DEQ-Recommended Additional Sampling

DEQ has outlined next steps for sampling in the table below. Samples with "Analyze" under "Analysis Timing" (also marked with a darker highlight) indicate those that are required at minimum to characterize the site. Those marked "Hold" are samples that may be analyzed later based on shallower soil contaminant profiles as a method for soil removal cost reduction. While samples marked "Hold" may not need to be analyzed, they may be collected during the sampling event to reduce re-mobilization costs later. Pease refer to Table 1 at the end of this document for a full list of recommended sampling.

Rationale for additional recommended sampling

Human Health

GEM has demonstrated that for dieldrin, which is one driver of human health risk concern at the site, the leaching to groundwater pathway is not complete for any decisional unit (DU). A second risk driver of human health risk concern at the site, the soil ingestion, dermal contact, and inhalation pathway is a complete pathway at DU2. However, vertical profiling (below) will narrow the volume of soil needed for removal. Current data indicate a removal depth of 2' is needed without additional vertical delineation.

Vertical Profiling (DU2)

DEQ recommends more vertical profiling to reduce the volume of soil for excavation and disposal. Getting more samples will allow you to finish the characterization and help you reduce the cost of the remedy. DEQ suggests sampling 6"-1' and 1'-2'. GEM can begin by analyzing the 6"-1' sample and holding the 1'-2' sample. If contaminant concentrations at 6"-1' are below applicable risked-based concentrations (RBCs), you can remove to a depth of 6 inches. If there are detections and exceedances of applicable RBCs at that depth, analyze the 1'-2' depth to determine what depth soil removal is needed.

Horizontal Delineation (DU2)

GEM has flagged DU2 for soil removal because of human health risk from dieldrin. DU 2 screening was performed using a 4-point composite sample at 0-6" (and 2'-3' for dieldrin only) over an entire acre. Subsequently, GEM took grab samples at 2a, 2b, 2c, and 2d in an attempt to narrow the area of soil removal needed. However, a single grab sample does not provide adequate delineation for ¼ acre removal. For DU2, DEQ is recommending splitting the unit into ¼ acre plots and using a 4-point composite sampling strategy for each ¼ acre plot. This sampling strategy will allow for sub-plots 2a, 2b, 2c, and 2d to be characterized to determine the horizontal extent of removal needed. Without analyzing composites on a ¼ acre scale, GEM would need to treat all of DU2 the same, which could result in a large volume of soil removal.

Metal Sampling

DEQ is providing additional information regarding human health and ecological RBCs for metals (Table 2 with additions to original table grey highlight). When DEQ does not list an RBC for a contaminant, we instead use EPA's regional screening levels (RSLs) to evaluate human health risk (described in our human health risk assessment guidance).

Agricultural pesticide and fertilizer use can result in metal contamination on agricultural lands. Without detailed chemical use information at a site, it is necessary to measure for the full suite of metals (17 TAL) in soil samples. Also, analyzing for the full suite of metals is recommended in the agricultural guidance. GEM analyzed for lead and arsenic related to possible lead arsenate pesticide use at the site.

Table 2: Metals and corresponding RBCs

Metal	*HH RBC/RSL (Direct Contact, Residential) mg/kg*	*ECO sediment RBC (mg/kg), fresh water*	*ECO most sensitive soil RBC (mg/kg), non-T&E species*	*Background (DEQ Fact Sheet 2018)*	*Previous Sampling 0-6" Result*
Antimony	31	3	2.7	0.39	
As	0.43	6	6.8	18	4.44 - 6.81
Hg	23	0.2	0.05	0.07	
Cd	78	0.6	1.6	1.6	
Ag	390	4.5	26	0.33	
Pb	400	35	23	28	12.5 - 29.3
Cu	3,100	36	43	140	
Ni	14,000	18	21	50	
Ba	15,000	nv	110	730	
Cr	120,000	37	73	100	
Be	160	nv	2.5	2.6	
Co	23	nv	13	None	
Mo	390	nv	26	None	
Se	390	nv	0.52	0.68	
Tl	0.78	nv	0.05	5.7	
Va	390	nv	9.5	370	
Zn	230	123	120	200	

nv is no value

Bank/Swale Sampling

DEQ recommends GEM sample below DU1, DU5, DU6, and DU7 along the bank. At each operable unit along the bank collect a 4-point composite samples from 0" to 6" and 6" to 1' for Organochlorine Pesticides and TAL Metals. GEM may hold the 6" – 1' pending the results of the 0- 6" samples.

DEQ also recommends taking discrete sediment samples upstream of the site, near the site, and downstream of the site from 0-6” to hold pending contaminant results from bank soil samples. This recommendation is based on minimizing costs for re-mobilization (if needed).

Tale 1: DEQ-Recommended Additional Sampling for Amity Oaks						
DU	**Sampling Frequency**	**No. Sample per DU**	**Depth**	**Analysis Timing**	**Analytes**	**Justification**
1	4-point composite per 1 acre	1	0-6”	Analyze	15 TAL metals (As and Pb not needed)	• Eco Risk: Screens for swale metals • Human Health: Screens for metals
	4-point composite per 1 acre	1	6”-1’	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
	4-point composite per 1 acre	1	1’-2’	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
	4-point composite per 1 acre	1	2’-3’	Hold	15 TAL metals (As and Pb not needed)	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
2	4-point composite per ¼ acre*	4	0-6”	Analyze	17 TAL metals	• Human Health: Screens for metals
	4-point composite per ¼ acre*	4	6”-1’	Hold	17 TAL metals	• Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
	4-point composite per ¼ acre*	4	1’-2’	Hold	17 TAL metals	• Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
	4-point composite per ¼ acre*	4	2’-3’	Hold	17 TAL metals	• Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
	4-point composite per ¼ acre*	4	6”-1’	Analyze	Dieldrin	• Method to Reduce Soil Disposal Cost
	4-point composite per ¼ acre*	4	1’-2’	Hold	Dieldrin	• Method to Reduce Soil Disposal Cost
3	-	-	-	-	-	No additional analysis
4	-	-	-	-	-	No additional analysis
5	4-point composite per 1 acre	1	0-6”	Analyze	15 TAL metals (As and Pb not needed)	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals
	4-point composite per 1 acre	1	6”-1’	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
	4-point composite per 1 acre	1	1’-2’	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals;

Tale 1: DEQ-Recommended Additional Sampling for Amity Oaks						
DU	**Sampling Frequency**	**No. Sample per DU**	**Depth**	**Analysis Timing**	**Analytes**	**Justification**
5 (cont)						• Method to Reduce Soil Disposal Cost
	4-point composite per 1 acre	1	2'-3'	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
6	4-point composite per 1 acre	1	0-6"	Analyze	15 TAL metals (As and Pb not needed)	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals
	4-point composite per 1 acre	1	6"-1'	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
	4-point composite per 1 acre	1	1'-2'	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
	4-point composite per 1 acre	1	2'-3'	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
7	4-point composite per 1 acre	1	0-6"	Analyze	15 TAL metals (As and Pb not needed)	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals;
	4-point composite per 1 acre	1	6"-1'	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
	4-point composite per 1 acre	1	1'-2'	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
	4-point composite per 1 acre	1	2'-3'	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Human Health: Screens for metals; • Method to Reduce Soil Disposal Cost
Swale Bank Below DU 1	4-point composite	1	0-6"	Analyze	17 TAL metals	• Eco Risk: Screens for swale metals
	4-point composite	1	6"-1'	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Method to Reduce Soil Disposal Cost

Tale 1: DEQ-Recommended Additional Sampling for Amity Oaks						
DU	**Sampling Frequency**	**No. Sample per DU**	**Depth**	**Analysis Timing**	**Analytes**	**Justification**
Swale Bank Below DU 1 (cont)	4-point composite	1	0-6”	Analyze	Organochlorine Pesticides	• Eco Risk: Screens for swale organochlorine pesticides
	4-point composite	1	6”-1’	Hold	Organochlorine Pesticides	• Eco Risk: Screens for swale organochlorine pesticides; • Method to Reduce Soil Disposal Cost
Swale Bank Below DU 5	4-point composite	1	0-6”	Analyze	17 TAL metals	• Eco Risk: Screens for swale metals
	4-point composite	1	6”-1’	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Method to Reduce Soil Disposal Cost
	4-point composite	1	0-6”	Analyze	Organochlorine Pesticides	• Eco Risk: Screens for swale organochlorine pesticides
	4-point composite		6”-1’	Hold	Organochlorine Pesticides	• Eco Risk: Screens for swale organochlorine pesticides; • Method to Reduce Soil Disposal Cost
Swale Bank Below DU 6	4-point composite	1	0-6”	Analyze	17 TAL metals	• Eco Risk: Screens for swale metals
	4-point composite	1	6”-1’	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Method to Reduce Soil Disposal Cost
	4-point composite	1	0-6”	Analyze	Organochlorine Pesticides	• Eco Risk: Screens for swale organochlorine pesticides
	4-point composite	1	6”-1’	Hold	Organochlorine Pesticides	• Eco Risk: Screens for swale organochlorine pesticides; • Method to Reduce Soil Disposal Cost
Swale Bank Below DU 7	4-point composite	1	0-6”	Analyze	17 TAL metals	• Eco Risk: Screens for swale metals
	4-point composite	1	6”-1’	Hold	17 TAL metals	• Eco Risk: Screens for swale metals; • Method to Reduce Soil Disposal Cost
	4-point composite	1	0-6”	Analyze	Organochlorine Pesticides	• Eco Risk: Screens for swale organochlorine pesticides
	4-point composite	1	6”-1’	Hold	Organochlorine Pesticides	• Eco Risk: Screens for swale organochlorine pesticides; • Method to Reduce Soil Disposal Cost
Swale Sedi-ment –– Up-strea m	Discrete sediment sample - grab	1	0-6”	Hold	17 TAL metals	• Eco Risk: screens for swale metals in sediment (if bank samples show cause for concern) • Method to Reduce Soil Disposal and/or Re-mobilization Cost
	Discrete sediment sample - grab	1	0-6”	Hold	Organochlorine Pesticides	• Eco Risk: screens for swale organochlorine pesticides in sediment (if bank samples show cause for concern) • Method to Reduce Soil Disposal and/or Re-mobilization Cost

Tale 1: DEQ-Recommended Additional Sampling for Amity Oaks						
DU	**Sampling Frequency**	**No. Sample per DU**	**Depth**	**Analysis Timing**	**Analytes**	**Justification**
Swale Sedi-ment – Near the Site	Discrete sediment sample - grab	1	0-6”	Hold	17 TAL metals	• Eco Risk: screens for swale metals in sediment (if bank samples show cause for concern) • Method to Reduce Soil Disposal and/or Re-mobilization Cost
	Discrete sediment sample - grab	1	0-6”	Hold	Organochlorine Pesticides	• Eco Risk: screens for swale organochlorine pesticides in sediment (if bank samples show cause for concern) • Method to Reduce Soil Disposal and/or Re-mobilization Cost
Swale Sedi-ment – Down - Strea m	Discrete sediment sample - grab	1	0-6”	Hold	17 TAL metals	• Eco Risk: screens for swale metals in sediment (if bank samples show cause for concern) • Method to Reduce Soil Disposal and/or Re-mobilization Cost
	Discrete sediment sample - grab	1	0-6”	Hold	Organochlorine Pesticides	• Eco Risk: screens for swale organochlorine pesticides in sediment (if bank samples show cause for concern) • Method to Reduce Soil Disposal and/or Re-mobilization Cost

Table 3: Additional Sampling Priority Key	
Analyte	Analysis Timing
TAL Metals	Analyze Now
TAL Metals	Collect Now; Analyze later pending results of sample at depth above
Dieldrin Only	Analyze Now
Dieldrin Only	Collect Now; Analyze later pending results of sample at depth above
Organochlorine Pesticides	Analyze Now
Organochlorine Pesticides	Collect Now; Analyze later pending results of sample at depth above