. Elverson:

On behalf of the Albemarle Corporation, Arcadis is pleased to submit an updated version of the Corrective Action Work Plan (CAWP) based on the agency's comments dated January 3, 2022.

Albemarle is working with a prospective buyer who plans to purchase the facility as soon as possible and retain the property for non-residential land use. The property sale is contingent on EPA approval of the CAWP. We could greatly appreciate it if the agency would expedite their final review of the revised CAWP. If EPA agrees with the technical approach and proposed activities but has minor comments, we ask the agency to consider issuing a conditional approval letter for the revised CAWP (with a list of final comments to be addressed).

The proposed source control corrective actions include excavation and amendment injection inside building area(s). It has come to our attention that prospective buyer will likely demolish the buildings where excavations are planned. The timing of future site redevelopment activities has yet to be determined and may influence the schedule for implementing the corrective

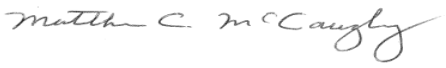
actions proposed in this work plan. As more information becomes available, an updated schedule will be provided to EPA.

We have removed the Environmental Covenant/Material Management Plan from the appendix of this Corrective Action Work Plan. These documents will be finalized separately. Revisions to the draft Environmental Covenant based on recent EPA comments were submitted to the agency on February 4, 2022. The draft Material Management Plan was submitted for agency review in August 2021. We received comments today, which are under review.

Please contact Trey Fortenberry (225-788-1448) or me (301-305-9673) if you have any questions or comments on this letter and/or on these submittals.

Sincerely,

Arcadis U.S., Inc.



Matthew McCaughey
Technical Manager

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Attachment

Response to January 3, 2022 Comments on the
Corrective Action Work Plan dated August 20, 2021

1. **<u>Section 2.1.1.1</u>: Moving forward, please consider revising the identifier for the well with the goal of consistency. Currently the text identifies the well as MW-15, Figure 4 as SB-06, and Table-1 as MP-15. Suggest you connect the text, figure, and table with a single identifier, if they all reference the same location.**

   Response: Acknowledged. Sample results refer to the sample id designation at the time of sample collection. At some locations, soil and groundwater samples were collected via direct-push methods prior to well installation. For example, soil boring SB-06 was converted into monitoring well MP-15. A few well ids are incorrectly referenced as 'MW' instead of 'MP', which was revised.

2. **<u>Section 2.1.1.1</u>: Figure 4 shows SB-15 with hexavalent chromium concentrations at 1,000 mg/kg. Therefore, it appears the wrong sample is being referenced in the following sentence.**

   Response: Acknowledged. The sample ID was changed from SB-14 to SB-15.

3. **<u>Section 2.1.1.1</u>: The following sentence is true with the exception of SB-14.**

   Response: Acknowledged. The text was revised.

4. **<u>Section 2.1.1.2</u>: Please consider in future documents revising the identifier for the well with the goal of consistency. Currently the text identifies the well as MW-16, Figure 5 as MP-16. Additionally, the well does not appear in Table-1 at all. Suggest you connect the text, figure, and table with a single identifier.**

   Response: See Response 1.

5. **<u>Section 2.1.2</u>: Please add a link in the document to the Statement of Basis on EPAs website.**

   Response: Agreed. A hyperlink to the document was provided in the references to facility information on EPA's website.

6. **<u>Section 2.2.1.2</u>: For clarity, please consider adding reference to "D8" in the below sentence, as follows:**

   A third drain/sump feature (D8) was observed in Building 5A adjacent to Building 6 and included in the assessment; these two buildings are interconnected without a dividing wall.

   Response: Agreed. The text was revised.

7. **<u>Section 4.2.1</u>: Suggest adding text to explain the 5-foot buffer between building walls and excavation area (as was done on figures).**

Response: Acknowledged. The text was revised. In addition, the extent of excavation is mentioned in Section 4.1.

8. **Section 4.3: Minor/Editorial: the term "should" makes this optional. Recommend actually speaking to the type of engineering controls that will be employed.**

   Response: Agreed. Fencing and signage will be used to prevent unauthorized personnel from entering the work zone.

9. **Section 4.3.1: What is the rationale behind performing air monitoring for VOCs when the contaminant of concern is an inorganic (Cr/CrVI are inorganics)? Is there a more applicable monitoring method/strategy? Further to this, suggest noting in the Site Description why VOCs might be encountered. The Site Description does say separate phase hydrocarbons are present and are being monitored, but does not say what type of hydrocarbons they are.**

   This states that monitoring at the perimeter and work area is for VOC and particulates, how Does the HASP describe the basis of the dust or odor thresholds established? What about monitoring at workers breathing zone, will that also be conducted?

   Particulate inhalation will be a concern both because of the physical inhalation, and because of the possible Cr(VI) inhaled with the particulate derived from contaminated soils. For Cr(VI) inhalation there are OSHA limits. I do not see this discussed. Please ensure that it is addressed to ensure any occupational health limits will not be exceeded for site workers, or for people offsite. Also, pls ensure you generate records to demonstrate that the limits are not exceeded, such as by use of sufficient recording perimeter particulate monitors coupled with a worst-case estimate of Cr(VI) concentration in the particulate.

   Response: VOC air monitoring was removed from the work plan. After the CAWP was submitted to EPA, Albemarle selected an excavation subcontractor to perform the excavation with oversight from Arcadis. The excavation contractor will prepare a site-specific HASP (including particulate monitoring) prior to the start of work.

10. **Section 4.3.2: The measures described below and in figure 6 do not describe actual traffic controls, just the facility layout and travel route. Keep in mind traffic control describes or showcases methods to control traffic (signs/flagmen) at points where the vehicles and equipment engaged in this work or the excavations could impact other vehicles or pedestrians in the areas. Please include the actual traffic control methods.**

    Response: After the CAWP was submitted to EPA, the prospective buyer has indicated they plan to demolish buildings 6 and 9. The timing of the property sale and future demolition will determine whether the proposed excavation is conducted before or after demolition and the specific traffic control methods. Traffic controls will be further described in the Construction Quality Assurance/Quality Control Plan, prepared prior to the start of work.

11. **Section 4.3.3: Is the broom cleaning being conducted dry or wet? Is there a potential that this could be a source of exposure for workers conducting this activity? It may be helpful to list the equivalent options to this decontamination process so they can be evaluated for effectiveness and for any additional hazards that maybe associated.**

    How will the deposited materials be cleaned from sidewalks and roads? Recommend strong prohibitions on dry sweeping this material during the cleanup efforts.

    Response: The text was revised to state that the cleaning and sweeping will be conducted wet to minimize exposure for workers conducting this activity.

12. **Section 4.3.3: Consider changing this sentence to "contact with impacted soil and will be segregated and will undergo waste characterization and disposal as appropriate"**

    Response: The text was revised.

13. **Section 4.3.4: Suggest adding the concentration threshold for hazardous and nonhazardous waste (total and hexavalent chromium) disposal to support the Waste Management discussion.**

    Response: The text was revised.

14. **Section 4.3.4: Please add "in accordance with MDE regulations" in regards to the waste characterization.**

    Response: The text was revised.

15. **Section 4.4: Please revise bottom samples to 1 per up to 500 square feet.**

    Response: The text was revised.

16. **Section 5: Pls check extra “the” in: “Performance monitoring will be conducted to [the] monitor the performance of onsite in-situ remediation, and long-term monitoring will be conducted throughout the plume as part of routine MNA evaluations.”**

    Response: The text was revised.

17. **Section 5.1.2: microbial reduction and/or direct chemical reduction by reduced iron and sulfide.”; I think the chemical route, rather than the microbial, would be considered “direct”, but I defer to you on this.**

    Response: The terms “direct” and “indirect” are not essential and have been removed from Section 5.1.2 text to avoid confusion.

18. **Section 5.1.2: Pls consider: "…the organic acids produced during the enhanced microbial activity results in a groundwater pH drop, which can inhibit the desired microbial activity."; use any wording you feel is correct; I merely think you should say why the pH drop should be avoided.**

    Response: The text was revised.

19. **Section 5.1.2: Suggest you add 2-3 sentences to explain the indicators of reducing conditions which the fermentable carbon will create. Then please use this to explain your choice of monitoring parameters. E.g., currently methane is being monitored, but unless one knows that molasses degradation in GW creates methane, one would not understand why methane is being monitored and may think it is due to site CoCs.**

    Response: Agreed. The text was revised.

20. **Section 5.1.4.4: The following sentences are redundant/repetitive; consider revising, as follows, to be concise:**
    "Each injection well will be developed to remove fine-grained material and ensure hydraulic communication with the surrounding formation using a combination of pumping, surging, and/or brushing methods."

    Response: Agreed. The text was revised.

21. **Section 5.1.4.5: Please include well survey including off-site wells that are within the plume boundary.**

    Response: The following text was added to the work plan: Additional administrative controls include conducting a (groundwater use) well survey within the plume boundary and notifying EPA, Prince George's County Health Department, and affected property owners of current groundwater quality conditions and whether these conditions prevent groundwater use. These activities will be conducted every fifth year by December 31th (based on the Final Decision signed in 2021).

22. **Section 5.1.5: "High-concentration (80 percent) molasses will be filtered and diluted with potable water to an injected concentration of 2 percent by volume via an in-line mixing system."**

    Response: The text was revised.

23. **Section 5.1.5: How are potable and clean water being confirmed "clean"? Include some verification water is potable and does not contain hex chromium.**

    Response: A sample will be collected from the potable water supply source and analyzed for hexavalent chromium. The results will be shared with USEPA prior to the start of injections.

24. ***Section 5.2.2.1: Re: "Water-level monitoring will be completed, to the extent possible, within an approximately 48-hour period."; Why "to the extent possible"? What would interfere with a simple***

water level measurement? If you mean performing a synoptic round in all wells in that time period, suggest explaining that.

Response: Synoptic water-levels are often completed within 12 hours. However, when monitoring off-site wells, access constraints can occasionally prevent one or more wells from being gauged at the time of the synoptic water-level survey (e.g., car parked over flush-mount well etc.). The 48-hour period is intended to allow time for the field staff to return to the site and attempt to access the well again if needed.

25. **Section 5.2.2.5: Will the decontamination water get collected for disposal as well?**

    Response: Yes. The text was revised.

26. **Section 6: This section only discusses the quality assurance that will be performed for sampling and analysis, while the level of effort requires removal of contamination, and procedures to ensure that those efforts have been successfully achieved is not described. This document is missing quality control measures that will be used for the source control corrective actions. Therefore, suggest generating a more specific QAPP.**

    Response: A description of the corrective action assessment and reporting activities have been added to the QAPP section of the CAWP. Additional procedures will be described in the Construction Quality Assurance/ Quality Control Plan based on the site redevelopment plan. As noted in Response 10, the timing of the property sale and future demolition will determine whether the proposed excavation is conducted before or after demolition.

27. **Section 6.2: That should be a MS/MSD at 1 per 20. This section should also be revised to list all of the laboratory QC samples as well.**

    Response: Agreed. The text was revised.

28. **Section 6.4.3, last bullet: How will you determine if IDW samples are required? Remove "if required".**

    Response: The term "If required" was removed.

29. **Table 2: Suggest adding the concentration threshold for hazardous and nonhazardous waste (total and hexavalent chromium) to support the disposal method. The addition of a foot note with this information would be acceptable.**

    Response: Agreed. Table 2 was revised to include RCRA parameters.

30. **Table 4: There should be samples designated for MS/MSD analysis as done in the other tables (8-10). Check verification in narrative for QAQC samples**

    Response: Table 4 was revised and the text was checked.

31. **Table 8: There should be a MS/MSD designated.**

Response: The MS/MSD sample is designated in the note's column.

32. **Table 11: The holding time for Hexavalent Chromium is 24 hours from collection for water per method 218.6, not the 28 days shown in the table. Also, this should be addressed in the narrative since the 24 hr holding time will be difficult for samplers and lab to meet. A potential approach to mitigate the difficulty is to have it specified that Cr(VI) water samples should be collected only late in the day in order to reduce the time between sampling and FedX shipping departure. Further please indicate the shipping to be used, such as FedX First Overnight for a morning delivery. Since Cr(VI) is the main CoC, the data is critical, so this extra detail is recommended to ensure that the holding time can be met. Ask Diane/Ruth.**

Response: The 24-hour holding time per Method 218.6 pertains to drinking water samples. The method allows preservation with a buffer to extend the hold time to 28 days for non-drinking water samples. Arcadis uses this method with the 28-day hold time for groundwater sample analysis at many hexavalent chromium sites across the United States. This method has been used at Beltsville site for several years. No method changes are planned.

33. **Table 11: There are no reporting limits listed for CrVI in water and soils. How do we know if the lab's reporting limits can reach the project's action limits? Suggest these be summarized in a table.**

Response: Acknowledged. Table 11 was updated to include reporting limits.

Albemarle Corporation

Corrective Action Work Plan

Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

February 21, 2022

Corrective Action Work Plan

Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

February 21, 2022

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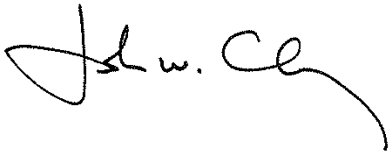
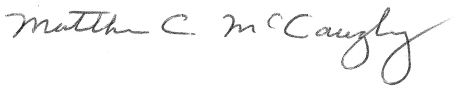


John Cherry
Project Manager



Matthew C. McCaughey
Technical Manager

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Acronyms and Abbreviations

µg/L	microgram per liter
Albemarle	Albemarle Corporation
Arcadis	Arcadis U.S., Inc.
bgs	below ground surface
CAWP	Corrective Action Work Plan
COC	constituent of concern
DO	dissolved oxygen
DQO	data quality objective
EC	Environmental Covenant
EDD	electronic data deliverable
HASP	Health and Safety Plan
IDW	investigation-derived waste
LUC	land use control
MDE	Maryland Department of Environment
mg/kg	milligram per kilogram
mg/L	milligram per liter
mL/min	milliliter per minute
MNA	monitored natural attenuation
mV	millivolt
NTU	nephelometric turbidity unit
ORP	oxidation-reduction potential
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
RSL	Regional Screening Level
SC	specific conductance
site	former Venator Americas LLC Facility, located at 7011 Muirkirk Road, Beltsville, Maryland
SPH	separate-phase hydrocarbon
s.u.	standard unit
TCLP	Toxicity Characteristic Leaching Procedure
UIC Program	Underground Injection Control Program
USEPA	United States Environmental Protection Agency

1 Introduction

On behalf of Albemarle Corporation (Albemarle), Arcadis U.S., Inc. (Arcadis) prepared this Corrective Action Work Plan (CAWP) for the former Venator Americas LLC Facility located at 7011 Muirkirk Road, Beltsville, Maryland (site; Figure 1). Previous investigations identified the presence of onsite chromium-impacted soil and groundwater, and separate-phase hydrocarbon (SPH) and chromium impacts in offsite groundwater. Chromium impacts, related to past pigments-based manufacturing activities, include total and hexavalent chromium.

Since 2015, chromium-related environmental activities have been conducted by Albemarle with oversight from the United States Environmental Protection Agency (USEPA) Region III Resource Conservation and Recovery Act Corrective Action Program. SPH gauging and recovery related to petroleum-based impacts is ongoing and overseen by the Maryland Department of Environment's (MDE's) Oil Control Program.

1.1 Site Description

The site is located approximately 2 miles north of Beltsville, Maryland. This area is generally industrial and commercial in use, with railroad tracks and Baltimore Avenue (Route 1) to the west, Muirkirk Road to the north, Conway Road to the east, and an industrial park to the south (Figure 1).

The approximately 5-acre site encompasses two tax parcels with 19 vacant buildings previously used for manufacturing, storage, office, and laboratory space. Building footprints range from approximately 1,000 to 20,000 square feet. The site contains an existing low-permeable surface cap (either concrete or asphalt, or a combination) and a few grassy, landscaped areas as shown on Figure 2.

The facility is currently owned by Excalibur Realty, a subsidiary of Albemarle. Excalibur Realty was acquired in its entirety by Albemarle on January 13, 2015. Huntsman Pigments America, and subsequently Venator, were the lessees of the site at the time of acquisition. Manufacturing operations continued during the period of the lease and stopped in April 2019 when Venator vacated the site. Currently, the site is vacant and for sale; the expected future land use is to remain industrial/commercial.

1.2 Selected Remedy

The USEPA issued the Final Decision (USEPA 2021) for the site in 2021. The selected remedy for onsite chromium-impacted soil is site-wide land use controls (LUCs) combined with source control measures within the Building 6 and Building 9 areas. To address onsite and offsite total and hexavalent chromium concentrations in groundwater, a combination of monitored natural attenuation (MNA), LUCs, and onsite in-situ groundwater treatment is planned. The selected remedy was developed to meet the following media-specific corrective action objectives:

- *Soil.* Prevent direct exposure to construction and site workers (under a non-residential land use scenario) and limit soil to groundwater leaching (for hexavalent chromium).
- *Groundwater.* Prevent drinking water exposure and attain drinking water standards throughout the plume (for hexavalent and total chromium).

The site-wide groundwater plume is shown on Figure 3. The selected remedy is further described in Section 2.

1.3 Document Organization

The remainder of this CAWP is organized into the following sections:

- Section 2 presents the site background details.
- Section 3 describes the proposed land use controls.
- Section 4 describes the source control corrective actions.
- Section 5 describes the groundwater corrective actions.
- Section 6 describes the quality assurance project plan elements.
- Section 7 presents the proposed the schedule.
- Section 8 lists the references used to prepare this CAWP.

2 Site Background

This section summarizes current environmental conditions and further describes the selected remedy.

2.1 Building Sub-Slab Soils

2.1.1 Current Conditions

The 2019-2020 soil sample results provide useful data to assess current concentrations in subsurface soil below paved areas within former manufacturing areas at the site. The results indicate that hexavalent chromium is the primary constituent of concern (COC) for onsite soil with detections exceeding the industrial Regional Screening Level (RSL) within or near Building 6, Building 9, east of Building 9, and north of Building 14 (Figure 2). Hereafter, the terms Building 6 area and Building 9 area are used because the soil investigations included two soil borings in a building adjacent to Building 6 (Building 5A) and one boring in a building adjacent to Building 9 (Building 11). Historical chromium processing activities occurred in these buildings before being phased out in 2007. Historical floor drains and sumps in these buildings may have served as a conduit for sub-slab impacts and are planned for closure.

2.1.1.1 Building 9 Area

The building concrete slab thickness ranges from 6 to 10 inches. A total of 13 soil borings were advanced through the concrete floor to depths ranging from 7.5 to 25 feet below ground surface (bgs). Depth to water readings collected at MP-15, a monitoring well installed inside the building, was measured at 12.8 feet bgs in November 2020 (Table 1).

The horizontal and vertical distribution of chromium soil sample results are shown on Figure 4. Higher sub-slab hexavalent chromium soil concentrations are present on the northwestern side of the building and concentrations decrease rapidly with depth. The maximum hexavalent chromium concentration (SB-15 at 1,000 milligrams per kilogram [mg/kg]) was detected at 2.5 to 3.0 feet bgs. At depths greater than 5 feet below the existing grade (i.e., the concrete floor), the observed hexavalent chromium concentrations were less than or within 10 times the hexavalent chromium industrial RSL value of 6.3 mg/kg, except for SB-14 at a depth of 5.5 to 6 feet bgs (218 mg/kg).

2.1.1.2 Building 6 Area

The building concrete floor thickness ranges from 8 to 16 inches. A total of 10 soil borings were advanced below the concrete floor to depths ranging from 7.5 to 25 feet bgs. Depth to water readings collected at MP-16, a monitoring well installed inside the building, was measured at 9.7 feet bgs in November 2020.

The horizontal and vertical distribution of chromium soil sample results is shown on Figure 5. Higher sub-slab hexavalent chromium soil concentrations are present in the central and northern side of the building and concentrations decrease rapidly with depth. The maximum hexavalent chromium concentration (SB-29 at 3,890 mg/kg) was detected at 2.3 to 3.0 feet bgs. At depths greater than 5 feet below the existing grade (i.e., the concrete floor), the observed hexavalent chromium concentrations are within 10 times the industrial RSL value of 6.3 mg/kg. One exception is at boring location SB-25, where hexavalent chromium was detected at a concentration of 88.4 mg/kg (approximately 15 times the industrial RSL) at a depth of 7.0 to 7.5 feet bgs.

2.1.2 Selected Remedy

As stated in the Final Decision (USEPA 2021), the selected soil alternative is Alternative S-3B – LUCs and Source Control (100 mg/kg). Alternative S-3B is protective of human health and the environment, achieves the cleanup objectives, is effective for source control, and is ranked high in terms of the seven balancing criteria. Specifically, the selected soil remedy includes the following remedy components:

- *LUCs*. These controls include preparation of an Environmental Covenant (EC) to maintain industrial/ commercial land use and specify appropriate engineering controls (i.e., low-permeable surface cap and security fencing) and administrative controls (i.e., Material Management Plan) to prevent future exposure to potentially impacted soils.
- *Source control measures*. Per the Final Decision (USEPA 2021), these measures include removal and/or in situ treatment of impacted soil greater than 100 mg/kg within accessible portions of the site. In this work plan, focused shallow excavation within the Building 9 and Building 6 areas is proposed as the soil source control measure combined with wastewater sump and line closure. The 100 mg/kg soil concentration value was selected as an interim remedial goal based on the sub-slab soil concentration profile and the target excavation depth of up to 5 feet bgs within the Building 9 and Building 6 areas.

2.2 Building Floor Drains and Sumps

2.2.1 Current Conditions

An assessment of the floor drain and sump features was conducted in September and October 2020 (Arcadis 2020). Sump water sample results are presented in Table 2.

2.2.1.1 Building 9 Area

The building has a single concrete floor and four existing drains/sumps (Drains D1 through D4). Drain/sump D5 was previously abandoned. Drains D1 and D2 housed drum-like steel basins beneath the concrete floor. Drains D3 and D4 contained sump-like concrete features. A steel rod was used to confirm the integrity of the sump bottoms. Drains D1, D3, and D4 were interconnected, and contained approximately 24 inches (Drain D1) to 18 inches (Drains D3 and D4) of standing water, which was subsequently removed. Drain D1 contained a sump pump and appeared to be located lower in elevation than Drains D3 and D4, while Drain D2 was dry and filled to within 6 inches of the grate with sediment. Samples were collected from standing water in the drains and sumps for analysis of total and hexavalent chromium yielding maximum results of 1,100 and 434 micrograms per liter (µg/L), respectively (Table 2; Figure 4). The standing water recovered from the Building 9 sumps and drain lines was containerized and shipped offsite as nonhazardous waste.

2.2.1.2 Building 6 Area

Inspection of the concrete floor core holes indicated that two slabs were present suggesting that a second concrete slab was poured on top of the first one (during building renovations at some point after initial construction). Two drains/sumps (Drains D6 and D7) were identified. A third drain/sump feature (D8) was observed in Building 5A adjacent to Building 6 and included in the assessment; these two buildings are interconnected without a dividing wall. Drains D6 and D7 were constructed of concrete and interconnected with

two PVC pipes, which contained water at the time of the 2020 assessment. Drains D6 and D7 contained sediment in both sumps and the interconnected piping. Drain D8 had a steel plate welded to the top. A pry bar was used to lift and inspect the interior from one corner. The drain/sump was dry and appeared to be filled with sediment to within 2 inches of the steel cover. No apparent connection between Drain D8 and other drains or exterior stormwater sewers was observed. Standing water in the drains and sumps was analyzed for total and hexavalent chromium yielding maximum results of 7,300 and 6,890 µg/L, respectively (Table 2; Figure 5). The standing water recovered from the Building 6 sumps and drain lines was containerized and shipped offsite as hazardous waste.

2.2.2 Selected Remedy

Floor drain and sump closure is part of Alternative S-3B – LUCs and Source Control (100 mg/kg). Specifically, within the excavation boundary, sumps or drain line infrastructure will be removed. Outside the excavation boundary, sumps and drain line infrastructure will be abandoned via grouting in place.

2.3 Groundwater

2.3.1 Current Conditions

A comprehensive monitoring well network has been installed to monitor groundwater impacts. The well locations are shown on Figure 3 and well construction details are presented in Table 3. The site-wide chromium plume is approximately 115 acres (based on the 1 µg/L isocontour), while the plume core is approximately 9.2 acres (based on the 1,000 µg/L isocontour) and is limited to the industrial/commercial developed areas downgradient from the site.

The onsite extent of hexavalent chromium impacts in groundwater with concentrations above the project-specific action level of 0.35 µg/L is shown on Figure 2. The site-wide hexavalent chromium plume is shown on Figure 3. Well J serves as a sentinel monitoring well, located approximately 0.8 mile downgradient from the site boundary.

The 2019-2020 investigation results suggest that chromium groundwater impacts likely originated from Building 9, although other sources could exist. Historical floor drains and sumps within the Building 9 area (Figure 4) may have served as a conduit for sub-slab groundwater impacts and are planned for closure.

Within the Building 6 area, hexavalent chromium has not been detected in groundwater at concentrations greater than 1 µg/L. Detections in soil underlying the Building 6 area were greater than detections in soil underlying the Building 9 area. The presence of more abundant silts and clays underlying the Building 6 area and hexavalent chromium detections (42.6 to 52.3 µg/L) in new downgradient monitoring wells (MP-24 and MP-19) suggest that limited soil to groundwater leaching occurs in this area.

Hexavalent chromium concentrations (7,830 and 8,620 µg/L) were detected in groundwater at new well (MP-23), installed in fall 2020 as shown on Figure 2. Groundwater pH conditions are predominantly slightly acidic (with pHs in the mid 5 to 6 standard unit [s.u.] range), except near MP-23, were lower pH conditions (around 4 s.u.) were noted. This well was installed in Building 7A along the southern property boundary between wells MP-24 and MP-7.

2.3.2 Selected Remedy

As stated in the Final Decision (USEPA 2021), the selected groundwater alternative is Alternative GW-3 (MNA and LUCs with Onsite In-Situ Treatment). This alternative is protective of human health and the environment, achieves the cleanup objectives, is effective for source control, and ranked high in terms of seven balancing criteria. Future groundwater monitoring and reporting will provide a means to evaluate the effectiveness of the implemented remedies. Specifically, the selected groundwater remedy includes the following remedy components:

- *LUCs*. These controls include an EC preventing use of impacted groundwater and notification of the extent of groundwater impacts to Prince George's Health Department and property owners every five years.
- *MNA with Onsite In-Situ Treatment*. These remedy components include:
    - Routine groundwater monitoring and reporting to monitor natural attenuation conditions.
    - The use of biological or chemical amendments introduced via injection wells or direct injection to create reducing conditions favorable for reduction of hexavalent chromium to trivalent chromium.

In this CAWP, biological treatment using an organic carbon amendment, with sodium hydroxide for pH adjustment will be implemented as needed for in-situ treatment. If other amendments are used in the future, notification will be provided to the USEPA.

3 Land Use Controls

This section describes the proposed LUCs based on the Environmental Covenant (EC)/Material Management Plan (presented under separate cover). These LUCs may be modified during final review and signature of the EC by the USEPA, MDE, and the current property owner.

3.1 Administrative Controls

Administrative controls include implementation of an EC to maintain industrial/commercial land use, restrict onsite groundwater use, and describe material and soil management considerations to prevent unauthorized subsurface intrusive activity.

Additional administrative controls include conducting a (groundwater use) well survey within the plume boundary and notifying EPA, Prince George's County Health Department, and affected property owners of current groundwater quality conditions and whether these conditions prevent groundwater use. These activities will be conducted every fifth year by December 31st based on the Final Decision signed in 2021.

3.2 Engineering Controls

A low-permeability surface cap will be maintained to limit groundwater recharge and potential exposure to impacted soils. In addition, security fencing with signage will be maintained around the site to restrict access to unauthorized individuals.

A low-permeability surface cap currently exists across the site. As an initial surface cap improvement, existing building sump and drain lines in Building 9 and Building 6 will be closed. Specifically, sumps and drain lines within the footprint of the proposed excavation boundary will be removed during soil excavation, while sumps and drain lines outside the proposed excavation boundary will be capped and grouted in place. Prior to closure, standing water and sediment will be removed from the drains and sumps to the extent possible.

As described in the Material Management Plan, annual site inspections of the surface cap will be conducted by a qualified environmental consultant. The need to make repairs or improvements to the surface cover will be based on findings of the annual site inspections.

4 Source Control Corrective Actions

Soil excavation is planned as a source control measure to remove shallow hexavalent chromium-impacted soils below the building slabs in two former chromium processing areas (Building 9 and Building 6). A hexavalent chromium soil concentration of 100 mg/kg was selected as an interim remedial goal based on the horizontal and vertical extents of contamination. The estimated horizontal extent of the 100 mg/kg hexavalent chromium soil boundary is shown on Figure 6.

4.1 Planning

The preliminary design of Alternative 3B – LUCs and Source Control (100 mg/kg) involves concrete slab removal and excavation to 5 feet using a mini-excavator, as presented in the Corrective Measures Study Report (Arcadis 2021b). During development of this alternative, it was anticipated that the extent of excavation would remain a safe distance from building walls and interior structural supports to prevent compromising the building integrity. A structural assessment will be performed to determine the extent of safe excavation in proximity to building infrastructure. The target excavation depth is 5 feet below grade.

Pre-excavation sampling activities will be completed for waste characterization purposes. A qualified excavation contractor will be selected to perform the focused sub-slab excavation of concrete and soils within the impact areas as shown on Figure 7 and Figure 8. The contractor will perform a site inspection and structural assessment to determine a safe method for accessing and preparing the proposed work areas, and removing, handling, and transporting the excavated materials offsite.

The proposed approach and procedures will be further described in a Construction Quality Assurance/Quality Control (CQA/CQC) Plan, and Health and Safety Plan (HASP); upon request, this plan will be submitted for USEPA review.

4.2 Pre-Excavation Sampling

4.2.1 Concrete and Soil

Concrete and subsurface soil samples will be collected for waste characterization purposes prior to the start of excavation and tested for total and hexavalent chromium, and leachable chromium, via the Toxicity Characteristic Leaching Procedure (TCLP) as presented in Table 4. Additional waste characterization parameters may be collected if required by the waste disposal facility. Grab concrete chip samples will be collected from the concrete slab cores from 0 to 1-foot bgs. Composite soil samples will be collected from 1 foot to 5 feet bgs.

Pre-excavation samples will be collected at a density of one sample per every 500 to 800 square feet based on a grid network placed over the estimated extent of the 100 mg/kg soil impacts in Building 9 and Building 6. A total of eight pre-excavation characterization samples will be collected in Building 9 (as shown on Figure 7), while seven pre-characterization samples will be collected in Building 6 (as shown on Figure 8).

Concrete samples will be collected using a wet concrete/rock core press. Soil samples will be collected via direct-push drilling or hand augering methods.

Prior to intrusive activity, the following utility clearance protocols will be followed:

- Review available existing drawings and plans.
- Visually inspect the proposed subsurface work.
- Notify Miss Utility of Maryland of the proposed work at least 48 hours in advance of land disturbance.
- Retain a private utility locator to use ground penetrating radar, electromagnetic resonance scanning and concrete scanning (as appropriate) in an area up to 10 square feet surrounding each well location.

Drilling activities will not commence within 36 inches of any detected subsurface anomaly, and alternative locations may be selected and scanned as needed to find accessible drilling locations. Hand augering may be performed at select locations if warranted prior to the start of drilling activities.

4.2.2 Sump/Drainline Sediment

The drains and sumps will be inspected for standing water and sediment accumulation. Sediment samples will be collected for waste characterization purposes. A composite sample will be collected from the cumulative sediment in the sumps and analyzed for total chromium, hexavalent chromium and TCLP chromium (Table 2). Additional waste characterization parameters may be collected if required by the waste disposal facility. Standing water and sediment will be removed to the extent possible via a combination of manual methods, vacuum extraction, or water flushing and recovery.

4.3 Excavation and Sump Closure

Concrete slabs overlying the proposed soil excavation areas will be demolished utilizing conventional heavy equipment and tools. The concrete is estimated to be approximately 10 to 16-inches thick. Excavation of impacted soil is proposed to approximately 5-feet below ground surface. The estimated volume of material to be removed is approximately 1,100 cubic yards of soil and 275 cubic yards of concrete as presented in Table 5. The proposed excavation boundary (based on the 100 mg/kg hexavalent chromium soil isocontour) is presented on Figure 7 and Figure 8. These boundaries may be adjusted based on the pre-excavation and post-excavation soil sample results. Sumps and associated piping within the excavation boundary will be removed during the source control corrective action. For sumps and associated piping located outside the excavation boundary, sump sediment and waster will be removed prior to grouting the sumps and piping in place.

4.4 Material Handling and Management

During intrusive activities, engineering controls, including fencing and signage, will be established around the work zone to prevent unauthorized personnel from entering the intrusive work area. Excavation workers and authorized personnel should use appropriate personal protective equipment as specified in the HASP to be prepared by the contractor.

4.4.1 Dust Control

Wet methods will be used when sweeping, brushing, and cleaning work areas as a dust control measure. Trucks equipped with tarps will be used for the transportation and offsite disposal of impacted soil and construction debris. Soil stockpiles will be covered with tarps and/or polyethylene sheeting when not being used. Workers, using both visual and real-time air monitoring, will monitor for particulates at the perimeter and within the work

area. If fugitive dust exceeds action thresholds specified in the HASP, the work will temporarily cease until proper engineering controls are in place (e.g., use of a water truck, tarps/temporary covers).

4.4.2 Traffic Control and Road Maintenance

Trucks and subsurface excavation equipment will enter the site using one of the entrances shown on Figure 6. Truck and excavation equipment will be staged onsite and loaded in order of arrival. Truck and excavation equipment tires/treads will be broom cleaned or equivalent using wet methods prior to exiting the site via the approved entrance to minimize the trackout of sediment onto offsite streets, other paved areas, and sidewalks. If material is tracked out from the site onto the surface of offsite streets, other paved areas, or sidewalks, the deposited material will be removed as soon as possible, or at a minimum, daily.

4.4.3 Concrete Processing and Handling

Concrete removed from the excavation will be disposed of offsite at an approved waste disposal facility; it will not be used as fill material or recycled. Excavated concrete will be segregated from excavated soils if needed based the pre-excavation waste characterization results.

4.4.4 Stormwater Management

The type of stormwater management controls implemented during the excavation depends on the prospective buyer's site redevelopment schedule. If the excavation occurs inside the buildings and the covered loading area is used for loading of excavated materials prior to offsite transport and disposal, stormwater management controls will be minimal. If buildings are demolished prior to excavation, greater controls will be needed to manage stormwater. Stormwater management controls will be described in the CQA/CQC Plan based on the site redevelopment plan.

4.4.5 Waste Management

The following waste streams will be generated during the source control correction actions: concrete, subsurface soil, sump sediment, and decon water. In addition, sump water and stormwater may be generated as an additional waste stream. Pre-excavation concrete, soil, and sediment samples will be collected for waste characterization purposes (as described in Section 4.2) to minimize the duration of onsite stockpiling of excavated materials. If the results indicate some waste materials are hazardous based on exceedance of the TCLP total chromium limit of 5 mg/L, they will be segregated and managed separately from the non-hazardous waste. Additional waste characterization samples may be collected if required by the disposal facility. All waste materials will be containerized onsite in DOT-approved containers until the waste material has been characterized and profiled in accordance with state and federal regulations. Waste management activities will be further described in the CQA/CQC Plan.

4.5 Post-Excavation Verification Sampling

Excavation sidewall and bottom samples will be collected to document the soil concentrations at the excavation boundaries. Sidewall samples will be collected at a spacing of one sample every 20 to 30 linear feet. Up to 10

sidewall samples will be collected in Building 9 (Figure 7) and up to 13 sidewall samples will be collected in Building 6 (Figure 8). These samples will be collected as grab samples at the middle sidewall depth and will be submitted to the laboratory for total and hexavalent chromium analysis (Table 4). Bottom samples will be collected at a density of one sample per every 500 square feet. Up to four bottom samples in Building 9 (Figure 7) and up to six bottom samples in Building 6 (Figure 8) will be submitted to the laboratory for total and hexavalent chromium analysis (Table 4).

4.6 Backfill and Restoration

After completion of soil excavation and sump/drain line closure, clean fill will be added to the excavation and a new concrete floor will be poured to bring the excavation area up to the existing grade. Clean fill will be certified by the supplier and/or demonstrated to be clean based on analytical testing. Fill material that contains total and hexavalent chromium levels less than regional background concentrations (determined by either batch testing by the fill supplier or site-specific testing) will be considered suitable for use as backfill. Site soils will not be used for backfilling, regrading, or restoration activities unless specifically approved by the USEPA and MDE.

Excavations will be backfilled with clean fill within approximately 1 foot of grade and restored to original surface cover. Clean fill will be natural mineral soil, void of debris. General backfill may contain up to 5 percent organic material. General backfill will be sampled and results will be maintained at the site. Fill material will be spread in 12-inch lifts and compacted with a minimum of four passes of a vibratory compactor or approved equivalent. Soil compaction, clean fill, and concrete slab specifications will be further described in the CQA/CQC Plan.. .

Based on verification soil sample results, an organic carbon substrate (such as dry cheese whey) may be placed in the excavation prior to backfilling. The purpose of the organic carbon substrate is to provide an amendment that will leach through the vadose zone and to promote biological treatment of hexavalent chromium reduction. The organic carbon substrate will be placed via an excavator bucket, hydrated, and mixed with backfilled soil. Hexavalent chromium concentrations in the clean fill material will be less than regional background levels, determined either from batch testing by the fill supplier or site-specific testing.

4.7 Final Survey

A final survey will be performed to document the lateral extent of the excavation, excavation depth, and final surface grade. A land surveyor licensed in the State of Maryland will document the horizontal coordinates and surface elevation, while a field technician will document the excavation depth in each grid area. The following control datums will be used:

- Horizontal Coordinates – North American Datum of 1983/2011 (NAD83/2011) Maryland State Planar System (feet).
- Vertical Elevations – North American Vertical Datum of 1929 (NAVD29) (feet).

5 Groundwater Corrective Actions

In-situ groundwater remediation of the 1,000 µg/L onsite hexavalent chromium plume hotspot (Figure 9) will be performed as part of the selected remedy. The goal of onsite plume treatment is to establish declining concentrations at the property boundary and thereby reduce mass flux toward the offsite portion of the chromium plume. Performance monitoring will be conducted to monitor the performance of onsite in-situ remediation, and long-term monitoring will be conducted throughout the plume as part of routine MNA evaluations.

5.1 In-Situ Remediation

5.1.1 Underground Injection Control Program

Prior to implementation, this CAWP will be submitted to the MDE Groundwater Permits Division, Underground Injection Control Program (UIC Program) as notification of the planned the injection program. The MDE UIC Program was previously notified of the injection test conducted at the site in fall 2020.

5.1.2 Amendment Selection

The conversion of hexavalent chromium to trivalent chromium (which is sequestered) occurs through microbial reduction and/or chemical reduction by reduced iron and sulfide. In-situ treatment will employ biological (e.g., carbon substrates) and/or chemical (e.g., calcium polysulfide) amendments to create reducing conditions favorable for reduction of hexavalent chromium to trivalent chromium. Trivalent chromium, which has lower toxicity and solubility than hexavalent chromium, will be sequestered on aquifer solids through precipitation (e.g., chromium hydroxide) and sorption processes. Several biogeochemical analytes are useful indicators of the extent of reducing conditions established. Examples include nitrate, dissolved (i.e., ferrous) iron, sulfate, sulfide, and methane.

Biological treatment will be used at the outset of the project due to its relative ease of implementation and low cost. In-situ biological treatment relies on injection of an organic carbon source (such as cheese whey, molasses, lactate, or emulsified vegetable oil) to stimulate the growth of naturally occurring microbes in the subsurface and to stimulate reducing conditions. The initial organic carbon amendment will be 1 percent molasses. Following establishment of reducing conditions, alternative biological or chemical treatment amendments may be implemented if needed.

Molasses contains sucrose, reducing sugars, organic non-sugars, and water, all of which are fully soluble in water. The total consumable carbohydrate concentration in the molasses is approximately 60 percent by weight. In some hydrogeologic settings, the organic acids produced during the enhanced microbial activity results in a groundwater pH decrease, which can inhibit the desired microbial activity. These changes are often short-lived; however, if field data indicate that additional buffering is required, sodium hydroxide will be added to the injection solution. Amendment specifications are provided in Appendix A.

5.1.3 Injection System Design and Layout

The following design parameters were derived from an injection test conducted in fall 2020; additional information is provided in the Pre-Design Investigation Memo (Arcadis 2021a):

- Injection rate: 1 to 2 gallons per minute
- Injection pressure: less than 10 pounds per square inch
- Injection radius: 10 feet
- Vertical treatment interval: 15 feet
- Mobile porosity: 25 percent

This mobile porosity estimate is higher than typical values for unconsolidated sediments in Arcadis' experience and likely represents some vertical fluid movement during the test. The boring log for IW-01 (presented in Table 1) indicates that well-sorted medium sands extend several feet below the target injection interval.

In-situ groundwater remediation of the 1,000 µg/L onsite hexavalent chromium plume hotspot (Figure 9) will be performed as part of the selected remedy. Thirty 4-inch injection wells (IW-02 through IW-31; Figure 9) will be installed in transects approximately perpendicular to groundwater flow. One injection well (IW-01) was previously installed (Arcadis 2021a). Proposed transects will be arranged around existing buildings and road infrastructure. Approximately half the wells will be installed inside existing buildings. Given the extensive infrastructure onsite, exact well locations will be determined in the field based upon rig access and subsurface infrastructure locations. Injection well transects were designed with a target injection radius of 10 feet, with wells spaced approximately 15 to 20 feet apart. Partial overlap of injection radius is preferred to promote uniform lateral distribution of reagents. Wells will be screened over a thickness of 15 feet, targeting approximately 10 to 12.5 feet of saturated thickness and 5 to 2.5 feet of the deeper vadose zone soils, depending on conditions encountered during drilling. The top of the well screen will be no shallower than 15 feet below grade. Well construction details are further described in Section 5.1.4.

5.1.4 Injection Well Installation

This section describes the utility clearance, soil boring, well construction, well development, and testing scope and procedures. Field forms are provided in Appendix B.

5.1.4.1 Utility Clearance

The utility clearance process will involve:

- Review of available existing drawings and plans.
- Visual inspection of the proposed subsurface work.
- Notification of Miss Utility of Maryland of the proposed work at least 48 hours in advance of land disturbance.
- Manual excavation using hand augers to a typical depth below utilities (approximately 5 feet bgs).

Note that in locations within buildings, coring through 6 to 12 inches of concrete will be required prior to hand augering.

If the utility avoidance evaluation suggests a potential conflict, this issue will be discussed with Albemarle prior to selecting a suitable alternate location. In addition to the above lines of evidence, a private utility locator will be retained to use ground-penetrating radar, electromagnetic resonance scanning, and concrete scanning (as appropriate) in an area up to 10 square feet surrounding each well location. Drilling activities will not commence

within 36 inches of any detected subsurface anomaly, and alternative locations may be selected and scanned as needed to find adequately clear drilling locations.

5.1.4.2 Soil Boring

Continuous cores will be collected and described by the field geologist to identify the depth and type of fill material and to describe the color, texture, and moisture content of any native soils encountered. Lithology will be logged continuously from select macrocores advanced prior to overdrilling with hollow-stem augers to install the wells.

5.1.4.3 Well Construction

A typical injection well construction detail is shown on Figure 10. Each injection well will be constructed of 4-inch-diameter, Schedule 40 polyvinyl chloride (PVC) well casing with 0.010-inch stainless steel v-wire wrapped screen. These materials will be installed by overdrilling the 2-inch borehole with 6.25- or 8.25-inch-outer-diameter hollow-stem augers.

Each well will be constructed with a 15-foot screen to allow injection across the saturated zone and deeper vadose zone. The screen intervals will be determined in the field based upon the lithologic conditions encountered. Once the well casing and screen are inserted into the borehole, the annular space between the well screen and the borehole will be backfilled with FilPro #1 filter pack or equivalent. The filter pack will extend 2 feet above the top of the well screen, followed by 1 foot of choker sand, and completed with neat cement grout to 0.5 foot below grade.

Each well will be completed as a flush mount with a traffic-rated well cover and will be fitted with a quick-disconnect at the wellhead. Wells inside buildings will be completed with 8-inch-diameter well covers and the surrounding concrete floors will be repaired. Wells outside of buildings will be completed with 12-inch-diameter traffic-rated well covers, with 18- by 18-inch concrete pads.

Additionally, each wellhead will be fitted with pressure monitoring and sampling ports. A threaded well seal will be placed on each injection well between injection events.

5.1.4.4 Well Development and Testing

Each injection well will be developed to remove fine-grained material and ensure hydraulic communication with the surrounding formation. Well development will include a combination of surging, pumping, scrubbing, and/or brushing. Following a round of surging and scrubbing/brushing, the well will be pumped until water quality parameters stabilize. If parameters fail to stabilize, the process will be repeated.

At the end of development, a water acceptance test will be performed, which will include injection of a small amount of potable water (10 to 30 gallons) while measuring the hydraulic response.

5.1.4.5 Well Survey

Newly installed wells will be surveyed to determine their horizontal coordinates and vertical elevations. All wells will be surveyed by a land surveyor licensed in the State of Maryland. Vertical elevations will be measured at ground surface and the highest point on the inner well casing. For quality control purposes, at least three existing onsite wells at the Site will also be surveyed for comparison to historical survey records. The following control datums will be used:

- Horizontal Coordinates – North American Datum of 1983/2011 (NAD83/2011) Maryland State Planar System (feet).
- Vertical Elevations – North American Vertical Datum of 1929 (NAVD29) (feet).

5.1.5 In-Situ Mixing System

A mobile injection trailer will be used to deliver a dilute organic carbon substrate into the injection network (Figure 10). The injection system will be designed for injection into approximately half of the wells at one time. High-concentration (80 percent) molasses will be filtered and diluted with potable water to an injected concentration of 2 percent by volume via an in-line mixing system. A sample will be collected from an onsite water supply source and analyzed for hexavalent and total chromium and the results will be compared to groundwater standards to assess whether the water source is appropriate as mixing water for the injection program. The target injection volume of 8,850 gallons for each well is calculated based upon a mobile porosity of 25 percent and screen length of 15 feet (Table 6), for a total approximate target volume of 280,550 gallons per event. At an anticipated average flow rate of 1 to 2 gallons per minute, the duration of each injection event is expected to be several weeks. The anticipated injection rate will be confirmed by performing water acceptance tests after injection well installation and development.

During each injection event, the carbon substrate mixture, discussed in Section 5.1.2, will be injected into the network of injection wells. Carbon substrate will be delivered as an 80 percent by volume solution, stored in a temporary tank, diluted onsite with potable water, and delivered to the injection wells using a portable injection system. The injection setup will also include provisions for the addition of injection amendments (e.g., pH buffering), as necessary. The pH will be adjusted with 50 percent sodium hydroxide to maintain a circumneutral injection solution pH during the first injection event, and the need for future pH adjustment will be evaluated based upon performance monitoring data. The mixed injection solution will be transferred to a piping manifold to split the flow to the injection locations and allow for the simultaneous injection of solution into approximately half of the 31 injection wells at one time. The injection manifold will be equipped with flow control valves, flow totalizers, and pressure gauges to monitor and control the flow rate and pressure to each injection location. A conceptual injection system layout is shown on Figure 11. Potable water for generation of the diluted carbon solution will be obtained from an onsite available water source (i.e., water line inside Building 12, hydrant on Conway Road; Figure 9). Potable water may also be trucked in bulk and stored in a temporary onsite tank. As discussed previously, the potable water will be sampled and analyzed for total and hexavalent chromium prior to use in the injection program.

5.1.6 Amendment Injection

The reagent solution, initially consisting of dilute molasses and water, will be injected into the subsurface to provide a readily degradable source of carbohydrates for the indigenous microbial populations, ultimately resulting in reduction of hexavalent chromium to trivalent chromium and sequestration in the formation. During each injection event, the dilute molasses solution will be prepared via in-line mixing using a dosing pump connected to the main water line as shown on Figure 11. The dilute molasses solution will then be pumped into the injection wells using a manifold system designed to deliver fluid to approximately half of the 31 injection wells simultaneously. Injection volumes will be monitored at each well point using a liquid flow meter. The total volume injected into each well to be monitored during each event and the data will be compiled throughout the injection program.

Field readings will be collected from the injection trailer system a minimum of once per day and the frequency of field measurements may increase based on observed injection rates. These readings will include:

- Totalizer values for the main water line and individual injection wells
- Totalizer values for other injection amendments (e.g., pH adjustment), if employed
- Carbon amendment percentage
- Wellhead pressure readings
- Injection flow rate for each well
- Timing and cause for any system shutdowns
- Pre- and post-filter pressure readings (if filters are needed)

The injection system will be staffed during operation. The system will be shut down by field personnel if well pressures fall outside of the target range, or if adverse conditions (e.g., daylighting of injected solution) occur. Field forms are provided in Appendix B.

Injection lines will be flushed with clean water regularly to prevent potential biofouling along the reagent distribution lines and at injection wells. At the end of each injection day, approximately 10 to 20 gallons of clean water will be injected into each injection well that was injected during the day. Upon completion of each injection event, approximately 50 to 75 gallons of clean water will be injected into each injection well. The clean water flush volume will be recorded on injection event monitoring logs.

The molasses tank will be cleaned at the end of each injection event by rinsing to the extent possible with a hose connected to an onsite water source. The rinse water will be containerized for disposal. Once clean, the tank will be filled with approximately 50 gallons of clean water for final flushing of dosing lines and pumps during final system flushing. The bag filter will also be removed, thoroughly cleaned, and reinstalled.

5.1.7 Injection Frequency

For in-situ biological treatment to be successful, sufficient carbohydrates must be added to the subsurface to stimulate microbial activity, provide excess organic carbon, create the zone of anaerobic and reducing conditions, and propagate the in-situ reactive zone in the target treatment area. Injection events are planned to occur three times per year for 2 years and twice during the third year (for biological treatment), with the goal of establishing declining COC concentrations at the property boundary. Amendment dosing and the frequency and timing of injection events may be modified based upon observed performance. Adjustments and modifications to the injection program will be discussed in semiannual reports provided to the USEPA.

5.2 Groundwater Monitoring

The groundwater monitoring program is discussed below and presented in Table 7.

5.2.1 Monitoring Program

5.2.1.1 Baseline Monitoring

Baseline groundwater monitoring (Table 8) will be conducted following installation of the injection well network to determine groundwater quality conditions prior to initiation of the injection program. Baseline monitoring will consist of water-level gauging and sampling via the low-flow sampling method for eight onsite monitoring wells for filtered chromium, filtered hexavalent chromium, total organic carbon, nitrate, filtered iron, sulfate, sulfide, and methane; and water level gauging and sampling of 31 injection wells for filtered chromium, filtered hexavalent chromium, total organic carbon, filtered iron, and sulfate. Field procedures will be conducted as discussed in Section 5.2.2.

5.2.1.2 Remediation Performance Monitoring

Performance monitoring (Table 9) will be conducted approximately 4 to 6 weeks following each injection event. The purpose of performance monitoring is to evaluate reagent distribution and longevity, and to document establishment and maintenance of the in-situ reactive treatment zone downgradient from the injection wells. Performance monitoring will include:

- Water-level gauging and sampling of nine injection wells for filtered hexavalent chromium, total organic carbon, and filtered iron.
- Water-level gauging and sampling of seven monitoring wells for filtered chromium, filtered hexavalent chromium, total organic carbon, nitrate, filtered iron, sulfate, sulfide, and methane.
- Sampling one deep monitoring well (MP-7D) for filtered chromium, filtered hexavalent chromium, and total organic carbon.

Performance monitoring groundwater samples will be collected from onsite monitoring wells using low-flow methods. Injection wells will be sampled using the low-flow sampling pump or a disposable bailer. Additional information on field procedures is described in Section 5.2.2.

Results of the performance monitoring will be used to assess amendment distribution, redox conditions, and treatment performance. Performance monitoring results will be evaluated to determine the need for modifications to the injection dosing program. Long-term monitoring results (see Section 5.2.1.3) will also be used to monitor remedy performance.

5.2.1.3 Long-Term Monitoring

Routine long-term groundwater monitoring (Table 10) and reporting will be completed to document stability and natural attenuation of the chromium plume in groundwater. These activities will include groundwater gauging at 32 well locations and groundwater sampling at 21 well locations for COCs (filtered chromium and filtered hexavalent chromium). At a subset of 16 well locations, samples will also be analyzed for total organic carbon, nitrate, filtered iron, sulfate, and sulfide. In addition, a set of six samples will be analyzed for dissolved methane. Groundwater samples will be collected using the low-flow sampling method. Field procedures will be conducted as discussed in Section 5.2.2.

Semiannual monitoring in Years 1 through 5, followed by annual monitoring starting in Year 6. The need to future modifications to the long-term monitoring program will be based on data evaluations.

5.2.2 Field Procedures

5.2.2.1 Water-Level Monitoring

Synoptic water-level monitoring will be completed within an approximately 24-hour period. Water-level measurements will be collected using an electronic water-level indicator with an accuracy of +0.01 foot. Measurements will be recorded from a permanently marked reference point located on the top of the inner casing (i.e., the measuring point). If a marked reference point is not observed, measurements will be recorded from the highest point on the top of the inner casing. Water levels will be measured at least two times to check the reproducibility of the measurement data and improve accuracy. The water-level meter will be decontaminated between well locations.

5.2.2.2 Low-Flow Groundwater Sampling

Groundwater samples will be collected using the USEPA low-flow sampling method. A decontaminated low-flow pump will be used for purging and sampling with dedicated polyethylene tubing. Care will be used during the collection of water-level measurements and pump installation to prevent suspension of possible sediment in the well bottom. Pumps will be positioned in the middle portion of the saturated well screen.

Purging will be conducted at an optimal pump rate that matches the well recharge rate from the aquifer formation to minimize drawdown. The pump rate should not exceed 300 milliliters per minute (mL/min) during purging and should be reduced to approximately 100 mL/min during sampling. Regular measurements of the pump rate and water level will be collected to verify that the pumping water level (i.e., drawdown) is minimal. Also, regular measurements of water quality field parameters (dissolved oxygen [DO], temperature, pH, specific conductance [SC], oxidation-reduction potential [ORP], and turbidity) will be collected at 5-minute intervals until parameters stabilize within the ranges listed below (at least three consecutive readings to ensure that formation water has entered the well and achieved steady state conditions):

- pH ± 0.1
- DO ± 10 percent for values greater than 0.5 milligram per liter (mg/L) or if three DO values are less than 0.5 mg/L, consider the values as stabilized
- SC ± 3 percent
- Temperature ±3 percent
- Turbidity ± 10 percent for values greater than 5 nephelometric turbidity units (NTUs) or if three turbidity values are less than 5 NTUs, consider the values as stabilized
- ORP ± 10 millivolts (mV)

For analyses that require field filtering of groundwater samples, a dedicated, single-use, 0.45-micrometer filter will be affixed to the discharge of the tubing.

5.2.2.3 Poorly Recharging Wells

If there is insufficient water present in the well to fill the required sample containers, purging will be stopped, and the well will be allowed to recharge overnight. Sampling will be performed the following day using low-flow sampling methods or a bailer if there is insufficient water in the well for purging. If possible, one final set of field parameters will be recorded during groundwater sampling.

5.2.2.4 Bailer Grab Sampling

Grab samples for performance monitoring may be collected from injection wells using a disposable bailer. Bailer grab samples will be collected without purging. A dedicated, single-use, 0.45-micrometer filter will be affixed to the end of the bailer if filtered groundwater samples are required. A downhole probe may be used to collect field parameters (pH, temperature, DO, SC, and ORP).

5.2.2.5 Equipment Decontamination

Proper decontamination of sampling equipment is essential to prevent sample cross contamination. Monitoring wells will be sampled in the order of least to most impacted (based on available data and well location) to minimize the potential for cross contamination. Dedicated (i.e., tubing) or disposable (i.e., bailers) sampling equipment will be used to the maximum extent possible and will require no decontamination. Other sampling equipment will be decontaminated before each sampling event and between each sample. Sampling and other down-hole equipment will be decontaminated according to the following procedures:

- Clean with tapwater and laboratory detergent (biodegradable Alconox® or Liquinox®) using a brush if necessary to remove particulate matter and surface films.
- Rinse thoroughly with tapwater.
- Rinse thoroughly with distilled water and allow to air dry.

Decontamination fluids will be containerized for disposal.

6 Quality Assurance Project Plan

This section presents the data quality objectives (DQOs), the environmental sampling and analysis program, and quality assurance/quality control procedures that will be employed to ensure that technical data generated are accurate, representative, and of known and usable quality.

6.1 Data Quality Objectives

DQOs are qualitative or quantitative statements derived during the planning process. The DQOs are used to clarify the study objectives and define the appropriate type of data required to support project decisions. The DQOs for this scope of work are presented below:

- Waste characterization sample data will be collected in such a manner that the data will be usable to determine appropriate waste disposal measures.
- Soil quality data will be collected in such a manner to determine the extent to which soil removal activities achieve the interim remedial goal of 100 mg/kg for hexavalent chromium at the target depths of 0 to 5 feet below ground surface within the Building 9 and Building 6 areas.
- Groundwater quality data will be collected in such a manner that the data will be suitable to determine whether the groundwater quality meets established COC standard.

DQOs will be achieved through the implementation of specific procedures for sample collection, blank assessments, COC documentation, equipment calibration, internal quality control audits, preventative maintenance, and corrective actions as necessary. The laboratory analytical methods and reporting limits, and standards for chromium are presented in Table 11.

6.2 Analytical Quality Controls

Laboratory quality control samples will include laboratory control samples/laboratory control sample duplicates, initial and continuing calibration standards, laboratory duplicates, matrix spike/matrix spike duplicates, and method blanks. A matrix spike/matrix spike duplicate sample will be analyzed at a frequency of one in 20 samples per COC. The matrix spike will be a replicate of one of the environmental samples.

6.3 Sampling Quality Controls

6.3.1 Field Documentation

Pre-printed field forms and logs or electronic field forms will be used to document field operations and sample custody. For daily activities, a pre-printed daily log or bound field logbook will be used.

All aspects of sample collection and handling as well as visual observations will be documented. All entries will be dated, legible, and contain accurate and inclusive documentation of project activities. At the end of each day's activity, or of a particular event as appropriate, all documents in the field will be secured by the field manager for each task. Once completed, the pre-printed field forms and electronic field records will be maintained a part of the project files.

6.3.2 Field Quality Assurance

Field quality assurance components of the proposed sampling-related activities are described below.

Waste Characterization. Pre-excavation concrete, soil, and sediment samples will be collected for waste characterization purposes. Additional waste characterization analysis may be performed if required by the waste disposal facility. The sampling program is described below; additional information is provided in Section 4.2.

- *Pre-Excavation Concrete*. Concrete chip samples will be collected using a wet concrete/rock core press for waste characterization purposes. Samples will be as grab samples from the 0 to 1 ft bgs interval and analyzed for total and hexavalent chromium, and leachable chromium, via the TCLP method (Table 4).
- *Pre-Excavation Soil*. Subsurface soil samples will be collected using a direct-push macro-core sampler or hand auger for waste characterization purposes. One composite sample per grid area will be collected from the 1 to 5-foot bgs interval and composited in a stainless-steel trowel and bowl. Samples will be analyzed for total and hexavalent chromium, and leachable chromium, via the TCLP as presented in Table 4.
- *Pre-Excavation Sediment*. Sediment samples will be collected from floor drains and sumps within Buildings 6 and 9 for waste characterization purposes. One composite sample per building will be collected where an equal amount of sediment will be collected from each sump and composited in a stainless-steel trowel and bowl. Samples will be analyzed for total chromium, hexavalent chromium and TCLP chromium (Table 2).

Post-Excavation Verification Soil. Soil samples will be collected from the sidewall and bottom of the excavation. Sidewall samples will be collected as grab samples from the middle sidewall depth at a spacing of one sample every 20 to 30 linear feet. Bottom samples will be collected at a density of one sample per every 500 square feet. The samples will be collected with an excavator or telescoping pole with a sampling cup to minimize the need for the sampler to enter the excavation. Post-excavation verification samples will be analyzed for total and hexavalent chromium analysis (Table 4). The sampling program is further described in Section 4.4.

Groundwater. Groundwater samples will be collected in accordance with the low-flow sampling procedures described in Section 5.2.2 to ensure that samples are representative of groundwater quality conditions. Water quality parameters will be collected prior to sample collection until parameters stabilize within 10 percent for temperature, turbidity, and DO; ± 0.1 for pH; ± 3 percent for conductivity; and ± 10 mV for redox potential) in three consecutive readings. Monitoring wells will be sampled in the order of least to most impacted (based on available data and well location) to minimize the potential for cross contamination.

Decontamination. Decontamination of nondedicated sampling equipment will be conducted using a three-step decontamination process (gross wash, gross rinse, and distilled water rinse) before and after sample collection at each location. Distilled water will be used during decontamination activities.

Duplicates and Blanks. Sampling precision will be measured through the collection and evaluation of duplicate field samples for COCs. Duplicate samples will be collected contemporaneously at a frequency of one in 10 samples per matrix for COCs. Rinse blanks will be collected at a frequency of one blank per 20 environmental samples but will not be required if dedicated sampling equipment is used. Duplicate samples and rinse blanks will be treated as separate samples during collection, shipping, and analysis, and will be analyzed by the same laboratory as the environmental samples.

6.4 Sampling Procedures, Handling, and Custody

6.4.1 Calibration Procedures

Field equipment such as water quality meters will be calibrated daily in accordance with the manufacturer's instructions as appropriate. Calibration records will be recorded on a field form or in the field logbook.

6.4.2 Sample Management

Appropriate sample containers, preservatives, and holding times are presented in Table 12. Immediately after the samples are collected, they will be stored in insulated coolers pre-chilled to less than 6 degrees Celsius using double bags of ice. Samples will remain in the possession of the field technician until delivered to the lab courier or common carrier. Chain of custody forms will be used to document sample cooler possession at a frequency of one chain of custody per sample collection day. Sample coolers will be sealed with custody seals prior to shipment.

6.4.3 Sample Identification

Each sample will be given a unique identification based upon sample matrix, location, and depth (for direct-push technology samples). Labels with sample identification including sample date, time, and preservation will be attached to each container.

Sample information will also be recorded on the chain of custody form and the daily log. Sample identification for the proposed sampling activities has been designated for each medium as follows:

- *Groundwater samples*. Designated to start as MP##(mmddyy) for onsite monitoring wells and Well#(mmddyy) for offsite monitoring wells.
- *Duplicates*. Designated by adding 100 to the parent ID. For example, a duplicate for groundwater sample MP02(060121) would be named MP102(060121). When duplicate samples are collected, the location of the parent ID will be recorded in the field notes.
- *Rinse blanks*. Designated to start with RB##(mmddyy). The rinse blank number will indicate the number of rinse blanks collected on a specific day.
- *Pre-excavation soil samples*. Designated to start with PC#-X(ft-ft) where # indicates the building number (9 or 6) and X indicates the grid location (e.g., A, B, C) and ft-ft indicates the sample collection depth below ground surface.
- *Verification sidewall soil samples*. Designated to start with VSSS#-#(ft-ft) where # indicates the building number (9 or 6) and # indicates that sample number (e.g., 1, 2, 3) and ft-ft indicates the sample collection depth below ground surface.
- *Verification bottom soil samples*. Designated to start with VBSS#-#(ft-ft) where # indicates the building number (9 or 6) and # indicates that sample number (e.g., 1, 2, 3) and ft-ft indicates the sample collection depth below ground surface.

- *IDW characterization samples*. IDW characterization samples will be designated to start as “IDW”, then the storage container type and the date collected (mmddyy). For example, a sample collected from an onsite purge water storage drum on June 1, 2021, would be named: IDWDRUM (060121).

6.5 Analytical Procedures

Field samples will be analyzed using USEPA-approved methods by a fixed-base laboratory. The proposed analysis and analytical methods for the groundwater samples are presented in Table 12.

6.6 Data Management and Validation

The project analytical laboratory will provide a Level II analytical laboratory report and electronic data deliverable (EDD). Laboratory data reports will be provided in Contract Laboratory Program type packages that include final results (uncorrected for blanks and recoveries), analytical methods, quantitation/detection limits, surrogate recovery data, and method blank data. EDDs will be provided in EQuIS 4-file format by the analytical laboratory.

Data validation will be conducted for this scope of work based on USEPA guidance (USEPA 2002; USEPA 2020). For samples collected in support of COC groundwater monitoring and post-excavation soil verification sampling, 100 percent of the data will undergo USEPA Region III Level II data verification and validation.

Samples collected in support of in-situ groundwater treatment performance monitoring or waste characterization for disposal will not be validated. If anomalous results are observed, a USEPA Region III Level II review will be performed. Additional verification validation will be performed as necessary if this level of review indicates potential deficiencies with laboratory performance.

Data validation will be summarized in a checklist-style report documenting the items reviewed with text explanations and notations of deficiencies, and a summary of the qualifications applied to the analytical data. For data that will undergo the USEPA Region III Level II validation, field documents will be reviewed within the perspective of impact to data quality. Any issues noted in field documentation or records that could impact data usability or quality will be noted in the validation reports.

6.7 Assessment and Reporting

Analytical results will be promptly reviewed and compared to media standards presented in Table 11 to make informed decisions and assess the overall performance of the correction action measures. Remedial action completion report(s) will be prepared to document the proposed corrective actions have been implemented in accordance with this plan. Additional components of the assessment and reporting program are described below:

- ***Soil***. Post-excavation soil sampling will document the site conditions after the target volume of impacted soils have been removed. If the post-excavation soil results indicate that hexavalent chromium concentrations remain in place above the interim remedial goal of 100 mg/kg, a vadose zone soil amendment such as cheese whey will be added to the excavation prior to backfilling. Alternatively, additional soils may be excavated if those activities can be performed in a safe manner and without negatively impacting the structural integrity of the building(s).
- ***Groundwater***. Demonstration of decreasing trends for the onsite treatment area will be used to determine when to cease the amendment injection program, while stability and natural attenuation of the site-wide

chromium plume will be assessed through long-term monitoring and reporting. For planning purposes, a performance monitoring event will be conducted within 4 to 6 weeks of an injection event during active groundwater treatment, while semi-annual site-wide groundwater monitoring and reporting will continue for five years and then will be ramped down to annual monitoring and reporting afterwards. Modifications to the groundwater monitoring and reporting program (including the need for any contingency measures) will be determined will be based on the performance monitoring results. Recommendations will be provided for EPA review in routine monitoring reports prior to implementation.

6.8 Construction Quality Assurance/Quality Controls

A CQA/CQC Plan will be prepared for the proposed source control corrective actions. The CQA Plan will provide is a planned system of activities by oversight personnel to provide adequate confidence that the construction contractor's products and services meet the contractual and regulatory requirements and will be perform satisfactorily in service. The CQC Plan will provide a planned of activities by the construction contractor to provide a means to measure and regulate the characteristics of a product or service to the contractual or regulatory requirements. The scope of the CQA/CQC Plan will be based on the prospective buyer's site redevelopment activities which are ongoing and anticipated to influence the work control zones, material staging areas, stormwater management, and onsite traffic controls.

This CQA/CQC Plan will include requirements for the following documentation elements:

- Photographs representative of all site activities
- Field logbooks to document observations
- Daily records of personnel on-site, truck arrival/departure times, and other vital project information
- Truck/equipment inspection logs
- Post-completion survey of soil removal limits and restoration features
- Weekly reporting of transportation activities and accomplishments.

7 Schedule and Reporting

Long-term monitoring of groundwater will continue in April and November of each year. Continued semiannual monitoring and reporting is planned for the next 5 years. Additional remedial actions (as proposed in this CAWP) will begin within 90 days of regulatory approval. EPA will be notified if the future site redevelopment plan is anticipated to affect the remedial action schedule.

8 References

Arcadis. 2020. Current Conditions Report. Former Rockwood Pigments Plant, Beltsville, Maryland.

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Arcadis. 2021b. Corrective Measures Study Report, Former Rockwood Pigments Plant, Beltsville, Maryland. March.

USEPA. 2002. Guidance on Environmental Data Verification and Data Validation, EPA QA/G-8. EPA/240/R-02/004. November.

USEPA. 2020. National Functional Guidelines for Inorganic Superfund Methods Data Review. OLEM 9240.1-66. EPA 542-R-20-006. November.

USEPA. 2021. Final Decision. Former Rockwood Pigments Plant, Beltsville, Maryland. November. Accessible at https://www.epa.gov/hwcorrectiveactionsites/documents-reports-and-photographs-venator-americas-llc-formerly-huntsman-p

Tables

Table 1
Soil Descriptions
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well ID	Screen Interval (feet bgs)	Depth to Water (feet bgs)	Screen Fully Saturated (Yes/No)	Logged Depth (feet bgs)	Soil Description
Injection Line 1					
MP-15	15 to 25	12.83 (11/2020)	Yes	21	10 to 20 feet: Coarse SAND. 12 to 13 feet: CLAY 13 to 14 feet: Coarse SAND 14 to 17 feet: SAND with clay 17 to 19 feet: Fine SAND 19 to 20 feet: SAND with clay 20 to 21 feet: CLAY
SB-6	10 to 20	13.3 (10/2019 temp well) 14 (10/2019 borehole)	No	21	10 to 20 feet: Coarse SAND. 12 to 13 feet: CLAY 13 to 14 feet: Coarse SAND 14 to 17 feet: SAND with clay 17 to 19 feet: Fine SAND 19 to 20 feet: SAND with clay 20 to 21 feet: CLAY
SB-19	n/a	not encountered	n/a	20	10 to 17 feet: Coarse SAND 17 to 18 feet: Coarse SAND and CLAY 18 to 19 feet: CLAY 19 to 20 feet: Coarse SAND and CLAY
SB-31	n/a	15	n/a	20	10 to 11 feet: Fine SAND 11 to 15 feet: CLAY 15 to 19 feet: Medium SAND 19 to 20 feet: CLAY
Injection Line 2					
SB-3	11 to 21	15.9 (11/20 temp well) (17 10/20 borehole)	No	21	10 to 16 feet: GRAVEL 16 to 19.5 feet: CLAY 19.5 to 21 feet: SILT
SB-16	--	not encountered	--	20	10 to 17 feet: CLAY 17 to 19 feet: CLAY and coarse SAND 19 to 20 feet: Coarse SAND
SB-17	--	15.0 (10/20 borehole)	--	20	10 to 15 feet: Coarse SAND 15 to 16 feet: Coarse SAND and CLAY 16 to 18 feet: CLAY 18 to 20 feet: Fine SAND, Fine SAND and CLAY
MP-19	15 to 25	11.5 (11/2020 well) 15.0 (10/2020 borehole)	Yes	30	10 to 15 feet: Medium SAND 15 to 25 feet: Coarse SAND 25 to 29 feet: CLAY with SAND 29 to 30 feet: Medium SAND
Injection Line 3					
MP-20	9 to 29	22.5 (11/2020 well) 22.0 (10/2020 borehole)	No	30	9 to 10 feet: GRAVEL 10 to 17 feet: Medium SAND 17 to 19 feet: CLAY with sand 19 to 21 feet: CLAY 21 to 25 feet: Medium SAND 25 to 28 feet: GRAVEL 28 to 29 feet: Medium SAND 29 to 30 feet: CLAY
MP-22	15 to 25	19.1 (11/2020 well) 21.0 (10/2020 borehole)	No	30	10 to 11 feet: Medium SAND 11 to 12 feet: CLAY 12 to 21 feet: Coarse SAND 21 to 25 feet: Medium SAND 25 to 26 feet: CLAY 26 to 27 feet: Coarse SAND and GRAVEL 27 to 30 feet: CLAY
MP-3	13 to 23	18.0 (11/2020 well) 15.0 (6/1985 borehole)	No	23	10 to 15 feet: Fine to medium SAND 15.5 to 19 feet: Medium to coarse SAND and GRAVEL 19 to 23 feet: Fine to medium SAND
IW-01	20 to 30	17.7 (11/2020 well) 18.0 (10/2020 borehole)	Yes	35	10 to 17 feet: Medium SAND 17 to 20 feet: CLAY 20 to 23 feet: CLAY with sand 23 to 32 feet: Medium SAND 32 to 35 feet: CLAY

Table 1
Soil Descriptions
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well ID	Screen Interval (feet bgs)	Depth to Water (feet bgs)	Screen Fully Saturated (Yes/No)	Logged Depth (feet bgs)	Soil Description
DR-01	20 to 30	18.0 (11/2020 well) 20.0 (10/2020 borehole)	Yes	30	10 to 11 feet: Medium SAND 11 to 18 feet: Coarse SAND 18 to 20 feet: CLAY 20 to 24 feet: Medium to fine SAND 24 to 27 feet: Fine SAND 27 to 28 feet: Medium to fine SAND 28 to 30 feet: Medium to coarse SAND
Injection Line 4					
MP-19	15 to 25	11.5 (11/2020) 15.0 (10/2020 borehole)	Yes	30	10 to 15 feet: Medium SAND 15 to 25 feet: Coarse SAND 25 to 29 feet: CLAY with sand 29 to 30 feet: Medium SAND
IW-01	20 to 30	18.3 (11/2020) 20.0 (10/2020 borehole)	Yes	35	10 to 17 feet: Medium SAND 17 to 20 feet: CLAY 20 to 23 feet: CLAY with sand 23 to 32 feet: Medium SAND 32 to 35 feet: CLAY
DR-01	20 to 30	18.0 (11/2020 well) 20 (10/2020 borehole)	Yes	30	10 to 11 feet: Medium SAND 11 to 18 feet: Coarse SAND 18 to 20 feet: CLAY 20 to 24 feet: Medium to fine SAND 24 to 27 feet: Fine SAND 27 to 28 feet: Medium to fine SAND 28 to 30 feet: Medium to coarse SAND
MP-3	13 to 23	18.0 (11/2020 well) 15.0 (06/1985 borehole)	No	23	10 to 15 feet: Fine to medium SAND 15.5 to 19 feet: Medium to coarse SAND and GRAVEL 19 to 23 feet: Fine to medium SAND
MP-20	9 to 29	22.5 (11/2020 well) 22.0 (10/2020 borehole)	No	30	9 to 10 feet: GRAVEL 10 to 17 feet: Medium SAND 17 to 19 feet: CLAY with sand 19 to 21 feet: CLAY 21 to 25 feet: Medium SAND 25 to 28 feet: GRAVEL 28 to 29 feet: Medium SAND 29 to 30 feet: CLAY
MP-22	15 to 25	19.1 (11/2020 well) 21.1 (10/2020 borehole)	No	30	10 to 11 feet: Medium SAND 11 to 12 feet: CLAY 12 to 21 feet: Coarse SAND 21 to 25 feet: Medium SAND 25 to 26 feet: CLAY 26 to 27 feet: Coarse SAND and GRAVEL 27 to 30 feet: CLAY
Injection Line 5					
MP-7	17 to 27	21.1 (11/20 well) 19 (09/1985 borehole)	No	27	10 to 11.5 feet: Medium SAND 15 to 16 feet: Fine SAND 16 to 16.5 feet: Fine SAND and GRAVEL 20 to 21.5 feet: Fine SAND 25 to 26.5 feet: SILT 30 to 31.5 feet: SILT and SAND (MWto7D log)
SB-01	20 to 30	23.0 (10/2019 temp well) 22.0 (10/2019 borehole)	No	30	10 to 26 feet: Medium SAND 26 to 29 feet: CLAY with sand and GRAVEL 29 to 30 feet: CLAY with sand
MP-13	20 to 30	20.3 (11/2020 well)	~Yes	30	10 to 26 feet: Medium SAND 26 to 29 feet: CLAY with sand and GRAVEL 29 to 30 feet: CLAY with sand
MP-23	13 to 23	12.6 (11/2020 well) 13.0 (10/2020 borehole)	Yes	30	10 to 12 feet: Fine to Medium SAND 12 to 16 feet: Fine SAND 16 to 17 feet: CLAY with sand 17 to 24 feet: Fine to medium SAND 24 to 30 feet: CLAY

Acronyms and Abbreviations:
bgs = below ground surface
n/a = not available

Table 2
Sump Water Results and Proposed Sediment Analysis
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Sample ID	Building Location	Located in Field (Y/N)	Water Present and Removed (Y/N)	Sediment Present (Y/N)	Sample Date	Total Chromium (µg/L) Filtered	Hexavalent Chromium (µg/L) Filtered	Proposed Sediment Analysis
Building 9 Features								
D-1	Building 9	Yes	Yes	Yes (< 1 inch)	10/23/20	**550**	**434**	Note 1
D-2	Building 9	Yes	No	Yes (~6 inches)	--	--	--	Note 1
D-3	Building 9	Yes	Yes	Yes (< 1 inch)	10/23/20	**370**	**166**	Note 1
D-4	Building 9	Yes	Yes	Yes (< 1 inch)	10/23/20	**1,100**	**354**	Note 1
D-5	Building 9	Abandoned	No	Abandoned	--	--	--	None
Building 6 Features								
D-6	Building 6	Yes	Yes	Yes (< 1 inch)	10/23/20	**7,300**	**6,890**	Note 1
D-7	Building 6	Yes	Yes	Yes (< 1 inch)	10/23/20	**5,100**	**6,180**	Note 1
D-8	Building 6	Yes	No	Yes**	--	--	--	Note 1

Notes:
1. One composite sediment sample will be collected per building for total chromium, hexavalent chromium, and Toxicity Characteristic Leaching Procedure (TCLP) chromium.

2. Bold indicates constituent was detected.
3. Total chromium concentration from TCLP analysis above 5 mg/L is considered a RCRA hazardous waste.

Acronyms and Abbreviations:
** Sediment probing was not performed due to a welded steel plate over the sump. One corner was pried up for a visual inspection.
µg/L = microgram per liter
< = less than reporting limit
~ = approximately
-- = not analyzed
N = no
Y = yes

Table 3
Well Construction Details
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well ID	Well Permit ID	Northing [1]	Easting [1]	Measuring Point Elevation (feet msl) [2]	Ground Elevation (feet msl) [2]	Well Completion	Well Diameter (inches)	Screened Interval (feet bgs)	Well Depth (feet bgs)
Onsite Monitoring Wells									
MP-1	--	--	--	170.35	--	Stickup	2	18 - 28	28.0
MP-2	--	--	--	179.35	--	Stickup	2	28 - 38	38.0
MP-3	--	507688	1344963	162.72	161.79	Stickup	2	13 - 23	23.0
MP-4	--	507909	1344806	157.54	155.90	Stickup	2	5 - 15	15.0
MP-5	--	507773	1344705	156.43	156.60	Stickup	2	5 - 15	15.0
MP-7	--	507579	1344988	166.30	165.10	Stickup	2	17 - 27	27.0
MP-7D	--	507584	1344992	166.10	165.10	Stickup	2	50 - 55	55.0
MP-8	--	--	--	160.69	--	Flush mount	2	13 - 23	23.0
MP-9	--	--	--	161.09	--	Flush mount	4	8.5 - 28.5	28.5
MP-10	--	--	--	161.33	--	Flush mount	4	8.5 - 28.5	28.5
MP-11	PG-88-2198	--	--	161.60	--	Flush mount	4	10 - 30	30.0
MP-12	PG-88-2197	507734	1345054	161.85	162.15	Flush mount	4	9.5 - 29.5	29.5
MP-13	PG-14-0009	507607	1345055	165.75	166.14	Flush mount	2	20-30	30.0
MP-14	PG-14-0019	507706	1345026	162.04	162.42	Flush mount	2	20-30	30.0
MP-15	PG-14-0026	507792	1344990	158.35	158.76	Flush mount	2	15-25	25.0
MP-16	PG-14-0053	507811	1344803	157.09	157.47	Flush mount	2	15-25	25.0
MP-17	--	507782	1345168	162.54	162.81	Flush mount	2	20-30	30.0
MP-18	PG-14-0028	507927	1344966	159.63	160.05	Flush mount	2	20-30	30.0
MP-19	--	507743	1344895	157.28	157.74	Flush mount	2	15-25	25.0
MP-20	--	507693	1345084	165.94	166.39	Flush mount	2	9-29	29.0
MP-21	--	507645	1345135	167.46	167.84	Flush mount	2	19-29	29.0
MP-22	--	507645	1345012	162.92	163.21	Flush mount	2	15-25	25.0
MP-23	--	507655	1344877	157.04	157.54	Flush mount	2	13-23	23.0
MP-24	--	507720	1344794	157.32	157.77	Flush mount	2	9-19	19.0
DR-01	--	507694	1345024	162.18	162.49	Flush mount	2	20-30	30.0
Onsite Injection Wells									
IW-01	--	507699	1345023	161.97	162.47	Flush mount	4	20-30	30.0
Offsite Monitoring Wells									
Well A	PG-11-0472	--	--	162.18	--	Flush mount	2	15 - 35	35.0
Well B	PG-95-3437	506755	1345232	171.61	172.60	Flush mount	2	25 - 45	45.0
Well C	PG-95-3439	507319	1345055	165.51	166.30	Flush mount	2	15 - 35	35.0
Well D	PG-14-0349	505855	1344792	159.56	159.89	Flush mount	2	76 - 86	86.0
Well E	PG-14-0338	505269	1345267	165.49	162.76	Stickup	2	118 - 129	129.0
Well F	PG-14-0350	505097	1345965	170.91	168.18	Stickup	2	87 - 97	97.0
Well G	PG-14-0346	505181	1346629	170.05	167.39	Stickup	2	85 - 95	95.0
Well H	PG-14-0340	504155	1346695	169.24	166.76	Stickup	2	95 - 105	105.0
Well I	PG-14-0339	504147	1345329	176.14	173.53	Stickup	2	130 - 140	140.0
Well J	PG-14-0351	503609	1346469	186.23	183.50	Stickup	2	145 - 155	155.0
Abandoned Monitoring Wells									
MP-6	--	--	--	158.69	--	--	--	6 - 16	16.0

Notes:
[1] North American Datum of 1983/2011.
[2] National Geodetic Vertical Datum of 1929.

Acronyms and Abbreviations:
-- = not applicable or available
bgs = below ground surface
msl = mean sea level

Table 4
Pre- and Post-Excavation Sampling and Analysis Program
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Location ID	Concrete					Soil				
	Depth Interval (feet bgs)	Sample Type	Total Chromium (Method 6020)	Hexavalent Chromium (Method 7196)	TCLP Chromium (Method 1311/6010)[1]	Depth Interval (feet bgs)	Sample Type	Total Chromium (Method 6020)	Hexavalent Chromium (Method 7196)	TCLP Chromium (Method 1311/6010)[1]
Building 9										
Pre-Excavation Characterization Soil Sampling and Analysis										
PC9-A	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC9-B	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC9-C	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC9-D	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC9-E	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC9-F	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC9-G	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC9-H	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
Total			**8**	**8**	**8**			**8**	**8**	**8**
Post-Excavation Verification Sidewall Soil Sampling and Analysis										
VSS9-01	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS9-02	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS9-03	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS9-04	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS9-05	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS9-06	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS9-07	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS9-08	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS9-09	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS9-10	--	--	--	--	--	Mid-Depth	Grab	X	X	--
Total								**10**	**10**	
Post-Excavation Verification Bottom Soil Sampling and Analysis										
VBS9-01	--	--	--	--	--	Bottom Depth	Grab	X	X	--
VBS9-02	--	--	--	--	--	Bottom Depth	Grab	X	X	--
VBS9-03	--	--	--	--	--	Bottom Depth	Grab	X	X	--
VBS9-04	--	--	--	--	--	Bottom Depth	Grab	X	X	--
Total								**4**	**4**	

Table 4
Pre- and Post-Excavation Sampling and Analysis Program
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Location ID	Concrete					Soil				
	Depth Interval (feet bgs)	Sample Type	Total Chromium (Method 6020)	Hexavalent Chromium (Method 7196)	TCLP Chromium (Method 1311/6010)[1]	Depth Interval (feet bgs)	Sample Type	Total Chromium (Method 6020)	Hexavalent Chromium (Method 7196)	TCLP Chromium (Method 1311/6010)[1]
Building 6										
Pre-Excavation Characterization Soil Sampling and Analysis										
PC6-A	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC6-B	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC6-C	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC6-D	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC6-E	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC6-F	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC6-G	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
PC6-H	0-1.0	Chip	X	X	X	1.0 to 5.0	Composite	X	X	X
TOTAL			**8**	**8**	**8**			**8**	**8**	**8**
Post-Excavation Verification Sidewall Soil Sampling and Analysis										
VSS6-01	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-02	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-03	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-04	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-05	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-06	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-07	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-08	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-09	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-10	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-11	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-12	--	--	--	--	--	Mid-Depth	Grab	X	X	--
VSS6-13	--	--	--	--	--	Mid-Depth	Grab	X	X	--
TOTAL								**10**	**10**	
Post-Excavation Verification Bottom Soil Sampling and Analysis										
VBS6-01	--	--	--	--	--	Bottom Depth	Grab	X	X	--
VBS6-02	--	--	--	--	--	Bottom Depth	Grab	X	X	--
VBS6-03	--	--	--	--	--	Bottom Depth	Grab	X	X	--
VBS6-04	--	--	--	--	--	Bottom Depth	Grab	X	X	--
VBS6-05	--	--	--	--	--	Bottom Depth	Grab	X	X	--
TOTAL								**5**	**5**	

Note:
MS/MSD samples will be collected by media at a frequency of 1 per 20 samples for pre- and post-excavation.
Duplicate samples will be collected by media at a frequency of 1 per 10 samples for pre- and post-excavation.
Total chromium concentration from TCLP analysis above 5 mg/L is considered a RCRA hazardous waste.
[1] Additional waste characterization samples will be collected if requested by the disposal facility.

Table 5
Proposed Excavation Volumes
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Grid ID	Depth (feet bgs)	Material	Depth (lf)	Area (ft^2)	Concrete Volume (ft^3)	Soil Volume (ft^3)
Building 9						
Grid 9A	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 9B	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 9C	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 9D	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 9E	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 9F	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 9G	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 9H	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Subtotal (ft^3)					**3200**	**12800**
Building 6						
Grid 6A	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 6B	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 6C	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 6D	0-1.0	Concrete	1	400	400	
	1.0-5.0	Soil	4	400		1600
Grid 6E	0-1.0	Concrete	1	600	600	
	1.0-5.0	Soil	4	600		2400
Grid 6F	0-1.0	Concrete	1	200	200	
	1.0-5.0	Soil	4	200		800
Grid 6G	0-1.0	Concrete	1	750	750	
	1.0-5.0	Soil	4	750		3000
Subtotal (ft^3)					**3150**	**12600**
Totals						
Total (ft^3)[1]					**7310**	**29240**
Total (cy)[1]					**271**	**1083**
Roll-Off Container Fill Capacity at 5 tons					**9%**	**12%**
Roll-Off Container Fill Capacity at 18 tons					**31%**	**42%**
No. of Roll-Off Containers (30 cy, at 18 tons)					**29**	**85**

Note:

[1] Expansion Factor	30%
Soil Density (lbs/ft^3)	105
Concrete Density (lbs/ft^3)	145

Acronyms and Abbreviations:

% = percent	ft^3 = cubic foot
bgs = below ground surface	lb = pound
cy = cubic yard	lf = linear foot
ft^2 = square foot	

Table 6
Amendment Dosing Details
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well ID	Soil Logging	Screen Length (feet)	Radius of Influence (feet) [1,2]	Amendment Solution (gallons)	Injection Rate (gpm)	Duration (days) [3]	Daily Clean Water Flush (gallons)	Total Clean Water Flush Volume	Total Volume (gallons)	Injection Pressure (psi)	Solution Strength (%)	Injected Amendment (lbs) [4]
Injection Line 1												
IW-02	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-03		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-04	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
Injection Line 2												
IW-05	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-06		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-07	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-08		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
Injection Line 3												
IW-09	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-10	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-01	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-11	X	15	10	8,850	1.5	12.3	15	200	9,050	< 8	2	1,388
Injection Line 4												
IW-12		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-13	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-14		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-15	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-16	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-17		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-18	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388

Table 6
Amendment Dosing Details
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well ID	Soil Logging	Screen Length (feet)	Radius of Influence (feet) [1,2]	Amendment Solution (gallons)	Injection Rate (gpm)	Duration (days) [3]	Daily Clean Water Flush (gallons)	Total Clean Water Flush Volume	Total Volume (gallons)	Injection Pressure (psi)	Solution Strength (%)	Injected Amendment (lbs) [4]
Injection Line 5												
IW-19	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-20		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-21	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-22		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-23	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-24		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-25	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-26		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-27	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-28		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-29	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-30		15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
IW-31	X	15	10	8,850	1.5	12.3	15	200	9,050	< 10	2	1,388
Totals	**19**			**274,350**	**47**		**465**	**6,200**	**280,550**			**43,028**

Notes:

[1] Radius of influence (feet) = square root ((injection volume [gallons] / conversion factor [7.48 gal/ft^3]) / (3.14 x screen length [e.g., 10 feet] x mobile porosity [e.g., 25%]))

[2] Mobile porosity (i.e., volume to distance relationship) of 25% assumed for injection planning based on injection test performed within permeable area of site. Mobile porosity may vary across site.

[3] Injection duration calculated based upon total amendment solution volume injected during 8-hour work days. Approximately half of the wells will be injected into simultaneously.

[4] Amendment (lbs) = injection volume (gal) x % solution (e.g., 2%) x substrate specific gravity at 100% strength (e.g., 1.41) x density of water (8.34 lbs/gal).

Acronyms and Abbreviations:

% = percent
< = less than
ft^3 = cubic foot
gal = gallon
gpm = gallon per minute
lb = pound
psi = pound per square inch
X = soil logging to be performed

Table 7
Groundwater Monitoring Program Summary
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well ID	Baseline Monitoring[1]	Performance Monitoring[2]	Long Term Monitoring[3]
Onsite Monitoring Wells			
MP-1			X
MP-2			X
MP-3	X	X	X
MP-4			X
MP-5			X
MP-7	X	X	X
MP-7D	X	X	X [4]
MP-8 [5]			
MP-9 [5]			
MP-10 [5]			
MP-11			X
MP-12 [5]			
MP-13			X
MP-14	X	X	X
MP-15	X	X	X
MP-16			X
MP-17			X
MP-18			X
MP-19			X
MP-20			X
MP-21			X
MP-22	X	X	X
MP-23	X	X	X
MP-24			X
DR-01	X	X	
Total	8	8	20

Well ID	Baseline Monitoring[1]	Performance Monitoring[2]	Long Term Monitoring[3]
Onsite Injection Wells			
IW-01	X		
IW-02	X		
IW-03	X	X	
IW-04	X		
IW-05	X		
IW-06	X		
IW-07	X	X	
IW-08	X	X	
IW-09	X		
IW-10	X		
IW-11	X		
IW-12	X		
IW-13	X		
IW-14	X		
IW-15	X	X	
IW-16	X		
IW-17	X		
IW-18	X		
IW-19	X		
IW-20	X		
IW-21	X	X	
IW-22	X		
IW-23	X		
IW-24	X		
IW-25	X	X	
IW-26	X		
IW-27	X		
IW-28	X		
IW-29	X	X	
IW-30	X	X	
IW-31	X	X	
Total	25	8	

Well ID	Baseline Monitoring[1]	Performance Monitoring[2]	Long Term Monitoring[3]
Offsite Monitoring Wells			
Well A			X
Well B			X
Well C			X
Well D			X
Well E			X
Well F			X
Well G			X
Well H			X
Well I			X
Well J			X
Total			10

Notes:
[1] Baseline groundwater monitoring will be conducted following installation of the injection well network.
[2] Performance monitoring will be conducted approximately 4 to 6 weeks following each injection event.
[3] Long-term monitoring will be conducted as follows: semi-annual in Year 1 through 5, and annual in Year 6 and beyond.
[4] Groundwater level gauging only.
[5] Maryland Department of Environment Oil Control Program well; possible free product present.

Table 8
Baseline Groundwater Monitoring Program
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well Details				Constituents of Concern		Biogeochemical Parameters						Notes
Well ID	Well Screen (ft bgs)	Sample ID	Gauging	Chromium, Filtered	Chromium (VI), Filtered	Total Organic Carbon	Nitrate	Iron, Filtered	Sulfate	Sulfide	Methane	
Filtration				YES	YES	NO	NO	YES	NO	NO	NO	
Method				6020	218.6	9060A	300	6020	300	SM4500	RSK-175	
Onsite Monitoring Wells												
MP-3	13 - 23	MP-03(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-7	17 - 27	MP-07(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-7D	50 - 55	MP-07D(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-14	20 - 30	MP-14(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-15	15 - 25	MP-15(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-22	15 - 25	MP-22(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-23	13 - 23	MP-23(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-23	13 - 23	MP-123(MMDDYY)	X	X	X							duplicate/MS/MSD
DR-01	20 - 30	DR-01(MMDDYY)	X	X	X	X	X	X	X	X	X	
TOTAL			**9**	**9**	**9**	**8**	**8**	**8**	**8**	**8**	**8**	
Injection Wells												
IW-01	20 - 30	IW-01(MMDDYY)	X	X	X	X		X	X			
IW-02	20 - 30	IW-02(MMDDYY)	X	X	X	X		X	X			
IW-03	20 - 30	IW-03(MMDDYY)	X	X	X	X		X	X			
IW-04	20 - 30	IW-04(MMDDYY)	X	X	X	X		X	X			
IW-05	20 - 30	IW-05(MMDDYY)	X	X	X	X		X	X			
IW-06	20 - 30	IW-06(MMDDYY)	X	X	X	X		X	X			
IW-07	20 - 30	IW-07(MMDDYY)	X	X	X	X		X	X			
IW-08	20 - 30	IW-08(MMDDYY)	X	X	X	X		X	X			
IW-09	20 - 30	IW-09(MMDDYY)	X	X	X	X		X	X			
IW-10	20 - 30	IW-10(MMDDYY)	X	X	X	X		X	X			
IW-11	20 - 30	IW-11(MMDDYY)	X	X	X	X		X	X			
IW-12	20 - 30	IW-12(MMDDYY)	X	X	X	X		X	X			
IW-13	20 - 30	IW-13(MMDDYY)	X	X	X	X		X	X			
IW-14	20 - 30	IW-14(MMDDYY)	X	X	X	X		X	X			
IW-15	20 - 30	IW-15(MMDDYY)	X	X	X	X		X	X			
IW-16	20 - 30	IW-16(MMDDYY)	X	X	X	X		X	X			
IW-17	20 - 30	IW-17(MMDDYY)	X	X	X	X		X	X			
IW-18	20 - 30	IW-18(MMDDYY)	X	X	X	X		X	X			
IW-19	20 - 30	IW-19(MMDDYY)	X	X	X	X		X	X			
IW-20	20 - 30	IW-20(MMDDYY)	X	X	X	X		X	X			
IW-21	20 - 30	IW-21(MMDDYY)	X	X	X	X		X	X			
IW-22	20 - 30	IW-22(MMDDYY)	X	X	X	X		X	X			

Table 8
Baseline Groundwater Monitoring Program
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well Details				Constituents of Concern		Biogeochemical Parameters						Notes
Well ID	Well Screen (ft bgs)	Sample ID	Gauging	Chromium, Filtered	Chromium (VI), Filtered	Total Organic Carbon	Nitrate	Iron, Filtered	Sulfate	Sulfide	Methane	
Filtration				YES	YES	NO	NO	YES	NO	NO	NO	
Method				6020	218.6	9060A	300	6020	300	SM4500	RSK-175	
IW-23	20 - 30	IW-23(MMDDYY)	X	X	X	X		X	X			
IW-24	20 - 30	IW-24(MMDDYY)	X	X	X	X		X	X			
IW-25	20 - 30	IW-25(MMDDYY)	X	X	X	X		X	X			
IW-26	20 - 30	IW-26(MMDDYY)	X	X	X	X		X	X			
IW-27	20 - 30	IW-27(MMDDYY)	X	X	X	X		X	X			
IW-28	20 - 30	IW-28(MMDDYY)	X	X	X	X		X	X			
IW-29	20 - 30	IW-29(MMDDYY)	X	X	X	X		X	X			
IW-30	20 - 30	IW-20(MMDDYY)	X	X	X	X		X	X			
IW-31	50 - 30	IW-31(MMDDYY)	X	X	X	X		X	X			
TOTAL			**31**	**31**	**31**	**31**	**0**	**31**	**31**	**0**	**0**	
QA/QC Sampling												
Rinse Blank-01		RB(MMDDYY)		X	X							Chromium only
Rinse Blank-02		RB(MMDDYY)		X	X							Chromium only
TOTAL				**2**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	

Acronyms and Abbreviations:
ft bgs = feet below ground surface
MS/MSD = matrix spike/matrix spike duplicate

Table 9
IRZ Performance Groundwater Monitoring Program
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well Details				Constituents of Concern		Biogeochemical Parameters						Notes
Well ID	Well Screen (feet bgs)	Sample ID	Gauging	Chromium, Filtered	Chromium (VI), Filtered	Total Organic Carbon	Nitrate	Iron, Filtered	Sulfate	Sulfide	Methane	
Filtration				YES	YES	NO	NO	YES	NO	NO	NO	
Method				6020	218.6	9060A	300	6020	300	SM4500	RSK-175	
Onsite Monitoring Wells												
MP-3	13 - 23	MP-03(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-7	17 - 27	MP-07(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-7D	50 - 55	MP-07D(MMDDYY)	X	X	X	X						
MP-14	20 - 30	MP-14(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-15	15 - 25	MP-15(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-22	15 - 25	MP-22(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-23	13 - 23	MP-23(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-23	13 - 23	MP-123(MMDDYY)	X	X	X							duplicate/MS/MSD
DR-01	20 - 30	DR-01(MMDDYY)	X	X	X	X	X	X	X	X	X	
TOTAL			**9**	**9**	**9**	**8**	**7**	**7**	**7**	**7**	**7**	
Injection Wells												
IW-03	20 - 30	IW-01(MMDDYY)	X		X	X		X				
IW-07	20 - 30	IW-07(MMDDYY)	X		X	X		X				
IW-08	20 - 30	IW-08(MMDDYY)	X		X	X		X				
IW-15	20 - 30	IW-15(MMDDYY)	X		X	X		X				
IW-21	20 - 30	IW-21(MMDDYY)	X		X	X		X				
IW-25	20 - 30	IW-25(MMDDYY)	X		X	X		X				
IW-29	20 - 30	IW-29(MMDDYY)	X		X	X		X				
IW-30	20 - 30	IW-30(MMDDYY)	X		X	X		X				
IW-31	20 - 30	IW-31(MMDDYY)	X		X	X		X				
TOTAL			**19**	**10**	**19**	**18**	**8**	**17**	**8**	**8**	**8**	
Quality Assurance/Quality Control Sampling												
Rinse Blank-01		RB(MMDDYY)		X	X							Chromium only
			Totals	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	

Acronyms and Abbreviations:
bgs = below ground surface
IRZ = in-situ reactive zone
MS/MSD = matrix spike/matrix spike duplicate

Table 10
Long-Term Monitoring Program
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well Details				Constituents of Concern		Biogeochemical Parameters						Notes
Well ID	Well Screen (feet bgs)	Sample ID	Gauging	Chromium, Filtered	Chromium (VI), Filtered	Total Organic Carbon	Nitrate	Iron, Filtered	Sulfate	Sulfide	Methane	
Filtration				YES	YES	NO	NO	YES	NO	NO	NO	
Method				6010	218.6	9060A	300	6020B	300	SM4500	RSK-175	
Onsite Monitoring Wells												
MP-1	18 - 28	MP-01(MMDDYY)	X	X	X	X	X	X	X	X		
MP-2	28 - 38	MP-02(MMDDYY)	X	X	X	X	X	X	X	X		
MP-3	13 - 23	MP-03(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-4	5 - 15	MP-04(MMDDYY)	X	X	X							
MP-5	5 - 15	MP-05(MMDDYY)	X	X	X							
MP-7	17 - 27	MP-07(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-7D	50 - 55	MP-07D(MMDDYY)	X									
MP-11	10 - 30	MP-11(MMDDYY)	X	X	X							
MP-13	20 - 30	MP-13(MMDDYY)	X	X	X	X	X	X	X	X		
MP-14	20 - 30	MP-14(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-15	15 - 25	MP-15(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-16	15 - 25	MP-16(MMDDYY)	X	X	X	X	X	X	X	X		
MP-17	20 - 30	MP-17(MMDDYY)	X	X	X	X	X	X	X	X		
MP-18	20 - 30	MP-18(MMDDYY)	X	X	X							
MP-19	15 - 25	MP-19(MMDDYY)	X	X	X							
MP-20	9 - 29	MP-20(MMDDYY)	X	X	X							
MP-21	19 - 29	MP-21(MMDDYY)	X	X	X							
MP-22	15 - 25	MP-22(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-23	13 - 23	MP-23(MMDDYY)	X	X	X	X	X	X	X	X	X	
MP-23	13 - 23	MP-123(MMDDYY)	X	X	X							duplicate/MS/MSD
MP-24	9 - 19	MP-24(MMDDYY)	X	X	X							
Offsite Monitoring Wells												
Well-A	15 - 35	Well-A(MMDDYY)	X	X	X							
Well-B	25 - 45	Well-B(MMDDYY)	X	X	X	X	X	X	X	X		
Well-C	15 - 35	Well-C(MMDDYY)	X	X	X							
Well-D	76 - 86	Well D(MMDDYY)	X	X	X	X	X	X	X	X		
Well-E	118 - 129	Well-E(MMDDYY)	X	X	X							
Well-F	87 - 97	Well-F(MMDDYY)	X	X	X	X	X	X	X	X		
Well-G	85 - 95	Well-G(MMDDYY)	X	X	X							
Well-H	95 - 105	Well-H(MMDDYY)	X	X	X	X	X	X	X	X		
Well-I	130 - 140	Well-I(MMDDYY)	X	X	X							
Well-J	145 - 155	Well-J(MMDDYY)	X	X	X	X	X	X	X	X		
Well-J	145 - 155	Well-JJ(MMDDYY)	X	X	X							duplicate/MS/MSD
TOTAL			**32**	**31**	**31**	**16**	**16**	**16**	**16**	**16**	**6**	

Table 10
Long-Term Monitoring Program
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Well Details				Constituents of Concern		Biogeochemical Parameters						Notes
Well ID	Well Screen (feet bgs)	Sample ID	Gauging	Chromium, Filtered	Chromium (VI), Filtered	Total Organic Carbon	Nitrate	Iron, Filtered	Sulfate	Sulfide	Methane	
Filtration				YES	YES	NO	NO	YES	NO	NO	NO	
Method				6010	218.6	9060A	300	6020B	300	SM4500	RSK-175	
Quality Assurance/Quality Control Sampling												
Rinse Blank-01		RB(MMDDYY)		X	X							Chromium only
Rinse Blank-02		RB(MMDDYY)		X	X							Chromium only
TOTAL				**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	

Acronyms and Abbreviations:
bgs = below ground surface
MS/MSD = matrix spike/matrix spike duplicate

Table 11
Laboratory Analytical Methods, Reporting Limits, and Standards for Chromium
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Analytical Program						Media Standards		
Parameter	Preparation Method	Analytical Method	Reporting Limit	Method Detection Limit	Units	Value	Units	Basis
Soil								
Hexavalent Chromium	SW846 3060A	SW846 7196A	0.20	0.12	mg/kg	6.3	mg/kg	USEPA Industrial RSL
Total Chromium	SW846 3050B	SW846 6020A	1	0.30	mg/kg	1,800,000*	mg/kg	USEPA Industrial RSL
Water								
Hexavalent Chromium, Filtered	--	EPA 218.6	0.020	0.0075	µg/L	0.35**	µg/L	Final Decision
Total Chromium, Filtered	SW846 3015	SW846 6020A	2.2	0.74	µg/L	100	µg/L	Federal MCL

Notes:

Analytical services will be performed by ALS Environmental

Laboratory limits will be adjusted accordingly based on initial sample volume, final extract volume, and any necessary dilutions

[1] Analysis is for total chromium and hexavalent chromium; trivalent chromium (insoluble salts) is calculated as the difference between total chromium and hexavalent chromium.

*USEPA Regional Screening Levels Table for Chromium(III), Insoluble Salts, November 2021

** site-specific value (10X the Tapwater RSL) base on the 2021 Final Decision

µg/kg = micrograms per kilogram

µg/L = micrograms per Liter

MCL = Maximum Contaminant Level

RSL = Regional Screening Levels

SSLs = Soil Screening Levels

USEPA = United States Environmental Protection Agency

Table 12
Analytical Methods, Containers, and Preservation
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Parameter	Matrix	Preparation Method	Analytical Method	Container	Preservative	Field Filtration	Holding Time
Constituents of Concern							
Hexavalent Chromium, Filtered	Water	--	EPA 218.6	1 x 250 mL plastic	Field filtered to 0.45 µm, 1mL $NH_4OH/(NH_4)_2SO_4$ per 1L, Cool <6 °C	Yes	28 days
Chromium, Filtered	Water	SW846 3015	SW846 6020A	1 x 125 mL plastic	pH <2 with HNO_3, Cool <6°C	Yes	6 months
Hexavalent Chromium	Solid	SW846 3060A	SW846 7196A	1 x 4 oz. glass or plastic jar	Cool <6°C	NA	28 days
Total Chromium	Solid	SW846 3050B	SW846 6020A	1 x 4 oz. amber glass jar	Cool <6°C	NA	6 months
Total Solids/Percent Moisture	Solid	--	SM2540G	1 x 4 oz. glass jar	--	NA	7 days
TCLP Chromium	Solid	EPA 1311/ SW846 3015	SW846 6010C	1 x 4 oz. glass jar	Cool <6°C	NA	6 months

Table 12
Analytical Methods, Containers, and Preservation
Former Venator Americas LLC Facility
7011 Muirkirk Road
Beltsville, Maryland

Parameter	Matrix	Preparation Method	Analytical Method	Container	Preservative	Field Filtration	Holding Time
Natural Attenuation Parameters							
Iron, Filtered	Water	SW846 3015	SW846 6020A or SW846 6010C	1 x 125 mL plastic	pH <2 with HNO_3	Yes	6 months
Nitrate	Water	--	EPA 300.0	1 x 250 mL plastic	Cool <6°C	No	48 hours
Sulfate	Water	--	EPA 300.0	1 x 250 mL plastic	Cool <6°C	No	28 days
Sulfide	Water	--	SM4500S2F-2011	2 x 250 mL glass	Zn Acetate; NaOH pH > 9; Cool <6° C	No	7 days
Total Organic Carbon	Water	--	SM5310B /	2 x 40 mL amber glass	pH <2 with HCl, Cool <6°C	No	28 days
Dissolved Methane	Water	--	RSK175	2 x 40 mL VOA with Teflon™-lined septum	HCl to pH <2, Cool <6°C	No	14 days

Note:
1. Field filtration with 0.45 µm filter membrane.

Acronyms and Abbreviations

°C = degree Celsius
< = less than
> = greater than
HCl = hydrochloric acid
HNO_3 = nitric acid
L = liter
mL = milliliter
NA = not applicable
NaOH = sodium hydroxide
NH_4OH = ammonium hydroxide
$(NH_4)_2SO_4$ = ammonium sulfate
TCLP = Toxicity Characteristic Leaching Procedure
VOA = volatile organic analysis
Zn = zinc

Figures

SITE LOCATION

FIREBIRD FARM (UNIVERSITY OF DISTRICT OF COLUMBIA AGRICULTURAL RESEARCH FARM)

BARC Well 5

BARC Well 6

BARC Well 3

BARC Well 1

BARC Well 4

BARC Well 2

BARC Well 7

Indian Creek

Beaverdam Creek

Beck Branch

U S DEPT OF AGRICULTURE

RESEARCH CENTER

RESEARCH FACILITY

Muirkirk

Ammendale

Beltsville

Vansville

Montpelier

Blue Pond

Chestnut Hills

Whitehouse

Edgewood

Home Acres

Rosedale Park

Legend

- Firebird Farm Irrigation Well (Inactive)
- BARC Irrigation Well
- Hexavalent Chromium Concentration Contour 1 microgram per liter (µg/L)
- Existing Site Property Boundary
- Historic Stream Location
- National Hydrography Dataset Flowline
- University of District of Columbia Property Boundary
- USDA Beltsville Agricultural Research Center Property Boundary

Note: A portion of Indian Creek runs through culverts in developed areas.

Feet
0 2,000 4,000

PROJECTION: NAD 1983 2011 StatePlane Maryland FIPS 1900 Ft US
BASEMAP SOURCE: ESRI World Topo Basemap

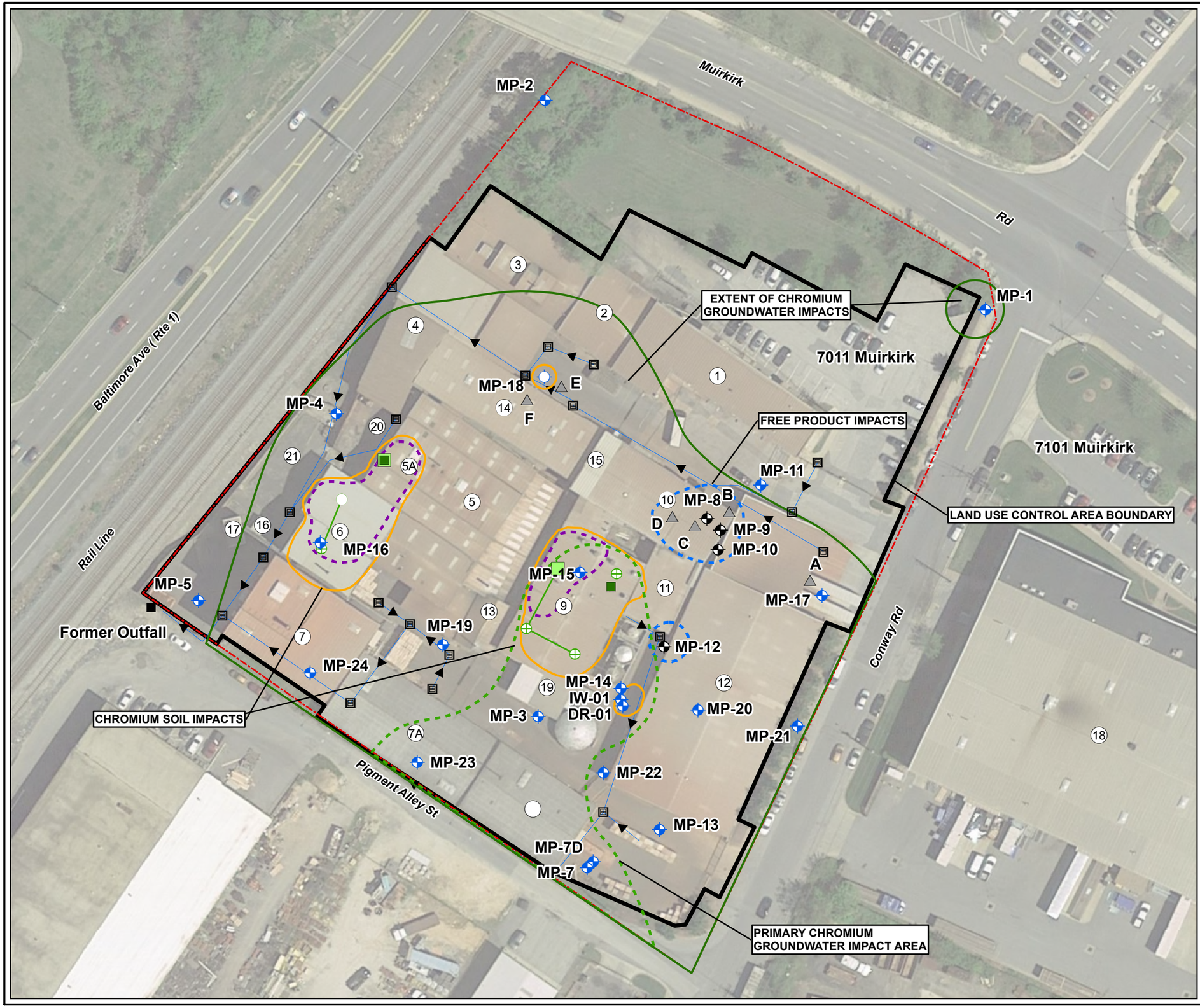
FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK RD.
BELTSVILLE, MD

Site Location Map

ARCADIS

FIGURE
1

CITY:(KNOXVILLE) DIV/GROUP:(ENV/GIS) LD:() PIC:() PM:() TM:()
PROJECT: TN000000 PATH: Z:\GISPROJECTS_ENVROCKWOOD_PIGMENT_PLANT_BELTSVILLE_MD\MXD\2020\FIGURE1_SITE_LOCATION.MXD SAVED: 3/11/2020 11:12:42 AM BY: LDRUM



Legend

- Existing Site Property Boundary
- Existing Surface Cap (Asphalt/Concrete Extent)
- Estimated Extent of Chromium Impacts (CrVI> 6.3 mg/kg)
- Extent of Chromium Groundwater Impact (CrVI > 0.35 µg/L)
- Free Product Impact
- Primary Chromium Groundwater Impact Area (CrVI > 1,000 µg/L)
- Primary Chromium Soil Impacts (CrVI > 100 mg/kg)
- Building Number
- Former Underground Storage Tank
- Storm Drain (Approximate)
- Former Outfall
- Historical Sump
- Groundwater Monitoring Well
- Product Recovery Well
- Storm Drainage (Approximate)
- Building Drain Line
- Observed Sump Location
- Observed Floor Drain Location

Feet
0 70 140

PROJECTION: NAD 1983 2011 StatePlane Maryland FIPS 1900 Ft US
AERIAL SOURCE: Google Earth Imagery April 2018

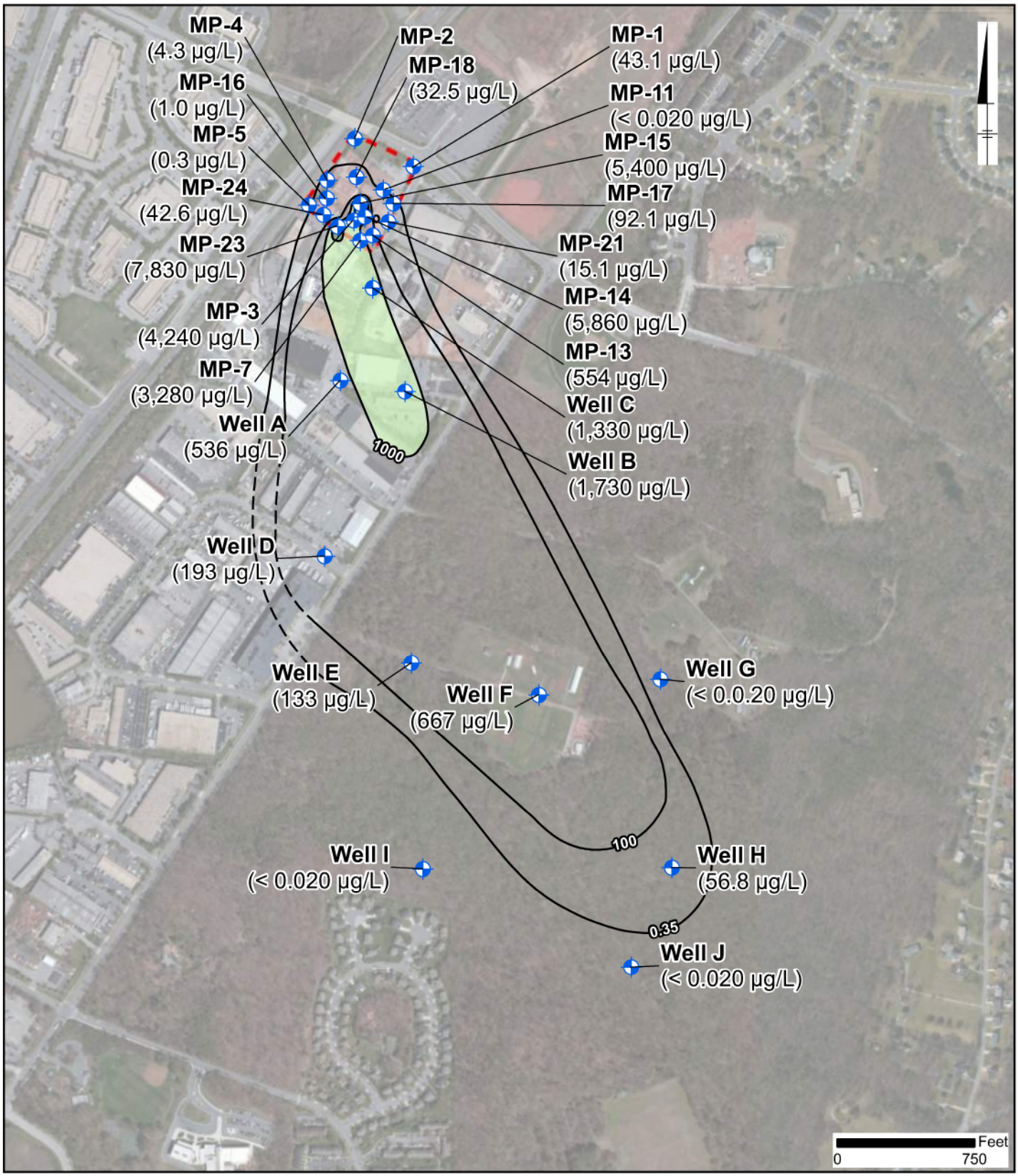
FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK RD.
BELTSVILLE, MD

Facility Property Layout with Environmental Impacts

ARCADIS

FIGURE 2

PATH: T:_ENVIROCKWOOD_ALBERMARLE\MXD\2021\CORRECTIVEACTIONFIGURE2_FACILITYLAYOUT.MXD SAVED: 6/28/2021 BY: LDRUM



PROJECTION: NAD 1983 2011 StatePlane Maryland FIPS 1900 Ft US
AERIAL SOURCE: ESRI World Imagery (Clarity) Web Map

Legend

- Groundwater Monitoring Well
- Existing Site Property Boundary
- Hexavalent Chromium Concentration Contour micrograms per liter (µg/L)

Hexavalent Chromium Concentration

- > 1,000 µg/L
- > 5,000 µg/L

(57 µg/L) Hexavalent Chromium Concentrations

Note: Monitoring well network gauged and sampled in November 2020.

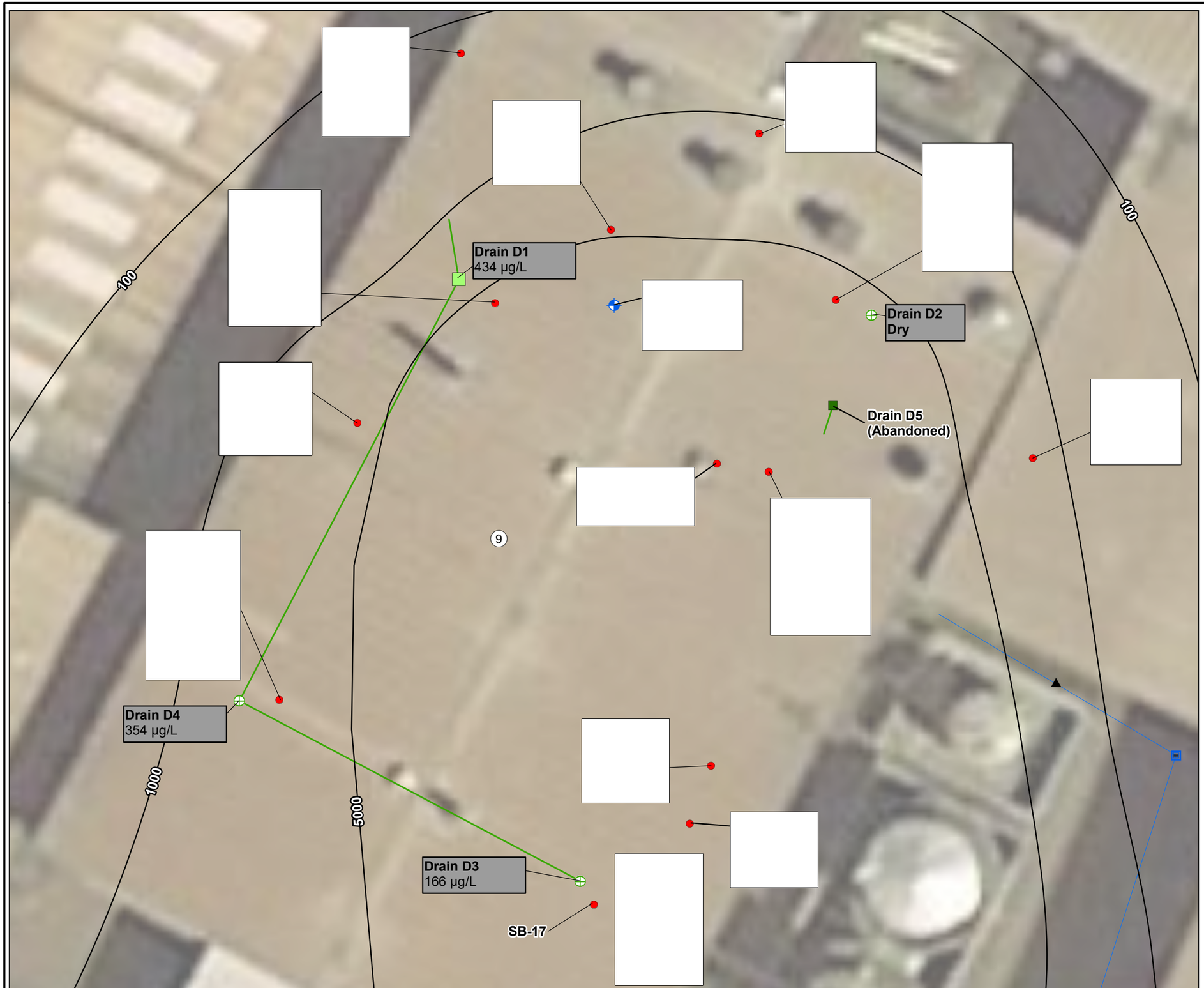
Plume contours are dashed where inferred.

FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK ROAD
BELTSVILLE, MARYLAND

Site-Wide Hexavalent Chromium Groundwater Plume (Fall 2020)

ARCADIS

FIGURE
3



Legend

- Soil Boring Location
- Groundwater Monitoring Well

Building Schedule

9. Zinc Phosphate Area/Former Blg 20

- Storm Drain (Approximate)
- Historical Sump
- Storm Drainage (Approximate)
- Observed Sump Location
- Observed Floor Drain Location
- Building Drain Line
- Hexavalent Chromium Concentration Contour micrograms per liter (µg/L)

Soil Sample ID
Sample depth (ft): CrVI result (mg/kg)

Bold values exceed EPA Industrial Soil RSL of 6.3 mg/kg

Sump Water ID
CrVI result (µg/L)

Feet
0 10 20

PROJECTION: NAD 1983 2011 StatePlane Maryland FIPS 1900 Ft US
AERIAL SOURCE: Google Earth Imagery April 2018

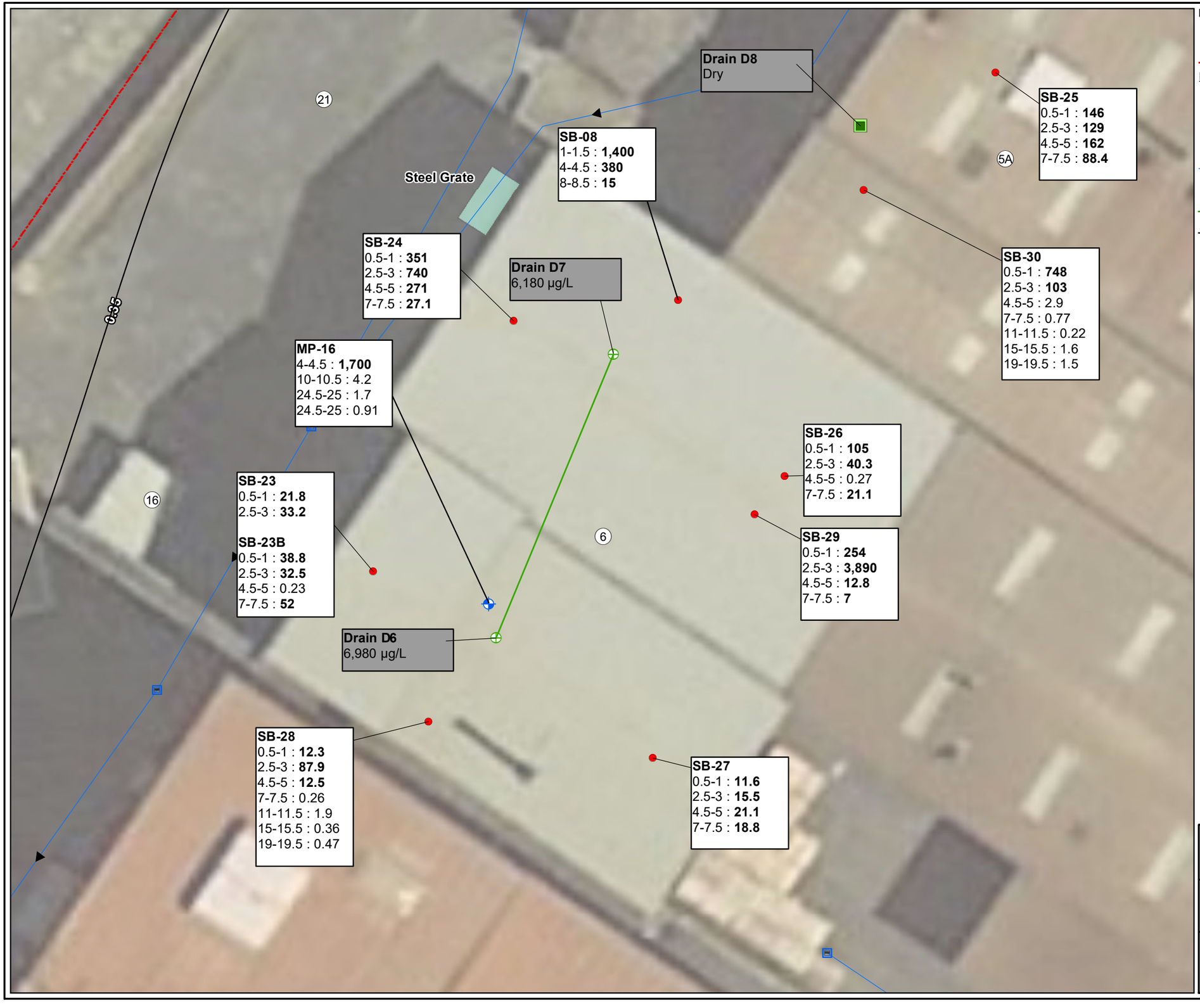
FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK RD.
BELTSVILLE, MD

Building 9
Investigation Results (Fall 2020)

ARCADIS

FIGURE
4

PATH: T:_ENVIROCKWOOD_ALBERMARLE\MXD\2021\CORRECTIVEACTIONFIGURE4_SB_SUMP_BUILDING9.MXD SAVED: 7/22/2021 BY: LDRUM



Legend

- Soil Boring Location
- Groundwater Monitoring Well
- Existing Site Property Boundary

Building Schedule

- 5A. Water Treatment Area
- 6. New Repack Area/Former Zinc Chromate Plant
- 16. WSSC Room
- 21. WWTP Emergency Sump
- Storm Drain (Approximate)
- Historical Sump
- Storm Drainage (Approximate)
- Observed Sump Location
- Observed Floor Drain Location
- Building Drain Line
- Hexavalent Chromium (CrVI) Concentration Contour micrograms per liter (µg/L)

Soil Sample ID
Sample depth (feet): CrVI result (mg/kg)

Bold values exceed EPA Industrial Soil RSL of 6.3 mg/kg

Sump Water ID
CrVI result (µg/L)

Feet
0 12 24

PROJECTION: NAD 1983 2011 StatePlane Maryland FIPS 1900 Ft US
AERIAL SOURCE: Google Earth Imagery April 2018

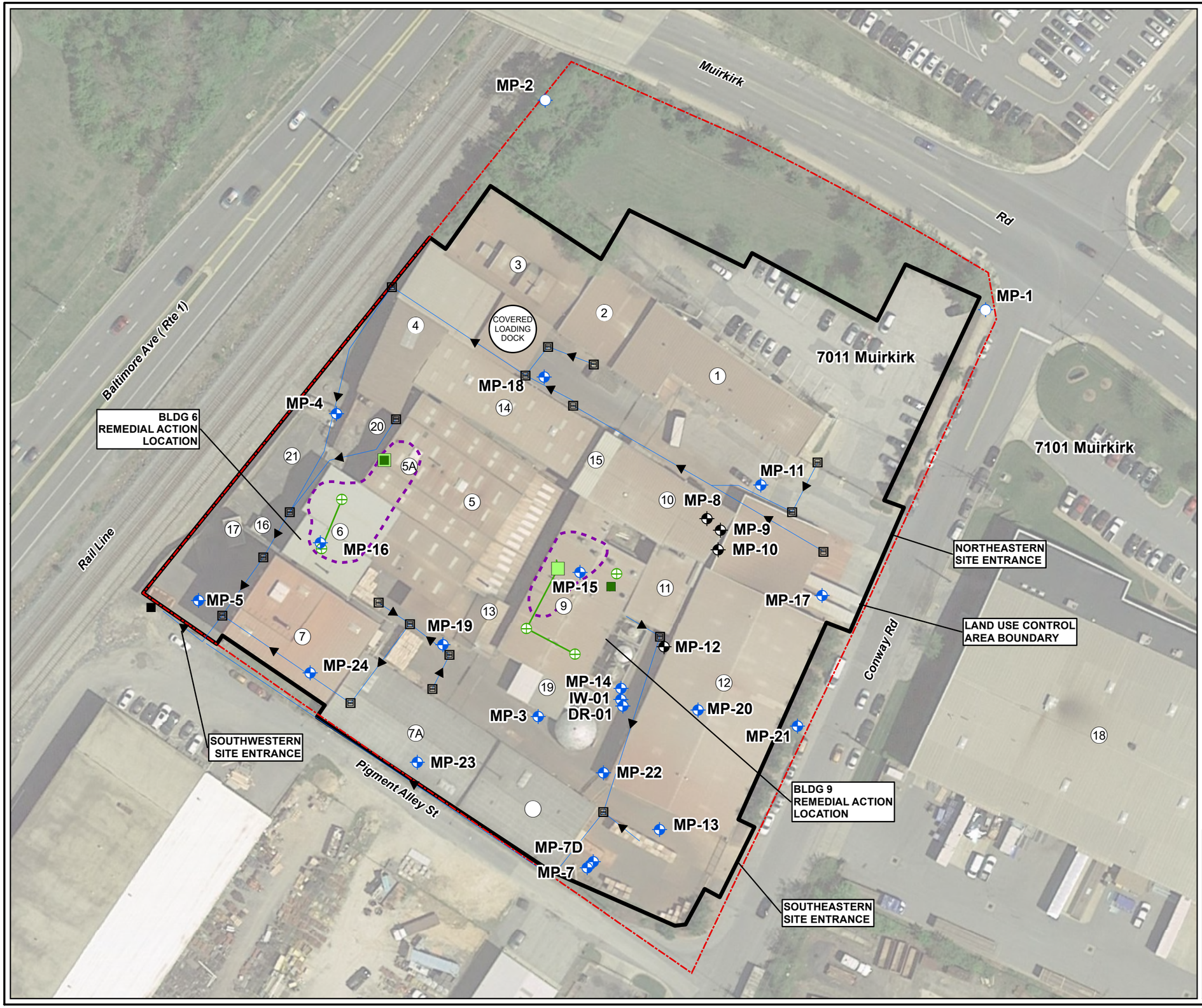
FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK RD.
BELTSVILLE, MD

Building 6
Investigation Results (Fall 2020)

ARCADIS

FIGURE
5

PATH: \\10.19.7.200\DATA_ENVROCKWOOD_ALBERMARLE\MXD\2021\CORRECTIVEACTIONFIGURE5_SB_SUMP_BUILDING6.MXD SAVED: 6/2/2021 BY: DHOLMES



Legend

- Existing Site Property Boundary
- Existing Surface Cap (Asphalt/Concrete) Extent
- Primary Chromium Soil Impacts (CrVI > 100 mg/kg)
- Building Number
- Storm Drain (Approximate)
- Former Outfall
- Historical Sump
- Groundwater Monitoring Well
- Product Recovery Well
- Storm Drainage (Approximate)
- Building Drain Line
- Observed Sump Location
- Observed Floor Drain Location

Notes:
> = greater than
CrVI = hexavalent chromium
mg/kg = milligram per kilogram

Feet
0 70 140

PROJECTION: NAD 1983 2011 StatePlane Maryland FIPS 1900 Ft US
AERIAL SOURCE: Google Earth Imagery April 2018

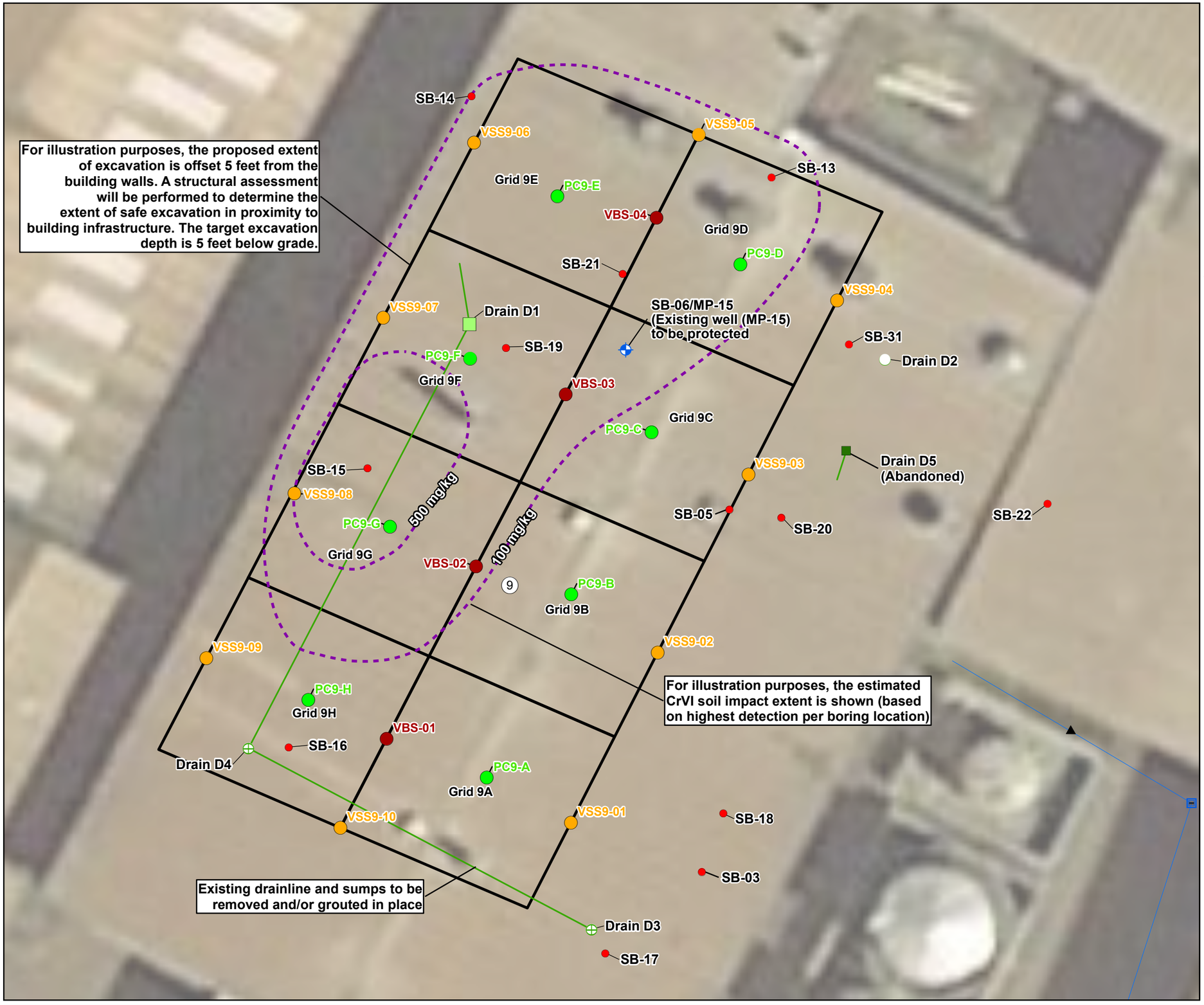
FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK RD.
BELTSVILLE, MD

Facility Property Map with Land Use Control and Remedial Action Areas

ARCADIS

FIGURE
6

PATH: T:_ENVIROCKWOOD_ALBERMARLE\MXD\2021\CORRECTIVEACTION\FIGURE6_FACILITYLAYOUT_LUC.MXD SAVED: 7/22/2021 BY: LDRUM



Legend

- 2019-2020 Soil Boring (Abandoned)
- Groundwater Monitoring Well

Building Schedule

- 9. Zinc Phosphate Area/Former Blg 20
- Storm Drain (Approximate)
- Historical Sump
- Storm Drainage (Approximate)
- Observed Sump Location
- Observed Floor Drain Location
- Building Drain Line
- Hexavalent Chromium Soil Extent
- Proposed Post-Excavation Verification Bottom Sample (VBS)
- Proposed Pre-Excavation Characterization (PC) Soil Boring / Sample
- Proposed Post-Excavation Verification Sidewall (VSS) Sample
- Proposed Excavation Grid Boundary
- 9A Proposed Grid ID

Notes:
1. Pre-Excavation Characterization Samples (PC): A pre-excavation grab sample will be collected from the concrete material and a composite sample will be collected from 1 to 5 feet below ground surface. Samples will be analyzed for total, hexavalent, and leachable (Toxicity Characteristic Leaching Procedure) chromium.
2. Verification Sidewall Samples (VVS): A post-excavation grab sample will be collected at the middle depth of the sidewall. Samples will be analyzed for Total and Hexavalent Chromium.
3. Verification Bottom Samples (VBS): A post-excavation grab sample will be collected at the bottom of the excavation. Samples will be analyzed for Total and Hexavalent Chromium.

Feet
0 10 20

PROJECTION: NAD 1983 2011 StatePlane Maryland FIPS 1900 Ft US
AERIAL SOURCE: Google Earth Imagery April 2018

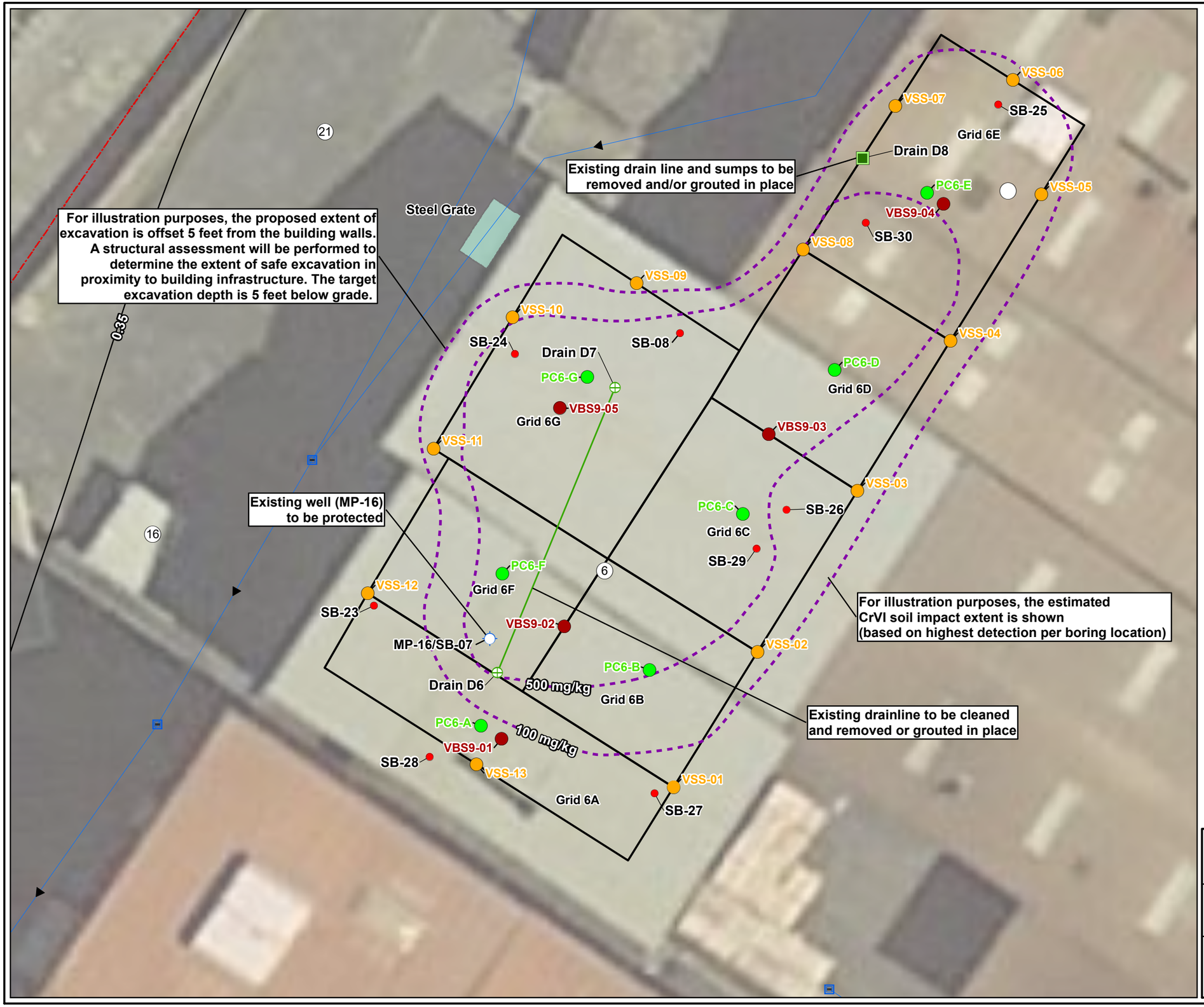
FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK RD.
BELTSVILLE, MD

Building 9
Proposed Remedial Actions

ARCADIS

FIGURE
7

PATH: T:_ENVIROCKWOOD_ALBERMARLE\MXD\2021\CORRECTIVEACTION\FIGURE7_PROPOSED_REMEDIAL_ACTIONS.MXD SAVED: 7/22/2021 BY: LDRUM



Legend

- 2019-2020 Soil Boring (Abandoned)
- Groundwater Monitoring Well
- Existing Site Property Boundary

Building Schedule

- 5A. Water Treatment Area
- 6. New Repack Area/Former Zinc Chromate Plant
- 16. WSSC Room
- 21. WWTP Emergency Sump

- Storm Drain (Approximate)
- Historical Sump
- Storm Drainage (Approximate)
- Observed Sump Location
- Observed Floor Drain Location
- Building Drain Line
- Hexavalent Chromium Soil Extent
- Hexavalent Chromium Concentration Contour micrograms per liter (µg/L)
- Proposed Post-Excavation Verification Bottom Sample (VBS)
- Proposed Pre-Excavation Characterization (PC) Soil Boring / Sample
- Proposed Post-Excavation Verification Sidewall (VSS) Sample
- Proposed Excavation Grid Boundary
- Proposed Grid ID

6A

Notes:
1. Pre-Excavation Characterization Samples (PC): A pre-excavation grab sample will be collected from the concrete material and a composite sample will be collected from 1 to 5 feet below ground surface. Samples will be analyzed for total, hexavalent, and leachable (Toxicity Characteristic Leaching Procedure) chromium.
2. Verification Sidewall Samples (VVS): A post-excavation grab sample will be collected at the middle depth of the sidewall. Samples will be analyzed for Total and Hexavalent Chromium.
3. Verification Bottom Samples (VBS): A post-excavation grab sample will be collected at the bottom of the excavation. Samples will be analyzed for Total and Hexavalent Chromium.

Feet
0 12 24

PROJECTION: NAD 1983 2011 StatePlane Maryland FIPS 1900 Ft US
AERIAL SOURCE: Google Earth Imagery April 2018

FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK RD.
BELTSVILLE, MD

Building 6
Proposed Remedial Actions

ARCADIS

FIGURE
8

PATH: T:_ENVIROCKWOOD_ALBERMARLE\MXD\2021\CORRECTIVEACTION\FIGURE8_SB_SUMP_BUILDING6.MXD SAVED: 7/22/2021 BY: LDRUM

Legend

- Existing Site Property Boundary
- Potential Water Connection
- Storm Drain (Approximate)
- Historical Sump
- Storm Drainage (Approximate)
- Building Drain Line
- Groundwater Monitoring Well
- Hexavalent Chromium Concentration Contour, micrograms per liter (µg/L)

Hexavalent Chromium Concentration

- > 1,000 micrograms per liter (µg/L)
- > 5,000 µg/L
- Installed Injection Well With Injection Radius With 10-foot Injection Radius
- Proposed Sample Location for Performance Monitoring
- Proposed Injection Well With 10-foot Injection Radius

Note:
Hexavalent chromium concentration isocontours interpreted based on samples collected in fall 2020

Feet
0 40 80

PROJECTION: NAD 1983 2011 StatePlane Maryland FIPS 1900 Ft US
AERIAL SOURCE: Google Earth Imagery April 2018

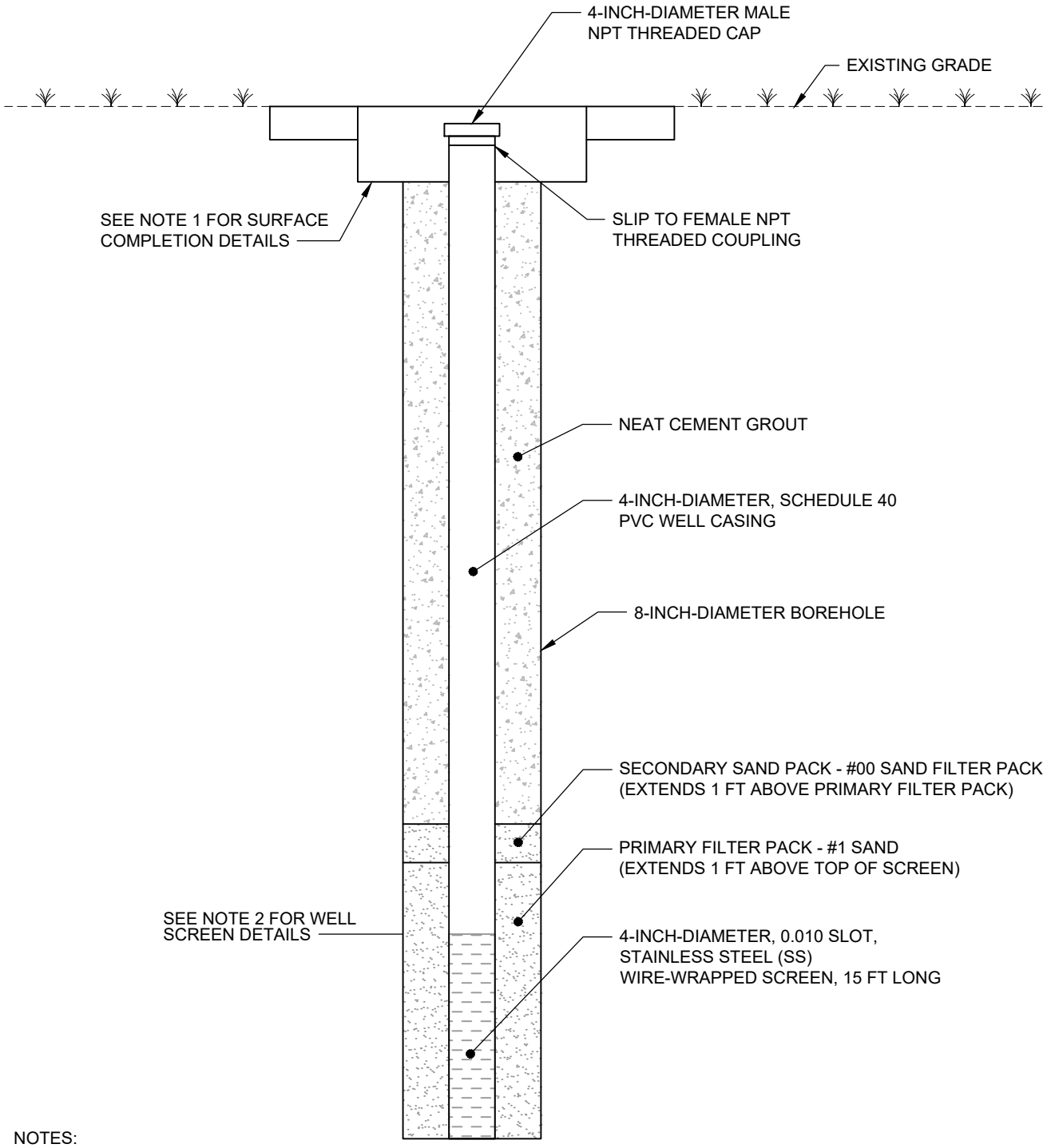
FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK RD.
BELTSVILLE, MD

Proposed Remediation Layout for Groundwater In-Situ Treatment

ARCADIS

FIGURE
9

PATH: T:_ENV\ROCKWOOD_ALBERMARLE\MXD\2021\CORRECTIVEACTION\FIGURE6_GW_INSITU.MXD SAVED: 4/21/2021 BY: LDRUM



NOTES:

FT = FOOT

NPT = NATIONAL PIPE THREAD

PVC = POLYVINYL CHLORIDE

1. INJECTION WELLS COMPLETED INSIDE BUILDINGS WILL BE SET 3 INCHES BELOW GRADE AND FINISHED WITH A STANDARD 8-INCH FLUSH-MOUNT WELL COVER. WELLS COMPLETED IN TRAFFIC AREAS WILL BE SET 6 INCHES BELOW GRADE AND FINISHED WITH A 12-INCH FLUSH-MOUNT TRAFFIC-RATED WELL COVER WITH AN 18-INCH BY 18-INCH CONCRETE PAD.

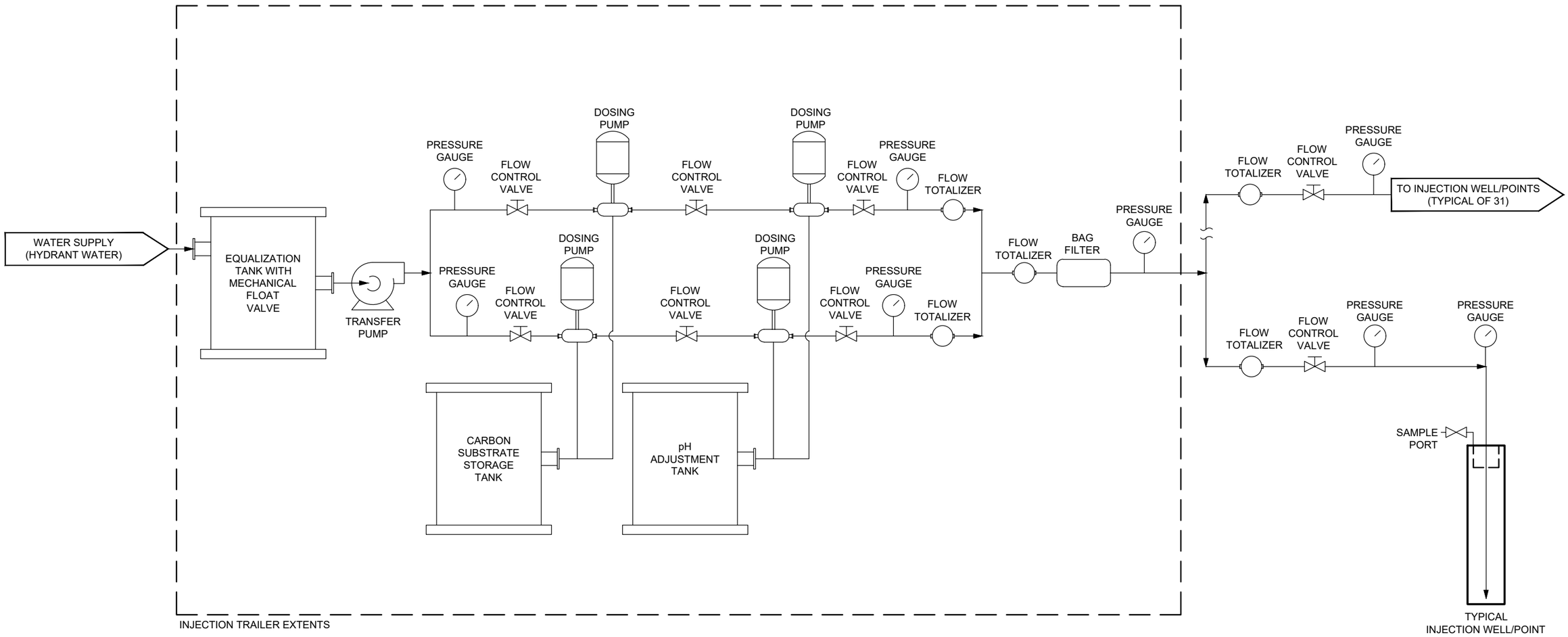
2. THE LENGTH AND PLACEMENT OF THE WELL SCREEN WILL BE DETERMINED IN THE FIELD. THE TARGET DEPTH TO SCREEN TOP IS 2.5 to 5 FT BELOW THE WATER TABLE, BUT NOT SHALLOWER THAN 15 FT BELOW GRADE.

FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK RD.
BELTSVILLE, MD

Proposed Injection Well Construction Diagram

ARCADIS

FIGURE
10



FORMER VENATOR AMERICAS LLC FACILITY
7011 MUIRKIRK RD.
BELTSVILLE, MD

Conceptual Groundwater In-Situ Treatment System Diagram

ARCADIS

FIGURE
11

C:\Users\roberlander\ACCDocs\Arcadis\ANA - ALBEMARLE CORPORATION\Project Files\ALBEMARLE BELTSVILLE SITE\20210\1-DWG\FRPP_Figure 11_Conceptual Groundwater In-Situ Treatment System Diagram.dwg SAVED: 6/18/2021 2:18 PM BY: OBERLANDER, ROSEANNE
XREFS: IMAGES:

Appendix A

Amendment Information

SAFETY DATA SHEET

PELS® Caustic Soda Beads

Section 1. Identification

GHS product identifier : PELS® Caustic Soda Beads

Product code : Not available.

Other means of identification : Anhydrous Sodium Hydroxide; Caustic Soda; NaOH; PELS® Plus Caustic Soda Beads; Sodium Hydroxide

Product type : Solid.

Relevant identified uses of the substance or mixture and uses advised against

Product use : Chemical reagent.

Area of application : Industrial applications.

Manufacturer : Axiall, LLC
Westlake Vinyls, Inc.
Westlake Vinyls Company LP
2801 Post Oak Blvd
Suite 600
Houston, TX 77056
United States Telephone:+1-713-960-9111
www.westlake.com

e-mail address of person responsible for this SDS : sdsinfo@westlake.com

Emergency telephone number (with hours of operation) : CHEMTREC USA 24 Hrs: 1-800-424-9300

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture :

H314	SKIN CORROSION - Category 1A
H318	SERIOUS EYE DAMAGE - Category 1
H335	SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : H314 - Causes severe skin burns and eye damage.
H335 - May cause respiratory irritation.

Precautionary statements

United States

Section 2. Hazards identification

Prevention : P280 - Wear protective gloves or clothing.
P271 - Use only outdoors or in a well-ventilated area.
P260 - Do not breathe dust.
P264 - Wash hands thoroughly after handling.
P363 - Wash contaminated clothing before reuse.

Response : P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P310 - Immediately call a POISON CENTER or doctor.
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P321 - Specific treatment (see First Aid instruction).

Storage : P403 + P233 - Store in a well-ventilated place. Keep container tightly closed.
P405 - Store locked up.

Disposal : P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Do not taste or swallow. Wash thoroughly after handling.

Hazards not otherwise classified : Causes severe digestive tract burns.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Other means of identification : Anhydrous Sodium Hydroxide; Caustic Soda; NaOH; PELS® Plus Caustic Soda Beads; Sodium Hydroxide

CAS number/other identifiers

CAS number : Not applicable.

Ingredient name	Other names	%	CAS number
sodium hydroxide	-	95 - 100	1310-73-2
sodium chloride	-	0 - 2	7647-14-5
sodium carbonate	-	0 - 2	497-19-8

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health and hence require reporting in this section.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : In case of contact with substance, immediately flush eyes with running water for at least 20 minutes. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Inhalation : If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If not breathing, give artificial respiration. Move exposed person to fresh air.

Section 4. First aid measures

Skin contact : For minor skin contact, avoid spreading material on unaffected skin. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Remove and isolate contaminated clothing.

Ingestion : If swallowed, rinse mouth with water (only if the person is conscious). Do not induce vomiting. Do not use mouth-to-mouth method if victim ingested the substance. If swallowed then seek immediate medical assistance.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage. Direct contact with the eyes can cause irreversible damage, including blindness.

Inhalation : May cause corrosive burns - irreversible damage.

Skin contact : Causes severe burns.

Ingestion : Severely corrosive to the digestive tract. Causes severe burns. May cause irreversible damage to mucous membranes.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion : Adverse symptoms may include the following:
stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : SMALL FIRE: dry chemical, carbon dioxide or water spray
LARGE FIRE: Use dry chemical, CO_2, alcohol-resistant foam or water spray (fog).

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Hot containers may explode.

Hazardous thermal decomposition products : Depending on conditions, hazardous combustion products may include the following materials: Sodium monoxide, halogenated compounds, metal oxide/oxides

Special protective actions for fire-fighters : Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.
SMALL FIRE: Move containers from fire area if this can be done without risk.

Special protective equipment for fire-fighters : Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : Do not touch or walk through spilled material. Wear appropriate personal protective equipment; avoid direct contact. Do not touch damaged container or spilled material. Ventilate the area before entry.
Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). As an immediate precautionary measure, isolate spill or leak for at least 50 meters (150 feet) in all directions. Stay upwind/keep distance from source. Keep out of low areas. Do not allow water to enter container. Keep unauthorized personnel away.

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Avoid dust generation. Carefully shovel or sweep up spilled material and place in suitable container.

Large spill : Avoid dust generation. Carefully shovel or sweep up spilled material and place in suitable container. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Handle and open container with care. Use only with adequate ventilation. Wear appropriate personal protective equipment. Avoid direct contact with the human body. Do not breathe dust. Do not get in eyes, on skin or on clothing. Do not ingest. Add this product only to water. Never add water to this product. Do not add to warm or hot water, a violent eruption or explosive reaction can result. Avoid contact with organic materials. Take any precaution to avoid mixing with strong acids. May cause fire or explosion. When making solutions or diluting, only add caustic soda slowly to surface of cold water while stirring. Attacks many metals producing extremely flammable hydrogen gas which can form explosive mixtures with air. Caustic soda may react with various sugars to generate carbon monoxide. Hazardous carbon monoxide gas can form upon contact with food and beverage products in enclosed vessels and can cause death. Follow appropriate tank entry procedures (see ANSI Z117.1 - 2009 Safety Requirements for Confined Spaces). Empty containers retain product residue and can be hazardous. Do not reuse container. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Ventilate the area before entry. Keep only in the original container. Keep container tightly closed. Keep away from incompatibles. Store in a dry, cool and well-ventilated area. User should ensure that equipment and procedures are in place to ensure safe handling of the caustic at temperatures involved, which may include the need to heat or maintain temperature of the material. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
sodium hydroxide	**ACGIH TLV (United States, 3/2019).** C: 2 mg/m³ **NIOSH REL (United States, 10/2016).** CEIL: 2 mg/m³ **OSHA PEL (United States, 5/2018).** TWA: 2 mg/m³ 8 hours.
sodium chloride	None.
sodium carbonate	None.

Appropriate engineering controls : Good general ventilation should be used. Ventilation rates should be matched to conditions. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Environmental exposure controls : Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways. Follow best practice for site management and disposal of waste.

Individual protection measures

United States

Section 8. Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Wear chemical splash goggles and face shield.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : If workers are exposed to concentrations above the exposure limit, they must use appropriate, certified respirators. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Solid. [Dustless granules.]

Color : White.

Odor : Odorless.

Odor threshold : Not available.

pH : Strongly basic.

Melting point : 310 to 320°C (590 to 608°F)

Boiling point : 1390°C (2534°F)

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : Not available.

Relative density : 2.13 [Water = 1]

Density : Not available.

Solubility : Easily soluble in the following materials: cold water and hot water.

Solubility in water : 100%

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Section 9. Physical and chemical properties

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not available.

Flow time (ISO 2431) : Not available.

Section 10. Stability and reactivity

Reactivity : No dangerous reaction known under conditions of normal use.

Chemical stability : The product is stable under normal conditions.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur. Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid excessive heat. Incompatible materials

Incompatible materials : Keep away from the following materials to prevent strong exothermic reactions: oxidizing agents, strong alkalis, strong acids. Reactive or incompatible with the following materials: metals (Attacks many metals producing extremely flammable hydrogen gas which can form explosive mixtures with air. Metals: Magnesium. Aluminum. Zinc. tin. Chromium Compounds. copper, bronze, brass), acids, organic materials (May cause fire or explosion.), food sugars (Caustic soda may react with various sugars to generate carbon monoxide.), water (Aqueous reaction with caustic soda can generate heat (strongly exothermic).)

Hazardous decomposition products : Decomposition products may include the following materials: carbon oxides, halogenated compounds, metal oxide/oxides

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
sodium chloride	LD50 Oral	Rat	3000 mg/kg	-
sodium carbonate	LD50 Oral	Rat	4090 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
sodium hydroxide	Eyes - Mild irritant	Rabbit	-	400 ug	-
	Eyes - Severe irritant	Rabbit	-	24 hours 50 ug	-
	Eyes - Severe irritant	Rabbit	-	1 %	-
	Eyes - Severe irritant	Rabbit	-	0.5 minutes 1 mg	-
	Skin - Severe irritant	Rabbit	-	24 hours 500 mg	-
sodium chloride	Eyes - Moderate irritant	Rabbit	-	24 hours 100 mg	-
	Eyes - Moderate irritant	Rabbit	-	10 mg	-

United States

Section 11. Toxicological information

	Skin - Mild irritant	Rabbit	-	24 hours 500 mg	-
sodium carbonate	Eyes - Mild irritant	Rabbit	-	0.5 minutes 100 mg	-
	Eyes - Moderate irritant	Rabbit	-	24 hours 100 mg	-
	Eyes - Severe irritant	Rabbit	-	50 mg	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 mg	-

Sensitization

Not available.

Mutagenicity

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
sodium hydroxide	Category 3	-	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Routes of entry anticipated: Oral, Dermal, Inhalation.

Potential acute health effects

Eye contact : Causes serious eye damage. Direct contact with the eyes can cause irreversible damage, including blindness.

Inhalation : May cause corrosive burns - irreversible damage.

Skin contact : Causes severe burns.

Ingestion : Severely corrosive to the digestive tract. Causes severe burns. May cause irreversible damage to mucous membranes.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

United States

Section 11. Toxicological information

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion : Adverse symptoms may include the following:
stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Inhalation
Acute: May cause corrosive burns - irreversible damage.
Skin
Acute: Causes severe skin burns and eye damage.
Eye
Acute: Causes serious eye damage. Direct contact with the eyes can cause irreversible damage, including blindness.
Ingestion
Acute: Material is destructive to tissue of the mucous membranes and upper respiratory tract.

Potential delayed effects : Inhalation
Chronic: Repeated or prolonged exposure to corrosive fumes may cause bronchial irritation with chronic cough.
Skin
Chronic: Repeated or prolonged exposure to corrosive materials will cause dermatitis.
Eyes
Chronic: Repeated or prolonged exposure to corrosive materials or fumes may cause conjunctivitis.
Ingestion
Chronic: Can cause gastrointestinal disturbances.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapors) (mg/l)	Inhalation (dusts and mists) (mg/l)
PELS® Caustic Soda Beads	3381.1	N/A	N/A	N/A	N/A
sodium chloride	3000	N/A	N/A	N/A	N/A
sodium carbonate	4090	N/A	N/A	N/A	N/A

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
sodium hydroxide	Acute EC50 40.38 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia - Neonate	48 hours
	Acute LC50 125 ppm Fresh water	Fish - Gambusia affinis - Adult	96 hours
sodium chloride	Acute EC50 2430000 µg/l Fresh water	Algae - Navicula seminulum	96 hours
	Acute EC50 519.6 mg/l Fresh water	Crustaceans - Cypris subglobosa	48 hours
	Acute EC50 402.6 mg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute IC50 6.87 g/L Fresh water	Aquatic plants - Lemna minor	96 hours
	Acute LC50 1000000 µg/l Fresh water	Fish - Morone saxatilis - Larvae	96 hours
	Chronic LC10 781 mg/l Fresh water	Crustaceans - Hyalella azteca - Juvenile (Fledgling, Hatchling, Weanling)	3 weeks
	Chronic NOEC 6 g/L Fresh water	Aquatic plants - Lemna minor	96 hours
	Chronic NOEC 0.314 g/L Fresh water	Daphnia - Daphnia pulex	21 days
	Chronic NOEC 100 mg/l Fresh water	Fish - Gambusia holbrooki - Adult	8 weeks
sodium carbonate	Acute EC50 242000 µg/l Fresh water	Algae - Navicula seminulum	96 hours
	Acute LC50 176000 µg/l Fresh water	Crustaceans - Amphipoda	48 hours
	Acute LC50 265000 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 300000 µg/l Fresh water	Fish - Lepomis macrochirus	96 hours

Conclusion/Summary : Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Not available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Water Solubility (g/l): Soluble

Other adverse effects : No studies have been found.

Section 13. Disposal considerations

Disposal methods : Product waste: Dispose of contents and container in accordance with all local, regional, national and international regulations.
Packaging waste: Dispose of contents and container in accordance with all local, regional, national and international regulations.

Section 14. Transport information

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	UN1823	UN1823	UN1823
UN proper shipping name	Sodium hydroxide, solid	SODIUM HYDROXIDE, SOLID	Sodium hydroxide, solid
Transport hazard class(es)	8 	8 	8 
Packing group	II	II	II
Environmental hazards	No.	No.	No.

Additional information

DOT Classification : **Reportable quantity** 1039.3 lbs / 471.85 kg. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Limited quantity Yes.
Packaging instruction Exceptions: 154. Non-bulk: 212. Bulk: 240.
Quantity limitation Passenger aircraft/rail: 15 kg. Cargo aircraft: 50 kg.
Special provisions IB8, IP2, IP4, T3, TP33

IMDG : **Emergency schedules** F-A, S-B

IATA : **Quantity limitation** Passenger and Cargo Aircraft: 15 kg. Packaging instructions: 859. Cargo Aircraft Only: 50 kg. Packaging instructions: 863. Limited Quantities - Passenger Aircraft: 5 kg. Packaging instructions: Y844.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to IMO instruments : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 5(a)2 final significant new use rules**: mercury
TSCA 8(a) CDR Exempt/Partial exemption: Not determined
United States inventory (TSCA 8b): All components are active or exempted.
Clean Water Act (CWA) 307: Nickel powder; mercury
Clean Water Act (CWA) 311: sodium hydroxide

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

Section 15. Regulatory information

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : SKIN CORROSION - Category 1A
SERIOUS EYE DAMAGE - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
HNOC - Corrosive to digestive tract [severe]

Composition/information on ingredients

Name	%	Classification
sodium hydroxide	95 - 100	CORROSIVE TO METALS - Category 1 SKIN CORROSION - Category 1A SERIOUS EYE DAMAGE - Category 1 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 HNOC - Corrosive to digestive tract [severe]
sodium chloride	0 - 2	EYE IRRITATION - Category 2A
sodium carbonate	0 - 2	EYE IRRITATION - Category 2A

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	mercury	7439-97-6	<0.1
Supplier notification	: Not applicable.		

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: SODIUM HYDROXIDE

New York : The following components are listed: Sodium hydroxide

New Jersey : The following components are listed: SODIUM HYDROXIDE; CAUSTIC SODA

Pennsylvania : The following components are listed: SODIUM HYDROXIDE

California Prop. 65

⚠ Although Liquid Caustic Soda is not sold directly to consumers, this product can expose you to chemicals which are known to the State of California to cause cancer, and are known to the State of California to cause birth defects or other reproductive harm. Please contact your customer service representative for details.

Ingredient name	No significant risk level	Maximum acceptable dosage level
Nickel	-	-
Mercury and mercury compounds	-	-

International regulations

United States

Section 15. Regulatory information

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

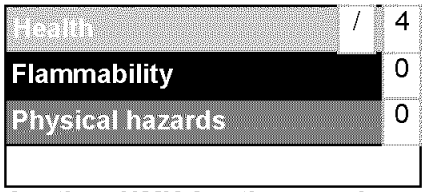
UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Section 16. Other information

Other special considerations : NSF® Standard 60 Drinking Water Treatment Chemicals – PELS™ Caustic Soda Beads and PELS™ Plus Caustic Soda Beads have Health Effect Listing and are certified for maximum use of 100 mg/l.

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

Procedure used to derive the classification

Classification	Justification
SKIN CORROSION - Category 1A	Calculation method
SERIOUS EYE DAMAGE - Category 1	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method

History

Date of issue/Date of revision : 09/17/2020

Date of previous issue : 07/13/2020

Version : 1.01

United States

Section 16. Other information

Prepared by : Sphera Solutions

Key to abbreviations : ATE = Acute Toxicity Estimate
AMP = Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
N/A = Not available
UN = United Nations

References : HCS (U.S.A.)- Hazard Communication Standard
International transport regulations

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

GOOD FOOD, INC.
www.goldenbarrel.com
Good Food, Inc. is a division of Zook Molasses Company and a sister Company of L & S Sweeteners

Certified WBENC Women's Business Enterprise

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Phone: 610-273-3776 • Fax 610-273-7652
Toll Free: 1-800-327-4406
E-mail: goodfood@goldenbarrel.com

Processors of
- Syrups
- Sugars
- Molasses
- Oils
- Dry Mixes

Services
- Liquid and Dry Blending
- Warehousing and Transportation
- Private Labeling
- Railcar Transloading
- Internal Truck Wash

SDS Waiver Letter

This is in response to your inquiry requesting a copy of our Safety Data Sheet (SDS).

Molasses

The above products supplied by Good Food, Inc. are under the jurisdiction of the FDA and are listed in the CFR-Title 21; Subchapter B as "Food for Human Consumption" and are classified as non-hazardous materials. As a result, they are exempt from the 29 CFR 1910.1200 OSHA Hazardous Communication Standard and Safety Data Sheets are not required.

This statement applies to all molasses products and molasses blends produced by Good Food, Inc.

Date Issued: 07/23/20
Supersedes: 06/24/19
Revision: 5
By: Mike Obert

REMOTOX®
SAFETY DATA SHEET

Issue Date: 11/01/2012 | Revision Date: 04/01/2019

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifier

Product Name	REMOTOX®
Chemical Name	Calcium Polysulfide Solution
Chemical Family	Inorganic Salt
CAS-No.	1344-81-6

1.2 Recommended use of the substance or mixture

Identified Uses	Industrial use. Heavy metal fixation agent.

1.3 Details of the supplier of the safety data sheet

Company	Graus Chemicals, LLC P.O. Box 768 Carefree, AZ 85377 1-623-328-5175 info@grauschemicals.com

1.4 Emergency phone number 1-888-255-3924 | CHEMTEL

SECTION 2: HAZARD(S) IDENTIFICATION

2.1 Classification of the substance or mixture

Acute toxicity – oral	Category 4
Acute toxicity – dermal	Category 4
Acute toxicity – inhalation	Category 4
Skin corrosion/irritation	Category 2
Eye damage/irritation	Category 1

2.2 GHS-US labeling

Signal word: Danger!

Hazard statement(s):

H302 Harmful if swallowed.
H315 Causes skin irritation.
H318 Causes serious eye damage.
H332 Harmful if inhaled.

Symbol(s):

Precautionary statement(s):

P221 Take any precaution to avoid mixing with ombustibles/acids/oxidizers.
P261 Avoid breathing dust/fumes/gas/mist/vapors/spray.
P262 Do not get in eyes, on skin, or on clothing.
P264 Wash thoroughly after handling.
P233 Keep containers tightly closed.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment – if this is not the intended use.
P280 Wear protective gloves/eye protection/face shield.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

Unclassified hazard(s): Acute aquatic toxicity

Unknown acute toxicity ingredient: None

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substance/Mixture

Chemical Name	Synonyms	Formula	CAS No.	EINECS No.	% by weight
Calcium Polysulfide	Lime Sulfur, Calcium Sulfide	CaS_X/KS_X	1344-81-6	215-709-2	26-34
Water	Water	H2O	7732-18-5	231-791-2	Remaining

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

Eye contact — Rinse immediately (the exposed eyes) with lukewarm, gently flowing water for at least 15-20 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get immediate medical advice/attention.

Skin contact — Wash immediately with soap and plenty of water. Rinse for at least 15 minutes. Remove contaminated clothing and wash it before reuse. If skin irritation or rash occurs: Get medical advice/attention.

Ingestion — Drink immediately a small amount of water or milk. Then call a Poison Control Center or doctor/physician right away. Do not induce vomiting unless instructed by poison control or a medical professional.

Inhalation — Remove victim to fresh air and keep at rest in a position comfortable for breathing. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get immediate medical advice/attention.

4.2 Most important symptoms and effects both acute and delayed

Acute — Eyes: Symptoms may include burns or irritation to the eyes.
Skin: Repeated or prolonged contact may cause dryness, cracking and dermatitis.
Inhalation: Symptoms may include irritation to the respiratory tract.
Ingestion: Symptoms may include burns or irritation of the gastrointestinal tract. Contact with stomach acid can liberate toxic hydrogen sulfide vapors.

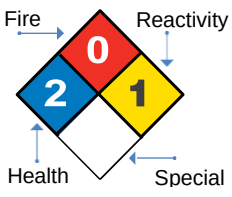
Delayed — No known chronic effects.

SECTION 5: FIRE FIGHTING MEASURES

5.1 Flammable properties

National Fire Protection Association (NFPA) Ratings

Health	2
Flammability	0
Reactivity	1
Special	-



HAZARD RATING:
4 SEVERE
3 SERIOUS
2 MODERATE
1 SLIGHT
0 MINIMAL

5.2 Suitable extinguishing media

Use firefighting measures that suit the environment.

5.3 Unsuitable extinguishing media

No restrictions known.

5.4 Specific hazards arising from the substance or mixture

Closed/sealed containers may rupture violently when heated. In a fire, the following hazardous materials may be generated: hydrogen sulfide (H2S) gas.

5.5 Protective equipment or precautions for firefighters
Firefighters should wear self-contained breathing apparatus (SCBA) and full firefighting turnout gear. Keep containers and storage vessels in the fire area cooled with water spray.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions
Wear protective equipment specified in Section 8. Isolate the release area and deny entry to unnecessary personnel.

6.2 Environmental precautions
Avoid release to the environment – if this is not the intended use. Dike spills and stop leakage where practical.

6.3 Methods and materials for containment and cleaning up

Small releases	Use absorbent material to collect and contain for salvage or disposal. Clean surface thoroughly to remove residual spill.
Large releases	Shut off release if safe to do so. Dike spill area with earth, sand or other inert absorbents to prevent runoff into surface waterways or drains. Recover as much of the released product as possible, using portable pump and hoses, and place into container(s) for later disposal. Following product recovery, flush area with water.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling
Wear suitable protective clothing, gloves and eye/face protection. Use only in a well ventilated area. Avoid contact with skin and eyes. Avoid prolonged or repeated breathing of vapors. Wash skin thoroughly after handling.

7.2 Conditions for safe storage, including any incompatibilities
Store in well ventilated area and away from combustibles, acids and oxidizing agents. Keep away from heat. Keep containers tightly closed and store out of direct sunlight at a moderate temperature.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

8.1 Occupational exposure limits
No exposure limits noted.

8.2 Engineering controls
Good ventilation should be used. Ventilation rates should be matched to site conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below reccommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Provide eyewash station where material is frequently handled.

8.3 Personal protection measures

	Eye Protection	Wear chemical goggles/full face shield. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 EU).
	Skin Protection	Wear neoprene rubber gloves and chemical protection suit to prevent repeated or prolonged contact with material. Use protective clothing tested and approved under appropriate government standards such as NIOSH (US) or Directive 89/686/EEC (EU).

	Respiratory Protection	Have self-contained breathing apparatus (SCBA) positive pressure, available in case of accidental release, equipment failure or other unforeseen incidents. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or EN 166 EU
	General Hygiene Considerations	Wash thoroughly after handling and before eating, drinking or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Deep red-yellow liquid
Upper/lower flammability limits	Not applicable
Odor	Slight rotten egg odor
Vapor pressure	Not determined
Odor threshold	4.7 ppb (hydrogen sulfide)
Vapor density	Not determined
pH	10.5-11.5
Relative density	1.27 g/cc or 10.6 lbs/gal
Melting point	Not applicable
Freezing point	18-25 °F (-7.7 to -3.9 °C)
Solubility	Completely soluble in water
Initial Boiling point/range	Not determined
Flash point	Not applicable
Evaporation rate	Not determined
Flammability (solid, gas)	Not applicable
Partition coefficient	No data available
Auto ignition temperature	Not applicable
Decomposition temperature	Not determined
Viscosity	2.95 cSt @ 20 °C, 2.5 cSt @ 30 °C

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity
Strong oxidizers and acids.

10.2 Chemical stability
Stable under moderate temperature and pressure.

10.3 Possibility of hazardous interactions
Acids, acidic materials, and strong oxidizers cause rapid decomposition, resulting in the formation of H_2S gas.

10.4 Conditions to avoid
Fire, excessive heat and freezing conditions.

10.5 Incompatible materials
Chemical substances: Acids, acidic materials and oxidizing agents. Materials of construction: Copper, carbon steel, aluminum or their alloys (i.e. brass, bronze, etc.).

10.6 Hazardous decomposition products
Hydrogen sulfide and oxides of sulfur.

SECTION 11: TOXICOLOGICAL INFORMATION

Oral	Rat	LD_{50}: 820 mg/kg
Dermal	Rabbit	LD_{50}: >2,000 mg/kg
Inhalation	Rat	LC_{50}: 3.9 mg/l (4 hr exposure) male rat
		LC_{50}: 3.1 mg/l (4 hr exposure) female rat
Eye		Primary eye irritation. Possible risk of irreversible effects.
Carcinogenicity		Not listed in NTP, IARC or by OSHA.
Teratology		No data available.
Reproduction		No data available.
Mutagenicity		No data available.

SECTION 12: ECOLOGICAL INFORMATION

12.1 Ecotoxicity

Green Algae	EC_{50}: 16.4 mg/l
Water Flea	EC_{50}: 13.7 mg/l
Bluegill	LC_{50}: 52.9 mg/l
Fathead Minnow	LC_{50}: 42.9 mg/l
Rainbow trout	LC_{50}: 8.8 mg/l
Honey Bee	LD_{50}: >25 µg ai/Bee
Avian	LD_{50}: 560 ai/kg
Bobwhite Quail	LD_{50}: 560 ai/kg body wt.

12.2 Persistence and degradability
Calcium Polysulfide present in moist soils and/or moist foliage is expected to dissociate rapidly; therefore, run-off and erosion into surface waters, as present calcium polysulfide, should be negligible. (US EPA 2005, RED)

12.3 Bioaccumulation potential
Product is not bio-accumulative.

12.4 Mobility in soil
No data available.

12.5 Other adverse effects
Toxic to aquatic organisms.

SECTION 13: DISPOSAL CONSIDERATION

13.1 Waste treatment methods
Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with the local/regional/national/international regulations.

SECTION 14: TRANSPORTATION INFORMATION

14.1 Basic shipping information

Proper shipping name	Calcium Polysulfide Solution	*(not regulated by US DOT)*
DOT Hazard Class	Not applicable	
UN Number	Not applicable	
Packing Group	Not applicable	
Placard(s)	Not applicable	
Labels	Not applicable	
Hazardous Substance	No	
Reportable quantity	No	

14.3	**USCG Classification**	Not determined
14.4	**International Transportation**	
	IMO	UN3082, Environmentally Hazardous Substance, liquid, n.o.s., (Calcium Polysulfide) 9, PG III, MARINE POLLUTANT
	IATA	Not regulated
	TDG (Canada)	Not regulated
	ADR (Europe)	UN3082, Environmentally Hazardous Substance, liquid, n.o.s., (Calcium Polysulfide) 9, PG III, MARINE POLLUTANT
	ADG (Australia)	UN3082, Environmentally Hazardous Substance, liquid, n.o.s., (Calcium Polysulfide) 9, PG III, MARINE POLLUTANT
14.5	**Emergency Response Guide**	Not applicable
14.6	**ERAP (Canada)**	Not applicable
14.7	**Special Precautions**	Not applicable

SECTION 15: REGULATORY INFORMATION

15.1	**US Federal Regulations**		
	OSHA	Meets the definition of a hazardous substance under the Federal OSHA Hazard Communication Standard (29 CFR 1910.1200).	
	TSCA	Included in the US EPA TSCA Inventory List.	
	CERCLA	Reportable quantity: No	
	SARA Title III	Extremely Hazardous Substance (EHS): No	
		Section 312 (Tier II) Ratings:	Immediate (acute): Yes
			Fire: No
			Sudden release No
			Reactivity: No
			Delayed (chronic) No
		Section 313 (Form R):	Not applicable
	RCRA	Not applicable	
	CAA (HAP):	Not applicable	
15.2	**State Regulations**	CA Prop 65: Not applicable	
15.3	**International Regulations**		
	WHMIS (Canada)	Not determined	
	DSL/NDSL (Canada)	Listed in NDSL, Record No. 28636	

SECTION 16: OTHER INFORMATION

16.1 Use of Substance/Preparation

This material is used for heavy metal removal in soil, groundwater and wastewater. Its use varies depending on the site and remediation technology employed. Therefore, exposure should be evaluated so that appropriate handling practices and training can be established to ensure safet workplace operations.

UNIVAR USA INC.
ISSUE DATE:2015-04-29
Annotation:

Distributed By:

2 Madison Ave. Larchmont, NY 10538
Ph: 914-834-1881 Fax: 914-834-4611

MSDS NO:10000088
VERSION:001 2015-04-29

Univar
3075 Highland Pkwy STE 200
Downers Grove, IL 60515
425-889-3400

SAFETY DATA SHEET

1. Identification

Product identifier: CAUSTIC SODA 50%

Other means of identification

Synonyms: Sodium Hydroxide

SDS number: 000100000088

Recommended use and restriction on use

Recommended use: Not available.

Restrictions on use: Not known.

Emergency telephone number:For emergency assistance Involving chemicals

call CHEMTREC day or night at: 1-800-424-9300. CHEMTREC INTERNATIONAL Tel# 703-527-3887

2. Hazard(s) identification

Hazard classification

Health hazards

Acute toxicity (Oral)	Category 4
Skin corrosion/irritation	Category 1A
Serious eye damage/eye irritation	Category 1
Environmental hazards Acute hazards to the aquatic environment	Category 3

Label elements

Hazard symbol

Signal word	Danger
Hazard statement	Corrosive. Harmful if swallowed. Causes severe skin burns and eye damage.
Precautionary statement	
Prevention	Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe dust or mists. Wear protective gloves/protective clothing/eye protection/face protection.
Response	IF INHALED: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. IF SWALLOWED: Call a POISON CENTER/doctor/ if you feel unwell. Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER/doctor. Specific treatment (see this label). Wash contaminated clothing before reuse.
Storage	Store in a closed container. Keep container tightly closed. Store in a well-ventilated place. Store in a dry place. Store locked up.
Disposal	Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.
Other hazards which do not result in GHS classification	None.

Version: 1.2
Revision date: 04/29/2015

3. Composition/information on ingredients

Substances

Chemical identity	Common name and synonyms	CAS number	Content in percent (%)*
Sodium hydroxide		1310-73-2	>=48 - <=52%
Water		7732-18-5	>=48 - <=52%
Sodium Chloride		7647-14-5	>=0 - <=5%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: CAUTION! First aid personnel must be aware of own risk during rescue!

Ingestion: Do NOT induce vomiting. Never give liquid to an unconscious person. Get medical attention immediately.

Inhalation: Move to fresh air. If breathing is difficult, give oxygen. Perform artificial respiration if breathing has stopped. Get medical attention immediately.

Skin contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Eye contact: If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor.

Most important symptoms/effects, acute and delayed

Symptoms: No data available.

Indication of immediate medical attention and special treatment needed

Treatment: No data available.

5. Fire-fighting measures

General fire hazards: No data available.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Use: Powder. In case of fire in the surroundings: all extinguishing agents allowed.

Unsuitable extinguishing media: No data available.

Specific hazards arising from the chemical:	No data available.

Special protective equipment and precautions for firefighters

Special fire fighting procedures:	No data available.
Special protective equipment for fire-fighters:	No data available.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	Use personal protective equipment. Keep unauthorized personnel away.
Methods and material for containment and cleaning up:	Absorb spillage with non-combustible, absorbent material. Dike for later disposal.

7. Handling and storage

Precautions for safe handling:	Use personal protective equipment as required. Use only with adequate ventilation. Container must be kept tightly closed.
Conditions for safe storage, including any incompatibilities:	No data available.

8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Chemical identity	Type	Exposure Limit values	Source
Sodium hydroxide	Ceiling	2 mg/m3	US. ACGIH Threshold Limit Values (03 2013)
	Ceil_Time	2 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	PEL	2 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	Ceiling	2 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	Ceiling	2 mg/m3	US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A (06 2008)
Sodium hydroxide - Particulate.	ST ESL	20 µg/m3	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (02 2013)
	AN ESL	2 µg/m3	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (02 2013)
Sodium hydroxide	Ceiling	2 mg/m3	US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (02 2012)

Appropriate engineering controls No data available.

Individual protection measures, such as personal protective equipment

General information: Use personal protective equipment as required. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned. Practice good housekeeping.

Eye/face protection: Use personal protective equipment as required. Wear goggles/face shield.

Skin protection

Hand protection: No data available.

Other: No data available.

Respiratory protection: No data available.
Hygiene measures: No data available.

9. Physical and chemical properties

Physical state:	Liquid
Form:	No data available.
Color:	No data available.
Odor:	No data available.
Odor threshold:	No data available.
pH:	14
Melting point/freezing point:	-12 - 10 °C
Initial boiling point and boiling range:	105 - 140 °C
Flash Point:	No data available.
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	No data available.
Vapor density:	No data available.
Relative density:	No data available.
Solubility(ies)	
Solubility in water:	No data available.
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity:	No data available.
Chemical stability:	No data available.
Possibility of hazardous reactions:	No data available.
Conditions to avoid:	No data available.
Incompatible materials:	No data available.
Hazardous decomposition products:	No data available.

11. Toxicological information

Symptoms related to the physical, chemical and toxicological characteristics

Ingestion:	No data available.
Inhalation:	No data available.
Skin contact:	No data available.
Eye contact:	No data available.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product: ATEmix (): 353.488372 mg/kg

Dermal

Product:

Not classified for acute toxicity based on available data.

Inhalation

Product: No data available.

Specified substance(s):

Sodium Chloride — LC 50 (Rat,): > 42 mg/l 2 (reliable with restrictions)

Repeated dose toxicity

Product: No data available.

Skin corrosion/irritation

Product: No data available.

Serious eye damage/eye irritation

Product: No data available.

Respiratory or skin sensitization

Product: No data available.

Carcinogenicity

Product: No data available.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ cell mutagenicity
In vitro
Product: No data available.
In vivo
Product: No data available.
Reproductive toxicity
Product: No data available.
Specific target organ toxicity - single exposure
Product: No data available.
Specific target organ toxicity - repeated exposure
Product: No data available.
Aspiration hazard
Product: No data available.
Other effects: No data available.

12. Ecological information

Ecotoxicity:
Acute hazards to the aquatic environment:
Fish
Product: No data available.
Specified substance(s):
Sodium hydroxide — LC 50 (Western mosquitofish (Gambusia affinis), 24 h): 125 mg/l Mortality LC 50 (Guppy (Poecilia reticulata), 24 h): 145 mg/l Mortality LC 50 (Goldfish (Carassius auratus), 24 h): 160 mg/l Mortality LC 50 (Bony fish superclass (Osteichthyes), 48 h): 33 - 100 mg/l Mortality LC 50 (Western mosquitofish (Gambusia affinis), 48 h): 125 mg/l Mortality

Aquatic invertebrates
Product: No data available.
Specified substance(s):
Sodium hydroxide — EC 50 (Water flea (Ceriodaphnia dubia), 48 h): 34.59 - 47.13 mg/l Intoxication LC 50 (Common shrimp, sand shrimp (Crangon crangon), 48 h): 33 - 100 mg/l Mortality LC 50 (Cockle (Cerastoderma edule), 48 h): 330 -

1,000 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish

Product: No data available.

Aquatic invertebrates

Product: No data available.

Toxicity to Aquatic Plants

Product: No data available.

Persistence and degradability

Biodegradation

Product: No data available.

BOD/COD ratio

Product: No data available.

Bioaccumulative potential

Bioconcentration factor (BCF)

Product: No data available.

Partition coefficient n-octanol / water (log Kow)

Product: No data available.

Mobility in soil: No data available.

Known or predicted distribution to environmental compartments

Sodium hydroxide	No data available.
Water	No data available.
Sodium chloride	No data available.

Known or predicted distribution to environmental compartments

Water	No data available.

13. Disposal considerations

Disposal instructions: No data available.

Contaminated packaging: No data available.

14. Transport information

DOT

UN number:	UN 1824
UN proper shipping name:	Sodium hydroxide solution
Transport hazard class(es)	
Class:	8
Label(s):	8
Packing group:	II
Marine Pollutant:	Not regulated.

Special precautions for user: –

IMDG

UN number: UN 1824
UN proper shipping name: SODIUM HYDROXIDE SOLUTION
Transport hazard class(es)
Class: 8
Label(s): 8
EmS No.: F-A, S-B
Packing group: II
Marine Pollutant: Not regulated.
Special precautions for user: –

IATA

UN number: UN 1824
Proper Shipping Name: Sodium hydroxide solution
Transport hazard class(es):
Class: 8
Label(s): 8
Packing group: II
Environmental hazards Not regulated.
Special precautions for user: –
Other information
Passenger and cargo aircraft: Allowed.
Cargo aircraft only: Allowed.

15. Regulatory information

US federal regulationsUS. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Sodium hydroxide Reportable quantity: 1000 lbs.

Superfund amendments and reauthorization act of 1986 (SARA)

Hazard categories

Not listed.

SARA 302 Extremely hazardous substance

None present or none present in regulated quantities.

SARA 304 Emergency release notification

Chemical identity	RQ
Sodium hydroxide	1000 lbs.

SARA 311/312 Hazardous chemical

Chemical identity	Threshold Planning Quantity
Sodium hydroxide	500 lbs
Sodium Chloride	500 lbs

SARA 313 (TRI reporting)

None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

Sodium hydroxide Reportable quantity: 1000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

None present or none present in regulated quantities.

US state regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act

Sodium hydroxide Listed

US. Massachusetts RTK - Substance List

Sodium hydroxide Listed

US. Pennsylvania RTK - Hazardous Substances

Sodium hydroxide Listed

US. Rhode Island RTK

Sodium hydroxide Listed

Version: 1.2
Revision date: 04/29/2015

Inventory Status: Australia AICS:	Not in compliance with the inventory.
Canada DSL Inventory List:	Not in compliance with the inventory.
EU EINECS List:	Not in compliance with the inventory.
EU ELINCS List:	Not in compliance with the inventory.
Japan (ENCS) List:	Not in compliance with the inventory.
EU No Longer Polymers List:	Not in compliance with the inventory.
China Inv. Existing Chemical Substances:	Not in compliance with the inventory.
Korea Existing Chemicals Inv. (KECI):	Not in compliance with the inventory.
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	Not in compliance with the inventory.
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	Not in compliance with the inventory.
Japan ISHL Listing:	Not in compliance with the inventory.
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16.Other information, including date of preparation or last revision

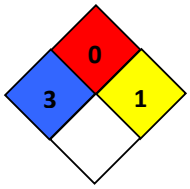
HMIS Hazard ID

Health	*	3
Flammability		0
Physical hazards		1
PERSONAL PROTECTION		B

B - Safety Glasses & Gloves

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; *Chronic health effect

NFPA Hazard ID



Flammability
Health
Reactivity
Special hazard.

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue date:	04/29/2015
Revision date:	No data available.
Version #:	1.2
Further information:	No data available.

Version: 1.2
Revision date: 04/29/2015

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

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This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

Westway

MATERIAL SAFETY DATA SHEET
MOLASSES/MOLASSES BLENDS

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Chemical Name	Chemical Formula	Molecular Weight
NA	Mixture of liquid Agricultural commodities	No data

Trade Name – Molasses/Molasses Blends

Synonyms	DOT Identification No.
Liquid animal supplement	NA

Company Identification:

Westway Trading Corporation
365 Canal Street, Suite 2900
New Orleans, Louisiana 70130
(504) 525-9741

2. COMPOSITION, INFORMATION ON INGREDIENTS

Component(s), Chemical Name	CAS Registry No.	%(Approx.)	ACGIH TLV-TWA
Proprietary **See ingredient tag**	NA	No data	No data

3. HAZARDS IDENTIFICATION

Emergency Overview

This material should be stored in a vented tank designed to contain a material with a specific gravity of 1.3 or greater. Material can ferment if excessive moisture contamination is allowed. Fermentation can yield carbon dioxide with possible traces of ethanol or volatile fatty acids (e.g. acetic, propionic, lactic, or butryic) and if exposed to a spark or flame may result in an explosion. These conditions should be avoided. If maintenance of tank requires entry by personnel, OSHA's Confined Space standard (29CFR1910.146) shall be complied with. If welding is to be performed, the tank should be gas freed and only certified welders shall perform welding operations.

Potential Health Effects

Eyes - Mild irritant
Skin - None
Inhalation – Insufficient oxygen may be present in vessels containing the product due to the generation of carbon monoxide during fermentation

4. FIRST AID MEASURES

Eyes: Flush eyes for 15 minutes.
Skin: Wash with soap and water.
Ingestion: No data

5. FIRE FIGHTING MEASURES

Flashpoint (Method used)	Flammable Limits in Air
Non-flammable Non-combustible	Non-flammable Non-combustible

Extinguishing Agents - NA

Unusual Fire and Explosion Hazards – Fermentation occurs when diluted with water and is accelerated by heat. During fermentation carbon monoxide with possible traces of ethanol or volatile fatty acids (e.g., acetic, propionic, lactic, or butryic) is given off, which produces inhalation hazards and possible explposion hazards.

6. ACCIDENTAL RELEASE MEASURES

Steps to be Taken in Case Material is Released or Spilled

Small spills - Stop the source of the spill. Recover as much product as possible for reuse. Absorb remaining spill and dispose solids in waste container.

Large spills - Stop the source of the spill. Create diversionary structures to minimize the extent of the release. Prevent the release from entering a waterway or sewer. Recover useable product. Absorb remaining spill and dispose of at an approved facility such as a municipal landfill or land application site.

7. HANDLING AND STORAGE

This material should be stored in a vented tank designed to contain a material with a specific gravity of 1.3 or greater. Material can ferment if excessive moisture contamination is allowed.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

Respiratory Protection - None

Ventilation – Provide adequate ventilation to prevent accumulation of vapors.

Skin Protection - Rubber gloves

Eye Protection - Safety glasses

Hygiene - Wash any exposed area promptly with soap and water. Launder contaminated clothing.

Other Control Measures - None

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance Dark brown syrupy liquid	Odor Sweet
Physical State Liquid	Specific Gravity 1.45
Boiling Point Very high	Freezing/Melting Point Varies
Vapor Pressure Low	% Volatile, by Volume No data
Evaporation Rate No data	Vapor Density in Air Water vapor only
Solubility in Water Soluble	pH 2.25 to 6.0

10. STABILITY AND REACTIVITY

Chemical Stability - Stable

Conditions to Avoid – Excess moisture or heat. Unventilated containers.

Incompatibility with Other Materials -

Reacts with concentrated nitric acid or concentrated sulphuric acid. Ferments when diluted with water.

Hazard Decomposition Products – Carbon monoxide, alcohol or fatty acid vapors

Hazardous Polymerization - NA

11. ECOLOGICAL INFORMATION

Prevent releases to land or water. Results in high Biological Oxygen Demand (BOD) and potential oxygen depletion of aquatic systems.

12. DISPOSAL CONSIDERATIONS

Dispose of waste material at an approved municipal landfill or land application site.

13. TRANSPORT INFORMATION

Hazardous Materials Description/ Proper Shipping Name - NA

DOT Hazard Class - NA

DOT Identification Number - NA

X This product is not a DOT hazardous material.

14. REGULATORY INFORMATION

Discharges to a water of the U.S. are regulated by the Environmental Protection Agency.

15. OTHER INFORMATION

None.

Date of Preparation: 3/15/96 **REVISED: 10/12/01**

Prepared by: Jane Besch, Director - HSE

Disclaimer:

WESTWAY FEED PRODUCTS provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. WESTWAY FEED PRODUCTS makes no representations or warranties, either express or implied, including without limitation any warranties of merchantability, fitness for a particular purpose with respect to the information set forth herein or the product to which the information refers. Accordingly, WESTWAY FEED PRODUCTS will not be responsible for damages resulting from use of or reliance upon this information.

Appendix B

Field Forms

ARCADIS

Daily Log

Project _____ Project No. _____ Page __ of _____

Site Location _____

Prepared By _____

Date/Time	Description of Activities

ARCADIS

Sample/Core Log

Boring/Well _____ Project/No. _____ Page _____ of _____

Site Location _____ Drilling Started _____ Drilling Completed _____

Total Depth Drilled _____ Feet Hole Diameter _____ inches Type of Sample/ Coring Device _____

Length and Diameter of Coring Device _____ Sampling Interval _____ feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used _____ None _____ Drilling Method _____

Drilling Contractor _____ Driller _____ Helper _____

Prepared By _____ Hammer Weight _____ Hammer Drop _____ ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	PID Reading (ppm)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description

ARCADIS

Sample/Core Log (Cont.d)

Boring/Well _____ Page ____ of ____

Prepared by _____

Sample/Core Depth (feet below land surface)		Core Recovery	PID Reading	Time/Hydraulic Pressure or Blows per 6	
From	To	(feet)	(ppm)	Inches	Sample/Core Description

ARCADIS

Sample/Core Log

Boring/Well ____________ Project/No. ______________________________ Page ____ of ____

Site Location ______________________ Drilling Started ____________ Drilling Completed ____________

Total Depth Drilled ________ Feet Hole Diameter ________ inches Type of Sample/ Coring Device ____________

Length and Diameter of Coring Device ______________________ Sampling Interval ________ feet

Land-Surface Elev. ________ feet ☐ Surveyed ☐ Estimated Datum ____________

Drilling Fluid Used ______________________ Drilling Method ____________

Drilling Contractor ______________________ Driller ____________ Helper ____________

Prepared By ______________________ Hammer Weight ____________ Hammer Drop ________ ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	PID Reading (ppm)	Sample/Core Description

ARCADIS

Soil/Sediment Sample Log

Sample ID _____ Project/No. _____

Date _____ Sampling Personnel _____

Time _____

Weather _____

DESCRIPTION OF SAMPLE LOCATION:

_____ Soil _____ Sediment

Location _____ Name of Water Body _____

Sample depth (ft) _____ Location _____

Soil type _____ Depth of water _____

_____ Velocity of water _____

Substrate description _____

Description of vegetation _____

_____

FIELD PARAMETERS:

Sample Method _____

Sample Description _____

_____

Color _____

Odor _____

Salinity _____

CONTAINER DESCRIPTION: From _____ Lab _____

Number	Container	Analysis

TOTAL: ☐

ARCADIS

Groundwater Sampling Form

Page ____ of ____

Project No. _____ Well ID _____ Date _____

Project Name/Location _____ Weather _____

Measuring Pt. Description _____ Screen Setting (ft-bmp) _____ Casing Diameter (in.) _____ Well Material ____ PVC ____ SS ____ Other

Total Depth (ft-bmp) _____ Static Water Level (ft-bmp) _____ Water Column in Well _____ Gallons in Well _____

Calc.Gallons Purged _____ Pump Intake (ft-bmp) _____ Purge Method: Centrifugal _____ Sample Method _____

Gallons Purged _____ MP Elevation _____ Submersible _____

Disp. Bailer _____ Pump On/Off _____

Sample Time: Label _____ Replicate/ Other _____

Code No. _____ Sampled by _____

Time	Minutes Elapsed	Rate (gpm) (mL/min)	Depth to Water (ft) TOC	Gallons Purged	pH	Cond. (µmhos) (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temp. (°C) (°F)	Redox (mV)	Appearance	
											Color	Odor

Constituents Sampled	**Container**	**Number**	**Preservative**

Well Information

Well Location: _____ Well Locked at Arrival: Yes / No

Condition of Well: _____ Well Locked at Departure: Yes / No

Well Completion: Flush Mount / Stick Up Key Number To Well: _____

NOTES: _____

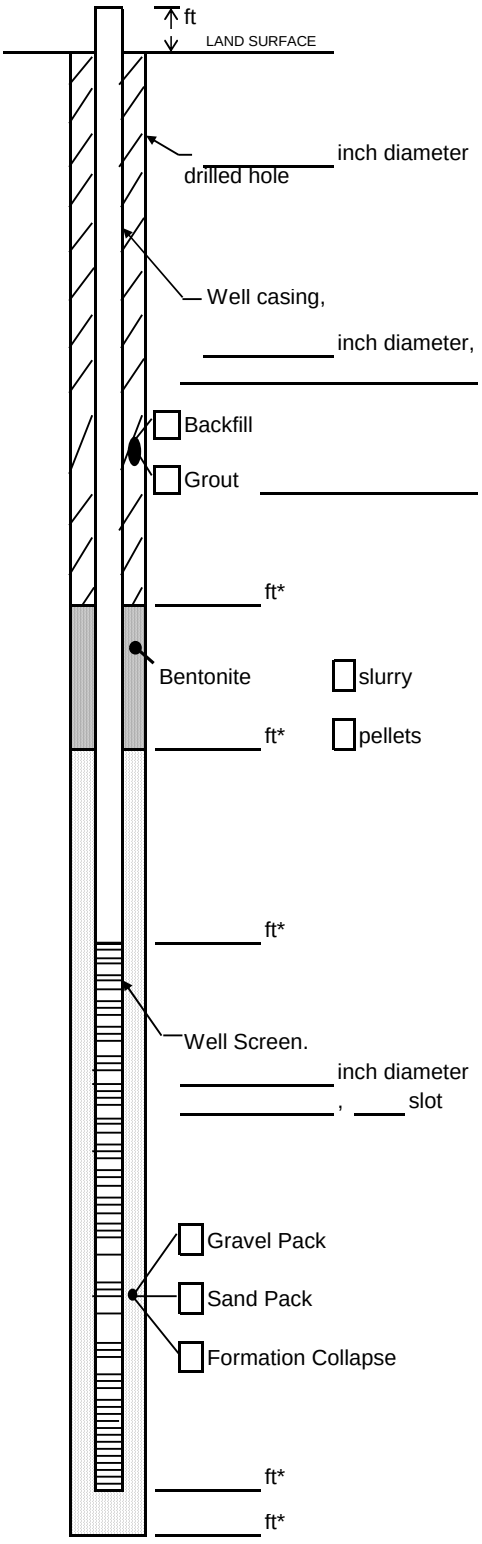
Well Casing Volumes

Gallons/Foot					
	1" = 0.04	1.5" = 0.09	2.5" = 0.26	3.5" = 0.50	6" = 1.47
	1.25" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	

ARCADIS

Well Construction Log

(Unconsolidated)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

* Depth Below Land Surface

Project _____ Well _____

Town/City _____

County _____ State _____

Permit No. _____

Land-Surface Elevation and Datum:

_____ feet ☐ Surveyed

☐ Estimated

Installation Date(s) _____

Drilling Method _____

Drilling Contractor _____

Drilling Fluid _____

Development Technique(s) and Date(s)

Fluid Loss During Drilling _____ gallons

Water Removed During Development _____ gallons

Static Depth to Water _____ feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration _____ hours

Yield _____ gpm Date _____

Specific Capacity _____ gpm/ft

Well Purpose _____

Remarks _____

Prepared by _____

ARCADIS

Monitoring Well Development Log

Page _____ of _____

Project/No. _____ Well _____ Date _____

Total Depth _____ Casing Diameter (inches) _____ Purge Method

Water Level _____ Well Volume (gal) _____ Centrifugal _____

Water Column _____ Total Volume Purged _____ Submersible _____

Pump On _____ Pump Off _____ Other _____

Developed By _____

	Well Casing Volumes			
gallon/foot	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

Time	Minutes Elapsed	Rate (gpm) (mL/min)	DTW (ft)	Gallons Purged	pH	Specific Conductance (mS/cm)	Temp. (C) (F)	Turbidity (NTU)	REMARKS (PID readings, color, odor, etc.)

ARCADIS

Water Level Measurement Form

Page _____ of _____

Project Name: _____ Date: _____

Project Number: _____ Weather: _____

Field Personnel: _____

Well Casing Volumes

gallon/foot			
1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

Well ID	Time	Measuring Point	TSD (ft)	DTP (ft)	DTW (ft)	Notes

Notes:

ARCADIS

Instrument Calibration Log

Project Name: _____ Date: _____

Project Number: _____

Calibrating Personnel: _____

Time of Calibration: _____

Weather Conditions: _____

Barometric Pressure: _____ mm Hg

CALIBRANT	INSTRUMENT	INITIAL READING	VALUE ENTERED	FINAL READING	TIME	TEMP
pH 7.00						
pH 4.00						
Conductivity (____1.413____)						
Turbidity (1.0 NTU)						
Turbidity (10.0 NTU)						
DO (mg/L)	--	--	--	--	--	--
DO%						
ORP (mV)						
_____						
_____						
_____						

Notes: _____

ARCADIS

In-Situ Groundwater Parameter Log

Client: _____ Project # : _____ Date: _____

Location: _____ City: _____ State: _____

Location # : _____ Instument: _____

Technician: _____ Project Mngr: _____

WELL	TIME	DTW (ft bmp)	Depth of Reading	DO (mg/L)	DO (Charge*) (25-75)	REDOX (ORP) (mV)	pH	SC (µS/cm)	TEMP (^{0}C)

NOTES:

* DO CHARGE MUST BE 25 - 75 FOR PROPER OPERATION OF DO PROBE

ARCADIS

Delivery Truck Log

Page _____ of _____

Project/No. _____ Date _____

Location/Area _____

Prepared By _____

Time Onsite	Begin Pump Time	End Pump Time	Time Offsite	Truck Company	Driver	Grace Period (Hrs)	Overage (Hrs)

Comments: _____

_____

_____

ARCADIS

Investigation Derived Waste Log

Page ____ of ____

Project Name/Location _____ Date _____

Project/No. _____ Weather _____

Technician _____ Project Manager _____

Date	Container Number	Container Type (drum, rolloff, tank)	Container Capacity	Container Description (OT, CT, etc.)	Media (SO, GW)	Content Description	Source	Volume from Source	Storage Location

NOTES:

ARCADIS

Photograph Log

Date: _____

Site Name: _____ Project No.: _____

Street: _____ City/State: _____

Photo #	Direction of View	Description

ARCADIS

Well Abandonment Log

Site Name/Location				Recorded by	
Project/No.		Well ID		Date	
Total Depth (ft)		Construction Material		Casing Diameter (in)	
Start Time		End Time		Well Volume (gallon)	
Method: Overdrill (ft)		Grout/Chips		Bags of Material	
Contractor		Driller		Helper	

	Well Casing Volume Conversion Factor				
gallon/foot	1" = 0.04	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
		1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

Time	Notes

NR = Not Recorded

TSD = Total Sound Depth

bgs = below ground surface
PID = Photo Ionization Detector
ppm = part per million

Arcadis Injection Log (Single Well Injection Event)

Project Name and No. _____ **Amendment** _____

Location _____ **Vendor** _____

Scope _____ **Tank Size** _____

Personnel _____

Date	Time Start (military)	Time Stop (military	Field Activity	Injection Active (Y/N)	Injection Rate (gpm)	Injection Pressure (psi)	Water Totalizer (gallons)	Optional	Optional

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