

TECHNICAL MEMORANDUM

Project No.: 100094

December 22, 2011

To: Russ Olsen, Department of Ecology

cc: Ron Carpenter, Bremerton School District

From: Doug Hillman, LHG
Principal Hydrogeologist

Re: DRAFT – Interim Action Work Plan – Surficial Soil Removal Action
Crownhill Elementary School Remedial Investigation
Agreed Order No. DE 7916

The purpose of this Technical Memorandum is to obtain Washington State Department of Ecology's (Ecology's) written approval for an interim action that will remove surficial soils exceeding unrestricted land use cleanup levels. The removal action would be completed in the area at the south end of the school property and extend on to the Bremerton United Methodist Church (Church) property (Figure 1). This proposed plan is presented on behalf of the Bremerton School District (BSD) and in response to comments provided by Ecology regarding results of the Spring 2011 Investigation Program. The interim action outlined in this plan is intended to address Ecology's comments (November 9, 2011) in a manner consistent with the responses provided by Aspect (November 29, 2011).

Interim Action Objectives

The objectives of the interim action are to:

- Maintain protective surface soil conditions for students and area stakeholders;
- Remove soils from the 0 to 1-foot-depth interval in areas where contaminants exceed cleanup levels; and
- Complete an interim action that would be compatible with further action, if warranted, following completion of the Remedial Investigation/Feasibility Study (RI/FS) process.

Surficial Soil Quality Data

The spring 2011 sampling program identified specific areas where near-surface soil samples (collected from 0 to 3 feet in depth) contained concentrations of lead, arsenic, and other compounds at concentrations above soil quality cleanup levels established for this project. Ecology conveyed the importance of cleanup level compliance at ground surface (for practical purposes, 0 to 1 foot in depth) and required an interim action to attain this objective. To design the interim action, BSD completed the November 2011 supplemental sampling in these areas of exceedances under a refined grid sampling program specific to the 0 to 1 foot depth interval.

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Two areas were identified for this follow-on investigation: 1) north of the portable classroom building; and 2) at the south property line between the Crownhill Elementary School and the Church. Sampling was conducted at a 25-foot-spacing to provide greater resolution in the vicinity of the Spring 2011 exceedances. Figure 1 illustrates the grid sampling locations and results for both the Spring 2011 event (left side of the figure) and the supplemental November 2011 event (right side). Table 1 summarizes the analytical results.

Exceedances at the 0 to 1 foot depth interval were only located in the area at the south property line between the school and church. Metals that exceeded cleanup levels included antimony, arsenic, copper, and lead. Only one exceedance was located on school property adjacent to the fence line defining the property boundary between the Church and school. The remainder of the exceedances is located on the Church property just south of the School property. The exceedances encompass an area approximately 100 by 50 feet (See lower right inset on Figure 1). Figures 1 and 2 show the proposed extent of the soil removal action. Removal activities are discussed in the next section.

Proposed Removal Action

This section provides a summary of cleanup activities that will be completed as part of this interim action.

Soil Excavation

The surficial soil quality data indicates that an interim removal action is warranted only in the south landfill area. Figures 1 and 2 depict the area of the removal action. Soils will be excavated from the 0 to 1 foot depth interval. Note that the outline of the removal action extends approximately 10 feet past the known 0 to 1 foot interval exceedances, and extends onto the southern portion of the Crownhill school property. This is to ensure that the interim action is conservative and results in protective surficial soil conditions. The excavation has a slight T-shape and is approximately 50 feet by 100 feet (Figure 2). The volume of soil to be removed is estimated to be approximately 150 cubic yards.

The following provides a description of the soil excavation process:

- Use existing chemical data from grid sampling to complete waste profile and obtain soil disposal approval as a Class 3 waste;
- Using GPS, stake out the perimeter of the proposed removal area as depicted in Figure 2;
- Dig a trench along that staked outline to a depth of one foot to facilitate sidewall soil sampling at the beginning of the removal effort;
- Collect confirmation soil samples from the outside trench sidewall and submit samples for laboratory analysis (see next section for confirmation soil sampling details);
- Excavate soil from within the trench outline and direct-load to trucks for transport and disposal off site for disposal as Class 3 waste;

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- Interpret chemical results from sidewall samples to determine if lateral extension of the excavation is warranted; and
- Extend lateral bounds of excavation area, as necessary, to obtain cleanup level compliance in sidewall boundaries.

Confirmation Soil Sampling

Confirmation soil samples will be collected along the excavation side wall approximately every 25 feet. Figure 2 illustrated the outline of the proposed excavation area with the proposed confirmation soil sample locations. Soil samples will be a composite of the 0 to 1 foot depth interval.

Soils samples will be submitted for laboratory analysis of metals (antimony, arsenic, copper and lead; EPA Method 200.8) and diesel-range petroleum hydrocarbons (by Method NWTPH-Dx). Soil sampling and laboratory chemical analyses will be conducted using the methods and procedures approved by Ecology in the project-specific Sampling and Analysis Plan (Aspect, March 9, 2011).

Site Restoration

Following soil removal, a permeable geotextile membrane will be placed at the bottom of the excavation, thus providing a separation between imported backfill and native materials. The excavation will be backfilled with imported soil and covered with sod returning the site to its original grade.

Waste Disposal

Excavated soils and sod will be disposed of off-site as Class 3 waste.

Permitting

Since work is being completed under an Agreed Order, a grading permit is not required. However the action is subject to State Environmental Policy Act (SEPA) review. BSD is the lead agency for the SEPA process and the completed checklist is provided under separate cover. BSD has determined the interim action does not have a probable significant adverse impact on the environment and is prepared to issue a “determination of non-significance.” Following Ecology’s approval of the proposed interim action, BSD will publically advertise their SEPA for public comment.

Attachments:

Table 1 – Supplemental Surficial Soil Sampling Results – Fall 2011

Figure 1 – Summary of Surface Soil Sampling Results

Figure 2 – Proposed Extent of Soil Removal Action

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Table 1 - Supplemental Surficial Soil Sampling Results - Fall 2011

Crownhill Elementary

Chemical Name	Soil, Method A, Unrestricted Land Use, Table Value (mg/kg)	Soil, Direct Contact, Most Restrictive (mg/kg)	PCA-SS-1 11/11/2011	PCA-SS-2 11/11/2011	PCA-SS-3 11/11/2011	PCA-SS-4 11/11/2011	PCA-SS-5 11/11/2011	PCA-SS-6 11/11/2011	PCA-SS-7 11/11/2011	PCA-SS-8 11/11/2011
Total Petroleum Hydrocarbons										
Diesel Range Hydrocarbons in mg/kg	2,000	2,000								
Lube Oil Range Hydrocarbons in mg/kg		2,000								
Oil (C25-C36) in mg/kg	2,000									
Metals										
Antimony in mg/kg		32								
Arsenic in mg/kg	20	20	1.32	1.86	2.06	1.64	2.2	1.71	1.78	1.53
Copper in mg/kg		3,000								
Lead in mg/kg	250	250	6.55	7.56	8.49	10.7	19.6	8.14	17.2	16.5
Polycyclic Aromatic Hydrocarbons (PAHs)										
Acenaphthene in mg/kg										
Acenaphthylene in mg/kg										
Anthracene in mg/kg		24,000								
Benzo(g,h,i)perylene in mg/kg										
Fluoranthene in mg/kg		3,200								
Fluorene in mg/kg		3,200								
Phenanthrene in mg/kg										
Pyrene in mg/kg		2,400								
Naphthalene in mg/kg	5	1,600								
Benzo(a)anthracene in mg/kg										
Benzo(a)pyrene in mg/kg	0.1	0.14								
Benzo(b)fluoranthene in mg/kg										
Benzo(k)fluoranthene in mg/kg										
Chrysene in mg/kg										
Dibenzo(a,h)anthracene in mg/kg										
Indeno(1,2,3-cd)pyrene in mg/kg										

Notes

Concentrations in shaded cells indicate value exceeds Soil, Method A, Unrestricted Land Use, Table Value (mg/kg)

Concentrations within bold border indicate value exceeds Soil, Method B, Most Restrictive Standard Formula Value (mg/kg)

U - Analyte was not detected at or above the reported result.

Uca - The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

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V:\100094 BSD Crownhill Elementary RIFS\Deliverables\Interim Action Plan\Dec22 Draft\Fall Soil Sampling Summary 2011

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Crownhill Elementary

Chemical Name	Soil, Method A, Unrestricted Land Use, Table Value (mg/kg)	Soil, Direct Contact, Most Restrictive (mg/kg)	PCA-SS-9 11/11/2011	PCA-SS-10 11/11/2011	PCA-SS-11 11/11/2011	PCA-SS-12 11/11/2011	PCA-SS-13 11/11/2011	SPL-SS-1 11/11/2011	SPL-SS-2 11/11/2011	SPL-SS-3 11/11/2011
Total Petroleum Hydrocarbons										
Diesel Range Hydrocarbons in mg/kg	2,000	2,000								
Lube Oil Range Hydrocarbons in mg/kg		2,000								
Oil (C25-C36) in mg/kg	2,000									
Metals										
Antimony in mg/kg		32								
Arsenic in mg/kg	20	20	1.89	1.97	1.63	1.84	2.87	2.42	2.3	4.07
Copper in mg/kg		3,000								
Lead in mg/kg	250	250	15	25.9	9.25	20.6	127	41.2	21.4	59.4
Polycyclic Aromatic Hydrocarbons (PAHs)										
Acenaphthene in mg/kg										
Acenaphthylene in mg/kg										
Anthracene in mg/kg		24,000								
Benzo(g,h,i)perylene in mg/kg										
Fluoranthene in mg/kg		3,200								
Fluorene in mg/kg		3,200								
Phenanthrene in mg/kg										
Pyrene in mg/kg		2,400								
Naphthalene in mg/kg	5	1,600								
Benzo(a)anthracene in mg/kg										
Benzo(a)pyrene in mg/kg	0.1	0.14								
Benzo(b)fluoranthene in mg/kg										
Benzo(k)fluoranthene in mg/kg										
Chrysene in mg/kg										
Dibenzo(a,h)anthracene in mg/kg										
Indeno(1,2,3-cd)pyrene in mg/kg										

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Crownhill Elementary

Chemical Name	Soil, Method A, Unrestricted Land Use, Table Value (mg/kg)	Soil, Direct Contact, Most Restrictive (mg/kg)	SPL-SS-4 11/11/2011	SPL-SS-5 11/11/2011	SPL-SS-6 11/11/2011	SPL-SS-7 11/11/2011	SPL-SS-8 11/11/2011	SPL-SS-9 11/11/2011	SPL-SS-10 11/11/2011	SPL-SS-11 11/11/2011
Total Petroleum Hydrocarbons										
Diesel Range Hydrocarbons in mg/kg	2,000	2,000								
Lube Oil Range Hydrocarbons in mg/kg		2,000								
Oil (C25-C36) in mg/kg	2,000									
Metals										
Antimony in mg/kg		32								
Arsenic in mg/kg	20	20	3.02	3.05	6.15	2.78	2.44	2.96	2.49	3.6
Copper in mg/kg		3,000								
Lead in mg/kg	250	250	52.7	53	143	22.6	63.8	66.1	26.7	254
Polycyclic Aromatic Hydrocarbons (PAHs)										
Acenaphthene in mg/kg										
Acenaphthylene in mg/kg										
Anthracene in mg/kg		24,000								
Benzo(g,h,i)perylene in mg/kg										
Fluoranthene in mg/kg		3,200								
Fluorene in mg/kg		3,200								
Phenanthrene in mg/kg										
Pyrene in mg/kg		2,400								
Naphthalene in mg/kg	5	1,600								
Benzo(a)anthracene in mg/kg										
Benzo(a)pyrene in mg/kg	0.1	0.14								
Benzo(b)fluoranthene in mg/kg										
Benzo(k)fluoranthene in mg/kg										
Chrysene in mg/kg										
Dibenzo(a,h)anthracene in mg/kg										
Indeno(1,2,3-cd)pyrene in mg/kg										

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Concentrations within bold border indicate value exceeds Soil, Method B, Most Restrictive Standard Formula Value (mg/kg)

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Crownhill Elementary

Chemical Name	Soil, Method A, Unrestricted Land Use, Table Value (mg/kg)	Soil, Direct Contact, Most Restrictive (mg/kg)	SPL-SS-12 11/11/2011	SPL-SS-13 11/11/2011	SPL-SS-14 11/11/2011	SPL-SS-15 11/11/2011	SPL-SS-16 11/11/2011	SPL-SS-17 11/11/2011	SPL-SS-18 11/11/2011	SPL-SS-19 11/11/2011
Total Petroleum Hydrocarbons										
Diesel Range Hydrocarbons in mg/kg	2,000	2,000			50 U	50 U		50 U	60 x	
Lube Oil Range Hydrocarbons in mg/kg		2,000			250 U	250 U		250 U	690	
Oil (C25-C36) in mg/kg	2,000				250 U	250 U		250 U	690	
Metals										
Antimony in mg/kg		32			29.6	729		114	48.4	
Arsenic in mg/kg	20	20	3.02	2.76	5.26	24.7	2.43	7	3.11	1.52
Copper in mg/kg		3,000			370	6,160		2,180	423	
Lead in mg/kg	250	250	54.3	67.8	725	5,290	34.3	1,640	152	3.45
Polycyclic Aromatic Hydrocarbons (PAHs)										
Acenaphthene in mg/kg					0.01 U	0.01 U		0.01 U	0.01 U	
Acenaphthylene in mg/kg					0.01 U	0.01 U		0.01 U	0.011	
Anthracene in mg/kg		24,000			0.01 U	0.01 U		0.01 U	0.01 U	
Benzo(g,h,i)perylene in mg/kg					0.1	0.057		0.13	0.058	
Fluoranthene in mg/kg		3,200			0.11	0.061		0.03	0.043	
Fluorene in mg/kg		3,200			0.01 U	0.01 U		0.01 U	0.01 Uca	
Phenanthrene in mg/kg					0.033	0.029		0.016	0.027	
Pyrene in mg/kg		2,400			0.19	0.096		0.036	0.091	
Naphthalene in mg/kg	5	1,600			0.01 U	0.011		0.01 U	0.01 U	
Benz(a)anthracene in mg/kg					0.059	0.033		0.024	0.034	
Benzo(a)pyrene in mg/kg	0.1	0.14			0.1	0.054		0.063	0.051	
Benzo(b)fluoranthene in mg/kg					0.13	0.07		0.11	0.06	
Benzo(k)fluoranthene in mg/kg					0.033	0.018		0.034	0.015	
Chrysene in mg/kg					0.094	0.052		0.057	0.079	
Dibenzo(a,h)anthracene in mg/kg					0.016	0.01 U		0.022	0.015	
Indeno(1,2,3-cd)pyrene in mg/kg					0.093	0.05		0.1	0.041	

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Table 1 - Supplemental Surficial Soil Sampling Results - Fall 2011

Crownhill Elementary

Chemical Name	Soil, Method A, Unrestricted Land Use, Table Value (mg/kg)	Soil, Direct Contact, Most Restrictive (mg/kg)	SPL-SS-20 11/11/2011	SPL-SS-21 11/11/2011	SPL-SS-22 11/11/2011
Total Petroleum Hydrocarbons					
Diesel Range Hydrocarbons in mg/kg	2,000	2,000			
Lube Oil Range Hydrocarbons in mg/kg		2,000			
Oil (C25-C36) in mg/kg	2,000				
Metals					
Antimony in mg/kg		32			
Arsenic in mg/kg	20	20	3.38	15.5	4.28
Copper in mg/kg		3,000			
Lead in mg/kg	250	250	477	146	25.7
Polycyclic Aromatic Hydrocarbons (PAHs)					
Acenaphthene in mg/kg					
Acenaphthylene in mg/kg					
Anthracene in mg/kg		24,000			
Benzo(g,h,i)perylene in mg/kg					
Fluoranthene in mg/kg		3,200			
Fluorene in mg/kg		3,200			
Phenanthrene in mg/kg					
Pyrene in mg/kg		2,400			
Naphthalene in mg/kg	5	1,600			
Benz(a)anthracene in mg/kg					
Benzo(a)pyrene in mg/kg	0.1	0.14			
Benzo(b)fluoranthene in mg/kg					
Benzo(k)fluoranthene in mg/kg					
Chrysene in mg/kg					
Dibenzo(a,h)anthracene in mg/kg					
Indeno(1,2,3-cd)pyrene in mg/kg					

Notes

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Unrestricted Land Use, Table Value (mg/kg)

Concentrations within bold border indicate value exceeds Soil, Method B,
Most Restrictive Standard Formula Value (mg/kg)

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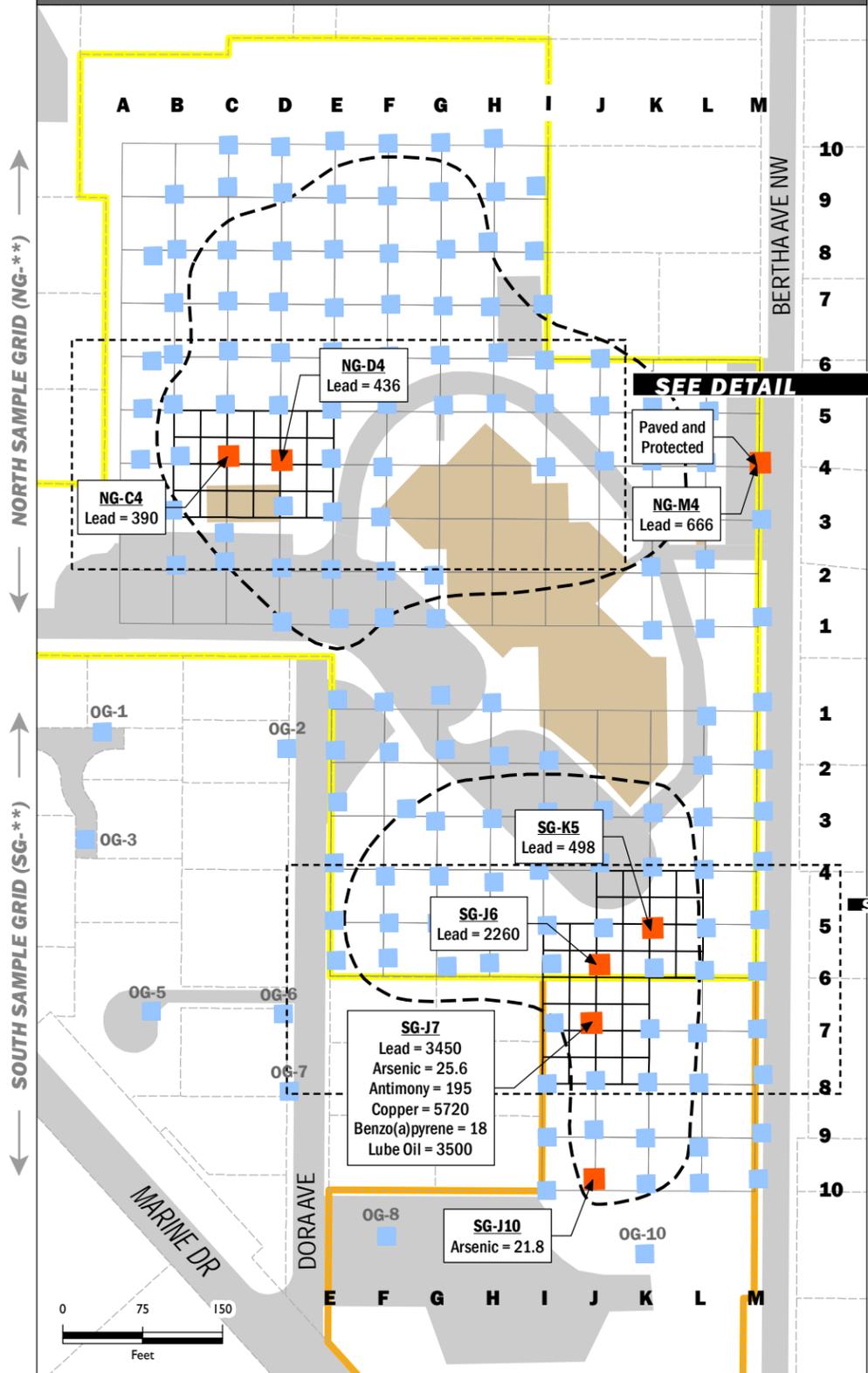
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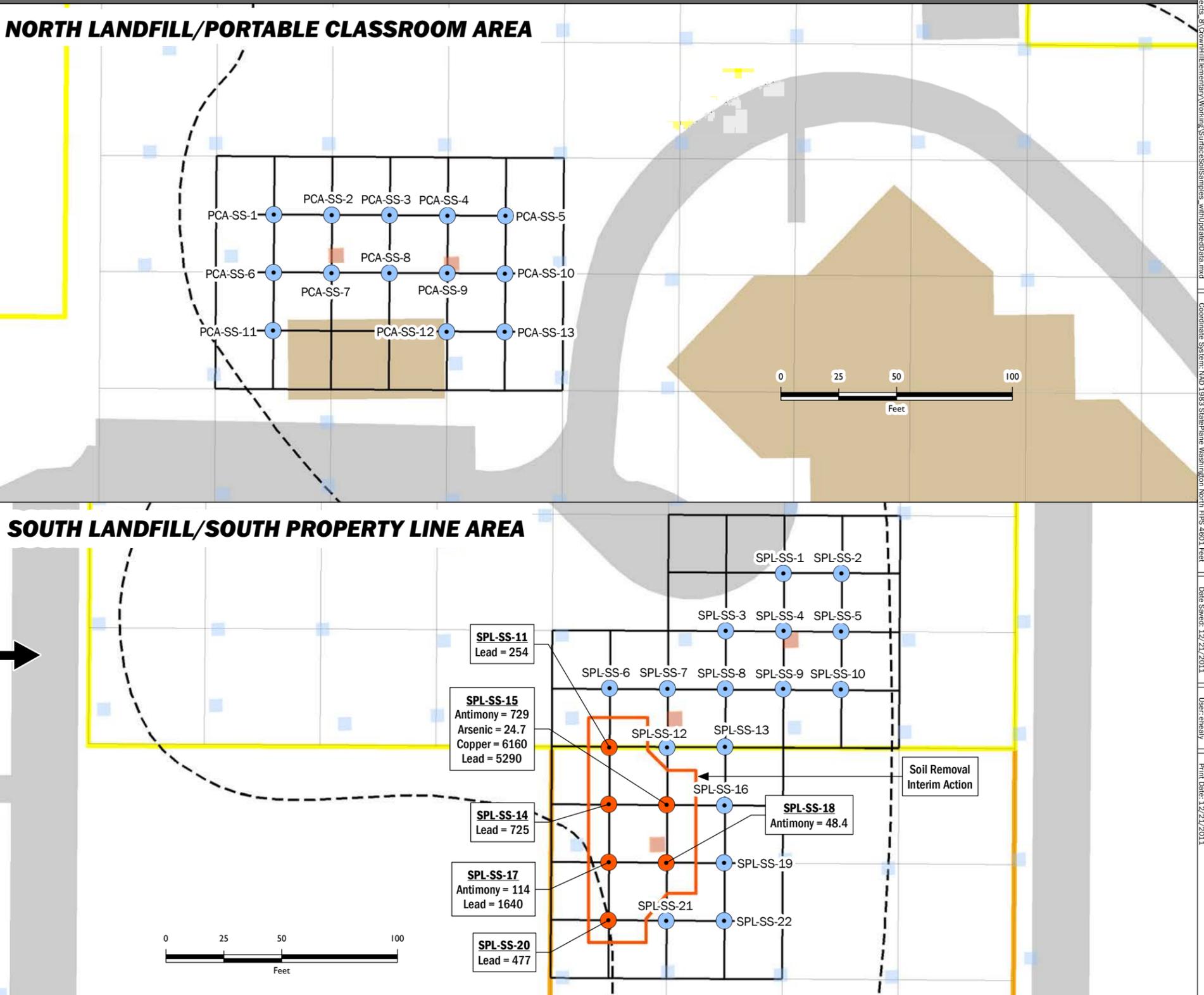
SPRING 2011 SOIL SAMPLING RESULTS

SOIL SAMPLE DEPTH INTERVAL: 0 TO 3 FEET BGS



SUPPLEMENTAL SOIL TESTING (NOVEMBER 2011)

SOIL SAMPLE DEPTH INTERVAL: 0 TO 1 FOOT BGS



Soil Sampling Locations

- Sample Location ID: SG-J6, Lead = 2260
- Location with One or More Exceedance of Direct Contact Soil Cleanup Level (Orange square)
- Location with No Direct Contact Cleanup Level Exceedance (Blue square)
- enumerated exceedances of direct contact soil cleanup levels at given location (results are in mg/kg)

- Supplemental Soil Testing: 0-1 foot Samples (Circle)
- Spring 2011 Soil Sampling: 0-3 foot Samples (Square)

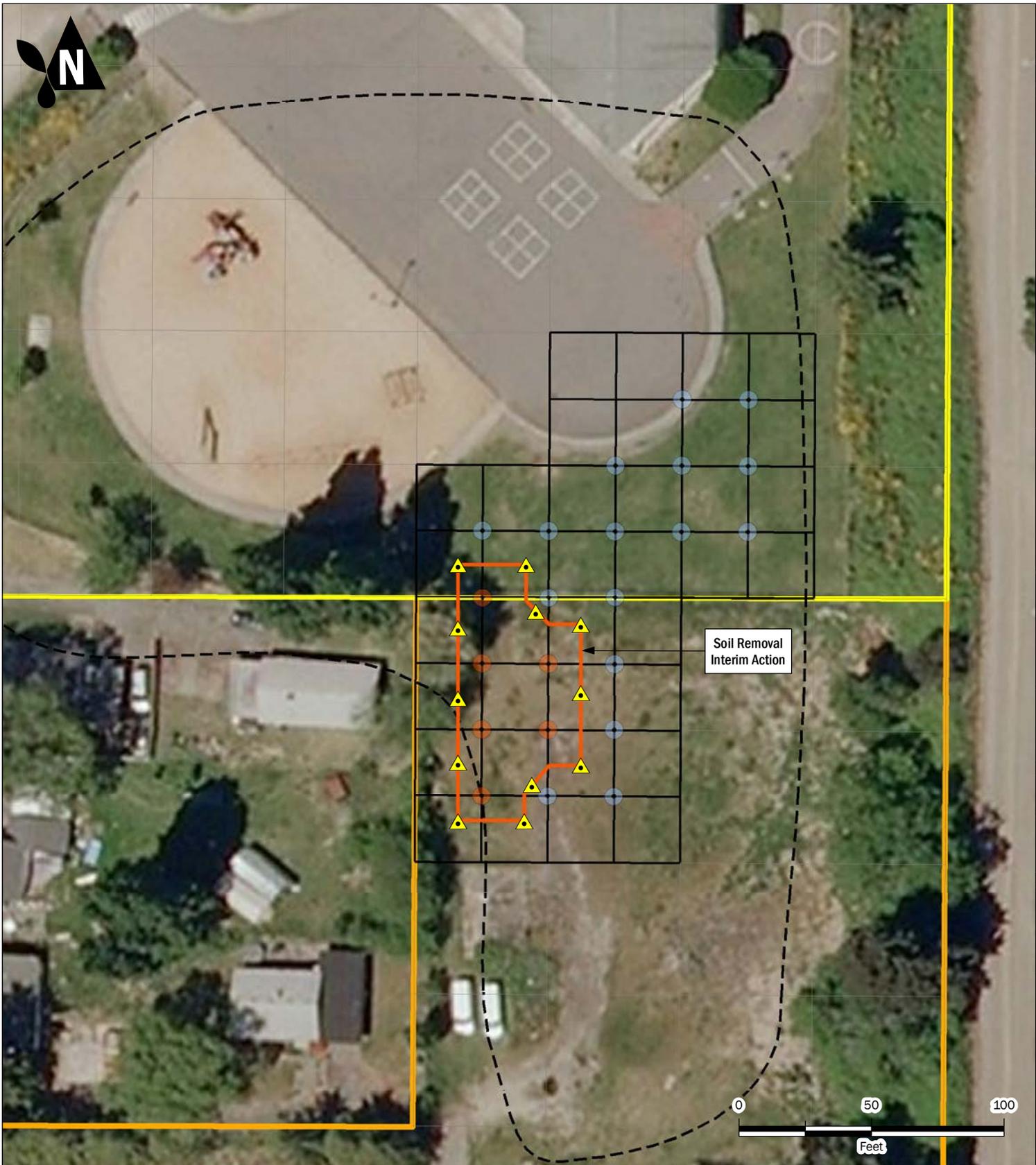
- Bremerton School District Property Boundary (Yellow outline)
- Bremerton United Methodist Church Property Boundary (Orange outline)
- Action Area Extent (Red outline)
- Parcel Lines (Dashed line)
- Interpreted Extent of Landfill Activity (Dashed circle)
- School Building Footprint (Brown shape)
- Pavement (Grey shape)

Summary of Surface Soil Sampling Results

Crownhill Elementary RI/FS - Bremerton, Washington

	DEC-2011	BY: DLH / PPW	FIGURE NO. 1
	PROJECT NO. 100094	REV BY: EAH	

GIS Path: \\projects_8\CrownhillElementary\Working\SurfaceSoilSamples\withUpdatedData.mxd | Coordinate System: NAD 1983 StatePlane Washington North FIPS 4901 Feet | Date Saved: 12/21/2011 | User: eahv | Print Date: 12/21/2011



- ▲ Confirmation Soil Samples
- Surface Soil Grab Sample (0 to 1 foot depth) With One or More Exceedance of Direct Contact Soil Cleanup Level
- Surface Soil Grab Sample (0 to 1 foot depth)
- Action Area Extent
- Interpreted Extent of Landfill Activity
- Proposed Surface Sample Grid
- Existing Sample Grid
- Bremerton School District Property Boundary

Proposed Extent of Soil Removal

Crown Hill Elementary RI/FS
Bremerton, Washington



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BY:
DLC / EAH
REV BY:

FIGURE NO.
2