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Memorandum

To: Mohsen Kourehdar, Washington State Department of Ecology

Copies: Dan Silver, B&L Woodwaste Site Custodial Trust; Larry McGaughey, AMEC; and Teri Floyd, Floyd|Snider

From: Brett Beaulieu, Megan McCullough, and Jenny Graves, Floyd|Snider

Date: November 21, 2014

Project No: B&L-O&M Task 1525

Re: **Ditch Bank Soil Extent Investigation Results and Remedial Design Basis**

INTRODUCTION

In this memorandum, data are presented supporting the delineation of arsenic soil contamination along the South Ditch, adjacent to the B&L Woodwaste Landfill (Landfill) at the B&L Woodwaste Site (Site). The South Ditch area is shown on Figure 1. These data were collected as part of a direct-push investigation described in a June 20, 2014 memorandum to the Washington State Department of Ecology (Ecology) entitled, "Ditch Bank Soil Extent Investigation" (Floyd|Snider/AMEC 2014a). A previous phase of investigation in this area of impacted soil was conducted in 2013 (Floyd|Snider/AMEC 2013) and the results are described in the "Ditch Bank Remedial Action" memorandum (Floyd|Snider/AMEC 2014b).

The purpose of this investigation was to further delineate the extent of elevated concentrations of arsenic in soil at the eastern and western edges of the impacted area of the South Ditch to support the excavation of contaminated soil by the B&L Woodwaste Site Custodial Trust (Trust).

In addition, this memorandum presents the design basis assumptions for the excavation of two ditch bank areas, the South Ditch and the West Ditch, planned for completion in 2015. The West Ditch area is shown on Figure 2.

FIELD METHODS

The investigation consisted of two rounds of direct-push borings with soil sampling. Boring locations from both rounds of 2014 investigation, as well as the 2013 investigation phase are shown on Figure 1.

For both the July and September sampling events, property access, utility clearance, boring advancement, and sample collection and analysis were conducted in accordance with the

procedures described in the *Sampling and Analysis Plan/Quality Assurance Project Plan* (Appendix B to the *Groundwater Remediation Work Plan*; Floyd|Snider/AMEC Geomatrix 2009) and the "*Ditch Bank Soil Investigation*" memorandum (Floyd|Snider/AMEC 2013). Soil samples were collected from 3 feet down to 8 feet below ground surface (bgs) at 1-foot intervals. Selected samples taken at depths ranging from 3 to 8 feet bgs were analyzed for total arsenic by U.S. Environmental Protection Agency (USEPA) Method 200.8. The remaining intervals were archived for potential future analysis.

July Sampling Event

On July 16, 2014, eight direct-push borings were advanced along the eastern and western edges of the South Ditch (AV-33 through AV-39). Six of these borings (AV-33, AV-34, AV-36, AV-38, and AV-39) were advanced along the south side of the bank, within approximately 5 feet of the edge, and spaced along the ditch at approximately 15-foot intervals, as shown on Figure 1. Two borings, AV-35 and AV-37, were advanced at distances approximately 10 to 15 feet south of the ditch bank.

September Sampling Event

Based on the July results, it was determined that additional samples were necessary for delineation purposes. On September 22, 2014, nine additional direct-push borings were advanced along the eastern and western edges of the South Ditch (AV-40 through AV-48) to further delineate the contaminated soil. These borings were advanced along the south side of the bank, within approximately 5 feet of the edge, and were spaced along the ditch at approximately 20- to 40-foot intervals, as shown on Figure 1.

DATA VALIDATION

A Compliance Screening, Tier 1 data quality review was performed on the results of laboratory analysis for total arsenic. The analytical data were validated in accordance with the USEPA *National Functional Guidelines for Inorganic Superfund Data Review* (USEPA 2013).

A total of 49 soil samples were submitted, in one sample delivery group (FB409392), to Friedman & Bruya, Inc. of Seattle, Washington. Of the submitted samples, 12 were archived and the remaining 37 underwent chemical analysis. For the samples that were analyzed, the analytical holding times were met and the method blanks had no detections. The internal standard, laboratory control sample, matrix spike (MS) and matrix spike duplicate (MSD) recoveries, and MS/MSD relative percent differences all met USEPA requirements.

No qualifiers were added to the analytical results based on the data quality review. Data are determined to be of acceptable quality for use as reported by the laboratory.

EXTENT OF SOIL ARSENIC CONTAMINATION

Results for both the July and September sampling events are presented in Table 1 and illustrated on Figure 1. Detected arsenic concentrations ranged from 1.1 milligrams per kilogram (mg/kg) to 204 mg/kg. The highest detected concentration (204 mg/kg) was from the 3- to 4-foot interval of AV-48. This result, though of acceptable data quality, is not considered representative of the soil in the area because the arsenic concentration in the field duplicate (AV-48-DUP) was 38.4 mg/kg.

Along the length of the ditch bank, soil arsenic contamination is present for approximately 375 lineal feet, with an apparent isolated exceedance located in shallow soil west of this section. The ditch effectively ends east of AV-47, where the ground surface elevation rises to meet the Fife Way East roadway. This roadway existed prior to the dumping of the woodwaste and slag in the 1970s and 1980s, so the extent of elevated arsenic in soil on the eastern edge of the ditch bank is estimated to extend a short distance east of AV-47.

In a central "hotspot" area located approximately between AV-4/AV-3 and AV-27/AV-26, elevated soil arsenic concentrations extend into the Autumn Village Apartments (Apartments) property up to approximately 15 feet. Contamination from the hotspot area is thought to be the main source of elevated arsenic in groundwater in this area, as measured at PD-31 and AV-31. Outside the hotspot area, it appears that the elevated soil arsenic contamination extends approximately 10 feet or less from the ditch bank, based on the lower concentrations measured in these areas and several borings that establish an approximate southern boundary.

Elevated soil arsenic concentrations extend to depths of at least 8 feet in portions of the hotspot area, and in several boring locations east of the hotspot area (AV-38, AV-46, AV-44, and AV-47). West of the hotspot, elevated soil arsenic contamination is shallower in depth (approximately 4 to 5 feet deep).

DESIGN BASIS FOR DITCH BANK CLEANUP ACTION

Excavation is the selected remedial action for the soils with elevated arsenic concentrations in the banks adjacent to the agricultural ditch (Floyd|Snider 2014b), referred to as the South Ditch and the West Ditch. This remedial action will proceed as a continuation of the 2008 Cleanup Action Plan (CAP) implementation, which included excavation and off-site disposal of contaminated ditch sediments and contaminated soil.

The purpose of this section is to document the key assumptions and basis for design of the ditch bank excavation to be completed in 2015. The assumptions and basis presented in this section will be used to complete the design, engineering, plans, and specifications for 2015 remedial action. The design basis for the 2015 remedial action is largely consistent with the approach used in the contaminated sediment excavation in 2012.

This section identifies the engineering considerations, design constraints, property issues, and other conditions to be considered during development of the design and preparation of the plans

and specifications for the remedial activities. These considerations form the basis for design of the remedial action and are described below.

1. Ditch bank soil in the West Ditch and South Ditch exceeding the arsenic cleanup level (CUL) of 20 mg/kg will be removed from the Site for disposal as confirmed by the following method:
    a. Verification sampling will be conducted in the excavation areas to confirm that remediation objectives have been attained. Compliance will be demonstrated in accordance with the Model Toxics Control Act (Washington Administrative Code [WAC] 173-340-740(7)(c)(iv)) by calculating a 95 percent upper percentile concentration of the data set that complies with the CUL of 20 mg/kg.
        i. Existing data for soil left in place following excavation will be included in the compliance data set.
        ii. Not more than 10 percent of the total samples of soil left in place will exceed the CUL.
        iii. No samples of soil left in place will exceed 2 times the CUL.
    b. In areas where existing data locations are excavated, new verification samples will be collected every 50 feet along the excavation sidewalls. The ditch bank is situated several feet above the ditch center, and sidewalls may not be present in locations where the excavation opens into the ditch. Samples will be collected from the depth of the most elevated arsenic concentrations observed in existing borings. Excavation base samples will also be collected every 50 feet along the length of the excavation, from the center of the excavation area.
2. Soil known to exceed the arsenic CUL in the bank of the West Ditch as shown on Figure 2 will be excavated.
3. Soil known to exceed the arsenic CUL in the South Ditch adjacent to the Apartments as shown on Figure 1 will be excavated.
    a. Based on existing data and the conceptual site model, it is assumed that soil exceeding the CUL generally extends below ground 10 feet or less from the top of the ditch bank. It is also assumed that soil exceeding the CUL consistently extends approximately 10 feet or less from the edge of the ditch, except in the hotspot area, where soil exceeding the CUL extends up to approximately 15 feet from the edge of the ditch.
    b. For soil on the landfill property (delineated on Figure 1) that contains arsenic concentrations less than 2 times the CUL, the remedial action may be re-evaluated in consultation with Ecology. The soil may be identified by further characterization of the area, or by verification samples. If the exceedances of the CUL in this area prevents the 95 percent upper percentile concentration from being in compliance, these samples may be considered in a separate compliance evaluation.

4. Contaminated soil will be estimated to extend half-way between the distance from a location in which soil exceeds the CUL and a location in which soil does not exceed the CUL.
5. Methods for soil removal from the ditch bank areas should be conducted in a manner that minimizes excavated volumes and limits the removal of soil/sediment with arsenic concentrations less than 20 mg/kg.
6. Contaminated groundwater or stormwater removed from work areas can be treated in the groundwater treatment plant (GWTP) if standards set by the treatment plant engineer for total suspended solids (TSS) and/or turbidity in the influent water stream are met by settling, filtration, or other methods.
7. Surface water that flows into the work area from upgradient areas must be managed without resulting in erosion, discharge of turbid water to water bodies, mobilization of contaminants from the work area, flooding, or other adverse effects. Upgradient water that does enter the work area can be redirected to downgradient drainage ditches.
8. Dewatering should be implemented to minimize the potential for sediment transport during excavation, reduce the moisture content of excavated sediments, and limit the amount of handling required to decrease water content prior to transportation for disposal.
9. Decontamination procedures and other considerations shall be implemented to control incidental transport of contaminated material from the work area.
10. The work should be performed in a manner that minimizes generation of dust and aerosols.
11. Construction will be completed in a manner that limits impact to property owners, residents, and the public. The health and safety of the public, workers, and residents of the Apartments will be the highest priority in project planning and execution. Precautions will be implemented to prevent access to the excavation area, contact with contaminated media, and disruption of fire and emergency services.
12. Impacted areas will be restored to existing conditions, or equivalent, following excavation. Pre-existing grades will be restored with imported, compacted fill and topsoil where appropriate. Existing structures, including sidewalks and driveways, will be restored with construction materials and workmanship equivalent to the existing level of quality. Affected landscaping, including trees, will be replaced with similar species and density. Replaced trees will be less mature than existing trees. Restored landscaping will be maintained for 1 year following planting.
13. Construction activities will not permanently damage existing wetlands or environmentally sensitive areas. Any damage to these areas will be repaired to existing conditions.

14. All excavated material will be disposed of at a Subtitle D, non-hazardous waste landfill. Dewatering or stabilization of some excavated material for moisture control may be required prior to disposal to ensure the material can be placed within a landfill with no further treatment.
15. Existing soil data will be used to profile excavated material for landfill disposal as non-hazardous waste. If additional data are required for waste profiling and disposal purposes, representative sampling and analyses will be conducted to achieve disposal requirements.
16. If material containing identifiable slag is encountered during excavation activities, this material will be segregated, sampled, and submitted for total arsenic analysis. Results from these analyses will be used to determine the appropriate method for waste management and disposal.
17. The construction activities will be scheduled during the dry season and will begin no earlier than June 1, 2015, and concluded no later than October 15, 2015.
18. The remedial action construction area will be managed with stormwater Best Management Practices (BMPs), and all stormwater runoff from the construction area will be contained and treated (as needed) to comply with the substantive requirements of the Washington State Stormwater Industrial Discharge Permit turbidity limit of 25 Nephelometric Turbidity Units (NTUs). A Construction Stormwater General Permit will not be required because the construction activities are limited to less than an acre of disturbed area. A stormwater pollution prevention plan (SWPPP) will be prepared to describe the BMPs and other measures to prevent violations of surface water quality.

REFERENCES

Floyd|Snider/AMEC Geomatrix. 2008. Unpublished Technical Memorandum from Teri Floyd and Brett Beaulieu, Floyd|Snider, and Larry McGaughey, AMEC Geomatrix, to Dom Reale of the Washington State Department of Ecology Re: Arsenic Characterization Study Report. 10 December.

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Floyd|Snider/AMEC. 2013. Unpublished Memorandum from Brett Beaulieu and Erin Murray, Floyd|Snider to Dom Reale of the Washington State Department of Ecology Re: Ditch Bank Soil Investigation. 17 April.

———. 2014a. Unpublished Memorandum from Brett Beaulieu, Floyd|Snider, to Mohsen Kourehdar of the Washington State Department of Ecology re: Ditch Bank Soil Investigation. 20 June.

———. 2014b. Unpublished Memorandum from Brett Beaulieu, Megan McCullough, and Erin Murray, Floyd|Snider, to Mohsen Kourehdar of the Washington State Department of Ecology re: Ditch Bank Remedial Action. 21 May.

U.S. Environmental Protection Agency (USEPA). 2013a. *National Functional Guidelines for Inorganic Superfund Data Review*. EPA-540-R-013-001. October.

ATTACHMENTS

Table 1 South Ditch Soil Arsenic Results

Figure 1 South Ditch Arsenic Results and Estimated Excavation Extent

Figure 2 West Ditch Arsenic Results and Estimated Excavation Extent

Table

Table 1
South Ditch Soil Arsenic Results

Location	Sample ID	Sample Date	Top Depth (feet)	Bottom Depth (feet)	Arsenic Concentration (mg/kg)
AV-33	AV-33-3-4'	7/16/2014	3	4	**96.4**
	AV-33-4-5'	7/16/2014	4	5	**40.5**
	AV-33-5-6'	7/16/2014	5	6	8.09
	AV-33-6-7'	7/16/2014	6	7	5.87
AV-34	AV-34-3-4'	7/16/2014	3	4	**103**
	AV-34-4-5'	7/16/2014	4	5	18.7
	AV-34-5-6'	7/16/2014	5	6	9.83
	AV-34-6-7'	7/16/2014	6	7	6.54
AV-35	AV-35-3-4'	7/16/2014	3	4	7.73
	AV-35-6-7'	7/16/2014	6	7	4.29
AV-36	AV-36-3-4'	7/16/2014	3	4	**157**
	AV-36-3-4' DUP	7/16/2014	3	4	**98.2**
	AV-36-4-5'	7/16/2014	4	5	**126**
	AV-36-5-6'	7/16/2014	5	6	**57.2**
	AV-36-6-7'	7/16/2014	6	7	8.9
AV-37	AV-37-3-4'	7/16/2014	3	4	2.41
	AV-37-6-7'	7/16/2014	6	7	1.99
	AV-37-6-7' DUP	7/16/2014	6	7	2.06
AV-38	AV-38-3-4'	7/16/2014	3	4	**37.2**
	AV-38-6-7'	7/16/2014	6	7	**44.8**
	AV-38-7-8'	7/16/2014	7	8	**51.5**
AV-39	AV-39-3-4'	7/16/2014	3	4	**68.8**
	AV-39-3-4' DUP	7/16/2014	3	4	**88.6**
	AV-39-6-7'	7/16/2014	6	7	**45.2**
	AV-39-7-8'	7/16/2014	7	8	17.4
AV-40	AV-40-3-4’	9/22/2014	3	4	9.95
	AV-40-3-4’ DUP	9/22/2014	3	4	8.02
	AV-40-6-7’	9/22/2014	6	7	9.37
AV-41	AV-41-3-4’	9/22/2014	3	4	**38.5**
	AV-41-4-5’	9/22/2014	4	5	7.16
	AV-41-5-6’	9/22/2014	5	6	4.07
	AV-41-6-7’	9/22/2014	6	7	4.19
	AV-41-6-7’ DUP	9/22/2014	6	7	4.38
AV-42	AV-42-3-4’	9/22/2014	3	4	2.25
	AV-42-6-7’	9/22/2014	6	7	1.12
AV-43	AV-43-3-4’	9/22/2014	3	4	63
	AV-43-4-5’	9/22/2014	4	5	4.93
	AV-43-5-6’	9/22/2014	5	6	3.49
	AV-43-6-7’	9/22/2014	6	7	4.06
AV-44	AV-44-3-4’	9/22/2014	3	4	**34**
	AV-44-4-5’	9/22/2014	4	5	**48.5**
	AV-44-5-6’	9/22/2014	5	6	**105**
	AV-44-6-7’	9/22/2014	6	7	**31.2**
	AV-44-7-8’	9/22/2014	7	8	**39.5**
AV-45	AV-45-3-4’	9/22/2014	3	4	2.79
	AV-45-6-7’	9/22/2014	6	7	3.04
	AV-45-6-7’ DUP	9/22/2014	6	7	2.39
AV-46	AV-46-3-4’	9/22/2014	3	4	19.6
	AV-46-4-5’	9/22/2014	4	5	**84.4**
	AV-46-5-6’	9/22/2014	5	6	**48.3**
	AV-46-6-7’	9/22/2014	6	7	**26.1**
	AV-46-7-8’	9/22/2014	7	8	**105**
AV-47	AV-47-3-4’	9/22/2014	3	4	**25.1**
	AV-47-4-5’	9/22/2014	4	5	**89.1**
	AV-47-5-6’	9/22/2014	5	6	**41.2**
	AV-47-6-7’	9/22/2014	6	7	**45.4**
	AV-47-7-8’	9/22/2014	7	8	**28.2**
AV-48	AV-48-3-4’	9/22/2014	3	4	**204**
	AV-48-3-4’ DUP	9/22/2014	3	4	**38.4**
	AV-48-4-5’	9/22/2014	4	5	6.34
	AV-48-5-6’	9/22/2014	5	6	3.54
	AV-48-6-7’	9/22/2014	6	7	2.09

Note:

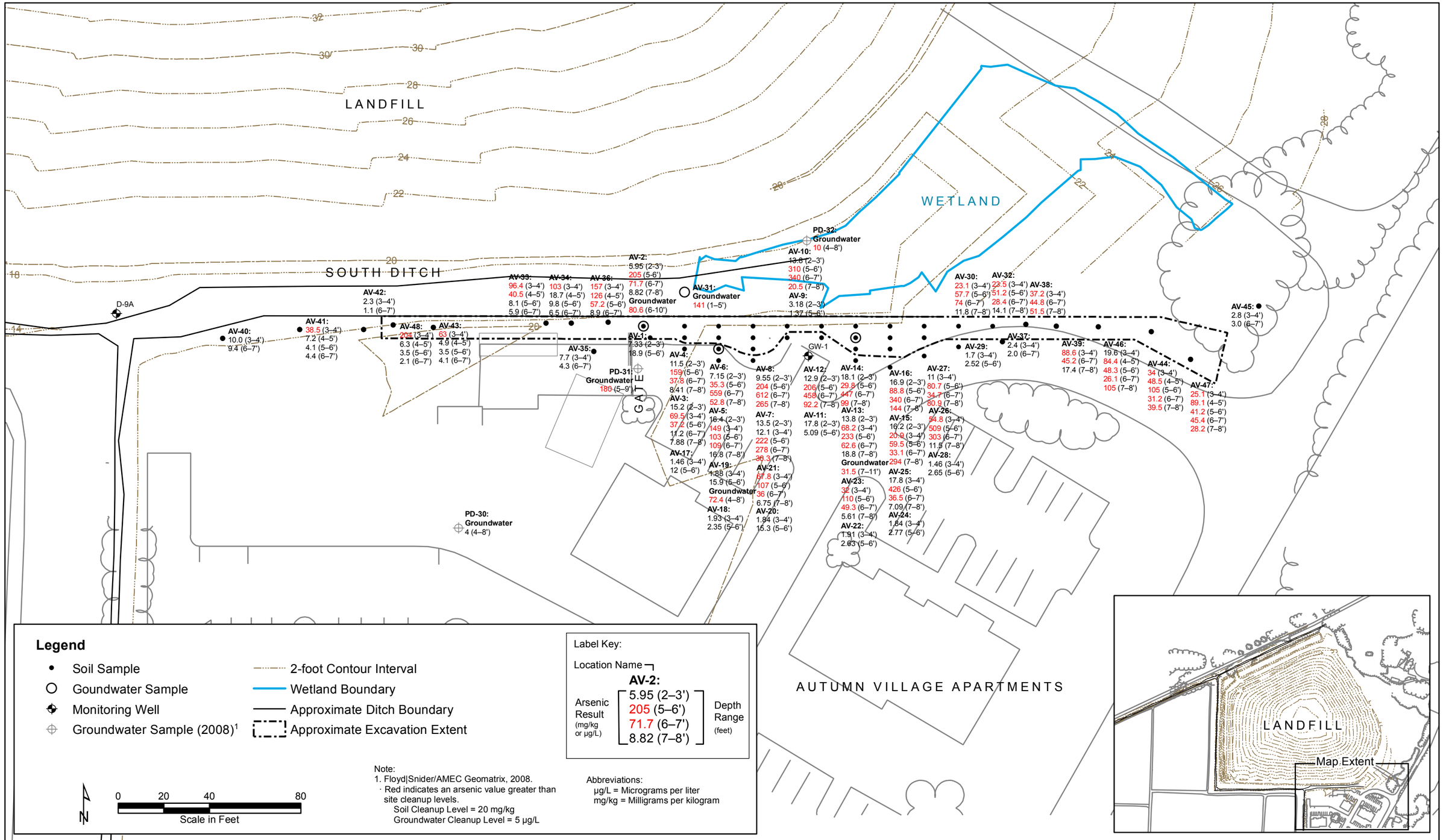
Bold Indicates concentration is greater than the cleanup level of 20 mg/kg for soil and 5 µg/L for groundwater.

Abbreviations:

µg/L Micrograms per liter

mg/kg Milligrams per kilogram

Figures



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Ditch Bank Soil Extent Investigation and Remedial Design Basis
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Figure 1
South Ditch Arsenic Results and Estimated Excavation Extent

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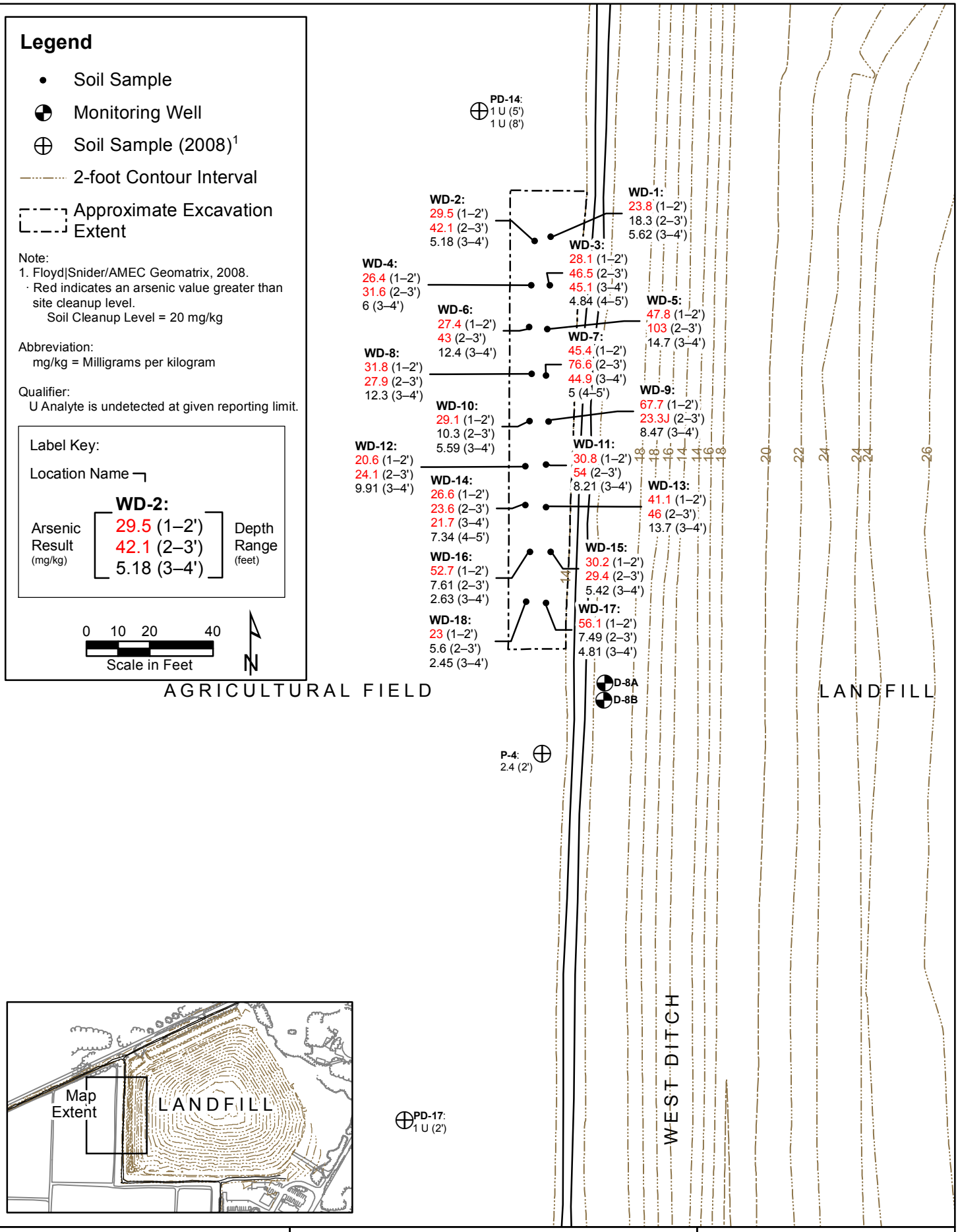

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Ditch Bank Soil Extent Investigation and Remedial Design Basis
B&L Woodwaste Site
Pierce County, Washington

Figure 2
West Ditch Arsenic Results and Estimated Excavation Extent

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