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STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

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August 10, 2012

12-NWP-138

Mr. Doug Hildebrand  
Richland Operations Office  
United States Department of Energy  
PO Box 550, MSIN A6-38  
Richland, Washington 99352

Re: ~~Department of Ecology Extension for Reviewing the~~ <sup>POV</sup> 200-SW-2 Radioactive Landfills  
Group Operable Unit RCRA Facility Investigation/ Corrective Measures Study/Remedial  
Investigation/Feasibility Study Work Plan, DOE/RL-2004-60 Revision 1, Draft A

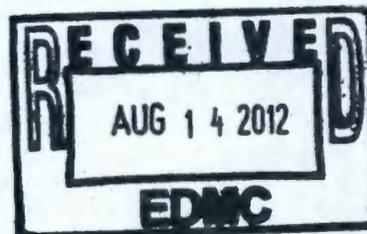
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Dear Mr. Hildebrand:

On November 14, 2011 the Department of Ecology (Ecology) received the 200-SW-2 Radioactive Landfills Group Operable Unit RCRA Facility Investigation/ Corrective Measures Study/Remedial Investigation/Feasibility Study Work Plan, DOE/RL-2004-60 Revision 1, Draft A (Work Plan) for review and comment. Enclosed is a Review Comment Record form containing our detailed and general comments. Several over-arching issues are of greatest concern. These are listed below in no particular order.

- Work Plan does not contain sufficient detail to define further investigation to complete the Remedial Investigation/Feasibility Study for 200-SW-2.
- Work Plan proposes too little characterization to support conclusions regarding impacts to groundwater.
- Work Plan proposes too little characterization for the vadose zone below the trenches and the former pond sites.
- Information pertinent to Conceptual Site Models for individual landfills is scattered throughout the document which is not acceptable.

Ecology expects that the Work Plan will be revised and requests that USDOE provide a schedule to finalize the work plan.



200-SW-2



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If there are any questions, please contact me at 509-372-7923 or Robin Varljen at 509 372-7930.

Sincerely,

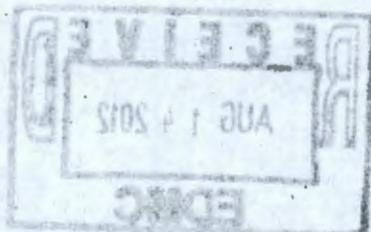


Deborah Singleton  
Waste Management Project Manager  
Nuclear Waste Program

rv/jvs

cc:

Stuart Harris, CTUIR  
Gabriel Bohnee, NPT  
Russell Jim, YN  
Susan Leckband, HAB  
Ken Niles, ODOE  
**Administrative Record**  
Correspondence Control, US-DOE-RL  
Environmental Portal



**Review Comment Record**

**Washington State Department of Ecology  
Nuclear Waste Program  
Waste Management Project/Section**

Date 8/10/2012

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Document Title(s)/Number(s): 200-SW-2 Radioactive Landfills Group Operable Unit RCRA Facility Investigation/ Corrective Measures Study/Remedial Investigation/ Feasibility Study Work Plan, DOE/RL-2004-60 Revision1, Draft A

Document Lead/Phone #/email: Robin Varljen / 509-372-7930 / rvar461@ecy.wa.gov

Project Manager/Phone #/email: Deborah Singleton / 509-372-7923 / dsin461@ecy.wa.gov

Item # Page # Section # Line/¶ #s	Comment and Basis/Justification	Modification Needed	DOE Response	Ecology Response	O/C	Reviewer (Initials)
Item 1 P: Global S: L/¶:	The objective of this document is to provide a framework for performing unbiased characterization of the site. Therefore this document should contain facts but not include speculative statements such as "it is generally expected that the extent of contamination from the 200-SW-2 landfills is limited", or that "the likelihood of contaminant migration below the trenches is expected to be low" (page 3-4, lines 6-9), etc.	Remove speculative comments.				MS
Item 2 P: Global S: L/¶:	Passive soil vapor sampling detected significant amounts of organic vapors at numerous shallow, near surface, locations throughout the 200-SW-2 OU Landfills in the 200 West and 200 East Areas. The compounds detected in soil vapors include dense non-aqueous phase liquid (DNAPL) chemicals, for example: 1,1-Dichloroethane, 1,1-Dichloroethene, 1,1,1-Trichloroethane, 1,1,2-Trichlorotrifluoroethane, 1,2-Dichloroethane, 1,2-Dichloropropane, Carbon tetrachloride, Chloroform, Tetrachloroethene, and Trichloroethene.  The results of the passive soil vapor sampling suggest that sources of DNAPLs are present in the SW-2 landfills. This observation should be addressed in the Conceptual Site Model (CSM) and it should be considered in the basis for proposed further characterization of the 200-SW-2 OU.  Please note that Ecology does not assert here that DNAPLs originating from the SW-2 landfills are or are not present in the groundwater.	Revise CSMs as directed.				MS
Item 3 P: Global S: L/¶:	The document should be reorganized to include distinct locations (Sections?) for information pertaining to Conceptual Site Models for each individual landfill. Currently this information is scattered throughout the document, giving an impression that DOE does not understand that each individual landfill at this site is complex enough to warrant individual evaluation. For example information for W-4B is found on pg. 4-4, B-39, E-29, B-39, A-9, A-60, , etc. This is not acceptable.	Revise as directed				MS
Item 4 P: Global S: L/¶:	In the CSMs, DOE should use Hydro GeoAnalyst for documenting geologic conditions and contaminant transport data in graphical formats. DOE/PNNL has evaluated several software products and concluded that Hydro GeoAnalyst should be used at Hanford to document geologic and contaminant transport data in graphical interpretations in order to facilitate consistent and defensible graphics and digital data sharing among the various Hanford Site agencies and contractors. DOE has already used the Hydro GeoAnalyst for developing 2D and 3D graphical interpretations of subsurface conditions at the C Farm and groundwater OUs in the River Corridor.					MS

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Item 5 P: Global and lines page vi, lines 12- 19 S: L/¶:	Ecology acknowledges that issues related to groundwater characterization, monitoring and remediation are not within the scope of the 200-SW-2 RFI/CMS/RI/FS. However, Ecology expects that: The Work Plan should make it clear if the groundwater under the 200-SW-2 OU Landfills has been monitored for the chemicals detected by the passive soil-vapor sampling.	Revise as directed.				MS
Item 6 P: v S: L/¶:footn ote 7	The footnote to the HFFACO is not incorrect but this listed one is better.	This is a better link: <a href="http://www.hanford.gov/page.cfm/TriParty">http://www.hanford.gov/page.cfm/TriParty</a>				EE
Item 7 P: Global S: L/¶:	Please review waste disposal records and address the disposal of liquids in individual landfills in Section 2.4, and in the CSMs for individual landfills in Appendix E. For example, 218-W-3A Landfill is known to include documented disposal of organic liquids, but it is not reflected in Section 2.4.1.3 or in the CSM in Appendix E (page E-26).	Revise as directed.				MS
Item 8 P: Global S: L/¶:	Based on information available in Appendices, but not discussed in the body of the document, it appears that no characterization data is available for the SW-2 landfills except for the results of near-surface (3-4 m depth) surveys. It is noted that the geophysical surveys were reconnaissance-level surveys, and the depth of investigation for the instruments used in the geophysical survey work was limited to approximately 3 to 4 m. Passive soil vapor sampling is also a reconnaissance-level near-surface survey. Therefore, only the shallowest aspects of the landfills were actually investigated.	The observation that only the shallowest aspects of the landfills were actually investigated should be discussed in the CSM and considered in the basis for proposed further characterization of the 200-SW-2 OU.				MS
Item 9 P: Global S: 4 L/¶:	EPA guidance suggests inferring significant DNAPL source presence in the vicinity if organic vapor concentrations detected in soil gas exceed 100-1000 ppm (DNAPL Site Characterization, EPA /540/F-94/049, Table 5).  Passive soil-vapor sampling is a field screening method that provides an estimate of the relative concentrations of contaminants in soil vapor; it relies on diffusion of organic vapors from subsurface sources and adsorption onto sample media placed in shallow, near surface, holes in the soil. Passive soil vapor sampling detected numerous DNAPL chemicals at levels > 100 ng/sample, and many >1000 ng/sample. Although these results are indicative of significant concentrations of contaminants, ng/sample cannot be compared to ppm.	The RFI/RI phase of the work plan (Section 4) should include installation of soil vapor monitoring wells to investigate the horizontal and vertical nature and extent of DNAPL and other contaminants in the 200-SW-2 OU landfills and in the vadose zone below.				MS

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Item 10 P:1-9 S: L/¶:4	Comment: "Transuranic waste is defined as waste containing elements...." 435.1 is mentioned in the Glossary under "Landfill"  Basis/Justification: There can be different definitions of transuranic waste. 435.1 defines it based on the waste acceptance criteria for WIPP, and it does not include U isotopes although they would normally be considered to transuranic elements. *435.1 is mentioned in the Glossary under "Landfill"	"Transuranic waste is defined in DOE O 435.1 as waste containing elements...."				EE
Item 11 P:1-12 S: L/¶:9	There is a missing period after 1940s.	Edit as necessary.				EE
Item 12 P:1-12 Table 1-2 S: L/¶:	Why are we talking about Dose in this table without any context. This table should be revised to contain only information pertinent to the text.	Revise as directed. Further explain or remove last two columns.				EE
Item 13 P:1-13 S: L/¶:	Please provide references for the documents referenced in the bullets, or provide a reference for the disposal authorization statement addressed in the statement directly above the bullets.	Revise as directed.				MS
Item 14 P: 1-13 S: 1.3 L/¶:27-32	Comment: The document claims that PAs from the 1990s are sufficient is probably a too strong claim. Or are they just claiming that they were good in July 2000.  Basis/Justification: With all certainty, the PAs will have to be reevaluated with this investigation proceeds.	Clarify.				EE
Item 15 P:1-14 S: L/¶:	This entire page talks about PAs and 435.1 but there is no mention of the two actual PAs that Marc Woods did in the 1990s for the SW-2 landfills.	Please discuss and reference these documents.				EE
Item 16 P:1-15 S: L/¶:26	I-62, what is this?	Clarify.				EE
Item 17	Comment: "zone" is missing after vadose.	Insert "zone" after vadose.				EE

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P:1-16 S: L/¶:14	Basis/Justification:					
Item 18 P:2-2 S:2.3 Landfill Categorie s L/¶:	The concept of geographic overlays, currently described in Section A1.4 of Appendix A, should be moved forward to Section 2.3. The relationship between the GOs and the binning system should be described, and the objectives of both classifications should be stated. In particular, please explain how the approach proposed in Chapter 4 for the RFI/RI would benefit from each classification system.	Revise as directed.				MS
Item 19 P:2-2 S:2.3.1 Table 2-1 L/¶:	Table 2-1 is confusing and does not help to understand why landfills were included in particular bins.	Clarify. Suggest including Table E-1 (page E-2) in Section 2.3.1.				MS
Item 20 P:2-7 S: L/¶:24-25	This sentence is not clear. The alpha caissons are part of SW-2. The 218-W-4B landfill cannot be closed until the waste and caissons have been removed.	Clarify.				EE
Item 21 P:2-7 S: L/¶:42	Line 42 references Section 1.4.5., however, there is no Section 1.4.5 in the document. Green Islands are discussed in Section 1.5.5. Provide correct section reference.	Revise as directed.				MS
Item 22 P:2-9 S:2.4.1.3 L/¶:	218-W-3A Landfill is known to have included sorbed containerized liquid disposal and disposal of organics. This is not reflected in Section 2.4.1.3. Please review records and reference the disposal of organics and liquids in 218-W-3A and other landfills.	Revise as directed.				MS
Item 23 P:2-9 S: L/¶:33& Figure B-12	Please identify the three trenches that are known to contain MLLW. Figure B-12 shows two "Green Island" waste locations, in trenches 6S and 19.	Revise as directed.				MS
Item 24 P:2-11 W-4B landfill S:	Please address the SVE operations in trench #7 including: <ul style="list-style-type: none"> <li>Operational objectives of the SVE remediation</li> <li>Horizontal and vertical extent of the zones of SVE remediation in the landfill and/or in the vadose zone under the landfill</li> <li>Horizontal and vertical extent of elevated concentrations of carbon</li> </ul>	Revise as directed.				MS

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L/¶:	tetrachloride remediated by SVE in 218-W-4B. • Types and amounts of chemicals recovered					
Item 25 P:2-12 W-4C landfill S: L/¶:	Please address the SVE operations in trench #4 including: • Operational objectives of the SVE remediation • Horizontal and vertical extent of the zones of SVE remediation in the landfill and/or in the vadose zone under the landfill • Horizontal and vertical extent of elevated concentrations of carbon tetrachloride remediated by SVE in 218-W-4C. • Types and amounts of chemicals recovered	Revise as directed.				MS
Item 26 P:2-13 S: L/¶:29-30	An additional two MLLW trenches (Trenches 31 & 34) were constructed. These trenches are regulated under the RCRA permit and are out of scope of this work plan.	Update this sentence to make it clearer.				EE
Item 27 P:2-19 S: L/¶:2.4.2. 13	218-W-2 has a large amount of Pu onsite in the landfill (126 kg). This should be mentioned.	Update.				EE
Item 28 P:2-20 S: L/¶:17	"Size" is missing at the end of the line.	Insert "size" at the end of line.				EE
Item 29 P:2-20& 2-19 S: L/¶:18 &26	Is this the same truck mentioned under W-2A?	Clarify.				EE
Item 30 P:2-20 S: L/¶:30	This description indicates that this is the major inventory at the landfill. Other information says this landfill has 68 kg of Pu.	Update and clarify.				EE
Item 31 P:2-20 S:2.4.2.1 6	W-4A is the high U site with 394000 kg. It talks about 500 drums.	Clarify what type of U is at this site.				EE

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L/¶:44						
Item 32 P:2-37 through 2-43 Figures 2-12, 2- 13, 2-14 & 2-15 S: L/¶:	It is not clear which type of unit(s) is colored green on these figures	Please include clarifications on the Figures.				MS
Item 33 P:2-47 S:2.7 L/¶:12-16 Figure 2- 17	Figure 2-17 does not show the locations of the groundwater OUs relative to the twenty-four 200-SW-2 landfills. Please include a figure that unambiguously shows all units pertinent to this RFI/CMS/RI/FS including locations of all 200-SW-2 landfills and the groundwater OUs.	Revise on this or on other maps such as figure 3-4 and 3-5.				MS
Item 34 P:2-47-2- 50 S:2.7.1& 2.7.2 L/¶:	Please include in this section information pertinent to this RFI/CMS/RI/FS including: maps illustrating sources and locations of the referenced plumes of contaminants relative to the twenty-four 200-SW-2 landfills ; and maps showing locations all other features referenced throughout these two subsections (pump-and-treat extraction and injection wells, the interim treatment facility in the 200 West Area, SALDS, WMA T ad TX-TY, ETF, RCRA and CERCLA past-practice units in the 200 East Area, etc.)	Revise as directed. Reference map.				MS
Item 35 P:3-3 S: L/¶:17	References are made to non-existing Sections 2.2.1 and 2.2.2. Revise the text to reference correct Sections.	Revise as directed.				MS
Item 36 P:3-10 S: L/¶:8	Remove redundant "also".	Edit.				EE
Item 37 P: 3-4, 3- 5, 3-6 S: L/¶:	Please include information pertinent to this RFI/CMS/RI/FS including maps illustrating locations relative to the 200-SW-2 landfills of all facilities and wells referenced throughout Section 3.2.1, i.e. the cribs near Waste Management Area (WMA) T and the 216-Z Cribs and trench disposal facilities, location of the injection of 200-ZP-1 Groundwater OU pump-and-treat water up gradient of the landfills, etc.	Revise as directed. Reference map.				MS

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Item 38 P: 3-10, 3-11 S:3-5 L/¶:	Please include in the CSM and reference here a map showing locations of all features discussed in Section 3.2.5, including: 1. Horizontal and vertical extent of the zones of SVE remediation in the vadose zone under the landfills 2. Horizontal and vertical extent of elevated concentrations of carbon tetrachloride remediated by SVE in 218-W-4B and in 218-W-4C.	Revise as directed. Reference map.				MS
Item 39 P:3-11 S:3.2.7 in general L/¶:41-43	Please provide factual data to support the statement that "Based on historical groundwater monitoring data, groundwater has not been impacted by the 200-SW-2 landfills". In particular: 1. Provide evidence that carbon tetrachloride from 218-W-4B and 218-W-4C has not impacted groundwater even though its concentrations in these landfills were so high as to warrant SVE remediation. 2. Please discuss if the historical groundwater monitoring, including the RCRA and CERCLA groundwater monitoring programs, include monitoring of the chemicals detected in the landfills by the passive soil-vapor sampling. 3. In case of chemical plumes known to originate from other locations (for example: carbon tetrachloride), please discuss evidence for no impacts to these plumes from the chemicals in the landfills other than "the comparisons conducted for four contaminant indicator parameters: pH, specific conductance, total organic carbon, and total organic halides" (page 3-16, lines 8-10).	Revise as directed.				MS
Item 40 P:3-18 Figure 3-4 L/¶:	Mark on the map the UP-1/ZP-1 border for reference. A few other landmarks would be good as well, such as PFP, U-Plant, T-Plant.	Update.				EE
Item 41 P:3-18 S: L/¶:6-8	The statement that "None of these plumes have shown to be caused by or contributed to from releases originating from the 200-SW-2 landfills." Is true because no data exist. Please state this explicitly.	Revise as directed.				MS
Item 42 Table 3-4 S: L/¶:	ARARs do not address asbestos	Add Standard for demolition and renovation 40CFR 61.145 Add Standard for waste disposal for manufacturing, fabrication ,etc. 40CFR 61.150 Add National Emission Std for Asbestos 40CFR61 Subpart M Applicability 40CFR61.140				BJ
Item 43 Table 3-4		Add WAC173-350 Solid Waste handling storage				BJ

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S: L/¶:						
Item 44 Table 3-4 S: L/¶:	WAC 173-340-745 (5) is incomplete	Change to WAC 173-340-745 (5)(b)				BJ
Item 45 P:3-27 Table3-4 S: L/¶:last table entry	WAC 173-340-7490 and WAC 173-340-7494 are for simplified. DOE should be using site specific WAC 173-340-7493	Replace entry with WAC 173-340-7493				BJ
Item 46 Table 3-4 S: L/¶:	New Source is omitted	Add ARAR for New Source				BJ
Item 47 Table 3-4 S: L/¶:	WAC 173-400-075; Why is this ARAR added?	Provide answer to question asked.				BJ
Item 48 Table 3-4 S: L/¶:		Add WAC 173-304-200-Onsite containerized storage, collection and transportation for solid waste				BJ
Item 49 Table 3-4 S: L/¶:	WAC 173 480-060; Is this ARAR appropriate	Provide answer to question asked.				BJ
Item 50 Table 3-4 S: L/¶:		Add 173-303-170 Generators of dangerous waste				BJ
Item 51 Table 3-4, WAC 173-303-610(2)	Description incorrect as it describes RCRA closure/post closure performance standards. Rationale for including incorrect as Substantive requirements of these regulations are ARARs for TSD Units encountered during remedial actions	Modify as described in comment.				BJ

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entry S: L/¶:						
Item 52 Table 3-4 S: L/¶:	The first entry is a repeat. OSWER Directive 9285.7-55 is not in MTCA. Add WAC 173-303-745 Industrial CUL's	Edit as directed.				BJ
Item 53 P:3-19 Figure3-5 L/¶:	Mark on the map the borders between the different groundwater OUs for reference. A few other landmarks would be good as well, such as PUREX, B-Plant.	Update.				EE
Item 54 P:3-35 S:3.6 And numerous other locations, for example Figure e- 10 L/¶:	<ol style="list-style-type: none"> <li>1.The CSM should recognize that DNAPL chemicals have been detected in the landfills by passive soil-vapor sampling.</li> <li>2.The CSM should discuss contaminant fate and transport of DNAPL chemicals, including no need for recharge in order to migrate from the unlined landfills into the vadose zone and into the groundwater (downward mobility of DNAPL chemicals does not depend on the presence of a hydraulic driving force).</li> <li>3.The CSM should recognize that concentrations of carbon tetrachloride (a DNAPL chemical) in 218-W-4B and 218-W-4C were high enough to warrant remediation by SVE. Please describe the programmatic objectives of these SVE operations including whether targeting the contents of the landfill or the vadose zone below the landfill and horizontal extent of the SVE operations. Please describe the SVE performance history including: types of VOCs extracted in addition to carbon tetrachloride; organic vapor removal rates versus time; individual chemical removal rates versus time; total volumes of individual chemicals removed; and reasons for the SVE termination.</li> </ol>	Revise as directed. . This should include information from PW-1/3/6, ZP-1 and UP-1 and other relevant OUs.				MS
Item 55 P:3-35 S: L/¶:22-26	The RFI/CMS/RI/FS Work Plan should include a summary of all known information pertaining to the CSM, without expecting the reader to seek out and review reference documents. Please include a summary of information pertinent to the CSM in addition to providing a reference on lines 25-26.	Please include a summary of information pertinent to the CSM in addition to providing a reference on lines 25-26.				MS
Item 56 P:3-35 S: L/¶:36-37	As defined in CERCLA RI/FS, BRA is the acronym for Baseline Risk <b>Assessment</b> , not "Analysis". Also please see lines 40-42 for a correct definition of BRA.	Edit.				MS
Item 57	Volatile Organics.	Edit.				MS

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P:3-39 Table 3-5 L/¶:	In the third column there is "cis-1,2- <u>C</u> ichloroethene". Should it be cis-1,2- <u>D</u> ichloroethene?					
Item 58 P:4-1 S:4.1 L/¶:	Section 4.1 should state that the depth of investigation for the instruments used in the passive soil-gas data and the geophysical survey results to date work was limited to approximately 3 to 4 m (Appendix G, Geophysical Investigations Summary Report -- 200 Area Burial Grounds). Therefore, only the shallowest aspects of the landfills were actually investigated. This observation should then form basis for the identification of data gaps in Section 4.2.	Revise as directed.				MS
Item 59 P:4-1 S: L/¶:31	Make the following change: "...development of the BRA, the conceptual <u>contaminant</u> -site model and the development, screening and..."	Revise as directed.				MS
Item 60 P:4-1 S: L/¶:35	Make the following change: "Chapter 2 presents historical and background information for the 200-SW-2 landfills. # <u>Chapter 3</u> also identifies an initial set of technologies and remedial alternatives that would be screened. "	Revise as directed.				MS
Item 61 P:4-2 S:4.2.1 L/¶:	The evaluation of existing data should include the information that the depth of investigation for the instruments used in the passive soil-gas data and the geophysical survey results to date work was limited to approximately 3 to 4 m. This should be compared to the actual depths of trenches in the landfills and reflected in the text and in Tables in Section 4.2.1.	Revise as directed.				MS
Item 62 P:4-5 – 4-9 S:4.2 including tables L/¶:	1. Global characterization activities should include installation of soil vapor monitoring wells to investigate the horizontal and vertical nature and extent of chemicals in the 200-SW-2 OU landfills and in the vadose zone below. <ul style="list-style-type: none"> <li>The passive soil-vapor survey results should be used as a guidance to locate soil-vapor monitoring wells throughout 200-SW-2 OU landfills. EPA guidance suggests inferring significant DNAPL source presence in the vicinity if organic vapor concentrations detected in soil gas exceed 100-1000 ppm (DNAPL Site Characterization, EPA /540/F-94/049, Table 5). Passive soil vapor sampling detected numerous DNAPL chemicals at levels &gt; 100 ng/sample, and many &gt;1000 ng/sample, which are indicative of significant concentrations of contaminants present in the landfills, however, ng/sample cannot be compared to ppm.</li> <li>Soil-vapor monitoring wells should also be considered for 218-W-4B and 218-W-4C where carbon tetrachloride concentrations have warranted SVE remediation.</li> </ul>	Revise as directed.				MS

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Item # Page # Section # Line/¶ #s	Comment and Basis/Justification	Modification Needed	DOE Response	Ecology Response	O/C	Reviewer (Initials)
	<p>2. Global characterization activities should include collecting passive soil-vapor sampling from the locations that were identified as candidates for passive soil-vapor sampling but for various reasons had not been sampled.</p> <p>3. Passive soil-vapor sampling should also be evaluated for all other remaining landfills.</p> <p>4. Installation of more soil vapor monitoring wells may be warranted based on results from the additional passive soil-vapor sampling.</p>					
Item 63 P:4-5 S: L/¶:20-32	<p>Comment: Ecology does not concur that additional record searches are advisable or necessary.</p> <p>Basis/Justification: How many records searches can be done? All the data should have been reviewed at this time.</p>					EE
Item 64 P:4-10 S:4.2.4.1 L/¶:	This discussion should recognize that mobility of DNAPL chemicals does not depend on a downward hydraulic driving force (recharge, infiltration from precipitation and/or other events).	Revise as directed.				MS
Item 65 P:4-11 S: L/¶:13-15	Active soil-gas concentration data are also needed to investigate the horizontal and vertical nature and extent of DNAPL chemicals in the 200-SW-2 OU landfills and in the vadose zone below.	Revise as directed.				MS
Item 66 P:4-12 Table 4-5 S: L/¶:	This table should include information about depths of investigations and other limitations of the investigation methods.	Revise as directed.				MS
Item 67 P:4-13 Table 4-6 S: L/¶:	Table 4-6 should also include soil-vapor monitoring wells.	Revise as directed.				MS
Item 68 P:4-15 S:	It is not true that "historically, treatability studies have been conducted post-ROD." See: "Guidance for Conducting RI/FS Under CERCLA", EPA/540/G-89/004, Section 5: <a href="http://www.epa.gov/superfund/policy/remedy/pdfs/540g-89004-s.pdf">http://www.epa.gov/superfund/policy/remedy/pdfs/540g-89004-s.pdf</a>	Revise to state that, per EPA guidance and as a matter of practice, treatability studies are conducted in parallel with the FS and the results are reflected in the				MS

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Item # Page # Section # Line/¶ #s	Comment and Basis/Justification	Modification Needed	DOE Response	Ecology Response	O/C	Reviewer (Initials)
L/¶:36		FS.				
Item 69 P:4-17 S:4.6 L/¶:	Please note that the selection and screening of remedial alternatives should be consistent with "Guidance for Conducting RI/FS Under CERCLA", EPA/540/G-89/004. Section 4.6 should be revised to reflect the guidance document.	Section 4.6 should be revised to reflect the guidance document.				MS
Item 70 P:5-4 S:5.3.3 L/¶:	Proposed field investigation summary should include installation of soil vapor monitoring wells to investigate the horizontal and vertical nature and extent of chemicals in the 200-SW-2 OU landfills and in the vadose zone below.	Revise as directed.				MS
Item 71 P:A-1 S: L/¶:19	Missing period.	Correct it.				EE
Item 72 P:A-4 S: L/¶:29-31	Suggest re-stating as follows to account for the potential release of chemicals that are not soluble in water and thus are not a part of an actual leachate: "Data collection may address, but not be limited to, <del>one or more of</del> one or more of the following: gas migration due to releases from volatilization, <del>or</del> releases to the vadose zone from leachate from the landfill areas, <u>or non-aqueous phase chemicals' migration from the landfills.</u> "	Revise as directed.				MS
Item 73 P:A-4 S: L/¶:35-40 and P:A-5 L:1-2	Please address the following: <ul style="list-style-type: none"> <li>• Which landfills show evidence of presence of DNAPL chemicals in the landfills?</li> <li>• Which landfills show evidence of presence of DNAPL or other chemicals in the vadose zone under the landfills?</li> <li>• Which landfills show evidence of DNAPL chemicals having been released to the groundwater?</li> </ul>	Revise as directed.				MS
Item 74 P:A-5 S: L/¶:31	Directional duplicated.	Remove.				EE
Item 75 P:A-14 Table A-2 S: L/¶:	Inconsistent nomenclature among the anions	Correct it.				EE
Item 76 P:A-15	It should be pointed out in the header that Aroclors are PCBs.	Revise as directed.				EE

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Table A-2 S: L/¶:						
Item 77 P:A-16 Table A-3 S: L/¶:	It should be pointed out in the header that these are soil criteria for soil sample analysis	Revise header as follows: Analytical Performance Requirements for <b>Soil Samples</b> for 200-SW-2				EE
Item 78 P:A-55 S:A3.4.1.4 L/¶:		Delete one "Directional" in the paragraph heading.				JA
Item 79 P:A-55 S: L/¶:40-41	There are no directional well locations on figures A-13 through A-16. Horizontal wells are shown in Fig. A-20 together with the excavation activities. What is the correct terminology? Direct Push and Directional Drilling are two different drilling techniques. Please clarify terminology between the three techniques.  It would really be better if all the information in figure A-20 was added to figures a-6 through A-19. It would make the information a lot less cluttered. This may mean a few larger scale figures for some landfills, which is appropriate.	Edit as directed.				JA/EE
Item 80 P:B-2 Figure B-1 S: L/¶:	Please mark the location of the 216-C-9 liquid waste disposal area in the Unused Solid Waste Area of the 218-C-9 landfill.	Revise as directed.				MS
Item 81 P:C-2 S: L/¶:4-8	The following statement is inconsistent with the intent and requirements of 40 CFR Parts 264/265 and WAC 173-303: "The purpose of a liner in a <i>Resource Conservation and Recovery Act of 1976</i> (RCRA)-permitted landfill is to catch water that may come into contact with uncovered waste during burial operations. This water is collected and appropriately treated. Once the landfill is filled and the waste is covered, the liner has no environmental effect or benefit for the performance of the landfill, and in most cases disintegrates after a number of years."	Revise text to reflect the intent of CFR Parts 264/265, in particular § 264.301(a)(1), and that of WAC 173-303-665(2)(i), both of which include requirements for double liner systems <i>designed to prevent the migration of dangerous constituents during the life and post-closure period of the landfill.</i>				MS

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Item # Page # Section # Line/¶ #s	Comment and Basis/Justification	Modification Needed	DOE Response	Ecology Response	O/C	Reviewer (Initials)
	It is inappropriate to claim that correctly designed and constructed US EPA RCRA Subtitle C double composite-lined landfills are expected not to prevent leachate from passing through the liner system. In particular, § 264.301(a)(1) requires liner systems to be "designed, constructed, and installed to prevent any migration of wastes out of the landfill to the adjacent subsurface soil or ground water or surface water anytime during the active life (including the closure period) of the landfill." Likewise, WAC 173-303-665(2)(i) includes requirements for double liner systems designed to prevent the migration of dangerous constituents during the life and post-closure period of the landfill.					
Item 82 P: S: Figure E-45, and other figures throughout the document L/¶:	CCL4 and other DNAPL chemicals have been detected at this landfill. DNAPLs do not require recharge for downward migration. This needs to be recognized in the "Current Information Assessment", "Data Gaps and Needs", and "Characterization Plan and Rationale".	Revise as directed.				MS
Item 83 P: S:3.2.7 L/¶:	Per 3.2.7, the groundwater under 200-SW-2 has not been impacted by the landfills. Which of the landfills have been known to have leaked at least into the vadose zone?	Provide answer to question asked.				JA
Item 84 P:A-30 S: L/¶:38	Directional duplicated.	Remove.				EE
Item 85 P: A-33 S: L/¶:5	Directional duplicated.	Remove.				EE
Item 86 P:A-35 S: L/¶:19	SAPS is incorrect and should be SAPs.	Edit.				EE
Item 87	Directional duplicated	Edit.				EE

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Item # Page # Section # Line/¶ #s	Comment and Basis/Justification	Modification Needed	DOE Response	Ecology Response	O/C	Reviewer (Initials)
P:A-43 Table A-4 S: L/¶:						
Item 88 P:A-48 Table A-5 S: L/¶: 2 <sup>nd</sup> to last	The text says 218-WAC. What is this landfill?	Provide answer.				EE
Item 89 P:A-49 Table A-5 S: L/¶: 3 <sup>rd</sup> & 4 <sup>th</sup> from bottom	The text says 218-W-I A. What is this landfill?	Provide answer.				EE
Item 90 P:A-51 S: L/¶:38	Ecology concurs that the INL- multi-detector probe should be deployed to investigate the vadose zone at SW-2. However, the primary component of the detector, the β-probe, still requires final development and field demonstration. During 2010, the DOE demonstrated that the β-probe can detect contamination with 1 pCi/gm accuracy. Ecology encourages DOE to finalize the development of the β-probe.	The Work Plan should acknowledge DOE's commitment to finalizing the development of the β-probe.				MS
Item 91 P:A-54 S: L/¶:24	The text says 218-E-4A. There is no such landfill. Should it be 218-W-4A?	Answer and/or Edit.				EE
Item 92 P:B-22 Table B-1 S: L/¶:	Under UPR-200-W-84 it talks about "Trench TS9". Is it supposed to be 9S?	Answer and/or Edit.				EE
Item 93 P:C-9	218-W-2A is incorrect when it refers to Pu inventory.	Edit to "218-W-2, -W-1,-W-3 and -W-4A"				EE

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Item # Page # Section # Line/¶ #s	Comment and Basis/Justification	Modification Needed	DOE Response	Ecology Response	O/C	Reviewer (Initials)
S: L/¶:35						
Item 94 App. D S: L/¶:	Mobile Surface Contamination Monitor (MSCM) Survey Data is not included for all landfills	MSCM Survey Data maps should be included for all landfills. For those where data and maps are not available, MSCM Survey data should be obtained.				EE
Item 95 P: D-19 S: L/¶:3	218-1-1A is incorrect	Edit to "218-W-1A".				EE
Item 96 P: D-22 & D-23 S: L/¶:	Reference missing	Include D&D-30708 used in the text.				EE
Item 97 P:D-17 S: L/¶:	It is difficult to distinguish the burial ground boundaries between 218-W-11,-1 &-2.	Delineate between the burial grounds.				Group
Item 98 P:D-17 S: L/¶:	Various hot spots have been detected.	Advanced geophysics recommended in individual burial ground comment sheets should focus on hot spot areas.				Group
Item 99 P:E-13 S: L/¶:	"It is believed that 2 trenches run parallel to the railroad tracks". This is not really what SGW-43771, Rev0 says. For discussion purposes it talks about 3 areas which could be part of two trenches.	Edit according to reference.				EE
Item 100 P:E-18 S: L/¶:	This site has M-91 waste. This site thus has retrievably stored waste and "green island "waste. The retrievably stored waste is not shown on any M-91 maps. This needs to be clarified in both this and permitting documents if what is said is correct.	Answer AND edit.				EE
Item 101 P:E-21,- 23,-25,- 28 S: L/¶:	All these sites mention they "contain at least 90% of the pre-1970 alpha contaminated LLW". Combined that is correct, but not for each individual site	Clarify and correct.				EE
Item 102	OU and Category is missing for this landfill	Edit.				EE

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Item # Page # Section # Line/¶ #s	Comment and Basis/Justification	Modification Needed	DOE Response	Ecology Response	O/C	Reviewer (Initials)
P:E-26 Summary Informati on S: L/¶:						
Item 103 P:E-29 S: L/¶:	The alpha caissons are mentioned but are not part of the SW-2 project. Does that mean that the listed Pu and U inventories does not include the inventories in the alpha caissons?  This need to be clarified. These inventories are commonly cited as are other landfill inventories, and I think it is assumed that the numbers include the M-91 inventories	Clarify, answer and edit.				EE
Item 104 P:E-41 S: L/¶:	It says "no evidence of downward driving force". This site has DNAPLs which only require gravity for downward driving force.	Clarify and edit.				MS
Item 105 P:E-60 Landfill content S: L/¶:	This listed Pu and U content is incorrect. It should say 1.393 kg of Pu and 7.64 kg of U.	Revise as directed.				EE
Item 106 P:F-22 S: L/¶:40	Missing period.	Edit.				EE
Item 107 P:Global S: L/¶:	There is insufficient soil vapor data presented in the document to make adequate decisions on further investigation.	All the results of previous passive soil vapor sampling should be mapped together to show (1) areas where significant amounts of contaminants were detected, and (2) areas of the burial grounds which were and were not sampled.				Group
Item 108 P: S: L/¶:	See individual comment page for 218-W-2A (GO-1)					
Item 109	See individual comment page for 218-W-3 (GO-1)					

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P: S: L/¶:						
Item 110 P: S: L/¶:	See individual comment page for 218-W-3A (GO-1)					
Item 111 P: S: L/¶:	See individual comment page for 218-W-3AE (GO-1)					
Item 112 P: S: L/¶:	See individual comment page for 218-W-5 (GO-1)					
Item 113 P: S: L/¶:	See individual comment page for 218-W-1 (GO-2)					
Item 114 P: S: L/¶:	See individual comment page for 218-W-2 (GO-2)					
Item 115 P: S: L/¶:	See individual comment page for 218-W-4A (GO-2)					
Item 116 P: S: L/¶:	See individual comment page for 218-W-11 (GO-2)					
Item 117 P: S: L/¶:	See individual comment page for 218-W-4B (GO-3)					
Item 118 P: S:	See individual comment page for 218-W-4C (GO-3)					

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L/¶:						
Item 119 P: S: L/¶:	See individual comment page for 218-E-2 (GO-4)					
Item 120 P: S: L/¶:	See individual comment page for 218-E-2A (GO-4)					
Item 121 P: S: L/¶:	See individual comment page for 218-E-4 (GO-4)					
Item 122 P: S: L/¶:	See individual comment page for 218-E-5 (GO-4)					
Item 123 P: S: L/¶:	See individual comment page for 218-E-5A (GO-4)					
Item 124 P: S: L/¶:	See individual comment page for 218-E-9 (GO-4)					
Item 125 P: S: L/¶:	See individual comment page for 218-E-8 (GO-5)					
Item 126 P: S: L/¶:	See individual comment page for 218-E-12A (GO-5)					
Item 127 P: S: L/¶:	See individual comment page for 218-W-12B (GO-5)					
Item 128	See individual comment page for 218-W-1A (GO-X)					

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P: S: L/¶:						
Item 129 P: S: L/¶:	See individual comment page for 218-C-9 (GO-X)					
Item 130 P: S: L/¶:	See individual comment page for 218-E-1 (GO-X)					
Item 131 P: S: L/¶:	See individual comment page for 218-E-10 (GO-X)					

**218-W-2A (GO-1)****Industrial (includes area of former 216-T-4 Pond)****Existing information:**

- Baseline geophysics Yes p. 4-4
- Rad surface survey Yes, p. D-14, p. 3-6
- Passive SV Yes p. 4-4
- Well logs Yes p. B-39
- CSM p. E-24, E-40
- Inventory: 6.38 kg Pu; 2690 kg of U; 247000 Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- High dose rate site Yes p E-24
- GW contaminants Carbon tetrachloride, nitrate
- Other Pu glovebox in Trench 21
- Other PCE found in vapor sample. Origin??
- Other "presence of mobile constituents" p. E-40.

**DOE Proposed investigation:**

1. Active SV p. A-56
2. Advanced geophysics p. A-51
3. Direct push One push p. A-56
4. Directional drilling only under NE part of site (pond area) p. A-72
5. Excavation Two sites

**Discussion and Ecology proposed actions of investigation:**

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.

Proposed Active SV sampling as described with SUMMA canisters is acceptable. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

Ecology notes that evaluation of existing data (in Chapter 4 and elsewhere) did not recognize that DNAPL chemicals have been identified via the passive soil gas sampling. In addition to the SUMMA canister sampling, the RFI/RI phase of the work plan (Section 4) should include plans for installation of soil vapor monitoring wells to investigate the horizontal and vertical nature and extent of DNAPL chemicals in the 200-SW-2 OU landfills and in the vadose zone below.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** Ecology concurs that several of the described methods need to be used as suggested. The investigation objectives should be clearly defined. Ecology notes that most geophysical methods interrogate the near-surface and relatively shallow depths only.
- **Push sampling:** One push is not likely to give much information. That is decision making based on one data point. Ecology expects that more pushes will be performed to reach the investigation objectives. Additional pushes should focus on the location of the 216-T-4 pond area with the objective to investigate the conditions of the vadose zone under the pond area. Ecology expects that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.
- **Soil Vapor (Gas) sampling wells:** The landfill needs nested SV sampling wells, pushed or drilled down to the top of the saturated zone and completed at multiple horizons. Locations shall be based on the passive and active SV sampling. The SV wells should be sampled for a minimum of 8 consecutive quarters during the investigation. This should supply data about contaminant mobility from the landfill and in the vadose zone. No such data is currently available. This can help to settle the question whether or not the landfill has contributed to the groundwater contamination, or if it is likely to do so in the future. This is a most essential part of this investigation. Currently, carbon tetrachloride and nitrate concentrations are above drinking water standards below the site. The vapor monitoring wells will be left in place for future environmental monitoring. When the wells are installed, measurement of radioactivity and collection of soil samples shall be performed. (SV wells are also part of the monitoring system proposed for closure of the NRDWL/SWL landfills.)
- **Directional drilling:** Just one well is suggested through the NE corner of the landfill in the area that used to be the 216-T-4 Pond. This might not be enough. Further horizontal wells might have to be performed under the central part of the landfill. The results from the Advanced Geophysics, push sampling and vapor well sampling will decide the need for additional directional drilling.
- **Excavation:** Ecology concurs that excavations are needed. The number and extent of the excavations will be based on the results of other investigations. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.

**218-W-3 (GO-1) Dry waste alpha**

**Existing information:**

- Baseline geophysics Yes p. 4-4
- Rad surface survey Yes, p. D-16, p. 3-6
- Passive SV Yes p. 4-4
- Well logs Yes p. B-39
- CSM p. E-25, E-41
- Inventory: 68 kg Pu; 70000 kg of U; 900 Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- High dose rate site Yes p E-25
- GW contaminants Carbon tetrachloride, nitrate
- Other 1957-1961
- Other drums with depleted U
- Other "some mobile constituents" p. E-41
- Other chloroform, carbon tetrachloride, PCE in vapor

**DOE Proposed investigation:**

1. Active SV p. A-57
2. Direct push One push p. A-68
3. Directional drilling No p. A-72
4. Excavation No

**Discussion and Ecology proposed actions of investigation:**

Of special concern for this landfill is the large mass and potential mobility of Pu and U in this old unlined landfill.

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.

Proposed Active SV sampling as described with SUMMA canisters is acceptable. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Several of the described methods need to be used with the objective to better characterize the landfill.
- **Push sampling:** One push is not likely to give much information. That is decision making based on one data point. Ecology expects that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will also be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.
- **SV sampling wells:** The landfill needs nested SV sampling wells, pushed or drilled down to the top of the saturated zone and completed at multiple horizons. Locations shall be based on the passive and active SV sampling. The SV wells should be sampled for a minimum of 8 consecutive quarters during the investigation. This should supply data about contaminant mobility from the landfill and in the vadose zone. No such data is currently available. This can help to settle the question whether or not the landfill has contributed to the groundwater contamination, or if it is likely to do so in the future. This is a most essential part of this investigation. Currently, carbon tetrachloride and nitrate concentrations are above drinking water standards below the site. The vapor monitoring wells will be left in place for future environmental monitoring. When the wells are installed, measurement of radioactivity and collection of soil samples shall be performed. (SV wells are also part of the monitoring system proposed for closure of the NRDWL/SWL landfills.)
- **Directional drilling:** No horizontal well is suggested for this landfill. This might be sufficient. The results from the Advanced Geophysics, push sampling and SV sampling will decide the need for horizontal well under the landfill.
- **Excavation:** This is an old landfill with limited record quality. Ecology suggests that excavations may be needed in order to address the large mass of Pu and U. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.

**218-W-3A (GO-1)****Dry waste (TSD)****Existing information:**

- Baseline geophysics	No p. 4-4
- Rad surface survey	No
- Passive SV	Yes p. 4-4
- Well logs	Yes p. B-39
- CSM	p. E-26, E-42
- Inventory:	0.6 kg Pu; 634 kg of U; 1,330,000 Ci $\beta/\gamma$ at burial
- Green Islands	Yes (Trench 19 and 6S)
- RSW	Yes (Trench 17 is empty.)
- High dose rate site	Yes p E-26
- GW contaminants	Carbon tetrachloride, nitrate
- Other	Carbon tetrachloride, chloroform, PCE, TCE found in vapor samples.
- Other	"presence of some mobile constituents" p. E-42.
- Other	episodic water p. E-42

**DOE Proposed investigation:**

1. Baseline geophysics	
2. Active SV	16 samples p. A-58
3. Direct push	6 pushes p. A-9, A-58
4. Directional drilling	No, p. A-72
5. Excavation	No

**Discussion and Ecology proposed actions of investigation:**

Ecology concurs with the concept that a baseline geophysics investigation needs to be performed to understand the waste site.

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.

Proposed Active SV sampling as described with SUMMA canisters is acceptable. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** No advanced geophysics investigation is proposed. Ecology disagrees with this approach. Advanced geophysics using several methods needs to be used to fully understand the vadose zone under that landfill. This information will be used together with the other methods suggested below.
- **Push sampling:** Six pushes are likely to give much information, but maybe not enough to describe this complicated and large landfill. Ecology expects that more pushes will be performed to reach the investigation objectives. Additional pushes should focus on the location of the 216-T-4 pond area flooding with the objective to investigate the conditions of the vadose zone under the pond area. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.
- **SV sampling wells:** The landfill needs nested SV sampling wells, pushed or drilled down to the top of the saturated zone and completed at multiple horizons. Locations shall be based on the passive and active SV sampling. The SV wells should be sampled for a minimum of 8 consecutive quarters during the investigation. This should supply data about contaminant mobility from the landfill and in the vadose zone. No such data is currently available. This can help to settle the question whether or not the landfill has contributed to the groundwater contamination, or if it is likely to do so in the future. This is a most essential part of this investigation. Currently, carbon tetrachloride and nitrate concentrations are above drinking water standards below the site. The vapor monitoring wells will be left in place for future environmental monitoring. When the wells are installed, measurement of radioactivity and collection of soil samples shall be performed. (SV wells are also part of the monitoring system proposed for closure of the NRDWL/SWL landfills.)
- **Directional drilling:** Horizontal wells might have to be drilled under parts of the landfill. The results from the Advanced Geophysics, push sampling and SV sampling will decide the need for this.
- **Excavation:** No excavations are planned. Ecology does not concur with this approach. Ecology suggests that the Green Island waste in trenches 19 and 6S be retrieved and properly designated and disposed. Additional excavations may be needed. The number and extent of the excavations will be based on the results of other investigations. This will verify the quality of the disposal records for this site. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.

**218-W-3AE (GO-1)****Industrial (TSD) (includes area of former 216-T-4 Pond)****Existing information:**

- Baseline geophysics	No p. 4-4
- Rad surface survey	No
- Passive SV	Yes p. 4-4
- Well logs	Yes p. B-39
- CSM	p. E-27, E-43
- Inventory:	0.12 kg Pu; 439 kg of U; 223,000 Ci $\beta/\gamma$ at burial
- Green Islands	Yes (trenches 5 and 8)
- RSW	No
- High dose rate site	Yes p E-27
- GW contaminants	Carbon tetrachloride, nitrate
- Other	PCE and 1,1,1-trichloroethane in soil vapor
- Other	"presence of some mobile constituents" p. E-43

**DOE Proposed investigation:**

1. Baseline geophysics	
2. Active SV	3 samples; p. A-59, A-3
3. Advanced geophysics	p. A-51, A-3
4. Direct push	One push p. A-59
5. Directional drilling	only under S part of site (pond area) p. A-72
6. Excavation	None

**Discussion and Ecology proposed actions of investigation:**

Ecology concurs with the concept that a baseline geophysics investigation needs to be performed to understand the waste site.

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.

Proposed Active SV sampling as described with SUMMA canisters is acceptable. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** Ecology concurs that several of the described methods need to be used as suggested. The investigation objectives should be clearly defined. Ecology notes that most geophysical methods interrogate the near-surface and relatively shallow depths only.
- **Push sampling:** One push is not likely to give much information. That is decision making based on one data point. Ecology expects that more pushes will be performed to reach the investigation objectives. Additional pushes should focus on the location of the 216-T-4 pond area with the objective to investigate the conditions of the vadose zone under the pond area. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.
- **SV sampling wells:** The landfill needs nested SV sampling wells, pushed or drilled down to the top of the saturated zone and completed at multiple horizons. Locations shall be based on the passive and active SV sampling. The SV wells should be sampled for a minimum of 8 consecutive quarters during the investigation. This should supply data about contaminant mobility from the landfill and in the vadose zone. No such data is currently available. This can help to settle the question whether or not the landfill has contributed to the groundwater contamination, or if it is likely to do so in the future. This is a most essential part of this investigation. Currently, carbon tetrachloride and nitrate concentrations are above drinking water standards below the site. The vapor monitoring wells will be left in place for future environmental monitoring. When the wells are installed, measurement of radioactivity and collection of soil samples shall be performed. (SV wells are also part of the monitoring system proposed for closure of the NRDWL/SWL landfills.)
- **Directional drilling:** Just one well is suggested through southern part corner of the landfill in the area that used to be the 216-T-4 Pond. This might not be enough. Further horizontal wells might have to be performed under the central part of the landfill. The results from the Advanced Geophysics and SV sampling will decide the need for this.
- **Excavation:** No excavations are planned. Ecology does not concur with this approach. Ecology suggests that the Green Island waste in trenches 5 and 8 be retrieved and properly designated and disposed. Additional excavations may be needed. The number and extent of the excavations will be based on the results of other investigations. This will verify the quality of the disposal records for this site. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.

**218-W-5 (GO-1) Dry waste (not including the Mixed Waste Trenches 31 & 34).**

**Existing information:**

- Baseline geophysics No p. 4-4
- Rad surface survey No
- Passive SV Yes p. 4-4
- Well logs No p. B-39
- CSM p. E-31
- Inventory: 0.17 kg Pu; 6915 kg of U; 31000 Ci  $\beta/\gamma$  at burial
- Green Islands yes
- RSW No
- High dose rate site Yes p E-24
- GW contaminants Carbon tetrachloride
- Other PCE, 1, 1,-dichloroethene, 1,1,1-trichloroethane found in vapor sample.
- Other "presence of some mobile constituents" p. E-47.

**DOE Proposed investigation:**

1. Baseline geophysics
2. Active SV p. A-62
3. Direct push One push p. A-62

**Discussion and Ecology proposed actions of investigation:**

Ecology concurs with the concept that a baseline geophysics investigation needs to be performed to understand the waste site.

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.

Proposed Active SV sampling as described with SUMMA canisters is acceptable. However, only taking one sample might not be enough. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** No advanced geophysics investigation is proposed. Ecology disagrees with this approach. Advanced geophysics using several methods needs to be used to fully understand the vadose zone under that landfill. This information will be used together with the other methods suggested below.
- **Push sampling:** One push is not likely to give much information. That is decision making based on one data point. Ecology expects that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will also be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.
- **SV sampling wells:** The landfill needs nested SV sampling wells, pushed or drilled down to the top of the saturated zone and completed at multiple horizons. Locations shall be based on the passive and active SV sampling. The SV wells should be sampled for a minimum of 8 consecutive quarters during the investigation. This should supply data about contaminant mobility from the landfill and in the vadose zone. No such data is currently available. This can help to settle the question whether or not the landfill has contributed to the groundwater contamination, or if it is likely to do so in the future. This is a most essential part of this investigation. Currently, carbon tetrachloride and nitrate concentrations are above drinking water standards below the site. The vapor monitoring wells will be left in place for future environmental monitoring. When the wells are installed, measurement of radioactivity and collection of soil samples shall be performed. (SV wells are also part of the monitoring system proposed for closure of the NRDWL/SWL landfills.)
- **Directional drilling:** Horizontal wells might have to be performed under parts of the landfill. The results from the Advanced Geophysics, push sampling and SV sampling will decide the need for this.
- **Excavation:** No excavations are planned. Ecology does not concur with this approach. Ecology suggests that the Green Island waste in trench 22 be retrieved and properly designated and disposed. Additional excavations may be needed. The number and extent of the excavations will be based on the results of other investigations. This will verify the quality of the disposal records for this site. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.

## 218-W-1 (GO-2) Dry waste alpha

### Existing information:

- Baseline geophysics Yes p. 4-4
- Rad surface survey Yes, p. D-17
- Passive SV Yes p. 4-4
- Well logs No p. B-39
- CSM p. E-21, E-37
- Inventory: 94 kg Pu: 700 kg of U: 200 Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- GW contaminants Carbon tetrachloride
- Other 1944-52
- Other low quality records
- Other geophysical anomalies observed in "non"-trench areas

### DOE Proposed investigation:

1. Direct push One push p. A-66

### Discussion and Ecology proposed actions of investigation:

Of special concern for this landfill is the large mass and potential mobility of Pu and U in this old unlined landfill.

The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

Very little is known about the waste at this landfill and the record are of low quality. To make a minimal effort at any characterization is unacceptable, but that is what the proposed plan does. This site has neither good information about the landfill nor information about the vadose zone.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Geophysical anomalies were noted in areas other than known trenches. Ecology requests that advanced geophysics methods be used to investigate anomalies discovered during previous investigations. Several of the described methods need to be used.
- **Push sampling:** One push is not likely to give much information. That is decision making based on one data point. Ecology expects that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.
- **SV sampling wells:** SV wells might need to be considered in the future when more passive soil vapor information is available. These wells should be nested SV sampling wells, pushed or drilled down to the top of the saturated zone and completed at multiple horizons. Locations shall be based on the passive and active SV sampling. The SV wells should be sampled for a minimum of 8 consecutive quarters during the investigation. No such data is currently available. This can help to settle the question whether or not the landfill has contributed to the groundwater contamination, or if it is likely to do so in the future. This is a most essential part of this investigation. Currently, carbon tetrachloride concentration is above drinking water standards below the site. The vapor monitoring wells will be left in place for future environmental monitoring. When the SV wells are installed, measurement of radioactivity and collection of soil samples shall be performed. (SV wells are also part of the monitoring system proposed for closure of the NRDWL/SWL landfills.)
- **Directional drilling:** No horizontal well is suggested for this landfill. This might be sufficient. The results from the Advanced Geophysics and SV sampling will decide the need for horizontal well under the landfill.
- **Excavation:** No excavations are planned. Ecology does not concur with this approach. Ecology suggests that excavations may be needed in order to address the large mass of Pu and U. The number and extent of the excavations will be based on the results of other investigations. This will verify the quality of the disposal records for this site. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding Pu mobility from the trench.

## 218-W-2 (GO-2) Dry waste alpha

### Existing information:

- Baseline geophysics Yes p. 4-4
- Rad surface survey Yes, p. D-17, p. 3-6
- Passive SV Yes p. 4-4
- Well logs Yes p. B-39
- CSM p. E-23, E-39
- Inventory: 126 kg Pu: 1400 kg of U: 500 Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- GW contaminants Carbon tetrachloride
- Other 1953-56
- Other low quality records

### DOE Proposed investigation:

1. Direct push One push p. A-66

### Discussion and Ecology proposed actions of investigation:

Of special concern for this landfill is the large mass and potential mobility of Pu and U in this old unlined landfill.

The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

Very little is known about the waste at this landfill and the record are of low quality. To make a minimal effort at any characterization is unacceptable, but that is what the proposed plan does. This site has neither good information about the landfill nor information about the vadose zone.

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.

Ecology also proposes performing some Active SV monitoring as described with SUMMA canisters. Ecology assumes that the locations are based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has

already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs..

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Several of the described methods need to be used with the objective to better characterize the landfill.
- **Push sampling:** One push is not likely to give much information. That is decision making based on one data point particularly when no advanced geophysics data is available to guide where it would be most beneficial to obtain information from the push samples. Ecology expects that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals including DNAPLs may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **SV sampling wells:** SV wells might need to be considered in the future when more passive and active soil vapor information is available. These wells should be nested SV sampling wells, pushed or drilled down to the top of the saturated zone and completed at multiple horizons. Locations shall be based on the passive and active SV sampling. The SV wells should be sampled for a minimum of 8 consecutive quarters during the investigation. This should supply data about contaminant mobility from the landfill and in the vadose zone. No such data is currently available. This can help to settle the question whether or not the landfill has contributed to the groundwater contamination, or if it is likely to do so in the future. This is a most essential part of this investigation. Currently, carbon tetrachloride concentration is above drinking water standards below the site. The vapor monitoring wells will be left in place for future environmental monitoring. When the SV wells are installed, measurement of radioactivity and collection of soil samples shall be performed. (SV wells are also part of the monitoring system proposed for closure of the NRDWL/SWL landfills.)
- **Directional drilling:** No horizontal well is suggested for this landfill. This might be sufficient. The results from the Advanced Geophysics and SV sampling will decide the need for horizontal well under the landfill.
- **Excavation:** No excavations are planned. Ecology does not concur with this approach. Ecology suggests that excavations may be needed in order to address the large mass of Pu and U. The number and extent of the excavations will be based on the results of other investigations. This will verify the quality of the disposal records for this site. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding Pu mobility from the trench.

## 218-W-4A (GO-2)

## Dry waste alpha and caissons

### Existing information:

- Baseline geophysics	Yes p. 4-4
- Rad surface survey	Yes, p. D-18, p. 3-6
- Passive SV	No p. 4-4
- Well logs	Yes p. B-39
- CSM	p. E-28, E-44
- Inventory:	35.4 kg Pu: 394,000 kg of U: 3820 Ci $\beta/\gamma$ at burial
- Green Islands	No
- RSW	No
- GW contaminants	Carbon tetrachloride
- Other	"pipe unit" caissons in trench 16 and potentially in trench 17,18, 19
- Other	1961-68

### DOE Proposed investigation:

1. Passive soil vapor	p. A-9
2. Active soil vapor	"Maybe"
3. Direct push	1 push p. A-9
4. Excavation	1 excavation p. A-72

### Discussion and Ecology proposed actions of investigation:

Of special concern for this landfill is the large mass and potential mobility of Pu and U in this old unlined landfill.

Ecology concurs with the concept that a passive soil vapor investigation needs to be performed to understand the waste site. Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants.

Ecology also proposes performing some Active SV monitoring as described with SUMMA canisters. Ecology assumes that the locations are based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has

already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Several of the described methods need to be used with the objective to better characterize the landfill.
- **Push sampling:** One push is not likely to give much information. That is decision making based on one data point. Ecology expects that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Passive soil-vapor sampling of the entire burial grounds is requested and should ensure complete coverage of the landfill.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals including DNAPLs may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **SV sampling wells:** SV wells might need to be considered in the future when more passive soil vapor information is available. These wells should be nested SV sampling wells, pushed or drilled down to the top of the saturated zone and completed at multiple horizons. Locations shall be based on the passive and active SV sampling. The SV wells should be sampled for a minimum of 8 consecutive quarters during the investigation. This should supply data about contaminant mobility from the landfill and in the vadose zone. No such data is currently available. This can help to settle the question whether or not the landfill has contributed to the groundwater contamination, or if it is likely to do so in the future. This is a most essential part of this investigation. Currently, the carbon tetrachloride concentration is above drinking water standards below the site. The vapor monitoring wells will be left in place for future environmental monitoring. When the soil vapor wells are installed, measurement of radioactivity and collection of soil samples shall be performed. (SV wells are also part of the monitoring system proposed for closure of the NRDWL/SWL landfills.)
- **Directional drilling:** Horizontal wells might have to be performed under parts of the landfill. The results from the Advanced Geophysics and SV sampling will decide the need for this.
- **Excavation:** One excavation is planned. Ecology concurs with this approach, but it might not be enough. There is great uncertainty about the presence of caissons and waste material in the "pipe unit" caissons located at this landfill. Ecology suggests that the excavation efforts be focused on the caisson waste. The caisson waste might have to be retrieved as part of this effort and properly designated and disposed. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding Pu mobility from the trench.

**218-W-11 (GO-2)****Dry waste****Existing information:**

- Baseline geophysics Yes p. 4-4
- Rad surface survey Yes, p. D-17, p. 3-6
- Passive SV Yes p. 4-4
- Well logs Yes p. B-39
- CSM p. E-32, E-48
- Inventory ? kg Pu: ? kg of U: ? Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- High dose rate site Yes p E-32
- GW contaminants Carbon tetrachloride
- Other uncertainty on trench existence
- Other 1960
- Other low quality records

**DOE Proposed investigation:**

1. Direct push One push p. A-69, A-9

**Discussion and Ecology proposed actions of investigation:**

The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

Very little is known about the waste at this landfill and the record are of low quality. To make a minimal effort at any characterization is unacceptable, but that is what the proposed plan does. This site has neither good information about the landfill nor information about the vadose zone. Of special concern for this landfill is potential mobility of radioactive metals such as U and Pu.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- o **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Ecology requests that advanced geophysics methods be used to investigate anomalies discovered during previous investigations. Several of the described methods need to be used.
- o **Push sampling:** One push is not likely to give much information. That is decision making based on one data point particularly when no advanced geophysics data is available to guide where it would be most beneficial to obtain information from the push samples. Ecology expects that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be

logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.

- **Excavation:** The needs for excavation will be evaluated based on the results from the direct push sampling. This is an old landfill with limited record quality.

**218-W-4B (GO-3)****Dry waste and caissons (TSD)****Existing information:**

- Baseline geophysics No p. 4-4
- Rad surface survey No
- Passive SV Yes p. 4-4
- Well logs Yes p. B-39
- CSM p. E-29, E-45
- Inventory 9 kg Pu; 21.6 kg of U; 406,000 Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW Yes (Trench 7 and 11. Part of Trench 7 (TV7) is empty.)
- High dose rate site Yes p E-29
- GW contaminants Carbon tetrachloride, nitrate
- Other 1967-1990
- Other 11 Caissons. 7 belong to SW-2 and 4 belong to M-91.
- Other Carbon tetrachloride, chloroform found in vapor samples.
- Other "presence of some mobile constituents" p. E-45.
- Other episodic water p. E-29, E-45

**DOE Proposed investigation:**

1. Baseline geophysics
2. Advanced geophysics
3. Active SV 1 sample p. A-9, A-60
4. Direct push 3 pushes p. A-9, A-60
5. Directional drilling p. A-72

**Discussion and Ecology proposed actions of investigation:**

Ecology is very concerned about the type of waste disposed in these trenches including Be, Pb, Zr, and oil. Trench 8 had high levels of CCl<sub>4</sub> in excess of 70,000 ng/ sample. This is a site with a history of episodic water events that can release constituents from the landfill.

This site is close to several 216-Z trenches, the major source of carbon tetrachloride. It is very important to distinguish between landfill and trench sources.

Ecology concurs with the concept that a baseline geophysics investigation needs to be performed to understand the waste site.

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.

Proposed Active SV sampling as described with SUMMA canisters is acceptable. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation.

Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

Ecology notes that evaluation of existing data (in Chapter 4 and elsewhere) did not recognize that DNAPL chemicals have been identified via the passive soil gas sampling. In addition to the SUMMA canister sampling, the RFI/RI phase of the work plan (Section 4) should include plans for installation of soil vapor monitoring wells to investigate the horizontal and vertical nature and extent of DNAPL chemicals in the 200-SW-2 OU landfills and in the vadose zone below.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** Ecology concurs that several of the described methods need to be used as suggested. The investigation objectives should be clearly defined. Ecology notes that most geophysical methods interrogate the near-surface and relatively shallow depths only.
- **Push sampling:** Three pushes are likely to give much information, but maybe not enough to describe this complicated landfill. Ecology expects that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.
- **SV sampling wells:** The landfill needs nested SV sampling wells, pushed or drilled down to the top of the saturated zone and completed at multiple horizons. Locations shall be based on the passive and active SV sampling. The SV wells should be sampled for a minimum of 8 consecutive quarters during the investigation. This should supply data about contaminant mobility from the landfill and in the vadose zone. No such data is currently available. This can help to settle the question whether or not the landfill has contributed to the groundwater contamination, or if it is likely to do so in the future. This is a most essential part of this investigation. Currently, carbon tetrachloride and nitrate concentrations are above drinking water standards below the site. The vapor monitoring wells will be left in place for future environmental monitoring. When the wells are installed, measurement of radioactivity and collection of soil samples shall be performed. (SV wells are also part of the monitoring system proposed for closure of the NRDWL/SWL landfills.)
- **Directional drilling:** A horizontal well is planned. Ecology agrees with this approach, but more wells might have to be performed under other parts of the landfill. The results from the advanced geophysics, push sampling and SV sampling will decide the need for this.

- **Excavation:** No excavations are planned. Ecology does not concur with this approach. Ecology suggests some excavation for records verification. Additional excavations may be needed. The number and extent of the excavations will be based on the results of other investigations. This will verify the quality of the disposal records for this site. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.
- **Caisson investigation:** page A-51 describes the potential use of INL's multi-detector probe to investigate the caissons. Ecology concurs that this is a good approach. However, the multi-detector probe requires additional development and demonstration which Ecology strongly encourages.

**218-W-4C (GO-3)****Dry waste (TSD)****Existing information:**

- Baseline geophysics	No p. 4-4
- Rad surface survey	No
- Passive SV	Yes p. 4-4
- Well logs	Yes p. B-39
- CSM	p. E-30, E-46
- Inventory	0.026 kg Pu; 215 kg of U; 1,100,000 Ci $\beta/\gamma$ at burial
- Green Islands	Yes (Trench NC, 14, 58)
- RSW	Yes (Waste only remains in Trench 24. All other trenches are empty.)
- High dose rate site	Yes p E-30
- GW contaminants	Carbon tetrachloride, nitrate
- Other	1,1,1-trichloroethane found in vapor samples.
- Other	"presence of some mobile constituents" p. E-46.
- Other	episodic water p. E-46

**DOE Proposed investigation:**

1. Baseline geophysics
2. Advanced geophysics
3. Active SV 1 sample p. A-9, A-61
4. Direct push 5 pushes p. A-9, A-61
5. Directional drilling p. A-72

**Discussion and Ecology proposed actions of investigation:**

Ecology is very concerned about the type of waste disposed in these trenches including organic and inorganic chemicals and potential for containerized liquids. Soil vapor extraction was necessary in Trench 4 prior to TRU retrieval. This is a site with a history of flooding events that can release constituents from the landfill.

This site is close to several 216-Z trenches, the major source of carbon tetrachloride. It is very important to distinguish between landfill and trench sources.

Ecology suggests that DOE consider the earlier sampling recommendations from HNF-44899 should be reviewed and considered.

Ecology concurs with the concept that a baseline geophysics investigation needs to be performed to understand the waste site.

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.

Proposed Active SV sampling as described with SUMMA canisters is acceptable. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

Ecology notes that evaluation of existing data (in Chapter 4 and elsewhere) did not recognize that DNAPL chemicals have been identified via the passive soil gas sampling. In addition to the SUMMA canister sampling, the RFI/RI phase of the work plan (Section 4) should include plans for installation of soil vapor monitoring wells to investigate the horizontal and vertical nature and extent of DNAPL chemicals in the 200-SW-2 OU landfills and in the vadose zone below.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods addressed in the Work Plan:

- **Advanced Geophysics:** Ecology concurs that several of the described methods need to be used as suggested. The investigation objectives should be clearly defined. Ecology notes that most geophysical methods interrogate the near-surface and relatively shallow depths only.
- **Push sampling:** Five Pushes are likely to give much information, but maybe not enough to describe this landfill. Ecology assumes that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.
- **SV sampling wells:** The landfill needs nested SV sampling wells, pushed or drilled down to the top of the saturated zone and completed at multiple horizons. Locations shall be based on the passive and active SV sampling. The SV wells should be sampled for a minimum of 8 consecutive quarters during the investigation. This should supply data about contaminant mobility from the landfill and in the vadose zone. No such data is currently available. This can help to settle the question whether or not the landfill has contributed to the groundwater contamination, or if it is likely to do so in the future. This is a most essential part of this investigation. Currently, carbon tetrachloride and nitrate concentrations are above drinking water standards below the site. The vapor monitoring wells will be left in place for future environmental monitoring. When the wells are installed, measurement of radioactivity and collection of soil samples shall be performed. (SV wells are also part of the monitoring system proposed for closure of the NRDWL/SWL landfills.)

- **Directional drilling:** A horizontal well is planned. Ecology agrees with this approach, but more wells might have to be performed under other parts of the landfill. The results from the Advanced Geophysics, push sampling and SV sampling will decide the need for this.
- **Excavation:** No excavations are planned. Ecology does not concur with this approach. Ecology suggests that the Green Island waste in trenches NC, 14, and 58 be retrieved and properly designated and disposed. Additional excavations may be needed. The number and extent of the excavations will be based on the results of other investigations. This will verify the quality of the disposal records for this site. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.

**218-E-2 (GO-4) Industrial**

**Existing information:**

- Baseline geophysics Yes p. 4-3
- Rad surface survey Yes, p. D-9
- Passive SV No p. 4-3
- Well logs No p. B-39
- CSM p. E-11, E-51
- Inventory 0.8 kg Pu; 300 kg of U; 25,000 Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- High dose rate site Yes p E-11
- GW contaminants ?
- Other 1945-53
- Other low record quality

**DOE Proposed investigation:**

1. Passive gas samples 4 samples p. A-9
2. Active SV "maybe" p. A-9, A-53
3. Direct push 1 push p. A-9, A-53
4. Directional drilling 2 wells under GO-4 p. A-72

**Discussion and Ecology proposed actions of investigation:**

Ecology concurs with the concept that a passive soil vapor investigation needs to be performed to understand the waste site. Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants.

This should be followed by Active SV monitoring as described using SUMMA canisters. Ecology assumes that the locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill. .

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs..

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** No advanced geophysics investigation is proposed. Ecology disagrees with this approach. Advanced geophysics using several methods needs to be used to fully understand the vadose zone under that landfill. This information will be used together with the other methods suggested below.
- **Push sampling:** Ecology concurs, however, additional investigation might be required pending the results. Ecology expects that the push will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Passive soil-vapor sampling of the burial grounds is requested and should provide full coverage of the landfill.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **Directional drilling:** Two horizontal wells are suggested for the entire GO-4 area. Ecology concurs.
- **Excavation:** Ecology concurs that excavations are probably unnecessary. The decision will have to be based on the vapor and drilling results.

## 218-E-2A (GO-4) Industrial

### Existing information:

- Baseline geophysics Yes p. 4-3
- Rad surface survey Yes, p. D-9, p. 3-6
- Passive SV No p. 4-3
- Well logs No p. B-39
- CSM p. E-12, E-52
- Inventory ? kg Pu; ? kg of U; ? Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- High dose rate site Yes p E-24
- GW contaminants ?
- Other 1945-50
- Other No records.
- Other Believed to be construction debris.

### DOE Proposed investigation:

1. Direct push 1 push p. A-9, A-53
2. Directional drilling 2 wells under GO-4 p. A-72
3. Excavation 1 excavation

### Discussion and Ecology proposed actions of investigation:

Ecology is concerned with the total lack of information about the waste in this landfill.

Ecology suggests that a first step is to do passive gas samples as none has been performed for this site. Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants.

Based on results from passive soil vapor sampling, Active SV monitoring as described using SUMMA canisters may be required. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Several of the described methods need to be used with the objective to better characterize the landfill.
- **Push sampling:** Ecology concurs, however, additional investigation might be required pending the results. Ecology expects that the push will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Passive soil-vapor sampling of the burial grounds is requested and should provide full coverage of the landfill.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **Directional drilling:** Two wells are suggested for the entire GO-4 area. Ecology concurs.
- **Excavation:** Ecology concurs that an excavation is necessary. This site has no records but it is believed to contain construction debris. A confirmation of this is necessary. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.

## 218-E-4 (GO-4) Construction

### Existing information:

- Baseline geophysics Yes p. 4-3
- Rad surface survey Yes, p. D-10
- Passive SV No p. 4-3
- Well logs No p. B-39
- CSM p. E-13, E- 53
- Inventory 0.01 kg Pu; 1 kg of U; 10 Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- GW contaminants ?
- Other 1955-56
- Other low records quality

### DOE Proposed investigation:

1. Passive soil vapor 5 samples, p. A-9, A-53
2. Active SV "maybe" p. A-9
3. Direct push 1 push p. A-9, A-53
4. Directional drilling 2 wells under GO-4 p. A-72

### Discussion and Ecology proposed actions of investigation:

Ecology is concerned with the lack of records regarding the waste in this landfill.

Ecology concurs that a first step is to do passive gas samples as none has been performed for this site. Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants.

Based on results from passive soil vapor sampling, Active SV monitoring as described using SUMMA canisters may be required. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Several of the described methods need to be used with the objective to better characterize the landfill
- **Push sampling:** Ecology concurs, however, additional investigation might be required pending the results. Ecology expects that the push will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Passive soil-vapor sampling of the burial grounds is requested and should provide full coverage of the landfill.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **Directional drilling:** Two wells are suggested for the entire GO-4 area. Ecology concurs.
- **Excavation:** Ecology concurs that excavations are probably unnecessary. The decision will have to be based on the vapor and drilling results.

## 218-E-5 (GO-4) Industrial

### Existing information:

- Baseline geophysics	Yes p. 4-3
- Rad surface survey	Yes, p. D-9
- Passive SV	Yes p. 4-3
- Well logs	No p. B-39
- CSM	p. E-14, E-54
- Inventory	0.62 kg Pu; 120 kg of U; 3,500 Ci $\beta/\gamma$ at burial
- Green Islands	No
- RSW	No
- High dose rate site	Yes p E-14
- GW contaminants	?
- Other	1954-65 (p E-14) or 1954-56 (p. E-54)
- Other	low record quality

### DOE Proposed investigation:

1. Direct push One push p. A-9, A-53
2. Directional drilling 2 wells under GO-4 p. A-72

### Discussion and Ecology proposed actions of investigation:

Ecology is concerned with the lack of records regarding the waste in this landfill.

Based on results from passive soil vapor sampling, Active SV monitoring as described using SUMMA canisters is recommended. Ecology assumes that the locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- o **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Several of the described methods need to be used with the objective to better characterize the landfill.
- o **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

- **Push sampling:** Ecology concurs, however, additional investigation might be required pending the results. Ecology expects that the push will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Directional drilling:** Two wells are suggested for the entire GO-4 area. Ecology concurs.
- **Excavation:** Ecology concurs that excavations are probably unnecessary. The decision will have to be based on the vapor and drilling results.

## 218-E-5A (GO-4) Industrial

### Existing information:

- Baseline geophysics	Yes p. 4-3
- Rad surface survey	Yes, p. D-9
- Passive SV	Yes p. 4-3
- Well logs	No p. B-39
- CSM	p. E-15, E-55
- Inventory	1.38 kg Pu; 120 kg of U; 16,500 Ci $\beta/\gamma$ at burial
- Green Islands	No
- RSW	No
- High dose rate site	Yes p E-15
- GW contaminants	?
- Other	1956-61
- Other	Low record quality

### DOE Proposed investigation:

1. Direct push One push p. A-9, A-53
2. Directional drilling 2 wells under GO-4 p. A-72

### Discussion and Ecology proposed actions of investigation:

Ecology is concerned with the lack of records regarding the waste in this landfill.

Based on results from passive soil vapor sampling, Active SV monitoring as described using SUMMA canisters is recommended. Ecology assumes that the locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs. So this should include information about moisture (leachate) as well as chemical and radiological constituents in the vadose zone.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- o **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Several of the described methods need to be used with the objective to better characterize the landfill.
- o **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level

approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

- **Push sampling:** Ecology concurs, however, additional investigation might be required pending the results. Ecology expects that the push will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Directional drilling:** Two wells are suggested for the entire GO-4 area. Ecology concurs.
- **Excavation:** Ecology concurs that excavations are probably unnecessary. The decision will have to be based on the vapor and drilling results.

**218-E-9 (GO-4) Industrial**

**Existing information:**

- Baseline geophysics No p. 4-3
- Rad surface survey Yes, p. D-9
- Passive SV Yes p. 4-3
- Well logs Yes p. B-39
- CSM p. E-17, E-57
- Inventory ? kg Pu; ? kg of U; ? Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- High dose rate site Yes p E-17
- GW contaminants ?
- Other 1943-58
- Other No records
- Other Used for above ground storage and might not have any waste.

**DOE Proposed investigation:**

1. Passive soil vapor 7 samples, p. A-9, A-53
2. Active SV "maybe" p. A-9
3. Direct push 1 push p. A-9, A-53
4. Directional drilling 2 wells under GO-4 p. A-72

**Discussion and Ecology proposed actions of investigation:**

Ecology is concerned with the lack of records regarding the waste in this landfill.

Ecology concurs with the concept that a passive soil vapor investigation needs to be performed to understand the waste site. Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants.

Based on results from passive soil vapor sampling, Active SV monitoring as described using SUMMA canisters is recommended. Ecology assumes that the locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor is recommended for use to develop and illustrate the CSMs

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Several of the described methods need to be used with the objective to better characterize the landfill.
- **Passive Soil Vapor monitoring:** Passive soil-vapor sampling of the burial grounds is requested and should provide full coverage of the landfill.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals including DNAPLs may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **Push sampling:** Ecology concurs, however, additional investigation might be required pending the results. Ecology expects that the push will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Directional drilling:** Two wells are suggested for the entire GO-4 area. Ecology concurs.
- **Excavation:** Ecology concurs that excavations are probably unnecessary. The decision will have to be based on the vapor and drilling results.

## 218-E-8 (GO-5) Construction

### Existing information:

- Baseline geophysics	Yes p. 4-3
- Rad surface survey	Yes, p. D-11, p.3-6
- Passive SV	Yes p. 4-3
- Well logs	Yes p. B-39
- CSM	p. E-16, E-56
- Inventory	0.02 kg Pu; 2 kg of U; 10 Ci $\beta/\gamma$ at burial
- Green Islands	No
- RSW	No
- High dose rate site	No p E-16
- GW contaminants	?
- Other	1958-59
- Other	low record quality

### DOE Proposed investigation:

1. Direct push 1 push p. A-9, A-63
2. Excavation 1 excavation A-72

### Discussion and Ecology proposed actions of investigation:

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled. This investigation should include geophysical anomalies adjacent to the identified landfill site.

Once mapped data of the passive soil vapor sampling is available the investigation may be complemented by active SV monitoring as described using SUMMA canisters. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Push sampling:** Ecology concurs, however, additional investigation might be required pending the results. Ecology expects that all pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals including DNAPLs may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **Excavation:** Ecology concurs that one excavation is probably sufficient. The decision will have to be based on the vapor and push sampling results. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.

## 218-E-12A (GO-5)

## Dry Waste

### Existing information:

- Baseline geophysics Yes p. 4-3
- Rad surface survey Yes, p. D-12, p. 3-6
- Passive SV Yes p. 4-3
- Well logs Yes p. B-39
- CSM p. E-19, E-59
- Inventory 8.9 kg Pu; 995 kg of U; 890 Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- High dose rate site No, but medium rate p E-19
- GW contaminants ?
- Other 1953-67
- Other depleted uranium waste
- Other low quality records

### DOE Proposed investigation:

1. Direct push 1 push p. A-9, A-65, A-72

### Discussion and Ecology proposed actions of investigation:

Ecology is concerned with the large size of this site and the limited amount and quality of the available records.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Several of the described methods need to be used with the objective to better characterize the landfill.
- **Push sampling:** One push is not likely to give much information. Ecology expects that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Excavation:** No excavations are planned. Ecology does not concur with this approach. Ecology suggests that excavations may be needed due to the large size of the site and the limited number of records. The number and extent of the excavations will be based on the results of other investigations. This will verify the quality of the disposal records for this site. In addition a direct examination of the vadose zone directly below the trench floor should be conducted.

**218-E-12B (GO-5)****Dry waste (TSD)****Existing information:**

- Baseline geophysics	No p. 4-3
- Rad surface survey	No
- Passive SV	No p. 4-3
- Well logs	Yes p. B-39
- CSM	p. E-20, E- 60
- Inventory	1.39 kg Pu; 7.64 kg of U; 183,000 Ci $\beta/\gamma$ at burial
- Green Islands	No
- RSW	Yes
- High dose rate site	Yes p. E-20
- GW contaminants	?
- Other	1967-present
- Other	Episodic water

**DOE Proposed investigation:**

1. Passive soil vapor	TBD samples, p. A-9, A-63
2. Advanced geophysics	p. A-9
3. Active SV	"maybe" p. A-9
4. Direct push	4 push p. A-9, A-63
5. Directional drilling	1 well p. A-9, A-72

**Discussion and Ecology proposed actions of investigation:**

Ecology concurs with the concept that a baseline geophysics investigation needs to be performed to understand the waste site.

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Passive soil-vapor sampling of the burial grounds is requested to provide good coverage of the whole area.

Based on results from passive soil vapor sampling, active SV monitoring as described using SUMMA canisters is recommended. Ecology assumes that the locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better

developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** The proposed plan does not suggest advanced geophysics for this landfill. Ecology disagrees with this approach. Several of the described methods need to be used with the objective to better characterize the landfill.
- **Push sampling:** Ecology concurs that 4 pushes are likely to give enough preliminary information. Ecology expects that more pushes may need to be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Passive soil-vapor sampling of the burial grounds is requested to ensure complete coverage of the burial ground.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals including DNAPLs may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **Directional drilling:** Just one well is suggested. Ecology concurs that this may be sufficient. However, pending investigation results, further horizontal wells might have to be performed under the central part of the landfill. The results from the Advanced Geophysics and SV sampling will decide the need for additional wells.
- **Excavation:** Ecology concurs that excavations are probably unnecessary. The decision will have to be based on the vapor and drilling results.

## 218-W-1A (GO-X) Industrial

### Existing information:

- Baseline geophysics	Yes p. 4-4
- Rad surface survey	Yes, p.D-13, p.3-6
- Passive SV	Yes p. 4-4
- Well logs	Yes p. B-39
- CSM	p. E-22, E-38
- Inventory	2 kg Pu; 900 kg of U; 48,000 Ci $\beta$ / y at burial
- Green Islands	No
- RSW	No
- High dose rate site	Yes p E-22
- GW contaminants	Carbon tetrachloride, nitrate, chromium, tritium
- Other	1944-1960

### DOE Proposed investigation:

1. Direct push 1 push p. A-9, A-67

### Discussion and Ecology proposed actions of investigation:

Ecology suggests that a more thorough investigation be performed.

Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. The burial ground locations sampled to date have been somewhat limited, and based on incomplete burial ground records or the results of other investigations. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Additional passive soil-vapor sampling of the burial grounds is requested to provide coverage of areas not previously sampled.

Once mapped data of the passive soil vapor sampling is available and based on all results from passive soil vapor sampling, active SV monitoring as described using SUMMA canisters is recommended. Ecology assumes that the locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** Ecology suggests that several advanced geophysics methods be used to fully understand the vadose zone under that landfill. This information will be used together with the other methods suggested below.
- **Push sampling:** One push is unlikely to give much information, but maybe not enough to describe this landfill. Ecology expects that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Additional passive soil-vapor sampling of the burial grounds is requested to ensure complete coverage of the landfill.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals including DNAPLs may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **Directional drilling:** No horizontal well is planned. Ecology agrees with this approach, but wells might have to be performed under other parts of the landfill. The results from the Advanced Geophysics, push sampling and SV sampling will decide the need for this.
- **Excavation:** No excavations are planned. Ecology does not concur with this approach. The number and extent of the excavations will be based on the results of other investigations. This will verify the quality of the disposal records for this site. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.

218-C-9

(GO-X)

Construction

**Existing information:**

- Baseline geophysics Yes p. 4-3
- Rad surface survey Yes, p.D-7, p.3-6
- Passive SV No p. 4-3
- Well logs Yes p. B-39
- CSM p. E-9, E-49
- Inventory 0 kg Pu; 0 kg of U; 43 Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- GW contaminants ?
- Other 1985-89
- Other Cs and Sr brought to surface by plants
- Other used to be 216-C-9 Pond
- Other Burn Pit/ Ash

**DOE Proposed investigation:**

1. Direct push 1 push p. A-9
2. Advanced geophysics p. A-9
3. Directional drilling 1 well p. A-9, A-72

**Discussion and Ecology proposed actions of investigation:**

Ecology suggests that the investigation start by performing passive soil vapor monitoring. Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Passive soil-vapor sampling of the burial grounds is requested to provide good coverage of the whole area.

Based on results from passive soil vapor sampling, active SV monitoring as described using SUMMA canisters is recommended. Ecology assumes that the locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** Ecology agrees with the approach to use several advanced geophysics methods to fully understand the vadose zone under that landfill. This information will be used together with the other methods suggested below.
- **Push sampling:** One push is unlikely to give much information, but maybe enough to describe this landfill. Ecology assumes that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Passive soil-vapor sampling of the burial grounds is requested to provide coverage.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals including DNAPLs may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **Directional drilling:** One horizontal well is planned. Ecology agrees with this approach.

**218-E-1 (GO-X) Dry waste**

**Existing information:**

- Baseline geophysics Yes p. 4-3
- Rad surface survey Yes, p.D-8, p.3-6
- Passive SV Yes p. 4-3
- Well logs No p. B-39
- CSM p. E-10, E-50
- Inventory 0.9 kg Pu; 400 kg of U; 100 Ci  $\beta/\gamma$  at burial
- Green Islands No
- RSW No
- High dose rate site No, but medium dose rate p E-10
- GW contaminants ?
- Other 1945-53
- Other Burn pit/ash
- Other Low quality records

**DOE Proposed investigation:**

1. Direct push 1 push p. A-9
2. Directional drilling 1 well p. A-9, A-72
3. Excavation 1 excavation p. A-9, A-72

**Discussion and Ecology proposed actions of investigation:**

Ecology concurs with the proposed investigation.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- o **Push sampling:** One push may give enough information to describe this landfill. But, Ecology assumes that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- o **Directional drilling:** A horizontal well is planned. Ecology agrees with this approach, but more wells might have to be performed under other parts of the landfill.
- o **Excavation:** One excavation is planned. Ecology concurs with this approach. Enough information will probably be acquired records verification. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trench.

## 218-E-10 (GO-X) Industrial

### Existing information:

- Baseline geophysics	No p. 4-3
- Rad Surface Survey	No
- Passive SV	No p. 4-3
- Well logs	Yes p. B-39
- CSM	p. E-18, E-58
- Inventory:	4.94 kg Pu; 801 kg of U; 4,700,000 Ci $\beta/\gamma$ at burial
- Green Islands	Yes
- RSW	Yes (one box, not mentioned in M-91 documents??)
- High dose rate site	Yes p E-18
- GW contaminants	?
- Other	1960-2004

### DOE Proposed investigation:

1. Passive soil vapor	TBD, p. A-9
2. Active SV	pending p. A-9
3. Direct push	1 push p. A-9
4. Excavation	3 excavations p. A-9, A-72

### Discussion and Ecology proposed actions of investigation:

Ecology insists that both a baseline geophysics investigation and a passive soil vapor investigation need to be performed to understand the waste site.

Ecology suggests that the investigation start by performing passive soil vapor monitoring. Passive soil-vapor sampling is an inexpensive non-intrusive characterization technology which indicates the presence of volatile organic contaminants in the soil. The results can be used to focus intrusive sampling and provide a list of expected contaminants. Uncertainty remains as to whether the burial grounds are a potential source of groundwater contamination. Passive soil-vapor sampling of the burial grounds is requested to provide good coverage of the whole area.

Based on results from passive soil vapor sampling, active SV monitoring as described using SUMMA canisters is recommended. Ecology assumes that the locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.

However, having a good understanding of the landfills does not set the bar high enough for the understanding of the potential impacts of this landfill on the vadose zone. The approach to the investigation is summarized in the three bullets on page 4-2, and the suggested investigation does not go far enough to fulfill those objectives.

To fully understand this site, this site needs a thorough vadose zone investigation. Enough information should be collected to understand conditions throughout the vadose zone down to the groundwater. Conceptual site models (CSMs) for the individual landfills and the site as a whole need to be better developed and illustrated. Hydro GeoAnalyst (a product of Schlumberger Water Services which DOE has

already used at the C-Farm and along the River Corridor) is recommended for use to develop and illustrate the CSMs.

Ecology has the following comments regarding the following characterization methods expected in the Work Plan:

- **Advanced Geophysics:** Ecology suggests an approach to use several advanced geophysics methods to fully understand the vadose zone under that landfill. This information will be used together with the other methods suggested below.
- **Push sampling:** One push is unlikely to give enough information to describe this landfill. Ecology assumes that more pushes will be performed to reach the investigation objectives. Ecology assumes that the pushes will be logged for radioactivity, and the samples will be analyzed for chemical and radiological constituents based on the list on pages A14-15 in the work plan.
- **Passive Soil Vapor monitoring:** Passive soil-vapor sampling of the burial grounds is requested to provide complete coverage.
- **Active Soil vapor:** Ecology requests active SV sampling as described in other landfills with SUMMA canisters. Ecology assumes that sampling locations will be based on burial records and information from the passive SV investigation. Ecology notes that SUMMA sampling is a screening level approach to investigate if organic chemicals including DNAPLs may be present at a particular time in a particular location within a landfill and is not representative of conditions elsewhere in the landfill.
- **Excavation:** Three excavations are planned. Ecology concurs with this approach for records verification. In addition a direct examination of the vadose zone directly below the trench floor should be conducted. This investigation could provide answers regarding contaminant mobility from the trenches.