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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
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April 2, 2010

Mr. Mathew S. McCormick, Assistant Manager
Richland Operations Office
United States Department of Energy
P.O. Box 550, MSIN: H6-60
Richland, Washington 99352

Re: Department of Ecology (Ecology) Comments on the *216-U-8 Crib and 216-U-12 Crib Vadose Zone Characterization Sampling and Analysis Plan*, DOE/RL-2009-94, Draft A (SAP)

Reference: Letter 10-AMCP-0085, dated February 16, 2010, from M. S. McCormick, USDOE-RL, to J. A. Hedges, Ecology, "216-U-8 Crib and 216-U-12 Crib Vadose Zone Characterization Sampling and Analysis Plan, DOE/RL-2009-94, Draft A"

0085Ld

Dear Mr. McCormick:

Enclosed are Ecology's comments on the SAP, in accordance with the Hanford Federal Facility Agreement and Consent Order, Section 9. We request the United States Department of Energy-Richland Operations Office to respond to our comments in a timely manner and update the SAP so that drilling and sampling may occur in September 2010.

If there are any questions, contact Michelle Hendrickson, P.E. at 509-372-7970.

Sincerely,

Alicia J Boyd

for Nina M. Menard
Environmental Restoration Project Manager
Nuclear Waste Program

mh/aa
Enclosure

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cc w/enc:

Craig Cameron, EPA	Susan Leckband, HAB
Kevin Leary, USDOE	Ken Niles, ODOE
Mike Hickey, CHPRC	Administrative Record: 200/Environmental Restoration
Stuart Harris, CTUIR	Hanford Operating Record General File
Gabriel Bohnee, NPT	Environmental Portal
Russell Jim, YN	USDOE-RL Correspondence Control

REVIEW COMMENT RECORD	Date April 2, 2010	Review No. First
	Project No. U-8 & U-12 SAP Deep Vadose Characterization	Page Page 1 of 16

Document Number(s)/Title(s)	Program/Project/Building Number	Reviewers	Organization/Group	Location/Phone
216-U-8 Crib and 216-U-12 Crib Vadose Zone Characterization Sampling and Analysis Plan (DOE/RL-2009-94)	**NWP/Clean-up Section/ER Project**	**Dib Goswami, Michelle Hendrickson, Zelma Jackson, Beth Rochette, Jerry Yokel**	**Clean-up Staff**	**372-7970**

Comment Submittal Approval: Agreement with indicated comment disposition(s) Status:

Organization Manager (Optional)	Date	Michelle Hendrickson Reviewer/Point of Contact	Date	Reviewer/Point of Contact
		Michelle Hendrickson Author/Originator		Author/Originator

Item	Page #, Line #, or Section and Paragraph	Comment (s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/resolve the discrepancy/ problem indicated.)	Hold Point	Disposition (Provide justification if NOT accepted.)	Status
1.	General	**Comment:** It appears that very little integration has occurred in this SAP with the ongoing efforts of the Treatability Test Plan data quality objectives (DQO) effort. **Justification:** This sampling and analysis plan (SAP) is to serve several purposes. One of which is collecting deep vadose zone characterization information and the feasibility of this specific collection effort and to fill data gaps/needs for deep vadose zone treatability tests. **Modification needed:** Ensure that all of the requirements for deep vadose zone characterization and the Treatability Test Plan are included in this SAP and part of the characterization effort at the 216-U-8 and 216-U-12 Cribs. (DG)			

2.	General	**Comment:** While this SAP follows the EPA /R-5 and the Ecology publication 04-03-030 Guidelines for preparing Quality Assurance Project Plans; it appears to be supporting the collection of data for modeling a select group of contaminants of concern (COCs) in the vadose zone. **Justification:** This SAP is to serve several purposes including resolving comments from the United States Geological Survey (USGS). **Modification needed:** More data from a broader set of analyses needs to be collected to aid regulatory decision making for closure. (JY)			
3.	General	**Comment:** Previous characterization data and figures including the groundwater contour map, geophysical logging, and spectral gamma logging that were developed for 216-U-8 and 216-U-12, are not in the SAP. **Justification:** This information and data are needed to support the proposed sampling effort. **Modification needed:** Include these data, information, and figures in the SAP. (DB & BR)			
4.	General and p. 1-1, 2-20, 2-25, 3-1, 3-4, etc.	**Comment:** The SAP discusses the parameters need for various modeling efforts. However, it is silent on integration aspects with the ongoing efforts of the Treatability Test Plan effort and resolution of the USGS comments. **Justification:** This sampling and analysis plan (SAP) is to serve several purposes. One of which is collecting deep vadose zone characterization information and the feasibility of this specific collection effort and to fill data gaps/needs for deep vadose zone treatability tests as indicated in Appendix B of the Deep Vadose Treatability Test Plan. Also, both EPA and Ecology have agreed the USGS comments are applicable and requested that USDOE incorporate these data needs in the supplemental characterization effort occurring at the 216-U-8 and 216-U-12 Cribs.			

		Modification needed: Add or ensure that all of these requirements for deep vadose zone characterization respective to the Treatability Test Plan technologies listed in Appendix B and the data gap needs being developed with the ongoing DQO effort. Also, address and resolve the comments from USGS and include a discussion of these in the SAP; including: • Stratigraphy parameters of the deep vadose zone (thickness, dip angle, texture, structure, etc). • Hydraulic parameters of the Cold Creek Units (CCU) and their potential impacts on lateral spreading of the contaminants • Results of boiling effluent discharges with high concentrations of nitric acid on geochemistry parameters of various vadose stratigraphies including the CCU • Resolution of the proposed conceptual site models regarding the cause of lateral spreading • Explanation regarding the increased concentration of nitrate found sorbed to the soils under the cribs with uranium, especially when Tc-99 is (same mobility constant) is absent • Boundaries and lateral spreading • Results of water table fluxing Draft language may include, "Data collected by this effort will meet the needs to sufficiently characterize the deep vadose zone below the 216-U-8 and 216-U-12 Cribs to that all USGS comments can be fully resolved, deep vadose zone treatability test plan DQOs and data needs can be met, and a remedial alternative can be chosen for these cribs which can be agreed to by Ecology and EPA." (MH)			
5.	General	**Comment:** Insufficient information is provided in the SAP to address the high amounts in contaminant concentrations (uranium and nitrate) immediately below the cribs. **Justification:** To address the Principal Study Questions (PSQ) in the DQO			

		(SGW-42772, Rev. 0) regarding uranium and nitrate's threat to groundwater, the geochemistry and stereochemistry of these contaminants need to be determined. **Modification needed:** Modify the SAP to include soil sample collection immediately below the cribs in known areas of high nitrate and uranium contamination below the cribs and include various additional analyses to determine the geo- and stereochemistries of these contaminants (i.e. presence of organic and ligands that may cause the contaminants to bind to the soil particles immediately below the cribs). Enough information should be obtained from these samples to update the conceptual site models (CSMs), mobility constants (k_d values) and determine an appropriate surface remedial action at these sites. Also, these results can be compared with the deep vadose zone characterization results to determine if the geochemistry of the contaminants and resulting physical properties including k_d change with depth. (MH)			
6.	General, Figure 3-2 and related text	**Comment:** Is borehole #2 near the 216-U-8 Crib far enough away from the crib to determine extent of contamination in the shallow and deep vadose zone in order to choose a remedial alternative? **Justification:** Based on previous characterization data present in 2007, 2008, and 2009 to Ecology including figures and modeling efforts, and the USGS comments, it appears that this location may be too close to the crib to determine an actual extent of contamination from the crib. **Modification needed:** Reconsider the location for Borehole #2 and either change the location of this borehole and update the SAP or provide additional justification as to the selection of this specific location. (MH)			
7.	General	**Comment:** No information is provided in the DQO or SAP how the results from the sampling, indirect data sources (as noted in the DQO) and subsequent modeling efforts will be presented to both Ecology and EPA. Nor is there any discussion how these activities will affect updating conceptual site model. Will the Remedial Investigation (RI) and Feasibility Study (FS) reports be updated with this information? **Justification:** Both Ecology and EPA will be responsible parties to sign a			

		Record of Decision for these waste sites. And while the lead agency for these cribs may become EPA, Ecology will be responsible for the Deep Vadose Zone Operable Unit. **Modification needed:** Include information regarding the follow-up reporting of these SAP results, indirect data collection efforts, and subsequent modeling in this SAP. And include both Agencies on distribution. (MH)			
8.	p. v Line 3	**Comment:** The phrase "of plant-related contaminants of concern" (COCs) is not accurate or appropriate given the listing that is presented. **Justification:** This phrase would be appropriate if all the COCs listed in DOE/RL-2000-60, Rev. 0 were used. **Modification needed:** Change phrase to "select contaminants of concern based on previous characterization results and data gaps". (MH)			
9.	p. xi	**Comment:** The definition for "RME" is missing from the acronym list. **Justification:** All acronyms should be defined in the document. **Modification needed:** Include this acronym and definition. (MH)			
10.	p. 2-3 Lines 14&15	**Comment:** Is this statement referring to the utilization of an adaptive sampling and analysis plan (ASAP)? If it is a dynamic work plan then what technical/ administration position will manage refinement of the conceptual site model? **Justification:** A combination of Bayesian analysis and geostatistics will be necessary to guide ASAP design and implementation **Modification needed:** Indicate if this SAP is an ASAP and if so describe how it will be impact the conceptual site models. (ZJ)			
11.	p. 2-4 Line 36	**Comment:** What laboratory was contracted for this work? **Justification:** A Washington State accredited laboratory is required to analyze the samples to produce defensible data for regulatory decision making.			

		Modification needed: Ensure that all samples will be sent to an accredited laboratory for analyses or obtain a waiver from Ecology's Chemist. (JY)			
12.	p. 2-4&5 and Section 1.5of the DQO (SGW-42772, Rev.0)	**Comment:** Ecology is not able to determine remedial action lacking data regarding organic constituents. **Justification:** Using data from only one sample to make the decision to not test for organics is not statistically defensible. **Modification needed:** Include organic constituents in the SAP. (JY)			
13.	p. 2-4&5 and Section 1.5of the DQO (SGW-42772, Rev.0)	**Comment:** The contaminant of Concern selection needs to be summarized in the DQO. **Justification:** Step 3 of the EPA 7 Step DQO Process creates a list of contaminants of interest based on characteristics of the matrix, data usability and how the data describe the conceptual site model. Ecology assumes the document "Technical Memorandum Summary of Data and Document Review for Development of a Conceptual Site Model for the 216-U-12 Crib" found in appendix A of the DQO is the Department of Energy's (DOE) basis for contaminants of potential concern (COPC) selection. **Modification needed:** Outlined this process in section 1.5 of the DQO as a logic diagram and include this information in the SAP. For example since the process which created this contaminated site was from the tributyl phosphate (TBP) process used at U-Plant to recover uranium from tank waste why is TBP and breakdown chemicals not listed as COPC's? (JY)			
14.	p. 2-4&5 and Section 1.5 and page A-46 of the DQO (SGW-42772, Rev.0Page A-46	**Comment:** It is not apparent what COCs the beta results in Table A 4-2 of the DQO represents. **Justification:** These constituents should be reflected in the SAP, but Ecology is unable to determine if they are. **Modification needed:** Specify what COCs the beta results in the DQO represent and how they are carried through to the SAP. (JY)			
15.	p. 2-5	**Comment:** Will the gamma spectroscopy and soil sample analyses provide a			

	Lines 23 and 24	speciation of uranium isotopes? **Justification:** The speciation of uranium should be reflected in the SAP, but Ecology is unable to determine if they are. **Modification needed:** Specify if speciation of uranium will occur. (MH)			
16.	p. 2-5 – 2-6, Section 2.1.4.1	**Comment:** There are additional contaminants of concern for these cribs. **Justification:** At least 3 different, though partially overlapping, lists of COCs can be found in DOE/RL-2003-51, DOE/RL-2003-24, and Table 2-7 of this document. All pertain to these cribs. **Modification needed:** To encompass the various COCs for these cribs, analyze samples for the following chemical contaminants/contaminant groups: anions, ICP metals, mercury (by cold vapor), PAHs, tri-butyl phosphate, semi-volatile organics, volatile organics, kerosene (or TPH), and uranium. (BR)			
17.	p. 2-7 Section 2.1.5	**Comment:** There is little mention of previous characterization and results for these cribs. **Justification:** A summary of this information is needed to help establish what data gaps/needs remain and how they are being addressed by the methods presented in this SAP. **Modification needed:** Add this information. (MH)			
18.	p. 2-9, Table 2-2	**Comment:** The soil screening concentration for total uranium is given as 480 µg/kg, which is 0.48 mg/kg. However, Hanford site background for uranium is roughly 3.2 mg/kg. **Justification:** WAC 173-340-747 Method B (the 3-phase model) gives a cleanup value for uranium of 1.3 mg/kg. Using Hanford site background for total uranium would be reasonable in this case. **Modification needed:** Modify the soil screening concentration to 3.2 mg/kg for total uranium and footnote that it is based on Hanford site background. (BR)			

19.	p. 2-13, Figure 2-2	**Comment:** The second decision diamond asks "Do the data represent the RME and/or appropriately conservative or bonding conditions?" The text requires modification. **Justification:** In order to answer this the RME scenario must be defined. It is not, and RME is not on the acronym list. Also, the last part of the question is very subjective. Finally, this describes risk assessment, which is an activity to occur in the RI and FS, along with many other activities that are not discussed in the summary logic. **Modification needed:** Change the text in the second decision diamond to "Are the data adequate for use in RI/FS risk assessments?" (BR)			
20.	p. 2-13, Figure 2-2	**Comment:** The box on the bottom left makes reference to a technical memorandum rather than an RI/FS document. **Justification:** The risk evaluation for the new data belongs in a revised feasibility study document. The existing FFS was not approved by Ecology. The documentation for these waste sites is not complete. **Modification needed:** Change the text in the box on the bottom left to: Prepare and issue a revised feasibility study to include the results of supplemental characterization, risk analysis and alternatives analysis for U-8 and U-12 cribs. (BR)			
21.	p. 2-18, Table 2-4	**Comment:** The table lists EPA Method 8141B. Is this method intended for tributyl phosphate? **Justification:** This method is for organophosphorus pesticides. **Modification needed:** Provide a footnote listing the contaminants of concern that will be investigated with this method. (BR)			
22.	p. 2-20, Section 2.2.2 and elsewhere	**Comment:** The Sampling Process Design does not have a strong tie to the data gaps/needs previously identified and discussed in the DQO and during the workshops.			

		Justification: SAPs are primary documents that "stand alone". This information from the DQO that was subject to many workshops and several hours where USDOE, Contractors, and Regulatory Agency staff discussed and decided the data gaps/needs in-depth must be included. **Modification needed:** Add this information into the SAP and provide a stronger tie to the DQO and workshop efforts. (MH)			
23.	p. 2-20, Line 2 and lines 10 - 11	**Comment:** Though the additional boreholes are critically needed for remedy selection and appreciated, they will not provide the quantity and distribution of contaminants in the vadose zone, since only 2 boreholes will be drilled in crib U-8 and 1 in crib U-12. **Justification:** In order to fully know the distribution and amount of contamination a statistically-based investigation would be required. **Modification needed:** Modify the text in line 2 to: The requirements of this study are to obtain more information about selected contaminants.... Also, modify line 10 to: short distance from the crib; this location will provide additional information about the magnitude and location within (BR)			
24.	p. 2-21 – 2-25, Table 2-5	**Comment:** There is insufficient effort described for determining concentrations of contaminants of concern. **Justification:** The table describes a great deal of sample characterization, including selective extractions and TOC analysis. However, the table is vague and incomplete for COC concentration measurements. It mentions carbon tetrachloride and degradation products, though other tables (such as Table 2-2) do not include these contaminants. **Modification needed:** Focus efforts on COC concentrations. Analyze samples for the following chemical contaminants/contaminant groups: anions, ICP metals, mercury (by cold vapor), PAHs, tri-butyl phosphate, semi-volatile organics, volatile organics, kerosene (or TPH), and uranium. (BR)			
25.	p. 2-25, Section	**Comment:** There is insufficient information presented describing the indicators and criteria associated with collecting soil samples for laboratory analyses during			

	2.2.2.4, p. 3-8, Section 3.3.2, and p.3-13, Figure 3-12	the sampling effort. **Justification:** While various portions of the SAP and DQO allow one to "piece together" this information; it should be clearly discussed and described. **Modification needed:** Add this information to the sections specified and re-work the figure. (MH)			
26.	p. 2-25 and 2-26, Sections 2.2.2.4 and 2.2.3, and various text after these sections	**Comment:** Organic Vapor Monitoring (OVM) and gross gamma/passive neutron logging were not included as field measurement methods for this SAP. **Justification:** According to previous DQO efforts, organics and plutonium, while not present in large quantities, are still COCs of concern for these cribs. OVM and gross gamma/passive neutron logging are field measurement techniques, which are relatively inexpensive and reliable. **Modification needed:** Consider adding these field measurement techniques and update the SAP or provide additional justification why these measurements will not be included in this effort. (MH)			
27.	p. 2-26, Section 2.2.2.4, 2nd bullet on pg., and p. 2-27, Section 2.2.5, Table 2-7	**Comment:** Measurements of oxidation-reduction potential are not likely to provide meaningful data unless the samples are saturated with vadose zone water, sampled without contacting the atmosphere, stored to prevent contact with the atmosphere, measured in their field-saturated condition in an atmosphere of inert gas (such as N_2 or argon). **Justification:** Any contact with the atmosphere or introduction of laboratory water will alter the redox potential such that the results mainly reflect the redox potential of the laboratory water. Measurements will not provide redox potentials representative of those in the subsurface environment. **Modification needed:** Focus on contaminant concentrations and omit redox potential measurements. (BR)			
28.	p. 2-28, Table 2-7	**Comment:** The detection limit goal for arsenic is too high. **Justification:** Arsenic cleanup levels are all below site background, so the			

		detection limit goal should be at least as low as Hanford site background. **Modification needed:** Reduce the detection limit for arsenic to the Hanford site background value of 6.5 mg/kg. (BR)			
29.	p. 2-28, Table 2-7 – 2-9	**Comment:** The table is not complete. **Justification:** See other comments regarding contaminants of concern. **Modification needed:** Analyze samples for the following chemical contaminants/contaminant groups: anions, ICP metals, mercury (by cold vapor), PAHs, tri-butyl phosphate, semi-volatile organics, volatile organics, kerosene (or TPH), and uranium. Add these to the table. (BR)			
30.	p. 2-28, Table 2-7 – 2-9	**Comment:** Sorption should be assessed by measuring isotherms, rather than simple individual partition coefficients. **Justification:** Isotherms indicate the extent of non-linearity and provide data that can be used in modeling (Freundlich and/or Langmuir coefficients). These results can also be used for determining individual partition coefficients at various concentrations. **Modification needed:** Include isotherm analyses instead of individual partition coefficient measurements. (BR)			
31.	p. 2-32 – 2-33, Table 2-9	**Comment:** Several of the required quantitation limits are too high. **Justification:** Several of the required quantitation limits exceed MCLs or risk-based thresholds. **Modification needed:** Reduce the quantitation limits to the following: Antimony to 6 µg/L based on the MCL Arsenic to 10 µg/L based on the MCL Cadmium to 1 µg/L based on the MCL Mercury to 2 µg/L based on the MCL Thallium to 1 µg/L based on WAC 173-340-720 Method B (the MCL is 2 ug/L) Fluoride to 940 µg/L based on WAC 173-340-720 Method B			

		(BR)			
	p. 2-36, sub bullets on last bullet	**Comment:** Why are hexavalent chromium and mercury excluded from the metals listing? **Justification:** These are important metals to include in analyses, are present at the Hanford site in large quantities, and influence risk assessments. **Modification needed;** Include these metals in the analysis or provide a justification why they are not included. (MH)			
32.	p. 3-1, Section 3.1	**Comment:** The text states "The vadose zone characterization at the 216-U-8 and 216-U-12 Cribs is intended to fill data needs…" However, the data needs are not provided. **Justification:** A clear list of data needs is not given in the document. **Modification needed:** Provide the data needs here or on Section 2.2.2. If they are included in Section 2.2.2, add a reference to that section in Section 3.1. (BR)			
33.	p. 3-3, Section 3.2	**Comment:** Field observations and descriptions of the geologic media should be recorded during sampling. **Justification:** Field observations provide valuable information that is useful in data interpretation and correlation of borehole data, as well as indicating certain chemical conditions in the media. For instance, visible signs of iron depletions and concentrations help discern which units have reducing or periodically reducing conditions. **Modification:** Add a bullet for field observations and descriptions of geologic media during sampling. (BR)			
34.	p. 3-4, Section 3.3.1.1, 3rd paragraph of section	**Comment:** The text states "The result of the soil resistivity survey will be evaluated and considered in final borehole placement, specifically for location of Borehole 2, outside the crib footprint." Ecology requests that we be consulted for choosing a location for this borehole. **Justification:** The borehole will be expensive and should be located based on			

		the judgment and needs of all parties. **Modification needed:** Consult Ecology when choosing the location for Borehole 2 and include a statement in this document that Ecology will be consulted for locating Borehole 2. (BR)			
35.	p. 2-18, Table 2-4	**Comment:** The table lists EPA Method 8141B. Is this method intended for tributyl phosphate? **Justification:** This method is for organophosphorus pesticides. **Modification needed:** Provide a footnote listing the contaminants of concern that will be investigated with this method. (BR)			
36.	Page 3-4 Lines 6-8	**Comment:** Cable tool drilling may have demonstrated satisfactory performance at the Hanford Site but it does have some disadvantages. **Justification:** The rate of penetration is very slow and there are problems with "heaving sands", just as with the hollow-stem auger. **Modification needed:** Consider this drilling method and potential for "heaving sands" and plan accordingly for this event in the field during characterization. – or - disregard this comment if cable tool drilling is not deployed in drilling any of the three boreholes. (ZJ)			
37.	Pages 3-4 to 17 and page 7-6 of the DQO (SGW-42772, Rev.0)	**Comment:** It appears that the SAP does not sample or provide an adequate basis for sampling at the "high uranium" depths below ground surface as noted by Figure 7-2 in the DQO. **Justification:** Figure 7-2 of the DQO is the 216-U-8 crib vertical distribution of uranium based on previous characterization data. **Modification needed:** The SAP needs to direct some sampling efforts for the new boreholes in relation to the contaminant distribution as shown in this figure for "high uranium" levels. (JY)			
38.	p. 3-7, lines 9 to 17	**Comment:** This paragraph is inappropriate for this SAP.			

		Justification: The entire point of the SAP is to provide further characterization so that a remedial alternative can be chosen from the data gathered directly and indirectly, and subsequent modeling efforts to be performed after characterization is completed. No remedial alternative will be selected during the sampling effort. Thus, it is inappropriate to not complete characterization should contamination be encountered at moderate depths. Also, care in drilling should be taken to avoid any contamination of the deep vadose zone from this characterization effort. **Modification needed:** Strike this paragraph. (MH)			
39.	p. 3-12 – 3-13, Figures 3-8 and 3-9	**Comment:** The sample preparation process appears to allow contact of the sample with the atmosphere (especially during splitting). If so, analysis of ORP is not meaningful. **Justification:** See prior comment describing conditions needed for meaningful determination of ORP. **Modification needed:** Omit ORP determination. (BR)			
40.	p. 3-12, Figure 3-8	**Comment:** The figure should be re-titled "Sample Measurement or Initial Assessment" and a new Figure added before it that describes the criteria to collect a sample. **Justification:** The decision logic employed to collect a soil sample interval from the continuous soil column collect has not been adequately defined or presented. **Modification needed:** Change the title of Figure 3-8 and include a new figure prior that includes the following decision logic soil sample collection criteria: 1. Noted increase in field measurements for gamma, beta, alpha, OVM, etc. 2. Texture change 3. Known depth of contamination based on previous characterization and logging data 4. Change in physical properties 5. General interest, etc. (MH)			
41.	p. 3-13,	**Comment:** The sample preparation quantities are missing in the white boxes.			

	Figure 3-9	**Justification:** Soil sample quantities are needed to ensure all analyses can be performed on the sample collected. **Modification needed:** Add appropriate sample quantities needed. (MH)			
42.	p. 3-15, Figure 3-11	**Comment:** The third and fourth boxes make reference to detailed analysis for only some segments of the borehole. Contaminant analysis is needed for all sections of these expensive boreholes. **Justification:** Given the expense of drilling boreholes, all segments of the boreholes should be analyzed for all contaminants of potential concern. **Modification needed:** Analyze all segments of the boreholes for the following chemical contaminants/contaminant groups: anions, ICP metals, mercury (by cold vapor), PAHs, tri-butyl phosphate, semi-volatile organics, volatile organics, kerosene (or TPH), and uranium. (BR)			
43.	p. 3-15, Figure 3-11	**Comment:** The third box from the bottom on the right side of the figure should be modified to list sorption isotherms. **Justification:** See prior comment on the value of sorption isotherms over individual partition coefficient measurements. **Modification needed:** Modify the third box from the bottom on the right side of the figure to list sorption isotherms. (BR)			
44.	Page 3-16 Lines 3-7	**Comment:** Clarify drilling and screening methods in the SAP. **Justification:** Technology and industry practices have changed in the use of long-screened only in monitoring wells. Screens are being installed with intervals as short as 2 or 3 feet. The primary drilling method selected, rotary sonic drilling usually is continuous and relatively undisturbed samples can be obtained with the split spoon attached. This method has the ability to drill easily at any angle in unconsolidated areas in a formation. **Modification needed:** Include language describing the potential use of shorter			

		screen length in preventing lost of representative samples at depth below the water table in the unconsolidated formation. (ZJ)			
45.	p. 3-16, Section 3.3.2, lines 35-36	**Comment:** Visual observations of iron depletions and concentrations should be substituted for measurement of ORP. **Justification:** Retaining the field ORP during sampling and analysis is challenging. Redox depletions/concentrations are visual indicators that will be retained after sampling. **Modification needed:** Substitute visual indicators of redox conditions for ORP measurements. (BR)			
46.	p. A-1	**Comment:** The Kd assumed for uranium is questionable and not representative of the range for uranium sorption values. Sorption isotherms should be measured to assess uranium sorption in these samples. Also, the units for Kd are L/kg or mL/g, rather than µg/L. **Justification:** See prior comments about the value of measuring sorption isotherms. Measured values should be used rather than assumed values for Kd. **Modification needed:** Measure uranium sorption isotherms rather than using an assumed Kd value for uranium. (BR)			