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October 27, 2014 14-NWP-226

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EDMC

Mr. Briant Charboneau, Federal Project Director
Richland Operations Office
United States Department of Energy
PO Box 550, MSIN: A5-11
Richland, Washington 99352

Re: United States Department of Energy Letter 15-AMRP-0003, Dated October 17, 2014, "Remedial Investigation/Feasibility Study for the 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2 and 100-HR-3 Operable Units, DOE/RL-2010-95, Revision 0" (DOE/RL-2010-95, Rev 0)

Dear Mr. Charboneau:

In accordance with Tri-Party Agreement Section 9.2.1, Ecology reviewed the final Review Comment Record (RCR) of DOE/RL-2010-95, Rev 0, and determined that they are adequate. Enclosed is a copy of the RCR to be submitted to the Administrative Record in accordance with Tri-Party Agreement Section 9.4.

If you have any questions, please contact me at kim.welsch@ecy.wa.gov or (509) 372-7882.

Sincerely,

Kim Welsch
Tri-Party Agreement Project Manager (delegated)
Nuclear Waste Program

tkb
Enclosure: compact disc

cc: See page 2

100-DR-1, 100-DR-2, 100-HR-1, 2 & 3
1227202, 1227251

cc w/enc:

Administrative Record: 100-DR-1, -2, 100-HR-1, -2, and -3 Operable Units

cc w/o enc:

Stuart Harris, CTUIR
Gabriel Bohnee, NPT
Russell Jim, YN
Steve Hudson, HAB
NWP Central File
NWP Reader File

cc electronic w/o enc:

Rod Lobos, EPA
Jim Hansen, USDOE
Jim Hanson, USDOE
Cliff Clark, USDOE
Rob Piippo, MSA
Ken Niles, ODOE
Nina Menard, Ecology
John Price, Ecology
Robin Varljen, Ecology
Kim Welsch, Ecology
Cheryl Whalen, Ecology
USDOE-RL Correspondence Control
Environmental Portal
Hanford Operating Record

Three documents follow:

1. The Combined Review Comment Response (RCR) for the *Remedial Investigation/Feasibility Study: 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 Operable Units* (DOE/RL 2010-95, Rev. 0), including
    - Resolved comments for a crosswalk of WAC requirements associated with fate and transport modeling, and
    - Resolved comments for modeling package report SGW-50776,
2. The Combined Review Comment Response (RCR) for the *Tier 1 Risk-Based Concentrations Protective of Ecological Receptors at the Hanford Site* (CHPRC-0078), and
3. The Combined Review Comment Response (RCR) for the *Tier 2 Terrestrial Plant and Invertebrate PRGs for Nonradionuclides for Use at the Hanford Site* (ECF-Hanford -11-0158).

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-1	Comment: All references to laws and regulations and to documents that are periodically updated must be to the most current version of that reference. Also, wherever there is mention of MTCA regulations, specify which year MTCA applies in the verbiage (e.g. 1996 or 2007). Basis/Justification: Consistency, clarity, and accuracy.	Make corrections/update to all applicable references.	General	General	Accept	The comment will be incorporated as suggested as part of the final document preparation.	Yes - 5/19/2014
DH-2	Comment: Radiation issues should be consolidated and summarized. Some Hanford stakeholders are almost exclusively interested in radiation issues. To the extent information about such issues is difficult to find and understand, such stakeholders may believe there is a deliberate attempt to hide things from them. While it is appropriate for radiation issues to be discussed in the sections pertaining to each site, it would be useful if they were also consolidated in an appendix or attachment. As part of the context for radionuclides, when historic inventories are included in a document, a "current", decay-corrected inventory should also be given. This is particularly true when the inventory was high, but consisted mostly of fission products with short half-lives. Basis/Justification: Clarity and ease to understand.	Consolidate and summarize radiation issues per the comment. Also, include "current" decay-corrected inventory when radionuclides are listed.	General	General	No change	Text applicable to radiological and non-radiological contamination are addressed in the various sections of this report in waste site, groundwater and CSM discussions. Radiological and non-radiological contamination, are described collectively by media (contaminated soil, groundwater) in this report. Chapter 4 describes the nature and extent of existing vadose contamination. Because the data was collected over an 18 year timeframe, the radiological data was normalized (decay-corrected) to 2012. This is addressed on page 4-13, line 39 and the legend in figures 4-5, 4-7 and other vertical profiles.	Yes - 9/9/2013
DH-3	Comment: General Chapter 1 comment: Consider summarizing USDOE's Office of Environmental Management Technical Solutions Report No. 031102-027 *Optimization of Groundwater Pump and Treat Systems at Hanford* (September 30, 2004). Also, consider summarizing *Technical Evaluation of the Interaction of Groundwater with the Columbia River at the Department of Energy Hanford Site, 100-D Area* (SGW-39305). Basis/Justification: Completeness.	See comment.	1	General	Accept with Modification	A short summary of SGW-39305 was added to section 1.2.3.4. The HQ document does not appear to be relevant since more current RPO work has been conducted. The newer evaluations are described later in the document.	Yes - 8/7/2013
DH-4	Comment: Text stating that 100-KE and 100-KW contain the waste sites for this document is in error. Basis/Justification: This document deals with the 100-D and 100-H areas.	Modify sentence to include 100-D and 100-H areas instead of 100-KE and 100-KW areas or re-write paragraph to omit sentence.	1	1-1/34	Accept	Replaced 100-KE and 100-KW with 100-D and 100-H.	Yes - 5/2/2013
DH-5	Comment: Figure 1-2 indicates the 100-HR-3 operable unit (OU) does not underlie the entire 100 DH Area. In addition, Figure 1-2 indicates the 100-HR-3 OU goes beyond the 100 DH Area (southeast portion). Basis/Justification: The figure should agree with Integrated 100 Area RI/FS Work Plan (DOE/RL-2008-46).	The 100-HR-3 OU boundary and the 100 DH Area boundary should be identical even if it makes sense to re-draw the 100 DH Area boundary.	1	1-3	No change	The 100-D/H study area boundary in Figure 1-2 of the RI/FS document is consistent with the D/H boundary shown in Figure 1-2 of the Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan (DOE/RL-2008-46). The 100-HR-3 groundwater operable unit boundary is consistent with the boundary described in the Hanford Site Groundwater Monitoring Report for 2011 (DOE/RL-2011-118). That the two boundaries do not match exactly does not affect the study that was conducted in the RI/FS.	Yes - 8/7/2013
DH-6	Comment: Figure 1-2 indicates the 100-DH Area does not include D Island. Basis/Justification: DOE/RL-2008-46 states: "If Hanford Site contamination that requires remedial action is identified in the river, and it is associated with a current groundwater or soil contamination source, a cleanup decision that offers protection for the river may be included with the final ROD for one or more of the River Corridor decision units. If Hanford Site contamination that requires remedial action is identified in the river beyond the River Corridor decision unit boundary and it is associated with a past release, a separate remedial decision for the river may be developed." Contamination occurring on D Island is associated with a current soil contamination source (i.e., non-remediated contamination that is currently acting as a source) and should be included within the 100 DH Area boundary.	Include D Island within the 100 DH Area boundary.	1	1-5/17-20	No change	Figure 1-2 indicates that D-Island is a part of the 100-DH study area by the dashed line around the island as shown in the legend.	Yes - 7/2/2013
DH-7	Comment: The text states: "If cleanup levels are not achievable in a reasonable time or are determined to be technically impracticable, programs will be implemented to prevent further migration of the plume, prevent exposure to contaminated groundwater, and evaluate further risk reduction opportunities or seek an applicable or relevant and appropriate requirements (ARAR) waiver." The TI waiver guidance provides guidance on using time as a basis for a TI waiver. Basis/Justification: TI waiver guidance.	Re-write the sentence. Possible wording: "If cleanup levels are determined to be technically impracticable, programs will be implemented to prevent further migration of the plume, prevent exposure to contaminated groundwater, and evaluate further risk reduction opportunities or seek an applicable or relevant and appropriate requirements (ARAR) waiver."	1	1-5/17-20	Accept	Text has been revised as suggested.	Yes - 5/2/2013

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DH-8	Comment: It is stated here, and repeated way too many times throughout the document, that cleanup levels will be established "that will be protect human health and the environment." Or, "the proposed cleanup levels [PRGs] are numeric values that meet ARARs and are protective of human health and the environment." While this may be true, these statements need to be made in the correct context of, 'cleanup values meeting applicable and current MTCA (2007) and EPA statutes/requirements are protective of human health and the environment.' Further, almost ANYTHING that is done to cleanup this project will aid in 'protect human health and the environment', regardless of meeting required standards. The blanket statement without correct context is hollow and does not have real meaning. Basis/Justification: This added language clarifies that actions within this RI/FS and resulting Final ROD(s) will meet current MTCA/EPA standards/statutes/requirements, and will assist in explaining the difference between Interim Closeouts and Final Closeouts of waste sites per the Final Rod(s). Additional comments will be made concerning clarification of Interim Closeouts vs. Final Closeouts of waste sites.	Reduce the numbers of times throughout the document the statement is made that actions "are protective of human health and the environment." When this type of statement is made, it must add the context of meeting 'current MTCA or EPA standards/requirements.'	1	1-6/First Para	Accept with Modification	The statement is standard CERCLA language in which it is implicit that actions are protective in the context of ARARs, MTCA, and other applicable standards. It is not inaccurate as written and adding the additional phrase will not change the meaning or change the decisions. As final revisions to the document are made, we will be sensitive to the way the phrase "protective of human health and the environment" is used to ensure that it is not overused.	Yes - 5/5/2014
DH-9	Comment: Additional information needs to be added discussing the relationship between waste sites within this RI/FS and Orchard Lands OU. Perhaps not in this section, but somewhere within this RI/FS ALL cleanup scenarios where there is interface between this RI/FS and Orchard Lands OU need to be explained and detailed both within this document and the applicable OL OU document(s). Basis/Justification: Consistency and accuracy.	A much greater effort/language needs to be added to this RI/FS detailing ALL cleanup scenarios where there is interface between this RI/FS and Orchard Lands OU. These details include, which project (100-D/H or Orchard Lands OU) will clean up on overlapped waste sites, or adjacent waste sites between the two projects.	1	1-10/13-18 and Figure 1-4	Accept with Modification	The details describing the cleanup of overlapping 100-DH waste sites and orchard lands are provided in Section 4.1. The 100-OL-1 Remedial Investigation will provide additional detail about the Orchards Lands investigation. Note that Figure 4-1 is being revised to remove non-orchard farm sites (see comment DH-12).	Yes - 8/27/2013
DH-10	Comment: Text stating that TPA Change Notice C-12-01 established the 100-OL-1 Operable Unit is in error. Basis/Justification: The 100-OL-1 orchard lands Operable Unit was established by TPA Change Notice C-12-02.	Modify this and other locations in the document that contain this error.	1	1-10/15	Accept	Text has been revised to reflect that 100-OL-1 was established in TPA Change Control Form C-12-02	Yes - 5/2/2013
DH-11	Comment: Add "for the 100-OL-1 OU". Basis/Justification: Clarity that this is for a different OU and not 100-D/H	Clarity to which OU is being discussed.	1	1-10/18	Accept	Text has been revised as suggested.	Yes - 5/2/2013
DH-12	Comment: All figures/maps depicting Orchard Lands OU must be consistent with the Orchard Lands maps/data. In addition, Figure 1-20 uses the term "Pre-Hanford farm Sites." This term has little to no bearing on cleanup associated with the 'official' TPA term 'Orchard Lands OU', since many pre-Hanford Farms sites included gardens that did not use lead arsenate – which is the only contaminate of concern under the Orchard Lands OU. Basis/Justification: Consistency and accuracy.	This RI/FS needs to get the latest and most accurate maps for the Orchard Lands OU project, and use those map overlaps in this RI/FS. Also, do not use the term 'pre-Hanford Farms sites'. This does not add to clarification of cleanup issues within this RI/FS, and inaccurately discusses a term that will be differentiated for discussion within the Orchard Lands OU documentation.	1	1-10, 1-33/Figs. 1-4 and 1-20	Accept	The pre-Hanford orchard locations shown in Figures 1-4, 1-19, 1-20, and 4-1 are consistent with the orchard locations shown in *RI/FS Work Plan to Evaluate the 100-OL-1 OU Pre Hanford Orchard Lands* (DOE/RL-2012-64, Draft A) Figures 1.1 and3.3. The text has been revised to limit the discussion to orchard lands. Figures 1-4 and 4-1 will be revised to remove the former farm locations. The legend in Figures 1-19 and 1-20 will be revised to refer only to pre-Hanford orchard sites.	Yes - 8/27/2013
DH-13	Comment: The text explains the evaluation of environmental impacts associated with the reactors and describes the selection of ISS in the Reactor Decommissioning ROD. The text also describes the plan to dispose the reactors after 75 years. Environmental monitoring and routine inspections are appropriate associated with the ISS reactor configuration. For completeness, the text should describe inspections and monitoring associated with the ISS reactors that occur. Basis/Justification: The text describes the ISS reactor configuration and for completeness should also indicate routine inspections are performed and that environmental monitoring occurs.	The text should also indicate that routine inspections occur and describe what environmental monitoring occurs.	1	1-12/4-12	Accept	Inserted a new paragraph after line 12 that addresses the routine inspections and monitoring.	Yes - 5/2/2013
DH-14	Comment: Add a reference at the end of "the reactors are planned to be disposed of in 200 Area Burial Grounds". Basis/Justification: a reference is needed to support the basis of this statement	Add reference to support basis of the sentence.	1	1-12/12	Accept with Modification	Reference added; also modified sentence to match the reference wording.	Yes - 7/2/2013
DH-15	Comment: Provide references for the material being discussed. Basis/Justification: References are needed to support the various discussions of the operations at 100-D and 100-H Areas.	References are needed to support the basis of the discussion on operations at 100-D and 100-H.	1	1-12/14-44	Accept	A paragraph listing the key references has been added at the beginning of section 1.2.2.	Yes - 7/2/2013
DH-16	Comment: Ponds and trenches are liquid waste disposal sites. The words "discharge sites" and "waste sites" don't accurately describe the function of the waste sites. Basis/Justification: The description of ponds and trenches should be clarified.	Possible wording: "Unlined, liquid disposal sites that were…" and "Shallow, narrow, unlined surface liquid waste disposal sites…."	1	1-15/1 & 5	Accept	The comment will be incorporated as suggested.	Yes - 7/2/2013
DH-17	Comment: Provide references for the planned disposal units being discussed. Basis/Justification: References to support the size and uses of these facilities is warranted.	References are needed to support the basis of the discussion on how disposal of material was conducted.	1	1-15/1-21	Accept	A paragraph listing the key references has been added at the beginning of section 1.2.2. Note that the units listed are not planned disposal units, but descriptions of historical disposal sites.	Yes - 7/2/2013

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DH-18	Comment: Provide a reference or references for "Materials Used or Produced in 100-D/H" in the shaded blue box. Basis/Justification: References to support the size and uses of these facilities is warranted.	References are needed to support the basis of the material or produced in 100-D/H.	1	1-15/shaded blue box	Accept	A paragraph listing the key references has been added at the beginning of section 1.2.2.	Yes - 7/2/2013
DH-19	Comment: The text states: "The 100 Area burial grounds may have also received pieces of spent nuclear fuel…." As removal of pieces of spent nuclear fuel from 100 Area burial grounds has occurred, the wording should correctly describe this fact. Basis/Justification: Text correction needed.	Possible wording: "The 100 Area burial grounds also received pieces of spent nuclear fuel…." Also, include reference of documentation of this (e.g., UMM notes, reports, etc.).	1	1-16/8-9	Accept	The comment has been incorporated as suggested. Note that the reference has also been corrected.	Yes - 7/2/2013
DH-20	Comment: Provide references to support the descriptions of French drains and unplanned release sites. Basis/Justification: Numerous references exists supporting French drain designs and disposal methods, provide a reference to support this description as well as the unplanned release sites.	References are needed to support the basis of the discussion on French drains and unplanned release sites.	1	1-16/1-4 and 12-16	Accept	A paragraph listing the key references has been added at the beginning of section 1.2.2.	Yes - 7/2/2013
DH-21	Comment: Provide references to support the descriptions of the reactors. Basis/Justification: References to support the size and discussion of the reactors is warranted.	References are needed to support the basis of the discussion on the reactors.	1	1-17/6-13	Accept	A paragraph listing the key references has been added at the beginning of section 1.2.2.	Yes - 7/2/2013
DH-22	Comment: The text states: "…was subsequently discharged to the river or to the vadose zone." Functionally, discharged is synonymous to disposed. Basis/Justification: Text clarification needed.	Possible wording: "…was subsequently discharged/disposed to the river or to the vadose zone."	1	1-17/16	No change	As noted, discharged is synonymous with disposed and is a typical term used to describe the activity.	Yes - 7/2/2013
DH-23	Comment: Provide references to support the descriptions and amount of cooling water used by the reactors. Basis/Justification: References to support the amount and discussions of the cooling water is warranted.	References are needed to support the basis of the discussion on the cooling water.	1	1-17-1-18/18-21 and 1-2	Accept	A paragraph listing the key references has been added at the beginning of section 1.2.2.	Yes - 7/2/2013
DH-24	Comment: Provide this reference in the Administrative Record, A Proposal for Liquid Sodium Dichromate Facilities for the 100-C and 100-D Areas, HW-27270. Basis/Justification: This document is not in the AR record and all references in this document should be incorporated into the administrative record.	This reference is needed in the Administrative Record since it presents the information when the change to solid to liquid sodium dichromate occurred.	1	1-21/15-16	Accept	The report has been placed in the AR and can be found at http://www5.hanford.gov/arpir/?content=findpage&AKey=0088899.	Yes - 7/2/2013
DH-25	Comment: Provide references to support the statement: "Shipments of 226.8 kg (500 lb) drums of solid sodium dichromate dihydrate were received and stored at the 185-D Building from 1955 until 1959. Basis/Justification: No reference supports the 1959 date. Documentation for the operation timeline for the chromium VI contamination at the various buildings is needed to support the conceptual site model.	References are needed to support the timeline to support the conceptual site model.	1	1-22/32-33	Accept	References added to HW-61789 and HW-61399, *Monthly Record Report* [s]. These are more accurate references to the Sodium Dichromate changes and can be found in the DDRS.	Yes - 7/2/2013
DH-26	Comment: Provide references to support the statement: "The shipments of bags and drums of solid sodium dichromate dihydrate were replaced with shipments of 70 wt% sodium dichromate water solutions beginning in 1959 and continued until D Reactor was shut down in 1967." No reference is provided that supports the 1959 date in this paragraph. Basis/Justification: Documentation for the operation timeline for the chromium VI contamination at the various buildings is needed to support the conceptual site model.	References are needed to support the timeline to support the conceptual site model.	1	1-22/38-39	Accept	References added to HW-61789 and HW-61399, *Monthly Record Report* [s]. These are more accurate references to the Sodium Dichromate changes and can be found in the DDRS.	Yes - 7/2/2013
DH-27	Comment: Provide references to support the statement: "Beginning in 1959, 70 wt% sodium dichromate solutions were transferred from the 185-D Building to the 183-DR inside storage tanks via underground piping." Basis/Justification: Documentation is needed for the operation timeline of the chromium VI start of sodium dichromate to support the conceptual site model.	References are needed to support the timeline to support the conceptual site model.	1	1-24/12-13	Accept	References added to HW-61789 and HW-61399, *Monthly Record Report* [s]. These are more accurate references to the Sodium Dichromate changes and can be found in the DDRS.	Yes - 7/2/2013
DH-28	Comment: Change "progress" to "process". Basis/Justification: The incorrect word progress is used that does not make sense as written.	Change the word "progress" to "process".	1	1-24/29	Accept	The text has been revised.	Yes - 5/2/2013
DH-29	Comment: Figures 1-24 and 4-67 indicate there is no hexavalent chromium contamination between the near-shore wells and the river. Cr+6 was detected at an aquifer tube sampled during the spring: 47-M (3.4 µg/L on 4/28/2011). Basis/Justification: The figure should be accurate.	The data should be added to the figure and the hexavalent chromium plume should be extended closer to the river at/near aquifer tube 47-M.	1	1-24	Accept with Modification	Text has been added to the section to clarify the data used for Figure 1-24. The caption and legend will be modified to indicate high river and the actual dates captured in the figure. "Spring" is actually high water, with data from May through July. Note that Figure 1-25 was also revised to reflect similar changes.	Yes - 7/17/2013

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DH-30	Comment: Figures 1-24 and 4-67 indicate there is no hexavalent chromium contamination between the near-shore wells and the river. Cr+6 was detected at aquifer tubes sampled during the spring: C6293 (8.1 µg/L on 9/22/2011) and AT-H-2-D (2.3 µg/L on 9/22/2011). Basis/Justification: The figures should be accurate.	The data should be added to the figure and the hexavalent chromium plume should be extended closer to the river at/near aquifer tubes C6293 and AT-H-2-D.	1 and 4	1-25	Accept with Modification	Text has been added to the section to clarify the data used for Figure 1-24. The caption and legend will be modified to indicate high river and the actual dates captured in the figure. "Spring" is actually high water, with data from May through July. Note that Figure 1-25 was also revised to reflect similar changes.	Yes - 7/17/2013
DH-31	Comment: Figures 1-25 and 4-66 indicate hexavalent chromium contamination reaches the river in several places. From HEIS, it is noted that during fall sampling, the aquifer tubes where specific conductance measurements were at or near160 µS/cm, there were no hexavalent chromium detections. As low specific conductance measurements typically indicate surface water, it is not surprising that Cr+6 were not detected except at these locations. On 10/5/2011, 49 µg/L was measured at well 199-D5-20; however, Figures 1-25 and 4-66 do not appear to include this data. Also, it appears Figures 1-25 and 4-66 use the average of measurements (e.g., 3 measurements [112, 106, and 77 µg/L] at well 199-D8-89 to depict 98.3 µg/L). However, neither the text nor the figure communicates this. Considering the low specific conductivity measurements at the majority of aquifer tubes (during higher river stage), Figures 1-25 and 4-66 Cr+6 plume concentrations should be drawn to clearly indicate uncertainty of Cr+6 concentrations between the near-shore wells and the river. Basis/Justification: Figures 1-25 and 4-66 Cr+6 concentrations should be accurate and uncertainty of Cr+6 concentrations between the near-shore wells and the river should be reflected. All relevant data should be included. For conservatism, the figure should use the highest concentrations measured during the season.	Include all relevant Cr+6 concentration observations. Cr+6 plume concentrations should be drawn to clearly indicate uncertainty of Cr+6 concentrations between the near-shore wells and the river (i.e., use dashes to delineate extent of plumes). For conservatism, the figure should use the highest concentrations measured during the season.	1 and 4	1-25 and 4-149	Accept with Modification	1. A plume may not show in locations where all the surrounding data are below detection. The plumes are graphical presentations and dashed lines will not be added. 2. The label for well 199-D5-20 appears to be covered. The figure was edited. Please note that the data were used for the figure. 3. Text will be edited to indicate that averages were used. 4. The variability associated with aquifer tubes is already described in the text (page 60, top of page).	Yes - 7/17/2013
DH-32	Comment: Rewrite sentence to read, "…, closed out sites meet applicable 1996 MTCA cleanup standards." Basis/Justification: Accuracy and not giving the impression of complying with current MTCA (2007).	Add "…1996 MTCA" to the sentence.	1	1-41/17-18	Accept	….1996 MTCA will be added to the text.	Yes - 7/2/2013
DH-33	Comment: This page (or the rest of the RI/FS) does not distinguish and clarify waste site Interim closeouts vs. Final closeouts. Clarification is needed to explain how waste sites were evaluated for compliance of 1996 MTCA for Interim actions, and where/how this RI/FS evaluated applicable waste sites meeting current 2007 MTCA cleanup values for Final actions under the Final ROD. Basis/Justification: Consistency and accuracy.	Add tables that list the interim cleanup values and the final cleanup values for each contaminant.	1	1-45	Accept with Modification	The information is provided and defined in Table 1-4. Tables 1-5 thru 1-8 show how site status applies to all waste site in 100-DH. Information applicable to the interim action ROD and RDR/RDA will be provided by reference. Insert on page 1-41, line 15, DOE/RL-96-17, Remedial Design Report/Remedial Action Work Plan (RDR/RAWP) for the 100 Area details the design and implementation of interim remedial action process. The RDR/RAWP, Table 2-1 provided interim soil clean-up values that are based on MTCA 1996. Final cleanup values based on MTCA 2007 are developed in chapter 6 and presented in Table 6-12.	Yes - 7/17/2013
DH-34	Comment: THIS NEEDS THE MOST CURRENT ECOLOGY POSITION/IMPLEMENTATION OF As/Pb CLEANUP STANDARDS. Basis/Justification: Consistency and accuracy.	Update language to accommodate Ecology's official position on regulating As at the Hanford Site.	2	2-52 and 2-53/last para on 2-52 and first para 2-53	Accept with Modification	Text was revised to reflect guidance in June 11, 2013 Ecology memo.	Yes - 7/17/2013
DH-35	Comment: The text states: "Figure 1-26 shows that the 100-D Cr(VI) trend splits (southern plume)." The sentence is unclear. If the sentence is describing the bifurcation of the plume, it is recommended the word "plume" be used. Basis/Justification: Clarification needed.	Possible wording: "Figure 1-26 shows that the 100-D Area southern Cr(VI) plume splits ."	1	1-53/3-4	Accept	Text revised.	Yes - 5/2/2013
DH-36	Comment: The text states: "Even though the former HR-3 and DR-5 groundwater pump-and-treat systems were deemed undersized, it is clear from the trend plots accompanying Figures 1-26 through 1-28 that they reduced Cr(VI) concentrations in the unconfined aquifer." Figure 1-26 provides trend plots for wells Group 3 which clearly show declining Cr+6 observations. From Base map A-1, it appears Group 3 wells are located closest to 100-D-100 waste site. Considering when source removal began, the declining Cr+6 concentrations may largely be due to source removal rather than the effectiveness of the pump-and-treat systems. The text should acknowledge field remediation and source removal as possibly being the majority of the explanation for the declining Cr+6 observations. Basis/Justification: Accuracy and context.	The text should acknowledge field remediation and source removal as possibly being the majority of the explanation for the declining Cr+6 observations.	1	1-53/8-11	Accept	Text was added to indicate that source area remediation is a contributor to reduced Cr(VI) concentrations.	Yes - 5/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-37	Comment: The text states: "Even though the former HR-3 and DR-5 groundwater pump-and-treat systems were deemed undersized, it is clear from the trend plots accompanying Figures 1-26 through 1-28 that they reduced Cr(VI) concentrations in the unconfined aquifer." Figure 1-26 provides trend plots for wells Group 4 which clearly show inclining Cr+6 observations. From base map A-1, it appears Group 4 wells are located downgradient of the 100-D-100 waste site. Considering source removal, the size of the remediation excavation, and the mobility of Cr+6, the inclining Cr+6 concentrations are likely due to open excavation conditions at 100-D-100. The text should acknowledge localized areas in the plume where Cr+6 are inclining (i.e., are the exception) and provide an explanation, if available. Basis/Justification: Accuracy and context.	The text should acknowledge localized areas in the plume where Cr+6 are inclining (i.e., are the exception) and provide an explanation, if available.	1	1-53/8-11	Accept with Modification	Text was added to indicate that concentrations increased in some wells. This is likely due to the effect of extraction and injection well placement.	Yes - 5/2/2013
DH-38	Comment: Figures 1-24 and 4-67 indicate there is no hexavalent chromium contamination between the near-shore wells and the river. Cr+6 was detected at two aquifer tubes sampled during the spring: Redox 1-6.0 (88.4 µg/L on 4/26/2011) and Redox 2-6.0 (13 µg/L on 4/26/2011). Basis/Justification: The figure should be accurate.	The data should be added to the figure and the hexavalent chromium plume should be extended to the river at/near Redox 1-6.0 and Redox 2-6.0 aquifer tubes.	1	1-55 and 4-150	Accept with Modification	Text has been added to the section to clarify the data used for Figure 1-24. The caption and legend will be modified to indicate high river and the actual dates captured in the figure. "Spring" is actually high water, with data from May through July. Note that Figure 1-25 was also revised to reflect similar changes.	Yes - 7/17/2013
DH-39	Comment: Figures 1-24 and 4-67 indicate there is no hexavalent chromium contamination between the near-shore wells and the river. During spring sampling, many specific conductance measurements were at or near160 µS/cm. These measurements typically indicate surface water. As such, it is not surprising that Cr+6 was not detected except at 2 locations. Although only a cursory comparison was made, the following HEIS data are not consistent with concentrations presented on Figures 1-24 and 4-67: • On 3/7/2011, 12 µg/L was measured at well 199-D8-54A; however, Figures 1-24 and 4-67 indicate 4 µg/L (i.e., no Cr+6 plume) • On 3/7/2011, 16 µg/L was measured at well 199-D8-53; however, Figures 1-24 and 4-67 indicate 6 µg/L (i.e., no Cr+6 plume) • On 3/14/2011, 174 µg/L was measured at well 199-D4-39; however, Figures 1-24 and 4-67 indicate 66.7 µg/L (i.e., mustard yellow rather than yellow plume concentration) • On 3/14/2011, 280 µg/L was measured at well 199-D8-88; however, Figures 1-24 and 4-67 indicate 198.5 µg/L • On 3/14/2011, 28 µg/L was measured at well 199-D8-90; however, Figures 1-24 and 4-67 indicate 25.5 µg/L • On 3/14/2011, 32 µg/L was measured at well 199-D8-91; however, Figures 1-24 and 4-67 indicate 20.3 µg/L • On 3/14/2011, 159 µg/L was measured at well 199-D8-73; however, Figures 1-24 and 4-67 indicate 67.3 µg/L (i.e., mustard yellow rather than yellow plume concentration) • On 3/15/2011, 271, 345, and 269 µg/L were measured at well 199-D8-88; however, Figures 1-24 and 4-67 indicate 198.5 µg/L • On 3/22/2011, 96.8 and 95.2 µg/L were measured at well 199-D8-89; however, Figures 1-24 and 4-67 indicate 34.7 µg/L (i.e., blue rather than mustard yellow plume concentration) • On 4/4/2011, 10 µg/L was measured at well 199-D8-54A; however, Figures 1-24 and 4-67 indicate 4 µg/L (i.e., no Cr+6 plume) • On 4/4/2011, 16 µg/L was measured at well 199-D8-53; however, Figures 1-24 and 4-67 indicate 6 µg/L (i.e., no Cr+6 plume) • On 4/4/2011, 81 µg/L was measured at well 199-D8-89; however, Figures 1-24 and 4-67 indicate 34.7 µg/L (i.e., blue rather than mustard yellow plume concentration) • On 4/4/2011, 155 µg/L was measured at well 199-D8-73; however, Figures 1-24 and 4-67 indicate 67.3 µg/L (i.e., mustard yellow rather than yellow plume concentration) • On 4/4/2011, 155 µg/L was measured at well 199-D4-39; however, Figures 1-24 and 4-67 indicate 66.7 µg/L (i.e., mustard yellow rather than yellow plume concentration)	Depict the highest Cr+6 concentration values. Cr+6 plume concentrations should also be drawn to clearly indicate uncertainty of Cr+6 concentrations between the near-shore wells and the river (i.e., use dashes to delineate extent of plumes).	1 and 4	1-55 and 4-150	Accept with Modification	Text has been added to the section to clarify the data used for Figure 1-24. The caption and legend will be modified to indicate high river and the actual dates captured in the figure. "Spring" is actually high water, with data from May through July. Note that Figure 1-25 was also revised to reflect similar changes.	Yes - 7/17/2013
DH-39 (Cont'd)	• On 4/26/2011, 59.6 µg/L was measured at well 199-D8-5; however, Figures 1-24 and 4-67 indicate 43.5 µg/L (i.e., blue rather than mustard yellow plume concentration) • On 5/10/2011, 131 µg/L was measured at well 199-D8-73; however, Figures 1-24 and 4-67 indicate 67.3 µg/L (i.e., mustard yellow rather than yellow plume concentration) • On 5/10/2011, 117 µg/L was measured at well 199-D4-39; however, Figures 1-24 and 4-67 indicate 66.7 µg/L (i.e., mustard yellow rather than yellow plume concentration) If the spring concentrations were averaged, neither the figure nor text indicate this. Also, it is noted that there are a number of averages (or inaccuracies) that have caused the plume concentration to be lower as depicted on Figures 1-24 and 4-67 (e.g., mustard yellow rather than yellow plume concentration, blue rather than mustard yellow plume concentration, no Cr+6 plume, etc.). For purposes of communicating the highest Cr+6 observations, it is recommended that observations not be averaged. In this way, the most conservative plume configuration for the season will be depicted. Also, considering the low specific conductivity measurements at the majority of aquifer tubes (during higher river stage), Figures 1-24 and 4-67 Cr+6 plume concentrations should be drawn to clearly indicate uncertainty of Cr+6 concentrations between the near-shore wells and the river. Basis/Justification: Figures 1-24 and 4-67 should communicate the highest Cr+6 concentrations (i.e., concentrations should not be averaged), should be accurate, and should clearly communicate uncertainty of Cr+6 concentrations between the near-shore wells and the river.							

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-40	Comment: Page 1-54 includes the following statements about Columbia River pore water studies: "These studies showed Cr(VI) values above the AWQC at several river sites opposite the reactor areas during very low river stage. Although the majority of the sites did not show Cr(VI) above detection limits, values up to 331 µg/L and 46 µg/L were observed for the D and H areas, respectively." Similarly, the following statements are included: "Cr(VI) concentrations ranged from not being detected at many sample locations to a maximum of 632 µg/L." Later in the same section, it is explained that "Data are used to evaluate effectiveness of upgradient treatment systems, such as groundwater pump-and-treat systems and permeable reactive barriers, and to quantify contaminant entry into the river." Neither Figure 1-24 nor 1-25 indicate the locations in the river where Cr+6 was observed above remedial action goals. Figure 1-24 can be interpreted to indicate that Cr+6 concentrations above10 µg/L are not reaching the river. Similarly, Figure 1-25 can be interpreted to indicate that Cr+6 concentrations above 10 µg/L are reaching the river only at 2-3 locations. Basis/Justification: Accuracy and completeness.	On Figures 1-24 and 1-25, include the locations in the river where Cr+6 were observed above remedial action goals. Also, from those observations, infer shoreline locations where Cr+6 concentrations above10 µg/L could be (or are likely) reaching the river.	1	1-55 and/or 1-56/Figs 1-24 and/or 1-25	No change	Recent pore water studies were conducted from 2008 to 2010 for the entire River Corridor, including 100-D/H (Field Summary Report for Remedial Investigation of Hanford Site Releases to the Columbia River, Hanford Site, Washington: Collection of Surface Water, Pore Water, and Sediment Samples for Characterization of Groundwater Upwelling [WCH-380, Rev. 1]. These studies showed Cr(VI) values above the AWQC at several river sites opposite the reactor areas during very low river stage. Although the majority of the sites did not show Cr(VI) above detection limits, values up to 331 µg/L and 46 µg/L were observed for the D and H areas, respectively. The sample locations and detailed results for the pore water study are provided in Chapter 2 of this RI/FS report. Section 2.1.7 discusses the previous study and Figures 2-5 through 2-8 present the sample locations from the previous investigations mentioned. Figures 1-24 and 1-25 represent conditions post Interim Action P&T enhancement to show the dramatic effect of the P&T system on Columbia River protection. Historic Cr(VI) values indicated levels exceeding regulatory limits and the Figures representing 2011 monitoring results indicate a substantial improvement to historic exceedances. In addition, data are provided on the figures 1-24 and 1-25 indicating where exceedances are present.	Yes - 7/2/2013
DH-41	Comment: Figure 1-25, the plume designated at well 199-H4-82 appears to be based on an average. Because measurements on 11-29-2012 and 10-28-2012 were above 20 µg/L, the average of the fall measurements appears to be above 20 µg/L, there are no other wells in the vicinity that indicate plume concentration between 10 and 20 µg/L, and because it is appropriate to conservatively reflect information, the 20-48 µg/L plume designation should be indicated at well 199-H4-82, thus connecting the 20-48 µg/L plumes in that vicinity. Basis/Justification: Accuracy.	The 20-48 µg/L plume designation should be indicated at well 199-H4-82, thus connecting the 20-48 µg/L plumes in that vicinity.	1	1-56	No change	While we agree that the data at that well location could be mapped as having higher values, the methodology used in creating the plumes had consistent weighting for all well location. The combination of extraction well 199-H4-82 and injection wells 199-D7-5 are creating an area of lower concentrations in that area.	Yes - 7/2/2013
DH-42	Comment: Figure 1-25 shows Cr+6 plume depictions across the Horn for fall of 2011. However, there do not appear to be Cr+6 measurements at 699-95-45 (last sampled 5/17/2010), 699-94-43 (last sampled 3/18/2010), 699-97-45 (last sampled 5/17/2010), 699-93-48A (last sampled 10/9/2009), 699-94-41 (last sampled on 11/6/2008), 699-95-48 (last sampled on 10/9/2009), 699-98-46 (last sampled on 11/7/2008), 199-H4-79 (only sampled once on 9/21/2010), 699-90-45 (last sampled on 5/17/2010), 699-91-46A (last sampled on 11-30-2009), 699-99-44 (last sampled on 11-30-2009), etc. collected during the fall of 2011. The figure should clearly indicate that the majority of the Horn plume depiction is based on older observations. Basis/Justification: Accuracy.	The figure should clearly indicate that the majority of the Horn plume depiction is based on older observations. Consider the use of dashed lines or fading plume boundaries. Also, consider including information in the figure's key that communicates why dashed lines or fading plume boundaries have been used.	1	1-59	Accept with Modification	Only data from the last 3 years was used in developing plume maps. The process is described in ECF-Hanford-12-0075, Rev 0. Wells indicated in the comment were almost all sampled in 2011, as indicated by the symbol used on the figure (see legend). Well 199-H4-79 was sampled one time in 2010 and that data is used and the date of the sample is indicated by the symbol used. Well 699-90-45 was sampled only once in 2011, and that data was used in the figure, as indicated by the symbol used. Legend includes an indicator of when the sample was collected, by year. Text has been added to the section to clarify the data used for Figure 1-25. The caption and legend will be modified to indicate low river and the actual dates captured in the figures. "Fall" is actually low water, with data from October and November.	Yes - 7/17/2013
DH-43	Comment: Figure 1-28 shows Cr+6 plume depictions and trend plots across the Horn. However, there do not appear to be recent Cr+6 measurements at 699-95-45 (last sampled 5/17/2010), 699-94-43 (last sampled 3/18/2010), 699-97-45 (last sampled 5/17/2010), 699-93-48A (last sampled 10/9/2009), 699-94-41 (last sampled on 11/6/2008), 699-95-48 (last sampled on 10/9/2009), 699-98-46 (last sampled on 11/7/2008), 199-H4-79 (only sampled once on 9/21/2010), 699-90-45 (last sampled on 5/17/2010), 699-91-46A (last sampled on 11-30-2009), 699-99-44 (last sampled on 11-30-2009), etc. The figure should be revised to clearly indicate that the Horn portion of the plume depiction is primarily based on 2009 and 2010 data. Basis/Justification: Accuracy, completeness, and clarification.	The figure should be revised to clearly indicate that the Horn portion of the plume depiction is primarily based on 2009 and 2010 data.	1	1-59	No change	Only data from the last 3 years was used in developing plume maps. Wells indicated in the comment were almost all sampled in 2011, as indicated by the symbol used on the figure (see legend on Figure 1-24 and 1-25). Well 199-H4-79 was sampled one time in 2010 and that data is used and the date of the sample is indicated by the symbol used on Figures 1-24 and 1-25. Well 699-90-45 was sampled only once in 2011, and that data was used in the figure, as indicated by the symbol used. Legend includes an indicator of when the sample was collected, by year. The figure shows the plume as a backup for the trend plots, which are the important feature. No change made.	Yes - 7/17/2013
DH-44	Comment: Cite any documentation related to the biostimulation studies including treatability test plans or other similar documents. The reader should not have to go to Appendix B to find documentation for this study. Basis/Justification: Supporting documentation is needed in this section.	Provide documentation for the biostimulation study.	1	1-64/6-13	Accept	A reference to the PNNL biostimulation treatability test results report was added to this paragraph.	Yes - 5/2/2013

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DH-45	Comment: This sentence, "A series of modifications starting in CY 2000, and ending in CY 2010 added five extraction wells to the system." does not seem to reflect all the wells that were installed over this period of time (11 years) and is currently being used under 100-HX and 100-DX system. Reference and specify the pump and treat system (100-HR-3 or 100-DR-5) discussed in this sentence and section for clarity to the reader. Basis/Justification: Unclear what system is being referred to and covers a lot of time when other activities were ongoing.	See comment.	1	1-65/9-10	Accept with Modification	Added system identifier. Later in the section, the full RPO expansion and installation of the DX and HX systems, which added 70 wells, is discussed. The paragraph being referred to is giving history on the DR-5 and HR-3 systems. No additional change to text.	Yes - 5/2/2013
DH-46	Comment: Explain how DOE is planning for the cost to implement these five tasks? Basis/Justification: Based on budget constraints and the importance to change extraction and injection locations based on contaminant plume migration, additional information and discussion of obtaining budget to provide for these changes is required.	See comment.	1	1-65/34-42	Not Accepted	A description of DOE's process for obtaining the budget for work on the Hanford Site is not appropriate to be included in the RI/FS document.	Yes - 7/2/2013
DH-47	Comment: The text states: "It is anticipated that the DX pump-and-treat system will maintain separation of the 100-D northern and southern plumes, and operation will remain flexible downstream from the ISRM barrier to enable extraction (initially) or injection (eventually)." The text is silent about preventing the northern plume's migration across the Horn. From Figure 1-32, there are a number of extraction wells placed between the northern plume and the rest of the Horn which appear to be placed to prevent the northern plume's migration across the Horn. It is requested the text identify if it is anticipated that the DX pump-and-treat system will be operated to prevent the northern plume's migration across the Horn. Basis/Justification: Pump-and-treat remediation optimization and completeness.	It is requested the text identify if it is anticipated that the DX pump-and-treat system will be operated to prevent the northern plume's migration across the Horn.	1	1-66/30-33	Accept with Modification	Text was modified to address the Horn plume. Text related to the northern and southern D area plumes will be edited for accuracy. Plumes have not been maintained as separate due to the reduced leakage from the 182-D Reservoir.	Yes - 5/2/2013
DH-48	Comment: The text states: "Groundwater data needs were met by collecting one groundwater sample from each new well and analyzing for Cr(VI), anions, metals, tritium, technetium-99, and strontium-90." The text speaks to data gaps that were identified in the RI/FS workplan. Because the text speaks to anticipated operation of remediation systems, the text should acknowledge anticipated new data gaps (e.g., Cr+6 near-shore concentrations [what are they?], extent of Cr+6 contamination in the confined aquifer, Cr+6 plume configuration across the Horn, etc.). Basis/Justification: Completeness by acknowledging that since the expansion of the pump-and-treat system and the RI/FS investigation, new data gaps now exist.	Because the text speaks to anticipated operation of remediation systems, the text should acknowledge anticipated new data gaps (e.g., Cr+6 near-shore concentrations [what are they?], extent of Cr+6 contamination in the confined aquifer, Cr+6 plume configuration across the Horn, etc.).	1	1-66/26-27	No change	The section in the text is describing past activities, such as the RPO expansion. The reference to filling a data need is specific to that effort. The current nature and extent, including uncertainties, are discussed in Chapter 4 (multiple sections).	Yes - 7/2/2013
DH-49	Comment: The text states that groundwater is currently extracted, treated by ion exchange, and reinjected into the unconfined aquifer. However, the text does not identify what the groundwater is treated for. For completeness, identify that the groundwater is treated for Cr+6 and for any other contaminants that it is treated for. If the groundwater is not treated for other contaminants (e.g., nitrate, etc.), the text should identify if it is anticipated if the pump-and-treat system will be modified to treat additional contaminants. Basis/Justification: Clarification and completeness.	Identify that the groundwater is treated for Cr+6 and also identify if the groundwater is treated for any other contaminants. If the groundwater is not treated for other contaminants (e.g., nitrate, etc.), the text should identify if it is anticipated if the pump-and-treat system will be modified to treat additional contaminants.	1	1-66/36	Accept with Modification	Text was modified to clarify. Future adjustments to the system are discussed in the FS section of the report.	Yes - 5/2/2013
DH-50	Comment: "The HR-3 ion exchange treatment plants have been placed on cold standby status for possible future use to treat hot spots or for other special applications." Basis/Justification: Explain what non-operating HR-3 and DR-5 pump-and-treat systems might be used for at a later date.	Describe further what 'other special applications' might mean in this context, or refer to another section in document that provides an explanation.	1	1-69/4	Accept with Modification	Text referring to future uses was deleted.	Yes - 5/2/2013
DH-51	Comment: The text states: "The ISRM barrier will continue to provide a measure of conversion to Cr(III) until the amendments are exhausted." The text also indicates that new DX extraction wells were installed downgradient from the barrier to treat this area. The text should identify if it is anticipated that after the amendments are exhausted, whether any of the ISRM wells will be converted to extraction or injection wells to act as a barrier against Cr+6 migration toward the river. Basis/Justification: Clarification and completeness.	The text should identify if it is anticipated that after the amendments are exhausted, whether any of the ISRM wells will be converted to extraction or injection wells to act as a barrier against Cr+6 migration toward the river.	1	1-69/21-22	Not Accepted	It is not appropriate to discuss future remedial enhancements in this section of the RI/FS. Chapter 1 provides the history of the ISRM barrier. Design modifications to the pump and treat system are discussed in the FS and details will be included in the RD/RA work plan.	Yes - 7/2/2013
DH-52	Comment: State that there have been three 5-year reviews conducted at the time of the report. Basis/Justification: Current text in the first and last paragraphs in the section do not agree on whether two or three 5-year reviews have been conducted. The Third CERCLA Five-Year Review Report for the Hanford Site (DOE/RL-2011-56 Rev. 1, which was published in March of 2012.	Make the first and last paragraphs both reflect that three 5-year reviews have been conducted.	1	1-73/24	Accept	The text has been revised.	Yes - 7/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-53	Comment: Provide the issues and actions identified in the third 5-year review document (DOE/RL-2011-56, Rev. 1). These issues reflect current level of understanding. Basis/Justification: The most current information provides insights into how the interim ROD is being met.	Add the issues and actions taken in the 5-year review report to provide how the IROD for 100-HR-3 is being fulfilled.	1	1-73-1-74/S. 1.2.5, entire section	Accept	The text has been revised to incorporate the issues and actions.	Yes - 7/2/2013
DH-54	Comment: "There were no issues identified for the 100-D/H Area." This is an incorrect statement. Two issues were identified for 100-D Area associated with Issue 2 and Issue 3. Modify the text to include these two issues and their associated actions. Basis/Justification: Statement is incorrect as written. Two issues were identified in the Third Five-Year Review Report (DOE/RL-2011-56, Rev. 1)	Two issues were identified. One was the following: Recent data indicates a low spot in the surface of the Ringold Upper Mud in the 100-HR-3 OU that may trap hexavalent chromium in the aquifer, which in combination with a likely continuing vadose source of hexavalent chromium at the adjacent 100-D-100 waste site results in persistent hexavalent chromium concentrations in groundwater southeast of the 182-D Reservoir. The second issue was: Leakage and spills from the 182-D Reservoir and export water system may contribute to movement of contaminants into the vadose zone.	1	1-74/36	Accept	The text has been revised to incorporate the issues and actions.	Yes - 7/2/2013
DH-55	Comment: Data Gap 6 discusses the Integrated Work Plan task for evaluating and developing an approach to obtain data that will demonstrate compliance with ambient water quality criteria in the river; however, there is no discussion of any activity or results from this task in the "Work Conducted" section. Basis/Justification: This task was a requirement of the Integrated Work Plan (DOE/RL-2008-46) and is needed to propose a method for demonstrating compliance in the Record of Decision and related Remedial Action Work Plan.	Discuss actions taken and/or schedule on this task or justification for not fulfilling the work plan requirement.	2	2-5	Accept	New Section (2.1.7.1) was added describing the actions taken to address Data Gap 6 (e.g., aquifer tube monitoring, upwelling sampling, DOE-RL's goal to prevent groundwater COCs from entering the river, and identifying basic research findings regarding groundwater-river interactions in the hyporheic zone and how they relate to AWQC compliance in the Columbia River).	Yes - 4/14/2014
DH-56	Comment: Perform characterization for the D-Island to determine levels of contaminants present and appropriate remedial actions to mitigate these contaminants. Basis/Justification: No characterization of soil samples or the D and DR effluent pipeline samples from the lines on the D-Island were able to be obtained due to high River stage. Yet, Figure 1-16 shows that these pipelines diverted waste effluents out to the Columbia River and they are likely contaminated.	Perform characterization for the D-Island to determine levels of contaminants present and appropriate remedial actions to mitigate these contaminants.	2	2-25/35-36	Justification Added	Characterization of D-Island was performed prior to the remedial investigation. Additional text was added to describe previous characterization activities. The pipelines are addressed in section 6.4.3.	Yes - 8/7/2013
DH-57	Comment: The final bullet seems to be out of place in this list. Basis/Justification: Items listed are controlling documents, except for the final entry, which is a description.	Remove final bullet from list or modify text to clarify.	2	2-34/7	Accept	Text was revised. The ideas from the bullet were inserted into the text.	Yes - 5/2/2013
DH-58	Comment: The heading for the Legend of Figure 2-11 is entitled "Fall 2009 Hexavalent Chromium". However, the listed contaminant ranges are shown to be for "Cr". Provide specificity on which type of chromium is being presented in the table. For technical accuracy, it should either be "Chromium (Total)" or "Cr(VI)".	Provide specificity on which type of chromium is being presented in the table. For technical accuracy, it should either be "Chromium (Total)" or "Cr(VI)".	2	2-35/ Fig 2-11	Accept	The legend was updated to reflect that the figure represents Cr(VI) data. Note that the figure was also updated to reflect more recent data.	Yes - 7/17/2013
DH-59	Comment: The Nonradionuclides section of Table 2-9 lists "Molybdenum Nickel". The two analytes should be separated.	Separate Molybdenum and Nickel.	2	2-39/ Table 2-9	Accept	The comment has been incorporated as suggested.	Yes - 5/2/2013
DH-60	Comment: It is unclear why the below ground structure of the fuel storage basins at D and H would have different actions (1 remains, 1 has been removed). Basis/Justification: Clarity needed.	Clarify if the difference between 118-H-6:3 and 118-D-6:3 are due to different remediation (and why) or because the D Fuel Storage Basin has not yet been remediated.	2	2-41/5	Accept	Revised text to include clarification.	Yes - 5/2/2013
DH-61	Change "two borehole summary reports" to "three borehole summary reports" to match the bulleted borehole summary reports listed. Basis/Justification: Sentence reads, "The following two borehole summary reports contain the borehole logs, detailed sampling summary, well summary sheets, and the final survey data:"	Incorrect number of reports identified; change to correct number of three.	2	2-53/10-11	Accept	The comment will be incorporated as suggested.	Yes - 5/2/2013

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DH-62	Comment: Elaborate and include the basic understanding of the site conceptual model incorporating the following major points: • Aquifer thickness map incorporating the highest water level data • Understanding of the basic conceptual model incorporating available information on deep scouring surface in the Ringgold formation and its implication on the fate and transport of contaminants-especially on Cr. • Movement of contaminants from Hanford Formation to the underlying less transmissive Ringgold Formation (ref. Chapter 3) • Continuity of various transmissive zone in the RUM with diagrams • Incorporation of actual field observation on the extent of the impact of Columbia River fluctuations in terms flow and transport of groundwater, contaminants, etc. (e.g. Chapter 3). Basis/Justification: Clarity and accuracy.	Add the recommended analysis per the comments.	3, 4, 5, 10, and Appendix F	General	Accept with Modification	Note that response has been revised to add more information and point to existing sections of the RI/FS report. (1) Figures showing unconfined aquifer thickness during high and low water added. (2) Text has been expanded in Chapter 3 to describe the RUM surface in more detail, however several paragraphs already exist on that topic. Text in Section 4.5.1.1 already includes information on the topic of how the RUM surface affects contaminant movement. Also, additional text on the effect of this on fate and transport has been added to Chapter 4 (Section 4.5.1.3). (3) Text on the mechanism for movement of contaminants to the RUM aquifer is already present in Section 3.7.4 and 4.5.1.3 (4) Text was added to clarify, consistent with the response to DH-67. (See DH-67 text changes) (5) The model includes this discussion, as presented in section 3.3.1 and 5.8.1.6. Section 3.7.2 and 4.4.1 discusses the impact of the river.	Yes - 4/8/2014
DH-63	Comment: Provide more information on which organization measures and records the Columbia River stage hourly at 100-D and 100-H or provide a reference for the data. Basis/Justification: Statement needs citation or acknowledgement to the organization that is collecting the data for DOE.	See comment.	3	3-7/35	Accept with Modification	Text will be modified to identify DOE as the organization that maintains the measurements (through use of contractors).	Yes - 5/6/2013
DH-64	Comment: Provide the months that highest discharge rates typically occur in the Columbia River. Basis/Justification: The discharge rates support the timing of high river stage and low river stage sampling activities. Associated time range of occurrence supports these aquifer tube sampling efforts.	See comment.	3	3-7/40	Accept	Months when high river stage occurs will be added.	Yes - 5/2/2013
DH-65	Comment: Provide June for Figure 3-2. Since high river stage occurs usually in June, this month will aid in understanding when high river stage does occur. Basis/Justification: Provides a clearer understanding when significant events occur.	See comment.	3	3-8/ Figure 3-2	Accept	While the figure currently includes June, it was modified to show when exactly that timeframe falls on the graphic.	Yes - 7/1/2013
DH-66	Comment: Rewrite this sentence or clarify what is meant by "Additional documents are listed in Appendix B and Chapter 11, References. Basis/Justification: Additional documents are not typically found in the reference section without first being cited.	Clarity to why additional documents are listed in the Reference Section without first being cited, unless the citation is in Appendix B.	3	3-10/40	Accept	Text was edited to clarify.	Yes - 5/2/2013
DH-67	Comment: Figure 3-3 indicates the transmissive silty sand layer in the RUM is not connected under the D Area or under the H Area. Well summary sheets included in SGW-49912-Rev. 0 for the two deep boreholes in the D Area indicate there is a "gravely sandy silt" and "gravely silt" layer occurring at 199-D5-134 (131.5 – 158.0 feet below ground surface) and at 199-D5-141 (160.5 – 175.0 feet below ground surface) respectively. As such, Figure 3-3 should indicate the occurrence of a transmissive layer in the RUM under the D Area may be interpreted to be continuous. Well summary sheets included in SGW-49912-Rev. 0 for the three deep boreholes in the H Area indicate there is a "silty sand", a "sand", and a ""sand" layer occurring at 199-H2-1 (86-97 feet below ground surface), 199-H3-9 (76-97 feet below ground surface), and at 199-H3-10 (98-114 feet below ground surface) respectively. As such, figure 3-3 should indicate the occurrence of a transmissive layer in the RUM under the H Area may be interpreted to be continuous. The extent of the silty sand/sand layer beneath the H Area is particularly important because the confined aquifer (from yielding horizons in the RUM) is contaminated (Cr+6). Confirm if the deep boreholes that extend to a transmissive (silty sand/sand) layer in the RUM have all encountered the same layer at approximately the same depth beneath the H Area. Basis/Justification: Accuracy of figure and CSM clarification.	1. Confirm if the deep boreholes that extend to the gravely sandy silt and gravely silt layer in the RUM have all encountered the same layer at approximately the same depth beneath the D Area. If so, modify Figure 3-3 to indicate the transmissive layer is continuous under D. 2. Confirm if the deep boreholes that extend to the silty sand and sand layer in the RUM have all encountered the same layer at approximately the same depth beneath the H Area. If so, modify Figure 3-3 to indicate there is also a transmissive layer under H that is continuous. 3. Revise the text, where applicable, to describe what may be interpreted as continuous transmissive layers occurring beneath D and H Areas (even if they aren't the same transmissive layer). Also, as necessary, revise the conceptual site model to identify that additional information is needed at depth to determine the extent of the Cr+6 contamination in the confined aquifer beneath the H Area.	3	3-11	Accept with Modification	(1.) The continuity of the first water bearing unit within the RUM has not been established. The elevation of the various layers will be evaluated, however, we know that the RUM surface is undulating and a consistent elevation alone does not adequately eliminate the uncertainty regarding a hydraulic connection across an area. The project is working to obtain information to eliminate this uncertainty in areas where contamination is present. The section on geochemistry (Section 3.7.6) further discusses the water bearing units in the RUM. Figure 3-3 is a generalized geology and is not being edited. (2.) See answer to item 1. (3.) Text will be added to clarify to potential for the units to be connected, or isolated. See also section 3.7.6 on geochemistry, and Section 3.7.4 aquifer interconnections. Regarding extent of contamination, no contamination was found in the deep boreholes and so the wells were completed in the first water bearing unit of the RUM, as per the work plan.	Yes - 7/1/2013
DH-68	Comment: Remove this bullet since Ringold Formation Unit C (sand and gravel) is not in 100-D/H Area. Basis/Justification: This unit is not located or is not known to be present in 100-D/H. See page 3-16, line 32.	See comment.	3	3-12/2	Accept with Modification	The Ringold Formation unit C may be thin in 100-D. This is clarified later in the chapter (Section 3.4.2.4). No change in this location.	Yes - 8/7/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-69	Comment: Discuss the Hanford H1 unit (gravel dominated) and Hanford H2 unit (sand dominated) in more detail since it is present throughout the region. Basis/Justification: These units deserve more discussion since they form the unconfined aquifer in the horn area and 100-H and to a lesser degree in 100-D.	Discussion of the black and white sands of the Hanford sand dominated unit along with the gravelly nature that would allow for more infiltration than silty sands and silts of the Surface deposits needs to be discussed..	3	3-13/24-30	Accept with Modification	Additional discussion on the Hanford units and surface deposits was added. Infiltration rates, represented as recharge (which is net infiltration) is represented in modeling of the vadose zone for development of SSL and PRG values as function of surface soil types and vegetation cover prevalent in the 100-D/H area, are presented in Chapter 5 (Section 5.4.1, Surface Cover, Infiltration, and Recharge).	Yes - 7/2/2013
DH-70	Comment: Unit C of Ringold has not been found in 100-D/H. Change "units" to unit and remove "and C" from the text. Basis/Justification: This unit is not located or is not known to be present in 100-D/H. See page 3-16, line 32.	See comment.	3	3-14/46	Accept with Modification	Text edited to clarify that unit C is described as either thin or absent at 100-D (WHC-SD-EN-TI-011), but has not been identified in borehole logs.	Yes - 5/2/2013
DH-71	Comment: The sentence reads, "Beneath 100-D/H, the Ringold Formation does not contain all of the commonly encountered stratigraphic units found elsewhere across the Hanford Site." Which units are missing or not known to exist in 100-D/H? List the units that are in 100-D/H. Basis/Justification: Clarify which units are missing.	See comment.	3	3-15/2	Accept	Text was edited to clarify which units are present or absent at 100-D/H. Reference was added.	Yes - 5/2/2013
DH-72	Comment: Editorial – Place a hyphen between "fine" and "grained" to read "fine-grained"	See comment.	3	3-15/6	Accept	Text changed.	Yes - 5/2/2013
DH-73	Comment: Provide a numerical range for the hydraulic conductivities from information presented in Section 3.6.1. Basis/Justification: Understanding of the numerical range being discussed, instead of "low" to "high" is not informative. This numerical range would provide a better understanding of the range being discussed.	Justification through numbers of what is "low" and what is "high" for the hydraulic conductivities is needed.	3	3-15/29	Accept	A numeric range provided for the appropriate material types.	Yes - 7/1/2013
DH-74	Comment: Remove parenthesis from around "Figure 3-4", to read "RUM is presented on Figure 3-4. Basis/Justification: No parenthesis is needed.	See comment.	3	3-15/35	Accept	The parenthesis were removed.	Yes - 5/2/2013
DH-75	Comment: Please provide this sentence back on p. 3-15 line 2. Basis/Justification: First place the discussion of missing units in the Ringold Formation.	See comment.	3	3-16/32-33	Accept with Modification	The information was added to the location suggested. Ringold Formation unit C has not been found, but may be present as a very thin layer (WHC-SD-EN-TI-011).	Yes - 5/2/2013
DH-76	Comment: Please add the following to this figure: Wells 199-D5-134, 199-D5-140, 199-D8-89, 199-D3-5, and the D and DR Reactors on the figure. Basis/Justification: Since discussions of these wells and the reactors are being discussed in relation to the RUM surface, these units will help the reader better understand the information presented on the figure and text.	Aid the reader in the clarity of the message.	3	3-17/ Figure 3-4	Accept with Modification	Wells that were installed during the RI are shown in red. Waste sites, including the reactors, are also present on the figure. As those items are not the focus of the figure, they are not called out specifically. The focus is the undulating RUM surface. Added text to reference Figures 4-66 and 4-67. Edited text to clarify the condition being discussed.	Yes - 9/9/2013
DH-77	Comment: Editorial comment. Please use different colors for the hexavalent chromium plume, the white color is difficult to see. Basis/Justification: Change color code for easy viewing.	See comment.	3	3-17/ Figure 3-4	Accept	Figure was edited to show plume more clearly.	Yes - 9/9/2013
DH-78	Comment: Please provide where the hydrogeologic cross sections, surface contour maps, and isopach maps of 100-D/H are presented. Basis/Justification: Statement is made that they are presented but no reference is made where in the document they can be found.	Parenthetical reference to the location for the hydrogeologic cross sections, surface contour maps and isopach maps of 100-D/H.	3	3-19/14-15	Accept with Modification	Cross sections are presented in Appendix M. Surface contours and an isopach map are present within the chapter (see Figures 3-1, 3-4, 3-7). Text modified for clarification.	Yes - 5/2/2013
DH-79	Comment: The heading for the Legend of Figure 3-5 is entitled "Fall 2009 Hexavalent Chromium". However, the listed contaminant ranges are shown to be for "Cr". Please provide specificity on which type of chromium is being presented in the table. For technical accuracy, it should either be "Chromium (Total)" or "Cr(VI)".	Provide specificity on which type of chromium is being presented in the table. For technical accuracy, it should either be "Chromium (Total)" or "Cr(VI)".	3	3-21/ Figure 3-5	Accept	Figure was edited for accuracy. It should be noted, however, that at Hanford nearly all chromium presents as Cr(VI) unless a reducing environment is present.	Yes - 7/17/2013
DH-80	Comment: Please provide the RI and RPO physical property data vs. the statistical mean values for Site-Wide sample data Basis/Justification: The table only shows the site-wide data, yet the text talks about comparisons of the RI/RPO data to site-wide data, yet it is not shown.	Provide a column with the bulk densities of the RI/RPO data set for comparison and contrast.	3	3-27/ Table 3-7	Accept	Data has been added.	Yes - 10/22/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-81	Comment: Please provide the content of these sands and gravels within the RUM? Please explain whether these sands and gravels are continuous across the Hanford Site? Historically, big siltstone rip-up blocks were deposited that are around 3 feet deep and 3 ft wide. Basis/Justification: Factual information of the type of material for these sands and gravels provide understanding of the CSM for the readers that is missing from the current discussion.	Better definition is needed to understand CSM.	3	3-28/11-16	Accept with Modification	Specifics on the sand content versus gravel and other features of this unit are described elsewhere, as is whether these units are continuous. The continuity of the water bearing units is also discussed in the remainder of the paragraph where the comment is located. Text was added to point the reader to Section 3.4.2.4 (geology of the RUM) and Section 3.6.2 (hydrogeology of the confined aquifer). The Borehole Summary Reports with complete documentation for each well/boring are referenced in Section 2.2. However, this section covers the general hydrogeology and is intended to be an introduction to the more specific sections to follow.	Yes - 7/2/2013
DH-82	Comment: Provide the basis for your statement, "Once groundwater entered the Hanford formation, it would be less likely to move back south into the less transmissive Ringold Formation unit E." Basis/Justification: No information is provided to support this statement other than professional judgment. More substantial information is required.	See comment.	3	3-30/1-2	Accept	Additional discussion will be added regarding the movement of water and preferential flow.	Yes - 7/2/2013
DH-83	Comment: The median value is incorrect for both the Ringold formation unit E and the Hanford formation. The median values should be 0.027 for the Ringold Formation unit E and 0.0375 for the Hanford formation.	See comment.	3	3-30/32	Accept with Modification	Text added to clarify what the summary statistics represent. Summary statistics for reported estimates of hydraulic conductivity for the Ringold Formation E and the Hanford formation in 100-D/H are presented in Section 3.6.1.1 of the 100-D/H RI/FS. The calculation of those summary statistics is based on data obtained from wells screened within those geologic units, and located in certain areas of the Hanford site, as provided in 100-HR-3 Remedial Process Optimization Modeling Data Package (SGW-40781, Rev.0) and tabulated in Table M-4, Appendix M, of the RI/FS> The reports summary statistics are correct and accurate, per the calculation method described in Section 3.6.1.1. As noted in Section 3.6.1.1, the data set included in Table M-4 comprises well locations in: 100-D (Ringold E); 100-H in the vicinity of the Reactor (Hanford); the Horn (Hanford); as well as locations in 100-H where the wells are screened in the RUM. Values for wells in Table M-4 that that completed in the RUM are not included in the calculation. When all data are considered (that is, no potential outliers are excluded from the data sets), and a mean value is calculated for each well that possesses multiple reported estimates of hydraulic conductivity, the calculated median hydraulic conductivity for each geologic unit reported in Section 3.6.1.1 (Page 3-30, 4th Paragraph) is correct. [Note that the calculated median value for the Hanford formation does not include the data from the three Horn wells]. The calculated ranges of values with and without identified potential outliers are listed in Table 3-9. The median values from the reviewer appear to coincide with statistics that are obtained using the slug test data values only. However, slug tests are only one source of information on hydraulic conductivity and as a result it is recommended that they be considered together with all other available data. It is noted that the correspondence between the statistics computed only on the basis of the slug tests and those computed as described above, are very similar and suggest that the median estimate of hydraulic conductivity in each area is robust.	Yes - 9/9/2013
DH-84	Comment: No data points are shown in the southern portion of 100-HR-3. Provide the data points used to contour values in the southern portion of the area and around the horn. Basis/Justification: Show all your data points that were used to contour the aquifer thickness map. This is a very important map that was used for the modeling effort and needs to be representative.	See comment.	3	3-31/ Figure 3-7	Not Accepted	Figure includes all data we have for that time frame (noted in the figure title), and data are extrapolated from areas outside of the map. Note that the figure is being revised in response to DH-85.	Yes - 7/17/2013
DH-85	Comment: Provide which geologic unit contains the aquifer in this figure. Provide an isopach map of the Hanford formation and Ringold Formation in relation to aquifer thickness. In addition, a surface top map of the Ringold Formation would also be beneficial to understand the transition between it and the Hanford formation. Basis/Justification: These maps would provide a visual of how the thickness of the aquifer changes and the less permeable Ringold Formation transitions into the Hanford formation.	See comment.	3	3-31/ Figure 3-7	Accept with Modification	Figure shows the unconfined aquifer which is described in the text as being in either the Hanford or Ringold unit E, depending on the location. This is noted in the Figure caption. A new figure was added to show which part of the Ringold E was above the water table. 2. The figure with aquifer thickness was changed out for 2 figures - one at low water and one at high water stage.	Yes - 10/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-86	Comment: Provide a reference for the use of 0.1 for the vertical anisotropy for all the wells, except 199-H3-6 that was assigned 0.01. Basis/Justification: No justification is provided for the values used.	Justification for the assumption needs to be provided.	3	3-36/14-15	Accept with Modification	Text expanded to explain. The vertical anisotropy of 0.1 that was used in the majority of slug test analyses is consistent with the value used in the 100 Area RI/FS model. For 199-H3-6, it was noted that the late-time response to the slug test was better matched using an anisotropy ratio of 0.01. However, it should be recognized that slug tests are not the most reliable technique for estimating vertical hydraulic conductivity and furthermore that estimates of hydraulic conductivity obtained from the slug tests are relatively insensitive to the value of the vertical hydraulic conductivity used [horizontal hydraulic conductivity of 33 m/d versus 38 m/d].	Yes - 10/2/2013
DH-87	Comment: Most of this discussion needs to be provided in Section 3.4.2.4 under the Ringold Formation upper mud unit. Basis/Justification: These paragraphs discuss the stratigraphy and need to be moved to that section. Information on how the stratigraphy is classified needs to be in the stratigraphy section of 3.4.2.4.	Move/copy text to be relevant with the discussion.	3	3-38/2-11	Not Accepted	The discussion on the RUM is focused on the geologic structure and surface variations. This section focuses on the aquifer properties. Separation of these concepts is difficult, however, for readability some delineation is needed. No change made.	Yes - 7/2/2013
DH-88	Comment: editorial. Add "-grained" after the second "fine" in the sentence. Basis/Justification: Needs to read, "very fine- to fine-grained sand"	See comment.	3	3-38/16	Accept	Text modified as suggested.	Yes - 5/2/2013
DH-89	Comment: Elevation is being discussed, so please place "amsl" after "95 to 105 m" and "(312 to 345 ft)" so it reads, "95 to 105 m amsl (312 to 345 ft amsl)". Basis/Justification: Elevation is measured from some reference point and that reference point is usually sea level with the abbreviation "amsl" for "above mean sea level".	Add above mean sea level or the abbreviation of amsl.	3	3-38/26	Accept with Modification	Text modified to include amsl.	Yes - 5/2/2013
DH-90	Comment: Elevation is being discussed, so please place "amsl" after "20 to 30 m" and "(66 to 98 ft)," so it reads, "20 to 30 m amsl (66 to 98 ft amsl)". Basis/Justification: Elevation is measured from some reference point and that reference point is usually sea level with the abbreviation "amsl" for "above mean sea level".	Add above mean sea level or the abbreviation of amsl.	3	3-39/4	Accept	Text modified to include amsl.	Yes - 5/2/2013
DH-91	Comment: Editorial. Add a "d" to "an" so it reads "and"	See comment.	3	3-41/13	Accept	Text edited.	Yes - 5/2/2013
DH-92	Comment: Place the actual timeframes being referred to in each conditions or operations. For example, Predevelopment conditions is pre-1862, Pre-Hanford is from settlement of the Hanford and White Bluffs townsites in 1900 to 1943. This will significantly aid the reader when discussions of these periods are discussed for the modeling in Chapter 5. Basis/Justification: Time frames are needed to aid the reader in understand what time periods are being discussed, especially in light of future discussions of these periods for groundwater modeling purposes.	Time periods need to be addressed for understanding of groundwater modeling discussions in Chapter 5.	3	3-41/16-29	Accept	Timeframes were added as suggested.	Yes - 5/2/2013
DH-93	Comment: I do not agree that the Post-operational conditions would be the same as pre-development time frame. I am more in agreement that it would be Pre-Hanford. Basis/Justification: Anthropogenic activity is still occurring more related to irrigation during the 1920s through 1943.	Change to read, "features of the pre-Hanford Site operations time frame."	3	3-41/24-26	Accept	Text was edited as suggested.	Yes - 5/2/2013
DH-94	Comment: Groundwater flow would migrate down vertically into the RUM and finally into the sand and gravel of the RUM with the amount of mounding that occurred in 100-D Area. It has already been established that communications to the RUM occurs. Delete sentences since they are not supported by the facts. Basis/Justification: To state that minimal amount of contaminated effluent was received in the RUM is not supported by these statements.	Delete sentences stating that the preferential pathway would be lateral flow away from the mound.	3	3-44/17-26	Not Accepted	Water will follow the path of least resistance, which would be a preference to flow through Hanford, then into Ringold, then finally, if conditions allow, into the RUM. Flow into the RUM would not be a preferable pathway due to the presence of clay and silt, which will limit the flow (and therefore contamination) to some degree. It is not stated that it is a "minimal amount of effluent", but rather that the hydrogeologic conditions would "minimize the vertical distribution", as compared to the migration in the rest of the aquifer. No change made.	Yes - 7/23/2013
DH-95	Comment: Comment: Editorial. Change "consistent" to "consisted". So it reads, "would also have consisted largely of spent reactor cooling water," Basis/Justification: Wrong word was used.	Make correction.	3	3-48/5	Accept	Text edit made.	Yes - 5/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-96	Comment: Make the vertical axis in feet instead of meters or provide two vertical axis, one in meters and one in feet, so the reader can compare the historical information that was provided in feet with current groundwater table maps that are provided in meters. Basis/Justification: Clarification and better communication of information would be gained by adding another vertical axis in feet above mean sea level.	Clarification.	3	3-48/ Figure 3-14	Accept	Figure was updated as requested.	Yes - 7/2/2013
DH-97	Comment: This statement seems to be a missed data gap for providing information on the lower water-bearing units in the Ringold Fm. Explain why RI wells were not drilled to provide information on the lower water-bearing units. Basis/Justification: An identified data gap appears to exist that was not successfully identified in the work plan or met in the field work for the lower water-bearing unit in the Ringold Formation.	Additional field work is required to answer the questions whether the lower water-bearing is connected to the upper water-bearing units.	3	3-62/13-15	Accept with Modification	Wells were drilled to the lower units, and samples were collected. The wells were not screened in those units based on the laboratory results from samples collected during drilling, per the work plan. This area of the document is related to hydraulic gradients and is not appropriate for a discussion of contaminants. Text was added to point the reader to the section with the data presentation and discussion (Section 4.5.2 - vertical distribution of contaminants).	Yes - 7/10/2013
DH-98	Comment: Add another sentence stating, "Contaminants may also desorb off the sediments to become mobile. It depends on what processes are occurring. Basis/Justification: In my professional training, remobilizing of contaminants can occur as easily as adsorbing to soil particles. It depends on what is available and the chemistry of the water and soils.	Add sentence to clearly state that contaminants can be adsorbed as well as become mobilized through precipitation events, varying calcium carbonate concentrations, pH, or reduction-oxidation conditions.	3	3-64/38/41	Accept with Modification	Text was added to clarify that desorbtion is possible.	Yes - 5/2/2013
DH-99	Comment: It appears that Figure 3-26 could work as well as Figure 3-27 for the cross-sectional depiction. Provide more discussion of Figure 3-27. It seems underused for the information presented on it. The streamlines on this figure do not appear to exist or got lost in the color scheme of the diagram. Basis/Justification: The piezometric measurements showing equipotential lines are not discussed in the document. This is a very important discussion that seems incomplete in the report, especially the relationship it has with river stage effects.	Needs to discuss why equipotential lines were placed on this figure and not discussed.	3	3-65/14	Accept with Modification	Added reference in sentence to include Figure 3-26, which shows a simplified cross section. Additional text was added to better describe the purpose of Figure 3-27. Streamlines will be made more visible in Figure 3-27.	Yes - 7/17/2013
DH-100	Comment: No streamlines exists on the figure or the color scheme has camouflaged them. Provide streamlines for this figure. Basis/Justification: Streamflow Lines are in the caption of the slide, but not on the figure.	Provide stream flow lines for the figure and address what the equipotential line is for well 199-D5-141.	3	3-66/ Fig. 3-27	Accept with Modification	Streamlines were modified so they are more clearly presented.	Yes - 7/17/2013
DH-101	Comment: Provide the equipotential and streamflow lines Well 199-D5-141 and the elevation of the Columbia River where the groundwater meets the river. Basis/Justification: Equipotential line for the well completed in the sands/silts of the RUM should be included in the figure.	Missing information based on the caption and figure.	3	3-66/ Fig. 3-27	Accept with Modification	Water level was added for the RUM well based on a comparison of the water levels between the unconfined aquifer well and the RUM well since the well was installed. The well was not present in March 2010.	Yes - 7/17/2013
DH-102	Comment: Discuss if aquifer communication exists under high river stage conditions as it did under operational conditions? Basis/Justification: Explanation of current conditions to conditions in the past.	Clarity of discussion	3	3-67/20-27	Accept	Text was edited regarding the hydrologic regime present under the different conditions.	Yes - 10/2/2013
DH-103	Comment: Provide the list of nested wells being referred to here? Please provide the names of the wells. Basis/Justification: Clarification	Clarity of discussion	3	3-68/6-9	No change	Wells are already identified specifically in the text. Sentence states "nested well completion of Well 199-H4-15". No change made to document.	Yes - 5/2/2013
DH-104	Comment: Provide the list of wells determined to have seal integrity issues and explain what is meant by this term "seal". Basis/Justification: Unclear what "seal" is being referred to in the sentence. It is also unclear which well or wells are being referred to.	Clarity of discussion - provide the list of wells with integrity issues and the list of wells. Provide information on what the term seal means in relationship to the seal integrity issue.	3	3-68/9	Accept	Added text to clarify the use of "seal." The previous sentence already states which well is being considered i.e. "… the nested well completion of Well 199-H4-15 was evaluated." Sentence was modified for clarity.	Yes - 7/2/2013
DH-105	Comment: Provide the numerical value of the "ambient water quality standard. Basis/Justification: Values are needed to understand what levels of cleanup for the remedial systems.	Add AWQC.	3	3-70/14	Accept	Added the numeric value. Text was clarified and made consistent.	Yes - 7/17/2013
DH-106	Comment: Change "aquatic" to "ambient" or change it to "AWQC". Basis/Justification: Wrong term is being used.	Change term.	3	3-70/20	Accept	Terminology corrected.	Yes - 5/2/2013
DH-107	Comment: Provide a reference for this document and when will this document be issued? Basis/Justification: An RDR/RAWP already exists for 100-HR-3 that is combined with 100-KR-4. Provide what is meant by "will address current and future issues". This is a forward looking statement and I am not sure which document is being referenced. A draft A document specifically for 100-HR-3 does exist, also.	Need to know which RDR/RAWP document is being referenced.	3	3-70/22	Accept with Modification	Deleted the sentence which was unclear and referred to an upcoming document revision.	Yes - 5/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-108	Comment: Figure 3-31 has nitrate listed on the wells representing H4-15A, -15B, H5-1A, H4-49. Change to Sulfate, like all the other radial plots, if appropriate. Basis/Justification: Unclear whether a mistake was made or it was intended to be nitrate on the plot.	Clarification on nitrate vs. sulfate on a radial plot.	3	3-72/ Fig. 3-31	Accept	Figure modified to correct error.	Yes - 7/17/2013
DH-109	Comment: Although the correct word "dissimilar" is used, for readability I feel using the word "different" would work better. Basis/Justification: Ease of readability and understanding.	Make change.	3	3-74/17	Accept	Text was edited as suggested.	Yes - 7/2/2013
DH-110	Comment: Provide more information on why these wells, 199-D4-15, 199-D5-14, 199-H4-48 and 199-H4-6, were chosen for time series evaluation vs. other wells. Basis/Justification: Unclear what justification of using the wells that are discussed for the time series evaluation. No reason is provided.	Add discussion on reasoning for use of these wells.	3	3-74/24-40	Accept	The purpose of the analysis was to determine: 1) if the geologic formation exhibited a consistent geochemical signature, 2) if waste sites were altering the geochemistry of the aquifer, and 3) if river water influenced the geochemistry. As a result, the historical data set was mined to make improvements to the CSM based on geochemical similarities. The wells selected were shown to have adequate data for analysis over time, while providing data from a variety of geologic formations, site conditions (such as the ISRM barrier), and a spatial distribution. Text was modified to clarify the process. Time series tables will be moved from Appendix M and placed into the text. A figure will also be added to provide clarity showing the time series changes. In addition, separate from this analysis, we have updated the proposed monitoring to provide better understanding of the CSM through this type of analysis.	Yes - 4/8/2014
DH-111	Comment: Extremely unclear which wells are being discussed and over which time periods. Write this paragraph by first discussing 100-D wells and then 100-H. Do not mix discussing both areas within the same paragraph because it is confusing. Please provide figures to aid in the discussion of the changes in geochemical patterns over time in these wells. The amount of time being evaluated is not provided. Basis/Justification: This paragraph is difficult to follow which wells are being discussed and over which period of time is being discussed. More graphical representation is needed to assist in the discussion so the reader can better understand what information the author is trying to convey.	Rewrite this section and provide graphs/figures that illustrate what is being discussed in the paragraph. Provide the time period for each well being analyzed and why these wells were chosen versus all the other potential wells that could have been used.	3	3-74/24-30	Accept	The historical data set was evaluated to make improvements to the CSM based on geochemical similarities. The wells selected were shown to have adequate data for analysis over time, while providing data from a variety of geologic formations, site conditions (such as the ISRM barrier), and spatial distribution. The data presented in the time series were based, generally, on 5-year intervals. However, this was modified as needed based on the available data record for each well. Text was modified to clarify the process. Time series tables will be moved from Appendix M and placed into the text. A figure will also be added to provide clarity, showing the time series changes. The discussion of 100-D and 100-H will be presented separately.	Yes - 4/8/2014
DH-112	Comment: Provide the name of the wells being discussed. It is unclear what well experienced small fluctuation of sulfate between 1988 and 1996. Basis/Justification: Unclear which well is being discussed in this paragraph.	Provide well name and well number.	3	3-74/31-33	Accept	Well name (199-H4-6) was added to the paragraph. In addition, well names were added for clarity in the preceding paragraphs where time series data is discussed.	Yes - 4/8/2014
DH-113	Comment: Add the cation/anion pairing for well 199-D5-33 for clarity. Basis/Justification: Clarification.	Clarification of the geochemistry of well 199-D5-33	3	3-74/39-40	Accept with Modification	Added text to refer reader to appropriate figure, and modified for clarity.	Yes - 5/2/2013
DH-114	Comment: Add the most important point in this section. "RUM wells near the river are not connected to the inland RUM wells based on river/aquifer and aquifer/aquifer communications." Basis/Justification: Add this bullet as it is an important CSM attribute.	Add bullet.	3	3-75/2	Accept with Modification	Text was edited for clarity.	Yes - 7/1/2013
DH-115	Comment: Explain in more detail what is meant that the "groundwater flow from reservoir leakage are indistinguishable from those created by nearby pump-and-treat activities." Basis/Justification: Clarification of what is being discussed with groundwater flow from reservoir leakage and pump-and-treat operations.	Clarification on leakage of 182-D Reservoir.	3	3-76/19-22	Accept	Text was edited to clarify that leakage is minimal and partially masked by the effects of the pump and treat system flow changes.	Yes - 5/2/2013
DH-116	Comment: Provide more information in a time frame stating as an example "by 19XX, groundwater mounding had dissipated". Unclear if the groundwater mounding has returned to normal after operations or does mounding occur during the high river stage and then dissipates back to a normal flow regime. Basis/Justification: Clarification.	Provide more information in a time frame per comment.	3	3-77/20-22	Accept	Dates were added to the text to provide clarification to the time frame.	Yes - 7/17/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-117	Comment: Editorial. Remove the first "held" and also add a "d" at the end of "discharge" so it reads, "Retention Basin, held-up spent reactor cooling water before discharged to the river; . . ." Basis/Justification: Extra held in the sentence.	Clarification.	3	3-77/24	Accept	Text was modified as suggested.	Yes - 5/2/2013
DH-118	Comment: Sentence states, "Table H-2 provide flora and fauna species listed by…" This table is actually H-21. Basis/Justification: Consistency and accuracy.	Change reference to Table H-21.	3	3-80/23	Accept	Text has been corrected as suggested.	Yes - 5/2/2013
DH-119	Comment: Section 3.9 Ecology only discusses species from a risk standpoint. No mention of any type of landscape recovery, backfilling and revegetation to support future species is omitted, and no reference or compliance with the Hanford Site Biological Resources Management Plan (DOE/RL-96-32) is made. Yet, Section 3.10 Cultural Resources, page 3-84, line 5 references compliance with the Hanford Cultural Resources Management Plan (DOE/RL-98-10). The following paragraph goes into little detail of the importance with compliance of applicable cultural resource laws per DOE/RL-98-10. Both of these plans must be followed. Basis/Justification: Consistency, accuracy, and listing applicable requirements.	In section 3.9, add a paragraph discussing the need to backfill and revegetate waste sites to return the waste site to a more 'natural' state that supports species habitat, and reference adherence to the Hanford Site Biological Resources Management Plan (DOE/RL-96-32).	3	3-79 through 3-84/ S. 3.9 & 3.10	Accept	A discussion of the waste site revegetation to return the waste site to a more 'natural' state that minimizes recharge and supports species habitat, with reference to the *Hanford Site Biological Resources Management Plan* (DOE/RL-96-32), has been added to Section 3.9.	Yes - 7/2/2013
DH-120	Comment: Correct the sentence to read more correctly. It currently reads, "At high river stage, the river water can flow impede on the groundwater aquifer along the shoreline and some distance inland, which is very site-specific and depends heavily on the stratigraphy of the location." I am not sure what is being discussed the flow or flow being impeded. Please clarify. Basis/Justification: Clarification.	Modify sentence to clarify what is being discussed.	3	3-89/30-32	Accept	Text will be modified to clarify.	Yes - 7/1/2013
DH-121	Comment: In addition to the listed hydrogeology influences, precipitation events occurring during remediation activities that require months to complete also affect contaminant transport (i.e., hydrogeological influence as surface drainage can be directed to topographic low points such as excavations). Also, certain precipitation events can be significant enough to influence contaminant transport (e.g., fast snow melt during a Chinook, significant rain events, etc.). Also, cocooned reactor run-off may have hydrogeological influences. All hydrogeology influences should be listed. Basis/Justification: Completeness.	All hydrogeology influences should be listed.	3	3-90/37-40	Accept with Modification	Text was added to indicate that the primary influences are listed. It is not intended to cover all potential hydrogeologic influences. Precipitation was added to the list.	Yes - 5/2/2013
DH-122	Comment: At a minimum include the following nonradioactive contaminants must be included in risk calculations for both water and soil, in all locations with detections that are above background. Nitrate, Carbon tetrachloride, Chloroform, Hexavalent chromium, Total chromium, Vanadium, Manganese, Tetrachloroethylene, Nickel, Cobalt, Lead, Molybdenum, Arsenic, Zinc, Fluoride, Silver, Strontium, Lithium, Barium, Trichloroethylene, Bis(ethylhexyl)phthalate, 1,2-dichloroethane, Uranium, Tributylphosphate, Cadmium, Aroclor-1254 (common soil contaminant), Di-n-butylphthalate (based on RCBRA deep zone), Aroclor-1242 (based on RCBRA deep zone)\, Aroclor-1260 (based on RCBRA deep zone), Fluoranthene (based on RCBRA deep zone)), Mercury (based on RCBRA deep zone), Pyrene (based on RCBRA deep zone) Basis/Justification: Based on the groundwater data (2006-2011) provided to Ecology in advance, these contaminants have been observed in groundwater (in many locations) at concentrations up to at least 10% of either the WAC 173-340 risk limit for individual contaminants (1E-06) in water, or the WAC 173-340 hazard quotient limit (1) for individual contaminants, or the federal MCL or ambient water quality criteria. Some exceed these limits. Since risk calculations should sum contaminant risks or hazard quotients for contaminants with similar modes of action and/or target organs, these contaminants should not be omitted as they could contribute significantly toward the total risk limit of 1E-05 and/or hazard index of 1. Some of the contaminants are on the list above because statistical tests used in River Corridor Baseline Risk Assessment (DOE/RL-2007-21, Vol. II, Draft C) (RCBRA used in this comment) indicated that these contaminants are greater in the deep zone of waste sites than in reference sites (see Ecology comments for RCBRA Vol. II).	Include at least all of these contaminants in risk calculations wherever they have been detected above background.	4, and 6	General	Accept with Modification	COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). The text will be revised to add discussion on ISRM actions, well development actions, and bioremediation testing in Chapter 4, including a description of how these actions affected arsenic and other metals in soil & GW. Will use timelines, graphs & maps as needed to support explanation. Will discuss that there have been localized spikes in some contaminants and will explain the "one-hit wonders". Will also discuss what was found in aquifer tubes and whether they met their objectives. Well-specific risk calculations will be added to Appendix G for 199-D3-6, 199-D3-2, 199-D5-38, 199-D8-88, 199-H4-11, 699-90-45 and 699-95-45. The following tables provide the summary of contaminant evaluation for the particular area (Note: Table numbers reflect numbering at time of Package 4 text submittal and may change by Rev. 0): Table 4-8. Summary of 100 D Groundwater Area Contaminant Evaluation Table 4-9. Summary of 100 H Groundwater Area Contaminant Evaluation Table 4-10. Summary of Horn Groundwater Area Contaminant Evaluation Table 4-12. Summary of Confined Aquifer Evaluation Table 4-14. Summary of 100 D ISRM Area Contaminant Evaluation Table 4-15. Summary of 100 H ISRM Area Contaminant Evaluation Table 4-16. Summary of 100 D Biostimulation Treatability Test Area Using Molasses Contaminant Evaluation Table 4-17. Summary of 100 D Biostimulation Treatability Test Area Using Emulsified	Yes - 5/21/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-123	Comment: Tritium, strontium-90 and technetium-99 have been observed in water in many locations and should be included in the risk calculations. Basis/Justification: These contaminants frequently have concentrations that are 10% or more of the 4 mrem/y limit for residential land use.	Include these contaminants in risk calculations for all locations where they have been detected above background.	4	General	No change	Tritium, strontium-90, and technetium-99 are included in the groundwater risk assessment presented in Section 6.3.7 (6.3.7 Risk Characterization Results of the EPA Tap Water Scenario) and discussed in detail in Section 6.3.7.1 (Use of Groundwater as a Potential Tap Water Source). Results are presented in Tables 6-48 through 6-54. This information is used to identify risk drivers and uncertainties. For example, in Table 6-49, the total risk for technetium-99 is 8.32E-07 and the percent contribution is 0.94.	Yes - 7/10/2013
DH-124	Comment: Information concerning radionuclides should be complete and consistent. Table 4-1 lists 16 radionuclides, Section 4.2.2.2 lists seven in the opening paragraph, then discusses three of them in separate paragraphs, along with uranium, which is not in either the table or the list (though separate uranium isotopes are in the table). Still other radionuclides are included elsewhere in the document (such as Np-237 in Fig. 4.9). Basis/Justification: Clarity and ease to understand.	A standard list of radionuclides should be developed, with a thorough discussion of individual isotopes. The discussion should include half-life, possible sources, clean-up standards, background levels if appropriate, discussions of pertinent chemical characteristics (such as Sr-90 being chemically similar to calcium), and any other interesting information. Then as a document is being developed the entry for each isotope that will be mentioned in the document can be added to a list that will appear in the radionuclide section.	4	General	Accept with Modification	1. The isotopes in Table 4-1 are the "standard list of radionuclides" for 100-D/H and were analyzed-for at most of the D/H waste sites characterized in the RI. Np-237 was prescribed for four waste sites in the SAP (116-D-1A, 116-D-1B, 118-D-6, and 118-H-6) and detected at each. It will be added to Table 4-1 and the Section 4.2.2.2 text. Cs-134 was prescribed for three waste sites (100-D-12, the 116-D-4, and the 116-H-4) but detected at none. It will not be added to Table 4-1, but will be included in the Section 4.2.2.2 text. 2. Added half-life information to Table 4-1 (new column). 3. Section 4.2.2.2 now includes possible radioisotope sources in the text. 4. Clean-up standards are presented and discussed in Chapters 5, 6, and 7 (no Chapter 4 text changes proposed). 5. Available background values are included in Table 4-1 (90th Percentile column) and they are presented in the vertical profile figures in Chapter 4. 6. Isotope discussions in the context of groundwater protection, HHE risk assessment, and pertinent chemical characteristics are presented in Chapters 5, 6, and 7	Yes - 1/30/2014
DH-125	Comment: There are many cases where waste sites have residual soil contamination with contaminants that are also present in nearby groundwater wells. In these cases, cleanup levels for these contaminants need to be adjusted downward considering contamination in the groundwater [see WAC 173-340-747(8)(vi)]. Basis/Justification: The following are a few examples: • Well 199-D2-6, which is north of 118-D-2, has Cr (VI) up to 59 µg/L, while waste site 118-D-2 has residual Cr (VI) as high as 1.6 mg/kg. • Well 199-D3-5, which is west of 118-D-2, has Cr (VI) up to 73 µg/L, while waste site 118-D-2 has residual Cr (VI) as high as 1.6 mg/kg; tritium up to 17,000 pCi/L with residual tritium in 118-D-2 soil; Tc-99 up to 190 pCi/L, with residual Tc-99 in 118-D-2 soil; tetrachloroethylene, with residual TPH in 118-D-2 and no VOC data for 118-D-2 soil. • Well 199-D5-144, which is close to waste site 100-D-12 (sodium dichromate pump station), has had Cr (VI) up to 241 µg/L, while 100-D-12 has residual Cr (VI) up to 0.8 mg/kg. • Well 199-D5-15, which is near portions of the 100-D-31:3 pipeline, is in the Cr (VI) plume with up to 2450 µg/L Cr (VI), while the excavation for 100-D-31:3 has residual Cr (VI) up to 0.99 mg/kg; this well has nitrate up to 68 mg/L, while the overburden used to backfill the excavation of 100-D-31:3 had residual nitrate.	Adjust contaminant cleanup levels by including in the modeling the concentration of the contaminants in the groundwater in adjacent wells.	4, and 5	General	Accept with Modification	Resolution: Ecology has determined (Email from K. Welsch, 12/16/13) that no dilution factor adjustments are needed in the alternative fate and transport modeling for the following reasons: • WAC language allows dilution factor adjustment, but does not require it. • The soil PRGs for protection of groundwater/surface water for hexavalent chromium is not based on the results of alternative fate and transport modeling, but on the values from the interim cleanup actions (originally based on the "100 times rule"). • The fate and transport modeling results show no migration of vadose zone contaminants to groundwater within 1000 years. With no migration to groundwater, the value of the dilution factor is irrelevant. Note that the "100 times rule" used as the basis for the interim cleanup actions produced a more conservative limit for hexavalent chromium than did the alternative fate and transport modeling. Response: SSLs and PRGs are calculated to determine the maximum residual soil concentration that will not cause future exce+L34edance of groundwater and surface water protection standards; these values were developed on the basis that existing groundwater contamination will be addressed through the remedy selection process in a shorter time frame. The modeling performed for this purpose is not intended to explain historic conditions, such as the inferences identified in this comment, between waste site soil contamination levels and current groundwater contamination levels. Because PRG values are established for protection of groundwater and surface water in the future, the predicted decline in groundwater contamination levels in the future are the appropriate upstream conditions to apply under WAC requirement 173-340-747(8)(b)(vi). Model results indicate that the existing groundwater contamination levels will decline below protection levels before a predictive Cr(VI) vadose zone model shows arrival in groundwater, and that the summation of these contaminant levels would not result in exceedances. Hence, the summed concentrations would not change the PRG values. ECF-Hanford-11-0063 has been modified and this information is included in the crosswalk.	Yes - 4/21/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-126	Comment: The text states: "Under current conditions, the primary contributor to groundwater contamination at 100-D/H is vadose zone contamination from unremediated waste sites (for example, Cr(VI) from 100-D-100, 100-D-30, and 100-D-104)." The statement does not acknowledge the fact that certain waste sites may have been remediated without confirming the presence or absence of Cr+6 at depth (i.e., below the extent of remediation). The statement should be qualified. Basis/Justification: MTCA cleanup levels are exceeded in the vadose zone. The following are examples: • 199-D5-141 Cr+6 0.730 mg/kg @ 24.77 m bgs • 199-D5-141 Cr+6 0.300 mg/kg (flagged "B") @ 27.94 m bgs • 199-D5-141 Cr+6 0.664 mg/kg (flagged "B") @ 32.54 m bgs • 199-D6-3 Cr+6 0.850 mg/kg @ 22.02 m bgs • 199-D6-3 Cr+6 0.250 mg/kg (flagged "B") @ 21.26 m bgs • 199-D5-134 Cr+6 0.680 mg/kg @ 24.69 m bgs • 199-D5-134 Cr+6 0.800 mg/kg @ 26.52 m bgs • 199-D5-134 Cr+6 0.310 mg/kg (flagged "B") @ 23.93 m bgs • 199-D5-134 Cr+6 0.360 mg/kg (flagged "B") @ 21.18 m bgs • Etc.,	Potential wording: "Under current conditions, it is believed the primary contributor to groundwater contamination at 100-D/H is vadose zone contamination from unremediated waste sites (for example, Cr(VI) from 100-D-100, 100-D-30, and 100-D-104). However, possibly an additional primary contributor to groundwater contamination at 100-D/H is vadose zone contamination beneath remediated waste sites that migrated beyond the extent of waste removal."	4	4-1/35-37	No change	Prior to the remedial investigation, the available DH data (i.e., LFI data, remediation data, analogous data and data gathered by implementing the observation approach) suggested that significant contamination (in term of risk and impact to groundwater) was not present in the vadose zone at remediated waste sites. This conclusion is supported and documented by the Tri-Parties in various interim close out packages and on waste site reclassification forms. Based on the results of all characterization efforts in 100-DH to-date, the data suggest that remediated sites are currently not impacting groundwater and will not impact groundwater in the future. The results cited are below the PRG for Cr(VI) of 2.0 mg/kg. It is acknowledged that there may exist lower levels of contamination from historic releases in the vadose zone beyond the waste site footprint identified for remediated waste sites during cleanup action. However, based on the conclusion noted above, these sources are not considered a primary contributor.	Yes - 7/17/2013
DH-127	Comment: Table 4-2 indicates that some of the background concentrations for the listed constituents are for filtered or unfiltered samples. Some of the constituents do not indicate that either sampling technique has been done. Please explain why some constituents have been filtered, unfiltered, or otherwise.	Explain why some constituents have been filtered, unfiltered, or otherwise.	4	4-7/Table 4-2	Accept	Text was added to clarify the data presentation. Additional information is available in DOE/RL-96-61, which details the use of filtered versus unfiltered samples for determining background.	Yes - 5/20/2013
DH-128	Comment: Table 4-2 shows "Chromium (total, filtered) in the Nonradionuclides section. The correct listing should be "Chromium (total) (filtered)".	Editorial: Change "Chromium (total, filtered)" to "Chromium (total) (filtered)".	4	4-7/Table 4-2	Accept	Inserted Chromium (total) (filtered) in place of Chromium (total, filtered)	Yes - 5/2/2013
DH-129	Comment: Section 4.2 describes primary & secondary sources of contamination. Basis/Justification. Document clarity.	Please add a visual format (figure or diagram) that depicts the information in section 4.2. Or, refer to a chapter already in document (such as Chapter 6).	4	4-8/1-17	Accept	Added a figure that provides a graphical example of primary and secondary sources.	Yes - 1/27/2014
DH-130	Comment: Text stating that vertical steel pipes were used for disposal of solid waste should be confirmed. Basis/Justification: The Technical Baseline Reports (BHI-00127 and WHC-SD-EN-TI-181) make no mention of the use of vertical steel pipes at 100-D or 100-H.	Confirm whether or not vertical steel pipes were ever used at 100-D or 100-H. Modify the text accordingly to either omit VPUs or to specify where they were used.	4	4-9/11	Accept with Modification	Text was meant to generically discuss a burial ground and has been amended. Question of vertical steel pipes is not relevant in that section of text and text has been made more generic.	Yes - 8/27/2013
DH-131	Comment: Where will the waste from coal ash sites be disposed? Basis/Justification: Regardless of applicable regulations, need an explanation of where this solid waste will be disposed.	Include a final disposal site for coal ash.	4	4-10/21	Accept	A sentence has been added to indicate that if removed, debris from these sites will be disposed of in approved solid waste disposal facilities.	Yes - 7/17/2013
DH-132	Comment: The text defines "secondary sources" as the contaminated vadose zone beneath facilities and waste sites. Contaminated vadose zone is inherently associated with liquid waste disposal sites. For this reason, RCRA considers contaminated vadose zone and groundwater beneath a waste site to be part of the waste site. Considering contaminants at depth in the vadose zone, even though the surficial portion of the waste site may have been removed/remediated, the contaminated vadose zone portion of the waste site has not been remediated. At a number of waste sites, the vadose zone contamination at depth is continuing to contaminate groundwater (e.g., 1301-N LWDF, 100-D-100 waste site, etc.). For these reasons, contaminated vadose zone beneath liquid waste sites and unremediated releases (e.g., 100-D-100) should be considered "primary sources". Note: It is the remediation of deep Cr+6 contamination beneath 100-D-100 waste site that is the predominant reason for lower chromium concentrations observed in nearby groundwater groundwater monitoring wells. Clearly, the hexavalent chromium contamination at depth was acting as a "primary source". Basis/Justification: Contaminant soil concentrations beneath liquid waste disposal facilities and unplanned releases exceeding concentrations protective of groundwater should be considered primary sources.	Change the text to identify that vadose zone contamination associated with liquid waste disposal sites and unremediated waste sites represent "primary sources" of contamination. The definition may differentiate between remaining contamination that exceeds concentrations protective of groundwater (primary sources) versus remaining contamination that does not exceed concentrations protective of groundwater (secondary sources).	4	4-10/33-34	No change	The designation of primary or secondary source centers on how contaminants arrived at a site, rather than their concentration. The RI/FS Work Plan for 100-D/H (DOE/RL-2008-46 ADD 1, section 4.2) defines primary sources as the three reactors (105-D, 105-DR, and 105-H Reactors) and the structures (e.g., fuel storage basins) and processes (e.g., sodium dichromate additions to reactor coolant) associated with reactor operations. The Work Plan defines secondary sources as contamination in areas such as ponds, ditches, cribs, burial grounds, and unplanned release sites created by releases to the environment. An important distinction is that primary sources are no longer operating and creating a pathway for contaminants to enter the environment/vadose zone. Section 4 and the conceptual site model are consistent with the Work Plan definitions. The Work Plan definitions are consistent with EPA 540-R-98-031 "A Guide To Preparing Superfund Proposed Plans, Records Of Decision, And Other Remedy Selection Decision Documents" (see page 6-11 where contaminated soil is identified as a secondary source). The designation does not diminish the importance of cleaning up secondary sources, such as waste sites inclusive of the contaminated vadose zone soils. In fact, much of the remediation associated with the 100-D/H operable units is focused on the secondary sources. The determination of whether remaining contamination exceeds concentrations protective of groundwater is made in the fate and transport analyses and the risk assessment irrespective of whether it is from a primary or secondary source.	Yes - 6/19/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-133	Comment: Add the term 'PRZ' to the Terms section of document. Basis/Justification: Useful for 'Secondary Sources' section on page 4-10 and overall document clarity.	Include 'PRZ' in document terms.	4	4-10/38	Accept	The comment was incorporated as suggested.	Yes - 5/2/2013
DH-134	Comment: The text states: "It is anticipated that most sources of contamination will have been addressed through interim actions before the ROD is released." Contamination beneath all liquid waste disposal facilities and unplanned releases exceeding concentrations protective of groundwater will not be addressed before the ROD is released. Basis/Justification: Contaminant soil concentrations beneath liquid waste disposal facilities and unplanned releases exceeding concentrations protective of groundwater should be considered primary sources.	It is recommended the sentence be deleted.	4	4-11/8-9	Accept	Will delete the sentences.	Yes - 7/2/2013
DH-135	Comment: The text states: "The potential for secondary sources to provide a significant ongoing source of contamination to groundwater is evaluated…" Basis/Justification: Contaminant soil concentrations beneath liquid waste disposal facilities and unplanned releases exceeding concentrations protective of groundwater should be considered primary sources.	The text should differentiate between contaminant soil concentrations beneath disposal sites that exceed concentrations protective of groundwater (as primary) and contaminant soil concentrations beneath non-disposal waste sites and facilities that do not exceed concentrations protective of groundwater (as secondary).	4	4-11/9-12	No change	The text as written is consistent with the definition of the secondary sources as approved in the RI/FS Work Plan (DOE/RL-2008-46, ADD1, Section 4.2). As noted in the response to DH-132, the designation of primary or secondary source centers on how contaminants arrived at a site, rather than their concentration. The determination of whether remaining contamination exceeds concentrations protective of groundwater is made in the fate and transport analyses and the risk assessment irrespective of whether it is from a primary or secondary source.	Yes - 6/19/2013
DH-136	Comment: The text states: "Four of these contaminants are shown to have affected groundwater at 100-D/H – Cr(VI), total chromium, nitrate, and Sr-90." See comments on Section 4.4.1.2. The groundwater data indicates the following contaminants have also negatively affected groundwater quality at 100-D/H: technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc. Basis/Justification: Accuracy and completeness.	Modify the text to identify all contaminants that have negatively affected groundwater quality at 100-D/H.	4	4-11/8-9	Accept	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10-5 excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify analytes that are not retained as a COPC that will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014
DH-137	Comment: On lines 19-20, it is stated, "Much of the cooling water was discharged directly to the Columbia River through the outfall pipe system." Basis/Justification: Document clarity; show the physical relationship of the Columbia River, 100 D, 100 DR and 100 H reactors, and the outfall piping systems.	Add a new figure, or refer to a previous section of the document that identifies the outfall pipe system for 100 D, DR, and H nuclear reactors. For example, page 1-19, figure 1-11 shows outfall locations.	4	4-12/19-20	Accept	Text was added to refer to Figure 1-11.	Yes - 7/17/2013
DH-138	Comment: The text discusses "the major contaminants of interest" but is not inclusive of all contaminants of interest. Basis/Justification: Completeness.	Include discussions of the following "major contaminants of interest": carbon tetrachloride, tetrachloroethene, fluoride, nitrite, sulfate, antimony, cadmium, cobalt, copper, iron, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc.	4	4-12-4-13/9-12	Accept with Modification	This section has been revised to clarify the sources of contaminants.	Yes - 7/17/2013
DH-139	Comment: This paragraph does not speak to any Hanford related sources of lead or arsenic. Throughout this RI/FS, all discussion of lead and arsenic points to pre-Hanford use on Orchard Lands. This gives the false impression that lead or arsenic were never used as part of Hanford operations. Basis/Justification: Several waste sites showed elevated levels of lead and/or arsenic at depths far below the one meter depth generally associated with orchard lands contamination (mostly surficial contamination).	Discuss Hanford related sources of lead and arsenic use during Hanford operations.	4	4-13/9-12	Accept	Will Insert discussion: the sources of lead and arsenic associated with 100 Area operations is not known but is likely linked to waste management practices and shielding used in the reactor.	Yes - 10/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-140	Comment: General Comment for Section 4.3. The borehole identifier is used in the text. However, in other places of the document, other identifiers are used (i.e., groundwater monitoring well). For example, Section 4.3.4 identifies borehole C7866 and yet the well name (199-D5-140) is used in other places of the document. It is unfair to a reviewer who may not be familiar with both identifying "names" and a reviewer should not have to consult HWIS or mine the document otherwise for the synonym. Basis/Justification: Clarification.	Include all identifying names/numbers in the text.	4	4-13/14 Sec 4.3	Accept	Identifying names and numbers will be included in the text.	Yes - 1/30/2014
DH-141	Comment: The text states: "Appendix D (Tables 1–26) provides the analytical results for residual contamination at the RI characterization sites." Appendix D, Table 1-4 appears to only provide soil borehole and groundwater sample numbers. No analytical results are provided. Basis/Justification: Accuracy.	The large document is difficult to use. Correctly describe the tables when referring the reader to appendices.	4	4-14/1-2	Accept	The call outs were corrected. Note that if additional tables are added or moved in Appendix D, the table numbers in the final document will be adjusted accordingly.	Yes - 9/9/2013
DH-142	Comment: More information regarding why 100-D-100 may have contributed the total chromium and Cr(VI) in the vadose zone at the 100-D-12 test pit/borehole site is needed. Basis/Justification: It is unclear from text or figures why/how 100-D-100 may have influenced the 100-D-12 test pit/borehole results. How close are the two waste sites?	Explain why 100-D-100 has contributed to the total chromium and Cr (VI) in the 100-D Area. Also, include either text describing the proximity of the 100-D-100 waste site to 100-D-12 or include the location of 100-D-100 on Figure 4-4.	4	4-19/4	Accept	Text clarifying location of sites was inserted.	Yes - 7/10/2013
DH-143a	Comment: The text states: "The maximum tritium concentration was 18.6 pCi/g (at 70 ft bgs), while the maximum total chromium, molybdenum, nickel, and strontium (metal) concentrations are detected about 18.9 m (62 ft) bgs. Only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells (see Figures 4-66 and 4-90 for well locations)." The 2010 groundwater annual report identifies groundwater sample collection can affect the contaminant concentration in the 300 Area. The issue is directly applicable to the other areas of the River Corridor. The 2010 groundwater annual report states: "As suggested by the rapid changes in groundwater concentrations that may be the result of changes in water table elevation and river stage, it is apparent that the timing of groundwater sample collection plays a significant role in determining the uranium concentration for the sample. Thus, concentration patterns shown in groundwater plume maps contain bias in regard to representing aquifer conditions. Bias is also introduced by the different construction features of the various monitoring wells and aquifer tubes that make up the groundwater monitoring network. This bias was evident in recent monitoring results at the polyphosphate treatability test site, which is located at the southern end of the former 300 Area Process Trenches. Significantly higher concentrations of uranium were measured in samples from wells with 0.6-meter screens located in the uppermost portion of the aquifer than in samples from wells with typical 5-meter screens ("River-Induced Wellbore Flow Dynamics in Long-Screen Wells and Their Impact on Aqueous Sampling Results" [Vermeul et al., 2010]). An understanding of bias in monitoring data is important when (1) describing uncertainties associated with the conceptual site model, and (2) establishing criteria for remedial action performance evaluation and subsequent compliance monitoring." Basis/Justification: Accuracy	DH-143a - [1. Figures 4-66 and 4-90 do not appear to include "C7625". Even though well 199-D5-141 may be included (a cursory view did not indicate it on the Figure 4-90), it is unfair to a reviewer who may not be familiar with both identifying "names" and a reviewer should not have to consult HWIS or mine the document otherwise for the synonym. In the text, include all identifying names/numbers.] 2. For all constituents that exceed groundwater protection standards in nearby wells, a plot of the vadose zone measurements (e.g., Virtual Library's "constituent vertical profiles") with groundwater level indicated should be included near the text that describes the characterization (i.e., not in a Figure that is located hundreds of pages away). The significance of this may be appreciated when the constituent vertical profile clearly indicates a significant concentration increase near the PRZ and/or groundwater level which could justify the use of lower soil concentrations for groundwater protection (via WAC 173-340-747). To explain, a soil concentration of 0.19 mg/kg for hexavalent chromium is clearly warranted because groundwater concentrations at 199-D5-144 are frequently above 48 µg/L. 3. The second sentence stating "Only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells (see Figures 4-66 and 4-90 for well locations)" is problematic. The statement appears dismissive of the significance of the maximum concentrations of other constituents near the PRZ and/or groundwater level when nearby monitoring wells are not indicating exceedances of drinking water standards. Because 100 D/H Area groundwater plume maps contain bias in regard to representing aquifer conditions and the bias is attributed to several factors (i.e., sampling timing and well construction), a qualifying statement should be added to the text. Possible language: "Although there are uncertainties associated with the accuracy of contaminant measurements, only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells…"	4	4-19	Accept	The intent of the figures is to show current groundwater impacts near the waste site/borehole drilled. Figures 4-66 and 4-90 show groundwater plumes; however, the location of the waste site is difficult to discern. The report will be modified clearly show applicable waste sites, or borehole IDs/name, and impact to groundwater.	Yes - 1/30/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-143b	Comment: The text states: "The maximum tritium concentration was 18.6 pCi/g (at 70 ft bgs), while the maximum total chromium, molybdenum, nickel, and strontium (metal) concentrations are detected about 18.9 m (62 ft) bgs. Only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells (see Figures 4-66 and 4-90 for well locations)." The 2010 groundwater annual report identifies groundwater sample collection can affect the contaminant concentration in the 300 Area. The issue is directly applicable to the other areas of the River Corridor. The 2010 groundwater annual report states: "As suggested by the rapid changes in groundwater concentrations that may be the result of changes in water table elevation and river stage, it is apparent that the timing of groundwater sample collection plays a significant role in determining the uranium concentration for the sample. Thus, concentration patterns shown in groundwater plume maps contain bias in regard to representing aquifer conditions. Bias is also introduced by the different construction features of the various monitoring wells and aquifer tubes that make up the groundwater monitoring network. This bias was evident in recent monitoring results at the polyphosphate treatability test site, which is located at the southern end of the former 300 Area Process Trenches. Significantly higher concentrations of uranium were measured in samples from wells with 0.6-meter screens located in the uppermost portion of the aquifer than in samples from wells with typical 5-meter screens ("River-Induced Wellbore Flow Dynamics in Long-Screen Wells and Their Impact on Aqueous Sampling Results" [Vermeul et al., 2010]). An understanding of bias in monitoring data is important when (1) describing uncertainties associated with the conceptual site model, and (2) establishing criteria for remedial action performance evaluation and subsequent compliance monitoring." Basis/Justification: Accuracy	1. Figures 4-66 and 4-90 do not appear to include "C7625". Even though well 199-D5-141 may be included (a cursory view did not indicate it on the Figure 4-90), it is unfair to a reviewer who may not be familiar with both identifying "names" and a reviewer should not have to consult HWIS or mine the document otherwise for the synonym. In the text, include all identifying names/numbers. <u>143b</u> - [2. For all constituents that exceed groundwater protection standards in nearby wells, a plot of the vadose zone measurements (e.g., Virtual Library's "constituent vertical profiles") with groundwater level indicated should be included near the text that describes the characterization (i.e., not in a Figure that is located hundreds of pages away). The significance of this may be appreciated when the constituent vertical profile clearly indicates a significant concentration increase near the PRZ and/or groundwater level which could justify the use of lower soil concentrations for groundwater protection (via WAC 173-340-747). To explain, a soil concentration of 0.19 mg/kg for hexavalent chromium is clearly warranted because groundwater concentrations at 199-D5-144 are frequently above 48 µg/L.] 3. The second sentence stating "Only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells (see Figures 4-66 and 4-90 for well locations)" is problematic. The statement appears dismissive of the significance of the maximum concentrations of other constituents near the PRZ and/or groundwater level when nearby monitoring wells are not indicating exceedances of drinking water standards. Because 100 D/H Area groundwater plume maps contain bias in regard to representing aquifer conditions and the bias is attributed to several factors (i.e., sampling timing and well construction), a qualifying statement should be added to the text. Possible language: "Although there are uncertainties associated with the accuracy of contaminant measurements, only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells…"	4	4-19	Accept with Modification	Hexavalent chromium and nitrate are the only contaminants that exceed groundwater MCLs or standards near the borehole. A plot of hexavalent chromium and other contaminants above background will be included "near the text". Because nitrate is not above background, a plot showing concentrations in the vadose zone will not be included. However, there is no information suggesting that the hexavalent chromium concentrations measured in this borehole explain groundwater measurements at 199-D5-144. The 199-D5-141 profile will be moved to this section.	Yes - 1/30/2014
DH-143c	Comment: The text states: "The maximum tritium concentration was 18.6 pCi/g (at 70 ft bgs), while the maximum total chromium, molybdenum, nickel, and strontium (metal) concentrations are detected about 18.9 m (62 ft) bgs. Only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells (see Figures 4-66 and 4-90 for well locations)." The 2010 groundwater annual report identifies groundwater sample collection can affect the contaminant concentration in the 300 Area. The issue is directly applicable to the other areas of the River Corridor. The 2010 groundwater annual report states: "As suggested by the rapid changes in groundwater concentrations that may be the result of changes in water table elevation and river stage, it is apparent that the timing of groundwater sample collection plays a significant role in determining the uranium concentration for the sample. Thus, concentration patterns shown in groundwater plume maps contain bias in regard to representing aquifer conditions. Bias is also introduced by the different construction features of the various monitoring wells and aquifer tubes that make up the groundwater monitoring network. This bias was evident in recent monitoring results at the polyphosphate treatability test site, which is located at the southern end of the former 300 Area Process Trenches. Significantly higher concentrations of uranium were measured in samples from wells with 0.6-meter screens located in the uppermost portion of the aquifer than in samples from wells with typical 5-meter screens ("River-Induced Wellbore Flow Dynamics in Long-Screen Wells and Their Impact on Aqueous Sampling Results" [Vermeul et al., 2010]). An understanding of bias in monitoring data is important when (1) describing uncertainties associated with the conceptual site model, and (2) establishing criteria for remedial action performance evaluation and subsequent compliance monitoring." Basis/Justification: Accuracy	1. Figures 4-66 and 4-90 do not appear to include "C7625". Even though well 199-D5-141 may be included (a cursory view did not indicate it on the Figure 4-90), it is unfair to a reviewer who may not be familiar with both identifying "names" and a reviewer should not have to consult HWIS or mine the document otherwise for the synonym. In the text, include all identifying names/numbers. 2. For all constituents that exceed groundwater protection standards in nearby wells, a plot of the vadose zone measurements (e.g., Virtual Library's "constituent vertical profiles") with groundwater level indicated should be included near the text that describes the characterization (i.e., not in a Figure that is located hundreds of pages away). The significance of this may be appreciated when the constituent vertical profile clearly indicates a significant concentration increase near the PRZ and/or groundwater level which could justify the use of lower soil concentrations for groundwater protection (via WAC 173-340-747). To explain, a soil concentration of 0.19 mg/kg for hexavalent chromium is clearly warranted because groundwater concentrations at 199-D5-144 are frequently above 48 µg/L. <u>143c</u> - [3. The second sentence stating "Only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells (see Figures 4-66 and 4-90 for well locations)" is problematic. The statement appears dismissive of the significance of the maximum concentrations of other constituents near the PRZ and/or groundwater level when nearby monitoring wells are not indicating exceedances of drinking water standards. Because 100 D/H Area groundwater plume maps contain bias in regard to representing aquifer conditions and the bias is attributed to several factors (i.e., sampling timing and well construction), a qualifying statement should be added to the text. Possible language: "Although there are uncertainties associated with the accuracy of contaminant measurements, only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells…"]	4	4-19	No change	There is variability in measurements vertically, as demonstrated by Vermuel et al. , 2010, where focused, short well screen intervals (based on a priori knowledge of uranium contamination location) yielded higher contamination levels. The sampling program supporting this RI uses appropriate well screen intervals, and the sampling program requires a systematic purging approach to achieve representative samples collected quarterly. There is seasonal variability (different than bias) that is encompassed in the sample data. Uranium concentrations in the 300 Area are strongly correlated to river stage due to geochemical behavior resulting from the mixing of river and groundwater; however, the implications of this geochemical behavior do not pertain to other contaminants that do not exhibit such a response.	Yes - 7/17/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-144	Specific and general Comment: The text states: "Only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells (see Figures 4-66 and 4-90 for well locations)." The second sentence stating "Only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells (see Figures 4-66 and 4-90 for well locations)" is problematic. The statement appears dismissive of the significance of the maximum concentrations of other constituents near the PRZ and/or groundwater level when nearby monitoring wells are not indicating exceedances of drinking water standards. Because 100 D/H Area groundwater plume maps contain bias in regard to representing aquifer conditions and the bias is attributed to several factors (i.e., sampling timing and well construction), a qualifying statement should be added to the text. Basis/Justification: Accuracy	Either delete these types of sentences or add qualifying language. Possible language: "Although there are uncertainties associated with the accuracy of contaminant measurements, only nitrate and Cr (VI) exceed drinking water standards in nearby groundwater monitoring wells…"	4	4-20/34-35	No change	As is described in the response to comment DH-143c, while variability in well sample data is acknowledged, the inferred bias is not.	Yes - 7/17/2013
DH-145	Comment: "The interim action excavation to 4.6 m (15 ft) bgs was potentially less than the depth of the original trench; a residual source of contamination may remain in the vadose zone that could affect groundwater quality." Basis/Justification: To ensure accurate trench characterization (116-D-1A) and groundwater data.	Reference supporting data for section 4.3.5 as provided in Appendix D – and where in Appendix D (or other section in document).	4	4-20/42-45	Accept	The section already references the table in appendix D. Added reference to appendix E, Table E1, 116-D-1A, "Waste Site Description and History with Associated Interim Action Closeout Data."	Yes - 7/17/2013
DH-146	Comment: Data for radionuclides needs context. For example, the Vertical Profiles starting at Figure 4-5 have charts with scales that vary not only from one radionuclide to another, but the scale on charts for a particular radionuclide changes from one site to another. Informed comparison is almost impossible. Basis/Justification: Clarity and understanding.	Each chart and table should include a line, such as the "background" lines in the charts of several of the chemicals in Fig. 4-5, or the appropriate clean-up or regulatory concentration. Should such concentrations be so far above or below the data on the chart as to distort it too badly, the information should be included in the heading of the chart.	4	4-27/ Figure 4-9	No change	Cleanup levels and regulatory concentrations are not provided in the profiles. Only the available background concentrations are included in various profiles for the purpose of defining the vertical distribution of contamination. Note that many radionuclides do not have a background level, as these isotopes do not naturally occur but are created in the nuclear fission process in a reactor. Cleanup levels are addressed in Chapters 5 and 6. The scales are appropriate for each contaminant and borehole to assess concentrations with depth. No change to text.	Yes - 7/17/2013
DH-147	Comment: Fig. 4-11. Data points for Sr-90 and Tc-99, as well as a number of non-radioactive COCs, are given for depths shallower than 15 ft., but no data is given for other radionuclides for which there is data at deeper points. This should be explained. Basis/Justification: Clarity and understanding.	Explain why data points below 15 feet as not shown, per the comment. Or provide added data below 15 feet.	4	4-27/ Figure 4-9	No change	The available data below 15 ft is shown in the profiles.	Yes - 8/7/2013
DH-148	Comment: Data points for Sr-90 and Tc-99, as well as a number of non-radioactive COCs, are given for depths shallower than 15 ft., but no data is given for other radionuclides for which there is data at deeper points. This should be explained. Basis/Justification: Clarity and understanding.	Explain why data points below 15 feet as not shown, per the comment. Or provide added data below 15 feet.	4	4-29/ Figure 4-11	No change	The data presented is from a LFI borehole drilled before interim remedial action (i.e., RTD) commenced. All of the available borehole data showing contaminant distribution is presented in various profiles.	Yes - 8/7/2013
DH-149	Comment: Fig 4-12. C-14, Np-237, and Pu-239/240 have "undetected" data points with higher values than some of the "detected" data points. This should be explained. Basis/Justification: Clarity and understanding.	Explain the data used and omitted, per the comment.	4	4-30/ Figure 4-12	Accept with Modification	The reported detections in these data sets are at or near minimum detectable activities (MDAs). There is variability in individual sample MDA values due to expected variance within the counting method and differences in the sample matrices. It is not unusual then to see undetected samples with reported MDA values nominally higher than near-MDA reported detections in other samples. A note will be added to the text and the profile graphics to explain that non-detects are plotted at the MDA values.	Yes - 10/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-150	Comment: Figures 4-12, 4-13, and 4-14 do not provide all contaminant vertical profiles that show elevated contaminant concentrations at depth (typically at the groundwater table). Note: Increased contaminant concentrations measured at and/or near groundwater table for: antimony, barium, chromium, hexavalent chromium, molybdenum, nickel, strontium, tin, aldrin, endrin, ketone, heptachlor epoxide, beta-BHC, and delta-BHC. This observation supports classification of groundwater COCs and carrying forward groundwater COPCs for further evaluation/monitoring. Basis/Justification: Accuracy and completeness.	1. Confirm the accuracy of the antimony plot; 2.4 mg/kg detection is not plotted. 2. Plot arsenic. 3. Plot beryllium. 4. Plot boron (even though most of data is flagged "B"). 5. Plot cadmium (even though most of data is flagged "B", profile would show concentration increase at water table). 6. Plot cobalt (data is not flagged and profile would show concentration increase at water table). 7. Plot copper (data is not flagged and profile would show concentration increase at water table). 8. Plot fluoride (most data flagged "B", but concentrations increase with depth and the last value is not flagged). 9. Plot iron (data is not flagged). 10. Plot lead (data is not flagged). 11. Plot lithium (data is not flagged and concentration increases at depth). 12. Plot magnesium (data not flagged and increased at water table). 13. Plot manganese (data not flagged). 14. Confirm accuracy of mercury plot. 15. Plot methylene chloride (highest value at groundwater table isn't flagged). 16. Plot sulfate (data isn't flagged and increases with depth). 17. Plot uranium-233/234 (data isn't flagged). 18. Plot uranium-238 (data isn't flagged). 19. Plot zinc.	4	4-30 through 4-32	No change	The vadose zone portion of Chapter 4 describes vadose zone contamination above background concentrations. Antimony was detected in the split samples above background at a concentration of 2.4 mg/kg. Because split samples are collected to assess precision between two independent laboratories, only the parent and duplicate samples are used to describe potential contamination shown in profile. This practice is common. Note that splits and other QA/QC samples are not typically used in the calculation of UCLs for interim actions for determination of contaminant distribution. Arsenic, beryllium, boron, cadmium, cobalt, copper, fluoride, iron, lead, lithium, magnesium, manganese, sulfate, uranium-233/234 and-238 and zinc are not plotted because their concentrations in the vadose zone are below background levels. Iron and magnesium are also not plotted because they are considered an essential nutrient. The mercury plot is accurate.	Yes - 7/10/2013
DH-151	Comment: The text states: "The maximum total chromium, molybdenum, and nickel concentrations are detected about 24.6 m (81 ft) bgs." If contaminant concentrations spike near the PRZ and/or groundwater level or if maximum soil concentrations exceed MTCA fixed parameter 3-phase partitioning model equation values (e.g., soil concentration protective of groundwater, etc.), as is the case for nickel at borehole C7866 (well 199-D5-140), the vertical profile(s) should be included. Basis/Justification: Completeness.	Include vertical profiles for contaminants that spike (i.e., maximum) near the PRZ and/or groundwater level or if maximum soil concentrations exceed MTCA fixed parameter 3-phase partitioning model equation values.	4	4-20/31-32	Accept with Modification	The profiles will be moved to this section of the report. The MTCA fixed-parameter 3-phase partitioning model is not applied as a basis for evaluation.	Yes - 11/19/2013
DH-152a	Comment: Waste site 116-D-1A does not fit the conceptual model that assumes that only the upper portion of the vadose zone is contaminated. Basis/Justification: The text states "Only nitrate, Cr (VI) and strontium-90 exceeded drinking water standards in nearby groundwater monitoring wells…." This indicates that contamination occurred all of the way to groundwater, rather than just at the surface, and that the conceptual model is not appropriate for all sites.	152a - [First, any modeling at this site should assume contamination throughout the vadose zone.] Second, adjust cleanup values downward using the groundwater concentrations currently present in the wells, consistent with WAC 173-340-747(8)(vi).	4	4-26/14-17	Not Accepted	The conceptual model assumes that relatively mobile COPCs with Kd < 2.0 mg/L are distributed throughout the vadose zone (100:0 model): this includes nitrate and Cr(VI). Also, as discussed in Chapter 5, strontium-90 was also assumed to be distributed throughout the vadose zone (100:0) model, despite its higher Kd value in recognition of the past transport mechanisms that led to this contaminants higher mobility under historic conditions. Because there were measurements of some COPCs in RI boreholes in the lower 30% of those profiles, conservatism testing was carried out with the numerical models (discussed in Chapter 5) that demonstrated the 70:30 uniformly contaminated profile for Kd > 2 COPCs yielded conservative results compared to all available actual contaminant profiles from RI boreholes. The CSM and numerical approach were thereby validated to yield bounding results. The conservatism testing is documented in Appendix F, ECF-HANFORD-11-0063 (Section 5.2.1, "Validation of Conservative Basis for 70:30 Source Distribution for High Kd Contaminants"). This testing compared model results obtained using the actual vertical profiles measured in RI boreholes to the results obtained from the generalized 70:30 initial distribution CSM. The results of the conservatism testing showed that the generalized 70:30 CSM was conservative with respect to SSL and PRG values, within the 1000-year period, compared to results obtained using actual vertical contaminant profiles measured in the RI boreholes. This comparison included, for example, evaluation of Pu-239, cadmium, chromium, lead, mercury, barium, molybdenum, and strontium metal found in the lower 30% of the vertical profiles for the 116-D-1A trench (Figures 4-8 and 4-9).	Yes - 5/6/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-152b	Comment: Waste site 116-D-1A does not fit the conceptual model that assumes that only the upper portion of the vadose zone is contaminated. Basis/Justification: The text states "Only nitrate, Cr (VI) and strontium-90 exceeded drinking water standards in nearby groundwater monitoring wells...." This indicates that contamination occurred all of the way to groundwater, rather than just at the surface, and that the conceptual model is not appropriate for all sites.	First, any modeling at this site should assume contamination throughout the vadose zone. 152b - [Second, adjust cleanup values downward using the groundwater concentrations currently present in the wells, consistent with WAC 173-340-747(8)(vi).]	4	4-26/14-17	Accept with Modification	Resolution: Ecology has determined (Email from K. Welsch, 12/16/13) that no dilution factor adjustments are needed in the alternative fate and transport modeling for the following reasons: • WAC language allows for dilution factor adjustment, but does not require it. • The soil PRGs for protection of groundwater/surface water for hexavalent chromium is not based on the results of alternative fate and transport modeling, but on the values from the interim cleanup actions (originally based on the "100 times rule"). • The fate and transport modeling results show no migration of vadose zone contaminants to groundwater within 1000 years. Wi+L5th no migration to groundwater, the value of the dilution factor is irrelevant. Note that the "100 times rule" used as the basis for the interim cleanup actions produced a more conservative limit for hexavalent chromium than did the alternative fate and transport modeling. Response: Contamination above background is present throughout the vadose zone beneath the site. However, the modeling and risk assessment in Chapter 5 and 6 suggest that concentrations are not significant in terms of risk and impact to groundwater. As such, this site fits the conceptual model well. Also note that contamination in groundwater is only an indicator of past impacts; it is not an indicator of a continuing source in this case. Comment is also addressed per comment DH-125 -WAC-173-340-747.	Yes - 4/21/2014
DH-152b (Cont'd)						SSLs and PRGs are calculated to determine the maximum residual soil concentration that will not cause future exceedance of groundwater and surface water protection standards; these values were developed on the basis that existing groundwater contamination will be addressed through the remedy selection process in a shorter time frame. The modeling performed for this purpose is not intended to explain historic conditions, such as the inferences identified in this comment, between waste site soil contamination levels and current groundwater contamination levels. Because PRG values are established for protection of groundwater and surface water in the future, the predicted decline in groundwater contamination levels in the future are the appropriate upstream conditions to apply under WAC requirement 173-340-747(8)(b)(vi). Model results indicate that the existing groundwater contamination levels will decline below protection levels before a predictive Cr(VI) vadose zone model shows arrival in groundwater, and that the summation of these contaminant levels would not result in exceedances. Hence, the summed concentrations would not change the PRG values. ECF-Hanford-11-0063 has been modified and this information is included in the crosswalk.	
DH-153	Comment: Figures 4-18 and 4-19 do not provide all contaminant vertical profiles that show elevated contaminant concentrations at depth (typically at the groundwater table). Note: Increased contaminant concentrations measured at and/or near groundwater table for: tritium, barium, chromium, hexavalent chromium, molybdenum, nickel, strontium, and tin. This observation supports classification of groundwater COCs and carrying forward groundwater COPCs for further evaluation/monitoring. Basis/Justification: Accuracy and completeness.	1. Plot arsenic (most data isn't flagged). Also, explain why there are so many results (14 versus 17). 2. Plot barium. Also, explain why there are so many results (14 plotted versus 71 in HEIS). 3. Plot cobalt (data isn't flagged). 4. Plot copper (data isn't flagged). 5. Plot iron (data isn't flagged). 6. Plot lead (data isn't flagged). 7. Plot lithium (data isn't flagged). 8. Plot magnesium (data isn't flagged). 9. Plot manganese (data isn't flagged and concentrations increase at groundwater table). 10. Plot methylene chloride (even though values are estimated - flagged "J").	4	4-37 & 4-38	No change	The vadose zone portion of Chapter 4 describes vadose zone contamination above background concentrations. Arsenic, cobalt, copper, iron, lead, lithium, magnesium, and manganese are not plotted because their concentrations in the vadose zone are below background levels. Iron and magnesium are not plotted because they are considered an essential nutrient. Barium is plotted in Figure 4-18. There is not a 1 to 1 correspondence between the data in HEIS and the data profile. Other types of data are in the HEIS database. Only the parent and duplicate soil samples from the borehole are used in the presentation of the information. Quadruplicate samples collected for batch leach testing, CVP, and field/laboratory QA/QC (with exception of duplicates) are not presented in the profiles. Methylene chloride is not plotted because it was present as a common laboratory contaminant (the evidence for this is method and travel blanks showed higher concentrations of methylene chloride than the VZ soil samples).	Yes - 7/10/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-154	Comment: Figure 4-29 does not provide all contaminant vertical profiles that show elevated contaminant concentrations at depth (typically at the groundwater table). Note: Increased contaminant concentrations measured at and/or near groundwater table for: carbon14, strontium-90, mercury, molybdenum, strontium, tin, arsenic, copper, iron, lead, lithium, manganese, vanadium, and zinc. These observations support classification of groundwater COCs and carrying forward groundwater COPCs for further evaluation/monitoring. Basis/Justification: Accuracy and completeness.	1. Plot arsenic. 2. Plot barium (data isn't flagged). 3. Plot beryllium (data isn't flagged). 4. Plot cadmium (some data flagged "B"). 5. Plot cobalt (data isn't flagged). 6. Plot copper (data isn't flagged). 7. Plot iron (data isn't flagged). 8. Plot lead (data isn't flagged). 9. Plot lithium (data isn't flagged). 10. Plot manganese (data isn't flagged). 11. Plot uranium-233/234 (data isn't flagged). 12. Plot uranium-238 (data isn't flagged). 13. Plot vanadium (data isn't flagged). 14. Plot zinc (data isn't flagged).	4	4-49	No change	The vadose zone portion of Chapter 4 describes vadose zone contamination above background concentrations. Arsenic, barium, beryllium, cadmium, cobalt, copper, iron, lead, lithium, manganese, uranium-233/234 and-238, vanadium, and zinc are not plotted because their concentrations in the vadose zone are below background levels. Iron is also not plotted because it is considered an essential nutrient.	Yes - 7/10/2013
DH-155	Comment: PAHs, metals such as nickel, and tributyl phosphate (TBP) can reach groundwater. Basis/Justification: Figures 4-30 and 4-35 indicate that some PAHs and nickel are detected in groundwater. Also, TBP has been observed in well 199-H4-45 within the past 5 years.	Revise modeling for PAHs and metals to be consistent with the observations of PAHs and metals in groundwater. Also, include TBP in the risk calculations for well 199-H4-45, since TBP in this well was observed at a concentration that is 10% of the unrestricted land use risk limit for individual contaminants.	4	4-54 - 4-58/ Figs. 4-30 - 4-35	No change	Comment refers to Figures 4-30 and 4-35, as well as pages 4-54 through 4-58. Since pages 4-54 through 4-58 include figures with PAHs, it is assumed that those are the correct figures (Waste site 116-H-1). For clarification, the figures presented in this section represent soil concentrations in mg/kg, and not groundwater results. Also, the comment is incorrect regarding the mobility of PAH compounds, which are not very mobile in either soil or groundwater. If released to soil, an estimated Koc value of 3.1X10+4 indicates chrysene is expected to be immobile. If released to soil, fluoranthene is expected to have no mobility based upon a Koc range of 29,500-295,000. Borehole C7864: chrysene and fluoranthene were detected in the soil at this location, just above the water table. Chrysene was detected at a concentration of 0.0014 mg/kg, and fluoranthene was detected near the water table at 0.00138 and 0.0010 mg/kg. These PAH compounds have very low concentrations, flagged by the laboratory as an estimated value, and are not considered to be very mobile. The PAH compounds identified as present in soil at 116-H-1 were not detected in groundwater sample results from C7864 and C3048. In addition, chrysene was detected at a depth of 4.97 and 6.37 m bgs with results of 0.00356 (duplicate of 0.00201) and 0.00257mg/kg, respectively. Fluoranthene was also detected at 0.0134 (duplicate of 0.0117) mg/kg at 4.97m, and 0.00235 mg/kg at 9.33 m. Groundwater in that location is approximately 13.3 m bgs. Well 199-H4-58 (also identified as Well 116-H-1) was drilled as a temporary well (for the purpose of vadose zone characterization) on 3/10/92 and decommissioned on 3/13/92. Per the well as-built, the total depth was 25.7 feet bgs, and groundwater was not encountered.	Yes - 2/25/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-155 (Cont'd)						Borehole C7855: both chrysene and fluoranthene had detections near the surface at low levels with no detections below that. Pyrene and phenanthrene follow the same pattern, with a single, low level detection near the surface and no deeper detections. In Well 199-H4-45 (A4631), phenanthrene was detected at 0.05 ug/L, flagged "JB", in 2009. The results also have a validation qualifier "U", indicating it is below detection limits. These results are below the usual detection limit for this compound and there have been no other detections. Tributyl phosphate (TBP) was detected in 2010 at 1.70 ug/L, "J" flagged. The required detection limit for TBP is 10 ug/L. There have been no other detections since that time, even though the well is currently monitored for TBP annually. Nickel was detected in C7864 and Well 199-H4-45, and is listed as a COPC for 100-H. Concentrations in C7864 were at 0.732 and 0.625 ug/L, with both results flagged "JB", which indicates an estimated value and that the compound was detected in the method blank. Nickel was not detected in C3048. In Well 199-H4-45, nickel was detected 11/5/2001 at 42.7 ug/L in a filtered sample. The duplicate sample was unfiltered, and had a result below the detection limit. Also in Well 199-H4-45, nickel was detected on 11/21/2006. A total of 4 samples were collected on that date, with an unfiltered/ filtered set sent to WSCF lab and the other set sent to STL-SL for analysis. The results from WSCF were analyzed outside of the hold time and had a result of 36.3 and 37.2 (filtered and unfiltered respectively). The results from STL-SL were below detection for both the filtered and unfiltered sample. Nickel continues to be monitored at this location. The PAH results indicate that groundwater is not impacted by PAHs or TBP. Nickel is already considered a COC. No change was made to the text or model.	
DH-156	Comment: The document is missing some important contaminant observations in well 199-H4-3, which is near 116-H-6. Basis/Justification: Uranium has been observed in well 199-H4-3 at concentrations up to 86 µg/L in the past 7 years (5/23/2006), and up to 29 µg/L in 2011, and Tc-99 has been observed in this well up to 810 pCi/L (also 5/23/2006). Tritium has been observed up to 3900 pCi/L within the past 5 years.	Discuss in the document the relationship between these observations in groundwater and the 116-H-6 site. Include these contaminants in the risk calculations for well 199-H4-3.	4	4-60/8-34	Accept	Text will be modified to reflect conditions current through the end of 2012, due to a single detection of uranium above the DWS. Tc-99 has been routinely monitored and not been detected above the 900pCi/L DWS since 2005 (well 199-H4-9). Tritium has not been detected above 3,900 pCi/L. Neither analyte is considered a COC near the 183-H solar evaporation basin, based on the lack of detections of these analytes. The COC identification process from the Work Plan was followed. Both Cr(VI) and Nitrate are known to be present in that area above DWS. In response to other comments, the waste site and associated groundwater will be included in FS evaluation.	Yes - 4/9/2014
DH-157	Comment: Cite the documentation that supports the approval of modified closure and groundwater monitoring. Eliminate "was approved" at the end of the sentence. It is redundant. Basis/Justification: Cited references are needed that support the statement "Protection of groundwater was demonstrated through modeling and a modified RCRA closure for 116-H-6 that included groundwater monitoring was approved."	Cite the modified closure certification of closure letter by Ecology as the reference.	4	4-60/28-30	Accept	Reference was added to text.	Yes - 8/7/2013
DH-158	Comment: Figure 4-41 does not provide all contaminant vertical profiles that show elevated contaminant concentrations at depth (typically at the groundwater table). Note: Increased contaminant concentrations measured at and/or near groundwater table for: carbon14, tritium, antimony, strontium, beryllium, cobalt, copper, iron, lithium, magnesium, manganese, vanadium, and zinc. These observations support classification of groundwater COCs and carrying forward groundwater COPCs for further evaluation/monitoring. Basis/Justification: Accuracy and completeness.	1. Plot arsenic (data isn't flagged). 2. Plot beryllium (data isn't flagged). 3. Plot cadmium (some data flagged "B"). 4. Plot cobalt (data isn't flagged). 5. Plot copper (data isn't flagged). 6. Plot iron (data isn't flagged). 7. Plot lithium (data isn't flagged). 8. Plot magnesium (data isn't flagged). 9. Plot manganese (data isn't flagged). 10. Plot uranium-233/234. 11. Plot uranium-238. 12. Plot vanadium (data isn't flagged). 13. Plot zinc (data isn't flagged).	4	4-63	No change	The vadose zone portion of Chapter 4 describes vadose zone contamination above background concentrations. Arsenic, beryllium, cadmium, cobalt, copper, iron, lithium, magnesium, manganese, uranium-233/234 and-238, vanadium, and zinc are not plotted because their concentrations in the vadose zone are below background levels. Iron and magnesium are also not plotted because they are considered an essential nutrient.	Yes - 7/10/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-159	Comment: Thank you for noting that contamination is migrating from this unit vertically into the groundwater system. Model this waste site further since ongoing groundwater contamination that exceeds the MCL for nitrate and uranium still is present. Basis/Justification: This waste site is known to have released waste into the soil that has migrated downward to the groundwater. Provide more in-depth vadose zone modeling of this waste site to establish its duration for contamination of groundwater.	Additional 2-D or 3-D vadose zone modeling is needed for the 116-H-6 waste site to delineate the duration of ongoing groundwater contamination from the vadose zone beneath this waste site.	4	4-64/3-14	Accept with Modification	As previously agreed with Ecology, the solar evaporation basin and associated groundwater will be included in the FS without site-specific modeling.	Yes - 7/17/2013
DH-160	Comment: Contaminants at aquifer tube C7650 may have some relationship with contamination from 116-H-7. Basis/Justification: Aquifer tube C7650, which appears to be downgradient from 116-H-7 (see Figure M-2), has had organic contaminants such as methyl methacrylate, tetrachloroethylene, trichloroethylene, and bis(ethylhexyl)phthalate in the past 5 years.	Discuss in the document the relationship between these observations in the aquifer tube and contaminants that were released at the 116-H-7 basin.	4	4-65/1-17	Accept with Modification	Text was edited to relate contaminant concentrations to the nearby waste site, which did not have these contaminants in the vadose zone. A discussion of the groundwater results was included.	Yes - 1/30/2014
DH-161	Comment: Text references Figures 1 through 14 in Appendix D. However, there are no figures in Appendix D, only tables. Basis/Justification: Clarity and understanding.	Cite the correct figures/tables in the document.	4	4-81/11	Accept	The callouts will be corrected.	Yes - 1/30/2014
DH-162	Comment: . "With few exceptions, low-levels of radioactive contamination were detected in soil and sediment samples adjacent to the water table. The maximum concentrations for cesium-137 (C7623), strontium-90 (C7624, C7626, and C7639), and tritium (C7625, C7626, C7627, and C7630) were 0.241 pCi/g, 0.906 pCi/g, and 18.6 pCi/g, respectively." These concentrations need context. Basis/Justification: Clarity and understanding.	Put concentrations in context per comment.	4	4-82/1-25	Not Accepted	This section covers the nature and extent of contamination and generally describes contaminant distribution and, where appropriate, provides a comparison to background. As is done with the chemical constituents listed in the succeeding paragraph in the document, the context for these concentrations are addressed in chapter 5 and 6 in terms of risk and impact to groundwater.	Yes - 7/17/2013
DH-163	Comment: The text states that the laboratory detected Cr(VI) in only one sample from the RUM. However, this sample had a laboratory "B" qualifier, which indicates it was below the laboratory quantitation limit. This definition of the "B: qualifier is inaccurate. The "B" qualifier for inorganics indicates that the analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate.) Since the laboratory quantitation limit is not necessarily equal to the contract required detection limit, this statement must be corrected. Basis/Justification: The correct definition of the laboratory "B" qualifier is shown on page 4-108, lines 44-45 of this document.	Edit the text to provide the accurate meaning of the "B" qualifier.	4	4-85/31-33	Accept with Modification	The initial comment response indicated that the definition of a "B" flag qualifier would be edited for accuracy. However, during a review of the RPO data provided in Table 4-5, it was noted that the sample from well 199-H1-7 was below the detection limit for Cr(VI) and no "B" flag was applied. Therefore, the text was edited for accuracy. Cr(VI) was not detected in any of the RPO soil samples. Data can be found in Appendix D.	Yes - 1/30/2014
DH-164	Comment: The heading for the Legend of Figure 4-58 is entitled "Fall 2009 Hexavalent Chromium". However, the listed contaminant ranges are shown to be for "Cr". Provide specificity on which type of chromium is being presented in the table. For technical accuracy, it should either be "Chromium (Total)" or "Cr(VI)". Basis/Justification: Clarity and accuracy.	Provide specificity on which type of chromium is being presented in the table. For technical accuracy, it should either be "Chromium (Total)" or "Cr(VI)".	4	4-86/ Figure 4-58	Accept	Figure was modified.	Yes - 7/17/2013
DH-165	Comment: It is not specified if the chromium values listed in the table are for hexavalent chromium or total chromium. Edit the table with appropriate information. Basis/Justification: Clarity and accuracy.	Edit the table to show the specific type of chromium that is being presented.	4	4-87/ Table 4-5	Accept	Table was edited for clarity	Yes - 5/2/2013
DH-166	Comment: The text states the following: "Water was added during drilling at 19 of the 27 wells and borings drilled during the RI. Seven of these locations have a subset of samples that potentially could have impacts to the characterization of mobile constituents ranging from one to six of the dozen or more samples collected at each location. Three locations (199-D3-5, 199-D5-134, and 199-D5-143) were affected to the extent that four to six of the split spoon samples collected might have received some impact." The information is presented in a convoluted manner, which becomes essentially nonsensical. The information must be re-written in a more logical and understandable manner. Basis/Justification: Clarity and accuracy.	Re-write the information in a more logical and understandable manner.	4	4-88 to 4-89/16-18, 2	Accept	Text was edited for clarity.	Yes - 5/20/2013
DH-167	Comment: In the fourth column of the table, "VOCs" needs to be identified as a "classification" of analytes. The way it is currently presented, "VOCs" appears to be an analyte of the "SVOCs continued". Basis/Justification: Clarity and accuracy.	Editorial: Edit the table to separate VOCs as a stand-alone classification of analytes.	4	4-90/Table 4-6	Accept	Shading added as a color to the VOCs area of the table.	Yes - 5/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-168a	Comment: The 2010 groundwater annual report identifies that groundwater sample collection can affect the contaminant concentration in the 300 Area. This issue is directly applicable to the other areas of the River Corridor. The 2010 groundwater annual report states: "As suggested by the rapid changes in groundwater concentrations that may be the result of changes in water table elevation and river stage, it is apparent that the timing of groundwater sample collection plays a significant role in determining the uranium concentration for the sample. Thus, concentration patterns shown in groundwater plume maps contain bias in regard to representing aquifer conditions. Bias is also introduced by the different construction features of the various monitoring wells and aquifer tubes that make up the groundwater monitoring network. This bias was evident in recent monitoring results at the polyphosphate treatability test site, which is located at the southern end of the former 300 Area Process Trenches. Significantly higher concentrations of uranium were measured in samples from wells with 0.6-meter screens located in the uppermost portion of the aquifer than in samples from wells with typical 5-meter screens ("River-Induced Wellbore Flow Dynamics in Long-Screen Wells and Their Impact on Aqueous Sampling Results" [Vermeul et al., 2010]). An understanding of bias in monitoring data is important when (1) describing uncertainties associated with the conceptual site model, and (2) establishing criteria for remedial action performance evaluation and subsequent compliance monitoring." In addition, contaminant concentrations in groundwater are also affected by pump-and-treat operations. Basis/Justification: Acknowledgement of uncertainty, and WAC 173-340.	168a - [1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing, well construction, pump-and-treat configuration and operations, etc.). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be referenced, and/or included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias.] 2. Explain that due to the uncertainty associated with the groundwater data, COCs will be classified. In addition, explain that there will be three categories of contaminants retained as COPCs (1] contaminants detected at levels above action level but below EQL with uncertain status, and 2] detected in concentrations up to at least 10% of: the WAC 173-340 risk limit for individual contaminants (1E-06) in water, the WAC 173-340 hazard quotient limit (1) for individual contaminants, or the federal MCL or ambient water quality criteria {with uncertain status}, and 3] statistical tests used in RCBRA indicated that contaminants are greater in the deep zone of waste sites than in reference sites {with uncertain status})	4	4-92	Not Accepted	The field tests described in the paper refer specifically to uranium, which has a different behavior and chemistry from Cr(VI). The paper notes that there is vertical variability for uranium in the aquifer, and the concentrations found in the fully penetrated well reflect that variability (as expected). At 100-D/H, depth discrete sampling and sampling during drilling was conducted to determine if there was a vertical distribution within the aquifer. No distinct pattern was identified (See Section 4.5.2 vertical distribution of contaminants). The seasonal effects on sampling results, as well as effects from the pump and treat systems, are discussed in detail in Chapter 3 and Chapter 4. Also, typical well construction results in a well screen of 20 feet at 100-D and often less than that at 100-H. This is identified in the cited reference as a "short well screen" (conclusions, first paragraph). Wells within 100-D/H are also screened in different sections of the aquifer. In addition, well construction and sampling methods are conducted using standard industry practices and approved SAPs, and both geologic logging and downhole geophysics (which has a different signal response in different stratigraphic zones) are used to best identify various transmissive zones.	Yes - 6/28/2013
DH-168b	Comment: The 2010 groundwater annual report identifies that groundwater sample collection can affect the contaminant concentration in the 300 Area. This issue is directly applicable to the other areas of the River Corridor. The 2010 groundwater annual report states: "As suggested by the rapid changes in groundwater concentrations that may be the result of changes in water table elevation and river stage, it is apparent that the timing of groundwater sample collection plays a significant role in determining the uranium concentration for the sample. Thus, concentration patterns shown in groundwater plume maps contain bias in regard to representing aquifer conditions. Bias is also introduced by the different construction features of the various monitoring wells and aquifer tubes that make up the groundwater monitoring network. This bias was evident in recent monitoring results at the polyphosphate treatability test site, which is located at the southern end of the former 300 Area Process Trenches. Significantly higher concentrations of uranium were measured in samples from wells with 0.6-meter screens located in the uppermost portion of the aquifer than in samples from wells with typical 5-meter screens ("River-Induced Wellbore Flow Dynamics in Long-Screen Wells and Their Impact on Aqueous Sampling Results" [Vermeul et al., 2010]). An understanding of bias in monitoring data is important when (1) describing uncertainties associated with the conceptual site model, and (2) establishing criteria for remedial action performance evaluation and subsequent compliance monitoring." In addition, contaminant concentrations in groundwater are also affected by pump-and-treat operations. Basis/Justification: Acknowledgement of uncertainty, and WAC 173-340.	1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing, well construction, pump-and-treat configuration and operations, etc.). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be referenced, and/or included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 168b - [2. Explain that due to the uncertainty associated with the groundwater data, COCs will be classified. In addition, explain that there will be three categories of contaminants retained as COPCs (1] contaminants detected at levels above action level but below EQL with uncertain status, and 2] detected in concentrations up to at least 10% of: the WAC 173-340 risk limit for individual contaminants (1E-06) in water, the WAC 173-340 hazard quotient limit (1) for individual contaminants, or the federal MCL or ambient water quality criteria {with uncertain status}, and 3] statistical tests used in RCBRA indicated that contaminants are greater in the deep zone of waste sites than in reference sites {with uncertain status}}]	4	4-92	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. Uncertainties associated with groundwater monitoring are discussed at length in Section 5.9. The text will be revised to indicate that the RD/RAWP will identify analytes that are not retained as a COPC that will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-169a	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) exceeded groundwater protection standards should be classified as COCs. As such, the following contaminants should be classified as COCs: tritium, tetrachloroethene (199-D5-38, 199-D3-5), sulfate (note: even though the elevated concentrations are associated with the ISRM barrier, it is unknown if sulfate concentrations up to 2.2 times greater than the SMCL are a risk), arsenic (numerous observations at numerous wells occurred above 4 µg/L), iron (note: even though some of the elevated concentrations are associated with the ISRM barrier, it is unknown if iron concentrations up to 46 times greater than the SMCL and 14 times the AWQC are a risk), manganese (199-D4-7, 199-D4-22, 199-D4-25, 199-D4-78, 199-D5-93, 199-D4-92, 199-D5-107, 199-D5-108), mercury (199-D2-6, 199-D5-19, 199-D5-43, 199-D5-144), selenium (199-D8-70, 199-D8-71, 199-D8-88, 199-D6-3), thallium (199-D5-36, 199-D5-144), and zinc (note: even though some of the elevated concentrations are associated with the ISRM barrier, it is unknown if zinc concentrations up to 8.4 times greater than the action level are a risk and a number of observations do not appear to be associated with the ISRM 199-D5-93, 199-D5-36, 199-D5-38, 199-D5133, 199-D4-141). Basis/Justification: See above.	169a - [1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be referenced, and/or included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased.] 3. Change text, where applicable, to acknowledge the above uncertainty associated with accuracy of measurements associated with action level exceedances and classify the following 100-D Area contaminants as COCs: strontium-90, tritium, carbon tetrachloride, chloroform, tetrachloroethene, nitrate, sulfate, antimony, arsenic, cadmium, chromium, chromium +6, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc. 4. For all 100-D Area contaminants discussed in Section 4.4.1.2 that are to be "carried forward as a COPC" for action level exceedances, the text should be revised to identify those contaminants as "classified as a COC" due to uncertainties associated with accuracy of contaminant measurements in groundwater. Therefore, the text should be changed for the following contaminant discussions to identify the following contaminants as "classified as a COC": strontium-90, carbon tetrachloride, chloroform, tetrachloroethene, nitrate, antimony, cadmium, chromium, chromium +6, cobalt, copper, lead, nickel, and silver.	4	4-101	Accept with Modification	Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. Additional information: The field tests described in the paper refer specifically to uranium, which has a different behavior and chemistry from Cr(VI). The paper notes that there is vertical variability for uranium in the aquifer, and the concentrations found in the fully penetrated well reflect that variability (as expected). At 100-D/H, depth discrete sampling and sampling during drilling was conducted to determine if there was a vertical distribution within the aquifer. No distinct pattern was identified (See Section 4.5.2 vertical distribution of contaminants). The seasonal effects on sampling results, as well as effects from the pump and treat systems, are discussed in detail in Chapter 3 and Chapter 4. Also, typical well construction results in a well screen of 20 feet at 100-D and often less than that at 100-H. This is identified in the cited reference as a "short well screen" (conclusions, first paragraph). Wells within 100-D/H are also screened in different sections of the aquifer. In addition, well construction and sampling methods are conducted using standard industry practices and approved SAPs, and both geologic logging and downhole geophysics (which has a different signal response in different stratigraphic zones) are used to best identify various transmissive zones.	10/2/2013
DH-169c	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) exceeded groundwater protection standards should be classified as COCs. As such, the following contaminants should be classified as COCs: tritium, tetrachloroethene (199-D5-38, 199-D3-5), sulfate (note: even though the elevated concentrations are associated with the ISRM barrier, it is unknown if sulfate concentrations up to 2.2 times greater than the SMCL are a risk), arsenic (numerous observations at numerous wells occurred above 4 µg/L), iron (note: even though some of the elevated concentrations are associated with the ISRM barrier, it is unknown if iron concentrations up to 46 times greater than the SMCL and 14 times the AWQC are a risk), manganese (199-D4-7, 199-D4-22, 199-D4-25, 199-D4-78, 199-D5-93, 199-D4-92, 199-D5-107, 199-D5-108), mercury (199-D2-6, 199-D5-19, 199-D5-43, 199-D5-144), selenium (199-D8-70, 199-D8-71, 199-D8-88, 199-D6-3), thallium (199-D5-36, 199-D5-144), and zinc (note: even though some of the elevated concentrations are associated with the ISRM barrier, it is unknown if zinc concentrations up to 8.4 times greater than the action level are a risk and a number of observations do not appear to be associated with the ISRM 199-D5-93, 199-D5-36, 199-D5-38, 199-D5133, 199-D4-141). Basis/Justification: See above.	1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be referenced, and/or included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased. 169c - [3. Change text, where applicable, to acknowledge the above uncertainty associated with accuracy of measurements associated with action level exceedances and classify the following 100-D Area contaminants as COCs: strontium-90, tritium, carbon tetrachloride, chloroform, tetrachloroethene, nitrate, sulfate, antimony, arsenic, cadmium, chromium, chromium +6, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc. 4. For all 100-D Area contaminants discussed in Section 4.4.1.2 that are to be "carried forward as a COPC" for action level exceedances, the text should be revised to identify those contaminants as "classified as a COC" due to uncertainties associated with accuracy of contaminant measurements in groundwater. Therefore, the text should be changed for the following contaminant discussions to identify the following contaminants as "classified as a COC": strontium-90, carbon tetrachloride, chloroform, tetrachloroethene, nitrate, antimony, cadmium, chromium, chromium +6, cobalt, copper, lead, nickel, and silver.]	4	4-101	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. Uncertainties associated with groundwater monitoring are discussed at length in Section 5.9. The text will be revised to indicate that the RD/RAWP will identify analytes that are not retained as a COPC that will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-170a	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) been measured to be above the 90th percentile Hanford Site background should be classified as COCs. Therefore, the following contaminants should be classified as COCs: nitrite (199-D4-14, 199-D4-25, 199-D4-31, 199-D5-127), sulfate (numerous wells besides those in close proximity to the ISRM exceed Hanford Site background level), arsenic (observations occurred above Hanford Site background level 7.85 µg/L), manganese, mercury, thallium (199-D5-36, 199-D5-144), vanadium (199-D5-15, 199-D3-2, 199-D5-37, 199-D5-39, 199-D4-20, 199-D5-41, 199-D4-25, 199-D4-27, 199-D4-31, 199-D4-32, 199-D4-36, 199-D4-38, 199-D4-39, 199-D4-48), and zinc (numerous non-ISRM-related observations exceeded Hanford Site background of 21.8 µg/L 199-D8-69, 199-D5-36, 199-D5-38, 199-D5-44, 199-D5-32, 199-D8-73, 199-D5-92, 199-D5-93, 199-D5-104, 199-D8-89, 199-D8-90, 199-D8-91, 199-D8-97, 199-D5-101, 199-D5-130, 199-D5-127, 199-D7-3, 199-D5-131, 199-D5-132, 199-D6-3, 199-D5-134, 199-D5-141). Basis/Justification: See above.	170a - [1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased.] 3. Change text, where applicable, to acknowledge the above-described uncertainty associated with accuracy of measurements associated with 90th percentile Hanford Site background exceedances and classify the following 100-D Area contaminants as COCs: nitrite, sulfate, arsenic, manganese, mercury, thallium, vanadium, and zinc. 4. For all 100-D Area contaminants discussed in Section 4.4.1.2 that are to be "carried forward as a COPC" for 90th percentile Hanford Site exceedances, the text should be revised to identify those contaminants as "classified as a COC" due to uncertainties associated with accuracy of contaminant measurements in groundwater. Therefore, the text should be changed for the following contaminant discussions to identify the following contaminants as "classified as a COC": strontium-90, carbon tetrachloride, chloroform, tetrachloroethene, nitrate, antimony, cadmium, chromium, chromium +6, cobalt, copper, lead, nickel, silver.	4	Sect. 4.4.1.2	Accept with Modification	Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. Additional information: The field tests described in the paper refer specifically to uranium, which has a different behavior and chemistry from Cr(VI). The paper notes that there is vertical variability for uranium in the aquifer, and the concentrations found in the fully penetrated well reflect that variability (as expected). At 100-D/H, depth discrete sampling and sampling during drilling was conducted to determine if there was a vertical distribution within the aquifer. No distinct pattern was identified (See Section 4.5.2 vertical distribution of contaminants). The seasonal effects on sampling results, as well as effects from the pump and treat systems, are discussed in detail in Chapter 3 and Chapter 4. Also, typical well construction results in a well screen of 20 feet at 100-D and often less than that at 100-H. This is identified in the cited reference as a "short well screen" (conclusions, first paragraph). Wells within 100-D/H are also screened in different sections of the aquifer. In addition, well construction and sampling methods are conducted using standard industry practices and approved SAPs, and both geologic logging and downhole geophysics are used to best identify various transmissive zones.	Yes - 10/2/2013
DH-170c	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) been measured to be above the 90th percentile Hanford Site background should be classified as COCs. Therefore, the following contaminants should be classified as COCs: nitrite (199-D4-14, 199-D4-25, 199-D4-31, 199-D5-127), sulfate (numerous wells besides those in close proximity to the ISRM exceed Hanford Site background level), arsenic (observations occurred above Hanford Site background level 7.85 µg/L), manganese, mercury, thallium (199-D5-36, 199-D5-144), vanadium (199-D5-15, 199-D3-2, 199-D5-37, 199-D5-39, 199-D4-20, 199-D5-41, 199-D4-25, 199-D4-27, 199-D4-31, 199-D4-32, 199-D4-36, 199-D4-38, 199-D4-39, 199-D4-48), and zinc (numerous non-ISRM-related observations exceeded Hanford Site background of 21.8 µg/L 199-D8-69, 199-D5-36, 199-D5-38, 199-D5-44, 199-D5-32, 199-D8-73, 199-D5-92, 199-D5-93, 199-D5-104, 199-D8-89, 199-D8-90, 199-D8-91, 199-D8-97, 199-D5-101, 199-D5-130, 199-D5-127, 199-D7-3, 199-D5-131, 199-D5-132, 199-D6-3, 199-D5-134, 199-D5-141). Basis/Justification: See above.	1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased. 170c - [3. Change text, where applicable, to acknowledge the above-described uncertainty associated with accuracy of measurements associated with 90th percentile Hanford Site background exceedances and classify the following 100-D Area contaminants as COCs: nitrite, sulfate, arsenic, manganese, mercury, thallium, vanadium, and zinc. 4. For all 100-D Area contaminants discussed in Section 4.4.1.2 that are to be "carried forward as a COPC" for 90th percentile Hanford Site exceedances, the text should be revised to identify those contaminants as "classified as a COC" due to uncertainties associated with accuracy of contaminant measurements in groundwater. Therefore, the text should be changed for the following contaminant discussions to identify the following contaminants as "classified as a COC": strontium-90, carbon tetrachloride, chloroform, tetrachloroethene, nitrate, antimony, cadmium, chromium, chromium +6, cobalt, copper, lead, nickel, silver.]	4	Sect. 4.4.1.2		Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. Additional information: COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established.	Yes - 10/2/2013
DH-171	Comment: Remove the text "fluoride will not be retained" and note that nitrate should be retained as a COC. Basis/Justification: Wrong chemical (fluoride) in this paragraph regarding nitrate.	Remove the text "fluoride will not be retained" and note that nitrate should be retained as a COC.	4	4-105/19	Accept with Modification	All nitrite concentrations were less than the DWS of 3,300 µg/L. The text will be revised to indicate that nitrite is not retained as a COPC. Nitrate is retained and is discussed in the FS.	Yes - 5/13/2014
DH-172	Comment: Remove the text "fluoride will not be retained" and note that sulfate should be retained as a COC. Basis/Justification: Wrong chemical (fluoride) in this paragraph regarding sulfate.	Remove the text "fluoride will not be retained" and note that sulfate should be retained as a COC.	4	4-105/33	Accept with Modification	The text will be revised to clarify that sulfate is not retained as a COPC in groundwater because a primary MCL is not published. EPA has promulgated a SMCL for sulfate for which it indicates that no adverse health effects are observed at the concentrations that are measured in the 100-HR-3 groundwater. Sulfate, anions, and metals are currently being monitored in the network of wells surrounding the ISRM barrier. The effects of the ISRM barrier on groundwater chemistry has been added to section 4.5.	Yes - 5/13/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-173	Comment: The text explains that sulfate is not carried forward as a COPC because it is associated with the ISRM remediation. The following is from EPA's website: "EPA has established National Secondary Drinking Water Regulations that set non-mandatory water quality standards for 15 contaminants. EPA does not enforce these "secondary maximum contaminant levels" or "SMCLs." They are established only as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color and odor. These contaminants are not considered to present a risk to human health at the SMCL." However, it is unknown if sulfate concentrations up to 2.2 times greater than the SMCL are a risk. In addition, as previously explained, there are uncertainties associated with sulfate measurements. Therefore, sulfate should be classified as a COC. Basis/Justification: It is unknown if sulfate concentrations (which are up to 2.2 times greater than the SMCL) are a risk to human health and the environment and there are uncertainties associated with sulfate measurements.	Classify sulfate as a COC.	4	4-105/20-33	Accept with Modification	Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. <u>Additional information:</u> Sulfate will not be retained as a COC based on concentrations up to 2.2 times the SMCL. EPA has studied the effects of elevated sulfate on sensitive subpopulations (infants and transients [persons who live in one place for a short period of time]) at concentrations up to 4.8 times the SMCL. As a result, EPA did not develop a primary MCL for the effects associated with exposure to sulfate.	Yes - 10/2/2013
DH-174	Comment: The text states the following: "Additionally, lead from these wells was not analyzed by the trace methods identified in the 100-D/H SAP but was analyzed by Method 6010, which is not accurate for measuring trace levels of lead." Explain which analytical method should have been used instead of Method 6010, since it is not apparent. Basis/Justification: Clarity and accuracy.	Explain which analytical method should have been used instead of Method 6010, since it is not apparent.	4	4-108, 4-109/47, 1	Accept	The sentence will be revised to identify the trace method listed in the SAP.	Yes - 7/17/2013
DH-175	Comment: Retain Manganese as a COC in the FS. Basis/Justification: Due to the high concentrations reported, residual drainage occurring and its impact on ecological receptors – aquatic plants and invertebrates as noted in Table 4-24 on page 4-226.	Retain Manganese as a COC in the FS.	4	4-109/18	Accept with Modification	Evaluation relating to the Columbia River is in section 4.6. The list of analytes listed in Table 4-24 on page 226 are area-wide and were not evaluated on an OU-specific basis. The evaluation of near-shore media collected from the 100-D/H area is presented in Appendix L. Section L.3.3.4.1 (100-D Source Area [p L-39]) and Section L.3.3.4.2 (100-H Source Area [p L-50]) indicate that manganese concentrations in pore water from 100-D/H are less than the ecological screening level (ESL) (120 µg/L). All sediment concentrations were less than the lower threshold ESL. Manganese is discussed with respect to the effects of the ISRM barrier on groundwater chemistry in section 4.5.	Yes - 5/13/2014
DH-176	Comment: The D Area discussion of zinc does not include identification and discussion of the Hanford Site background (21.8). Basis/Justification: Consistency and completeness.	Add identification and discussion of Hanford Site background for zinc in groundwater.	4	4-111/15-47	Accept	A discussion of zinc concentrations relative to Hanford background concentrations will be provided.	Yes - 4/8/2014
DH-177	Comment: Tables 4-8, 4-9, and 4-10 summarize "100-D Groundwater Plume Area Contaminant Evaluation", "100-H Groundwater Plume Area Contaminant Evaluation", and "Horn Groundwater Plume Area Contaminant Evaluation" respectively. Basis/Justification: Due to the configuration of the groundwater monitoring network, the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), and the non-representativeness of contaminant measurements at remediation wells, the word "plume" is problematic. Extent of contamination (i.e., whether contamination can be characterized as a plume) is an insufficient basis for not carrying the contaminant forward as a COC or COPC. In other words, contaminant observations are not required to satisfy plume criteria to be a COC or a COPC.	Delete the word "plume" in each table title. Recommended wording: "100-D Groundwater Area Contaminant Evaluation", "100-H Groundwater Area Contaminant Evaluation", and "Horn Groundwater Area Contaminant Evaluation"	4	4-112,4-120, and 4-129	No change	The table titles reflect the name of the exposure areas evaluated in the groundwater risk assessment and are not intended to imply COPC selection criteria.	Yes - 7/10/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-178	Comment: See previous comments regarding 100-D Area historical groundwater evaluation which occurs on pages 4-99 through 4-112. Basis/Justification: Uncertainties associated with groundwater data.	1. Table 4-8's category of "Retained as a COPC" should be changed to "Classified as a COC". 2. Under "Classified as a COC" include the following words: "Contaminant of potential concern classified as contaminant of concern based on evaluation of data collected January 2006 – December 2011 and uncertainties associated with data". 3. Include the following 100-D Area COCs on Table 4-8: "strontium-90, tritium, carbon tetrachloride, chloroform, tetrachloroethene, nitrate, nitrite, sulfate, antimony, arsenic, cadmium, chromium, chromium +6, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, zinc" 4. Delete Table 4-8's category of "Detected at levels above action level and background (uncertain status)" and corresponding constituent of: "antimony, cadmium, carbon tetrachloride, chloroform, cobalt, copper, lead, nickel, silver"	4	4-112/15-47	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6.However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. Uncertainties associated with groundwater monitoring are discussed at length in Section 5.9. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014
DH-179	Comment: See previous comments regarding 100-D Area historical groundwater evaluation which occurs on pages 4-99 through 4-112. Basis/Justification: Uncertainties associated with groundwater data.	1. Under Table 4-8's category of "Retained as a COPC", include the following sub-categories: 1) "Detected at levels above action level but below EQL (uncertain status)", 2) "Detected in concentrations up to at least 10% of: the WAC 173-340 risk limit for individual contaminants (1E-06) in water, the WAC 173-340 hazard quotient limit (1) for individual contaminants, or the federal MCL or ambient water quality criteria (uncertain status)", and 3) "contaminants greater in the deep zone of waste sites than in reference sites RCBRA statistical tests (uncertain status)" 2. For the sub-category of "Detected at levels above action level but below EQL (uncertain status)", include the following constituents: "1,1-dichloroethane and bromodichloromethane" 3. For the sub-category of "Detected in concentrations up to at least 10% of: the WAC 173-340 risk limit for individual contaminants (1E-06) in water, the WAC 173-340 hazard quotient limit (1) for individual contaminants, or the federal MCL or ambient water quality criteria (uncertain status)" include the following constituents: "beryllium, tetrachloroethylene/trichloroethane, molybdenum, strontium, lithium, barium, bis(ethylhexyl)phthalate, tributylphosphate" 4. For the sub-category of "contaminants greater in the deep zone of waste sites than in reference sites RCBRA statistical tests (uncertain status)" include the following constituents: di-n-butylphthalate, aroclor-1242, aroclor-1254, aroclor-1260	4	4-112/15-47	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-180	Comment: See previous comments regarding 100-D Area historical groundwater evaluation which occurs on pages 4-99 through 4-112. Basis/Justification: Uncertainties associated with groundwater data.	1. In Table 4-8, under "Is not retained as a COPC", delete sub-category of "Detected above action level, but not associated with a Hanford Site release or isolated instances and/or suspect data". 2. In Table 4-8, under "Is not retained as a COPC" and "Detected above action level, but not associated with a Hanford Site release or isolated instances and/or suspect data" category, delete constituents "sulfate, zinc". 3. In Table 4-8, under "Is not retained as a COPC, delete sub-category of "Detected in groundwater but below action level, EQL, or background concentrations". 4. In Table 4-8, under "Is not retained as a COPC" and "Detected in groundwater but below action level, EQL, or background concentrations" category, delete constituents "Arsenic, beryllium, bromodichloromethane, fluoride, iron, manganese, mercury, nitrite, selenium, technetium-99, tetrachloroethene, thallium, tritium, uranium, vanadium".	4	4-112/15-47	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6.However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify analytes that are not retained as a COPC that will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014
DH-181	Comment: See previous comments regarding 100-D Area historical groundwater evaluation which occurs on pages 4-99 through 4-112. Basis/Justification: Uncertainties associated with groundwater data.	In Table 4-8, under the "Is not retained as a COPC" category, include the sub-category of "Not detected in groundwater" and keep the listed constituents.	4	4-112/15-47	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6.However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify analytes that are not retained as a COPC that will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-182a	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) exceeded groundwater protection standards should be classified as COCs. As such, the following contaminants should be classified as COCs: chloroform (the action level was exceeded at numerous wells during the RI/FS characterization and historically, the EQL was exceeded at numerous wells; also text incorrectly states chloroform concentrations ranged between 0.32 and 2 µg/L because at well 199-H3-9 concentrations of 2.6, 3.6, 3.7, and 4.2 µg/L were measured), fluoride (concentrations have historically exceeded action level at well 199-H4-4 which is located downgradient to the 183-H Solar Evaporation Basins and well is currently being used as an extraction well and should not be relied on as being representative of plume conditions [i.e., should not be relied on as a basis for not carrying fluoride forward as a COC; also it appears fluoride has not been measured at well 199-H4-84), arsenic (the action level of 0.018 µg/L was exceeded at numerous wells: H4-11, H4-13, H4-10, H3-2C, H3-2A, H4-16, H4-3, H4-45, H4-46, H4-48, H4-5, H4-6, H4-7, H4-9, H5-1A, H3-4, H3-5, H1-40, H2-1, H3-9, H3-10, etc.), iron (H4-15CR, H4-3, H1-40), and uranium (H4-3, H4-12, H4-18; note: H4-18 is now an extraction well). Basis/Justification: See above.	182a - [1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased.] 3. Change text, where applicable, to acknowledge the above uncertainty associated with accuracy of measurements associated with action level exceedances and classify the following 100-H Area contaminants as COCs: strontium-90, technetium-99, carbon tetrachloride, chloroform, fluoride, nitrate, antimony, arsenic, cadmium, chromium, chromium +6, cobalt, copper, iron, lead, nickel, silver, uranium, and zinc 4. For all 100-H Area contaminants discussed in Section 4.4.1.2 that are to be "carried forward as a COPC" for action level exceedances, the text should be revised to identify those contaminants as "classified as a COC" due to uncertainties associated with accuracy of contaminant measurements in groundwater. Therefore, the text should be changed for the following contaminant discussions to identify the following contaminants as "classified as a COC": chromium +6, strontium-90, nitrate, carbon tetrarchloride, antimony, cadmium, chromium, cobalt, copper, lead, nickel, silver, and zinc.	4	Starting on 4-112	Accept with Modification	Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. Additional information: The field tests described in the paper refer specifically to uranium, which has a different behavior and chemistry from Cr(VI). The paper notes that there is vertical variability for uranium in the aquifer, and the concentrations found in the fully penetrated well reflect that variability (as expected). At 100-D/H, depth discrete sampling and sampling during drilling was conducted to determine if there was a vertical distribution within the aquifer. No distinct pattern was identified (See Section 4.5.2 vertical distribution of contaminants). The seasonal effects on sampling results, as well as effects from the pump and treat systems, are discussed in detail in Chapter 3 and Chapter 4. Also, typical well construction results in a well screen of 20 feet at 100-D and often less than that at 100-H. This is identified in the cited reference as a "short well screen" (conclusions, first paragraph). Wells within 100-D/H are also screened in different sections of the aquifer. In addition, well construction and sampling methods are conducted using standard industry practices and approved SAPs, and both geologic logging and downhole geophysics are used to best identify various transmissive zones.	Yes - 10/2/2013
DH-182c	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) exceeded groundwater protection standards should be classified as COCs. As such, the following contaminants should be classified as COCs: chloroform (the action level was exceeded at numerous wells during the RI/FS characterization and historically, the EQL was exceeded at numerous wells; also text incorrectly states chloroform concentrations ranged between 0.32 and 2 µg/L because at well 199-H3-9 concentrations of 2.6, 3.6, 3.7, and 4.2 µg/L were measured), fluoride (concentrations have historically exceeded action level at well 199-H4-4 which is located downgradient to the 183-H Solar Evaporation Basins and well is currently being used as an extraction well and should not be relied on as being representative of plume conditions [i.e., should not be relied on as a basis for not carrying fluoride forward as a COC; also it appears fluoride has not been measured at well 199-H4-84), arsenic (the action level of 0.018 µg/L was exceeded at numerous wells: H4-11, H4-13, H4-10, H3-2C, H3-2A, H4-16, H4-3, H4-45, H4-46, H4-48, H4-5, H4-6, H4-7, H4-9, H5-1A, H3-4, H3-5, H1-40, H2-1, H3-9, H3-10, etc.), iron (H4-15CR, H4-3, H1-40), and uranium (H4-3, H4-12, H4-18; note: H4-18 is now an extraction well). Basis/Justification: See above.	1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased. 182c - [3. Change text, where applicable, to acknowledge the above uncertainty associated with accuracy of measurements associated with action level exceedances and classify the following 100-H Area contaminants as COCs: strontium-90, technetium-99, carbon tetrachloride, chloroform, fluoride, nitrate, antimony, arsenic, cadmium, chromium, chromium +6, cobalt, copper, iron, lead, nickel, silver, uranium, and zinc 4. For all 100-H Area contaminants discussed in Section 4.4.1.2 that are to be "carried forward as a COPC" for action level exceedances, the text should be revised to identify those contaminants as "classified as a COC" due to uncertainties associated with accuracy of contaminant measurements in groundwater. Therefore, the text should be changed for the following contaminant discussions to identify the following contaminants as "classified as a COC": chromium +6, strontium-90, nitrate, carbon tetrarchloride, antimony, cadmium, chromium, cobalt, copper, lead, nickel, silver, and zinc.]	4	Starting on 4-112	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014
DH-183	Comment: Retain Zinc as a COC in the 100-D Area. Basis/Justification: Since Zinc is present as a COC over clean-up levels in the Horn and 100-H Areas, it is likely that it is present in the 100-D Area too, as the 100-D Area is more chemically contaminated than either of the two other areas.	Retain Zinc as a COC in the 100-D Area.	4	4-112/ Table 4-8	Accept with Modification	Zinc will not be retained as a COPC in the 100-D area. This discussion is provided in Section 6.3.2.3.9 and explains that zinc concentrations above the AWQC were associated with laboratory contamination. Manganese is discussed with respect to the effects of the ISRM barrier on groundwater chemistry in section 4.5. Note that although the comment indicates that zinc should be retained as a COC; the comment was intended for manganese to be retained instead of zinc.	Yes - 5/13/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-184	Comment: The nature and extent of the Tc-99 plume in the 100-H Area is not adequately characterized. Although Tc-99 hasn't exceeded 900 pCi/L in this plume since 1999, because well 199-H4-3 is being used as an extraction well, the observations should not be relied on as being representative of plume conditions. Also, nearby well 199-H4-84 has only been sampled once for Tc-99. Basis/Justification: See above.	Classify Tc-99 as a COC.	4	4-113	Not Accepted	Tc-99 was not detected above its MCL (900 pCi/L) during the six-year timeframe evaluated. Tc-99 is currently monitored in this area under the 183-H RCRA Permit. The highest Tc-99 concentrations have been measured at 199-H4-3 where concentrations range from a high of 870 pCi/L, measured in 2006, to a low of 157 pCi/L, measured in 2011. Tc-99 has not exceeded the MCL of 900 pCi/L in Well 199-H4-3 since November 4, 1999, when the value was 1070 pCi/L. Tc-99 has been detected in other wells in that vicinity, but has not exceeded 900 in those other wells since 2005. Tc-99 will not be retained as a COC for evaluation of remedial alternatives. Nature and extent discussion, however, will include data through 2012- including for Tc-99.	Yes - 7/10/2013
DH-185	Comment: Retain nitrate as a COC. Basis/Justification: Residual drainage from the vadose zone that will then increase concentrations present in the groundwater.	Retain nitrate as a COC.	4	4-114/29	Accept with Modification	The subject paragraph describes nitrite concentrations. Nitrite was not detected above the MCL of 3,300 mg/L during the six-year timeframe evaluated. As such, nitrite will not be retained as a COC for evaluation of remedial alternatives. Nitrite is discussed with respect to the effects of the ISRM barrier on groundwater chemistry in section 4.4 and Section 4.5. Nitrite is not retained as a COPC for monitoring in the 100-H area. However, it is retained as a COPC for monitoring in the 100-D area, the first mention of nitrite in the 100-D exposure area contains a forward reference to it being identified as a COPC for further monitoring in the 100-D ISRM exposure area.	Yes - 5/13/2014
DH-186	Comment: It is noted that tritium has not been sampled for at wells 199-H4-3 or 199-H4-82 which is the location of the Tc-99 plume. As such, the nature and extent of the tritium contamination in the 100-H Area is not adequately characterized. Basis/Justification: See above.	Retain tritium as a 100-H Area COPC.	4	4-121	Not Accepted	Tritium was analyzed a total 13 times at well 199-H4-3 between 2006 and 2011. Tritium concentrations at 199-H4-3 range between 1,370 pCi/L and 3,900 pCi/L, all less than the MCL of 20,000 pCi/L. As such, tritium will not be retained as a COC for evaluation of remedial alternatives.	Yes - 7/10/2013
DH-187	Comment: Sr-90 concentrations exceed 8 pCi/L at wells199-H4-11 and 199-H4-63. In addition, Sr-90 has only been sampled at 3 wells in the 100 H Area. As such, Sr-90 contamination is not adequately characterized. Basis/Justification: See above.	Classify Sr-90 as a COC.	4	4-121/Sect. 4.4.1.2	No change	Sr-90 was identified as a COC in the H Area and remedial alternatives were evaluated in the FS. It is also a COC in 100-D based on RI/FS results; the presence of Sr-90 was confirmed in later sampling. Sr-90 is routinely sampled in multiple locations at both 100-D and 100-H. Through 2011, 2012, and so far in 2013, Sr-90 was analyzed for in a total of 64 wells at 100-H.	Yes - 7/10/2013
DH-188a	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) exceeded the 90th percentile Hanford Site background should be classified as COCs: Therefore, the following contaminants should be classified as COCs: nitrite (nitrite concentrations exceeded Hanford background at: H3-2, H4-10, H4-11, H4-12A, H4-12C, H4-13, H4-15A, H4-15CQ, H4-15CR, H4-15CS, H4-16, H4-3, H4-45, H4-46, H4-48, H4-5, H4-6, H6-1, H4-15CP, H4-63, H4-64, H3-3, etc.), sulfate (sulfate concentrations exceeded Hanford background [with some plots trending upward] at: H4-12A, H4-15A, H4-4, H4-47, H4-8, H3-3, H3-4, H3-5, H4-65, H1-38, H1-32, H1-36, H1-40, H3-25, H4-70, H4-69, H1-43, etc.), iron (H4-15CR, H4-3), uranium (H4-3, H4-4, H4-12A, H4-18, H4-9; note: H4-18 is now an extraction well and there doesn't appear to be data for well 199-H4-84), and vanadium (H4-15CQ, H4-45, H4-5, H4-15CP, H3-5, H6-4, H2-1, H3-9, H3-10, H3-11). Basis/Justification: See above.	<u>188a</u> - [1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased.] 3. Change text, where applicable, to acknowledge the above-described uncertainty associated with accuracy of measurements associated with 90th percentile Hanford Site background exceedances and classify the following 100-H Area contaminants as COCs: nitrite, sulfate, iron, uranium, and vanadium.	4	Sect. 4.4.1.2	Accept with Modification	Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. <u>Additional information:</u> The field tests described in the paper refer specifically to uranium, which has a different behavior and chemistry from Cr(VI). The paper notes that there is vertical variability for uranium in the aquifer, and the concentrations found in the fully penetrated well reflect that variability (as expected). At 100-D/H, depth discrete sampling and sampling during drilling was conducted to determine if there was a vertical distribution within the aquifer. No distinct pattern was identified (See Section 4.5.2 vertical distribution of contaminants). The seasonal effects on sampling results, as well as effects from the pump and treat systems, are discussed in detail in Chapter 3 and Chapter 4. Also, typical well construction results in a well screen of 20 feet at 100-D and often less than that at 100-H. This is identified in the cited reference as a "short well screen" (conclusions, first paragraph). Wells within 100-D/H are also screened in different sections of the aquifer. In addition, well construction and sampling methods are conducted using standard industry practices and approved SAPs, and both geologic logging and downhole geophysics are used to best identify various transmissive zones.	Yes - 10/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-188c	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) exceeded the 90th percentile Hanford Site background should be classified as COCs: Therefore, the following contaminants should be classified as COCs: nitrite (nitrite concentrations exceeded Hanford background at: H3-2, H4-10, H4-11, H4-12A, H4-12C, H4-13, H4-15A, H4-15CQ, H4-15CR, H4-15CS, H4-16, H4-3, H4-45, H4-46, H4-48, H4-5, H4-6, H6-1, H4-15CP, H4-63, H4-64, H3-3, etc.), sulfate (sulfate concentrations exceeded Hanford background [with some plots trending upward] at: H4-12A, H4-15A, H4-4, H4-47, H4-8, H3-3, H3-4, H3-5, H4-65, H1-38, H1-32, H1-36, H1-40, H3-25, H4-70, H4-69, H1-43, etc.), iron (H4-15CR, H4-3), uranium (H4-3, H4-4, H4-12A, H4-18, H4-9; note: H4-18 is now an extraction well and there doesn't appear to be data for well 199-H4-84), and vanadium (H4-15CQ, H4-45, H4-5, H4-15CP, H3-5, H6-4, H2-1, H3-9, H3-10, H3-11). Basis/Justification: See above.	1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased. <u>188c</u> -[3. Change text, where applicable, to acknowledge the above-described uncertainty associated with accuracy of measurements associated with 90th percentile Hanford Site background exceedances and classify the following 100-H Area contaminants as COCs: nitrite, sulfate, iron, uranium, and vanadium.]	4	Sect. 4.4.1.2		Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. <u>Additional information:</u> COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs.	Yes - 10/2/2013
DH-189	Comment: As gross beta and gross alpha observations are indicators of water quality, H Area gross beta and gross alpha observations should be discussed. Note: Numerous gross beta observations exceed the 90th percentile Hanford Site background level; H1-7 [trending upward], H1-38, H1-40, H1-45, H2-1, H3-1, H3-2A [trending upward], H3-2B, H3-2C, H3-4, H3-5, H3-6, H3-9, H3-10, H4-1, H4-2, H4-3, H4-4, H4-5, H4-6, H4-9, H4-13, H4-84, etc.). Basis/Justification: Completeness.	Include a discussion of gross beta and gross alpha observations and explain that gross alpha and gross beta observations are indicators of water quality.	4	Starting on 4-112	Accept with Modification	Gross alpha and gross beta observations are discussed for each exposure area (see page 4-103, page 4-112, page 4-121). Changes made during comment resolution meeting to the text to add Sr-90 into the radionuclides paragraphs where applicable.	Yes - 8/7/2013
DH-190	Comment: See previous comments regarding 100-H Area historical groundwater evaluation which occurs on pages 4-112 through 4-120. Basis/Justification: Uncertainties associated with groundwater data.	1. Table 4-9's category of "Retained as a COPC" should be changed to "Classified as a COC". 2. Under "Classified as a COC" include the following words: "Contaminant of potential concern classified as contaminant of concern based on evaluation of data collected January 2006 – December 2011 and uncertainties associated with data". 3. Include the following 100-H Area COCs on Table 4-9: "strontium-90, technetium-99, carbon tetrachloride, chloroform, fluoride, nitrate, nitrite, sulfate, antimony, arsenic, cadmium, chromium, chromium +6, cobalt, copper, iron, lead, nickel, silver, uranium, vanadium, and zinc" 4. Delete Table 4-9's category of "Detected at levels above action level and background (uncertain status)" and corresponding constituent of: "antimony, cadmium, carbon tetrachloride, cobalt, copper, lead, nickel, silver, zinc"	4	4-120/Sect. 4.4.1.2	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However, Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-191	Comment: See previous comments regarding 100-H Area historical groundwater evaluation which occurs on pages 4-112 through 4-120. Basis/Justification: Uncertainties associated with groundwater data.	1. Under Table 4-9's category of "Retained as a COPC", include the following sub-categories: 1) "Detected at levels above action level but below EQL (uncertain status)", 2) "Detected in concentrations up to at least 10% of: the WAC 173-340 risk limit for individual contaminants (1E-06) in water, the WAC 173-340 hazard quotient limit (1) for individual contaminants, or the federal MCL or ambient water quality criteria (uncertain status)", and 3) "contaminants greater in the deep zone of waste sites than in reference sites RCBRA statistical tests (uncertain status)" 2. For the sub-category of "Detected at levels above action level but below EQL (uncertain status)", include the following constituents: "1,2-dichloroethane, bromodichloromethane" 3. For the sub-category of "Detected in concentrations up to at least 10% of: the WAC 173-340 risk limit for individual contaminants (1E-06) in water, the WAC 173-340 hazard quotient limit (1) for individual contaminants, or the federal MCL or ambient water quality criteria (uncertain status)" include the following constituents: "tritium, beryllium, beryllium, manganese, mercury, selenium, thallium, tetrachloroethylene/trichloroethane, molybdenum, strontium, lithium, barium, bis(ethylhexyl)phthalate, tributylphosphate" 4. For the sub-category of "contaminants greater in the deep zone of waste sites than in reference sites RCBRA statistical tests (uncertain status)" include the following constituents: di-n-butylphthalate, aroclor-1242, aroclor-1254, aroclor-1260	4	4-120/ Sect. 4.4.1.2	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014
DH-192	Comment: See previous comments regarding 100-H Area historical groundwater evaluation which occurs on pages 4-112 through 4-120. Basis/Justification: Uncertainties associated with groundwater data.	1. In Table 4-9, under "Is not retained as a COPC", delete sub-category of "Detected above action level, but not associated with a Hanford Site release or isolated instances and/or suspect data". 2. In Table 4-9, under "Is not retained as a COPC" and "Detected above action level, but not associated with a Hanford Site release or isolated instances and/or suspect data" category, delete constituent "uranium". 3. In Table 4-9, under "Is not retained as a COPC", delete sub-category of "Detected in groundwater but below action level, EQL, or background concentrations". 4. In Table 4-9, under "Is not retained as a COPC" and "Detected in groundwater but below action level, EQL, or background concentrations" category, delete constituents "Arsenic, beryllium, chloroform, fluoride, manganese, mercury, nitrite, selenium, sulfate, technetium-99, thallium, tritium, vanadium".	4	4-120/Sect. 4.4.1.2	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-193	Comment: See previous comments regarding 100-H Area historical groundwater evaluation which occurs on pages 4-112 through 4-120. Basis/Justification: Uncertainties associated with groundwater data.	In Table 4-9, under the "Is not retained as a COPC" category, include the sub-category of "Not detected in groundwater" and keep the listed constituents.	4	4-120/Sect. 4.4.1.2	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014
DH-194a	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) exceeded groundwater protection standards should be classified as COCs. As such, the following contaminants should be classified as COCs: arsenic (699-90-45, 699-91-46A, 699-95-48) and manganese (699-90-45). Basis/Justification: See above.	194a - [1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased.] 3. Change text, where applicable, to acknowledge the above uncertainty associated with accuracy of measurements associated with action level exceedances and classify the following Horn contaminants as COCs: arsenic and manganese. 4. For all Horn contaminants discussed in Section 4.4.1.2 that are to be "carried forward as a COPC" for action level exceedances, the text should be revised to identify those contaminants as "classified as a COC" due to uncertainties associated with accuracy of contaminant measurements in groundwater. Therefore, the text should be changed for the following contaminant discussions to identify the following contaminants as "classified as a COC": chromium +6, chromium, carbon tetrachloride, antimony, cadmium, cobalt, copper, lead, nickel, silver, and zinc.	4	Starting on 4-112	Not Accepted	The field tests described in the paper refer specifically to uranium, which has a different behavior and chemistry from Cr(VI). The paper notes that there is vertical variability for uranium in the aquifer, and the concentrations found in the fully penetrated well reflect that variability (as expected). At 100-D/H, depth discrete sampling and sampling during drilling was conducted to determine if there was a vertical distribution within the aquifer. No distinct pattern was identified (See Section 4.5.2 vertical distribution of contaminants). The seasonal effects on sampling results, as well as effects from the pump and treat systems, are discussed in detail in Chapter 3 and Chapter 4. Also, typical well construction results in a well screen of 20 feet at 100-D and often less than that at 100-H. This is identified in the cited reference as a "short well screen" (conclusions, first paragraph). Wells within 100-D/H are also screened in different sections of the aquifer. In addition, well construction and sampling methods are conducted using standard industry practices and approved SAPs, and both geologic logging and downhole geophysics are used to best identify various transmissive zones.	Yes - 6/28/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-194c	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) exceeded groundwater protection standards should be classified as COCs. As such, the following contaminants should be classified as COCs: arsenic (699-90-45, 699-91-46A, 699-95-48) and manganese (699-90-45). Basis/Justification: See above.	1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased. 194c - [3. Change text, where applicable, to acknowledge the above uncertainty associated with accuracy of measurements associated with action level exceedances and classify the following Horn contaminants as COCs: arsenic and manganese. 4. For all Horn contaminants discussed in Section 4.4.1.2 that are to be "carried forward as a COPC" for action level exceedances, the text should be revised to identify those contaminants as "classified as a COC" due to uncertainties associated with accuracy of contaminant measurements in groundwater. Therefore, the text should be changed for the following contaminant discussions to identify the following contaminants as "classified as a COC": chromium +6, chromium, carbon tetrachloride, antimony, cadmium, cobalt, copper, lead, nickel, silver, and zinc.]	4	Starting on 4-112	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014
DH-195a	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) been measured to be above the 90th percentile Hanford Site background should be classified as COCs. Therefore, the following contaminants should be classified as COCs: nitrate (699-94-43 [trending upward], H4-82, 699-96-43, 699-98-46, H1-4 [currently an extraction well]), nitrite (H1-1 [currently an extraction well], H1-3 [currently an extraction well], H1-4 [currently an extraction well], H1-7 [trending upward], H1-25 [currently an extraction well], H1-27 [currently an extraction well], H1-32 [currently an extraction well], H1-33 [currently an extraction well], H1-34 [currently an extraction well], H1-35 [currently an extraction well and trending upward], H1-36 [currently an extraction well], H1-37 [currently an extraction well], H4-76 [currently an extraction well], H4-77 [currently an extraction well], H4-81 [currently an extraction well], 699-94-43, etc.], sulfate (H1-1[currently an extraction well], H1-2 [currently an extraction well], H1-3 [currently an extraction well], H1-4 [currently an extraction well], H1-5 [currently an extraction well], H1-7, H1-25[currently an extraction well], H1-27 [currently an extraction well], H1-32 [currently an extraction well], H1-33 [currently an extraction well], H4-77 [currently an extraction well], H4-80 [currently an extraction well], H4-81 [currently an extraction well], H4-82 [currently an extraction well], 699-98-51, 699-97-48B [trending upward], 699-99-44, etc.), iron (699-97-51A, 699-98-49A,), manganese (699-90-45), and vanadium (H1-32 [currently an extraction well], H1-33 [currently an extraction well], H1-35 [currently an extraction well], H4-77 [currently an extraction well], H4-80 [currently an extraction well], H4-82 [currently an extraction well], 699-90-45, 699-91-46A, 699-94-41, 699-94-43, 699-95-45, 699-95-48, 699-97-48B, 699-97-51A, etc.). Basis/Justification: Note: the observation that the presence of iron at well 699-97-51A "does not appear to be associated with a trend" is an insufficient basis for not classifying the contaminant a COC. In other words, contaminant observations are not required to satisfy plume criteria to be a COC.	195a - [1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased.] 3. Change text, where applicable, to acknowledge the above-described uncertainty associated with accuracy of measurements associated with 90th percentile Hanford Site background exceedances and classify the following Horn contaminants as COCs: nitrite, nitrate, sulfate, iron, manganese, and vanadium. 4. For all Horn contaminants discussed in Section 4.4.1.2 that are to be "carried forward as a COPC" for 90th percentile Hanford Site exceedances, the text should be revised to identify those contaminants as "classified as a COC" due to uncertainties associated with accuracy of contaminant measurements in groundwater. Therefore, the text should be changed for the following contaminant discussions to identify the following contaminants as "classified as a COC": chromium +6, chromium, carbon tetrachloride, antimony, cadmium, cobalt, copper, lead, nickel, silver, and zinc.	4	Starting on 4-112	Not Accepted	The field tests described in the paper refer specifically to uranium, which has a different behavior and chemistry from Cr(VI). The paper notes that there is vertical variability for uranium in the aquifer, and the concentrations found in the fully penetrated well reflect that variability (as expected). At 100-D/H, depth discrete sampling and sampling during drilling was conducted to determine if there was a vertical distribution within the aquifer. No distinct pattern was identified (See Section 4.5.2 vertical distribution of contaminants). The seasonal effects on sampling results, as well as effects from the pump and treat systems, are discussed in detail in Chapter 3 and Chapter 4. Also, typical well construction results in a well screen of 20 feet at 100-D and often less than that at 100-H. This is identified in the cited reference as a "short well screen" (conclusions, first paragraph). Wells within 100-D/H are also screened in different sections of the aquifer. In addition, well construction and sampling methods are conducted using standard industry practices and approved SAPs, and both geologic logging and downhole geophysics are used to best identify various transmissive zones.	Yes - 6/28/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-195c	Comment: The text should clearly acknowledge uncertainty associated with contaminant concentration accuracy measurements in groundwater as a basis for classification of COCs and retention of COPCs. The text should also clearly acknowledge that contaminant concentrations measured at or near remediation wells (extraction or injection) may also be considered biased. Due to the bias in regard to representing aquifer conditions (i.e., sampling timing, well construction, pump-and-treat configuration, and concentrations measured at pump-and-treat wells), at a minimum, contaminants which have recently (within the last 6 years) been measured to be above the 90th percentile Hanford Site background should be classified as COCs. Therefore, the following contaminants should be classified as COCs: nitrate (699-94-43 [trending upward], H4-82, 699-96-43, 699-98-46, H1-4 [currently an extraction well]), nitrite (H1-1 [currently an extraction well], H1-3 [currently an extraction well], H1-4 [currently an extraction well], H1-7 [trending upward], H1-25 [currently an extraction well], H1-27 [currently an extraction well], H1-32 [currently an extraction well], H1-33 [currently an extraction well], H1-34 [currently an extraction well], H1-35 [currently an extraction well and trending upward], H1-36 [currently an extraction well], H1-37 [currently an extraction well], H4-76 [currently an extraction well], H4-77 [currently an extraction well], H4-81 [currently an extraction well], 699-94-43, etc.], sulfate (H1-1[currently an extraction well], H1-2 [currently an extraction well], H1-3 [currently an extraction well], H1-4 [currently an extraction well], H1-5 [currently an extraction well], H1-7, H1-25[currently an extraction well], H1-27 [currently an extraction well], H1-32 [currently an extraction well], H1-33 [currently an extraction well], H4-77 [currently an extraction well], H4-80 [currently an extraction well], H4-81 [currently an extraction well], H4-82 [currently an extraction well], 699-98-51, 699-97-48B [trending upward], 699-99-44, etc.), iron (699-97-51A, 699-98-49A,), manganese (699-90-45), and vanadium (H1-32 [currently an extraction well], H1-33 [currently an extraction well], H1-35 [currently an extraction well], H4-77 [currently an extraction well], H4-80 [currently an extraction well], H4-82 [currently an extraction well], 699-90-45, 699-91-46A, 699-94-41, 699-94-43, 699-95-45, 699-95-48, 699-97-48B, 699-97-51A, etc.). Basis/Justification: Note: the observation that the presence of iron at well 699-97-51A "does not appear to be associated with a trend" is an insufficient basis for not classifying the contaminant a COC. In other words, contaminant observations are not required to satisfy plume criteria to be a COC.	1. Include an identification and corresponding explanation in the PP and FS report texts that groundwater plume maps and contamination descriptions contain bias in regard to representing aquifer conditions and that the bias is attributed to several factors (i.e., sampling timing and well construction). In addition, it is requested that the published article by Vermeul (River-Induced flow Dynamics in Long-Screen Wells and Impact on Aqueous Samples) be included in the FS with a discussion of relevance to the uncertainty of contaminant concentrations due to bias. 2. Include an identification that contaminant concentrations measured at or near (i.e., within the zone of influence) remediation wells (pump-and-treat extraction or injection) may also be considered biased. <u>195c</u> - [3. Change text, where applicable, to acknowledge the above-described uncertainty associated with accuracy of measurements associated with 90th percentile Hanford Site background exceedances and classify the following Horn contaminants as COCs: nitrite, nitrate, sulfate, iron, manganese, and vanadium. 4. For all Horn contaminants discussed in Section 4.4.1.2 that are to be "carried forward as a COPC" for 90th percentile Hanford Site exceedances, the text should be revised to identify those contaminants as "classified as a COC" due to uncertainties associated with accuracy of contaminant measurements in groundwater. Therefore, the text should be changed for the following contaminant discussions to identify the following contaminants as "classified as a COC": chromium +6, chromium, carbon tetrachloride, antimony, cadmium, cobalt, copper, lead, nickel, silver, and zinc.]	4	Starting on 4-112	Accept with Modification	Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. <u>Additional information:</u> COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). All contaminants detected in groundwater for each exposure area were evaluated in the Tap Water exposure scenario and is provided in Chapter 6 (Section 6.3.7.). The purpose of this evaluation is to identify contaminants that are risk drivers or hazard drivers. For each exposure area, cumulative excess lifetime cancer risk and hazard indices are calculated, additionally the risk calculations show the excess lifetime cancer risk and/or hazard quotient for each individual contaminant and its percent contribution to the cumulative risk or hazard index. Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs.	Yes - 10/2/2013
DH-196	Comment: As gross beta and gross alpha observations are indicators of water quality, Horn Area gross beta and gross alpha observations should be discussed. Note: Numerous gross beta observations exceed the 90th percentile Hanford Site background level: gross alpha (H1-32 [currently an extraction well], H1-35 [currently an extraction well], H1-38[currently an extraction well], 699-90-45, 699-94-41, 699-94-43, 699-99-44, etc), and gross beta (H1-7 [trending upward], H1-32 [currently an extraction well], H1-38 [trending upward], 699-90-45, 699-94-41, 699-94-43, 699-95-45, 699-96-43, 699-97-51A, 699-97-43B, etc.) Basis/Justification: Completeness.	Include a discussion of gross beta and gross alpha observations and explain that gross alpha and gross beta observations are indicators of water quality.	4	Starting on 4-112	No change	Gross alpha and gross beta observations are discussed for each exposure area (see page 4-103, page 4-112, page 4-121).	Yes - 8/7/2013
DH-197	Comment: The text explains that iron concentrations have historically been detected in groundwater and "are a result of the corrosion of the carbon steel well casing that was installed in 1961". As corroded well casings can negatively affect groundwater quality, the text should point to where in the FS a recommendation is included for decommissioning the well. Basis/Justification: Accuracy.	1. If a camera survey has been conducted to confirm corrosion, include the information. If not, re-write the text to qualify the statement as a theory. 2. Include a statement that identifies where in the FS there is a recommendation or action (e.g., as one or several of the alternatives) to decommission this well.	4	4-125/Sect. 4.4.1.2	Accept with Modification	Existing information on the well will be evaluated and decommissioning incorporated into the text as appropriate.	Yes - 4/9/2014
DH-198	Comment: A review of mercury data indicates mercury was detected at 2 wells (699-97-51A and 699-96-43) in the early 1990s. However, these wells were not sampled for mercury since 1993 and 1994. This represents a data gap. Basis/Justification: Technical accuracy and completeness.	The text should describe/identify the data gap and carry mercury forward as a COPC. The text should also identify where in the FS, monitoring recommendations for this contaminant are made.	4	4-126	Not Accepted	Mercury was analyzed six times at 699-97-51A and 699-96-43 between 1992 thru 1994. Mercury concentrations ranged between less than 0.2 µg/L to 0.25 µg/L (the last three rounds from both wells were all nondetects). The nature and extent evaluation for the Horn area evaluated mercury results from a total of 16 monitoring wells. Mercury was detected in one of 50 samples analyzed over the last six years, the single detection was reported at a concentration of 0.11 µg/L (flagged with a "B" qualifier) and is less than the MTCA B groundwater cleanup level of 4.8 µg/L.	Yes - 7/10/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-199	Comment: See previous comments regarding Horn Area historical groundwater evaluation which occurs on pages 4-121 through 4-128. Basis/Justification: Uncertainties associated with groundwater data.	1. Table 4-10's category of "Retained as a COPC" should be changed to "Classified as a COC". 2. Under "Classified as a COC" include the following words: "Contaminant of potential concern classified as contaminant of concern based on evaluation of data collected January 2006 – December 2011 and uncertainties associated with data". 3. Include the following Horn COCs on Table 4-10: "chromium, chromium +6, carbon tetrachloride, nitrate, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, nickel, silver, vanadium, and zinc" 4. Delete Table 4-10's category of "Detected at levels above action level and background (uncertain status)" and corresponding constituent of: "antimony, cadmium, cobalt, copper, nickel, silver, zinc"	4	4-129	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014
DH-200	Comment: See previous comments regarding Horn Area historical groundwater evaluation which occurs on pages 4-121 through 4-128. Basis/Justification: Uncertainties associated with groundwater data.	1. Under Table 4-10's category of "Retained as a COPC", include the following sub-categories: 1) "Detected at levels above action level but below EQL (uncertain status)", 2) "Detected in concentrations up to at least 10% of: the WAC 173-340 risk limit for individual contaminants (1E-06) in water, the WAC 173-340 hazard quotient limit (1) for individual contaminants, or the federal MCL or ambient water quality criteria (uncertain status)", and 3) "contaminants greater in the deep zone of waste sites than in reference sites RCBRA statistical tests (uncertain status)" 2. For the sub-category of "Detected at levels above action level but below EQL (uncertain status)", include the following constituents: "1,2-dichloroethane, bromodichloromethane, chloroform, tetrachloroethane, trichloroethene, mercury, thallium" 3. For the sub-category of "Detected in concentrations up to at least 10% of: the WAC 173-340 risk limit for individual contaminants (1E-06) in water, the WAC 173-340 hazard quotient limit (1) for individual contaminants, or the federal MCL or ambient water quality criteria (uncertain status)" include the following constituents: "strontium-90, technetium-99, tritium, fluoride, beryllium, selenium, uranium, tetrachloroethylene/trichloroethane, molybdenum, strontium, lithium, barium, bis(ethylhexyl)phthalate, tributylphosphate" 4. For the sub-category of "contaminants greater in the deep zone of waste sites than in reference sites RCBRA statistical tests (uncertain status)" include the following constituents: "di-n-butylphthalate, aroclor-1242, aroclor-1254, aroclor-1260"	4	4-129	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-201	Comment: See previous comments regarding Horn Area historical groundwater evaluation which occurs on pages 4-121 through 4-128. Basis/Justification: Uncertainties associated with groundwater data.	1. In Table 4-10, under "Not retained as a COPC", delete sub-category of "Detected above action level, but not associated with a Hanford Site release or isolated instances and/or suspect data". 2. In Table 4-10, under "Is not retained as a COPC" and "Detected above action level, but not associated with a Hanford Site release or isolated instances and/or suspect data" category, delete constituent "iron". 3. In Table 4-10, under "Is Not retained as a COPC", delete sub-category of "Detected in groundwater but below action level, EQL, or background concentrations". 4. In Table 4-10, under "Is not retained as a COPC" and "Detected in groundwater but below action level, EQL, or background concentrations" category, delete constituents "Arsenic, beryllium, chloroform, fluoride, gross alpha, lead, manganese, nitrate, nitrite, selenium, sulfate, strontium-90, technetium-99, tetrachloroethene, trichloroethene, tritium, uranium, vanadium".	4	4-129	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014
DH-202	Comment: See previous comments regarding Horn Area historical groundwater evaluation which occurs on pages 4-121 through 4-128. Basis/Justification: Uncertainties associated with groundwater data.	In Table 4-10, under the "Is not retained as a COPC" category, include the sub-category of "Not detected in groundwater" and keep the listed constituents.	4	4-129	Accept with Modification	This comment is similar to those provided in Chapter 6 regarding COPC identification. COPC identification was performed during the Work Plan for this RI/FS. COPCs are refined in Chapter 6 to identify COCs that warrant evaluation of remedial alternatives in the FS. The process used in the RI/FS is based on nonradiological contaminant concentrations exceeding the cumulative 10^{-5} excess lifetime cancer risk threshold or an HI of 1 as defined in WAC 173-340-708(5). No change is recommended for the groundwater risk assessment approach presented in Chapter 6. However Chapter 6 figures will be modified in response to Ecology Chapter 6 comments to add clarity. The nature and extent evaluation will extend the date range from six years of data (January 2006 to December 2011) to seven years of data (January 2006 to December 2012). Extending the timeframe for the data set would address the uranium results measured at 199-H4-12A. Data from the ISRM barrier and wells downgradient from solar evaporation basins would be segregated from the remainder of wells in the 100-H area. Comparison of groundwater concentrations would include standards, cleanup levels, and AWQC for complete exposure pathways. Water quality standards and AWQC comparisons would be focused on near-river wells. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/9/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-203	Comment: Due to uncertainties associated with confined aquifer contaminant results (e.g., unknown extent of contamination, leaky aquifer causing sampling bias, etc.), include the following 100-D Area contaminants as groundwater COPCs for exceedances of 90th percentile Hanford Site background concentrations (wells 199-D5-141 or 199-D8-54B): nitrite, sulfate, chromium, copper, lead, manganese, vanadium, zinc, and strontium. Basis/Justification: Accuracy and completeness.	Revise text to identify that the following contaminants will be carried forward as confined aquifer COPCs due to contaminants being detected at levels above background (i.e., uncertain status): nitrite, sulfate, chromium, copper, lead, manganese, vanadium, zinc, and strontium.	4	4-131-141	Accept with Modification	Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. <u>Additional information:</u> COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs.	Yes - 10/2/2013
DH-204	Comment: Table 4-12 should be revised to agree with text changes that have added nitrite, sulfate, chromium, copper, lead, manganese, vanadium, zinc, and strontium as COPCs due to contaminants being detected above background (i.e., uncertain status). Basis/Justification: Accuracy.	Revise Table 4-12 and identify the following 100-D Area contaminants as "Detected at levels above background (uncertain status)": nitrite, sulfate, chromium, copper, lead, manganese, vanadium, zinc, and strontium.	4	4-142		Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. <u>Additional information:</u> COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs.	Yes - 10/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-205	Comment: Due to uncertainties associated with confined aquifer contaminant results (e.g., unknown extent of contamination, leaky aquifer causing sampling bias, etc.), include the following 100-H Area contaminants as groundwater COPCs for exceedances of 90th percentile Hanford Site background concentrations: technetium-99 (H2-1, H3-9), tritium (H3-9), nitrite, sulfate (H2-1, H3-9, H3-10), cobalt (H2-1), copper (H2-1), lead (H2-1, H3-2C), manganese (H2-1), nickel (H2-1), vanadium (H2-1, H3-2C), and zinc (H2-1). Basis/Justification: Accuracy and completeness.	Revise text to identify that the following contaminants will be carried forward as confined aquifer COPCs due to contaminants being detected at levels above background (i.e., uncertain status): technetium-99, tritium, nitrite, sulfate, cobalt, copper, lead, manganese, nickel, vanadium, and zinc.	4	4-142		Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. <u>Additional information:</u> COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs.	Yes - 10/2/2013
DH-206	Comment: Table 4-12 should be revised to agree with text changes that have added: technetium-99, tritium, nitrite, sulfate, cobalt, copper, lead, manganese, nickel, vanadium, and zinc as COPCs due to contaminants being detected above background (i.e., uncertain status). Basis/Justification: Accuracy.	Revise Table 4-12 and identify the following 100-H Area contaminants as "Detected at levels above background (uncertain status)": technetium-99, tritium, nitrite, sulfate, cobalt, copper, lead, manganese, nickel, vanadium, and zinc.	4	4-142/S. 4.4.1.3	Not Accepted	COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs.	Yes - 6/26/2013
DH-207	Comment: Comment: Due to uncertainties associated with confined aquifer contaminant results (e.g., unknown extent of contamination, leaky aquifer causing sampling bias, etc.), include the following Horn Area contaminants as groundwater COPCs for exceedances of 90th percentile Hanford Site background concentrations: nitrite, sulfate (699-97-43C), iron (699-97-43C), manganese (699-97-43C, 699-97-45B, 699-97-48C), vanadium (699-97-43C, 699-97-45B, 699-97-48C), and zinc (699-97-45B, 699-97-48C).	Revise text to identify that the following contaminants will be carried forward as confined aquifer COPCs due to contaminants being detected at levels above background (i.e., uncertain status): nitrite, sulfate, iron, manganese, vanadium, and zinc.	4	4-142/S. 4.4.1.3	Not Accepted	COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs.	Yes - 6/26/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-208	Comment: Table 4-12 should be revised to agree with text changes that have added: nitrite, sulfate, iron, manganese, vanadium, and zinc as COPCs due to contaminants being detected above background (i.e., uncertain status). Basis/Justification: Accuracy.	Revise Table 4-12 and identify the following Horn Area contaminants as "Detected at levels above background (uncertain status)": nitrite, sulfate, iron, manganese, vanadium, and zinc.	4	4-142/S. 4.4.1.3	Not Accepted	COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs.	Yes - 6/26/2013
DH-209	Comment: The Sr-90 standard is given with units of "pCi/l in km2". This unit needs much more explanation before the general public will understand it. Basis/Justification: Clarity and understanding.	Explain the units used.	4	4-143/ Table 4-13	Accept with Modification	An extra row was added to the table to show that the km2 is the area and not the standard. Text was edited for clarity.	Yes - 5/2/2013
DH-210	Comment: Change the sentence to read "The 183-H solar evaporation basin (116-H-6) area contains residual contamination in the vadose zone." Basis/Justification: The reason 183-H Solar Evaporation Basins were closed under modified closure was because contaminants were left in place that exceeded MTCA Method B for clean closure at depths of 25 ft bgs.	Delete the "may contain" portion because it is known that residual contamination exists in the vadose zone because of how it was closed under modified closure through the RCRA Permit.	4	4-247/34-35	Accept	Text revised to remove the word "may".	Yes - 9/9/2013
DH-211	Comment: The text states: "However, the potential remains for residual contamination within unremediated portions of the vadose zone, particularly near historical release points that produced groundwater contamination. Undefined secondary sources could gradually leach into the groundwater for a number of years and will be monitored in the groundwater. There remains uncertainty in how this residual contamination might behave within 100-D/H." Vadose zone contamination associated with liquid waste disposal sites may not be protective of groundwater. Because such contamination is primary in nature, it is incorrect to characterize the remaining vadose contamination as "residual". Vadose zone contamination associated with liquid waste disposal sites and unremediated waste sites represents "primary sources" of contamination. Basis/Justification: Accuracy. Conceptual site model incorrectly characterizes remaining vadose zone contamination as a "secondary source" and "residual". Characterization borehole data clearly indicate numerous contaminants increase in concentration in the PRZ – possibly at concentrations not protective of groundwater.	Recommended wording: "However, the potential remains for contamination within unremediated portions of the vadose zone, particularly near historical release points that produced groundwater contamination. Such primary sources could gradually leach into the groundwater for a number of years and will be monitored in the groundwater. There remains uncertainty in how this primary contamination source might behave within 100-D/H."	4	4-254/38	No change	The text as written is consistent with the definition of the secondary sources as approved in the RI/FS Work Plan (DOE/RL-2008-46, ADD1, Section 4.2). The term "residual" means contaminants that remain after remediation and does not attempt to quantify or qualify concentration or potential impact.	Yes - 6/19/2013
DH-212	Comment: The text states: "Residual contaminants with low Kd values (less mobile) may be retained within the vadose zone at, or near, historical release points. These contaminants may be mobilized and reach the water table under the driving forces of seasonal precipitation recharge or transient anthropogenic recharge events." Vadose zone contamination associated with liquid waste disposal sites may not be protective of groundwater. Because such contamination is primary in nature, it is incorrect to characterize the remaining vadose contamination as "residual". Vadose zone contamination associated with liquid waste disposal sites and unremediated waste sites represents "primary sources" of contamination. Basis/Justification: Accuracy. Conceptual site model incorrectly characterizes remaining vadose zone contamination as a "secondary source" and "residual". Characterization borehole data clearly indicate numerous contaminants increase in concentration in the PRZ – possibly at concentrations not protective of groundwater.	1. Recommended wording: " Contaminants with low Kd values (less mobile) may be retained within the vadose zone at, or near, historical release points. These contaminants are very likely mobilized and reach the water table under the driving forces of seasonal precipitation recharge or transient anthropogenic recharge events."	4	4-255/4	Accept with Modification	The text revised to correct the statement that low Kd values are associated with less mobile contaminants. The text as written is consistent with the definition of the secondary sources as approved in the RI/FS Work Plan (DOE/RL-2008-46, ADD1, Section 4.2). The term "residual" in this document means contaminants that remain after remediation and does not attempt to quantify or qualify concentration or potential impact.	Yes - 10/30/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-213a	Comment: The text states: "…but where the potential remained for residual contamination below the depth of remediation. Several characterization boreholes and wells were drilled at these locations to evaluate the presence of residual contamination; these results indicated no significant residual contamination at the locations where data gaps and uncertainty were identified." This reviewer does not agree that "the results indicated no significant residual contamination". Groundwater data indicates action level and background level exceedances for: technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc. In addition, borehole characterization results indicate numerous contaminant soil concentration increases in the PRZ. WAC 173-340-747 specifies how to derive soil concentrations for groundwater protection. Using the MTCA three-phase partitioning model with a dilution factor of 1 (for the "periodically re-wetted zone") and water-filled soil porosity for saturated zone (for the "periodically re-wetted zone"), conservative soil cleanup concentrations can be derived. Vadose zone contamination associated with liquid waste disposal sites may not be protective of groundwater. Because such contamination is primary in nature, it is incorrect to characterize the remaining vadose contamination as "residual". Vadose zone contamination associated with liquid waste disposal sites and unremediated waste sites represents "primary sources" of contamination. Basis/Justification: Accuracy. Conceptual site model incorrectly characterizes remaining vadose zone contamination as a "secondary source" and "residual". Characterization borehole data clearly indicate numerous contaminants increase in concentration in the PRZ – possibly at concentrations not protective of groundwater.	213a - [1. Recommended wording: "…but where the potential remained for primary source contamination below the depth of remediation. Several characterization boreholes and wells were drilled at these locations to evaluate the presence of contamination; these results indicated a number of contaminant concentration increases in the PRZ at the locations where data gaps and uncertainty were identified."] 2. Due to higher contaminant soil concentrations in the PRZ, lower soil cleanup levels should be derived per WAC 173-340-747(4)(e). Consider deriving soil concentrations for groundwater protection via WAC 173-340-747 where the dilution factor is 1 (for saturated vadose zone to conservatively represent the PRZ), conservative Kd values (e.g., nitrate and Cr+6 are 0), and water-filled soil porosity is .43 ml (for saturated vadose zone to conservatively represent the PRZ). After conservative soil concentrations are derived for groundwater protection for each contaminant, it is recommended the groundwater protection soil values be compared to the highest borehole contaminant measurements in the PRZ. If the highest PRZ borehole contaminant measurements are lower than the conservative soil groundwater protection values, statements may be included in the document that primary source PRZ contamination beneath waste sites is less than the soil groundwater protection values derived per a conservative application of WAC 173-340-747(4)(e). As an example of the recommended WAC 173-340-747 derivation of soil concentration for groundwater protection, the Cs for nitrate is 2.86 mg/kg (2,860 µg/kg). It is noted that most nitrate concentrations at borehole C7852 exceed the Cs. Similarly, it is noted that several nitrate concentrations (including at the PRZ) at borehole C7857 exceed the Cs. 3. Without an empirical demonstration (per WAC 173-340-747) for contaminant soil concentrations in the PRZ beneath waste units, all statements such as "these results indicated no significant residual contamination at the locations where data gaps and uncertainty were identified" are unsupported and should be deleted. Note: to perform an empirical demonstration, contaminant soil data from the PRZ and groundwater data from the same location or very close downgradient is needed.	4	4-255/6-11	Accept with Modification	1. Recommended wording is not accurate. Propose the following wording: "….but where the potential remained for residual contamination below the depth of remediation. Several characterization boreholes and wells were drilled at these locations to evaluate the presence of contamination; these results indicated no mobile constituents (beyond those already identified) are found beyond the depth of excavation or below the water table and no deep contamination was found that constitutes a groundwater or surface water protection issue." 2. Conservatism testing was conducted to evaluate the impact of contaminants located deeper in the vadose zone. The RI/FS documents that the vadose zone modeling calculations were bounding of these occurrences and no deep contamination was ever detected that could impact groundwater or surface water above applicable cleanup levels. For contaminants below the water table, evaluation of groundwater analytical results was conducted to evaluate whether downstream contamination has been detected or is likely to occur in the future (where no downstream groundwater monitoring results are available). The cited WAC requirements are addressed in the RI/FS using Section WAC-173-340-747(8). The cited nitrate concentrations are evaluated in Chapter 5 of the RI/FS and are found to be below the recommended soil screening levels (SSLs); which assume irrigation-based infiltration rate.	Yes - 11/19/2013
DH-213b	Comment: The text states: "…but where the potential remained for residual contamination below the depth of remediation. Several characterization boreholes and wells were drilled at these locations to evaluate the presence of residual contamination; these results indicated no significant residual contamination at the locations where data gaps and uncertainty were identified." This reviewer does not agree that "the results indicated no significant residual contamination". Groundwater data indicates action level and background level exceedances for: technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc. In addition, borehole characterization results indicate numerous contaminant soil concentration increases in the PRZ. WAC 173-340-747 specifies how to derive soil concentrations for groundwater protection. Using the MTCA three-phase partitioning model with a dilution factor of 1 (for the "periodically re-wetted zone") and water-filled soil porosity for saturated zone (for the "periodically re-wetted zone"), conservative soil cleanup concentrations can be derived. Vadose zone contamination associated with liquid waste disposal sites may not be protective of groundwater. Because such contamination is primary in nature, it is incorrect to characterize the remaining vadose contamination as "residual". Vadose zone contamination associated with liquid waste disposal sites and unremediated waste sites represents "primary sources" of contamination. Basis/Justification: Accuracy. Conceptual site model incorrectly characterizes remaining vadose zone contamination as a "secondary source" and "residual". Characterization borehole data clearly indicate numerous contaminants increase in concentration in the PRZ – possibly at concentrations not protective of groundwater.	1. Recommended wording: "…but where the potential remained for primary source contamination below the depth of remediation. Several characterization boreholes and wells were drilled at these locations to evaluate the presence of contamination; these results indicated a number of contaminant concentration increases in the PRZ at the locations where data gaps and uncertainty were identified." 213b - [2. Due to higher contaminant soil concentrations in the PRZ, lower soil cleanup levels should be derived per WAC 173-340-747(4)(e). Consider deriving soil concentrations for groundwater protection via WAC 173-340-747 where the dilution factor is 1 (for saturated vadose zone to conservatively represent the PRZ), conservative Kd values (e.g., nitrate and Cr+6 are 0), and water-filled soil porosity is .43 ml (for saturated vadose zone to conservatively represent the PRZ). After conservative soil concentrations are derived for groundwater protection for each contaminant, it is recommended the groundwater protection soil values be compared to the highest borehole contaminant measurements in the PRZ. If the highest PRZ borehole contaminant measurements are lower than the conservative soil groundwater protection values, statements may be included in the document that primary source PRZ contamination beneath waste sites is less than the soil groundwater protection values derived per a conservative application of WAC 173-340-747(4)(e). As an example of the recommended WAC 173-340-747 derivation of soil concentration for groundwater protection, the Cs for nitrate is 2.86 mg/kg (2,860 µg/kg). It is noted that most nitrate concentrations at borehole C7852 exceed the Cs. Similarly, it is noted that several nitrate concentrations (including at the PRZ) at borehole C7857 exceed the Cs. 3. Without an empirical demonstration (per WAC 173-340-747) for contaminant soil concentrations in the PRZ beneath waste units, all statements such as "these results indicated no significant residual contamination at the locations where data gaps and uncertainty were identified" are unsupported and should be deleted. Note: to perform an empirical demonstration, contaminant soil data from the PRZ and groundwater data from the same location or very close downgradient is needed.]	4	4-255/6-11	Accept with Modification	As previously discussed, COCs/COPCs will not be retained based solely on measured concentrations above background. A model postulating a continuous source from the vadose zone is not recommended. Such a model would primarily show the importance of the assumptions made about the source strength, and not add meaningful information to this decision-making process. Continuing sources of this type will be addressed during the operation of a pump-and-treat remedy. The noted exceedance of action levels in the comment is not consistent with results obtained using the alternative fate and transport modeling documented in Chapter 5. The text will be revised to indicate that the RD/RAWP will identify that analytes which are not retained as a COPC will be monitored. Monitoring results will be used to evaluate trends and identify plausible risks that may require further evaluation and to determine if additional action is warranted.	Yes - 4/8/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-214	Comment: The text states: "This zone has the potential to function as a secondary source for some contaminants…" Vadose zone contamination associated with liquid waste disposal sites and unremediated waste sites represents "primary sources" of contamination. The definition may differentiate between remaining contamination that exceeds concentrations protective of groundwater (primary sources) versus remaining contamination that does not exceed concentrations protective of groundwater (secondary sources). Basis/Justification: Accuracy.	Recommended wording: "This zone has the potential to function as a primary or secondary source for some contaminants…"	4	4-255/36	No change	The designation of primary or secondary source centers on how contaminants arrived at a site, rather than their concentration. The text as written is consistent with the definition of the secondary sources as approved in the RI/FS Work Plan (DOE/RL-2008-46, ADD1, Section 4.2).	Yes - 6/19/2013
DH-215	Comment: The text states: "Contaminants may enter the PRZ under two common conditions: by downward migration from an overlying vadose zone source, or by emplacement from contaminated groundwater during high water conditions, where the contaminant(s) may be retained by the soil matrix in that zone, and then re-enter the groundwater at the next high water period." Vadose zone contamination associated with liquid waste disposal sites and unremediated waste sites represents "primary sources" of contamination. The definition may differentiate between remaining contamination that exceeds concentrations protective of groundwater (primary sources) versus remaining contamination that does not exceed concentrations protective of groundwater (secondary sources). Basis/Justification: Accuracy.	Recommended wording: "Contaminants may enter the PRZ under two common conditions: by downward migration through the vadose zone from waste disposal activities (primary source), or by emplacement from contaminated groundwater during high water conditions, where the contaminant(s) may be retained by the soil matrix in that zone, and then re-enter the groundwater at the next high water period (secondary source)."	4	4-255	No change	The designation of primary or secondary source centers on how contaminants arrived at a site, rather than their concentration. The text as written is consistent with the definition of the secondary sources as approved in the RI/FS Work Plan (DOE/RL-2008-46, ADD1, Section 4.2).	Yes - 6/19/2013
DH-216	Comment: The text states: "This action essentially replenishes the contaminants in the PRZ until remediation activities remove the overlying source." As previously commented, vadose zone contamination associated with liquid waste disposal sites and unremediated waste sites represents "primary sources" of contamination. Borehole characterization results indicate contaminant concentrations are not consistent throughout the vadose zone. Fate and transport mechanisms vary per contaminant. As such, under certain conditions, contaminants can occur at high concentrations only immediately near the surface (e.g., aroclor-1254 [Figure 4-13], europium-154 [Figure 4-12], thallium [Figure 4-13], etc.). Similarly, under certain conditions, certain contaminants can occur at higher concentrations at or near only the PRZ (e.g., aldrin [Figure 4-13], tin [Figure 4-13], barium [Figure 4-12], molybdenum [Figure 4-12], etc.). Similarly, under certain conditions, certain contaminants can occur throughout the vadose zone (e.g., chromium [Figure 4-18], molybdenum [Figure 4-18], nickel [Figure 4-18], antimony [Figure 4-18], vanadium [Figure 4-13], etc.). Clearly, contaminant transport varies and even the same contaminant transport rates can vary under different conditions. By the text's repeated description of "secondary source" associated with waste disposal sites, it appears there is a difference in opinion regarding the conceptual site model. Basis/Justification: Accuracy.	1. Possible wording: "This action essentially replenishes the contaminants in the PRZ until contamination occurring throughout the vadose zone is remediated." 2. Throughout Section 4, text describing the CSM associated with "secondary source" or "residual" contamination transport should be revised to clearly identify that remaining vadose zone contaminants associated with waste disposal practices may continue to negatively impact groundwater as "primary source" contamination.	4	4-256/5-6	Accept with Modification	1. The last two sentences of the paragraph have been deleted. 2. The text as written in Section 4 is consistent with the definition of the secondary sources as approved in the RI/FS Work Plan (DOE/RL-2008-46, ADD1, Section 4.2). The term "residual" in this document means contaminants that remain after remediation and does not attempt to quantify or qualify concentration or potential impact.	Yes - 6/19/2013
DH-217	Comment: The text states: "Assuming that contamination is present in the overlying soil, this action can result in two different situations: immediate or nearly immediate response to the change in water level, or a delayed response." Because the statement is not predicated on a CSM that acknowledges that remaining vadose zone contaminants associated with waste disposal practices may continue to negatively impact groundwater as "primary source" contamination, the statement doesn't provide value. Basis/Justification: CSM needs to be corrected.	Delete the sentence.	4	4-256/7-8	Accept with Modification	Deleted the sentences.	Yes - 7/17/2013
DH-218	Comment: The text states: "In addition, because the Cr(VI) at the groundwater interface is localized, the fluctuations in Cr(VI) concentrations in groundwater from well 199-D5-99 are likely more directly related to the vadose source and not specifically a source in the PRZ." This scenario represents an excellent example of "primary source" contamination occurring in the vadose zone and should be clarified as such. Basis/Justification: CSM clarification.	Recommended wording: "In addition, because the Cr(VI) at the groundwater interface is localized, the fluctuations in Cr(VI) concentrations in groundwater from well 199-D5-99 are likely more directly related to the vadose (primary source) and not specifically the PRZ (secondary source)."	4	4-256/25-27	No change	The text as written in Section 4 is consistent with the definition of the secondary sources as approved in the RI/FS Work Plan (DOE/RL-2008-46, ADD1, Section 4.2).	Yes - 6/19/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-219	Comment: The text states: "Mobile contaminants located within the PRZ are most likely a continuation of the residual, overlying contamination in the vadose zone." This scenario represents an excellent example of "primary source" contamination occurring in the vadose zone and should be clarified as such. Basis/Justification: CSM clarification.	Recommended wording: "In this case, contaminants located within the PRZ are most likely a result of the primary source occurring in the vadose zone."	4	4-256/27-29	No change	The RI/FS Work Plan for 100-D/H (DOE/RL-2008-46 ADD 1, section 4.2) defines primary sources as the three reactors (105-D, 105-DR, and 105-H Reactors) and the structures (e.g., fuel storage basins) and processes (e.g., sodium dichromate additions to reactor coolant) associated with reactor operations. The Work Plan defines secondary sources as contamination in areas such as ponds, ditches, cribs, burial grounds, and unplanned release sites created by releases to the environment. The text as written is consistent with these definitions. The Work Plan definitions are consistent with EPA 540-R-98-031 "A Guide To Preparing Superfund Proposed Plans, Records Of Decision, And Other Remedy Selection Decision Documents" (see page 6-11 where contaminated soil is identified as a secondary source). Note that it is recognized that vadose zone contamination is significantly and currently impacting groundwater beneath 100-D-100. Because contamination at 100-D-100 extends to groundwater the entire vadose zone source beneath this site is being removed.	Yes - 6/19/2013
DH-220	Comment: The text states: "As not all waste sites have been remediated near the likely sources, it is not yet clear if strontium-90 is present throughout the vadose zone or in the limited area near the water table." This text represents an example of the difference in opinion regarding the conceptual site model. The text should be revised to clearly differentiate between vadose zone contaminations associated with waste disposal practices/occurrences as "primary source" versus "secondary source" contamination. Basis/Justification: CSM correction.	Recommended wording: "As contaminated vadose zone associated with all waste disposal sites (i.e., primary source contamination) has not been remediated, it is not yet clear if strontium-90 is present in concentrations unprotective of groundwater throughout the vadose zone or in the near the water table."	4	4-256/34-35	No change	As defined in the RI/FS Work Plan (DOE/RL-2008-46 ADD1, Section 4.2) the vadose zone is not considered a primary source.	Yes - 6/19/2013
DH-221	Comment: The text provides an example of a delayed response due to the distance of the well from the river and the fact that the water table is present within the less permeable or transmissive Ringold Formation unit E. From borehole characterization data, contaminants with lower a Kd can be seen to occur in higher concentrations above the PRZ (e.g., hexavalent chromium [Figure 4-12], nitrate [associated with C7855 but plot not included in FS], nitrate [associated with C7857], etc.). Basis/Justification: CSM completeness.	It is requested the text also describe a scenario of a delayed response due to the location of the primary source contamination above the PRZ (i.e., within silty horizons).	4	S. 4.9.8.2	Accept with Modification	The use of primary source is not correct. Contaminants in the vadose zone are secondary sources. The rate of downward contaminant migration of secondary source material is influenced where silt and clay layers are present. The layering can result in a longer pathway from the surface to groundwater and will primarily affect the time it takes less mobile contaminants to reach groundwater (i.e. delay). Migration of highly mobile contaminants is unlikely to be notably affected by these zones, regarding time frame, but the contaminant footprint in the soil column may be increased by such migration laterally. Text was modified to clarify the time frame for migration.	Yes - 9/9/2013
DH-222	Comment: The text provides an example of a delayed response due to the distance of the well from the river and the fact that the water table is present within the less permeable or transmissive Ringold Formation unit E. Basis/Justification: CSM completeness.	It is requested the text also describe a scenario of a groundwater response due to the application of dust suppression water and/or significant precipitation events due to the primary source contamination within the vadose zone.	4	S. 4.9.8.2	Accept	The use of term "primary source" is not correct. Contaminants in the vadose zone are secondary sources. Dust suppression water can have an affect on Cr(VI) contaminant levels in groundwater. For example, in well 199-D5-103 there has been an increase in Cr(VI) during the period of excavation at 100-D-30/104. However, near waste site 100-D-100, which is also undergoing remediation: well 199-D5-104 showed minor fluctuations in concentrations that are likely seasonal; well 199-D5-39 has a downward trend; and nearby well 199-D5-97 also had a decreasing trend. (It should be noted that the majority of suppression water has been placed on road surfaces and water applied directly into the excavation has been minimized to the extent possible.) Test was modified.	Yes - 9/9/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-223	Comment: The section describes the hyporheic zone. It is requested the text describe (and reference) the Technical Evaluation of the Interaction of Groundwater with the Columbia River at the Department of Energy Hanford Site, 100-D Area (SGW-39305 Revision 0). Basis/Justification: Completeness.	It is requested the text describe the panel's suggestion that the spatial extent of chromium discharge to the Columbia River should be evaluated further and correlated with the identified in-channel groundwater discharge zones. In addition, it is requested the text identify the panel's recommendation that the mixing/dilution conceptual model for the 100-D Area be evaluated in context of a local groundwater river-exchange conceptual model. In addition, it is requested the text describe the panel's recommendation that at 100-D Area, the Cr+6 source investigation should be continued and expanded to examine if observed Cr+6 distributions at near-bank sites may be due to regional groundwater discharge, water from the Ringold aquitard, and/or impacted vadose-zone sediments.	4	S. 4.9.8.4	Not Accepted	Section focus is on what is currently known regarding the hyporheic zone. The expert panel report (SGW-39305) was issued in October, 2008 and was referenced, and the recommendations considered as foundational for developing data gaps/data needs, in both the Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan (DOE/RL-2008-46 Rev 0, Section 2.3.3.4 and 5.3.1) and in the Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan Addendum 1: 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2,and 100-HR-3 Operable Units (DOE/RL-2008-46-ADD1 Rev 0, Section 4.5.4). The results of RI activities performed to satisfy the data needs have been incorporated into the RI/FS Report. The recommendations from the expert panel did not result, specifically, in a change of our understanding of the function of the hyporheic zone. Referencing the expert panel report and re-summarizing the recommendations at this point in time is redundant.	Yes - 7/10/2013
DH-224	Comment: The text does not appear to acknowledge contaminant transport effects of the water storage basins (182-D Reservoir). Basis/Justification: Completeness.	Describe how the leaking reservoir can affect contaminant fate and transport. Also, describe how contaminant fate and transport can be affected when the 182-D no longer leaks.	4	S. 4.9.8	Accept	Text added under groundwater subsection on how leakage from the reservoir affects migration by producing a groundwater mound.	Yes - 7/01/2013
DH-225	Comment: The text does not adequately acknowledge the contaminated vadose zone associated with waste disposal activities/events as primary sources of contamination. In most waste disposal cases, contaminants did migrate into the vadose zone – well beyond the typical depth of remedial excavation. Basis/Justification: CSM clarification.	Clearly acknowledge the confirmation (through characterization efforts) of contamination at depth in the vadose zone associated with waste disposal activities/events.	4	4-250/21-28	Accept with Modification	Additional text was added here for clarity.	Yes - 4/8/2014
DH-226	Comment: The text does not adequately acknowledge the migration of less mobile contaminants associated with waste disposal activities/events. The Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 5: 100-NR-1 and 100-NR-2 Operable Units (DOE/RL-2008-46, ADD5, Revision 0) includes a section which describes contaminant migration and distribution in the vadose zone ("Application of the CSM to the Fate and Transport of Other Contaminants Discharged in the 100-N Area" Section 4.3.6). The text includes a discussion of contaminant reactivity and describes 3 broad reactivity categories associated with fate and transport (e.g., nonreactive (e.g., tritium, nitrate, chromium), moderately reactive (e.g., strontium-90, etc.), highly reactive (e.g., cesium-137, plutonium, cadmium, lead, mercury, nickel, etc.). Section 4 appears to focus only on "nonreactive" contaminants. Basis/Justification: Action level and 90th percentile background groundwater exceedances and CSM completeness.	Expand the contaminant migration discussion by discussing moderately and highly reactive contaminant migration.	4	4.9.8	Accept	Text was added regarding reactive and non reactive contaminants to the extent it is appropriate. Since most of the analytes are not present, the discussion will be limited to the general concepts. Additional discussion on the mobility of contaminants is addressed in 4.9.8.1 Vadose Zone (Ch 4 part 5), along with Kd values.	Yes - 4/8/2014
DH-227	Comment: Comments from Appendix F should be applied also to this chapter where there is overlap between this chapter and Appendix F. Basis/Justification: There is overlap between this chapter and Appendix F.	Make corresponding revisions to this chapter as is needed for Appendix F.	5	General	Accept	All comments on Appendix F will be considered for impact on Chapter 5. Following incorporation into Appendix F, the comment set will be cross checked with Chapter 5 and changes applied where there is overlap.	Yes - 4/23/2014
DH-228	Comment: Groundwater modeling using the average concentration as input for the modeling of predictive analysis does NOT represent both conservative as well as real field scenario in the entire D and H area. The simulated results presented in this document have the following major impact : • Decrease in the actual remediation time frame to meet the Remedial Action Objectives (RAOs) • Wrong cost estimates and the associated analysis of alternatives proposed (specific to alternatives 2, 3 and 4). Please note that the groundwater remediation cost is about 75% of the entire cleanup cost in the D and H area in the alternatives analyzed. Therefore it is crucial to address it in this RI/FS for any final decision. Basis/Justification: Clarity and accuracy.	Carry out a better predictive analysis reflect the most conservative and real field observation and apply the information in the analysis of remedial alternatives.	5, 10, and Appx F	General	Accept	A sensitivity study for the initial concentrations used in the model will be developed, conducted, and documented and summarized in Chapter 5 to evaluate the impact of using maximum measured concentrations as the basis for the initial groundwater contaminant condition. The results of this analysis will be presented to Ecology and a path forward defined for disposition of the remaining assumptions in this comment regarding remedy impacts. A technical memorandum was prepared that evaluated differences in initial plume representations from using a maximum concentration basis contrasted with average concentration basis. This information was provided with ECY. ECY agreed, based on review and discussion of this information, that the average basis was appropriate for establishing initial conditions for modeling. Future evaluations of the GW plumes will consider the uncertainties associated with the analytical measurements and the observed transient effects of groundwater, the river, and pump-and-treat influences.	Yes - 4/23/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-229	Comment: Modeling of alternative scenarios must be carried out through sensitivity analysis in order to understand the following: • Better understand the impact of the low, average and highest concentrations observed at the site. Please note that the analysis/predictive simulation carried out using median and/ or average values are not the representative of the site. Please note that above approach should NOT be interpreted as "uncertainty" analysis. It is necessary to understand the significance of the situation observed in the D and H area groundwater and should be an integral part of the analysis. Please note that there are significant differences of concentration of Cr observed, even during low river stage of the Columbia River (e.g. the aquifer tube data varies from 2 ppb-70 ppb in H area [figure 4.81), well data varies from ~40K ppb to +60 ppb in 199-D-5 in D Area, etc.) • Carry out a specific sensitivity analysis in the H area incorporating the transmissive zones (s) encountered in the lower mud of the Ringgold Formation with no-flow boundary condition below it for better understanding of the plume behavior. Please note that we have observed persistent high concentration Cr. for the last 10 years or so in spite of our continued remediation activities in that limited area. • Carry out sensitivity analysis using 2D or 3D modeling approach on those areas where the vadose contamination already impacted the groundwater. Basis/Justification: Clarity and accuracy.	Carry out the necessary simulations of sensitivity analysis as justified in comments.	5, 10, and Appx F	General	Accept	A sensitivity study for the initial concentrations used in the model will be developed, conducted, and documented and summarized in Chapter 5 to evaluate the impact of using maximum measured concentrations as the basis for the initial groundwater contaminant condition. The results of this analysis will be presented to Ecology and a path forward defined for disposition of the remaining assumptions in this comment regarding remedy impacts. Initial evaluation of the contamination in the RUM was documented in ECF-100HR3-12-0025 (which will be placed in the AR and added to Appendix F). A summary of this evaluation will be added to Chapters 5 and 9. It must be noted that additional evaluation of RUM contamination is already planned as part of the remedial system optimization. In the future, the RD/RA WP will describe any additional RUM evaluations that will be needed to optimize remedy performance. (Sensitivity for the VZ contamination in areas already impacting GW are addressed in responses to other comments.) Future evaluations of the GW plumes will consider the uncertainties associated with the analytical measurements and the observed transient effects of groundwater, the river, and pump-and-treat influences. Additional conceptual site model consideration, e.g.: RUM contamination, will also continue to be evaluated as part of the remedial action process.	Yes - 4/23/2014
DH-230	Comment: Calibration of the modeling should include historical concentration profile observed in the field and see model behavior in predictive simulation. These calibration should be conducted in areas where there is no impact of the Columbia River (River) or very minimal. Ecology would like to provide specific location (well) appropriate for this calibration exercise. The following broad areas need to be considered: • Areas near the hot spot of D Area not impacted by the river • Further downgradient of the plume in D area not impacted by the river • H area Basis/Justification: Clarity and accuracy.	Provide necessary information justified in the comment to make sure that the basic framework of the modeling incorporates everything that is known and taking the right approach to make the final remediation decisions.	5, 10, and Appx F	General	Accept with Modification	The potential to apply historical concentration data, particularly tritium, to support inverse calibration of the groundwater model was considered. The available data were judged inadequate to this purpose, because only trailing edge behavior was available. Hence, these data are of limited value to calibrate a numerical flow and transport model. The model improvement plan for the 100 Area Groundwater Model will be revised to include activities to carry out exercise(s) using concentration profiles on a small-scale basis to improve the underlying models and provide better tools for the performance evaluation and continuing improvement of the P&T system.	Yes - 4/14/2014
DH-231	Comment: The current modeling sources in the RUM (e.g. in the H area). The presence of such sources could significantly prolong aquifer cleanup times. This assumption assumes that source area remediation will be successful at removing continuing sources and that groundwater monitoring will identify any continuing sources for further remediation. Note that there is no plan to remediate any source found below the water table other than to deal with the dissolved contamination found in the groundwater. A sensitivity analysis is important to understand how far the remediation could prolong under the current understanding of the site-especially in the H area. Basis/Justification: Clarity and accuracy.	Carry out a sensitivity analysis and its associated impact (cost and duration) on the current approach of pump and treat.	5, 10, and Appx F	General	Accept with Modification	Initial evaluation of the contamination in the RUM was documented in ECF-100HR3-12-0025 (which will be placed in the AR and added to Appendix F). A summary of this evaluation will be added to Chapters 4 and 9. Additional evaluation of RUM contamination is already planned as part of the remedial system optimization. This evaluation will be used to refine current estimates of the nature and extent of contamination in the RUM.	Yes - 1/27/2014
DH-232a	232a - [Comment: Provide more information on the site specific modeling studies especially on the following major topics: • Soil moisture profile, residual saturation used under different scenarios such as the irrigation, previously wetted zones (e.g. waste disposal sites), non-wetted zone, and recharge values in the disturbed areas with justification.] • Basis of justification Kd values in both vadose zone and groundwater modeling, their uncertainties and associated significance through sensitivity analysis • Use of graded approach with site specific data to meet the WAC and as per TPA agreement. • Rationale why 3-phase model was not used for the vadose zone fate and transport. Basis/Justification: Clarity and accuracy.	Provide information requested to justify the approaches taken or going to take in response to comments that reflect all the changes suggested to be made in this process.	5, 10, and Appx F	General	Accept	Responses to comments DH-243, DH-244, DH-248, & DH-251 require rerunning the entire set of SSL/PRG calculations for new recharge scenarios, then historical (pre-1944) irrigation will be assumed and included in the historical phase of flow modeling with STOMP for the recharge scenarios (a bounding approach to assume that all sites were subject to irrigation in the past) and this will be addressed in the base case rather than by sensitivity study.	Yes - 4/23/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-232b	Comment: Provide more information on the site specific modeling studies especially on the following major topics: • Soil moisture profile, residual saturation used under different scenarios such as the irrigation, previously wetted zones (e.g. waste disposal sites), non-wetted zone, and recharge values in the disturbed areas with justification. 232b - [• Basis of justification Kd values in both vadose zone and groundwater modeling, their uncertainties and associated significance through sensitivity analysis] • Use of graded approach with site specific data to meet the WAC and as per TPA agreement. • Rationale why 3-phase model was not used for the vadose zone fate and transport. Basis/Justification: Clarity and accuracy.	Provide information requested to justify the approaches taken or going to take in response to comments that reflect all the changes suggested to be made in this process.	5, 10, and Appx F	General	Accept with Modification	The methodology used to select Kd values will be more comprehensively presented in Chapter 5 in response to this and comment DH-261. Most Kd values are derived from the CLARC table values (with the notable exception of hexavalent chromium, for which a site-specific value based on batch leach testing for the residual soil contamination is used, and arsenic which will be modified to match new Ecology guidance per comment resolution). Those few values that differ from CLARC will be changed to match CLARC in response to comment CW-S-3. Basis is provided in the ECF that collected these values (ECF-HANFORD-11-0442 Rev 1, Appendix F), which will be revised, and a summary of this process added to Chapter 5 in response to Comment DH-261. A Sensitivity study was performed to evaluate the influence of Kd values on contaminant breakthrough, and is documented in the model package report (SGW-50776 Rev 1, Section 6.2.1). Note that the remaining portions of the comment are addressed in DH-232a and DH-232c.	Yes - 4/23/2014
DH-232c	Comment: Provide more information on the site specific modeling studies especially on the following major topics: • Soil moisture profile, residual saturation used under different scenarios such as the irrigation, previously wetted zones (e.g. waste disposal sites), non-wetted zone, and recharge values in the disturbed areas with justification. • Basis of justification Kd values in both vadose zone and groundwater modeling, their uncertainties and associated significance through sensitivity analysis 232c - [• Use of graded approach with site specific data to meet the WAC and as per TPA agreement. • Rationale why 3-phase model was not used for the vadose zone fate and transport.] Basis/Justification: Clarity and accuracy.	Provide information requested to justify the approaches taken or going to take in response to comments that reflect all the changes suggested to be made in this process.	5, 10, and Appx F	General	Justification Added	DOE/RL-2011-50 Rev. 1 provided the methodology applied to calculate soil contamination levels protective of groundwater and of surface water for the 100-D/H RI/FS. This methodology included the use of alternative fate and transport models, a method permitted under WAC 173-240-747 for establishing Method B soil cleanup levels or Method C soil cleanup levels. DOE/RL-2011-50 Rev. 1 also documented DOE's demonstration that the STOMP software meets the WAC requirements for implementation of alternative fate and transport models, while leaving parameterization to be presented in application-specific documents, including the 100-D/H RI/FS. Agency concurred with DOE/RL-2011-50 Rev. 1, with the caveat that justification of specifics for a given application is to be presented in application-specific documents. These specifics are provided in SGW-50776 and in ECF-Hanford-11-0063, documents that provide the basis and justification for construction and parameterization of the vadose zone flow and transport models used to calculate soil concentrations protective of groundwater and of surface water for this specific application. The WAC Crosswalk, under development to meet this and other comments, will provide the linkages between the use of this alternative fate and transport model and the WAC requirements. Implementation of the agreed-upon approach provided in DOE/RL-2011-50 Rev. 1, based on STOMP 1-D, is the justification for use of an alternative fate and transport model rather than the 3-phase model.	Yes - 1/30/2014
DH-233a	233a - [Comment: The RI/FS does not have a section to specifically address waste sites where the interim action excavation was performed into either the periodically rewetted zone and/or the saturated zone.] There are several waste sites where this specifically should be addressed including: 100-D-8, 100-D-65, 100-D-66, 116-H-5, 128-H-1, 132-H-3. Basis/Justification: The TPA dispute process that was initiated 2/10/12 resulted in: • Ecology agreed to reclassify the 116-H-5 and 128-H-1 waste site reclassification forms as "Interim Closed Out". • DOE agreed to specifically evaluate these and related rewetted/shoreline sites in the D/H Feasibility Study.	Include sub-section to discuss unique issues with these waste sites (extending into the periodically rewetted zone and/or into the saturated zone). Discussion should include modeling contaminants in the periodically rewetted zone. Discussion of the 128-H-1 waste site should include nearby groundwater monitoring results on a quarterly basis to determine if further remediation would be required.	5	General	Accept with Modification	A sub-section will be added to summarize considerations specific to these types of sites. However, differences between the six specific sites listed warrant different handling and associated supporting information elsewhere within the RI/FS, as described in the other sub-tiers of this comment. CLARIFICATION: this has been added in ECF-HANFORD-11-0063, Rev. 6, Section 5.3 "Special Consideration Waste Sites" and summarized in Chapter 5, with conclusion that No COPC soil concentrations exceeded the groundwater or surface water PRG values at special consideration waste site 128-H-1.	Yes - 4/9/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-233b	Comment: The RI/FS does not have a section to specifically address waste sites where the interim action excavation was performed into either the periodically rewetted zone and/or the saturated zone. 233b - [There are several waste sites where this specifically should be addressed including: 100-D-8, 100-D-65, 100-D-66,] 116-H-5, 128-H-1, 132-H-3. Basis/Justification: The TPA dispute process that was initiated 2/10/12 resulted in: • Ecology agreed to reclassify the 116-H-5 and 128-H-1 waste site reclassification forms as "Interim Closed Out". • DOE agreed to specifically evaluate these and related rewetted/shoreline sites in the D/H Feasibility Study.	Include sub-section to discuss unique issues with these waste sites (extending into the periodically rewetted zone and/or into the saturated zone). Discussion should include modeling contaminants in the periodically rewetted zone. Discussion of the 128-H-1 waste site should include nearby groundwater monitoring results on a quarterly basis to determine if further remediation would be required. Discussion in section 5.7.5 (text below bulleted list) should include 100-D-66. 100-D-66, like D-65 & D-8 also had SSLs exceeded (mercury for surface water SSL) . The paragraph in Section 5.7.5 should be reworded. Currently it appears to state that 100-D-65 and 100-D-8 SSL exceedences were all due to arsenic. However, a review of table 11 from ECF-HANFORD-11-0063 Rev. 6 shows both waste sites also had surface water SSL exceedences for copper. Please resend the updated Appendix L Tables L-72 and L-74 showing comparison of 100-D-8, D-65, and D-66 to ecological threshold screening levels. Text in ECF-HANFORD-11-0063 REV. 6 Section 5.3.1 stated that comparison had been included.	5		Accept with Modification	The 100-D-8, 100-D-65, and 100-D-66 sites are all shoreline sites that were not included in the site screening evaluation based on the data cutoff date. However, the verification data and below-OHWM informational data will be incorporated into the RI/FS. The "PRZ" for these sites is actually sediments below the ordinary high water mark (OHWM) of the river. As such, these below-OHWM data will not be modeled, but rather evaluated primarily in the context of the riparian and near shore evaluation (Appendix L) and summaries will be presented in Chapter 7 as needed. These sites are already generally included in the riparian-near shore evaluation (Appendix L). CLARIFICATION: this has been added in ECF-HANFORD-11-0063, Rev. 6, Section 5.3 "Special Consideration Waste Sites" and summarized in Chapter 5, with conclusion that No COPC soil concentrations exceeded the groundwater or surface water PRG values for the portion of special consideration waste sites 100-D-8, 100-D-65, and 100-D-66 that are above the OHWM.	Yes - 6/12/2014
DH-233c	Comment: The RI/FS does not have a section to specifically address waste sites where the interim action excavation was performed into either the periodically rewetted zone and/or the saturated zone. 233c - There are several waste sites where this specifically should be addressed including: 100-D-8, 100-D-65, 100-D-66, [116-H-5,] 128-H-1, 132-H-3. Basis/Justification: The TPA dispute process that was initiated 2/10/12 resulted in: • Ecology agreed to reclassify the 116-H-5 and 128-H-1 waste site reclassification forms as "Interim Closed Out". • DOE agreed to specifically evaluate these and related rewetted/shoreline sites in the D/H Feasibility Study.	Include sub-section to discuss unique issues with these waste sites (extending into the periodically rewetted zone and/or into the saturated zone). Discussion should include modeling contaminants in the periodically rewetted zone. Discussion of the 128-H-1 waste site should include nearby groundwater monitoring results on a quarterly basis to determine if further remediation would be required.	5		Accept with Modification	The 116-H-5 site is a near-shore site, and the PRZ is strongly influenced by immediate proximity of the river. This site will be evaluated using a site-specific model. CLARIFICATION: this has been added in ECF-HANFORD-11-0063, Rev. 6, Section 5.3 "Special Consideration Waste Sites" and summarized in Chapter 5, with conclusion that No COPC soil concentrations exceeded the groundwater or surface water PRG values at special consideration waste site 116-H-5.	Yes - 5/20/2014
DH-233d	Comment: The RI/FS does not have a section to specifically address waste sites where the interim action excavation was performed into either the periodically rewetted zone and/or the saturated zone. 233d - There are several waste sites where this specifically should be addressed including: 100-D-8, 100-D-65, 100-D-66, 116-H-5, [128-H-1,] 132-H-3. Basis/Justification: The TPA dispute process that was initiated 2/10/12 resulted in: • Ecology agreed to reclassify the 116-H-5 and 128-H-1 waste site reclassification forms as "Interim Closed Out". • DOE agreed to specifically evaluate these and related rewetted/shoreline sites in the D/H Feasibility Study.	Include sub-section to discuss unique issues with these waste sites (extending into the periodically rewetted zone and/or into the saturated zone). Discussion should include modeling contaminants in the periodically rewetted zone. Discussion of the 128-H-1 waste site should include nearby groundwater monitoring results on a quarterly basis to determine if further remediation would be required. (Referring specifically to 128-H-1): New text on "special consideration sites" in ECF-HANFORD-11-0063, Rev. 6 is good. The related new text in Chapter 5.7.5 related to 128-H-1 should also include a summary and discussion of supplemental groundwater monitoring (including results if possible) that was required as part of the reclassification to "Interim Closed Out".	5		Accept with Modification	The 128-H-1 site was an upland burn pit where former waste disposal and associated interim action remediation extended to the local groundwater table. ●A waste site-specific discussion will be added to Chapter 4. This will include a discussion of rewetted zone samples and associated area groundwater monitoring results equivalent to that in the interim closure documentation. ●The site deep zone verification data will be incorporated into discussion and documentation of conservatism testing for the 70:30 SSL/PRG development. CLARIFICATION: this has been added in ECF-HANFORD-11-0063, Rev. 6, Section 5.3 "Special Consideration Waste Sites" and summarized in Chapter 5, with conclusion that No COPC soil concentrations exceeded the groundwater or surface water PRG values at special consideration waste site 128-H-1.	Yes - 6/3/2014
DH-233e	Comment: The RI/FS does not have a section to specifically address waste sites where the interim action excavation was performed into either the periodically rewetted zone and/or the saturated zone. 233e - There are several waste sites where this specifically should be addressed including: 100-D-8, 100-D-65, 100-D-66, 116-H-5, 128-H-1, [132-H-3.] Basis/Justification: The TPA dispute process that was initiated 2/10/12 resulted in: • Ecology agreed to reclassify the 116-H-5 and 128-H-1 waste site reclassification forms as "Interim Closed Out". • DOE agreed to specifically evaluate these and related rewetted/shoreline sites in the D/H Feasibility Study.	Include sub-section to discuss unique issues with these waste sites (extending into the periodically rewetted zone and/or into the saturated zone). Discussion should include modeling contaminants in the periodically rewetted zone. Discussion of the 128-H-1 waste site should include nearby groundwater monitoring results on a quarterly basis to determine if further remediation would be required.			Accept with Modification	The 132-H-3 site was an upland subgrade structure for which remediation extended to the local groundwater table. ●Compare analytical results from 128-H-1 and nearby groundwater measurements to the contaminant analytical results at 132-H-3 to identify potential contaminants that could impact groundwater downstream from 132-H-3. CLARIFICATION: this has been added in ECF-HANFORD-11-0063, Rev. 6, Section 5.3 "Special Consideration Waste Sites" and summarized in Chapter 5, with conclusion that No COPC soil concentrations exceeded the groundwater or surface water PRG values at special consideration waste site 132-H-3.	Yes - 5/20/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-234	Comment: Provide a site-specific vadose zone and groundwater model for waste sites 100-D-8, 100-D-65 and 100-D-66 that evaluates the lower five feet of contamination in these waste sites that are influenced by the periodically rewetted zone. Ecology requires that this evaluation is done using MTCA 173-340-747(4)(e) parameters since these sites are located at or below the groundwater table. Evaluation should be compared against surface water and groundwater cleanup values, whichever is more stringent. Basis/Justification: Site is located abutting the river. Contamination exceeding interim cleanup values was located below the ordinary high water mark.	Provide a site-specific vadose zone and groundwater model for waste sites 100-D-8, 100-D-65 and 100-D-66.	5	General	Accept with Modification	These sites are on the shoreline; as such, the "PRZ" is actually sediments below the Ordinary High Water Mark (OHWM) of the river. Evaluation of risks for data in this region would be best accomplished by an ecological risk evaluation that considers sediment criteria. Data for these sites were not previously considered based on the data cutoff date, but will now be incorporated into the riparian evaluation (Appendix L), with corollary discussion in Chapter 7. CLARIFICATION: this has been added in ECF-HANFORD-11-0063, Rev. 6, Section 5.3 "Special Consideration Waste Sites" and summarized in Chapter 5, with conclusion that No COPC soil concentrations exceeded the groundwater or surface water PRG values for portions of special consideration waste sites at 100-D-8, 100-D-65, and 100-D-66 that are above the OHWL.	Yes - 5/21/2014
DH-235	Comment: Provide a site-specific vadose zone and groundwater model for waste sites 128-H-1, 116-H-5 and 132-H-3 that evaluates the lower five feet of contamination in these waste sites that are influenced by the periodically rewetted zone. Ecology requires that this evaluation is done using MTCA 173-340-747(4)(e) parameters since these sites are located at or below the groundwater table. Evaluation should be compared against surface water and groundwater cleanup values, whichever is more stringent. Basis/Justification: Site is located abutting the river or was excavated down to groundwater. Contamination exceeding interim cleanup values was located below the ordinary high water mark.	Provide a site-specific vadose zone and groundwater model for waste sites 128-H-1, 116-H-5 and 132-H-3.	5	General	Accept with Modification	The 128-H-1 and 132-H-3 site data will be explicitly considered within the conservatism testing for the existing SSL/PRG development modeling per WAC 173-340-747(8). A site-specific model will be used to evaluate the 116-H-5 site deep zone verification, following WAC 173-340-747(8) requirements. CLARIFICATION: this has been added in ECF-HANFORD-11-0063, Rev. 6, Section 5.3 "Special Consideration Waste Sites" and summarized in Chapter 5, with conclusion that No COPC soil concentrations exceeded the groundwater or surface water PRG values at special consideration waste sites 128-H-1, 116-H-5, and 132-H-3.	Yes - 5/21/2014
DH-236	Comment: Run the STOMP model again performing 3-D for the vadose zone for the waste sites along the river and across the horn including the pipelines to D Island. Basis/Justification: A 1-D model is not appropriate due to the amount of variability of heterogeneity and historical paleo-River channels present in this study area.	Run the model again performing 3-D for the vadose zone.	5	5-1/38	Justification Added	Added text to Chapter 5 acknowledging the potential use of models in the future, which will be discussed in the RD/RAWP. The pipelines to D Island (100-D-60 waste site) have been addressed based on site-specific risk assessments as described in Section 6.4.3; STOMP modeling was not a component of this assessment. The flow of groundwater across the Horn is discussed in detail in Section 3.6.1. Details on hydraulic conductivity and how that affects groundwater flow is also discussed in Section 3.6.1. Additionally, Ch. 5 refers to the stratigraphy discussion (presented in Ch. 3) and states that "The variability in stratigraphy observed at 100 D/H was recognized during design of the vadose transport simulation model used to evaluate the potential for migration of contaminants from the vadose zone to groundwater."	Yes - 4/8/2014
DH-237	Comment: Justify only a 75-year period of evaluation being conducted. Basis/Justification: Provide the regulatory justification for a 75-year period of evaluation. Most documents require either 100-year, 1000-year, or 10,000-year. Provide this justification of groundwater evaluation.	Justification for the 75-year period is required.	5	5-2/1-3	Accept	Clarify that the duration of the modeling evaluation is a function of the time until the maximum contaminant level has declined below the cleanup level for a COC. Cr(VI) is an exception; the maximum contamination level is still well above the cleanup level after 77 years and the rate of decline suggests that under the no-further-action case evaluated in Chapter 5 it will not reach the cleanup levels in 100 years. It was not deemed necessary to continue with further simulation to demonstrate the baseline (no-further-action scenario) was inadequate as a remedial option.	Yes - 12/4/2013
DH-238	Comment: Carry 116-H-6 forward into the FS, since ongoing groundwater monitoring clearly shows this waste site is still receiving vadose zone contamination that is impacting groundwater. Basis/Justification: Groundwater sampling and analysis data indicate waste site 116-H-6 is impacting groundwater and can be traced back to 116-H-6.	Modeling of 116-H-6 with vadose zone contamination in the lower portion of the vadose zone as a source for uranium, nitrate and technetium-99 releases during high river stage flushing into the aquifer.	5	5-2/11-16	Accept with Modification	Chapter 4 (Sec 4.3.15) text will be revised to expand the site-specific CSM and include groundwater monitoring data (including uranium, Tc-99, Cr(VI), and nitrate among others) through 2012. Per discussion and agreement with ECY, uranium is not a soil COPC at 183-H or other 100-D/H waste sites, and so modeling is not required.	Yes - 4/8/2014
DH-239	Comment: Explain what “representative” refers to where the third diamond from the top of figure 5-1 states “Is the SSL-PRG Representative ? ” Basis/Justification: Difficult to find examples in text.	Give a list for all examples of this screening step.	5	5-3/ Fig. 5.1	Accept	Is the CSM developed for the PRG process representative of the CSM for the waste site being evaluated. See second bullet on following page.	Yes - 8/28/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-240	Comment: The process of screening out contaminants eliminates risk contributors and is not a beneficial use of resources. Basis/Justification: Since site risk and hazard are based on sums of contaminants with similar modes of action or target organs, the sums will not be correct if contaminants have been eliminated from consideration. From K. Welsch's email on 10/30/13: Ecology has investigated the impact of eliminating contaminants from the risk calculations in this document (i.e., 100 D/H-RI/FS), based on comparisons with action levels. As an estimate, Ecology compared the maximum concentrations for the contaminants listed in Table 6-32 with WAC 173-340-720 (2007) Equation 720-1 and 720-2 concentrations to determine if they exceed hazard quotients of 0.1 or cancer risk of 1E-6 (based on USEPA Region 10 "Recommendations for Human Health Risk-based Chemical Screening and Related Issues at EPA Region 10 CERCLA and RCRA Sites", April 17, 2007 memorandum). These criteria were used to determine if the contaminants in Table 6-32 are likely to contribute greater than 1% of the risk or hazard (consistent with EPA/540/1-89/002) at groundwater wells. It was determined that for 100-D and H areas, based on this RI/FS, excluding contaminants from risk calculations based on action levels generally should not change risk assessment outcomes for 100-D and H areas (with the potential exceptions of nitrite and nickel) and will not require recalculations of risk and hazard indices as a result of screening against action levels. However, Ecology will not accept screening against action levels as a means of eliminating contaminants from risk calculations for other operable units.	Abandon the screening process. Instead, include all detected contaminants that have concentrations exceeding background and PQL, and have cancer slope factors and/or reference doses or an appropriate kinetic model (e.g. lead).	5	5-3/ Fig. 5.1	Accept with Modification	The use of the term "screening process" in the caption to Figure 5-1 was not an appropriate description of the process depicted in this figure. It is not a screening process, because no COPC's are "screened out". In fact, in this process, all of the COPCs (more than 200) are evaluated against soil screening levels, and those that exceed the soil screening levels are further evaluated against preliminary remediation goals. The figure caption has been changed to read "Process for Evaluation of Post-Remediation Site Measurement Data for all COPCs for Groundwater and Surface Water Protection" Per 5/21/14 meeting, ECY is closing this comment based on the evaluation described in the red text of the comment.	Yes - 5/21/2014
DH-241	Comment: These bulleted conditions do not appear to have been adequately applied to 116-H-6. Run a site-specific 2-D model that puts contamination in the lower part of the vadose zone and produces the current concentrations for uranium, nitrate, chromium VI and technetium-99. Then run the model until the vadose zone is depleted of these contaminants to see when the groundwater will no longer be impacted. Basis/Justification: Current modeling effort does not match current vadose zone and groundwater impacts.	Modeling conducted to assess current groundwater impacts vs. 1-D model that shows no contaminant impacts.	5	5-4/4-33	Accept with Modification	Per discussion and agreement with ECY, uranium is not a soil COPC at 183-H or other 100-D/H waste sites, and so modeling is not required.	Yes - 5/22/2013
DH-242	Comment: Add a discussion on the persistence of other heavy metals such as copper, cadmium, lead, etc. that are found at the study site. Basis/Justification: Missing these metals that persist in the discussion.	Add a discussion on the persistence of other heavy metals such as copper, cadmium, lead, etc. that are found at the study site.	5	5-7/ S.5.3.1	Accept	Suggested text revision incorporated.	Yes - 5/13/2014
DH-243	Comment: Most of the 100-D and 100-H Areas Hanford Sands representing all Areas with soils disturbed by excavations and represents the appropriate values for recharge. Values that should be used are 63 mm/yr. for no vegetation, 31.5 mm/yr. for cheatgrass, 8 mm/yr. for young shrub-steppe, and 4.0 for mature shrub-steppe. Basis/Justification: Soils are no longer natural and have been heavily disturbed by excavation activities associated with these soils. It does not matter which soil type it is.	Model the 100-D/H Area using recharge values that are representative of disturbed areas as a result of excavations.	5	5-10 and 5-12/ 27-31 and 1-41	Accept	Recharge rates will be revised to use the disturbed conditions values cited in PNNL-14702 Rev 1. Restoration of surface soils and native vegetation conditions are part of the restoration activities; DOE does not plan to leave these sites in disturbed conditions. Revegetation is occurring in accordance with the *Hanford Biological Resources Management Plan* . Revegetation is considered in the remedial design for the waste sites and is included in the cost estimates of the remedial action.	Yes - 4/21/2013
DH-244	Comment: As stated in Section 4.5.1 of the reference document, PNNL-14702, "Some portions of the Hanford Site along the Columbia River were farmed under irrigation and thus may have experienced increased recharge rates." The 100-D, horn and 100-H all were farming areas prior to 1944. This additional recharge should be included in the modeling effort for recharge, especially in the last few years before the official "Hanford Site" was established. The model runs using bare soil conditions needs to be conducted. Basis/Justification: Additional soil moisture would have been added to the system instead of the drier conditions using the referenced numbers.	Increase the soil moisture content by using a level between the operational value and natural conditions	5	5-12/9-12 and 31-37	Accept	Responses to comments DH-243, DH-247, DH-248, & DH-251 will require rerunning the entire set of SSL/PRG calculations for new recharge scenarios. The historical (pre-1944) irrigation rate will be incorporated into the revised recharge scenarios. Historical irrigation will be assumed for all sites as a bounding approach.	Yes - 4/21/2013
DH-245	Comment: In this paragraph a call-out to Table 5-3 is needed. The periods being discussed in this paragraph are fully discussed before Table 5-3 shows these values on p. 5-13. Basis/Justification: The reader is introduced to recharge periods and four paragraphs later, the table (Table 5-3) showing these values is presented.	Move the call-out to Table 5-3 to the paragraph that first introduces the post-2010 simulation recharge rates.	5	5-12/18-30	Accept	First callout to both Tables 5-2 and 5-3 was inserted at this point, but existing callouts later will be retained as well for clarity. If possible during final layout, table will be moved closer to the new first callout.	Yes - 7/24/2013
DH-246	Comment: Provide a call-out to Table 5-3 to point the reader to the values that are being discussed in the paragraph. Basis/Justification: Clarity and understanding to the reader for the periods of recharge rates being discussed	Provide a call-out to Table 5-3.	5	5-12/38-41	Accept	Additional callout to Table 5-3 was inserted.	Yes - 7/24/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-247	Comment: See the comment on Appendix F, p. F-263, regarding assumptions about native vegetation, the CPK parameter, and recharge. Basis/Justification: See the basis and justification for the referenced Appendix F comment.	Modify the recharge scenario as specified in the referenced Appendix F comment. Modify the text and tables accordingly.	5	5-12 - 5-14/ 38-41, p. 5-12 through 1-7, p. 5-13 and Tables 5-2 and 5-3	No change	RESOLUTION: ECY stated that the recharge and revegetation comments are resolved due to the use of irrigated PRGs proposed as CUL, and that the non-irrigated model will remain in the RI as a point of comparison. RESPONSE: Recharge rates will be revised to use the disturbed conditions values cited in PNNL-14702 Rev 1 per Comment DH-243. No separate change planned as a result of this comment. In comment resolution meeting discussions, it was recommended that the native vegetation recharge scenario be revised to use only bare-soil recharge rates because of uncertainty regarding re-vegetation. However, restoration of surface soils and native vegetation conditions are part of the restoration activities; DOE does not plan to leave these sites in disturbed conditions. Revegetation is occurring in accordance with the Hanford Biological Resources Management Plan. Revegetation is considered in the remedial design for the waste sites and is included in the cost estimates of the remedial action. Ecology staff were hosted on a site visit to revegetated sites to demonstrate this program. PRG values are based on the native vegetation scenario, which is reasonably based on re-vegetation as noted. However, the SSL values are used first for screening purposes. SSL values are based on the irrigation recharge scenario. Consequently, only those sites that fail an irrigation recharge rate scenario are compared to PRG values. In 100-D/H, none of the sites failed the (irrigation-based) SSL screening level. Thus, utilizing a native vegetation recharge scenario based on only bare-soil recharge rates for the PRG basis would not change the results of the EPC evaluation.	Yes - 4/16/2014
DH-248	Comment: Add a row that shows the "All Areas with soils disturbed by excavation". This is the recharge values that should be used for the 100-D Area and 100-H Area because this entire area has been excavated at one time or another and some areas more than once. These values should be used in the model for 100-D and 100-H Areas. Values that should be used are 63 mm/yr. for no vegetation 31.5 mm/yr. for cheatgrass 8 mm/yr. for young shrub-steppe, and 4.0 for mature shrub-steppe. Basis/Justification: Soils are no longer natural and have been heavily disturbed by excavation activities associated with these soils. It does not matter which soil type it is.	Model the 100-D/H Area using recharge values that are representative of disturbed areas as a result of excavations.	5	5-13/ Table 5-2	Accept	Recharge rates will be revised to use the disturbed conditions values cited in PNNL-14702 Rev 1. Restoration of surface soils and native vegetation conditions are part of the restoration activities; DOE does not plan to leave these sites in disturbed conditions. Revegetation is occurring in accordance with the *Hanford Biological Resources Management Plan* . Revegetation is considered in the remedial design for the waste sites and is included in the cost estimates of the remedial action.	Yes - 4/21/2014
DH-249	Comment: Provide a call-out to Table 5-3. Basis/Justification: Clarity and understanding to the reader for the periods of recharge rates being discussed.	Provide a call-out to Table 5-3.	5	5-13/1-7	Accept	Additional callout to Table 5-3 was inserted.	Yes - 7/24/2013
DH-250	Comment: Explain the RESRAD approach and its use, when a wealth of lysimeter data exists that provides more valid irrigation recharge rate scenarios. These lysimeter values would be more representative of the system. Basis/Justification: The methodology and approach used is not supportive and lacks defensibility. Better data is available that could be used for irrigational recharge rates.	Use better defensible recharge rate data from lysimeter tests conducted on the 300 Area and 200 Areas, rather than using RESRAD.	5	5-13/8-18	Justification Added	The following justification will be added: Recharge rates for the irrigation scenario were estimated using the same parameters employed to assess interim remediation at 100 Area waste sites. These site assessments used irrigation infiltration rates calculated from an overall 0.76 m/yr irrigation rate and an evapotranspiration coefficient value of 0.91 (Appendix B in WDOH 1997, *State of Washington Department of Health Interim Regulatory Guidance: Hanford Guidance for Radiological Cleanup*). The resultant recharge rate attributable to irrigation alone [68.4 mm/yr (2.7 in/yr) was added to the native vegetation recharge rates to determine a summed recharge rate (total) for the irrigation scenario for each soil type in the SSL and PRG estimate simulations. The resulting recharge rates for native vegetation and irrigation recharge scenarios for each surface soil type are shown in Table 5 3.	Yes - 12/4/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-251	Comment: Add another row that includes the disturbed soils by excavation and provide the recharge rates of 63 mm/yr. for no vegetation. Basis/Justification: All of the 100-D and 100-H has been excavated at one time or another. Soil types listed in the referenced document, PNNL-14702; state that the soil type is only 1-m thick. All soils types have been removed and Hanford Sand recharge rates shall be used to reflect better recharge rates.	Change recharge rates to a Hanford sand as used in the referenced document. These recharge rates are 63 mm/yr. (no vegetation/bare soil); 31.5 mm/yr. (cheatgrass); 8.0 mm/yr. (young shrub-steppe); and 4.0 mm/yr. (mature shrub-steppe).	5	5-14/ Table 5-3	Accept	Recharge rates will be revised to use the disturbed conditions values cited in PNNL-14702 Rev 1. Restoration of surface soils and native vegetation conditions are part of the restoration activities; DOE does not plan to leave these sites in disturbed conditions. Revegetation is occurring in accordance with the *Hanford Biological Resources Management Plan* . Revegetation is considered in the remedial design for the waste sites and is included in the cost estimates of the remedial action.	Yes - 4/21/2014
DH-252	Comment: Discuss the use of the June 2008 water table elevations as representative of the highest water table, a conservative (smaller) thickness of the vadose zone was computed for each well and borehole. Basis/Justification: Clarity to the reader.	Provide the information that supports using the June 2008 water table elevations vs. the June 2011 or any other water table elevation information.	5	5-15/1-2	Accept	Discussion of the VZ thickness basis will be added.	Yes - 12/4/2013
DH-253	Comment: The statement "Using the June 2008 water table elevations to represent the highest water table, a conservative (smaller) thickness of the vadose zone was computed for each well and borehole" is confusing and difficult to understand. Explain what is meant by "a conservative (smaller) thickness of the vadose zone was computed for each well and borehole." Basis/Justification: Unclear what is being communicated and why it is important. Explain in more detail.	Clarify what is meant by the statement, "a conservative (smaller) thickness of the vadose zone was computed for each well and borehole."	5	5-15/7-9	Accept	Discussion of the VZ thickness basis will be added.	Yes - 12/4/2013
DH-254	Comment: Not all backfilling was at a level of 15 ft bgs. Many backfilled sites have been less than 10 ft. Explain the justification for using 15 ft. bgs. This assumption/approach would indicate that no contamination would exist in the upper zone that would be of concern for direct contact. Groundwater impacts would also be reduced. Basis/Justification: Assumptions require some level of justification or basis. Assumption was made with no supporting justification, provide that justification.	Assumption was made with no supporting justification – provide that justification. State that residual contamination still exists within the top 15 ft at many waste sites.	5	5-15/7-11	Justification Added	Discussion of the backfill depth representation will be added, including sensitivity of PRG and SSL values to variation in this representation. (SSL and PRG values are a function of peak groundwater concentration resulting from VZ contamination; the peak groundwater concentration is relatively insensitive to contamination high the soil column given it is represented as uniformly distributed throughout the soil column - discussion and model sensitivity cases can be added to demonstrate this.) CLARIFICATION: a sensitivity case was prepared and evaluated in ECF-HANFORD-11-0063 that evaluated the impact of no backfill (maximum contaminated thickness) that showed that the PRG and SSL values were insensitive to backfill thickness.	Yes - 4/9/2014
DH-255	Comment: Several sites left waste in place at deeper than 15 ft bgs. It is unclear how these stratigraphic units were represented in the discussion. Basis/Justification: Previous and current remediation efforts do not include remediation of the top 15 feet in every remediated site that is discussed in the RI/FS; this is a faulty assumption/approach and removes some or all of the residual contamination.	Assumption provides a bias for low to no contamination that could migrate down vertically to groundwater.	5	5-15/7-11	Justification Added	Discussion of the backfill depth representation will be added, including sensitivity of PRG and SSL values to variation in this representation. (SSL and PRG values are a function of peak groundwater concentration resulting from VZ contamination; the peak groundwater concentration is relatively insensitive to contamination high the soil column given it is represented as uniformly distributed throughout the soil column - discussion and model sensitivity cases can be added to demonstrate this.) CLARIFICATION: a sensitivity case was prepared and evaluated in ECF-HANFORD-11-0063 that evaluated the impact of no backfill (maximum contaminated thickness) that showed that the PRG and SSL values were insensitive to backfill thickness.	Yes - 4/9/2014
DH-256	Comment: Which valence state of arsenic is being discussed, Arsenic (V) or Arsenic (III). Basis/Justification: The type of arsenic and the pH of the water in the soil are key parameters for determining the Kd values for arsenic in the soil. These need to be provided in the discussion.	Need to know which arsenic is being discussed. Provide what arsenic is being discussed and the typical pH of the pore water in the vadose zone.	5	5-15/27-41	Accept with Modification	This discussion rewritten to focus on chromium.	Yes - 2/12/2014
DH-257	Comment: Editorial. Change "think" to "thick" in both figures. Basis/Justification: Wrong word is used.	Make suggested corrections.	5	5-16 and 5-17/ Fig. 5-3 and 5-4	Accept	Word "think" will be changed to "thick" in both figures.	Yes - 10/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-258	Comment: This discussion does not apply to strontium and uranium in the periodically rewetted zone part of the vadose zone. Review Zachara et al. work in the 300 Area of the Uranium plume along the river which is similar to 100-H. Uranium does not always exhibit a high Kd (Kd>1 ml/g) and implement his finding related to river stage influences. Basis/Justification: Current knowledge is not being incorporated into the model for contaminant mobility associated with strontium and uranium.	Modify the model to include uranium at a Kd more reflective of recent studies in the 300 Area that shows Kd=0 mL/g for uranium as a result of river stage influences.	5	5-17/4-6	Accept with Modification	Uranium was not modeled per agreements for other comments. Chapter 4 (Sec 4.3.15) text will be revised to expand the site-specific CSM and include the most recent groundwater monitoring data. Corresponding Chapter 5 text will be revised to note uranium as a COPC for the local groundwater (specific to 116-H-6 area) without site-specific modeling analysis. The discussion that is the subject of this comment concerns mobility of strontium and uranium, and notes that different conditions may apply in the PRZ where river water chemistry can influence effective mobility. This will be acknowledged in a revision of this text to provide context in the PRZ, particularly for uranium. However, the focus of this discussion is to provide Kd values for the vadose zone to generate SSL and PRG values for residual contamination. For accuracy, the sentences that this comment are tagged to will be revised to read "Strontium 90 is likely to exist as cation in the 100-D/H subsurface environment while uranium is most likely to form aqueous complexes with carbonate, phosphate, and hydroxide (Behavior of Metals in Soils [EPA/540/S 92/018])."	Yes - 4/22/2014
DH-258 (Cont'd)						We have reviewed PNNL-22048, Updated Conceptual Model for the 300 Area Uranium Groundwater Plume. The field experiments discussed in Section 5.3 of this report indicates that uranium adsorption can be very small (Kd ≈ 0 L/kg) when sorption test is conducted in coarse-textured sediments with very large hydraulic conductivity (5000-7000 m/d) under ambient groundwater conditions. However, with intrusion of river water the Kd increased to nearly 0.375L/kg due to decreasing aqueous uranium complexation by bicarbonate. This observation and inferences drawn are reasonable under the conditions described, however, it is inappropriate to extrapolate the same result to vadose zone transport where the focus is on residual contamination and its effect on groundwater. First, due to residual contamination, the desorption (rather than adsorption) is the primary process controlling the release of uranium in the pore waters. The desorption Kds are usually much higher than the adsorption based Kds due to large contact times of contaminants with the sediments. Therefore the zero Kd from the PNNL experiment cannot be applied. Secondly, due to unsaturated conditions in the vadose zone, the large hydraulic conductivity value is not possible. The unsaturated hydraulic conductivity varies as a function of moisture content and is expected to be less than 0.001 m/d, which will provide sufficient water-sediment contact time in the vadose zone for any sorption-desorption reactions to reach equilibrium conditions and much larger Kd compared to experiment conditions where the contact time between the injected water and sediment was much shorter. Increasing the residence time would increase the Kd. This is also observed from the PNNL report (Section 5.3), where when the same experiment is conducted in relatively lower permeability zones (hydraulic conductivity about 2000 m/d) the Kd increased significantly to >2.4 L/kg.	
DH-259	Comment: Unclear the validity of leach test as it applies to real field conditions. Basis/Justification: Provide more information or a reference citation that supports the statement. As is, the statement is unjustified.	Provide more information or delete this sentence.	5	5-17/13-15	Accept with Modification	The sentence indicates that the description follows in subsequent text; revised text to reference Section 5.5 where these results are summarized. Ecology approved the Batch Leach testing with the approval of the D/H SAP DOE/RL-2009-40 Rev 0. Page 2-127 describes the procedure. It was also modified by TPA-CN-368 signed by Ecology on 8/26/2010 to allow for removing the requirement for pH adjustment of demineralized water.	Yes - 7/24/2013
DH-260	Comment: Contaminant Kd values play a significant role in mobility in the vadose zone. Provide a better table that shows the values between 0 and 1 ml/g. Basis/Justification: No values of Kd are provided in any figure or table that provides the specific values used in the modeling.	Provide a table that provides each constituent's Kd value that ranges between 0 and 1 ml/g in the main document.	5	5-18/ Table 5-4	Accept with Modification	This table introduces concepts regarding Kd and relationship to mobility with example contaminants; however, in response to other comments a full (very long) table of Kd values and the sources of those values will also be added to Chapter 5. By agreement with Ecology, this table will be sorted by Kd value (rather than contaminant name) to facilitate understanding of which contaminants compare to simulated Kd values used n the SSL/PRG approach.	Yes - 4/21/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-261	Comment: This is not a valid source. Directly indicate in the text the sources the Kd values were taken and provide another sentence stating they are provided in ECF-HANFORD-10-0442 in Appendix F. Basis/Justification: ECF-HANFORD-10-0442 is not a valid Kd source that has been agreed upon by the State and EPA. The actual sources need to be provided in the text instead of being worded that ECF-HANFORD-10-0442 is the source.	Provide the sources for the Kd values.	5	5-18/12-14	Accept	The ECF represents a compilation, rather than a source. Text modified accordingly. A discussion of how Kd values were selected will be added along with a table of Kd values by COPC with source.	Yes - 5/6/2014
DH-262	Comment: Provide the individual breakdown of these 26 Kd values ranging from 0 to 16 ml/g and what constituents they are associated. If a range from 0 to 16 ml/g yield peak groundwater concentrations within the simulation period, what are the specific contaminants that fall within that range? Basis/Justification: Lack of discussion on these 26 Kd values makes it difficult to understand what the author is communicating. The constituents of concern would be based off of these 26 Kd values that ranged from 0 to 16 ml/g.	Provide the constituents that have a range of 0 to 16 ml/g here in the document to give context to the discussion.	5	5-18/16-18	Accept with Modification	A new discussion will be incorporated to clarify how a discrete set of Kd values were modeled using STOMP to predict peak groundwater concentrations, and the results used to develop a relationship between Kd and peak groundwater concentration that was used to derive peak groundwater concentrations as a function of specific COPC Kd values. The new discussion will include illustrations to make the concept more clear to the reader. CLARIFICATION: this process was simplified by removing the interpolation of peak groundwater concentration based on Kd method; instead, every COPC is directly simulated with STOMP now so no interpretation is necessary, and doesn't need to be explained in Chapter 5 now. The text was revised accordingly.	Yes - 4/21/2014
DH-263	Comment: Provide the retardation factor being used? Please provide more discussion on what was done. It is impossible to understand what retardation factor is being applied. Basis/Justification: Lack of discussion makes it unclear what the author is communicating.	Clarify in more detail what retardation factor is being discussed and how it was clearly used. Do not refer to another document without giving the page or section number that provides this discussion.	5	5-18/18-21	Accept with Modification	A new discussion will be incorporated to clarify how a discrete set of Kd values were modeled using STOMP to predict peak groundwater concentrations, and the results used to develop a relationship between Kd and peak groundwater concentration that was used to derive peak groundwater concentrations as a function of specific COPC Kd values. The new discussion will include illustrations to make the concept more clear to the reader. CLARIFICATION: this process was simplified by removing the interpolation of peak groundwater concentration based on Kd method; instead, every COPC is directly simulated with STOMP now so no interpretation is necessary, and doesn't need to be explained in Chapter 5 now. The text was revised accordingly.	Yes - 4/21/2014
DH-264	Comment: Add “in the vadose zone” after “variably saturated flow conditions” to remind the reader we are still discussing vadose zone modeling and parameters. Basis/Justification: Clarity is needed to the reader to understand we are discussing vadose zone parameters.	Provide more information to avoid this unclear discussion.	5	5-18/24	Accept	Text was revised as suggested.	Yes - 7/24/2013
DH-265	Comment: Provide the context of the “medium” discussed It is unclear. Basis/Justification: Clarify what medium is being addressed.	Provide more information to avoid this unclear discussion.	5	5-18/26	Accept	Text was revised for clarity.	Yes - 7/24/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-266	Comment: See Appendix F comments regarding the Cr (VI) Kd. Basis/Justification: See justifications associated with Appendix F comments.	For any modeling that assumes that some portion of the vadose zone is not currently contaminated with Cr (VI), use a Kd value of 0 mL/g in the absence of sorption data for Cr (VI). Adjust the text accordingly.	5	5-19-5-21/General	Justification Added	Will add justification to explain conservatism and site-specific context of data used to develop the Kd value for Cr(VI) and note that Cr(VI) is simulated using the 100:0 initial contaminant condition (as are all COPCs with Kd < 2.0, as explained elsewhere in the RI and supporting documentation). In response to a sensitivity case proposed by an Ecology staff member during a comment resolution meeting, a one-off test simulation was performed using the most conservative column for 100-D that resulted in the PRG values in the analysis. In this sensitivity test, chromium migration was simulated with Kd = 0.8 over an upper 70% contaminated soil column range and with Kd = 0 over the lower 30% clean range and aquifer nodes. The peak concentration resulting from both the original model and the one-off analysis were plotted and compared. The original model yielded a higher peak groundwater concentration (the basis of PRG and SSL values) : 50.2 g/m3 for the original case versus 46.7 g/m3 for the sensitivity case. The same test was repeated for the SSL values (based on irrigation recharge rates); for SSL values the peak differences were closer, differing by only 0.2 percent between the original and sensitivity case, indicating that SSL values would not differ meaningfully under the alternative model posited in the sensitivity case. This analysis will be added to the ECF as a sensitivity case.	Yes - 4/21/2014
DH-267	Comment: Editorial. One of the sentences should be Cr (III), not both of them can be Cr (VI). Basis/Justification: Does not make sense that each one of them is Cr (VI).	Correct one of the sentence to reflect the correct Cr.	5	5-20/27-29	Accept	Text will be corrected.	Yes - 10/2/2013
DH-268	Comment: Provide this calculation sheet (0100X-CA-V0059). If in Appendix F, rewrite the sentence and indicate this fact. Basis/Justification: This calculation sheet should be in Appendix F of this document, since it is the primary constituent of concern.	Provide the calculation document in Appendix F, if it is not already in it. If it is in it, rewrite the sentence to indicate this.	5	5-21/34	Accept	0100X-CA-V0059 will be included in Appendix F and the citation changed here to note.	Yes - 2/4/2014
DH-269	Comment: This section must be modified to be consistent with the changes needed in Appendix F. Basis/Justification: Appendix F requires modification. Similar changes are also needed here.	Modify this section to be consistent with the changes needed for Appendix F.	5	5-21-5-26/General	Accept	All comments on Appendix F will be considered for impact on Chapter 5.	Yes - 4/23/2014
DH-270	Comment: Ecology needs all of the specific equations used in the STOMP 1-D modeling and the order in which those equations were used, as stated in an Appendix F comment. Basis/Justification: Ecology needs to evaluate this 1-D STOMP modeling effort to see that it complies with the requirements in WAC 173-340-747(8). It is not possible to evaluate this modeling effort without the specific equations, the order in which the equations were used, and the inputs. Also, readers should be able to use the equations and parameters to approximate the outputs in this document.	Provide in the document all of the specific equations and the order in which they have been used for the 1-D STOMP modeling, as well as the input parameters used in the 1-D STOMP modeling. [Note: referencing PNNL-12030 or any secondary document is not specific enough for this comment and does not meet the burden of proof requirement in WAC 173-340-702(14), an evaluation criterion given in WAC 173-340-747(8)(c)].	5	5-21-5-26/General	Not Accepted	DOE/RL-2011-50 Rev. 1 provided the graded approach for evaluating groundwater protection used here. Agency concurred with DOE/RL-2011-50 Rev. 1. Use of alternative fate and transport models is one method permitted under WAC 173-240-747 for establishing Method B soil cleanup levels or Method C soil cleanup levels. DOE/RL-2011-50 Rev. 1 documents DOE's demonstration that the software (STOMP) meets the WAC requirements for implementation of alternative fate and transport models and provides the graded approach to be used, while leaving parameterization for specific applications including the 100-D/H RI/FS. DOE/RL-2011-50 Rev. 1 provided the regulatory basis for use of the STOMP code to implement alternative fate and transport models. Agency concurred with DOE/RL-2011-50 Rev. 1. The governing equations STOMP solves for water and solute mass conservation and momentum, along with the constitutive relationships between primary and dependent variables, are well documented in the cited STOMP Theory Guide (PNNL-12030). STOMP solves a set of nonlinear partial differential equations that are variable in time and space using iterative techniques; direct solution using a pen-and-paper solution is not feasible.	Yes - 9/5/2013
DH-271	Comment: Provide the information on the other OUs being discussed. Basis/Justification: Provide the OUs that are being discussed or addressed.	The OUs being addressed needs to be provided in the document for clear understanding of which OU units this is being applied.	5	5-21/2	Accept	Text was added referencing ECF-HANFORD-11-0165 and the other 100 Area OUs.	Yes - 7/24/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-272	Comment: First, the Kd of 0.8 ml/g is based on all the soil samples from 100 Area, so this is not site-specific to 100-D, 100-H, and the horn. Second, the term "conservative estimate for the lower limit on residual Cr(VI) Kd values" is subjective at best. This statement is a matter of opinion and the purpose for using this value, which is not given in this section. Provide justification for the use of 0.8 ml/g as the lower limit on residual Cr(VI). Basis/Justification: I feel a value of 0 ml/g is conservative for impacts to groundwater. It depends on how one view the term "conservative". Studies clearly show that 0 ml/g or 0.1 ml/g is the most conservative estimate for the lower limit on residual Cr(VI) Kd value for 100-D and 100-H Area.	No justification is provided for the sentence why this is a conservative estimate for the lower limit.	5	5-21/16-22	Justification Added	Will add justification to explain conservatism and site-specific context of data used to develop the desorption Kd value for Cr(VI).	Yes - 4/9/2014
DH-273	Comment: Provide the information on the other OUs being discussed. Basis/Justification: Provide the OUs that are being discussed or addressed.	The OUs being addressed needs to be provided in the document for clear understanding of which OU units this is being applied.	5	5-21/38	Accept	The text is clarified.	Yes - 5/6/2013
DH-274	Comment: This document (SGW-50776) is not provided in the appendices nor is it in the TPA AR. This document needs to be provided for an understanding of the modeling and how it differs from the ones provided in Appendix F. Basis/Justification: This document is cited as the "model development for vadose zone models used to support this RI. . ."	Provide this document to the TPA AR and to Appendix F.	5	5-21/38-40	Accept	Add SGW-50776 to the AR and to Appendix F.	Yes - 1/28/2014
DH-275	Comment: Define or provide this retardation coefficient and provide how it was derived. Basis/Justification: Scaling using a retardation factor with no additional data does not provide enough information for a decision-making document.	Provide the details that are needed to support using a retardation factor, methodology of how it was used and what the results were for the peak concentrations and times from using this retardation factor.	5	5-22/12	Accept	A new discussion will be incorporated to clarify how a discrete set of Kd values were modeled using STOMP to predict peak groundwater concentrations, and the results used to develop a relationship between Kd and peak groundwater concentration that was used to derive peak groundwater concentrations as a function of specific COPC Kd values. The new discussion will include illustrations to make the concept more clear to the reader. CLARIFICATION: this process was simplified by removing the interpolation of peak groundwater concentration based on Kd method; instead, every COPC is directly simulated with STOMP now so no interpretation is necessary, and doesn't need to be explained in Chapter 5 now. The text was revised accordingly.	Yes - 4/24/2014
DH-276	Comment: Using a "Kd for Cr(VI) of 0.8 ml/g in all vadose zone strata in the model" is unacceptable and does not represent what is happening in the field where 95% of the Cr(VI) is leachable from studies conducted on 100-D Area soils. If this was used for a portion of the sites, but "all vadose zone strata in the model" is unacceptable and requires a significant modification and discussions to come to some agreement on what to use. Basis/Justification: Based on this logic, no Cr(VI) would ever hit the groundwater in 1,000 yrs. It does not represent reality, Kd studies or anything that is pertinent to vadose zone contaminant flow and makes the entire modeling effort erroneous.	Modify this sentence if it is incorrect. If correct, a meeting with Ecology to discuss in depth why 0.8 was used and why Ecology can show this does not meet reality. Proof is needed.	5	5-22/25-26	Justification Added	The Kd value for Cr(VI) applies to the residual remaining in the vadose zone (the other 5%) - not the leachable fraction.	Yes - 12/4/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-277	Comment: All recharge rates for the Native vegetation recharge scenario except for after 2045 are too low. This area was used as orchards before Hanford was establish – recharge rates for this period of time should be higher than 1.5 through 4 mm/yr. for the operational period, all the grading that was done removed the top 1 m of soil. All recharge values for all periods need to be greater than or equal to 50 mm/yr based on previous land use and used in previous studies (e.g. DOE/EIS-0391). Basis/Justification: The historical activities at 100-D and 100-H Areas do not align with the recharge rates chosen as input parameters to the model.	Correct the recharge rates for input models and re-run the model to see what differences can be observed using higher recharge rates, and rewrite this section with the new information and data. Obtaining additional recharge information from EPA may be needed.	5	5-22/5-23/ Table 5-5	Accept	Recharge rates will be revised to use the disturbed conditions values cited in PNNL-14702 Rev 1. The values cited from DOE/EIS-0391 are for bare soil conditions during the operational period used to establish the initial soil moisture profile in the models used for the EIS; these were not the recharge rates applied for the long-term conditions post-remediation. For sites without an engineered infiltration barrier, the rate applied in the EIS modeling for long-term infiltration was 3.5 mm/yr; this rate is comparable to the values used in the calculations for this RI/FS (1.5 to 4 mm/yr). Responses to comments DH-243, DH-247, DH-248, & DH-251 will require rerunning the entire set of SSL/PRG calculations for new recharge scenarios. The historical (pre-1944) irrigation rate will be incorporated into the revised recharge scenarios. Historical irrigation will be assumed for all sites as a bounding approach. Restoration of surface soils and native vegetation conditions are part of the restoration activities; DOE does not plan to leave these sites in disturbed conditions. Revegetation is occurring in accordance with the *Hanford Biological Resources Management Plan* . Revegetation is considered in the remedial design for the waste sites and is included in the cost estimates of the remedial action.	Yes - 2/12/2014
DH-278	Comment: Provide the rationale for the hydraulic gradients used for 100-D and 100-H either at the end of the table or a reference back to the section. Using the median values is not correct. Either use the arithmetic average values or provide better justification for using the median values. Basis/Justification: The median values need justification in the RI/FS document that is still lacking in the referenced document (ECF-HANFORD-11-0063).	Explain why the median values were used. It appears that more appropriate values should be used, like the arithmetic mean values.	5	5-23/ Table 5-5	Justification Added	Both the mean (arithmetic average) and median are measures of central tendency of a sample set; the median is typically a more robust measure for non-normal distributions, and the values are typically very similar for normal distributions. It is unclear why one would be more acceptable than the other in this application. In the evaluation documented in SGW-50776 where the gradient values were determined, the mean (arithmetic average) values were higher than the mean, meaning greater flow and hence greater dilution if mean values were used. Therefore, incorporation of this change would result in higher limits (less protectiveness). The discussion of hydraulic gradients will be revised to summarize this context.	Yes - 12/4/2013
DH-279	Comment: Provide discussion of which unit's (100-D or 100-H) hydraulic parameters addressed the Horn area in Table 5-5. Basis/Justification: Unclear which unit's hydraulic parameters were designated to the horn area.	Provide units in the text or at the end of the table for those used in the horn area.	5	5-24/ Table 5-5	Accept	Add footnote to Table 5-5 to note that parameters for waste sites are assigned based on whether the site is in the D- or H- Areas OUs (no waste sites are in the "Horn Area" apart from the D- or H- OUs)	Yes - 12/4/2013
DH-280	Comment: Document SGW-51818, Conceptual Basis for Distribution of Highly Sorbed Contaminants in 100 Vadose Zone is not in Appendix F or the TPA AR. This document is important to provide in the TPA AR record because it is one of the base documents used to partition contaminants of concern for low mobility and high mobility. Basis/Justification: This document provides the basis of how the model was constructed and needs to be available to the public for their review.	Add document to the TPA AR and to Appendix F.	5	5-25/1-7	Accept	Report SGW-51818 will be added to Appendix F and to the AR.	Yes - 1/27/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-281	Comment: This section needs more information to explain how the distribution of contaminants was arranged in the model. It is impossible to understand the difference between the 100:0 and the 70:30 profile discussions without significantly more information. Basis/Justification: It is unclear how the model was constructed, yet the section is entitled, "Vadose Zone Modeling Methods and Results". Information on how the contaminants were distributed in the vadose zone; what the difference between the 100:0 and 70:30 profiles,	Provide a detailed description of how contaminants were initially provided in the vadose zone.	5	5-25/1-14	Accept	Revise the discussion to improve clarity with regard to the representation of the distribution of contamination in the model. Specifically, we will clarify that the 100:0 model assumes that contamination is present throughout the soil column excluding backfill and the capillary fringe, and that the 70:30 model assumes contamination is only present in the top 70% of the soil column excluding backfill. We will also clarify that a unit concentration is applied to the contaminated portion and the resulting peak concentration in groundwater used in a back-calculation to derive the SSL or PRG value based on the ratio of the peak concentration in groundwater to the surface water or groundwater protection level. We will add one or more figures to illustrate the initial contaminant representation. References to the model package report (SGW-50776) documenting the model development and to the environmental calculation file (ECF-HANFORD-11-0063) documenting the model application to 100-D/H will be added to the text to provide pointers to the detailed explanation of these initial conditions. NOTE: New Figure 5-X (temporary figure number) is provided to clarify the description of initial contaminant distribution.	Yes - 12/4/2013
DH-282	Comment: Provide discussion why the two different recharge rates were used to calculate the PRGs and the SSLs. Expand on this discussion to answer Why. The reader is left hanging with no understanding of the process, and decisions to provide these decision-making numbers. Basis/Justification: The most important part of this document is the PRGs and SSLs and the author fails to provide the logic behind why certain input values were selected.	Expand on the discussion of why certain recharge rates were used that lead to the decision-making values of the PRGs and SSLs.	5	5-25/18-22	Accept	The following two sentences in section 5.6 discuss the basis for these two recharge values. These sentences are: [The SSL simulation uses a conservative recharge scenario based on irrigated agriculture land use. The PRG simulation, alternatively, uses a recharge scenario based on the expected future land use: conservation, with a native plant population re-established at the land surface.] A detailed discussion on recharge is provided in Section 5.4.1 (Surface cover, Infiltration, and Recharge) and a reference to that section and to Section 5.7.3 (Comparison of Vadose Zone EPCs to SSLs and PRGs) will be added. The word 'conservative' will be removed from the first sentence	Yes - 12/4/2013
DH-283	Comment: Explain the basis for the concentration term of 1mg/kg for a uniform unit source concentration. Multiple STOMP runs were used for peak calculations. Why weren't multiple concentration term values also run. The borehole data did not show a consistent concentration of 1 mg/kg vertically as shown on table 4-5 and borehole vertical profile figures in chapter 4. Basis/Justification: Borehole data don't show a constant concentration vertically to groundwater and should not be modeled as such.	Describe the basis for only using 1mg/kg for a uniform unit source concentration.	5	5-26/11	Accept	An overview will be added to explain how unit concentrations are modeled forward to predict a peak groundwater concentration, which is scaled to the MCL and then used to back-calculate the SSL or PRG value (which represents the concentration that would result in the MCL value, and hence the maximum allowable concentration that would not exceed the MCL). This will be coupled with additional discussion that emphasizes that the uniform concentration profile is used to conservatively bound the SSL/PRG value (by assuming the maximum concentration occurs throughout the soil profile range, 100:0 or 70:30 as appropriate). References to the model package report (SGW-50776) documenting the model development and to the environmental calculation file (ECF-HANFORD-11-0063) documenting the model application to 100-D/H will be added to the text to point to the detailed presentation of this approach.	Yes - 12/4/2013
DH-284	Comment: This section is largely a repeat of the information on p. 5-25. Consolidate the material in one place. In addition, the initial contaminant distribution is not discussed in this section at all, yet it is titled "Initial Contaminant Distribution". Basis/Justification: No discussion of initial contaminant distribution is provided.	In this section, provide the contaminant distribution within the vadose zone model as titled.	5	5-26/1-22	Accept	Section header will be changed to "Representation of Initial Contaminant Distribution" to reflect that this concerns how a bounding initial condition is applied in the model; all information on the initial distribution that appeared on p.5-25 will be consolidated in this section.	Yes - 7/24/2013
DH-285	Comment: Provide information that supports the assumption that uniform vadose zone contamination is appropriate. The cross-sectional profiles do not show uniform vadose zone contamination after cleanup, so why assume this. Basis/Justification: Contamination is not uniformly distributed throughout the vadose zone. This is an erroneous assumption.	Distribute the contamination proportionally through the vadose zone.	5	5-26/29-35	Accept	Additional discussion will be included that emphasizes that the uniform concentration profile is used to bound the SSL/PRG value. The "bounding condition" assumes the worst-case scenario, where the maximum contamination value actually encountered is present across the entire thickness of contamination range and used for the 100:0 or 70:30 model. An overview will be added to explain how unit concentrations are modeled forward to predict a peak groundwater concentration, which is scaled to the MCL and then used to back-calculate the SSL or PRG value (which represents the concentration that would result in the MCL value, and hence the maximum allowable concentration that would not exceed the MCL).	Yes - 12/4/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-286	Comment: Provide more information for what is meant by "Over a bounding portion of the soil column…" Basis/Justification: It is unclear what the "bounding portion of the soil column is being referred to.	See comment.	5	5-26/33	Accept	Text will be reworded for clarity. The "bounding condition" assumes the worst-case scenario, where the maximum contamination value actually encountered is present uniformly over the entire thickness of contamination range represented in the model (100:0 or 70:30 cases)	Yes - 12/4/2013
DH-287	Comment: Editorial. Add "on" after assuming a recharge scenario based" Basis/Justification: See comment.	See comment.	5	5-26/35	Accept	Missing word ("on") will be added.	Yes - 5/2/2013
DH-288	Comment: If the contaminants were uniformly distributed, explain how where it starts vertically plays a role. A larger role is the contaminants mass or inventory. This is the largest key factor followed by recharge rate. Basis/Justification: Based on the previous assumption of uniform vadose zone contamination, the COPC initial vertical distribution in the model should not play a key factor. It is a key factor in reality.	Modify the text to include the initial inventory of the COPC.	5	5-27/3-4	Accept	The modeled condition of uniform thickness assumes the worst-case scenario, where the maximum contamination value actually encountered is present across the entire thickness of contamination range of 100:0 or 70:30, including that zone near the groundwater interface. Agree that the actual vertical distribution of the COPC affects the outcome. However, modeled results present the worst case (bounding condition) because the approach assumes that the maximum contaminant concentration is present throughout the contaminated zone, including close to the water table. The SSL/PRG approach is a concentration-based, not inventory-based approach: it identifies the maximum concentration that can remain without causing an exceedance of a groundwater protection standard. Inventory enters indirectly through the waste site dimension in the direction of groundwater flow. The greater this dimensional length, the higher the waste site contribution to groundwater (representing greater inventory for a given concentration) - thus the approach allows for scaling the SSL or PRG value down for waste sites with a dimension parallel to the direction of groundwater flow that is greater than the representative waste site (10 meters).	Yes - 12/4/2013
DH-289	Comment: Please provide more information. How is it "intentionally bounding"? Why is it "intentionally bounding"? Over what area is it "intentionally bounding"? Answer these questions or refer back to the exact section in Chapter 4. This information leaves the reader with lots of unanswered questions. Basis/Justification: Not enough information is provided to understand the author's concept of what a "conservative approach" is.	More information is needed.	5	5-27/10-12	Accept	The modeled condition of uniform thickness assumes the worst-case scenario, where the maximum contamination value actually encountered is present across the entire thickness of contamination range of 100:0 or 70:30, including that zone near the groundwater interface. The actual vertical distribution of contaminants shown in the data indicates that this is not the case. A high concentration of contaminants located higher in the soil column would take longer to reach, and therefore longer to effect, groundwater. In essence, we are forcing the worst-case modeled case by assuming uniform maximum contamination in the soil column. Text will be edited to clarify.	Yes - 12/4/2013
DH-290	Comment: Explain what "Peak concentration refer to – groundwater or soil concentrations? Basis/Justification: Unclear what peak concentration is being discussed in the sentence.	Clarify.	5	5-27/13	Accept	Revise the text to clarify that the peak concentration is in groundwater.	Yes - 9/9/2013
DH-291	Comment: Provide more clarity in your discussion. What is meant by the sentences, "Peak concentrations were calculated by running multiple simulations using STOMP for a set of Kd values that represent the range of Kd values of contaminants for 100-D/H. Values for specific constituents were selected from within the results based on their particular representative Kd. It is extremely unclear what is being done. Basis/Justification: Unclear what is trying to be communicated. I had to read it over 10 times and I still do not understand what is being communicated	Clarify exactly what was done. If needed, use an example and walk step by step through the process.	5	line 13-16	Accept	An overview will be added to explain with greater clarity how a discrete set of Kd values are simulated to predict the resulting peak groundwater concentrations, which are in turn used to back-calculate SSL and PRG values as a function of these discrete Kd values. From this relationship, the SSL and PRG values are then derived as a function of their Kd by interpolation. CLARIFICATION: this process was simplified by removing the interpolation of peak groundwater concentration based on Kd method; instead, every COPC is directly simulated with STOMP now so no interpretation is necessary, and doesn't need to be explained in Chapter 5 now. The text was revised accordingly.	Yes - 4/21/2014
DH-292	Comment: What does "Peak concentration refer to – groundwater or soil concentrations? Basis/Justification: Unclear what peak concentration is being discussed in the sentence.	Clarify.	5	5-27/17	Accept	Revise the text to clarify that the peak concentration is in groundwater.	Yes - 9/9/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-293	Comment: The discussion in this paragraph contradicts the previous paragraph. It appears a shift in methodology has occurred. It is unclear what the author is trying to communicate and how this paragraph relates to the previous paragraph. Basis/Justification: It is unclear whether a shift in methodology has occurred or we are discussing a different aspect of the method for modeling constituents that have been binned in different Kd ranges. Provide clarity.	Clarify and provide context for what is being discussed.	5	5-27/17-23	Accept with Modification	These paragraphs will be revised to improve clarity in expressing how interpolation of results in the peak groundwater concentration versus Kd results is handled. This revision should remove any appearance of a shift in methodology. CLARIFICATION: this process was simplified by removing the interpolation of peak groundwater concentration based on Kd method; instead, every COPC is directly simulated with STOMP now so no interpretation is necessary, and doesn't need to be explained in Chapter 5 now. The text was revised accordingly.	Yes - 4/21/2014
DH-294	Comment: Based on this statement, no contaminants with a Kd > 1 reached groundwater in 1,000 years. If this is true, clearly state this fact here and why other contaminants with Kd values greater than 1 were carried forward in the modeling. Basis/Justification: Unclear exactly what is being stated.	Clarify and provide context for what is being discussed.	5	5-27/21-23	Accept	This statement will be clarified; it will be noted that the Kd threshold is strongly a function of the recharge scenario as well, and that it was necessary to simulate the range of Kds in order to determine the threshold for each recharge scenario.	Yes - 1/30/2014
DH-295	Comment: Residual contamination is being left behind in a footprint area of 20 ft. X 20 ft with 6 samples having concentrations of 0.3 to 1.8 mg/kg. Although these values are below the 2 mg/kg, cumulatively s the total impact to groundwater over this area needs to be evaluated to support that no migration downward to groundwater occurs. This is still very mobile (0 ml/g) Cr+6. Basis/Justification: Residual contamination within a small footprint in the soil could provide a significant impact to groundwater and needs to be addressed in the document.	Provide a model that provides a cumulative effect of residual Cr(VI) migration downward based on known residual migration.	5	5-27/28-29	No change	The representative model used to develop SSL and PRG values is assumed to be 10 meters in extent in the direction of groundwater flow (greater length in the critical direction than in the example provided in this comment), and so the 2 mg/kg value is still applicable. The width of the site in the direction perpendicular to the direction of groundwater flow does not affect SSL/PRG values. For sites that are greater than 10 meters parallel to the direction of groundwater flow, the protectiveness values must be scaled down accordingly.	Yes - 5/15/2013
DH-296	Comment: What is meant by “contaminant source distribution”? The initial conditions were for contamination to be “uniform” starting at 15 ft bgs. So, what is meant by this statement? Basis/Justification: Clarity is needed.	Clarify.	5	5-27/37	Accept	Clarification will be added to this text. Statement refers to the 100:0 and 70:30 distribution scenarios.	Yes - 12/4/2013
DH-297	Comment: Using terms like “most conservative source distribution and recharge scenarios” is subjective and should be used with care. The more appropriate terms would be to provide the data and let the results determine how the system responds. This is best done by using sensitivity analysis, which do not appear in this document and is not discussed in the document. It also does not provide the reader any information other than an opinion. Basis/Justification: Terms like “most conservative” is subjective and is not representative of how it is being applied.	Remove statements that have most conservative and write to the data and the results that it provides.	5	5-27/39-40	Accept	The use of uniform distribution in the model results in a worst case scenario, where there is maximum impact to groundwater from contamination remaining in the overlying soil, and is called "conservative" in that context. The text will be reworked to include the rationale for assertion of conservatism with a better explanation of what this represents while removing the word "most".	Yes - 12/4/2013
DH-298	Comment: Define the term “net infiltration rate” and how it defers from “recharge rate”? Basis/Justification: Change in terminology that is unclear what is meant.	Clarify.	5	5-28/10-11	Accept	Make terminology consistent.	Yes - 12/4/2013
DH-299	Comment: Provide this information in this document and cross-walk it in this document with WAC 173-340-747(8) requirements. Referencing the graded-approach document solely is not adequate based on the concurrence agreement in the front of the graded approach document that states as part of the last sentence, “….justification of specific parameters and assumptions for a given application of the graded approach is to be presented in application-specific documents.” This RI/FS is one of those application-specific documents. Basis/Justification: WAC 173-340-747(8) provides the requirements for use of alternative fate and transport modeling for establishing soil concentrations. They need to comply with WAC 173-340-702 (14), (15) and (16).	Provide the information how this alternative fate and transport model complies with the following regulations for its use here or cite and provide an appendix in the document that provides this information. Provide the information that is in the graded approach document for the reader in this location and refer to an appendix for the additional information that meets the regulations.	5	5-28/15-18	Accept	The crosswalk will be added to Appendix F, and a summary and reference added to Chapter 5. The crosswalk references the content in ECF-HANFORD-11-0063 that documents the specific application of the model in this application. The model itself is documented in model package report SGW-50776, which will be added to Appendix F and the AR in response to other comments. Presentation and justification of specific parameters and assumptions are accomplished in this RI, primarily in the reports mentioned and included in Appendix F (ECF-HANFORD-11-0063 and SGW-50776) with specific information pointed to in this crosswalk. DOE/RL-2011-50 is referenced only to cite the regulatory approval of the STOMP code for implementation of the model in a graded approach to calculate SSL and PRG values. The language in the crosswalk will be revised to emphasize strongly the limits to the use of DOE/RL-2011-50.	Yes - 2/12/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-300	Comment: Provide the information and compare them for the reader so the reader can understand how "this STOMP model" is different than what was used for methodologies, model inputs, and assumptions for computing remedial goals for the interim remedial action goals as part of the 100 Area RDR/RAWP (Appendix B of DOE/RL-96-17, Rev. 6). Basis/Justification: Provide the information to reader so they can justify how things differ instead of a sale pitch for STOMP.	Provide the methodologies, model input, and assumptions used for the interim remedial action process to that used for this document.	5	5-28/19-26	Accept with Modification	Following paragraph in the text deleted per feedback from Ecology. Once the paragraph was deleted, Ecology agreed to close out the comment.	Yes - 7/23/2013
DH-301	Comment: Explain why it would not be adequate. Provide the determining factors of adequacy. Provide more information on what was done. More detailed information is needed on what the methodology and assumptions are for the model. Basis/Justification: General statements like "conditions were not adequately representative" needs to be clearly detailed as to why, how and what is "not adequate" and why was this approach used in the beginning.	Provide why waste site conditions were not adequately represented by the default SSL and /or PRG simulations and how this was corrected in a clear, precise discussion.	5	5-28/40	Accept	An example of an inadequate representation will be included in this text to enhance clarity.	Yes - 12/4/2013
DH-302	Comment: Discuss whether any COPCs with Kd>25 did not reach groundwater or did not migrate downward at all in 1000 years. This statement contradicts or differs than the previous discussion of Kd>1 on p. 5-27, Section 5.7. Basis/Justification: Consistency and clarification.	Provide justification for the situation being discussed for the Kd>25 vs. Kd>1. More information is needed to understand the differences between what appears on p. 5-27 and 5-29 for Kd values. A list of Kd values and their corresponding representative constituents is highly needed in this chapter.	5	5-29/10, 12-18	Accept with Modification	The Kd threshold of 1 was for PRGs; to ensure conservatism in this screening a Kd threshold for SSLs (which is higher due to the increased recharge under the irrigation scenario) of 25 was used, based, as noted, on the observation that no results with Kd values higher than this yield groundwater concentrations above the nonrepresentative threshold (concentration 0.0001 µg/L or pCi/L). This does not imply that COPCs with higher Kds do not migrate; only that their migration is so slow as to result in trivial concentrations in groundwater within 1000 years. Hence, there is no contradiction, but clearly some clarification would be in order. The explanation of the Kd > 25 exclusion criteria will be expanded to improve clarity.	Yes - 12/4/2013
DH-303	Comment: Explain why the "most appropriate" wasn't chosen the 1st time? What are the determining factors of "most appropriate"? Please provide more information on what was done. More detailed information is needed on what the methodology and assumptions are for the model related to the 70:30 profile, 100:0 profile and the individual waste site models for 70:30 and 100:0. Basis/Justification: It is unclear why statements of "most appropriate" or "most adequate" are being stated. What is the basis for using the wrong approach and then having to "fix it"	Provide the detailed information why the "most appropriate" was not used in the beginning.	5	5-29/31-35	Accept	With regard to the question of why the most representative wasn't used in the first place, this is because for the first-level modeling under the graded approach the range of site conditions (multiple stratigraphies) were simulated and the most conservative result from that range used as to calculate SSL and PRG values. Hence, the result is often likely less representative (more conservative) for any given site than if the "most representative" stratigraphy (closest to the specific site under consideration) had been used. This passage is explaining how, in testing the conservatism, a specific profile chosen to most closely matches the site being evaluated is used. To clarify, this text will be modified to emphasize that, for purposes of testing the conservatism of the 70:30 representation, a single representative stratigraphic column (Figures 5-3 and 5-4) was chosen for detailed evaluation, in contrast to the generalized approach used to develop SSL and PRG values that simulates a range of representative stratigraphic conditions for the purpose of choosing the most conservative result.	Yes - 12/4/2013
DH-304	Comment: Not being able to screen against the PRGs/SSLs is unreasonable. Plenty of waste sites where residuals were left in place with some contaminants exceeding the 2007 WAC cleanup values need to be re-examined for final closeout. Basis/Justification: Ecology in their review of CVPs and RSVPs has found waste sites that exceeded the 2007 WAC cleanup values; therefore PRGs should have been exceeded and discussed.	Provide an explanation why no waste sites exceeded SSL values and/or PRG values. Direct comparisons of 1996 MTCA vs. 2007 MTCA cleanup values needs to be evaluated and shown for waste sites exceeding 2007 MTCA cleanup values.	5	5-30/36	No change	The EPCs calculated in Chapter 6 were used to screen all sites against the SSLs: none was found to exceed the SSLs. The SSL value that is based on the more conservative irrigation recharge scenario is always more restrictive than the PRG value that is based on the native vegetation recharge scenario. Therefore, if an EPC does not exceed the SSL, then mathematically it cannot exceed the PRG and a comparison is unnecessary.	Yes - 5/15/2013
DH-305	Comment: Provide your basis of assumption for "assumed to have moved slowly (at a groundwater flow velocity of about 0.3 m/day [1ft/day]) toward the Columbia River." Basis/Justification: Any assumption has to be based on some level of evidence or educated guess what is the information that provides the assumption value.	Provide the basis of the assumption for groundwater flow velocities.	5	5-31/33	Accept with Modification	This is not an assumption that impacts modeling; this sentence will be rewritten to place in better context as descriptive of historic dissipation of this mound and cross-reference Chapter 3 for information on current groundwater velocities.	Yes - 12/4/13

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-306	Comment: You are supposed to be modeling this phenomenon to see if it is feasible. The answer is? Model the residual vadose zone contamination to find out a predictable "timing and concentration/mass of released contamination and do not be "uncertain". No one knows "actually" but that is not the point of this exercise for this document. Basis/Justification: The point of the modeling in this document was to find out if vadose zone contamination reaches groundwater and what the "timing and concentration of the released is."	Delete this sentence that starts on p. 5-31 and model these residual plumes to see if they reach groundwater and in what concentration and time period this occurs.	5	5-32/1-2	Accept with Modification	Strike this sentence as suggested; it is not necessary to the discussion. Residual contamination in the vadose zone was modeled to develop soil screening levels and preliminary remediation goals (Section 5.7, Groundwater/Surface Water Protection Screening Level and Preliminary Remediation Goal Development).	Yes - 9/9/13
DH-307	Comment: Add the word "mixed" before "waste generated in . . ." and remove the word "radioactive" that comes before "waste". Basis/Justification: The waste disposed in the 183-H solar evaporation basins was mixed waste meaning it had both radioactive and hazardous waste. To state otherwise is inaccurate.	Delete "radioactive" and replace it with "mixed" to reflect its regulatory status.	5	5-32/5	Accept with Modification	Deleted the word 'radioactive', no additional changes made.	Yes - 5/2/2013
DH-308	Comment: Provide how this historical discharge was modeled for this report. Please provide more information whether the 100:0 model was used; stratigraphic column, Kds for the various contaminants like uranium, nitrate, sulfate, and sodium, where these contaminants were initially distributed in the vadose zone, etc. Provide information if this waste site was modeled on its own merit. A borehole was drilled through it – so one would think it was. Basis/Justification: This is a unique site in 100-H Area and deserves its own modeling effort. It is clearly an ongoing source of contamination in the groundwater today.	Provide more information on how this waste site was modeled.	5	5-32/3-9	No change	Historical modeling of vadose zone release is not a component of this effort; the issue at hand is future release from residual vadose zone contamination, which appears limited. Sensitivity analysis was conducted to determine if the 70:30 distribution resulted in the more conservative (higher impact) result to groundwater at sites where concentrations were elevated deeper in the vadose zone. Regarding sulfate and sodium - sulfate was present at high concentrations in the upper vadose zone and was removed during remediation activities (RTD); sodium is not a contaminant of concern.	Yes - 5/22/2013
DH-309	Comment: A contradiction seems to appear. In one place it states, "assuming 100 percent infiltration" and in another place it states, "a large fraction of dust-suppression water either evaporates, or is removed along with excavated soil." It cannot be 100 percent infiltration – meaning going into the ground and evaporated and hauled away. This leads to the question, what is the estimated rate of recharge and what size of an area does it cover" How much of this water gets to the groundwater? We clearly know it does. Basis/Justification: Discussion needs to focus on recharge and not on assumptions what gets infiltrated and then hauled away or evaporated.	Provide an estimate of how much recharge actually occurs. Clearly the 100 percent infiltration is a misleading statement.	5	5-32/23-26	Accept with Modification	Strike "assuming 100 percent infiltration" (this clause isn't necessary in presenting the rate of water application to the surface for dust suppression purposes). The sentence concerning water removal with excavated soil will be rewritten to acknowledge potential for elevated recharge resulting from dust suppression water applications, for short periods, with context.	Yes - 12/4/2013
DH-310	Comment: Identify which leaking storage basin is being discussed. Basis/Justification: Clarify.	Clarify which basin is being discussed, and when it leaked.	5	5-32/33	Accept	Text was revised to clarify that it was the retention basins and effluent lines, and a reference for the information was also added.	Yes - 7/24/2013
DH-311	Comment: Looking at figure 5-6 and figure 3-14 and wording in Section 3.7.1, additional wording is needed here to state "although it was largely gone by September 1967". This is supported by these two hydrographs. The data really does not support the "fully dissipated until about 1968 or 1969" statement. Nice cross-reference, thank you. Basis/Justification: Data from the hydrographs does not fully support the duration of groundwater mound.	Add the following words, "although it was largely gone by September 1967".	5	5-32/35	Accept	Text was modified as suggested.	Yes - 7/24/2013
DH-312	Comment: Add another y-axis as ft instead of m to add in comparison of the previous water table maps that were done in ft for easier comparison. Basis/Justification: Ease of understand the differences in water level as presented.	Better clarity.	5, and 3	5-34/ Figs. 5-6 and 3-14	Accept	Figure was updated with a secondary axis, as suggested.	Yes - 9/9/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-313	Comment: Provide why it is limited to contaminants in groundwater. This is not representative of future contaminants that could slowly migrate to groundwater from the vadose zone, like zinc, cadmium, copper, uranium (present today in groundwater) mercury, arsenic, lead, and others that have been detected in groundwater. These contaminants need to be included, and based on the sentence, should be included. Basis/Justification: To not include all contaminants that have been found in groundwater does not provide a thorough level of how cumulative impacts could occur	Include all contaminants that have been detected in groundwater in the last 5 years.	5	5-35-36/25-2	Accept with Modification	COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs. The list of contaminants in groundwater to simulate is limited to those presently in groundwater because the vadose zone is addressed through use of SSL and PRG values calculated to provide protection levels for vadose zone sites such that future migration of contaminants from the vadose zone to groundwater will not result in exceedances of respective MCLs. The section that is the subject of this comment will be revised to quantify ranges of Kd applicable to the COCs evaluated, and to forward reference Section 5.8.2.2 where the dual domain formulation for groundwater transport modeling is presented along with the specific sorption parameters for each COPC in each domain.	Yes - 1/30/2014
DH-314	Comment: What is meant by "protectiveness criterion (vadose zone evaluation in Section 5.4)? This reviewer could not find what was being referred back to in Section 5.4 that represents this "protectiveness criterion". Basis/Justification: Clarity.	Provide more "protectiveness criterion" detail so the reader can follow what is being discussed.	5	5-35/29-32	Accept	Term from comment no longer in the text in this location due to text changes from DH-313. Similar phrase used on page 5-9 and explanation has been provided in parentheses in this location.	Yes - 1/30/2014
DH-315	Comment: The statement, "migrate at the same velocity as groundwater under ambient geochemical conditions." Supports including uranium in the groundwater modeling effort since it is a contaminant in present-day groundwater in the 100-H and based on studies by Zachara et al. moves at the same velocity as groundwater under ambient geochemical conditions. See PNNL-22048. Basis/Justification: Conceptual site model is incorrect, especially as it relates to uranium in the PRZ.	Review the referenced document and redo the conceptual model that was done for waste site 116-H-6 (183-H solar Evaporation basins).	5	5-35/32-33	Accept with Modification	This sentence in the document erroneously identifies Cr(VI) as highly mobile in referencing Table 5-4, where it is identified as moderately mobile (non-zero K_d). The CSM will be updated to include the 2012 data, and will note that the uranium concentrations are low and show a decreasing trend overall. We have reviewed PNNL-22048, *Updated Conceptual Model for the 300 Area Uranium Groundwater Plume* . The field experiments discussed in Section 5.3 of this report indicates that uranium adsorption can be very small ($K_d \approx 0$ L/kg) when sorption test is conducted in coarse-textured sediments with very large hydraulic conductivity (5000-7000 m/d) under ambient groundwater conditions. However, with intrusion of river water the K_d increased to nearly 0.375L/kg due to decreasing aqueous uranium complexation by bicarbonate. This observation and inferences drawn are reasonable under the conditions described, however, it is inappropriate to extrapolate the same result to vadose zone transport where the focus is on residual contamination and its effect on groundwater. First, due to residual contamination, the desorption (rather than adsorption) is the primary process controlling the release of uranium in the pore waters. The desorption K_ds are usually much higher than the adsorption based K_ds due to large contact times of contaminants with the sediments. Therefore the zero K_d from the PNNL experiment cannot be applied. Secondly, due to unsaturated conditions in the vadose zone, the large hydraulic conductivity value is not possible.	Yes - 4/8/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-315 (Cont'd)						The unsaturated hydraulic conductivity varies as a function of moisture content and is expected to be less than 0.001 m/d, which will provide sufficient water-sediment contact time in the vadose zone for any sorption-desorption reactions to reach equilibrium conditions and much larger Kd compared to experiment conditions where the contact time between the injected water and sediment was much shorter. Increasing the residence time would increase the Kd. This is also observed from the PNNL report (Section 5.3), where when the same experiment is conducted in relatively lower permeability zones (hydraulic conductivity about 2000 m/d) the Kd increased significantly to >2.4 L/kg. Clarification: the trend of uranium concentrations declining over time (1996 to 2011) is presented in Section 4.5.4.	
DH-316	Comment: These terms "moderately mobile" and other places in the document refers to "slightly mobile" are nice terms but does not provide the reader what context is meant. Provide the actual vadose zone and groundwater Kds used for these constituents or the range that is being discussed. Kd values that are used are one of the most important parameters used besides recharge rates, and inventory/mass in modeling, provide the exact values. Basis/Justification: More specific information is needed to understand what the author is discussing.	Clarity in the precise Kd values being referenced.	5	5-36/1-2	Accept	Add quantitative ranges to all qualitative Kd references in Chapter 5, e.g. "moderately mobile" and "slightly mobile".	Yes - 12/4/13
DH-317	Comment: Add the phrase, "since 100-DX/HX systems came online" after "systems are no longer operational". Basis/Justification: Clarity of why they are no longer operational	Clarity.	5	5-36/7	Accept	Revision was made as suggested.	Yes - 7/24/2013
DH-318	Comment: Add "to 1400 gpm" after "capacity of the treatment system" to read, "increase the capacity of the treatment system to 1400 gpm." Basis/Justification: Correctness.	Make suggested change.	5	5-36/8	Accept	Capacity was added.	Yes - 7/24/2013
DH-319	Comment: This resembles recharge to the aquifer. It may not be by standard methods, but it is still recharge. Basis/Justification: Recharge can be from a losing stream, which is what is being described.	Clarity that recharge occurs from the river. This discussion needs to be added to the recharge section also, Section 5.8.1.2.	5	5-36/26-28	No change	River stage is represented as a transient lateral boundary condition (constant head within stress periods, with multiple stress periods); recharge is a term used to describe water entering the model domain as a flux rate (constant flux within stress periods, possibly with multiple stress periods if recharge changes in time). It is inappropriate to confuse these types of boundaries in the manner this comment suggests; no change will be made.	Yes - 6/19/2013
DH-320	Comment: The title of this section is "Saturated Zone Modeling Methods and Results". No results are present in this entire section for sections 5.8.2.1 through 5.8.2.3. Remove "and Results" from this title. Basis/Justification: No results are present in this entire section and therefore calling out that results are in this section is incorrect.	Remove the words "and Results" from the title of this section..	5	5-36/35	Accept	Remove "and Results" from the header title.	Yes - 6/19/2013
DH-321	Comment: This document is not in Appendix F, but should be. Provide this document in Appendix F. Basis/Justification: This document is an important document for the groundwater modeling effort and should be a document included in this RI/FS as it was for the 100-K RI/FS.	Missing a key document that needs to be included in Appendix F as cited.	5	5-36/39	Accept	Include SGW-46279 in the AR and in Appendix F.	Yes - 6/19/2013
DH-322	Comment: Provide discussion of how Rev. 2 of this model data package differs from Rev. 1 that is cited here? Basis/Justification: More recent version has been produced before the RI/FS was submitted to Ecology.	Explain what the difference is in the new revision.	5	5-37-24-25	Accept	Revision differences will be noted.	Yes - 12/4/2013
DH-323	Comment: All these model data packages, except for 100-HR-3, discuss 100-D and 100-H and how the lateral facies transition from Ringold Formation unit E in the west and south to the Hanford formation sands and gravels in the east and north of the model domain, between 100-D and 100-H Make sure it accurately reflects the communication that occurs between the Ringold RUM unit and the Hanford Formation is adequately discussed and presented. Basis/Justification: Justify that all these data packages discuss this geological transition including the RUM.	Clarity and accurate descriptions and discussions of the lateral transition between the Ringold Fm Unit E and the Hanford formation as well as the Ringold RUM throughout the 100-HR-3 OU.	5	5-37/22-30	Justification Added	Text will be checked, and revised as necessary, to ensure consistency with data packages for the geological transition.	Yes - 12/4/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-324	Comment: Perform another MODFLOW run utilizing the variable hydraulic conductivities generated by the large field characterization effort for physical properties when the new 100+ injection/extraction groundwater wells for the new pump and treat were installed; rather than estimating the hydraulic conductivities. Basis/Justification: Variable hydraulic conductivities is one of the single most sensitive parameters that impacts the MODFLOW modeling results. Ecology has performed this type of sensitivity in the past for the study area and noted very large differences in residual contamination, transport times, and resulting contamination concentrations present.	Perform another MODFLOW run utilizing the variable hydraulic conductivities generated by the large field characterization effort for physical properties when the new 100+ injection/extraction groundwater wells for the new pump and treat were installed; rather than estimating the hydraulic conductivities.	5	5-37&38/40-2, see bullet items in Comment 229	Accept with Modification	Additional explanation will be provided to explain that the hydraulic parameters that were used in the model were based on these recent characterization data; the model uses variable hydraulic conductivity representation.	Yes - 2/26/2014
DH-325	Comment: Compare the natural recharge rates in the vadose zone model for what the water flux coming out of the model was versus using the average 12 mm/yr. and provide appropriate documentation. Provide the justification that 12 mm/yr. is equivalent to the natural recharge rates applied to the vadose zone simulations. Basis/Justification: Justification is needed to support the claim that 12 mm/yr. is average natural recharge that occurs compared to the natural recharge rates used in the vadose zone simulations.	Justification through documentation is needed to support this paragraph, per comments.	5	5-38/3-20	Accept	Additional discussion will be included to further explain and justify the average value (12 mm/yr) applied over the extent of the 100AGWM as a function of spatial proportion of surface vegetation in the model extent.	Yes - 12/19/2013
DH-326	Comment: Using this reference, In-situ Redox Manipulation (ISRM) Annual report Fiscal Year 2007 (DOE/RL-2008-10) imply that the ISRM Pond is leaking, also. Basis/Justification: Provide rationale why this is a representative reference for artificial recharge for infiltration from surface reservoirs.	Rationale for this reference is needed.	5	5-38/21-22	Accept with Modification	Anthropogenic recharge applied in the 100 Area Groundwater Model is summarized in the model package report (SGW-46279) and for the 100-D and 100-H Areas, leakage events identified since 2000 are confined to the 182-D reservoir, in 3 distinct events. The reference to ISRM is noting historical discharges from the KW and KE reactors; it is not a pertinent reference in this context. This statement will be rewritten to correctly cite the anthropogenic discharges incorporated in the 100 Area Groundwater Model that are pertinent specifically to the 100-D and 100-H Areas.	Yes - 12/4/2013
DH-327	Comment: Provide discussion of how Rev. 2 of this model data package differ from Rev. 1 that is cited here. Basis/Justification: More recent version has been produced before the RI/FS was submitted to Ecology.	Explain what the difference is in the new revision.	5	5-38/41	Accept	Revision differences will be noted.	Yes - 12/4/2013
DH-328	Comment: Include uranium in this treatment system, because it is detected in groundwater. Basis/Justification: Uranium exists in the groundwater in 100-H Area and needs to be incorporated into the system.	Include uranium in the groundwater and run this through the treatment system module for 100-H Area.	5	5-39/16-19	Accept with Modification	Per agreement with Ecology, uranium will not be modeled because it is not a soil COPC at 183-H or other 100-D/H locations, and so modeling is not required.	Yes - 4/21/2014
DH-329	Comment: Provide each contaminant's Kd for the mobile domain and the immobile domain here in this paragraph. The reader should not have to go to another document to find out that information, even if it is in the document as an appendix. Basis/Justification: Pertinent information should be presented in the main text of the document, not in a secondary or tertiary document that the reader has to go and find that is needed to support the context of the discussion.	See comments for change.	5	5-39/32-44	Accept	Include contaminant Kd values for mobile and immobile domain.	Yes - 12/4/2013
DH-330	Comment: This document needs to be in the RI/FS report in Appendix F. Basis/Justification: This "Conceptual Framework and Numerical implementation of 100 Areas Groundwater Flow and Transport Model" supports the modeling effort with parameters, design and other important aspects that needs to be provided in this document.	See comments for addition.	5	5-39/43-44	Accept	Include SGW-46279 in the AR and in Appendix F.	Yes - 2/4/2014
DH-331	Comment: Discuss the Fall 2011 concentrations for Cr(VI) and if these are maximum values including the inland values from the Columbia River. Basis/Justification: Justification is needed to support this statement.	Provide information that supports this statement.	5	5-40/2-16	Accept	Discussion of Fall 2011 Cr(VI) concentrations will be included.	Yes - 12/4/2013
DH-332	Comment: Provide the time period that nitrate and strontium-90 concentrations were at their maximum values. Basis/Justification: Information is not provided for these two contaminants but was for Cr(VI).	Provide information that provides this information.	5	5-40/2-16	Accept	Add discussion of season in which these values are at maximum.	Yes - 1/27/2014
DH-333	Comment: Concentrations in the fall of 2011 are the same as Oct 2011, both occur in the fall of the year. Therefore these wells should show how they are being used. We are only talking about 10 days of fall from Sept 21 or 22 to October 1, 2011. The maps in the Hanford Site Groundwater Monitoring for 2011 (DOE/RL-2011-118) show the designation of these wells in the 100-H Area and eastern horn area. Basis/Justification: Provide how these wells will be designated vs. the open as inactive.	Provide the maps used in the Hanford Site Groundwater Monitoring for 2011 that shows Fall 2011 concentrations and symbols of the well's designation in the Fall 2011 timeframe.	5	5-40/2-16	Accept	Include Fall 2011 concentration maps. NOTE: the Fall 2011 map was already provided in chapter 1 (Figure 1-25); cross reference added.	Yes - 1/27/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-334	Comment: This sentence needs to be deleted, "In later figures that represent 2012, these wells will be depicted as triangles pointing in the appropriate direction as the systems are turned on later in 2011 and shut down in the end of 2012. Since 2011 maps for all the contaminants discussed in this section that shows how the wells are designated from the annual groundwater report, all the discussions on well designations can be deleted. Delete this sentence. If this sentence stays, delete the last phrase "and shut down in the end of 2012" because this is incorrect no matter which pump and treat system is being discussed. Basis/Justification: This information is not needed since existing document can be used to provide a replacement.	Remove all text that discusses the 100-H Area designation of wells and replace the figures with figures in Hanford Monitoring Report for Calendar Year 2011.	5	5-40/14-16	No change	It is important here to distinguish between observed data and model inputs derived and interpolated from those observed data. The purpose of these figures is to present the initial condition used by the model. Replacing these figures with interpolated plumes and observed data from monitoring report maps would not accurately portray what the model received as an initial condition. This purpose of this section is to present the initial condition used in the model. Subsequent figures depict subsequent migration predicted by the model, beginning from the initial condition shown. Well pumping activities discussed and portrayed in these figures are consistent with the no-further-action condition simulated using this model. Figures from the groundwater monitoring, while appropriate to a nature-and-extent discussion (Chapter 4), are not a substitute for displaying exactly what the model received as input and reports as output, along with an accurate portrayal of the pumping rates simulated in time and space, which these figures provide. If any underlying data or assumptions modified (e.g., by running a pump-and-treat system longer under the no-further-action scenario), then the model inputs, and hence these figures, would be modified to reflect.	Yes - 7/24/2013
DH-335	Comment: Editorial. A word is missing. Please insert "were" between "wells" and "assumed", so the sentence reads, "…pump and treat extraction and injection wells were assumed to be turned off at the end of CY 2012 and ambient flow conditions are simulated thereafter." Basis/Justification: Missing word in the sentence.	Insert were between wells and assumed.	5	5-40/24	Accept	Missing word was inserted.	Yes - 7/24/2013
DH-336	Comment: So the total amount of time covered is 152 years? Using the 2011-2012 pumping rate as the operating rate for the pump and treat system is the basis for the 77-year modeling pump and treat period. Basis/Justification: Unclear what time periods are represented.	Clarity is needed to understand how the modeling was conducted.	5	5-40/30-27-30	Accept	Clarify time periods represented. NOTE: Total time simulated is NOT 152 years - it is 77 years. The text will be revised to clarify that there is a 2-year period followed by a 75-year simulation, for a total of 77-years.	Yes - 12/4/2013
DH-337	Comment: Provide the justification that only 27 years is needed, why not all 77 years. Basis/Justification: Unclear for the period of time to justify modeling.	Clarity is needed to understand how the modeling was conducted, and justification of using 27 years vs. 77 years.	5	5-40/30-33	Accept	Add justification for time period in modeling.	Yes - 12/4/2013
DH-338	Comment: For the remaining 50 years explain why only one stress period is needed and why that period was January. Explain the methodology in more detail and 2hy an average could not be used over the course of the 12-month period that would represent an average number to apply over each 12- month period that would give an "annual average condition". Basis/Justification: Comment: Unclear for the period of time to justify this modeling concept.	Clarity is needed to understand how the modeling was conducted. Provide additional information and discussion to explain this modeling aspect.	5	5-40/33-40	Accept	Add brief explanation of stress periods (as representing constant stresses in the period; means river stage is held constant for trailing period).	Yes - 12/4/2013
DH-339	Comment: Perform a sensitivity study of MODFLOW using the hydraulic parameters of 0.1 and 0.3 for Specific storage and Specific yield as noted in SGW-40044, Rev. 1, and SGW-40781, Rev. 0, or provide a basis as to why these parameters were so significantly changed for this modeling effort. Basis/Justification: Table 5-6 lists these parameters, yet data packages show significantly larger numbers which would positively impact the amount and rate at which contaminated groundwater was removed from the HR-3 study area and thus provide a reduced amount of time needed to complete the treatment timeframe.	Perform a sensitivity study of MODFLOW using the hydraulic parameters of 0.1 and 0.3 for Specific storage and Specific yield as noted in SGW-40044, Rev. 1, and SGW-40781, Rev. 0, or provide a basis as to why these parameters were so significantly changed for this modeling effort.	5	5-44/ Table 5-6	Accept with Modification	The specific yield was adjusted through calibration (section 5.6.2 of SGW-46279, Rev. 02). It must be noted that model input values for river stage and hydraulic properties are based on all available measurements. This leaves specific yield as the most sensitive calibration factor. Additional information on model results and how they match observed water levels will be added to illustrate the accuracy of the calibration. Based on these results, it is clear that a significantly different value of specific yields will result in an uncalibrated model. For specific storage, it noted that the calibrated value is different than the few available measurements but this value is not likely to play a significant role given the shallow nature of the aquifer. Footnotes to the table of GW model parameter values will be revised to note these are calibrated values, and their relative sensitivity, and the fact that sensitivity studies on the specific storage parameter is not appropriate without full model recalibration for each sensitivity case.	Yes - 12/4/2013

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DH-340	Comment: "This evaluation considered a "no further action" condition as the baseline" is not understandable. What evaluation is being discussed here? Modeling using the pump and treat system for 77-years was previously stated in Section 5.8.3. What has changed? Basis/Justification: It is confusing what is being discussed.	Provide clarity in what evaluation is being discussed and better clarity in the entire modeling discussion.	5	5-46/12-14	Accept	Clarity will be added to this discussion.	Yes - 12/4/2013
DH-341	Comment: It is stated back on page 5-40 in Section 5.8.2.3, that fall 2011 plumes was used for Cr(VI), yet here it states it is December 2010. It also states that the starting point for the simulations is January 2011, but an estimate of hydraulic containment for 2012 was used. Why wasn't 2011 containment from 100-D Area used? 100-H Area started in October 2011, so data was not ready for the entire year for this pump and treat system, granted. Basis/Justification: Justification for which plume map is used and for what month and year is needed. Why real data was not used also needs to be provided.	Why real data was not used and the date that the plume maps are designated for modeling needs to be clear. The document states two different dates.	5	5-46/22-23	Accept	The caption for Figures 5-8, 5-9, and 5-10 will be revised to clearly indicate that these portray the initial condition of the contaminant plume entered into the groundwater transport model, and are taken to represent conditions when the forward simulations begin (January 1, 2011). The text will clarify that groundwater monitoring results from fall of 2011 were used for Cr(VI) to construct this initial condition, and that because contaminant data is not available from all wells on a single date, it is necessary to develop the initial condition from sampling made over a period of time (in this case, fall 2011) to estimate the initial condition at a single point in time when the model commences transport simulations.	Yes - 12/4/2013
DH-342	Comment: It is stated back on page 5-40 in Section 5.8.2.3, that fall 2011 plumes was used for Sr-90, yet here it states it is December 2010. Basis/Justification: Justification for which plume map is used and for what month and year is needed. Why real data was not used also needs to be provided.	Explain why real data was not used, and why the date that the plume maps are designated for modeling needs to be clear. The document states two different dates.	5	5-46/25-26	Accept	The caption for Figures 5-8, 5-9, and 5-10 will be revised to clearly indicate that these portray the initial condition of the contaminant plume entered into the groundwater transport model, and are taken to represent conditions when the forward simulations begin (January 1, 2011). The text will clarify that groundwater monitoring results from fall of 2011 were used for Cr(VI) to construct this initial condition, and that because contaminant data is not available from all wells on a single date, it is necessary to develop the initial condition from sampling made over a period of time (in this case, fall 2011) to estimate the initial condition at a single point in time when the model commences transport simulations.	Yes - 12/4/2013
DH-343	Comment: It is stated back on page 5-40 in Section 5.8.2.3, that fall 2011 plumes was used for NO3, yet here it states it is December 2010. Basis/Justification: Justification for which plume map is used and for what month and year is needed. Why real data was not used also needs to be provided.	Explain why real data was not used, and why the date that the plume maps are designated for modeling needs to be clear. The document states two different dates.	5	5-46/28-29	Accept	The caption for Figures 5-8, 5-9, and 5-10 will be revised to clearly indicate that these portray the initial condition of the contaminant plume entered into the groundwater transport model, and are taken to represent conditions when the forward simulations begin (January 1, 2011). The text will clarify that groundwater monitoring results from fall of 2011 were used for Cr(VI) to construct this initial condition, and that because contaminant data is not available from all wells on a single date, it is necessary to develop the initial condition from sampling made over a period of time (in this case, fall 2011) to estimate the initial condition at a single point in time when the model commences transport simulations. Additional clarification: two nitrate plumes in 100-H area depicted in the initial condition were the results of errors in the database that have subsequently been corrected; these plumes do not exist. Modeling did not predict these non-existent plumes would result in a need for action, so modeling was not repeated to correct for these artifacts in the initial condition. Text will be added to explain this and cross-reference the updated nitrate plume (Figure 4-90). A note will also be added to the figure caption for the nitrate initial condition.	Yes - 1/30/2014
DH-344	Comment: Would not the pump and treat system be turned off at midnight on January 1, 2013 and not sometime on December 31, 2012? Basis/Justification: These simulations begin starting on 2013, not on the last day of 2012, correct.	Modify text to indicate when the simulations begin.	5	5-46/30-31	No change	There is no real difference between December 31 and midnight on January 1. No change planned.	Yes - 7/24/2013
DH-345	Comment: Based on the migration of the plumes, they do not all migrate to the Columbia River, most of them migrate across the horn and diminish before ever reaching the Columbia River. Dominant plume migration appears to be to the north from 100-D Area. The map does not indicate all of the high nitrate values starting in 2011 and through 2012. These need to be shown on the nitrate map. Basis/Justification: Plume migration is up parallel to the river more than toward the river.	Modify the text to discuss how the contaminant plumes actually migrate. Some goes to the river, but most of it goes parallel to the river.	5	5-46/30-35	Accept	Text currently is speaking to where the plumes ultimately discharge; it will be clarified that the migration path is typically across the horn before discharging to the Columbia River. The maps depict model results, not observational data. A discussion on the comparison of the maps depicting model results and those from the annual report is planned for the monthly meeting.	Yes - 12/4/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-346	Comment: No Nitrate is shown along the river around wells 199-H4-4 where the plume from the 183-H solar evaporation basins is located. Wells in this area exceed 45 mg/L beginning in 2011 and 2012. It also existed back in 2006 and should be presented. Other areas have exceedance of nitrate MCL and are not shown. Provide all Nitrate MCL exceedance locations on the map. Basis/Justification: A true map indicating all nitrate MCL exceedances is not shown on figure 5-28.	Add information per comments.	5	5-64/ Fig. 5-28	No change	Nitrate results are shown in Figure 4-90, with a discussion of nitrate in Section 4.5.2. In Chapter 5, where this comment is located, the figure present model results, not the current groundwater monitoring results. To incorporate data as requested in this comment would be unnecessarily confusing and contrary to the purpose of this figure. The initial conditions in the model are present in Figure 5-10, which show nitrate near the river at 100-H.	Yes - 5/22/2013
DH-347	Comment: Define what is meant by "groundwater and surface"? Change to say "groundwater and surface water", if appropriate. Basis/Justification: Clarity. Sentence makes more sense with "water" added after "surface".	Missing word needs to be added or "and surface" needs to be removed.	5	5-73/4	Accept	Text modified to include 'surface water'	Yes - 5/2/2013
DH-348	Comment: This section should be written with more confidence in the fact that vadose zone contamination is reaching the groundwater at the south Cr(VI) groundwater plume as well as other places in 100-D/H. Rewrite this section asserting that vadose zone contaminants are reaching the groundwater, but current remedial activities are in the process of removing these "hot spots". Basis/Justification: Clarity.	See all comments. Clearly indicate that we understand that Cr(VI) is impacting the groundwater from the vadose zone, but remedial actions are removing this source at numerous locations in 100-D/H Area.	5	5-73/23-35	Accept	Revised to identify where VZ contamination is reaching groundwater and how addressed. Additional detail will be added regarding the 100-D-100 excavation and contamination and the potential for contamination to be reaching groundwater at 100-H-46.	Yes - 1/30/2014
DH-349	Comment: Perform additional sensitivity studies in MODFLOW using a continuous source for contaminants, rather than a single time point source as currently used in this modeling effort. Basis/Justification: This is most likely the largest source of uncertainty in the MODFLOW modeling effort as approximately 111 waste sites remain un-remediated as stated in Chapter 1, "one or more significant Chromium waste sites are continuing sources" as stated in section 4.3.20, and on pages 5-31 to 33, and page 5-35. Also, it is stated on page 4-144 that there is an "unknown location of contamination in the vadose zone contributing to the 100-D northern plume" thus, it is unproven if all of the chromium sources in the vadose zone have been discovered and will be remediated or excavated at this specific time.	Perform additional sensitivity studies in MODFLOW using a continuous source for contaminants for unremediated waste sites in areas that could impact groundwater., rather than a single time point source as currently used in this modeling effort.	5	5-73&74/16-45	Accept with Modification	A sensitivity study postulating a continuous source from the vadose zone is not recommended. There are three possible CSMs to consider as potential continuous sources. The first CSM is residual contamination from remediated waste sites. Given that no remediated waste sites evaluated failed in this RI failed the soil screening levels (SSLs), residual contamination at these sites does not constitute a continuing source that would result in groundwater contamination above groundwater or surface water protection levels at the downgradient boundary of these waste sites in the future, even under an irrigation recharge scenario. The second CSM is that an unremediated waste site constitutes a continuous source. Such potential sources will be addressed through remediation of these sites. The third CSM is for contamination in the deep vadose zone that is no longer contiguously connected to waste sites. Such a source might exist in 100-H Area, but would be very weak and not consequential. 100-D Area may contain such a source or sources, and indeed two investigative studies that included focused drilling were conducted that sought evidence of such sources but failed to uncover any. Defining this third CSM is highly speculative, subject to such high uncertainty that it is unsuitable to address this through modeling and is not meaningful for the RI/FS objectives (establishing the need for action and ranking of alternatives). Any model would primarily show the importance of the assumptions made in the CSM, and not add meaningful information to this decision-making process. Continuing sources of this type will be addressed during the operation of a pump-and-treat remedy.	Yes - 4/9/2014
DH-349 (Cont'd)						Following the ROD, the groundwater-monitoring program will be reviewed and revised if necessary following a DQO process to address the goals of the ROD. Five-year reviews will provide additional opportunity for assuring remedy protectiveness. Additionally the RD/RAWP following the ROD has a section on Work Tasks. One of the tasks that will be listed is an annual review of the monitoring data. This review of the data occurs as data is received and adds to remedial process optimization activities, such as well realignments (for example, adding wells 199-D8-53, 199-D4-14, and 199-D4-34 as extraction wells at DX; removing wells that are decommissioned; etc.).	
DH-350	Comment: What is the Kd value used for strontium-90 in this 100:0 profile? Basis/Justification: All the information is not provided to help the reader understand the information presented.	Clarify what is done including Kd used and any other changes in parameters.	5	5-74/19-22	Accept	Kd value used for Sr90 will be included in this sentence.	Yes - 12/4/2013
DH-351	Comment: Explain what is meant by this sentence. It is unclear why, how, where etc… Basis/Justification: More information is needed to understand how this uncertainty is being discussed.	Provide additional information that explains how, why, where, these effects occur.	5	5-74/26-28	Accept	Text was revised for clarity.	Yes - 7/24/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-352	Comment: This assumes a robust RTD remediation treatment before the CERCLA RI process is finished. Basis/Justification: The final treatment should not be decided until the FS has been accepted by Ecology and the public.	Delete discussion of RTD.	5	5-74/29	Accept	The RTD discussion (this paragraph) will be removed.	Yes - 7/24/2013
DH-353	Comment: All this discussion is based on opinion. This is a decision document and the uncertainties discussed leaves one to suspect not enough is known to make a decision. In addition, one conceptual model that has not been presented yet are the large void spaces that exist in the large pebbles to boulder size gravels both in the Hanford formation and the Ringold Formation would allow contaminants to migrate downward very rapidly and not leave a trace. This conceptual model does not appear to be addressed in this document, but should be. Provide more evidence of what is being discussed, why it is being discussed, how it is applicable, when will this information is needed for decision-making. Basis/Justification: More justification for the uncertainty discussion is needed. More evidence of what is being discussed, why it is being discussed, and how it is applicable is needed. This is a decision document and the uncertainties discussed leaves one to suspect not enough is known to make a decision.	Add language per comment.	5	5-74/29-43	Accept with Modification	The first paragraph referenced in this comment removed; it is unnecessary for the purposes of this discussion. The second paragraph referenced will remain; it is a relevant fact that laboratory techniques are used on the fine-grained portion of materials and this holds important implications for mass estimates and thereby an impact on calculated protection levels that should be acknowledged here.	Yes - 10/2/2013
DH-354	Comment: If all Kds are chosen as most mobile then actual contamination that is in the vadose zone could be missed and contaminants deleted from COC lists. Basis/Justification: Not enough field data to make this statement for all cases.	Explore contaminants that could be remaining in the vadose. Run a sensitivity analysis for a range of Kds.	5	5-75/10-19	Accept with Modification	Modify text to emphasize that the values chosen are for the specific purpose of calculating SSL and PRG values, and not for determination of residual contamination in the VZ for other exposure pathways.	Yes - 12/4/2013
DH-355	Comment: This entire section does not present uncertainty of contaminant transport parameters, and if so, how uncertain they are and what that means. Provide a more in-depth discussion of these contaminant transport parameters or remove the section entirely. Basis/Justification: Other than defining the terms, no real information is present here that has not already been presented elsewhere in the document. This section is not needed.	Delete this section since no new information is presented; or rewrite this section with how, why, and what was answered, per comments.	5	5-75/8-30	Accept with Modification	This section does discuss uncertainty in transport parameters (e.g., porosity is a key transport parameter, and the uncertainty in this parameter value is presented). However, this discussion is not comprehensive and will be revised to provide more information. The discussion of Kd will be revised to note the use of WAC values for non-radionuclide Kds except Cr(VI) and site-specific values for radionuclide Kds; discussion of other transport parameters (dispersivity) will be added, and the Kd treatment of Cr(VI) will be revised to distinguish between treatment in the VZ and in GW.	Yes - 1/30/2014
DH-356	Comment: These are bold statements and somewhat inaccurate without context, which is not provided. If you do not have the correct conceptual model, then whatever is produced by STOMP is not adequate. Provide more discussion and clarify what is meant by "simulates natural processes" because the code is only as good as the information input. Basis/Justification: The STOMP code, although robust, cannot simulate natural processes, it can only model and predict what is provided as inputs. If the conceptual model is incorrect, then it cannot simulate the correct output.	Tone down this discussion and discuss what the uncertainties, assumptions and limitations to the vadose zone model – therefore limitations to STOMP code.	5	5-75/32-36	Accept	Discussion will be rewritten to emphasize that STOMP has been shown through comparison to analytical solutions, benchmarking against other codes, and field validation to solve the governing equations it incorporates for flow and transport processes correctly, but that the representativeness of any given model implemented using STOMP is inherently limited by the accuracy of the conceptual representation and the representativeness of the parameterization.	Yes - 12/16/2013
DH-357	Comment: Additional water for the chromium VI site would have released additional Cr(VI) to the environment based on PNNL studies. So to state that it "should not have caused dramatic removal of mobile contaminants" is incorrect. Rewrite these sentences to reflect that idea by terminating this sentence on p. 5-75 at the end of "difficult to quantify." Basis/Justification: No supporting evidence. Clearly an opinion with the term, "believe".	Delete, ""however, it is believed that in most instances of water intrusion into the formation, the volume of water was modest and should not have caused dramatic removal of mobile contaminants."	5	5-75&5-76/45-2	Accept	Sentence will be revised to explain that a limited number of borehole soil samples may have been affected by water added during drilling and the resultant chemical results are subject to some degree of uncertainty. The magnitude of the effect of this condition is difficult to quantify, as discussed in Section 4.3.21. Additional uncertainties related to specific measurements (for example, batch leaching tests) are discussed earlier in this chapter.	Yes - 1/30/2014
DH-358	Comment: "Conservative" comes up throughout the document in reference to contaminants reaching the groundwater quickly. Parameters are chosen that cause this modeling effect. If contaminants leave the vadose zone this could preclude costly soil remediation. In reality describe why the other "non-conservative" effect may be happening. Contaminants may be staying in the vadose over a longer period of time which would require a different type of remediation or institutional control. Basis/Justification: A range of parameters and data should be looked at.	Show a range of parameters with a sensitivity analysis to define "conservative" as used on this page per the comments.	5	5-76/S. 5.9.4	Accept with Modification	Clarify text to indicate that conservatism is with respect to peak groundwater concentration, and the conservative bias in parameter choices only impact SSL and PRG determination; direct exposure to residual soil contamination is a separate calculation presented in Chapter 6 and does not use the models or parameter values presented in Chapter 5.	Yes - 12/4/2013
DH-359	Comment: Provide all the information needed for the discussion in this main text and not refer to another document even if it is in the appendix. Basis/Justification: Having to go to the appendix and find in another document information that supports what is being discussed is an inefficient means to present the information.	Bring the pertinent information to the main text from the document cited.	5	5-76/4-7	No change	Use of appendices for presentation of details supporting the information presented in the chapter provides a balance between readability of the chapter and availability of supporting detail; to include all the information in the chapters would render the chapter would significantly degrade the readability of the chapter.	Yes - 5/15/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-360	Comment: Although this is a list of assumptions, uncertainties should be presented in this bullet and others. In addition, using a Kd of 0.8 ml/g does not represent what occurs in the field, nor is it supported by actual field event occurrences. PNNL study shows that 95% of Cr(VI) is still leachable. Discuss this information. It is unclear whether the author is indicating that 0.8 ml/g assumption is representative. Provide more information that actually talks to uncertainty and limitations. Basis/Justification: Uncertainty is not provided/discussed in the discussion and should be.	Discuss what is uncertain about the 100:0 and 70:30 profiles and a Kd of 0.8 ml/g for Cr(VI). Provide additional information for the other assumptions that address uncertainty.	5	5-77/1-11	Accept	Uncertainty discussion of the initial contaminant distributions (100:0 and 70:30) will be expanded. The Kd of Cr(VI) will be broken out into a separate bullet and discussion of uncertainty included.	Yes - 2/12/2014
DH-361	Comment: No limitations are presented in this section. Delete this word from the title of this section. Basis/Justification: Limitations are not directly addressed.	Remove "Limitations" form the title.	5	S. 5.9.4	Accept with Modification	Rather than remove the concept of acknowledging model limitations, the text in this section will be augmented to include how limitations follow from the assumptions discussed. For example, using a 1-D column limits the model by restricting all flow to be vertical; this limitation causes in the model to predict higher peak groundwater concentrations that occur sooner than a multidimensional model was used with lateral spreading included in the framework.	Yes - 12/4/2013
DH-362	Comment: This document, Conceptual Framework and Numerical Implementation of 100 Areas Groundwater Flow and transport Model (SGW-46279) is not presented in Appendix F of this document. Please incorporate. Basis/Justification: Cited document not provided in Appendix.	Provide this document in Appendix F as cited.	5	5-77/42-43	Accept	Include SGW-46279 in the AR and in Appendix F.	Yes - 11/28/2013
DH-363	Comment: One year (2007) out of 5 years is inconsistent with the other 4 years. This would indicate that stating these conditions are representative of the typical conditions in the field and that future conditions will not vary significantly is inconsistent within itself. Basis/Justification: The inconsistent year over a 5 year period presents inconsistency within itself.	Provide more information on how year 2007 differs from the other 4 years.	5	5-78/1-8	Accept	Further explanation of year 2007 will be included.	Yes - 12/4/2013
DH-364	Comment: This document was used under the CFEST code. Is the 18% and 10% representative for MODFLOW model as an input parameter? This document is not in the TPA AR and needs to be provided, since it provides documentation of the values used. Basis/Justification: Provide the validity of the values used for effective porosity and specific yield for the cited document and include the cited document in the TPA AR because it is not in it.	Provide PNNL-10886 in the TPA AR. Provide the validity of using 18% and 10% for effective porosity and specific yield, respectively.	5	5-78/38-42	Accept with Modification	This paragraph will be revised to indicate the documents used to provide initial values of these parameters, and emphasize that the 18% and 10% values were final calibrated values (not sourced from the PNL document). The reference to the PNL report will be removed; it is not necessary and the differences in CFEST and MODFLOW treatment of this parameter are complications that don't need to be brought forward in this discussion.	Yes - 12/4/2013
DH-365	Comment: This assumption is invalid. Known vadose zone contamination exists that is still impacting groundwater. One of these is 116-H-6 waste site, 100-D-100, 100-D-30, 100-D-104, and northern plume hexavalent chromium plume probably has a continuous source that has not been located precisely, but is associated with 100-D-73 (108-Building). These waste sites should be recognized in this section, even though no vadose zone continuous source is presented. Basis/Justification: Field evidence does not support this assumption.	Include a discussion on waste sites that are still contributing a continuous source from the vadose zone to groundwater by actual sampling.	5	5-78 - 5-79/43-2	Accept	A discussion of waste sites that are still contributing a continuous source from the vadose zone to groundwater will be added.	Yes - 1/30/2014
DH-366	Comment: The groundwater contaminant modeling does not seem to extend to areas where upwelling occurs in the river, which conflicts with the stated purpose of Chapter 5. Basis/Justification: The document states "Chapter 5 describes and predicts how quickly or slowly contaminants migrate and their potential to enter the Columbia River."	Include modeling that extends to the areas of upwelling in the river.	5	5-80/20-21	Accept with Modification	The text will be revised to clarify that the purpose of the model is to predict the rate and concentrations at which contamination moves towards the river. (It is not the objective of the model to predict upwelling at specific locations in the riverbed.) CLARIFICATION: additional modeling will not be performed for this purpose.	Yes - 12/4/2013
DH-367	Comment: Ecology was provided a white paper, "Crosswalk of WAC Requirements (WAC 173-340-747(8), 2007) for Use of Alternative Fate and Transport Modeling to Modeling Basis of Soil Screening Levels and Preliminary Remediation Goals for 100-D/H Remedial Investigation / Feasibility Study", to explain how the modeling effort described in Chapter 5 and Appendix F meets the WAC 173-340 requirements for alternative fate and transport modeling. Information of the type found in this crosswalk is needed in Chapter 5. Ten comments follow specifically on the crosswalk. It is strongly suggested that the Crosswalk of WAC Requirements be included in the body of the RI/FS or as an addendum to the RI/FS. As such the comments on the crosswalk have been included here. Basis/Justification: Chapter 5 and Appendix F do not contain a sufficient justification for the modeling effort to make it acceptable to Ecology.	Include justification for the alternative fate and transport modeling used in this document. Use all of Ecology's comments on Chapter 5, Appendix F and the crosswalk as a basis for the justification.	5, Crosswalk	General	Accept	The crosswalk will be added to Appendix F, and a summary and reference added to Chapter 5. The crosswalk references content in ECF-HANFORD-11-0063 that documents the specific application of the model in this application. The model itself is documented in model package report SGW-50776, which will be added to Appendix F and the AR in response to other comments. DOE/RL-2011-50 (the graded approach document) is referenced to cite the regulatory approval of the STOMP code for implementation of the model in a graded approach to calculate SSL and PRG values. Presentation and justification of specific parameters and assumptions are accomplished in this RI, primarily in the reports mentioned in this response.	Yes - 2/12/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-368	Comment: The modeling involves many nondefault assumptions, associated with all of the equations that have been used in the modeling, which are not the default 3-Phase Model of WAC 173-340-747(4), equation 747-1. Ecology does not have the equations that were used so we cannot defend them. Basis/Justification: The modeling information provided does not meet the burden of proof requirements in WAC 173-340-702(14)(b), which is required under section -747(8)(c).	(1) Provide the equations (2) Make revisions as necessary after Ecology has had a chance to review the equation OR use Equation 747-1 instead.	5, Crosswalk	General	Not Accepted	DOE/RL-2011-50 Rev. 1 provided the graded approach for evaluating groundwater protection used here. Agency concurred with DOE/RL-2011-50 Rev. 1. Use of alternative fate and transport models is one method permitted under WAC 173-240-747 for establishing Method B soil cleanup levels or Method C soil cleanup levels. DOE/RL-2011-50 Rev. 1 documents DOE's demonstration that the software (STOMP) meets the WAC requirements for implementation of alternative fate and transport models and provides the graded approach to be used, while leaving parameterization for specific applications including the 100-D/H RI/FS. DOE/RL-2011-50 Rev. 1 provided the regulatory basis for use of the STOMP code to implement alternative fate and transport models. Agency concurred with DOE/RL-2011-50 Rev. 1. The governing equations STOMP solves for water and solute mass conservation and momentum, along with the constitutive relationships between primary and dependent variables, are well documented in the cited STOMP Theory Guide (PNNL-12030).	Yes - 9/4/2013
DH-369	Comment: The document states that uranium Kd values were determined using (5)(ii), site data. However, Ecology has not approved of the Kd of 2 mL/g for uranium, as past comments and comments on this document indicate. The document also indicates that the hexavalent chromium Kd was derived from batch leaching. However, Ecology also has comments on this. Basis/Justification: Ecology has considered recent documents on uranium in the 300 area, which indicate that a Kd of 2 mL/g is too high for uranium. For hexavalent chromium only desorption was considered, and no results provided for sorption.	Change the response in the crosswalk in the second and 3rd rows of the table on page 2 to No.	5, Crosswalk	P. 2	Accept with Modification	As agreed in response to comment DH-580, the uranium Kd will be identified as "No Value Required". The Kd value for Cr(VI) is explicitly a desorption value, in that it applies to the residual hexavalent chromium remaining in the soil column and not the mobile fraction that has already migrated out of the vadose zone. This will be clarified elsewhere in response to other comments.	Yes - 2/4/2014
DH-370	Comment: The document states that biodegradation was not incorporated into the model, and that this is conservative. This is not always conservative. Basis/Justification: Contaminants such as chloroform can degrade to methylene chloride and chloromethane, which have higher cancer slope factors. Dichloroethylene can eventually degrade to vinyl chloride, which has a higher cancer slope factor than dichloroethylene.	Indicate in the crosswalk that, in some circumstances, neglecting biodegradation is not conservative.	5, Crosswalk	P. 5	Accept	Crosswalk revised to state the assumption may be non-conservative in some circumstances. Examples of degradation of chloroform to methylene chloride and dichloroethylene to vinyl chloride are given.	Yes - 2/26/2014
DH-371	Comment: Lack of consideration of groundwater contamination is not accepted. Basis/Justification: The modeling does not meet the requirements of WAC 173-340-747(8)(b)(vi) without consideration of upgradient contamination. Several comments have been included for Chapter 5 & Appendix F.	Predict contamination for the many upgradient sources or use present-day contamination.	5, Crosswalk	P. 7	No change	Consideration of the groundwater contaminant level changes over for existing groundwater plumes in comparison to the time of arrival of groundwater contamination resulting from residual soil contamination does not support the use of present-day groundwater contaminant levels to represent upgradient concentrations for scaling down of PRG values for protection of groundwater in the future. Because PRG values are established for protection of groundwater and surface water in the future, the predicted decline in groundwater contamination levels in the future are the appropriate upstream conditions to apply under WAC requirement 173-340-747(8)(b)(vi). Model results indicate that the existing groundwater contamination levels will decline below protection levels before a predictive Cr(VI) vadose zone model shows arrival in groundwater, and that the summation of these contaminant levels would not result in exceedances. Hence, the summed concentrations would not change the PRG values. Clarification: Ecology has determined that no dilution factor adjustments are needed in the alternative fate and transport modeling for the following reasons: • WAC language allows for dilution factor adjustment, but does not require it. • The soil PRGs for protection of groundwater/surface water for hexavalent chromium is not based on the results of alternative fate and transport modeling, but on the values from the interim cleanup actions (originally based on the "100 times rule"). • The fate and transport modeling results show no migration of vadose zone contaminants to groundwater within 1000 years. With no migration to groundwater, the value of the dilution factor is irrelevant. (from K. Welsch email 12-16-13)	Yes - 3/31/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-372	Comment: A site-specific estimate of infiltration was used, rather than a default. This affirms that default assumptions were not used in the STOMP modeling approach. Additionally, the assumptions about recharge are not accepted. Basis/Justification: The disturbed soils at backfilled waste sites are not like their undisturbed counterparts due to lack of horizons and loss of topsoil or blending of topsoil with subsoil. The lack of horizons, which could take a century to redevelop to their pre-disturbed conditions, will result in greater percolation and minimal evapotranspiration relative to undisturbed soils. Comments on Appendix F include several comments about recharge rates.	Use an irrigation scenario or use an infiltration rate of no less than 50 mm/y (in all time periods) if site-specific modeling can be justified.	5, Crosswalk	P. 8	Accept with Modification	Groundwater protection PRGs will be based on an irrigated scenario.	Yes - 2/4/2014
DH-373	Comment: The table indicates that assumptions other than default values provided in this chapter (WAC 173-340) were not used. This is not the case. Basis/Justification: Non-default assumptions are made with the use of all of the equations that have been used in the modeling, which are not the default 3-Phase Model of WAC 173-340-747(4), equation 747-1. Ecology does not have the equations that were used so we cannot defend them. The modeling information provided does not meet the burden of proof requirements in WAC 173-340-702(14)(b), which is required under section -747(8)(c).	(1) Provide the equations (2) Make revisions as necessary after Ecology has had a chance to review the equations. OR use Equation 747-1 instead.	5, Crosswalk	P. 10, 11	Not Accepted	DOE/RL-2011-50 Rev. 1 provided the graded approach for evaluating groundwater protection used here. Agency concurred with DOE/RL-2011-50 Rev. 1. Use of alternative fate and transport models is one method permitted under WAC 173-240-747 for establishing Method B soil cleanup levels or Method C soil cleanup levels. DOE/RL-2011-50 Rev. 1 documents DOE's demonstration that the software (STOMP) meets the WAC requirements for implementation of alternative fate and transport models and provides the graded approach to be used, while leaving parameterization for specific applications including the 100-D/H RI/FS. DOE/RL-2011-50 Rev. 1 provided the regulatory basis for use of the STOMP code to implement alternative fate and transport models. Agency concurred with DOE/RL-2011-50 Rev. 1. The governing equations STOMP solves for water and solute mass conservation and momentum, along with the constitutive relationships between primary and dependent variables, are well documented in the cited STOMP Theory Guide (PNNL-12030).	Yes - 9/4/2013
DH-374	Comment: The table indicates that the theory or technique used has widespread acceptance within the relevant scientific community. This is debatable, as it is not evident what theory or practice was used in developing this model. Basis/Justification: The equations used in this fate and transport modeling, and the order of their use have not been provided; Ecology cannot verify that the modeling is based on an accepted theory or practice. DOE/RL-2011-50 generally restates regulations and guidance and lists what can be done with STOMP, but did not provide the equations or explain what was actually done. It did not make a convincing case that the modeling used for the RI-FS was based on an accepted theory or practice.	Provide the equations and make the modifications indicated in comments pertaining to fate and transport modeling.	5, Crosswalk	P. 12	Not Accepted	DOE/RL-2011-50 Rev. 1 provided the graded approach for evaluating groundwater protection used here. Agency concurred with DOE/RL-2011-50 Rev. 1. Use of alternative fate and transport models is one method permitted under WAC 173-240-747 for establishing Method B soil cleanup levels or Method C soil cleanup levels. DOE/RL-2011-50 Rev. 1 documents DOE's demonstration that the software (STOMP) meets the WAC requirements for implementation of alternative fate and transport models and provides the graded approach to be used, while leaving parameterization for specific applications including the 100-D/H RI/FS. DOE/RL-2011-50 Rev. 1 provided the regulatory basis for use of the STOMP code to implement alternative fate and transport models. Agency concurred with DOE/RL-2011-50 Rev. 1. The governing equations STOMP solves for water and solute mass conservation and momentum, along with the constitutive relationships between primary and dependent variables, are well documented in the cited STOMP Theory Guide (PNNL-12030).	Yes - 9/4/2013
DH-375a	375a - [Comment: The table indicates that the assumptions used in applying this information would err on behalf of protecting human health and the environment. This is not the case. Basis/Justification: Dilution factors from the 1-D STOMP modeling effort are roughly 1000 to 10,000 times higher for the base case (and 10 to 1000 times higher for irrigation) than the default dilution factor in WAC 173-340-747(4) of 20. Consequently, the base case of PRGs (and irrigation SSLs) ends up orders of magnitude higher than WAC 173-340-747 default soil cleanup levels.] Furthermore, use of recharge parameters that are based on undisturbed soil for backfilled waste sites does not err on behalf of protecting human health and the environment. These are just two examples of nonconservative assumptions. See all of Ecology's comments related to fate and transport modeling.	Provide the equations, revise the recharge rates, and make the other modifications to the modeling effort that are indicated in all of the comments made in this comment set about the fate and transport modeling.	5, Crosswalk	P. 14	Accept with Modification	Clarification will be added to note that default assumptions would be more conservative, but site-specific data is appropriate.	Yes - 9/4/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-375b	Comment: The table indicates that the assumptions used in applying this information would err on behalf of protecting human health and the environment. This is not the case. Basis/Justification: Dilution factors from the 1-D STOMP modeling effort are roughly 1000 to 10,000 times higher for the base case (and 10 to 1000 times higher for irrigation) than the default dilution factor in WAC 173-340-747(4) of 20. Consequently, the base case of PRGs (and irrigation SSLs) ends up orders of magnitude higher than WAC 173-340-747 default soil cleanup levels. 375b - [Furthermore, use of recharge parameters that are based on undisturbed soil for backfilled waste sites does not err on behalf of protecting human health and the environment. These are just two examples of nonconservative assumptions. See all of Ecology's comments related to fate and transport modeling.]	Provide the equations, revise the recharge rates, and make the other modifications to the modeling effort that are indicated in all of the comments made in this comment set about the fate and transport modeling.	5, Crosswalk	Pg. 14	Accept with Modification	Recharge rates will be revised to use the disturbed conditions values cited in PNNL-14702 Rev 1. Restoration of surface soils and native vegetation conditions are part of the restoration activities; DOE does not plan to leave these sites in disturbed conditions. Revegetation is occurring in accordance with the *Hanford Biological Resources Management Plan* . Revegetation is considered in the remedial design for the waste sites and is included in the cost estimates of the remedial action.	Yes - 9/4/2013
DH-376	Comment: The text indicates that the quality of information is based on a Quality Assurance Project Plan for Modeling. There is not enough information provided about this document for Ecology to find the QA project plan. Basis/Justification: It is stated that the QA project plan is based on EPA/240/R-02/007, EPA-QA-G-5M, which provides many elements that are needed in a QA project plan to demonstrate that the information used for this modeling is of sufficient quality. These elements include model design (conceptual model, mathematical formulation of the theory, identification of needed inputs, scientific peer review, calibration, and model testing). While the STOMP code in general or in specific applications may have been evaluated in this way, it does not appear that the 1-D STOMP model used here has been evaluated in this way. No document number or authors are provided to allow Ecology to find the QA Project Plan for this modeling effort.	Include in the RI-FS the Quality Assurance Project Plan for Modeling that was prepared for this modeling effort.	5, Crosswalk	P 15-16	No change	The Quality Assurance Project Plan for Modeling is an internal QA/QC procedure that is not appropriate for inclusion in the RI/FS document or AR. A hard copy was provided to Ecology for review.	Yes - 8/7/2013
DH-377	Comment: Insufficient information about the quality of all parameters, as well as the modeling effort, is provided here and in the RI-FS. Basis/Justification: EPA/240/R-02/007, EPA-QA-G-5M suggests ranking the importance of particular parameters based on how they influence the output, and putting the important parameters under the greatest scrutiny. These parameters would include sorption, recharge and hydrologic parameters. However, the quality control of all of the Kds, recharge values and the hydrologic parameters is not provided and needs to be to make a convincing case that the information is of sufficient quality with a known error rate. At this time it appears that this effort does not meet the requirements in WAC 173-340-702(16).	Describe the quality control procedures used to establish each Kd and each hydrologic parameter, and discuss the error rate for these parameters.	5, Crosswalk	General	Accept with Modification	Quality control is addressed through QA/QC procedure that requires checking of model applications (including input values) to ensure the inputs used in the code match those declared in the documentation (ECFs in Appendix F); text will be added in discussing model inputs to convey that these steps were taken to ensure models were constructed and applied under a QA/QC process. The source of the input parameter values is provided in the detailed information provided in the model package reports that document model construction (which will be added to Appendix F in response to other comments) and in the ECFs that document model application (ECFs are already in Appendix F). The question of parameter importance ranking is a separate matter than QA/QC; this is addresses through sensitivity and uncertainty analysis. The pedigree of Kd values is already fixed by the sources (primarily the WAC) and were hence not deemed suitable parameters for sensitivity/uncertainty analysis. Recharge values are represented in two very different recharge scenarios (native vegetation and irrigation) that demonstrate the sensitivity of results to variation in this parameter. Recharge values were chosen to be conservative relative to the source measurements quoted in the model package reports and ECFs. Sensitivity of the models to other hydrologic parameters are explored in the model package reports (which are being added to Appendix F).	Yes - 1/28/2014
DH-378	Comment: In our RCBRA comments, Ecology made many comments about contaminants that should be included in the risk assessment. A list of contaminants to be included in risk calculations is included above with our Chapter 4 comments. Basis/Justification: The list of contaminants is based on groundwater data and RCBRA.	See the contaminant list in a previous comment and include those contaminants in the risk calculations for the locations where the contaminants have been detected above background.			Accept with Modification	This comment will be addressed by the revisions made in response to comment DH-122.	Yes - 5/22/2014
DH-379	Comment: The text makes reference to PRG values from RCBRA. The text should specify the pathways for the PRGs, as the pathway to groundwater was not included in RCBRA. Basis/Justification: RCBRA only considered direct contact and food ingestion pathways for soils for humans. Furthermore, since RCBRA was not a primary document, and because we had many comments, Ecology did not accept the PRGs presented in RCBRA.	Specify in the bullet the pathways to which the PRG values apply in RCBRA.	6		Accept	Suggested text revision will be incorporated.	Yes - 1/27/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-380	Comment: Any reference to MTCA Method B as applied in RCBRA must specify direct contact, because the leaching pathway was not evaluated in RCBRA. Basis/Justification: RCBRA did not evaluate the leaching pathway, so risks associated with that pathway were overlooked. Ecology's comments on RCBRA stressed that all references to MTCA Method B must specify the direct contact pathway.	Modify the text in lines 36-39 , p. 6-3 to: Chapter 2 of the RCBRA (DOE/RL-2007-21, Volume II) presents a screening-level assessment of residual direct contact risks and noncancer hazards….. Also, modify the text in lines 23-24, p. 6-4 to: Residual cumulative cancer risks for the direct contact pathway from chemicals evaluated in the RCBRA are less than 1 x 10-5 using the interim action ROD residual scenario (that is, the direct contact pathway of MTCA Method B Unrestricted Land Use scenario).	6		Accept	Suggested text revision will be incorporated.	Yes - 10/22/2013
DH-381	Comment: Direct contact must be specified when referring to MTCA Method B and RCBRA. Basis/Justification: See other comments related to this comment.	In the third row, first column of the table, modify the text to MTCA Method B direct contact soil cleanup levels for unrestricted land use.	6	6-13/ Table 6-4	Accept	All references to MTCA Method B will specify the direct contact pathway.	Yes - 1/27/2014
DH-382	Comment: For technical accuracy, the sentence should be edited as follows: "Considerations for determining data to be retained include method-associated sample size, detection frequency, method sensitivity, and detection limits."	Edit sentence as follows: "Considerations for determining data to be retained include method-associated sample size, detection frequency, <u>method sensitivity</u>, and detection limits."	6	6-36/20-21	Accept	Suggested text revision will be incorporated.	Yes - 6/26/2013
DH-383	Comment: The document gives a list of conditions under which the EPC defaults to the maximum. The third bullet states "When a valid 95 percent UCL is greater than the maximum detected concentration" This is not accepted. Basis/Justification: Ecology has consistently stated that we would not accept the use of a maximum in cases where a 95% UCL is greater than the maximum. This generally occurs when the data set is small, creating uncertainty about the concentration because small data sets are often not representative of a population. Ecology is required to err on the side of protection. In this case that would be to use the 95% UCL.	Use the 95% UCL for the EPC in cases where the 95% UCL exceeds the maximum in the data set. From email sent 7/31/13 from ECY, the following clarifies this comment: Comment 383 refers to a situation where a valid 95% UCL can be calculated with ProUCL, but DOE is choosing a maximum value instead of the 95% UCL because the 95% UCL is greater than the maximum. In this case, WAC 173-340-740(7)(d)(i)(A) for soils and WAC 173-303-720(9)(d)(i)(A) for GW Ecology requires that the 95% UCL value is to be used.	6	6-41 and 6-42/9 and Fig. 6-42	Not Accepted	EPA guidance does not recommend the use of a value greater than the maximum for use as an exposure point concentration (EPC). When The ProUCL software calculates a 95% UCL greater than the maximum, the software automatically attempts to calculate a higher level upper confidence level (UCL) in this situation, including 97.5% UCL and 99% UCL, using the Chebyshev method. If any of these calculations succeed in calculating a UCL less than the maximum, ProUCL recommends this UCL and it is used as the EPC. ~~However, due to long tails and a few detections in some situations, none of these approaches works.~~ In all the waste sites evaluated in this RI/FS, this situation was encountered 52 out of 2,864 ProUCL calculations (1.8% frequency) at the 100-D OU and in 25 out of 1,479 ProUCL calculations for 100-H OU (1.7% frequency). Accordingly, a 95% UCL that exceeds the maximum was not used in the soil risk assessment. The environmental calculation will be revised to report summary statistics for those cases where a 95% UCL is greater than the maximum detected concentration; it will provide a qualitative evaluation to determine, and report, whether use of the 95% UCL would result in a different conclusion.	Yes - 7/17/2014
DH-384	Comment: The document states "Because the sampling design for these decision units focused on areas of suspected contamination, the conclusion that maximum detected concentration exceeds the true population mean in a focused decision unit can be made with certainty. Additionally, the closeout documentation for the focused decision units used the maximum detected concentration to determine whether the remedial action.. goal has been attained…" This text is misleading. Basis/Justification: A suspected area is not a certain area of contamination, and is not inclusive of all of the site contamination. The areas chosen for focused sampling are often chosen on the basis of indirect evidence, such as geophysical anomalies, and not based on analytical data for all of the contaminants. Furthermore, the maximum detected concentration is not necessarily a conservative result, since the limited coverage in focused designs may miss the areas of highest contamination.	Delete the quoted text.	6	6-41/15-20	Accept with Modification	Text changed during comment response meeting on 6/26/13 and the change was agreed upon.	Yes - 6/26/2013
DH-385	Comment: The text states, "For sample results where all uranium isotope results are reported as nondetects, the individual values are not summed, but the maximum nondetect value is retained and put in the ProUCL file, flagged as a nondetect." This is contradictory to the information presented in Figure 6-5, which states that if an analyte is not detected in the decision unit, then ProUCL assigns a value of "0"; and the analyte is eliminated from further consideration in the decision unit. Clarify the discrepancy.	Clarify the discrepancy between the text in section 6.2.2.3 and the information shown in Figure 6-5 pertaining to ProUCL treatment of nondetected uranium isotopes.	6	6-43/10-12	Accept	Text and associated figure will be revised to describe clearly how uranium isotopes were processed for input into ProUCL.	Yes - 6/26/2013
DH-386	Comment: The version of MTCA used for interim action remediation was the 1996 version of the regulation, rather than the current 2007 revision of the regulation. Basis/Justification: There were many changes made in the calculation methods for soil cleanup levels in the 2001 revision of MTCA. The year of the regulation is important information and must be included.	Give the year of the MTCA regulation in each instance where the regulation is cited throughout this RI/FS.	6	6-46/16-27	Accept	Text will be revised to indicate the year of the MTCA regulation.	Yes - 1/27/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-387	Comment: Though the residential scenario in RCBRA did not evaluate the inhalation pathway for groundwater, Ecology has requested this analysis in the past. We have requested consideration of hexavalent chromium inhalation as an aerosol during showering. Basis/Justification: Hexavalent chromium is a major contaminant in groundwater in the 100-D and H areas, and is a known carcinogen by inhalation. There is even evidence that it is a carcinogen by ingestion, and it may be treated in this way in the future. Furthermore, it is known that metals or nonvolatile contaminants can be incorporated in water aerosols; an example of this is Tc-99 in condensate from vapor extraction and soil drying efforts at Hanford. Additionally, some past risk assessments for tank farm evaluations have considered inhalation of hexavalent chromium during showering.	Include in the groundwater risk assessment an analysis of the inhalation pathway for hexavalent chromium, a carcinogen, during showering. 7/31/13 - ECY provided clarification via email on how to Close with Modification this comment, This was to be added to the RCR: Comment 387: Though the residential scenario in RCBRA did not evaluate the inhalation pathway for groundwater, Ecology has requested this analysis in the past. We have requested consideration of hexavalent chromium inhalation as an aerosol during showering. Basis/Justification: Furthermore, it is known that metals or nonvolatile contaminants can be incorporated in water aerosols; an example of this is Tc-99 in condensate from vapor extraction and soil drying efforts at Hanford. Additionally, some past risk assessments for tank farm evaluations have considered inhalation of hexavalent chromium during showering. Ecology will close this comment under the condition that the following be added to the document: "A study by Finley et al (1996) determined that cancer risk from exposure during showering with Cr (VI) aerosols from tapwater ranged from 9E-07 to 5.5E-06 for shower water having 2 to 10 mg/L Cr (VI).	6	6-46/28-46	Accept with Modification	In the text proposed on 7/13/13, Ecology indicates that differences in air concentrations are due in part to the relatively brief duration of showers, compared with those of chronic industrial or residential exposures through breathing ambient air. However, the basis for this conclusion is not provided (timeframe or exposure duration discussions are not provided in the paragraph). Moreover, the Finley et al (1996) study cannot be directly compared to the values published by ATSDR (MRL) or IRIS (RfC or IUR). The air concentrations reported in the Finley study are direct Cr(VI) measurements from 24 hours of shower use. The intermediate MRL that is cited above is based on 15 to 364 days exposure to hexavalent chromium aerosols and mists. The RfC is based on three studies with the median exposure time of 4.5 years. The URF values are based on the number of deaths over a lifetime. As a result, the air concentrations listed above are not comparable because the published values are not direct measures but are derived concentrations that are created from dose response curves from a variety of studies that represent different time frames and durations, occupational settings instead of a shower setting, adjusted by uncertainty factors and modifying factors, and are used to evaluate different endpoints. As such, the data from these studies can't be used to draw conclusions about air concentrations, groundwater concentrations, or potential risk levels that could result from showering. Suggest the discussion be limited to the Finley et al (1996) study and incorporate 100-D/H information. Text has been revised accordingly.	Yes - 1/30/2014
DH-387 (Cont'd)		This suggests that risks associated with showering with water having Cr (VI) concentrations greater than 2 mg/L would generally exceed 1E-06 cancer risk, which exceeds the WAC 173-340 risk limit for an individual carcinogen. Several wells in the Cr (VI) plume areas currently exceed 2 mg/L Cr (VI). It is recognized that the shower air Cr (VI) concentration in the above study, 87E-03 to 324E-03 µg/m3, was somewhat above the ASTDR minimum risk level (MRL) of 5E-03 µg/m3 for Cr (VI) in aerosol mists for chronic noncancer upper respiratory effects (ASTDR, 2012). The shower air Cr (VI) concentration was also above the IRIS 1E-04 risk level, associated with air having 8E-03 µg/m3 Cr (VI), which also happens to be equivalent to the IRIS RfC for nasal septum atrophy (a noncancer effect). The discrepancy between the Finley et al (1996) results and the ATSDR MRL and IRIS risk and RfC values likely relates, at least in part, to the relatively brief duration of showers, compared with those of chronic industrial or residential exposures through breathing ambient air." Also add the following References: "ATSDR. 2012. Toxicological profile for chromium, U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Atlanta, GA, accessed on 7/25/13 at http://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=62&tid=17 Finley, BD, DG Dodge, SM Meyers, RO Richter, and DJ Paustenbach, 1996. Assessment of airborne hexavalent chromium in the home following use of contaminated tapwater, J. Expo. Anal. Environ. Epidemiol. Apr-Jun. 6(2): 229-24"					
DH-388	Comment: The text states "It is noted that aquatic water quality criteria are only directly applicable where groundwater discharges to surface water." This isn't the case. Basis/Justification: WAC 173-340-720(4)(b)(ii) (2007) indicates that WAC 173-340 Method B for potable groundwater applies for the protection of surface water beneficial uses, and references WAC 173-340-730; in this way, water quality standards are incorporated in WAC 173-340-720. WAC 173-340-730(3)(b)(i) also gives the relationship of water quality standards and WAC 173-340. Therefore, the aquatic water quality criteria do apply to the ground water because the property abuts the surface water.	Delete the quoted text.	6	6-46/37-38	Accept with Modification	Sentence has been deleted. However, being protective of surface water and achieving surface water standards at the groundwater/surface water interface does not mean that surface water standards apply throughout the plume.	Yes - 2/12/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-389	Comment: The document discusses that the recent change in the cancer slope factor for trichloroethene (TCE) would result in increases in cleanup levels. However, this is superseded by the recent reduction in the noncancer reference dose and inhalation reference concentration. This should be discussed, since it is the reference dose and reference concentration that would set the cleanup levels using the revised toxicity information. Basis/Justification: The revised noncancer reference dose in IRIS is 5E-04 mg/kg/day for TCE, and the revised RfC is 2E-03 mg/m3.	Discuss the revisions in the reference dose and reference concentration and the impact of using these values on changes in the TCE cleanup levels.	6	6-57/20-32	Accept	Risk-based concentrations and risk estimates will be calculated using recently published toxicity values.	Yes - 5/21/2014
DH-390	Comment: The document states "When evaluating toxicity, 1,1-dichloroethane is not considered a carcinogen by Ecology." This is not correct. Basis/Justification: Though no slope factor value is given in CLARC on-line for 1,1-dichloroethane, a link is provided to an explanation about toxicity database hierarchy, with discussion about using Tier 3 values based on OSWER Directive 9285.7-53. The slope factor given in the Regional Screening Levels qualifies as a Tier 3 carcinogenic slope factor. Therefore, this is a defensible value that is consistent with CLARC on-line. Ecology considers 1,1-dichloroethane to be a carcinogen.	Delete the quoted text, and use the slope factor from the Regional Screening Levels.	6	6-58/7-16	Accept	Risk-based concentrations and risk estimates will be calculated using recently published toxicity values.	Yes - 5/21/2014
DH-391	Comment: The document states "The risk characterization step is completed through the comparison of the EPC to the PRG. This comparison step is used to determine whether the post-remediation soil concentrations are protective of human health." This is not entirely correct. Basis/Justification: Risk characterization includes comparing total cancer risk and hazard index to thresholds, rather than just comparing with PRGs.	Revise the statement to: Risk characterization is completed through the comparison of the EPC to the PRG, and comparison of total site cancer risk and site noncancer hazard index to their respective thresholds. These steps are used to determine whether the post-remediation soil concentrations are protective of human health.	6	6-58/21-23	Accept	Suggested text revision incorporated.	Yes - 10/22/2013
DH-392	Comment: Using a PRG in the denominator does not always yield a risk or hazard-based HQ. Basis/Justification: Line 31 indicates that the PRG is based on HQ = 1. However, some PRGs are based on MCLs, rather than risk-based (driven by a cancer slope factor) or hazard-based (driven by a reference dose) values. The calculation here is for a risk estimation method, so it should be based on health effects.	Change the denominator to a risk-based or hazard-based term.	6	6-59 - 6-60/equations	Accept with Modification	As agreed in 6/26/2013 review meeting, the term PRG was replaced with RBSL.	Yes - 10/2/2013
DH-393	Comment: The document states "Additionally, arsenic EPCs were compared to the MTCA ("Tables" [WAC-173-340-900], Table 740-1) Method A soil cleanup level for Unrestricted Land Use of 20 mg/kg." Method A is not appropriate for Hanford when Method B values are available as is the case for arsenic. Basis/Justification: WAC 173-340-740(2)(a) states "Method A soil cleanup levels may only be used at sites qualifying under WAC 173-340-704(1)", which states "Method A may be used to establish cleanup levels at sites that have few hazardous substances....." Hanford waste sites do not qualify as sites that have few hazardous substances. Therefore, Method A is not applicable for arsenic. For lead, on the other hand, a reference dose is not available for calculating a Method B value, so the IEUBK model is the approach that is generally used.	Since Method B values for arsenic are below Hanford site background, use the Hanford site background value of 6.5 mg/kg for arsenic.	6	6-60/20-21	Accept with Modification	Consistent with the June 11, 2013 memo from Ecology, the MTCA ("Tables" [WAC 173-340-900], Table 740-1) Method A soil cleanup level for Unrestricted Land Use of 20 mg/kg will be used.	Yes - 5/21/2014
DH-394	Comment: The document references ECF-HANFORD-11-0038 but does not include it or the background determinations that were to be conducted as part of RI/FS Task 3 in DOE/RL-2008-46 (see p. 5-7, Section 5.3.1 of Rev. 0). Basis/Justification: The RI/FS integrated work plan (DOE/RL-2008-46) stated that site-specific background values for antimony, boron, selenium and molybdenum would be determined for developing RAGs. At this time Ecology has not accepted the large SSLs, PRGs or ecological protection values provided in this document; site-specific background values are needed for all of these contaminants as WAC 173-340-Table 749-3 values are likely very close to background for these contaminants.	Provide ECF-HANFORD-11-0038 for Ecology review and as part of this document.	6	6-61/10-25	Accept	ECF-HANFORD-11-0038 will be added to Appendix F and the Administrative Record.	Yes - 7/10/2013
DH-395	Comment: This run-on sentence does not make sense. It states two different As and Pb levels for the same location. Basis/Justification: Consistency and accuracy.	Reword sentence.	6	6-99/37-40	Accept	Sentence has been revised to improve clarity.	Yes - 1/28/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-396	Comment: The text indicates that focused sampling, and having too few results to calculate a valid 95% UCL result in overstatement of risk. This is not correct. Basis/Justification: Focused sampling can miss areas of high contamination due to a lack of coverage and lack of indirect evidence of contamination.	Change line 38 to state: When these conditions are met, the sampling design is inadequate for estimating risk. The outcome may underestimate or overestimate risk.	6	6-110/32-38	Accept	Suggested text revision incorporated.	Yes - 10/2/2013
DH-397	Comment: For technical accuracy, the sentence should be edited as follows: "Considerations for determining data to be retained include method-associated sample size, detection frequency, method sensitivity, and detection limits."	Edit sentence as follows: "Considerations for determining data to be retained include method-associated sample size, detection frequency, method sensitivity, and detection limits."	6	6-125/20-21	Accept	Suggested text revision will be incorporated.	Yes - 6/26/2013
DH-398	Comment: The flow sheet for selecting COPCs and the method described in p. 6-121 through 6-162 are not accepted. The rejection of contaminants based on comparison with action levels is not accepted Basis/Justification: Ecology has consistently rejected comparisons with action levels as a basis for selecting contaminants because this approach overlooks spatial and temporal trends and additive risks associated with multiple contaminants. From K. Welsch's email on 10/30/13: Ecology has investigated the impact of eliminating contaminants from the risk calculations in this document (i.e., 100 D/H-RI/FS), based on comparisons with action levels. As an estimate, Ecology compared the maximum concentrations for the contaminants listed in Table 6-32 with WAC 173-340-720 (2007) Equation 720-1 and 720-2 concentrations to determine if they exceed hazard quotients of 0.1 or cancer risk of 1E-6 (based on USEPA Region 10 "Recommendations for Human Health Risk-based Chemical Screening and Related Issues at EPA Region 10 CERCLA and RCRA Sites", April 17, 2007 memorandum). These criteria were used to determine if the contaminants in Table 6-32 are likely to contribute greater than 1% of the risk or hazard (consistent with EPA/540/1-89/002) at groundwater wells. It was determined that for 100-D and H areas, based on this RI/FS, excluding contaminants from risk calculations based on action levels generally should not change risk assessment outcomes for 100-D and H areas (with the potential exceptions of nitrite and nickel) and will not require recalculations of risk and hazard indices as a result of screening against action levels. However, Ecology will not accept screening against action levels as a means of eliminating contaminants from risk calculations for other operable units.	Include at least all of the following nonradioactive contaminants in risk calculations for both water and soil, in all locations with detections that are above background: Nitrate, carbon tetrachloride, chloroform, hexavalent chromium, total chromium, vanadium, manganese, tetrachloroethylene, nickel, cobalt, lead, molybdenum, arsenic, zinc, fluoride, silver, strontium, lithium, barium, trichloroethylene, Aroclor-1254, bis(ethylhexyl)phthalate, 1,2-dichloroethane, uranium, tributylphosphate, cadmium, di-n-butylphthalate, Aroclor-1242, Aroclor-1260, fluoranthene, mercury, pyrene	6	6-121 and 6-125-6-162 and general/ Fig.6-6 and all of 6.3.2.2 and general	Accept with Modification	Flow sheets for identifying COPCs will be revised based on the email correspondence provided by Ecology (Kim Welsch) to RL (James A. Hansen) on November 5, 2013: "In addition, Ecology highly recommends the following changes to Figure 6-6 "Overview of COPC Identification Process" on page 6-121 of the RI/FS: Justification: The figure is confusing in identifying the datasets used for each portion of the figure. Although, the information may be contained in the text of the RI/FS, it would really assist the reader in understanding what datasets were used for the three different pathways (three pronged approach as discussed in meetings) illustrated to identify the COPCs. Changes: 1. rename the figure so that it is not confused with figures 6-9 and 6-11. 2. ideally, it would be better to split this figure into 3 figures: one for the "Comparison to Action Levels" (Red column), two for the "Individual Contaminant Evaluation" (Blue Column and three "Tap Water Evaluation" (Green column). Another less preferred option would be to split the top oval box into three, one for each section that would include a description of the data set that was used for each column. Also, the boxes and colors added to the figure by Theresa Bergman would be a very good addition." DH-122 revisions further address this comment.	Yes - 5/21/2014
DH-399	Comment: Ecology consistently rejects the use of the 90th percentile in lieu of the 95% UCL for exposure point concentrations when the 95% UCL exceeds the 90th percentile. Basis/Justification: Use of the 90th percentile was not conservative for important contaminants, such as carbon-14 and tritium, in 100-K, where the 95% UCL was twice the value of the 90th percentile (ECF-100KR4-10-0472 in DOE/RL-2010-97, Draft A). It also appears not to be conservative for Cr (VI) in the 100-D OU (p. 6-202, lines 15-18 of this document). It is also not consistent with OSWER 9285.6010.	Use the larger of the 95% UCL and the 90th percentile for calculating EPCs. 7/31/13 - ECY provided an email clarification to this comment as follows: Comment 399 refers to a situation in which a valid 95% UCL cannot be calculated due to a small number of detects. In this case, WAC 173-340-740(7)(f)(iv) for soils and WAC 173-303-720(9)(f)(iv) for GW Ecology requires the use of the maximum. Note: A 90th percentile is not consistent with ProUCL or WAC 173-340-740(7) compliance monitoring, and is not recommended. If, on a contaminant by contaminant basis, the 90th percentile is a more conservative (higher) value and DOE prefers it instead of a lower 95% UCL for a particular contaminant, DOE can make a case to use it.	6	6-144 and general/S. 6.3.2.3.6 and general	Accept with Modification	Per agreement in February 2014, column headings to Table 6-55 needed to change to include the term "or ProUCL Value". Table 6-55 is now labeled Table 6-57. Both sets of statistics are available for each groundwater exposure area based on the DURA data set. Forward risk estimates (residential tap water scenario) will be calculated using the 95% UCL value. Risk estimates will not be calculated using a combination of the two sets of statistics (i.e., using the largest of the 95% UCL and the 90th percentile value). Note that this sensitivity analysis is not likely to identify any additional contaminants as COPCs or COCs for evaluation of remedial alternatives.	Yes - 5/21/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-400	Comment: The document gives the primary noncancer health effect of Cr (VI) to be nasal septum atrophy. However, Cr (VI) has other toxic effects and target organs through ingestion that make its toxicity additive with that of other contaminants. Basis/Justification: While nasal septum atrophy is an important effect by inhalation, Cr (VI) is also a kidney toxin by ingestion, and the basis of the reference dose in IRIS is decreased water consumption, and accumulation in tissues.	Ensure that Cr (VI) hazard is added with those of other kidney toxins and toxins with similar modes of action for calculating hazard indices. 7/31/13 - ECY provided an email on how this comment could be closed as follows: 3. DH-400 – Closed if the following is added to your response on this comment (no addition to RI/FS would be required): Comment 400: The document gives the primary noncancer health effect of Cr (VI) to be nasal septum atrophy. However, Cr (VI) has other toxic effects and target organs through ingestion that make its toxicity additive with that of other contaminants. Basis/Justification: While nasal septum atrophy is an important effect by inhalation, Cr (VI) is also a kidney toxin by ingestion, and the basis of the reference dose in IRIS is decreased water consumption, and accumulation in tissues. Ecology is closing this comment under the condition that the following be added to the disposition (including References): "Ecology is closing this comment due to the scarcity of reference dose information for non-inhalation pathways and non-respiratory organs for Cr (VI). However, information from OEHHA (2000) and ATSDR (2012) indicate adverse effects to other target organs from chromium exposure by both inhalation and ingestion: "Urinary levels of beta2-microglobin in 24 chrome platers increased in dose-dependent fashion with increasing intensity of exposure to Cr (VI), indicating a nephrotoxic effect resulting from inhalation of Cr (VI) (Lindberg and Vesterberg, 1983). The 8-hr mean Cr (VI) levels ranged from 2 to 20 µg/m3 and averaged 6	6	6-178/8-9	No change	RL proposes to modify the response identified by Ecology to read: Ecology is closing this comment due to the scarcity of reference dose information for non-inhalation pathways and non-respiratory organs for Cr (VI). However, information from OEHHA (2000) and EPA (1998) indicate adverse effects to other target organs from chromium exposure by inhalation: "Urinary levels of beta2-microglobin in 24 chrome platers increased in dose-dependent fashion with increasing intensity of exposure to Cr(VI), indicating a nephrotoxic effect resulting from inhalation of Cr(VI) (Lindberg and Vesterberg, 1983a,b). The 8-hr mean Cr(VI) levels ranged from 2 to 20 µg/m3 and averaged 6 µg/m3. Total exposure times ranged from 0.1 to 26 years and averaged 5.3 years." (OHHEA, 2000); "Male workers in the chromate and dichromate production industry, whose occupational exposures were 0.05 to 1.0 mg Cr (VI)/m3 as chromium trioxide for a mean of 7 years, were reported to have elevated levels of low molecular weight proteins (retinol binding protein and tubular antigens) in the urine (Franchini and Mutti, 1988). The authors suggest that the presence of such proteins in the urine is an early indicator of kidney damage." (OHHEA, 2000); "Gastritis and duodenal ulcers, in addition to ulceration and perforation of the nasal septum, were observed in chrome platers exposed to a mean breathing zone concentration of 4 µg/m3 chromic acid for an average of 7.5 years (Lucas and Kramkowski, 1975). " (OHHEA, 2000). Franchini I, Mutti A. 1988. Selected toxicological aspects of chromium(VI) compounds. Sci Total Environ 71:379-387. Lindberg E, Vesterberg O. 1983a. Monitoring exposure to chromic acid in chrome plating by measuring chromium in urine. Scand J Work Environ Health 9:333-340. Lindberg E, Vesterberg O. 1983b. Urinary excretion of proteins in chrome platers, exchrome platers and referents. Scand J Work Environ Health 9:505-510.	Yes - 10/22/2013
DH-401	Comment: The text states "Based on the anticipation of uncertainty when quantifying exposure and toxicity, the health risks and hazards presented in this groundwater risk assessment are more likely to provide an upper boundary on risk." This is not correct. Basis/Justification: Many of Ecology's comments point out nonconservative assumptions for exposure assessment; toxicity assessment is also nonconservative. For instance, Cr (VI) appears to be carcinogenic by ingestion, but since this is new information Cr (VI) is not treated as such in this document; it is a very significant contaminant in these OUs, making its treatment only as a hazard quite nonconservative. Additionally, using a cleanup level for arsenic that is more than three times background and over 30 times the concentration for a 1E-06 risk is also very nonconservative. There are numerous additional issues (especially for exposure assessment) given in Ecology's comments.	Delete the quoted text.	6	6-193/5-6	Accept	Statement has been deleted as suggested.	Yes - 10/2/2013
DH-402	Comment: This paragraph discusses problems with calculating 95% UCLs that are not actually problems. Basis/Justification: The paragraph discusses that ProUCL can calculate 95% UCLs for censored data that actually use the nondetects.	Use the larger of the 95% UCL and the 90th percentile for calculating EPCs.	6	6-194/27-43	Accept with Modification	Per agreement in February 2014, column headings to Table 6-55 needed to change to include the term "or ProUCL Value". Table 6-55 is now labeled Table 6-57. Both sets of statistics are available for each groundwater exposure area based on the DURA data set. Forward risk estimates (residential tap water scenario) will be calculated using the 95% UCL value. Risk estimates will not be calculated using a combination of the two sets of statistics (i.e., using the largest of the 95% UCL and the 90th percentile value). Note that this sensitivity analysis is not likely to identify any additional contaminants as COPCs or COCs for evaluation of remedial alternatives.	Yes - 5/21/2014
DH-403	Comment: The table indicates that only about 57 results for each contaminant were used from the groundwater data set for all of 100-HR-3. Such a small dataset is not likely to be representative of this whole OU. Basis/Justification: This dataset may be based on only 5 years of data. This is a large OU, and 5 years can hardly represent the range of hydrologic conditions that may apply even in the coming year, let alone the future.	Use at least 10 years of groundwater data to represent this OU.	6	6-199-6-200/ Table 6-55	No change	Inclusion of an additional five years of historical data in the RI/FS report (which were included in the work plan analysis) would render results similar to those reported in the RI/FS work plan and those currently reported. Additional level of effort would be required to explain uncertainties associated with data quality, but would not result in a different set of contaminants that require evaluation of remedial alternatives.	Yes - 7/10/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-404	Comment: The document discusses that the recent change in the cancer slope factor for trichloroethene (TCE) would result in increases in cleanup levels. However, this is superseded by the recent reduction in the noncancer reference dose and inhalation reference concentration. This should be discussed, since it is the reference dose and reference concentration that would set the cleanup levels using the revised toxicity information. Basis/Justification: The revised noncancer reference dose in IRIS is 5E-04 mg/kg/day for TCE, and the revised RfC is 2E-03 mg/m3.	Discuss the revisions in the reference dose and reference concentration and the impact of using these values on changes in the TCE cleanup levels.	6	6-204-6-205/S. 6.3.8.3.5, whole section	Accept	Risk-based concentrations and risk estimates will be calculated using recently published toxicity values.	Yes - 5/21/2014
DH-405	Comment: The discussion of the Columbia River Component (CRC) Risk Assessment omits some important information from the CRC risk assessment. Basis/Justification: Section 4.2.1.1 in Volume II of the CRC RA discusses the high levels of chromium (including hexavalent chromium) in sediments and surface water in the D and H areas (river miles 378-379 and 372-373), and also discusses a number of radionuclides. Page 6-214 of this document does not give this level of detail.	Include pertinent information from Section 4.2.1.1 from Volume II of the CRC risk assessment regarding chromium, nickel and radionuclides (carbon-14, cobalt-60, europium-152, and cesium-137). Discuss the sources of these contaminants in 100-D and H areas specifically (river miles 378–379 and 372-373).	6	6-208-6-215/S. 6.4.2 General	Accept	The CRC looked at the River whereas the RI/FS looks at the larger pathway. This can augment some of the CRC conclusions and are reflected in text from Chapter 6, 7 and associated appendices. The CRC report was reviewed and RI/FS text is updated, with modifications to table and addition of a constituent in text. Additionally, Section 4.2.1.1 of the CRC Report (Rev.0) was reviewed for pertinent information regarding chromium, nickel, and radionuclides. Following this review, it was determined that nickel is listed in Section 4.2.1.1 as displaying a pattern of concentration different than the Hanford Site but "it does not exceed the human health risk benchmark" (Page 4-12) This conclusion is added to the discussion in Chapter 6. Although Cr(VI) and chromium were measured in sediment and discussed in Section 4.2.1.1, they were not identified as risk drivers for the exposure scenarios that evaluate exposure to sediment. The radionuclides listed in the comment (carbon-14, cobalt-60, europium-152, and cesium-137) are discussed in the text.	Yes - 2/25/2014
DH-406	Comment: Comparisons to WAC 173-340-747 and WAC 173-340-720 cleanup values is needed. Basis/Justification: Comparison to 2007 MTCA cleanup values is also an ARAR that needs to be addressed.	Include 2007 MTCA cleanup values in this discussion.	6	6-216/28-31	Accept	Text in Chapter 6 and Chapter 8 has been revised to identify the soil direct contact cleanup levels are from the appropriate version of MTCA and referenced accordingly. Text also identifies that soil concentrations were evaluated in Chapter 5 to determine if remaining soil concentrations have the potential to impact groundwater.	Yes - 4/21/2014
DH-407	Comment: On page 6-216, it is stated, "….sites cleaned up under interim action do not need to be revisited in the FS…." It is not clear that interim actions were evaluated against the most current MTCA 2007 regulations. The 100 Area RDR/RAWP and Interim actions are based on 1996 MTCA. There are no tables listing all waste sites with direct comparisons to the current MTCA values. A comprehensive table is needed showing comparisons of 1996 vs. 2007. On page 6-217, the statement is made "…and was brought up to date to be consistent with the most recent regulatory guidance." MTCA 2007 is not guidance, but a required regulation and ARAR that needs to be followed. Basis/Justification: Consistency, clarity, and accuracy.	Provide a table in the text (not appendices) clearly explaining and showing SSLs/PRGs, cleanup values for each waste site comparing 1996 MTCA compliant values to current 2007 MTCA compliant values.	6	6-216 & 6-217/28-31 & 1-4	Accept	Text in Chapter 6 and Chapter 8 has been revised to identify the soil direct contact cleanup levels are from the appropriate version of MTCA and referenced accordingly. Text also identifies that soil concentrations were evaluated in Chapter 5 to determine if remaining soil concentrations have the potential to impact groundwater. All sites that have been remediated under the interim action, as of the cut-off date have been compared to 2007 MTCA for final disposition. Text also revised to indicate that cleanup levels were brought up to date to be consistent with the most recent regulatory guidance and 2007 MTCA regulations.	Yes - 4/21/2014
DH-408	Comment: Include the metals and/or inorganic contaminants that were analyzed. Basis/Justification: Provide all the data and not limited to just radionuclides	Include the metals, and inorganic chemicals in this section in addition to the radionuclides.	6	6-217/26-28	Accept with Modification	The conclusions will be revised to indicate that radionuclides are the primary contaminants present in the soil of previously remediated waste sites. Metals concentrations do not exceed 2007 soil direct contact cleanup levels, therefore they were deleted from the sentence.	Yes - 2/12/2014
DH-409	Comment: The text states "EPCs developed from the floor and sidewalls of the excavated waste site overstate risk because the contaminant is assumed to be uniformly distributed across the entire decision unit, and exposure is assumed to occur at the surface. However, these sample locations are actually at depth and take no credit for the existing clean backfill that covers the remediated waste site." This is not completely true. Basis/Justification: The sidewalls intersect the surface, and the area of residual contamination at the surface is not known.	Modify the second sentence to: However, only the sidewalls intersect the surface.	6	6-222/30-34	Accept	Suggested text revision incorporated.	Yes - 10/22/2013
DH-410	Comment: Uranium should be included as a COPC for 100-H Area since it is found in groundwater above the MCL for the last two years. It should be evaluated in 100-H Source Area. Basis/Justification: Uranium is present in the groundwater above DWS MCL and should be included in the analysis.	Include uranium, chemical form, in the analysis.	6	6-224/30-33	Accept with Modification	Uranium will be added as a local groundwater COPC.	Yes - 6/19/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-411	Comment: The ecological PRGs cannot be accepted at this time since the documents in which they were developed require revision. Basis/Justification: Ecology has not received revised versions of the Tier 1 document for wildlife (CHPRC-00784) or the Tier 2 document for plants and invertebrates (ECF-Hanford-11-0158). Also, the remaining issues on the Tier 2 wildlife document (CHPRC-01311) have not been resolved. We are still missing O'Farrell et al. (1975) (we received O'Farrell (1975) instead), and the Jackson et. al (2000) reference (though we did receive Jackson and Jackson (2000)).	Provide the revised Tier I and Tier 2 documents and appendices and work with Ecology to resolve outstanding comments. Also, provide the requested references. Revise the PRGs accordingly.	7	General	Accept with Modification	The listed reference documents have been provided. The revised ECF-Hanford-11-0058 Rev. 1 (Tier 2 plants and invertebrates) and CHPRC-01311 Rev. 2 (wildlife) have been provided. Because of a significant amount of similar information (e.g., text, and some chemical and species specific data) between the Tier 1 and Tier 2 wildlife documents and the fact that PRG values within the Tier 2 document are being used for final decisions, DOE will provide CHPRC-00784 Rev. 1 after concurrence is reached for the Tier 2 document (CHPRC-01311 Rev. 2). Revisions to PRGs would only be made if warranted by changes in the final agreed to Rev. 2 of CHPRC-01311 and Rev. 1 of ECF-Hanford-11-0158.	Yes - 4/2/2014
DH-412	Comment: The ecological references that were provided to Ecology in support of CHPRC-01311 leave several uncertainties, listed below and in following comments. First of all, the median body mass of the killdeer, given as 75.6 g, cannot be verified. Basis/Justification: Stegman, 1955 gives weights for 2 killdeer, male 121.8 g and female 95.7 g. Jackson and Jackson, 2000 cite Stegman and give weights of 75.6 g for 2 males, which is the number reported in CHPRC-01311 Table 2.1, though the table states that this is the median from multiple studies. Dunning, 1993 gives values for males and females, with masses from 83.9 to 121 g, for 16 birds.	Include a discussion of this uncertainty in Section 7.4.9 or revise the value and recalculate the results.	7	General	No change	The median body mass was derived from the following values: 0.0711 kg (n=1 Purdue and Haines 1977); 0.0756 kg (n=2 Jackson and Jackson 2000; Note that this value was entered twice as n=2); 0.095 kg (mean of male and female values from Dunning 1993); 0.1218 kg (n=1 Stegman 1955) with the selected value being the median of: 0.0711, 0.0756, 0.0756, 0.095, 0.1218 = 0.0756 kg. Further 1) did not notice value for female in Stegman 1955 2) mean values were used to derive mean from Dunning 1993 (92.1 for male; 101 for female) 3) Jackson and Jackson (2000) references the male from Stegman (1955) at 121.8 g plus 2 males they sampled that had an average weight of 75.6g 4) Food ingestion is calculated based on an allometric model from Nagy (2001). Food ingestion rate increases as body weight decreases: 0.0711 kg BW=0.195 g/g/d; 0.0756 kg BW=0.192 g/g/d; 0.095 kg BW=0.182 g/g/d; 0.1218 kg BW=0.172 g/g/d. Therefore, the use of the 0.0756 kg bw is more conservative than a higher body weight would be. Given these data, the median body weight presented in Table 2-1 can be verified. Additional information will be added to the table so that a reader can reach reproduce the median.	Yes - 4/8/2014
DH-413	Comment: Another uncertainty from the ecological references is that the killdeer food intake and ingestion rates are difficult to verify. Basis/Justification: It is not clear why Wilson Bull., 107(l), 1995, pp. 174-178 was not used as a reference and source of references, since it includes a study of 72 killdeer. Also, the Jackson and Jackson (2000) reference does not give the soil ingestion percentage or the esophageal contents as stated in Table 2.1. Beyer et al, 1994 do give the Least sandpiper soil intake percentage as 7.3%. However, it isn't clear why this was taken as the most analogous to the Killdeer. Other sandpipers have diets with 17 to 30% soil (Beyer et al., 1994).	Include a discussion of this uncertainty in Section 7.4.9 or revise the value and recalculate the results.	7	General	No change	1) Fair et al. (1995) was not used because it is a diet study and does not report soil ingestion data other than 'grit was found in only a few samples'. Grit is not necessarily soil. 2) In the diet section of Jackson and Jackson (2000), the authors cite Rundle (1982) as stating that grit constituted 4.5% of volume of esophageal content of 15 birds from MO. 3) Diet studies (like Fair et al. 1995) indicate that killdeer consume primarily above-ground terrestrial invertebrates. Since it does not forage primarily by probing, soil ingestion is less than that for other sandpipers that forage by probing for infaunal invertebrates. the least sandpiper is known to feed on the upper edge of mudflats and in openings of marsh vegetation, probing less than other sandpipers. hence, the least sandpiper is a closer surrogate to the killdeer than other sandpipers. 4) Diet composition data, coupled with the dietary grit observations from Fair et al. (1995) and Rundle (1982) support the selection of 7.3 % soil ingestion rate as being a conservative estimate. 5) The value from Beyer et al. (1994) was also employed in the risk models for the RCBRA. Given all of the available information, the value of 7.3% for the least sandpiper was selected as a sufficiently acceptable surrogate.	Yes - 4/8/2014
DH-414	Comment: Continuing with uncertainties from ecological references - the body weight of the deer mouse is difficult to verify. Basis/Justification: Table 2-1 in CHPRC-01311 cites O'Farrell et al. (1975) as a source for the body weight of the deer mouse. This reference does not have the deer mouse weight, but instead focuses on the Great Basin Pocket Mouse. The table should probably cite O'Farrell (1975) (rather than O'Farrell et al., 1975, which is a different reference); Ecology does not have the O'Farrell (1975) reference.	Provide the O'Farrell (1975) reference to Ecology.	7	General	No change	1) Table 2-1 erroneously references O'Farrell et al. (1975). Table 2-2, which contains the actual data, correctly references O'Farrell (1975). 2) A copy of O'Farrell (1975) will be provided. Given these data, the median body weight presented in Table 2-1 can be verified.	Yes - 4/8/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-415	Comment: Continuing with uncertainties from ecological references - the avian TRV for chromium is difficult to trace. Basis/Justification: It appears that the TRV used for total chromium was 2.78 mg/kg/day but this value is for black ducks from an unpublished study, while the Eco SSL document gives 2.66 mg/kg/day as an avian TRV.	Revise the avian TRV to the EcoSSL value.	7	General	Accept with Modification	The TRV of 2.78 is the lowest LOAEL TRV above the 2.66 NOAEL TRV employed to develop the chromium EcoSSL. The value is presented in Table 5.1 of OSWER Directive 9285.7-66.	Yes - 4/2/2014
DH-416	Comment: Define SSLs and PRGs and highlight their difference. Basis/Justification: Terminology needs clarification.	Provide definitions for SSL and PRG.	7	7-2/14-15	Accept	Added footnote to Page 7-2 defining SSLs and PRGs and their differences.	Yes - 3/17/2014
DH-417	Comment: The listed acronym "COPECs" is not identified in the Terms section of the report. The Terms section does list, "COEC" (contaminant of ecological concern). Provide a definition of the acronym COPEC in the Terms section.	Provide a definition of the acronym COPEC in the Terms section.	7	7-4 and xxv/29	Accept	COPEC has been added to list of terms.	Yes - 7/24/2013
DH-418	Comment: The pH range cited (5.8-8.7) for the Tier 2 study (ECF-HANFORD-11-0158) overlaps with the pH range for potential Fe bioavailability (pH>8). Basis/Justification: The bioavailability of Fe is a function of soil pH.	Acknowledge that Fe may be bioavailable in high pH soils on the Hanford Site (pH>8) and may mediate potential toxicity of other metals.	7	7-6/24-36	Accept	Text was added to clarify that pH is greater than 8 at a limited number of locations and Fe may be bioavailable and have the potential to mediate toxicity at those locations.	Yes - 3/17/2014
DH-419	Comment: This paragraph omits the requirement to include listed Washington State Natural Heritage Program listed species of concern, of which there are reported species of myotis and pallid bats. Mitigation measures have been taken in the 100-D Area to assist in handling habitat for those species. Continued mitigation measures, as well as possible future remediation under the scope of this RI/FS may require further mitigation for protected bat species, per the Hanford Site Biological Resources Management Plan (DOE/RL-96-32). Basis/Justification: Hanford Site Biological Resources Management Plan (DOE/RL-96-32), Washington State Natural Heritage Program list, Evaluation of the 183-D Water Filtration Facility for Bat Roosts and Development of a Mitigation Strategy, 100-D Area, Hanford Site (WCH-438), Bat Surveys of Retired Facilities Scheduled for Demolition by Washington Closure Hanford (WCH-450), and Identification and Protection of a Bat Colony in the 183-F Clearwell: Mitigation of Bat Habitat on the Hanford Site (WCH-312).	Add discussion of referenced bat species already discovered within the scope of this RI/FS, mitigation measures taken, identify waste sites where bat habitat have been identified (e.g. 100-D-50:2, 100-D-50:3, and 116-D-8), and potential future mitigation measures that may be needed upon discovery.	7	7-7/35-40	Accept	Text is changed as follows: No species that regularly frequent the Hanford Site are listed as threatened or endangered under the Endangered Species Act of 1973. Species listed as threatened or endangered by Washington State include the burrowing owl (Athene cunicularia), Merriam's shrew (Sorex merriami), and Washington ground squirrel (Urocitellus washingtoni). However, no species are known or expected to occur onsite because of the highly developed nature of this area. Fauna previously identified at the site are listed in Appendix H, Table H-21. Table H-22 in Appendix H lists the Flora and Fauna on the Threatened and Endangered Species List and its state status. Bats have been found at the 183-H Clearwell and at 183-D Water Filtration Facility. A survey conducted in April 2009 and published in June 2011 concluded that there was no indication of bats at the 183-H clearwell (WCH-450). A similar survey during the same time frame was conducted at the 183-D Facility. Three types of bats were observed Yuma myotis (Myotis yumanensis), pallid bats (Antrozous pallidus), and a small number of canyon bats (Parastrellus hesperus). Pallid bats are a state-monitored species. A mitigation plan per DOE/RL-96-32 was carried out to provide an alternative roost. If needed, future mitigation plans will also follow Hanford Site Biological Resources Management Plan (DOE/RL-96-32, Rev 1).	Yes - 5/19/2014
DH-420	Comment: Add "wildlife" to footnote "a." Basis/Justification: Direct contact is insignificant only for wildlife (not soil biota, invertebrates, and plants).	Footnote "a" should read, "Insignificant pathways for terrestrial wildlife receptors."	7	7-9	Accept	"Wildlife" was added to footnote a.	Yes - 3/17/2014
DH-421	Comment: External exposure (rads) is missing in Figure 7-1. Also, a groundwater pathway for terrestrial wildlife is complete via exposure at seeps and via an irrigation scenario (i.e., groundwater pumped to the surface for irrigation of crops with subsequent exposure to terrestrial receptors). Basis/Justification: External exposure (rads), as well as exposure at seeps and surface water, should be included.	Add external exposure from rads to shallow soil. Also, add exposure for terrestrial wildlife at seeps and surface water (from irrigation) for rads and nonrads.	7	7-9	Accept	The groundwater pathway (via seeps and irrigation) was added to Figure 7-1. Additional changes to the figure notes and text have been added to acknowledge significant pathway for inhalation by fossorial mammals and to reference Bench et al. 2001	Yes - 4/8/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-422	Comment: For wildlife, screening values are more appropriately based on NOAELs, rather than LOAELs. Basis/Justification: ERAGS recommends the use of NOAELs as screening ecotoxicity values for protection of wildlife. In addition, EcoSSLs for wildlife select TRVs based on NOAELs.	Use NOAELS as a screening ecotoxicity value for wildlife populations.	7	7-12/1-2	Justification Added	DOE agrees that NOAELs are more appropriate for screening values and has added NOAEL-based Tier 2 values to CHPRC-01311 Rev. 1. The following is additional Ecology comments with DOE response on NOAELs vs. LOAELs for use in setting wildlife PRGs ***Ecology Comment:*** *1)Lowest Observable Adverse Effect Level (LOAEL) values have been used in the 100-D/H RI/FS for setting wildlife PRGs, rather than the more conservative No Observable Adverse Effect Levels (NOAELs) values. The use of NOAELs as the basis for PRGs can be considered to address specific conditions or uncertainties at a site for the reasons listed below: 1) Considerable uncertainty related to exposure assessment may be partly offset by use of NOAEL-based PRGs. For example, uncertainties include assumptions in exposure modeling (e.g., accurately characterizing soil to biota BAF and food ingestion rate) and incomplete pathway analysis (e.g., dermal and inhalation exposure typically ignored), along with contaminant bioavailability and area use issues.* **DOE Response:** DOE supports the use of LOAELs with the conservatisms that has been used as describe below. Bioavailability - Bioavailability of ingested contaminants is rarely over 75%, and typically less than 50% (DOI 10.1002/ieam.1482), but DOE conservatively applied an assumption of 100% contaminant bioavailability in calculations of PRGs. Sample et al. (2013) note that "the bioaccessibility and bioavailability of metals through diet borne exposure can be very low, and that this information can greatly decrease the estimated exposure dose (e.g., by a factor that could vary from between 10 and up to 100-fold)." Waste Site Size -The size of many of the waste sites at 100-D/H is significantly smaller than the home range of many of the receptors for which PRGs were developed. In the models used to calculate PRGs, DOE did not incorporate area use factors. This conservatively assumes that wildlife would obtain all of their food from prey living within the contaminated waste sites and none from uncontaminated areas outside the waste sites where PRGs will be applied. Characterizing soil to biota BAF – The soil to biota BAFs were part of the process to make the PRGs more site-relevant by choosing the appropriate food type –arthropods not earthworms and by incorporating paired soil and tissue samples collected from the Hanford Site in the bioaccumulation estimates. Food ingestion rate – Discussion of the uncertainty associated with not using site-specific food ingestion rates was presented in Section 7.4.9 of the 100-DH RI/FS. For 6	Yes - 5/21/2014
DH-422 (Cont'd)						of the 8 receptors, ingestion rates were determined by using median body weights estimated from multiple published studies and using equations that rely on allometric scaling to determine ingestion rates according to the body weight. This method was considered the most reliable & to have less uncertainty than other methods. Dermal and inhalation exposure – Discussion is provided in Section 7.3.2.2 that these are negligible and do not contribute significant exposure dose for chemicals except for VOCs, which have not been identified at concentrations of concern in the 100-D/H Area. Language will be added acknowledging the studies previously mentioned (Mayfield and Fairbrother, 2012, IAEM 9:114-123; Gallegos et al, 2007, ETC 26:1299-1303; and Mineau, 2012, ETP 34:416-427) with a clarifying statement that these are only important for waste sites with evidence of near-surface VOCs, where pesticides are significant, or either of these chemical groups are primary risk drivers. Contaminant bioavailability – The models DOE employed for the 100-D/H RI/FS assume 100% contaminant bioavailability, the most conservative assumption possible. As described in Sample et al., 2013, such a conservative assumption can overestimate the ingested dose by a factor of 10 to 100.. Area use issues – The consideration of area use is discussed in Section 7.6.1. As with bioavailability, the most conservative assumption possible was incorporated in the PRG models. Most ecological risk guidance, including EPA 540-R-97/006 and WAC 173-340-7493, allow for incorporation of area use factors in exposure modeling such as ratios of the waste site area to the home range of receptors or percent of the year spent on site for migratory species. **Ecology Comment:** *2) Considerable uncertainty is associated with effects assessment. For example, uncertainties include variation in species sensitivity, extrapolation from individuals to populations, and challenges associated with assessing cumulative and interactive effects of multiple contaminants.* **DOE Response:** The examples provided in this statement are uncertainties that are inherent to all risk assessments. These uncertainties are discussed within the 100-D/H Ecological Risk Assessment in Section 7.4.9. Methods to address these are not fully accepted, as evidenced by their exclusion from the EPA's EcoSSL methodology. Further, EPA guidance for ecological risk assessment does not provide guidance to address these uncertainties. However, EPA guidance does address cumulative effects for very specific chemicals such as PCBs and Dioxins.	

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-422 (Cont'd)						***Ecology Comment:*** *3) NOAELs (but not LOAELs) protect individuals, including special status species (Efroymson et al, 1997).* **DOE Response:** Ecology's comment is a good point which is already identified in the RI/FS. Section 7.2.1 of the RI/FS identifies that there are not special status species (threatened or endangered species) in the terrestrial environment, therefore,DOE has recommended the use of LOAELs for calculation of PRGs. **Ecology Comment:** *4) Ecology prefers the use of NOAELs for TRVs when substitute receptor species are employed (Ecology, 2007; WAC 173-340-7493[7][f][i]), as is the case for Hanford soil PRGs.* **DOE Response:** DOE recognizes that the TRVs used are from data used by EPA in the development of EcoSSLs. For chemicals for which EPA did not develop an EcoSSL, the lowest LOAEL TRVs for population level endpoints were selected. DOE has been able to confirm that sensitive species have been used to develop the LOAEL-based PRGs and that these substitute receptors species are sufficiently protective of the wildlife in the region, including sensitive species. **Ecology Comment:** *5) Use of NOAELs for TRV selection and PRG derivation appears more consistent with EPA recommendations for screening assessments than use of LOAELs (EPA, 1997, 1999, 2005). For example, NOAEL-based TRVs are used to derive Ecological Soil Screening Levels (EcoSSLs) for wildlife (EPA, 2005).* **DOE Response:** NOAELs are used for screening assessments and for developing screening levels like the EcoSSLs, but as identified (based on EPA guidance), LOAELs are used for baseline ecological risk assessments unless there are special status species. Use of LOAEL-based, wildlife risk assessment is consistent with several EPA guidance documents, including: Framework for Ecological Risk Assessment (EPA/630/R 92/001), Ecological Significance and Selection of Candidate Assessment Endpoints (EPA/540/F 95/037), Generic Ecological Assessment Endpoints (GEAEs) for Ecological Risk Assessment (EPA/630/P 02/004F), and Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites (OSWER Directive 9285.7 28 P).	
DH-422 (Cont'd)						**Ecology Comment:** *6) Use of NOAELs is consistent with USDOE guidance with respect to dose limits for radionuclides which underlie Biota Concentration Guides (BCGs), developed for populations of aquatic and terrestrial biota (USDOE, 2002).* **DOE Response:** DOE believes that this is out of context. DOE Biota Concentration Guides are developed in a Graded Approach that starts with screening levels based on NOAELs, but clearly can be further developed with site specific information and effects data. At Hanford, there was no need to increase the complexity of the calculation to include LOAEL information because NOAEL-based BCGs were not exceeded. **Ecology Comment:** 7) *Nonetheless, Ecology examined the impact of using LOAELs as a basis for setting PRGs in the 100-D and 100-H reactor areas. We determined that an estimated less than 10% of the waste sites that have been interim closed out under the Interim RODs and covered by DOE/RL-2010-95 (Draft A) Remedial Investigation/Feasibility Study for the 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 Operable Units, have residual contamination that exceeds DOE's proposed LOAEL-based wildlife PRGs. Less <u>than</u> 5% of the interim closed waste sites exceed NOAEL-based wildlife PRGs <u>only.</u>* **DOE Response:** The EPA guidance clearly supports the use of LOAEL unless there is a special status species that would be evaluated on a species-specific basis. DOE does not understand how this supports the decision of LOAEL v. NOAEL. However, the number of sites impacted by LOAEL v. NOAEL was part of the agreement on text to add to Section 7.4.2. **Ecology Comment:** *Due to the small number of sites that would be affected by basing PRGs on wildlife NOAELs for 100-D and 100-H areas, Ecology has chosen not to pursue a NOAEL basis for PRGs in the 100-D and 100-H areas.*	
DH-423	Comment: Text states, "Note that use of the EC20, MATC, and EC10 as toxicity parameters means that EcoSSLs for plants and soil invertebrates are not based on NOAECs." However, because MATC is a function of both NOAEC and LOAEC, MATC-based EcoSSLs are indirectly based on NOAECs (as well as LOAECs). Basis/Justification: The relationship between EcoSSL and NOAEC for plants and soil invertebrates needs clarification.	Clarify text on the relationship between EcoSSL and NOAEC for plants and invertebrates.	7	7-25/27-28	Accept	Text was added to clarify that an EcoSSL is not equivalent to a NOAEC, and that the EcoSSL represents a level that is considered to be protective of populations or communities.	Yes - 3/26/2014
DH-424	Comment: Consistent with EcoSSL derivation for wildlife, NOAELs should be used to derive Hanford SSLs and PRGs for wildlife. Basis/Justification: EcoSSL methodology should be followed.	Hanford SSLs and PRGs should be based on NOAELs for wildlife.	7	7-27/23-27	Justification Added	DOE agrees that NOAELs should be used to derive Hanford SSLs and PRGs for wildlife and has presented these values in CHPRC-00784 Rev. 1 and CHPRC-01311 Rev. 1. DOE emphasizes that when values from CHPRC-01311 are used within a BERA or for a risk management decision such as part of an RI/FS, DOE will rely on LOAEL-based values not NOAEL-based values. Please see discussion of NOAEL vs LOAEL in comment #422.	Yes - 5/21/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-425	Comment: In a departure from the arsenic EcoSSL, text recommends using Stanley et al (1994) to select a TRV (rather than Holeman and Stibilj, 1997), based on a longer exposure duration and a bounded NOAEL in Stanley et al (1994). However, note that Stanley et al (1994) evaluated sodium arsenate (As+5), while Holeman and Stibilj (1997) evaluated arsenic oxide (As+3). Basis/Justification: EcoSSL methods should be followed for evaluating As+3.	Consistent with the EcoSSL, use the Holeman and Stibilj (1997) study to select a TRV for As+3. The Stanley et al (1994) study could then be used to select a TRV for As+5.	7	7-27/28-43	Accept with Modification	The Eco SSL document considered nine studies on the effects of arsenic to have sufficient quality. The TRV selected for the ecoSSL development was an unbound NOAEL (no effect at the highest concentration tested). The Stanley study was conducted by a reliable research group (USFWS at Patuxent Wildlife Research Center) over a much longer time frame, and produced bounded results (i.e., the NOAEL was bound by a LOAEL). Further, the Stanley study included arsenic in the pentavalent state as arsenic +5 rather than trivalent arsenic +3. Detailed study of arsenic and lead in the Hanford Orchard lands (Ecology Publication-11-03-006) found pentavalent arsenic to be the primary form of detected arsenic. Therefore, the Stanley study is more reflective of the potential exposure to wildlife at Hanford. Given the differing intends of the EcoSSLs (screening) and CHPRC-01311 (risk management decisions), and the fact that it is more reflective of site specific conditions at Hanford, the Stanley study was selected for developing Hanford PRGs.	Yes - 4/8/2014
DH-426	Comment: The statement that inhalation and dermal contact pathways contribute little to wildlife contaminant exposure requires a citation. In fact, a recent review (Mayfield and Fairbrother, 2012, IAEM 9:114-123) notes that others have argued for inclusion of inhalation and dermal pathways for developing TRVs for VOCs in fossorial mammals (Gallegos et al, 2007, ETC 26:1299-1303) and pesticides in birds (Mineau, 2012, ETP 34:416-427), respectively. Basis/Justification: Documentation of statements are needed. Multiple views should be included with controversial issues.	Provide a citation supporting the statement that inhalation and dermal contact pathways contribute little to wildlife contaminant exposure. The countervailing view should be presented, as well.	7	7-29/19-20	Accept	Text was added indicating that recent publications have suggested the inclusion of inhalation and dermal pathways for developing TRVs for VOCs in fossorial mammals and pesticides in birds, but that VOCs and pesticides were not the primary COPECs identified for the 100-D/H OUs in past investigations. Reference to a recent publication citing the significance of inhalation of some metals by fossorial mammals was also added.	Yes - 3/17/2014
DH-427	Comment: It is unclear why ingestion of soil and food are evaluated separately from ingestion of water for wildlife. Basis/Justification: Contaminant exposure from all media and pathways should be evaluated in a coherent manner.	Clarify why ingestion of seep water was evaluated separately from ingestion of soil and food.	7	7-29/23-29	Justification Added	Mixed media evaluation was not included for two reasons. First, except in rare cases, or when the drinking water is known to be substantially contaminated, drinking water ingestion typically represents a relatively insignificant portion of the total dose of (or exposure to) contaminants. Second, Remedial actions have already occurred at a number of waste sites. Single media Remediation Goals represent an easy way to evaluate the effectiveness of the remedial actions that have taken place. Based on previous comments from Ecology, and additional evaluation of drinking water ingestion was included to verify that the exclusion of this pathway did not produce any false negatives, that is the evaluation served to identify any cases where no risk was determined when in fact there was risk.	4/2/2014
DH-428	Comment: Ps is more clearly defined as the "proportion of total food that is soil (kg soil/kg food)," rather than, "soil ingestion rate as a proportion of diet (unitless)." Basis/Justification: Define equation terms accurately.	Revise the definition of Ps to "proportion of total food that is soil (kg soil/kg food)."	7	7-30/6	Accept	Text was edited to state "proportion of total food intake that is soil (kg soil/kg food)"	Yes - 3/17/2014
DH-429	Comment: Equation is incorrect. "SSL or PRG" term should be grouped with "Fracs" term. See EPA EcoSSL Attachment 4-1 (see Equation 4-2 in OSWER Directive 9285.7-55). Also, the equation is inverted (more typically, HQ=exposure/effects). Basis/Justification: Equations should be accurate in terms of dimensional analysis.	Correct the equation, according to the comment.	7	7-30/15	Accept	Equation was revised to group "SSL or PRG" term with "Fracs" term., and the equation was inverted to place "TRV" in denominator.	Yes - 3/17/2014
DH-430	Comment: Contrary to text, incidental soil ingestion was included as part of the total dietary composition (Ps term). Basis/Justification: Ps is the proportion of total food intake that is soil (kg soil/kg food).	State that incidental soil ingestion was included as part of the total dietary composition.	7	7-31/18-19	Accept	Text was added to clarify that incidental soil ingestion was included as part of the total dietary composition, as reflected by the $Frac_s$ term in the dietary equation,	Yes - 3/17/2014
DH-431	Comment: Note that site specificity is diminished when Hanford data are combined with non-Hanford data from the literature in bioaccumulation models. Basis/Justification: Site specificity is reduced when generic data are included.	Note that site specificity is diminished when Hanford data are combined with non-Hanford data from the literature in bioaccumulation models.	7	7-32/15-22	Accept with Modification	Significant text has been added to CHPRC-01311 regarding the pros and cons of pooling Hanford data and that from the broader literature. Once final language is agreed to by Ecology and DOE, relevant discussion points will be brought forth to this document as needed.	Yes - 5/19/2014
DH-432	Comment: Footnote b states, "Aroclor 1254 was used as surrogate." However, "Total PCBs" and all Aroclors (except 1254) carry this footnote, yet often show unique SSL values. Clarify. Basis/Justification: Surrogates should be linked to a less well characterized contaminant.	Clarify footnote "b" in relation to "Total PCBs" and all Aroclors (except 1254).	7	7-36/footnote b	Accept with Modification	Revised footnote stating "Aroclor‑1254 TRV was used as surrogate in the calculation of the SSL. The reason the SSLs differed for each aroclor is that only a surrogate TRV from aroclor-1254 was used. Other factors are still chemical-specific resulting in differences in the final SSLs and PRGs.	Yes - 3/17/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-433	Comment: Metal hyperaccumulators should not necessarily be excluded from the plant bioaccumulation database. Basis/Justification: Exclusion of metal hyperaccumulators, would result in a biased distribution of plant species, comprising the bioaccumulation database.	Explain why plant species that hyperaccumulate metals were excluded (i.e., biasing BAFs low).	7	7-37/21	Not Accepted	Hyperaccumulator plants were not included in the evaluation for the following main reasons: 1) hyperaccumulator plant species are a unique group of plants and do not represent the majority of plant species. 2) the purpose of developing the bioaccumulation models was to be representative of plants as a group, upon which wildlife may feed and therefore be exposed 3) the models as presented and used for the Tier 2 (and Tier 1) PRGs are exactly as presented and used within the USEPA EcoSSLs. Data were neither included nor excluded. DOE therefore believes that it was appropriate not to include hyper accumulators in this evaluation.	Yes - 4/8/2014
DH-434	Comment: Despite including only field studies, an assumption of equilibrium between soil and small mammal tissue is uncertain (e.g., due to spatial heterogeneity of contaminant and mammal distributions). Basis/Justification: Uncertainty is associated with assumptions of equilibrium between abiotic and biotic media.	Acknowledge the uncertainty inherent in an assumption of equilibrium between soil and tissue.	7	7-38/11-14	Accept	Text was added to indicate that, although there is some uncertainty associated with this assumption based on the heterogeneity of concentrations in surface soil, the potential impact of this heterogeneity on the assumption of equilibrium is expected to be minimal based on the mobility of small mammals and the evaluation of multiple individuals, which would tend to provide an average estimate of tissue concentrations over the sampled area.	Yes - 3/17/2014
DH-435	Comment: Text states that nonlinear regression was used to characterize BAFs, although typically log-linear regression is used. Basis/Justification: Regression analysis needs to be described correctly.	If warranted, correct description of regression analysis to log-linear.	7	7-40/6	Accept	The text was corrected to indicate a log-linear regression was used.	Yes - 3/17/2014
DH-436	Comment: Text incorrectly describes a regression criterion as “p≥0.05” (should be “p<0.05”). Basis/Justification: Regression criteria need to be described correctly.	Revise text from “p≥0.05” to “p<0.05.”	7	7-40/14	Accept	The text was corrected to indicated p<0.05.	Yes - 3/17/2014
DH-437	Comment: NOAELs (rather than LOAELs) should be used to derive wildlife SSLs. Basis/Justification: EcoSSLs for wildlife are based on NOAEL TRVs (see p. 7-27). Furthermore, a recent SETAC workshop (“Ecological soil levels-Next steps in the development of metal cleanup levels,” Sept 2012), notes that exposure-response functions (e.g., ECx) are preferred to threshold approaches (e.g., NOAEL, LOAEL) when establishing wildlife TRVs to be used for site cleanup (i.e., beyond the screening stage). NOAEL can correspond to potentially large and potentially biologically important magnitude of effect (LOAEL would correspond to an even larger effect). The advantage of the regression method for the estimation of ECx is that information from the complete exposure-response function can be taken into account and confidence intervals can be calculated.	Use NOAEL TRVs to derive SSLs and PRGs for wildlife, and acknowledge that exposure-response functions are preferred.	7	7-40/18-20	Accept with Modification	DOE concurs that NOAELs should be used for SSL because they are intended for screening purposes. PRGs are intended for risk management decisions making and EPA guidance is clear that SSLs are not intended as PRGs. Please see the discussion of LOAELs versus NOAELs in comment 422.	Yes - 5/21/2014
DH-438	Comment: The wildlife PRG for manganese is difficult to verify because the LOAEL TRV, the diet, food intake rate and the body weight for the most sensitive species are difficult to verify. Basis/Justification: The manganese PRG is based on the Great Basin Pocket Mouse. CHPRC-01311 gives the body weight as 0.0175 kg as a median from multiple studies. The references cited are Scheffer (1938), O’Ferrell et al. (1975) and Schrieber (1978). The Scheffer (1938) reference gives the diet of the pocket mouse but does not give the body weight. The O’Ferrell et al. (1975) reference states that the body weight range for adults is 13 to 18 g, but does not give a median or other statistics. Neither of these references gives the food intake rate. Only Schrieber (1978) gives actual body weights (17.5 g is not the median; the median is approximately 16.8 g) The percent of soil in the pocket mouse’s diet is not known but was assumed to be the same as that of the white-footed mouse which has a more varied diet, including insects and other small mammals and road kill (while the pocket mouse is completely herbivorous). The LOAEL TRV of 71 mg/kg/day is stated in Table 2-7 as the “lowest bounded growth or reproductive LOAEL above the geometric mean NOAEL from EcoSSL.” However, there is a lower value of 65 mg/kg/day for growth, which is above the geometric mean of NOAELs (51.5 mg/kg/day) but was not selected.	Include a discussion of this uncertainty in Section 7.4.9 or revise the value and recalculate the results.	7	7-41/ Table 7-4	Accept with Modification	1) On Page 4 of Scheffer (1938), the author states: The average measurements and weights of 10 specimens of each sex of *Perognathus parvus* taken near Kennewick, Wash., April 25, were: Males, total length, 169.4 mm; tail, 89.5, hind foot, 22.8; weight, 17.25 g; females, total length, 161.5 mm; tail, 85.7; hind foot, 22.6; weight, 14.3 g. O'Farrell et al. (1975) should be O'Farrell (1975) - detailed body weights are in the later, not the former. Given these data, the median body weight presented in Table 2-1 can be verified. Additional information will be added to the table so that a reader can reach reproduce the median. 2) We agree that the diet of the white-footed mouse is more varied than the pocket mouse. The white-footed mouse was selected as a reasonable analog. 3) The lowest bounded LOAEL for growth or reproduction that is above the geometric mean NOAEL is 65 and not 71. However, the rat study was selected because assuming that there are similar toxicological mechanisms between a rat in the same family (rodentia) as the Great Basin Pocket Mouse is a smaller uncertainty than assuming similar toxicological mechanisms between different families as the other TRV is from a study on cattle (family bovidae). The selection of a TRV for cattle is no less uncertain than that for a rat when developing PRGs for the badger. However, three of the four mammalian receptors are in the same family as the study animal (rat) used for the TRV of 71 mg/kg-bw/day. Therefore, the rat study was considered the most appropriate. A footnote will be added to Table 2-7 explaining the rationale for the selection.	Yes - 4/8/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-439	Comment: The plant PRG selected for Pb (9090 mg/kg) appears high, relative to the EPA EcoSSL for plants (120 mg/kg), Ecology recommended values for plants (50 mg/kg [MTCA Table 749-3] and 390 mg/kg [Ecology Pub. No. 11-03-006]), as well as the RCBRA PRG for plants (125 mg/kg). Basis/Justification: Although the current study (9090 mg/kg) is site-specific (Sandberg bluegrass), EPA (120 mg/kg) considered multiple species with a systematic process, Ecology (390 mg/kg) was partly site-specific (soil but not test organism), and RCBRA (125 mg/kg) was site-specific (Sandberg bluegrass). Given the variability in soil and plant factors, a weight of evidence approach argues for a lower plant PRG for Pb. Also, the 9090 mg/kg is based on bioassay results. It appears that this result is from a waste sample from the Old Central Shop Area (OCSA) north of the 200 areas. In fact, 58 out of the 71 samples used for the lead bioassay analysis were from the OSCA. There were many other high lead samples from the OSCA and there was a large range of concentrations from this site. Without a description of this site and knowledge of the potential forms of lead at this location it is not possible to determine if this area represents most of Hanford lead-contaminated soil. Lead concentrations from the samples from the other 5 waste sites range from 4 to 87.2 mg/kg.	Reduce the plant PRG for Pb (Table 7-5), based on a weight of evidence approach. Also, add the following to this document: discussion of the OSCA, the other sources of soil for the plant and invertebrate bioassays, the potential forms of lead at the soil sampling locations, how representative these samples are of Hanford lead and other contaminants. 5/27/14 ECY (Welsch) email request: Also, add the following to this document: discussion of the OSCA, the other sources of soil for the plant and invertebrate bioassays, the potential forms of lead at the soil sampling locations, how representative these samples are of Hanford lead and other contaminants 5/27/14 ECY (Welsch) email request: Ecology will rely on the wildlife PRG results in CHPRC-01311 to set the terrestrial ecological PRG for lead for the 100-D and H areas. Ecology reserves the right to require additional lead plant bioassay measurements in the future, with Hanford soil, for other Hanford operable units.	7	7-45/ Table 7-5	Not Accepted	DOE acknowledges that 9090 mg/kg is high relative to other values cited, the result of no significant toxicity at this level was not an anomoly. In addition to this 9090 mg/kg concentration, no effects on plant germination were observed in any of the 14 samples with lead concentrations ranging from 1000 mg/kg to 7970 mg/kg. The previous site-specific bioassay work presented in the RCBRA resulted in a plant NOEC of 125 mg/kg, which was the PRG recommended in the RCBRA. The 2011 study was able to collect samples at concentrations higher than those measured in the RCBRA bioassay work and resulted in a higher no-effect concentration. Both studies have shown that there is no significant relationship between lead and biological response in the plant bioassays conducted. Thus, the highest concentration tested from the 2011 study of 9090 mg/kg is recommended as the PRG. ultimately, the wildlife PRGs for lead, all with high confidence assigned, are lower than this plant value, and as such, the wildlife PRG will drive risk decisions. Given the number of high concentrations in the test range of the 2011 study and the value of the other PRGS available for wildlife, the plant value presented was retained.	Yes - 6/5/2014
DH-440	Comment: The invertebrate PRG for zinc is not conservative. Basis/Justification: The invertebrate PRG value is 8980 mg/kg, which is far above the WAC 173-340 Table 749-3 value of 200 mg/kg. The 8980 mg/kg is from a bioassay with Hanford soil. This sample is from the Old Central Shop Area (OCSA) north of the 200 areas. The next soil concentration below this is 2620 mg/kg, also from the OSCA. Given the large gap between these concentrations, the 8980 mg/kg is an isolated high value that has not been reproduced by any other sample.	Use a more reproducible value for the zinc invertebrate PRG. 5/27/14 ECY (Welsch) email request: Ecology will rely on the wildlife PRG results in CHPRC-01311 to set the terrestrial ecological PRG for zinc for the 100-D and H areas. Ecology reserves the right to require additional zinc plant bioassay measurements in the future, with Hanford soil, for other Hanford operable units.	7	7-45/ Table 7-5	Not Accepted	DOE followed a process for selecting PRGs that included statistical analysis to evaluate whether zinc concentrations might be responsible for observed biological response and that process produced no such evidence. In establishing the PRGs for plants and invertebrates, consideration of other PRGs was also considered in making the final determination. While the final number is high relative to other values cited, the lowest wildlife PRGs for zinc of 856 mg/kg as well as several other wildlife PRGs, all with high confidence assigned, are lower than the invertebrate value of 8980 mg/kg. As such, the invertebrate number will not drive risk decisions so DOE chose to employ the invertebrate PRG of 8980 mg/kg.	Yes - 6/5/2014
DH-441	Comment: PCB data are preferentially expressed as congeners for ecological risk assessment, rather than as Aroclor mixtures. Basis/Justification: Aroclor data are imprecise, due to analytical limitations (e.g., chromatogram pattern recognition), as well as weathering in the environment. Furthermore, a congener approach is needed to assess toxicity of dioxin-like PCBs (e.g., as TEQ) and non-dioxin-like PCBs. Total PCBs is also more accurately quantified by summing individual congeners, rather than summing Aroclors (which contain overlapping congeners).	Acknowledge the uncertainty and limitations of evaluating PCBs with Aroclors vs. the benefits of congener analysis.	7	7-49/8-15	Justification Added	The following language has been added to the uncertainty discussion in section 7.4.9 "PCB congener data can be more beneficial than aroclor data. Congener analysis is more precise with less interference in the analysis from other chemicals, the quantitation is more accurate, and composition of weathered, degrade, or metabolized mixtures is easier. Congener analysis may be more appropriate when PCB hot spots have been identified, lower detection limits are needed, fingerprinting is necessary, adverse effect have been observed, or cleanup will be based on congener-specific TEFs. However, disadvantages of using congeners include more limited availability of toxicological data, more costly analysis, significant variation between laboratories, and a greater amount of effort in data management. Given that PCBs are not the primary constituent of concern at this site, collection and analysis of aroclor data was used for risk screening purposes with the understanding that congener analysis could be performed as an additional analytical step if it was determined from the conservative evaluation of the aroclor data that further evaluation of risk associated with PCBs is necessary. Screening assessment of aroclor data in soils at the 100-D/H OUs did not produce results suggesting further analysis using congeners was warranted." Additional details on some congener analyses performed at the site are as follows: DOE concurs that congeners can provide a more precise and definitive estimate of risk to ecological receptors. However, PCBs are not the primary constituent of concern at this site and the available Aroclor data should provide adequate data for screening ecological risk. Congener analysis could be done as an additional analytical step if it is determined from the conservative evaluation of the Aroclor data that further evaluation of risk associated with PCBs is necessary. PCB congeners were analyzed for in all media evaluated in the CRC Risk Assessment (DOE/RL-2010-117, Volume II, Rev. 0). This study analyzed sediment, island soil, surface water, and fish tissue for the 209 PCB congeners. Table 3-1 summarizes the analytical parameters by medium. Summary statistics for each medium analyzed are provided in Chapter 3 Table 3-3 through Table 3-12. Risk-based screening levels and their basis for each media type are provided in Table 3-15 through Table 3-17. Selection of COPCs are presented in Table 3-18 through Table 3-36. Risk characterization results are presented in Sections 6.5.1 and 6.5.2.	Yes - 5/28/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-441 (Cont'd)						In summary, the dioxin-like and nondioxin PCBs were not retained as COPCs, or if they were retained and carried forward into the risk characterization they were not identified as risk drivers. In all cases, PCB-like and nondioxin PCBs were identified as reference COPCs (not correlated with a Hanford-Site release). Similarly, six wells in the 100-HR-3 groundwater OU were analyzed for PCB congeners for this RI/FS. Dioxin like PCB congeners were analyzed (using EPA Method 1668A) at low and high river stage for the following 6 wells: 199 D5 15, 199 D8 55, 199 D8 71, 199 H4 10, 199 H4 13, and 199 H4 48 (summary statistics for these analyses are in Tables O-4 through O-19 in the RI/FS report). The approach was to conduct one round of samples for groundwater. If the results did not show concentrations greater than action levels, then further sampling was not required. Of the six wells that were analyzed, only well 199-H4-13 was sampled more than once because the first sampling round detected one PCB congener greater than the action level. However two subsequent rounds reported the same congener as nondetected or at a concentration less than the action level.	
DH-442	Comment: Risks in Table 7-8 were identified for plants and invertebrates, as well as wildlife (e.g., 100-D-31:5_Overburden: Selenium). Basis/Justification: Text should be consistent with tables.	Add “wildlife” to sentence referring to Table 7-8.	7	7-60/4	Accept	Revised by adding wildlife to text, in addition to plants and invertebrates.	Yes - 3/17/2014
DH-443	Comment: Risks in Table 7-9 were identified for plants and invertebrates, as well as wildlife (e.g., 118-H-6:5_Shallow_1:Lead). Basis/Justification: Text should be consistent with tables.	Add “wildlife” to sentence referring to Table 7-9.	7	7-61/6	Accept	Revised by adding wildlife to text, in addition to plants and invertebrates.	Yes - 3/17/2014
DH-444	Comment: Text notes that Table H-14 (100-H) specifies HQ>0.01 for Al, but Table H-14 does not show this. Basis/Justification: Text should be consistent with tables.	Revise text to be consistent with Table H-14 (i.e., HQ>0.01 for nitrate, not Al).	7	7-61/22-23	Accept	The text was corrected to indicate that 100-H indicates an HQ> 0.01 for nitrate, and not Al.	Yes - 3/17/2014
DH-445	Comment: Although drinking water is largely shown to be negligible in terms of total exposure, a single exposure model (including all pathways) is less fragmented and more transparent. Basis/Justification: A single exposure model, including all pathways, is more economical.	Consider including drinking water exposure in a single wildlife exposure model.	7	7-61	No change	DOE agrees that single exposure models are less fragmented and more economical. However, DOE does not plan to change the work presented since it still answers the question of risk to wildlife.	Yes - 3/17/2014
DH-446	Comment: A 95UCL should be calculated to represent EPC, independent of receptor type when local populations are considered. For example, a population of individuals of a sessile species (e.g., a terrestrial plant) may be distributed over a range of contaminant concentrations in soil. Therefore, a UCL95 (rather than the max) is the best estimate of EPC for a sessile species, just as it is for a mobile species. In addition, use of the max ignores most of the information in the data set. When the number of measurements is small (e.g., n<5) or the detection frequency is low (<5%), ProUCL ultimately recommends collection of more samples to compute defensible statistics. Basis/Justification: EPA’s ProUCL methods should be followed.	When possible, 95UCL should be calculated to represent EPC. Only in cases of small sample size (e.g., n<5) or low detection frequency (<5%) should EPC defer to the observed max, noting the uncertainty in EPC.	7	7-65/19-35	Accept with Modification	For samples collected under a statistical sampling design, 95% UCLs were calculated and used as the EPC for the purpose of comparing to Eco SSLs and PRGs. There are some instances where a 95% UCL could not be calculated and the maximum detect was used, these instances include when samples were collected using a focused sample design, a limited number of detections (< 5) or, when the 95% UCL was greater than the maximum. When the 95% UCL was greater than the maximum, the uncertainties were evaluated. This process and uncertainty evaluation is discussed in Section 6.2.6.2 of Chapter 6. Note that all instances when a 95% UCL was greater than the maximum was for deep decision units (exposure pathway is not complete at depths greater than 15' bgs). The EPCs approach agreed to in Chapter 6 will be used in comparisons for Chapter 7.	Yes - 6/12/2014
DH-447	Comment: Text states that Cr+6 in 100-D near shore filtered samples exceeded the ESL in aquifer tubes for 17 of 62 samples, while Table L-41 shows this to be the case for 161 of 308 samples (17 of 62 exceedances appear to represent total Cr, not Cr+6). Text also states that Cr+6 in 100-D near shore filtered samples exceeded the ESL for pore water (2 of 8 samples) and seeps (1 of 1 sample), but Table L-41 notes these exceedances were for non-filtered samples. Basis/Justification: Text and tables should be consistent.	Reconcile text and Table L-41.	7	7-74/4	Accept	The text was revised to clarify when filtered versus unfiltered sample data were presented. Filtered data were presented, when available, while unfiltered data outcomes were presented when filtered data were not available.	Yes - 3/17/2014
DH-448	Comment: Although Table 7-12 indicates that 100-D OUs are not potential sources for Ni in porewater, text specifies ESL exceedances in 100-D for Ni in aquifer tubes (8 of 62 samples [filtered]) and groundwater (2 of 37 samples [filtered]). Therefore, it appears that Ni should be retained for further evaluation in the FS, despite no ESL exceedances in porewater. Basis/Justification: ESL exceedances in aquifer tubes and groundwater justify retention of COPCs for further evaluation.	Retain Ni as a COPC for eco risk in riparian media.	7	7-77/9-12	Not Accepted	Ni was not retained as a COPC for further evaluation based on the evaluation presented in Section 4.4.1.4. In summary, nickel concentrations in groundwater (and some aquifer tubes) were elevated in the reductive zone influenced by the ISRM. Some of these concentrations were above the AWQC but concentrations have been steadily declining and no observed nickel concentrations have been reported above the AWQC since 2011. Exposure to ecological receptors occurs in the hyporheic zone in porewater or in the river water itself. Since there were no exceedances in either of these media, this RI/FS document analyses concluded that nickel should not be retained as a COPC or COPEC.	Yes - 6/10/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-449	Comment: Text states, "this value is actually an LC10 (effect noted in just 10 percent of organisms), which is an effect level more sensitive than commonly used." LC10 is not a particularly sensitive endpoint, considering lethality is the effect (i.e., any amount of lethality is not sensitive). Criteria to include/exclude nitrate as a COPC should rely on comparison to more sensitive endpoints, as well as comparison to reference/background concentrations. Basis/Justification: Lethality is an apical endpoint, a gross change observed in vivo. More sensitive (subtle) biochemical changes (e.g., molecular events) may be more relevant to initial screening. These more sensitive endpoints precede measurable physiological changes (e.g., lethality).	Delete text stating that LC10 is a sensitive effect.	7	7-77/19-20	Accept	Text was revised to remove these statements and to acknowledge nitrate as a COPEC to match Appendix L.	Yes - 3/17/2014
DH-450	Comment: In the discussion of wildlife ESL exceedances for Al, BEHP, and V, text should reference Tables L-60 and L-61 for clarity. Basis/Justification: Text should reference tables, when supporting data provide more clarity.	Cite Tables L-60 and L-61 in discussion of wildlife ESL exceedences for Al, DEHP, and V.	7	7-80/18-31	Accept	Table numbers were added to text.	Yes - 3/17/2014
DH-451	Comment: Text notes that total Cr and Cr+6 in 100-HR-3 groundwater OU warrant further evaluation in the FS, although the conclusion section in Appendix L (L5) also includes nitrate as a COEC. Basis/Justification: Text and appendices should be consistent.	Along with total Cr and Cr+6 in groundwater, include nitrate as a COEC which requires further evaluation in the FS for 100D/H.	7	7-81/38-44	Accept	The text will be revised to be consistent with Appendix L. Cr, Cr+6, and nitrate will all be identified.	Yes - 3/17/2014
DH-452	Comment: Text notes that sediment Sb and P exceed an upper threshold sediment biota ESL for 100 D/H, citing Tables L-72 and L-74. However, data show an upper ESL exceedances for Sb and Ag (not P) for 100-D (Table L-72). In addition, tables also present lower ESL exceedances for Sb, Fe, P, and Ag for 100-D (Table L-71), as well as for P for 100-H (Table L-73). Notably, these sediment ESLs are derived for invertebrates/microbes (e.g., Chironomous, Hyalella, Microtox), not aquatic plants (as the section title implies). Also, a sediment ESL for Sb is not recommended in the 2011 Ecology report (Pub. No. 11-09-054). Basis/Justification: Risks to aquatic plants should be assessed against relevant ESLs, (derived for aquatic plants), and text and appendices should be consistent.	Revise text in terms of relevance to aquatic plants and reconcile text and data tables.	7	7-82/11-16	Accept	The text was corrected to note silver as exceeding the tier 2 value, not phosphorous. And a note was added regarding that the fact that the screening values are really based on invertebrates, not plants. The values for antimony used were not those from Ecology report (Pub. No. 11-09-054) but rather the previous report (Pub. No. 03-09-088).	Yes - 4/8/2014
DH-453	Comment: Text states there was no correlation of clam survival with COPECs (despite decreased survival at study sites vs. reference sites) and concludes that substrate concentrations of COPECs were not toxic. However, decreased clam survival at study sites (relative to reference sites) may be due to cumulative effects among COPECs (mixture toxicity), rather single COPEC toxicity. Basis/Justification: Toxicity may result from multiple COPECs acting in combination.	Revise text to indicate that decreased clam survival at study sites (relative to reference sites) is consistent with potential mixture toxicity, attributed to multiple COPECs in abiotic media.	7	7-83/34-36	Accept with Modification	The potential for chemical mixtures to have additive and/or synergistic effects will be acknowledged. However, a number of different variables (both chemical and non-chemical) could lead to differences in survival between site and control samples. Determining if or which multiple variables could be causing such an effect is particularly difficult.	Yes - 3/17/2014
DH-454	Comment: Text has two sections labeled as, "7.5.5.3." Basis/Justification: Editorial.	Revise section numbers to eliminate duplication.	7	7-82 and 7-84	Accept	The duplication has been corrected.	Yes - 7/24/2013
DH-455	Comment: Explain how a statement here on waste site exceedances (i.e., 19 waste sites within 100-D and 8 wastes sites within 100-H report COPECs with EPCs>PRGs) relates to a previous statement (Section 7.5.7, p. 7-85) on waste site exceedances (i.e., 12 waste sites within 100-D and 4 waste sites within 100-H report EPC exceedances). Basis/Justification: Clarity is needed to ensure consistency in text.	Clarify the number and location of waste sites in 100-D and 100-H areas, containing COPECs with EPC>PRG.	7	7-87/11-12	Accept	The inconsistency was corrected.	Yes - 3/26/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-456	Comment: Text states that 19 waste sites (100-D) and 8 wastes sites (100-H) report COPECs with EPCs>PRGs, yet none of these waste sites are carried into the FS. This appears contrary to conventional methodology. Basis/Justification: First, this exclusion of waste sites (with EPC>PRG) undermines the utility of PRGs as a criterion to identify COPECs, since these waste sites are not retained. Second, Section 7.6 and Table H-20 appear to systematically reject observed results (EPC>PRG) by invoking a specific set of SMDP considerations (e.g., sample depth in relation to ecological receptors, magnitude and frequency of PRG exceedances, confidence in PRG, data quality, spatial factors) in a unilateral direction to eliminate COPECs. That is, SMDP concerns are never employed to include a COPEC when EPC<PRG (see Table H-20), as a result of uncertainties and a precautionary approach. In particular, these specific SMDP considerations (which systematically exclude COPECs) ignore notable uncertainties in exposure assessment (e.g., statistical limitations due to small sample size for deriving EPC, contaminant transfer factors in exposure models [e.g., BAFs], incomplete exposure models for wildlife [e.g., dermal and inhalation pathways typically omitted], cumulative and interactive effects of multiple contaminants [e.g., rad and nonrad COPECs]), uncertainties in effects assessment (e.g., extrapolation from individual to population effects, variation in species sensitivity, limitations in lab bioassay and field study methods, use of NOAELs and LOAELs to derive TRVs), and uncertainties in risk characterization (e.g., conflicting lines of evidence, precautionary vs. anti-precautionary biases, resource restrictions due to budgetary constraints). Many of these uncertainties support retention of COPECs and associated waste sites for further evaluation.	COPECs with EPC>PRG should generally be retained for further evaluation in the FS with few exceptions (e.g., EPC<background).	7	7-87 to 7-88/S. 7.6	Not Accepted	The need to move all COPECs with EPCs > PRG into FS is not accepted. At the end of chapter 7 a SMDP is presented with the intent (as described in EPA 540-R-97-006; Ecological Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments Interim Final) of reaching agreement on 4 items (assessment endpoints, pathways, risk questions, and a conceptual model) that need continued assessment. The weight-of-evidence table presented was intended to present a summary of the key lines that helped make decisions. All of the uncertainties listed in the comment can and should be discussed within the report. Not all necessitate inclusion within the weight-of-evidence as not all are really lines of evidence. The specific uncertainties mentioned are all included in various discussions within this report, some of which overestimate risk, some of which potentially underestimate risk, and some that are acceptable uncertainties but are part of the practices of the state of the science. Some additional context on some of these uncertainties relative to the presented lines of evidence can be made. However, in nearly all cases the type of evidence presented would tend to outweigh the uncertainties mentioned. The final outcome of waste sites being carried forward is not likely to change. Ecology and DOE agreed to add the following statements to Table H-20 in Appendix H to close this comment. <u>1607-D2-2</u> 1. For the row that discusses mercury add the following statement to the end of the discussion in the last column titled "Carry Waste Site into FS for Remedy Evaluation" -- "There were 2 of 9 samples that exceeded the PRG. Evaluation of contaminant concentrations and other ecological considerations lead to the conclusion that there was not a community level effect and therefore there is not a basis for action for mercury at this waste site." <u>Added to close comment: "There were 2 of 9 samples that exceeded the PRG. Evaluation of contaminant concentrations and other ecological considerations lead to the conclusion that there was not a community level effect and therefore there is not a basis for action for mercury at this waste site."</u>	Yes - 7/17/2014
DH-456 (Cont'd)						2. For the row that discusses silver add the following statement to the end of the discussion in the last column titled "Carry Waste Site into FS for Remedy Evaluation" -- "There was 1 of 10 samples that exceeded the PRG. Evaluation of contaminant concentrations and other ecological considerations lead to the conclusion that there was not a community level effect and therefore there is not a basis for action for silver at this waste site." <u>Added to close comment: "There was 1 of 10 samples that exceeded the PRG. Evaluation of contaminant concentrations and other ecological considerations lead to the conclusion that there was not a community level effect and therefore there is not a basis for action for silver at this waste site."</u> <u>128-H-1</u> For the row that discusses mercury add the following statement to the end of the discussion in the last column titled "Carry Waste Site into FS for Remedy Evaluation" -- "There was 1 of 12 samples that exceeded the PRG. Evaluation of contaminant concentrations and other ecological considerations lead to the conclusion that there was not a community level effect and therefore there is not a basis for action for mercury at this waste site." <u>Added to close comment: "There was 1 of 12 samples that exceeded the PRG. Evaluation of contaminant concentrations and other ecological considerations lead to the conclusion that there was not a community level effect and therefore there is not a basis for action for mercury at this waste site."</u>	
DH-457	Comment: Reference to Table L-4 should be to Table L-5 (sediment ESLs). Basis/Justification: Editorial.	Correct citation from Table L-4 to Table L-5.	7	7-91/32	Accept	Reference was changed to Table L-5.	Yes - 5/2/2013
DH-458	Comment: A freshwater sediment PRG for Sb (Table 7-13) is not recommended by Ecology, due to issues with analytical methods, a high level of false positives, and a lower threshold value (SQS/SL1) below background (Ecology Pub. No. 11-09-054). Also, add units (mg/kg) to Table 7-13, and specify that all values are from 2011 Ecology Pub. No. 11-09-054. Basis/Justification: Tables should provide units, references, and any qualifications on specific data.	Re Table 7-13, delete freshwater sediment PRG for Sb, add units to table (mg/kg), and add the Ecology reference (Ecology Pub. No. 11-09-054).	7	7-92/ Table 7-13	Accept	Antimony was removed from the table. Units were added to the table and a footnote was added indicating that all values represent Cleanup Screening Levels from 2011 Ecology Pub. No. 11-09-054.	Yes - 3/17/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-459	Comment: When using ProUCL with the Kaplan-Meier (KM) method to calculate a 95UCL for an analyte with nondetects, the calculated mean is the KM mean (not the mean of detects only). Basis/Justification: The KM mean incorporates all of the data (detects and nondetects). Therefore, KM 95UCL>KM mean, as expected. In the comparison of 90th percentile values vs. KM 95UCL (Table 6-55), the appropriate mean to be listed in the table is the KM mean (not the mean of detects only).	Revise text to compare the Kaplan-Meier (KM) mean vs. the KM 95UCL, and replace the mean in Table 6-55 with the KM mean.	6	6-194/27-43	Accept	Per agreement in February 2014, column headings to Table 6-55 needed to change to include the term "or ProUCL Value". Table 6-55 is now labeled Table 6-57. A column was added to the table for the KM mean and KM UCL.	Yes - 5/27/14
DH-460	Comment: Add uranium, because it is present in groundwater above the MCL. Basis/Justification: Uranium exceeds standards in 100-H Area.	See comment.	8	8-3/3	Accept	Uranium will be added as a local groundwater COPC. Agreement reached with Ecology in April 2014 to treat uranium as a groundwater COPC. Chapter text updated to reflect this agreement closes comment.	Yes - 6/19/2013
DH-461	Comment: Add uranium, because it is present in groundwater above the MCL. Basis/Justification: Uranium exceeds drinking water standards of 30 ug/L in 100-H Area.	See comment.	8	8-3/2-17	Accept	Uranium will be added as a local groundwater COC. Agreement reached with Ecology in April 2014 to treat uranium as a groundwater COPC. Chapter text updated to reflect this agreement closes comment.	Yes - 6/19/2013
DH-462	Comment: Explain how Cr(VI), total chromium, nitrate and strontium-90 are listed as contaminants in groundwater, but not listed as a COPC. In addition, gross beta, tritium, technetium-99, and sulfate should be added to the COPCs. I realize sulfate is identified as a nutrient, but it is also a contaminant of potential concern. Basis/Justification: These constituents are present in the groundwater near the MCLs or exceeding the MCLs and should be added to the analysis.	Add Cr(VI), total chromium, nitrate, strontium-90, gross beta, tritium, technetium-99, and sulfate to the list of COPCs.	8	8-3/2-17	Accept with Modification	Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. Additional information: Cr(VI), total chromium, nitrate, and strontium-90 were identified as COPCs in the groundwater risk assessment presented in Section 6.3 (Groundwater Risk Assessment). These contaminants are the contaminants that warrant evaluation of remedial alternatives in Chapter 8. Gross beta is an analysis that is used to indicate the presence of beta emitting radioisotopes. Gross beta is not identified as a COPC because it is an indicator parameter; isotope specific measurements are available for strontium-90 precluding the need to identify gross beta as a COPC. Tritium and technetium-99 are not identified as COPCs because all measured concentrations were less than their respective DWS. Sulfate will not be retained as a COC based on concentrations up to 2.2 times the SMCL. EPA has studied the effects of elevated sulfate on sensitive subpopulations (infants and transients [persons who live in one place for a short period of time]) at concentrations up to 4.8 times the SMCL. As a result, EPA did not develop a primary MCL for the effects associated with exposure to sulfate.	Yes - 10/2/2013
DH-463	Comment: Add the word “mixed” before “low-level radioactive waste” to read, “designated as mixed low-level radioactive waste that meets ERDF acceptance criteria” Basis/Justification: The waste will be mixed, containing both dangerous and radioactive waste, and should be stated as such.	See comment.	8	8-7/1-2	Accept with Modification	Text has been changed per discussion held during 5/2/13 Comment Resolution Meeting.	Yes - 8/7/2013
DH-464	Comment: A RD/RAWP already exists for the 100-D/H and all of 100 areas; therefore, add the final ROD RD/RAWP to be clear which one is being discussed. Basis/Justification: Specify which RD/RAWP is being discussed for clarity.	See comment.	8	8-7/25	Accept with Modification	Text revised.	Yes - 8/28/2013
DH-465	Comment: Provide the direct citation to the CLUP Supplemental Analysis as DOE/EIS-0222-SA-01. Is this finalized? If finalized, when did it become final?	See comment.	8	8-8/2	Accept	The Supplemental Analysis was finalized in 2008. The text will be revised to incorporate the document number (DOE/EIS-0222-SA-01). The correct citation for the document is included in the reference list in Chapter 11.	Yes - 5/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-466	Comment: This 5-line sentence is difficult to understand what is being discussed. Break it into more than one sentence. Here is a suggestion. "EPA generally defers to state agency definitions of useable groundwater provided under the various comprehensive state groundwater protection programs, administered by the states. EPA defers to the state's determination of groundwater usability at CERCLA sites [Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites (EPA/540/G-88/003)]. Basis/Justification: Sentence structure is so long that it is difficult to comprehend what is being stated here and throughout the document.	Clarify by using shorter sentences.	8	8-9/22-26	Accept	The text is revised as suggested.	Yes - 5/2/2013
DH-467	Comment: Shorten this sentence to: "The state of Washington has further determined that the highest beneficial use for potable groundwater at Hanford is as a potential source of domestic drinking water." (Groundwater Cleanup Standards" [WAC 173-340-720(1)(a)]. Basis/Justification: The site of interest is Hanford, so the focus should be on the Hanford Site.	Modify accordingly.	8	8-9/31-34	Accept with Modification	The sentence is making the point that the Hanford site is consistent with other cleanup sites across the state. The text has been revised.	Yes - 5/6/2013
DH-468	Comment: After 940 pages, this is the first time there is mention of "RIFS 2007 MTCA Method B values." Too late in the document. As can be seen in several comments above, this RI/FS is sorely lacking a clear comparison of Interim closeout values compliant with 1996 MTCA against current 2007 MTCA compliant values. Basis/Justification: Consistency, clarity, and accuracy.	As suggested previously, provide a clear comparison table of all applicable waste sites using 1996 vs. 2007 MTCA cleanup values within the body of this RI/FS.	8	8-11/22	Accept with Modification	Table 8-2 of the RI/FS shows SSLs/PRGs and cleanup values and provides both 1996 MTCA compliant values to current 2007 MTCA compliant values. This information allows the reader to compare where there are differences between 1996 and 2007 compliant values.	Yes - 5/20/2014
DH-469	Comment: Add uranium for 100-H Area. Basis/Justification: Currently detected in groundwater above DWS of 30 ug/L.	See comment.	8	8-27/2-8	Accept	Uranium will be added as a local groundwater COC. Agreement reached with Ecology in April 2014 to treat uranium as a groundwater COPC. Chapter text updated to reflect this agreement closes comment.	Yes - 6/19/2013
DH-470	Comment: Additional waste sites may need to be included in the FS than specified. Basis/Justification: Additional waste sites that may be continuous sources of contaminants, may have large concentrations of manganese, lead, or other COCs that were disregarded in Chapters 5 and 6 will need to be included in the FS per other Ecology comments regarding these and additional topics.	Additional waste sites may need to be included in the FS than specified.	8	8-28/39-42	Justification Added	As agreed in comment resolution meeting on 6/26/2013, this comment is resolved by the development of a process for transition from interim actions to final actions. Coordination of interim action activities with the final remedial actions is described in Section 10.5. Statement will be added to Proposed Plan with respect to the number of sites remediated since FS. If anomalies in groundwater concentrations (including areas of slower response to groundwater remediation) are discovered during the ongoing review of data, they will be investigated to determine if: - a vadose zone source may be present and contributing to the contamination levels - if geologic conditions are precluding an efficient cleanup using P&T technologies, or - if other conditions may exist.	Yes - 4/9/2014
DH-471	Comment: Change the columns with 1 X 10-5. This value should be 1 X 10-6 since this is a single pathway and is for one contaminant as listed in the rows. Basis/Justification: WAC 173-340-700.	See comment.	8	8-29/ Table 8-4 columns 8 and 12	Accept with Modification	As agreed in review meeting on 8/28/2013, Table 8-4 revised to remove the "Human Health water+organism" column.	Yes - 10/2/2013
DH-472	Comment: Waste site 116-H-6 should be carried forward in the FS, since ongoing groundwater contamination is linked to this waste site from the vadose zone contamination below 25 ft bgs. This waste site was remediated down to 15 ft bgs, but soil contamination was left in place. This soil contamination is still contributing to groundwater impacts as indicated by uranium and nitrate concentrations exceeding their respective standards. Carry forward into the FS and evaluate. Basis/Justification: Waste site has been proven to be supplying contamination of nitrate and uranium to the groundwater and needs to be carried forward into the FS.	See comment.	8	8-31/ Table 8-5	Accept with Modification	Remediation of this waste site extended to greater than 15 ft bgs in areas of elevated soil contamination. Residual contamination levels observed in site boreholes do not exceed SSLs. It is acknowledged that groundwater monitoring shows contamination, including a single exceedance of the uranium DWS. However, the overall trend in groundwater contamination related to the solar evaporation basins has been downward. The FS will be revised to include an MNA alternative for groundwater contamination above DWSs and associated ICs for the waste site. Agreement reached with Ecology in April 2014 to treat uranium as a groundwater COPC. Chapter text updated to reflect this agreement closes comment.	Yes - 5/22/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-473	Comment: Waste site 116-H-6 should be carried forward in the FS, since ongoing groundwater contamination is linked to this waste site from the vadose zone contamination below 25 ft bgs. This waste site was remediated down to 15 ft bgs only, but soil contamination was left in place deeper than 15 ft bgs in the vadose zone. This soil contamination is still contributing to groundwater impacts as indicated by uranium and nitrate concentrations exceeding their respective standards. Carry forward into the FS and evaluate. Basis/Justification: Waste site has been proven to be supplying contamination of nitrate and uranium to the groundwater and needs to be carried forward into the FS.	See comment.	8	8-33/ Figure 8-2	Accept with Modification	Remediation of this waste site extended to greater than 15 ft bgs in areas of elevated soil contamination. Residual contamination levels observed in site boreholes do not exceed SSLs. It is acknowledged that groundwater monitoring shows contamination, including a single exceedance of the uranium DWS. However, the overall trend in groundwater contamination related to the solar evaporation basins has been downward. The FS will be revised to include an MNA alternative for groundwater contamination above DWSs and associated ICs for the waste site. Agreement reached with Ecology in April 2014 to treat uranium as a groundwater COPC. Chapter text updated to reflect this agreement closes comment.	Yes - 5/22/2013
DH-474	Comment: List or discuss the analyzed constituents. Current groundwater risk show that the uranium and nitrate are exceeding their respective MCLs that are directly linked to the deep vadose zone contaminated soil at 100-H-33/116-H-6. For this reason, further action should be identified in the remedial action alternatives. Basis/Justification: Waste site has been proven to be supplying contamination of nitrate and uranium to the groundwater and needs to be carried forward into the FS.	Provide more constituent detail, per comments.	8	8-39/1-11	Accept with Modification	Chapter 4 (Sec 4.3.15) text will be revised to expand the site-specific CSM and include groundwater monitoring data (including uranium, Tc-99, Cr(VI), and nitrate among others) through 2012. Corresponding Chapter 5 text will be revised to note uranium as a COC for the local groundwater (specific to 116-H-6 area) without site-specific modeling analysis. It is acknowledged that groundwater monitoring shows contamination, including a single exceedance of the uranium DWS. CSM and N&E discussion will note that a correlation between upticks in concentrations in groundwater and groundwater elevation changes cannot be substantiated, and that concentrations of the analytes in groundwater in the area are decreasing overall. The FS will be revised to include an MNA alternative for groundwater contamination above DWSs and associated ICs for the waste site based on the low residual concentrations shown to be present in the vadose zone and the decreasing trend in contaminant concentrations. It should be noted that remediation of this waste site extended to greater than 15 ft bgs in areas of elevated soil contamination. Residual contamination levels observed in site boreholes do not exceed SSLs. Agreement reached with Ecology in April 2014 to treat uranium as a groundwater COPC. Chapter text updated to reflect this agreement closes comment.	Yes - 5/22/13
DH-475	Comment: The 116-H-33/183-H Solar Basin should be carried through the FS process. Basis/Justification: On page 8-44, line 21, the 183-H Solar Evaporation Basin, was partially closed by Ecology in 1997 is now thought to be a potential source of continuous Cr (VI) contamination. This site should be further evaluated before it is completely closed. Also, this site should undergo additional characterization and be carried forward as a potential Cr (VI) source until it can be definitively decided by field data that it is not contributing to ongoing vadose zone and groundwater contamination.	The 116-H-33/183-H Solar Basin should be carried through the FS process.	8	8-39/1-11	Accept with Modification	The waste site will be carried in the FS with ICs for soil and MNA for groundwater. It is acknowledged that groundwater monitoring shows continued contamination attributable to past disposal at the solar evaporation basins. However, borehole data has not detected contaminants above SSLs; groundwater monitoring does not show sustained DWS exceedances; and the overall trend in groundwater contamination related to the solar evaporation basins has been downward. It is appropriate to consider further alternatives for the groundwater, but no further remedial action is justified for the vadose zone waste sites. The waste site will be carried forward with ICs to restrict use of groundwater. Agreement reached with Ecology in April 2014 to treat uranium as a groundwater COPC. Chapter text updated to reflect this agreement closes comment.	Yes - 5/22/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-476	Comment: Clarify if any additional non-radionuclide constituents are present. Also, clarify in Chapter 9 if in situ biostimulation would help degrade the chemicals and radionuclides present. Basis/Justification: This potential remedial action was not discussed in the FS.	Clarify if any additional non-radionuclide constituents are present. Also, clarify in Chapter 9 if in situ biostimulation would help degrade the chemicals and radionuclides present.	8, 9	8-40/12-24	No change	Based on the data used for risk assessment, there are no non-radionuclide COCs in the deep zone (>15-ft bgs) that exceed direct exposure human health criteria. The direct contact exposure pathway is incomplete at depths greater than 15' bgs. Therefore, no further technology application is required and remedial action alternatives are not developed for these sites. No text changes are required for Chapters 8 or 9 in response to this comment. No additional non-radionuclide COCs were identified based on the "reevaluation" of waste sites based on groundwater and surface water impacts. As a result, no further technology application is required and remedial action alternatives are not developed for these sites. No text changes are required for Chapters 8 or 9 in response to this portion of the comment.	Yes - 5/13/2014
DH-477	Comment: Several of these waste sites have undergone confirmatory sampling and some have been interim closed. One of these sites is listed twice: 100-D-105. Should this be 100-D-106 based on Table J-1. Update accordingly. Basis/Justification: Information does not reflect current information.	See comment.	8	8-43/6-7	Accept	The sentence will be revised to reflect the cut-off date for the information. The second occurrence of 100-D-105 changed to 600-381.	Yes - 5/2/2013
DH-478	Comment: Update the Table to reflect that Biological reduction is also applicable to VOCs, Semi-VOAs, and heavy metals. Basis/Justification: Many of these have been studied by PNNL and even employed at the Hanford Site.	Update the Table to reflect that Biological reduction is also applicable to VOCs, Semi-VOAs, and heavy metals.	8	8-50/ Table 8-6	Accept	Updated as commented	Yes - 8/28/2013
DH-479	Comment: Retain phytoremediation on each table for the contaminants exiting through seeps and springs and associated contaminated sediments along the riparian zones. Basis/Justification: This has proven to be a very good remedial technology for this specific zone/purpose.	Retain phytoremediation on each table for the contaminants exiting through seeps and springs and associated contaminated sediments along the riparian zones.	8	8-50&62/ Table 8-6&7	Not Accepted	As identified in the technologies screening table this technology was not retained because phytoremediation is only effective when plants are active, thus the technology is not effective during the winter. Phytoremediation only treats soils to the approximate depth of the plant roots, and is only appropriate for low concentrations of contaminants. It is a slow process that is applied over long periods, that is, years or decades. Many metals and radionuclides are only taken up by the plants and not transformed to innocuous forms. Phytoremediation would only be effective for low concentrations of contaminants in shallow soils over long periods, and many metals and radionuclides would accumulate in the plants and would not actually be treated, posing risks to ecological receptors. Disadvantages of phytoextraction include: • Phytoremediation has no effect on aquifer restoration and the time required to achieve the DWS. • The willow plantation will require intensive management to maintain vigorous growth, with regular replacement of dead, diseased, or over mature plants. Substantial long-term O&M will be required to periodically harvest and dispose of strontium-90 contaminated plants (e.g., Coyote Willows). • Because phytoextraction concentrates the contaminant in biomass, there is a potential for strontium-90 to enter the food chain via the consumption of the plants by insects, birds, and mammals. Engineered barriers (fencing and netting) will be required to prevent animal intrusion, and maintained throughout the life of the phytoextraction remedial action.	Yes - 10/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-479 (Cont'd)						• Contaminated leaf litter has the potential for spreading strontium-90 on the river surface locally and downstream. Engineering controls will need to be deployed and maintained to control leaf litter throughout the life of the phytoextraction remedial action. • Roots that remain after the phytoextraction remedial action is completed will be contaminated and may serve as a food source for soil biota. It is unknown if this will increase the strontium-90 availability to the local food chain. • The shoreline is subject to flooding and associated high-velocity floodwater currents that has the potential for washing strontium-90 laden vegetation downstream, thus potentially constituting a "release" from a CERCLA Site. Engineering controls will need to be deployed and maintained to control this condition throughout the life of this remedial action. The potential benefits of implementing phytoextraction do not compensate for the significant risks associated with this technology, and that even with stringent engineering controls, monitoring, maintenance, and strictly enforced ICs, these risks cannot be completely eliminated.	
DH-480	Comment: Strontium-90 is listed as an applicable COPC for the Ion Exchange process; however, the effectiveness column does not address strontium-90. Basis/Justification: Table is inconsistent.	Either address strontium-90 in the effectiveness column or remove it as an applicable COPC for this technology.	8	8-58	Accept	Changed relative effectiveness text and the screening text to address Sr-90.	Yes - 4/9/2014
DH-481	Comment: Editorial: velocity needs to be corrected from "velocity" to "velocity". The "i" is in subscript format. Basis/Justification: See comment.	Make correction.	8	8-70/39	Accept	The text has been corrected as noted.	Yes - 5/2/2013
DH-482	Comment: Add after "Excavations are backfilled and compacted using clean overburden and borrow soil." The following sentence. "The excavated site is recontoured to reflect the surrounding terrain to the extent practical and revegetated with native species." Basis/Justification: Required by Mitigation Action Plan for the 100 and 600 Areas of the Hanford Site (DOE/RL-2001-22), Hanford Site Biological Resources Management Plan (DOE/RL-96-32), and RDR/RAWP for the 100 Area (DOE/RL-96-17, Rev. 6 Appendix H).	Add the sentence discussing revegetation. See comment.	8	8-76/ Fig 8-7	Accept	The figure will be modified as suggested.	Yes - 5/2/2013
DH-483	Comment: Add after "Excavations are backfilled and compacted using clean overburden and borrow soil." The following sentence. "The excavated site is recontoured to reflect the surrounding terrain to the extent practical and revegetated with native species." Basis/Justification: Required by Mitigation Action Plan for the 100 and 600 Areas of the Hanford Site (DOE/RL-2001-22), Hanford Site Biological Resources Management Plan (DOE/RL-96-32), and RDR/RAWP for the 100 Area (DOE/RL-96-17, Rev. 6 Appendix H).	Add the sentence discussing revegetation. See comment.	8	8-77/ Fig 8-8	Accept	The figure will be modified as suggested.	Yes - 5/2/2013
DH-484	Comment: On the figure relative implementability is shown as ranging from moderately low to high, yet Table 8-6 has high with no range discussion. Correct this figure or change Table 8-6 to reflect this range. Basis/Justification: Contradiction between Table 8-6 and Figure 8-12.	Correct the 'relative implementability to high instead of a range from moderately low to high.	8	8-81/ Fig 8-12	Accept	Figure updated to reflect high implementability as commented.	Yes - 5/2/2013
DH-485	Comment: The alternative 2, 3 and 4 needs to be evaluated based on 'general' comments identified for chapters 5 (first five comments to Chapter 5 above), 10 and Appendices F above. It is expected that there would significant changes in both cost and duration of the remediation based on these analyses to meet the RAOs identified the proposed plan and the RI/FS. Basis/Justification: Clarity and accuracy.	Make sure to incorporate the information changes as suggested for related text - especially in chapter 9 and 10.	9, 10	General	Accept	If comment resolution process results for comments on Chapter 5 or 10 or Appendix F result in significant changes to the alternative timeframes, these changes will be carried forward through the alternatives evaluation. RESOLUTION: Review of modeling results after implmenting all comment resolutions that resulted in changes to the modeling basis did not produce any changes to the remedial timeframes evaluated. Hence, no changes emerged that would necessitate changes to the alternatives evaluation.	Yes - 5/21/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-486	Comment: Explain the process through the CERCLA guidance how this will occur. For this statement, "indicate a need to re-evaluate the efficacy of the selected remedial action, the appropriate remedy modification will be used, consistent with CERCLA guidance." Cite the CERCLA guidance that is being discussed. Basis/Justification: Explanation how the CERCLA guidance provides the process to ensure remedy modification after the Final ROD.	Provide more detail on how the CERCLA guidance provides this path forward.	9	9-2/36-38	Accept	Added reference to guidance for ROD change	Yes - 8/28/2013
DH-487	Comment: This sentence seems inaccurate, "Institutional controls will be maintained for these sites until unrestricted use is allowable and remedial action alternatives are not developed for these sites." It is recommended that it is changed to read, "Institutional controls will be maintained for these sites until unrestricted use is allowable and remedial action alternatives are developed for these sites." Remove the "not". Basis/Justification: Sentence seems to be inconsistent with the topic of institutional controls.	See comment.	9	9-3/13-15	Accept with Modification	The sentence is making the point that the Hanford site is consistent with other cleanup sites across the state. The text has been revised for clarification.	Yes - 5/2/2013
DH-488	Comment: List here these "other COCs/COPCs". Basis/Justification: The reader should not have to guess or go back in the document to find out what COCs and COPCs are being carried forward.	Provide the other COCs and COPCs that are going to be evaluated in the FS in this bullet.	9	9-3/31	Accept with Modification	The bullets listed pertain to exposure pathways instead of risk drivers (which are chemicals). The text will be revised to list only the complete exposure pathways, no COCs or COPCs will be listed.	Yes - 4/21/2014
DH-489	Comment: Add uranium for 100-H Area.	Add uranium to the COC list for groundwater since it currently exceeds groundwater DWS.	9	9-3/32-34	Accept	Uranium will be added as a local groundwater COPC. Agreement reached with Ecology in April 2014 to treat uranium as a groundwater COPC. Chapter text updated to reflect this agreement closes comment.	Yes - 6/19/2013
DH-490	Comment: Groundwater flow and transport simulations for the remedial design after the final ROD is issued will need to address all known groundwater contamination in 100-D/H and across the horn. Currently several COCs are not being addressed with the main one being uranium. In addition, localized zinc, cadmium, mercury, and other metals have been detected and in some places have not been fully sampled and analyzed to develop a true conceptual site model of these constituents. Address how this will be accomplished. Basis/Justification: Historical groundwater monitoring has not occurred. Groundwater monitoring was not fully conducted across the horn until 2008 and 2009 and evaluated a limited set of constituents. In places along 100-H shoreline, groundwater associated with waste sites were not evaluated for metals until after they were discovered to exceed soil cleanup values for the protection of groundwater/surface water.	See comment.	9	9-3/35-43	Accept with Modification	Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. <u>Additional information:</u> COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs.	Yes - 10/2/2013
DH-491	Comment: This document, "Conceptual Framework and Numerical Implementation of 100 Areas Groundwater Flow and Transport Model (SGW-46279) is not located in Appendix F as stated. Provide since this document is stated as being in Appendix F in numerous chapters of this RI/FS, but is not provided. Basis/Justification: This document is not located in Appendix F as stated.	See comment.	9	9-4/3-5	Accept	The document will be located in the AR at and will be added to Appendix F. Document added to F. Will be placed in AR	Yes - 2/4/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-492	Comment: The text states: "Figures 9-2 and 9-3 show the initial distributions for strontium-90 and nitrate, respectively." The text should explain that for several reasons (e.g., groundwater monitoring network configuration, pump-and-treat system, bias due to time of sampling, bias due to monitoring well design, sampling frequency, sampling program, etc.), the plumes associated with other COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc) have not been adequately identified/characterized. The text should also identify that historical COC occurrences (exceeding action levels and/or 90th percentile Hanford Site background) for the classified COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc) are also shown on figures. Basis/Justification: Accuracy and completeness. See Chapter 4 comments on groundwater classified COCs.	1. In text, explain that plumes associated with the classified COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc) have not been adequately identified/characterized. 2. Include figures showing well locations where technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc have exceeded action levels and/or 90th percentile Hanford Site background.	9	9-4/6-7	Accept with Modification	Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. <u>Additional information:</u> Cr(VI), strontium-90, and nitrate are shown in Figure 9-1 through Figure 9-3 because they are contaminants that are consistently measured over time in monitoring wells at concentrations above the DWS or State water quality standard. Plume maps were not developed for the other analytes listed in this comment because they do not show consistent measureable results. Instead, these analytes are generally associated with erratic detections above a standard or cleanup level (i.e. not associated with a upward or downward trend) or do not report any concentrations above a standard or cleanup level. The results of Chapter 4 groundwater nature and extent evaluation identify that analytical methods for some analytes (mostly metals) used for historical samples cannot accurately measure concentrations at or near the standard or cleanup level. This data quality issue will be addressed in the associated remedial design work plan.	Yes - 10/2/2013
DH-493	Comment: The text states: "MNA and institutional controls will be used for strontium-90. Groundwater monitoring will confirm effectiveness of MNA for strontium-90 and determine the impact of pump-and-treat on the persistence of the COC within the aquifer over time." The text does not identify how co-extracted contaminants are addressed during pump-and-treat operations. Also, monitored natural attenuation is not an option for "co-extracted contaminants" during pump-and-treat remediation. Also, at this time, it is unknown if MNA is an option for all contaminants (COCs). Re-write the sentences. Basis/Justification: Completeness and OSWER Directive 9200.4-17P.	1. Identify how co-extracted contaminants are addressed during pump-and-treat operations. 2. Re-write the sentence to be consistent with OSWER guidance on MNA. Possible wording: "Co-extracted COCs (i.e., strontium-90, technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrate, nitrite, sulfate, chromium, chromium +6, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc) will meet the lowest applicable action levels prior to re-injection into the unconfined aquifer. MNA may be used to address residual contamination in groundwater after pump-and-treat operations have ceased for hexavalent chromium."	9	9-4 and 9-8/33-36, 10-12, and 24-27	Accept with Modification	1. Text will be updated to identify how co-extracted contaminants are addressed during pump-and-treat operations per comment. Co-extracted contaminants include chromium, nitrate, strontium-90, and uranium. Uranium is also identified as a local groundwater COC associated with the 183-H Solar Evaporation Basins based on comment review. Text will be added to summarize observed and predicted co-extracted COCs (i.e., chromium, nitrate, strontium-90, and uranium) in the P&T effluent are below the lowest applicable action levels prior to re-injection into the unconfined aquifer. MNA is used to address residual contamination in groundwater after pump-and-treat operations have ceased for hexavalent chromium. Clarification will be provided for remedies applied to nitrate and strontium-90 as identified below. • Provide additional clarification to identify strontium-90 and nitrate COCs are co-extracted with hexavalent chromium contaminated groundwater and blended with the P&T influent. The blended influent is treated by IX to remove hexavalent chromium. The current observed and predicted effluent strontium-90 and nitrate concentrations are below the DWS. Therefore, treatment is not considered further as there is no resulting risk reduction. • Include clarification that remaining Sr-90 contamination at 100-D and 100-H following P&T cessation are small relatively immobile plumes and is expected decay to less than DWS in a reasonable timeframe. P&T would not appreciably accelerate cleanup time due to the preference to bind with the aquifer sediments. • Expand on use of natural attenuation as passive remediation for strontium-90 following hexavalent chromium P&T remediation cessation. Include MNA discussion regarding Sr-90 radioactive decay. • Include clarification that the co-extracted nitrate meets DWS prior to Cr(VI) remediation completion. Add text to expand on use of modeling simulations to show nitrate contamination plumes are remediated to less than 45,000 µg/L before cleanup levels for the hexavalent chromium plumes are achieved so the P&T system only needs to run for the time frame needed to remediate hexavalent chromium contamination.	Yes - 4/8/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-493 (Cont'd)			9	9-4 and 9-8/33-36, 10-12, and 24-27	Accept with Modification	• Groundwater extraction and injection of the P&T operations provide hydraulic containment for strontium-90 and nitrate and induced gradients enhance dispersion and diffusion attenuation processes. Text will be added to the alternatives to include discussion on groundwater uranium contamination. • Increases in groundwater elevation resulting from seasonal river stage fluctuation could potentially cause uranium to desorb from sediments in periodically rewetted zone into the local groundwater. • Uranium groundwater concentrations have been attenuating in wells downgradient, which have concentrations decreasing overall. Effectiveness of continued natural attenuation will be monitored through performance monitoring sampling. • The localized groundwater uranium contamination, as detected, will be further reduced by dispersion and diffusion created through co-extraction and injection of the Cr(VI) P&T system. Any remaining uranium contamination in the groundwater following cessation of the P&T system will be managed through dispersion and diffusion by normal groundwater flow. 2. Alternatives are developed only for COCs. Identified COCs include chromium, hexavalent chromium, strontium-90, nitrate, and uranium. Treatment alternatives are not evaluated for other contaminants. Clarification can also be added regarding the role of MNA and decay following the pump-and-treat operations ceasing. Text will clarify that MNA may be used to address residual contamination in groundwater after pump-and-treat operations have ceased for hexavalent chromium. Text changes will also provide clarification that radioactive decay is only applicable to strontium-90.	
DH-494	Comment: The text states: "The groundwater treatment system effluent is not expected to exceed MCLs and no treatment is proposed for strontium-90 and nitrate. Specific treatment would be provided if the extracted groundwater in the pump-and-treat effluent stream exceeds the MCLs for the respective COCs before reinjection." The text does not acknowledge all COCs. The text should identify how groundwater treatment system effluent will be treated in the event that COC concentrations exceed MCLs. Basis/Justification: Accuracy, completeness, and ARARs that don't allow dilution to meet standards.	Possible wording: "Based on operational data, the groundwater treatment system effluent is not expected to exceed MCLs and no treatment is currently proposed for strontium-90, technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrate, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc. However, if, through normal operation of the groundwater treatment system, COC concentrations of co-contaminants exceed MCLs in the effluent specific treatment would be provided for the respective COCs before reinjection."	9	9-4 and 9-8/30-33, 7-9, and 21-24	Accept with Modification	Alternatives are developed only for COCs. Identified COCs include chromium, hexavalent chromium, strontium-90, nitrate, and uranium. Current measurements at the treatment plants in the 100-D and 100-H areas show that influent concentrations for both nitrate and Sr-90 are well below their respective drinking water standards. At the DX treatment plant influent concentrations of strontium-90 have ranged between 0.2 and 1.3 pCi/L while measured effluent concentrations ranged between -0.05 and 0.89 pCi/L (minor differences are related to the specific timing of the analytical results); well below the MCL value of 8 pCi/L. At the HX treatment plant, effluent and influent concentrations ranged between 1 and 3 pCi/L. For nitrates, influent and effluent concentrations at the DX treatment plant ranged between 25 to 28 mg/L, also below the MCL value of 45 mg/L (expressed as NO3). At the HX treatment plant, nitrate influent and influent concentrations ranged between 12 to 16 mg/L; also below the MCL. Observed concentrations and modeling results indicate that these concentrations will continue to decline over the next 10 to 20 years until all nitrate concentrations drop below the drinking water standard. Based on these measurements and expected future conditions, it is not expected that either contaminant will exceed their MCLs in the influent and no treatment is expected to be required. Text will be added to Chapter 9 to summarize recent influent measurements and the basis for future predictions.	Yes - 4/8/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-495	Comment: For Alternatives 2, 3, and 4 discussed on p. 9-4 and 9-8, nitrate is not addressed adequately to understand how it will be treated. Provide additional discussions here on how to address this COC. Basis/Justification: Nitrate has been identified as a COC in groundwater, yet no clear discussion of how it will be treated, including MNA. This should be discussed here and fully discussed in Section 9.2.3	Discuss briefly how nitrate, an identified COC for groundwater will be treated in this alternative.	9	9-4 and 9-8, 24-40	Accept	The nitrate plumes are within the Cr(VI) pump-and-treat capture zone and are hydraulically contained during operations. Current measurements at the treatment plants in the 100-D and 100-H areas show that influent concentrations for nitrate are well below the drinking water standard (see details in response to Comment DH-494). Observed concentrations and modeling results indicate that these concentrations will continue to decline over the next 10 to 20 years. Based on these measurements and expected future conditions, it is not expected that nitrate will exceed their MCLs at the treatment plants and no treatment is expected to be required. Text will be added to Chapter 9 to summarize recent measurements at the treatment plants and the basis for future predictions and plume containment during Cr(VI) pump-and-treat operations. MNA will be the dominant mechanism after cessation of pumping as needed until the MCL is reached.	Yes - 4/8/2014
DH-496	Comment: For Alternatives 2, 3, and 4 discussed on p. 9-4 and 9-8, treatment of nitrate and strontium-90 will not occur, yet the next sentence begins "Specific treatment would be provided . . ." Discuss how, where, and when specific treatment would be provided for nitrate and strontium-90. Basis/Justification: No basis is presented for how, where and when this treatment would be provided, yet it is stated it would be.	See comment.	9	9-4 and 9-8/30-33	Accept	Current measurements at the treatment plants in the 100-D and 100-H areas show that influent concentrations for both nitrate and Sr-90 are well below their respective drinking water standards. Modeling results indicate that these concentrations will continue to decline over the next 10 to 20 years. Based on these measurements and expected future conditions, it is not expected that either contaminant will exceed their MCLs in the influent and no treatment is expected to be required. Text will be added to Chapter 9 to summarize recent influent measurements and the basis for future predictions.	Yes - 4/8/2014
DH-497	Comment: For Alternatives 2, 3, and 4 discussed on p. 9-4 and 9-8, waste sites 116-H-6/100-H-33 will have institutional controls because it is a closed waste site with contamination being deeper than 15 ft bgs in the vadose zone and impacts groundwater with constituents of nitrate and uranium exceeding their MCLs. Clearly state that waste site 116-H-6 will have institutional controls in place because of impacts to groundwater and the lower vadose zone. Basis/Justification: The sentence states it will. "Institutional controls to restrict excavation will be applied at individual waste sites with residual risks associated with contamination at depths greater than 4.6 m (15 ft) bgs after remediation, but there is no direct exposure pathway." This sentence meets waste site 116-H-6 conceptual site model.	See comment and justification.	9	9-4 and 9-8/ 36-39	Accept with Modification	This sentence refers to waste sites where residual deep zone contaminant concentrations exceed shallow zone direct exposure criteria--an IC is conservatively applied to prevent future uncontrolled intrusion that could bring this contamination to the shallow zone. The sentence will be revised to clarify. ICs for uncontrolled soil intrusion/removal are not being applied to the 116-H-6/100-H-33 sites because residual vadose zone contaminant concentrations do not exceed direct exposure criteria. However, the FS will be revised to include the local uranium-contaminated groundwater area in conjunction with an MNA alternative for groundwater contamination above DWSs.	Yes - 4/8/2014
DH-498	Comment: Provide for Figures 9-1, 9-2, and 9-3 what calendar year the data represents. In one place in the document it states 2010 in another it states 2011. Basis/Justification: Cannot determine what the initial conditions are based on for the information presented in the text and figures.	Provide in the text and on the figures the calendar year for the data presented.	9	9-5, 9-6, 9-7/Figs. 9-1, 9-2, and 9-3	Accept	Text added. The initial plumes are based on calendar year 2011 plumes.	Yes - 8/28/2013
DH-499	Comment: Table 9-1 identifies MNA as a "retained technology" for groundwater. During pump-and-treat remediation, MNA is not an option. Basis/Justification: OSWER Directive 9200.4-17P	Delete the row.	9	9-9	Need Discussion	MNA can be used for nitrate and Cr(VI) following active remediation (by P&T). MNA by radioactive decay for strontium-90 is applicable and is not dependent on the active remediation of groundwater. Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493.	Yes - 7/17/2013
DH-500	Comment: It is stated, "....DOE and EPA will work with the Tribes to identify an alternative remediation strategy." As part of the tri-parties of the TPA and the regulator for this RI/RS, add Ecology to the sentence. Basis/Justification: Consistency, clarity, and accuracy.	Add Ecology with DOE and EPA to the sentence.	9	9-11/10-11	Accept	The text has been revised as suggested.	Yes - 5/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-501	Comment: Explain why 1200 gal/min is used, when the current treatment capacity is 1400 for DX and HX combined. I know these are maximum, but even with outages an assumption of 85% efficiency seems low. Especially since the current system availability is 96% to 98% efficiencies for run times and 99.8% removal efficiency. Basis/Justification: Explanation for the 85% efficiency value is not provided. Basis for this number is needed to understand the overall efficiency of meeting the cleanup timeframes.	See comment.	9	9-12/ Table 9-3	Accept	Text is clarified to indicate efficiency is based on history. The P&T system availability of >96% is associated with the time the P&Ts are running, but not the flow rate through the systems while running. Extraction flow rates vary based on well performance and river stage. Water level drop in extraction wells result in reduced flow in the extraction wells. In 2012 (full year with both DX and HX operational), the combined total volume through the DX and HX P&T systems was 624 million gallons. This averages to a combined flowrate of about 1,187 gpm through the two systems, or about 85% of the 1,400 gpm treatment plant capacity. It must be noted that total injection capacity can also limit the flow rate. All of these issues are taken into consideration when the P&T system is running.	Yes - 1/27/2014
DH-502	Comment: the regulations require a 95th UCL on the mean groundwater concentration values, yet your model runs used a 90 percentile as well as the maximum in ECF-100HR3-11-0114, REV.4 in Appendix F. Do these runs again using the 95 UCL to meet the requirements in WAC 173-340-720(9).		9	9-13/6-8	Not Accepted	The context of the commented text is addressing future EPCs that can be used to demonstrate groundwater remediation based on the 95th UCL rather than the model runs. No change needed.	Yes - 7/10/2013
DH-503	Comment: For cleanup time as presented in ECF-100HR3-11-0114, REV.4 in Appendix F, the maximum time would seem most appropriate to use for a bounding case. In addition, was this time compared to the pump and treat being turned off and the aquifer allowed to re-equilibrate? Basis/Justification: Based on WAC 173-340-720(9)(c)(vi), "groundwater cleanup levels shall be determined when the groundwater characteristics at the site are no longer influenced by the cleanup action".	Provide detail in the document (Appendix F, ECF-100HR3-11-0114, REV.4 and here that provides the information requested.	9	9-13/6-8	Accept with Modification	Will clarify that the maximum time to achieve cleanup as presented in ECF-100HR3-11-0114 is used as the bounding case for the P&T operating time frame. The modeled cleanup times does not include monitoring period for rebound. This is part of remedy performance monitoring to evaluate effectiveness of the remedial action. The cited WAC requirements will be addressed through the compliance monitoring phase of the remedy, as such the WAC reference is not appropriate for this document.	Yes - 1/27/2014
DH-504	Comment: These paragraphs do not explain the "Alternative development" that would discuss what treatment will be done if nitrate and strontium-90 exceed their MCLs in the influent. Provide this discussion here. Basis/Justification: Alternative development is mentioned but not discussed in the bulleted items that follow.	Provide the alternative development for treatment of nitrate and strontium-90, if these constituents exceed their respective MCLs in the influent groundwater.	9	9-14/3-40	Justification Added	Current measurements at the treatment plants in the 100-D and 100-H areas show that influent and effluent concentrations for both nitrate and Sr-90 are well below their respective drinking water standards (see details in response to Comment DH-494). Observed concentrations and modeling results indicate that these concentrations will continue to decline over the next 10 to 20 years. Based on these measurements and expected future conditions, it is not expected that either contaminant will exceed their MCLs in the effluent and no treatment is expected to be required. Text will be added to Chapter 9 to summarize recent influent measurements and the basis for future predictions. As explained in response to Comment DH-493, MNA will be identified for strontium-90 after cessation of pumping with radioactive decay as the attenuation mechanism. For nitrate, a period of MNA could be required after cessation of the chromium pump-and-treat operations.	Yes - 4/8/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-505	Comment: The text describes alternative development approaches to treat only 4 groundwater COCs. Basis/Justification: Completeness.	Describe alternative development approaches for all groundwater COCs (i.e., strontium-90, technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrate, nitrite, sulfate, chromium, chromium +6, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc).	9	9-14	Accept with Modification	Alternative development approaches have been developed for Cr(VI), chromium (total), strontium-90, and nitrate because they are contaminants that are consistently measured over time in monitoring wells at concentrations above the DWS or State water quality standard. <u>Additional information:</u> Uranium has been identified as a local COC and included in the alternative development approach. Agreement reached with Ecology in April 2014 to treat uranium as a groundwater COPC. Chapter text updated to reflect this agreement closes comment. Groundwater contaminants that do not warrant further evaluation in the FS, but have infrequent detections above an action level will be included in the RD/RAWP for continued monitoring at appropriate locations and frequency. The text has been revised accordingly. Alternatives were not developed for the other analytes listed in this comment because they do not show consistent measureable results. Instead, these analytes are generally associated with erratic detections above a standard or cleanup level (i.e. not associated with a upward or downward trend) or do not report any concentrations above a standard or cleanup level. The results of Chapter 4 groundwater nature and extent evaluation identify that analytical methods for some analytes (mostly metals) used for historical samples cannot accurately measure concentrations at or near the standard or cleanup level. This data quality issue will be addressed in the associated remedial design work plan.	Yes - 1/30/2014
DH-506	Comment: "No design or cost estimates are prepared for Alternative 1 because no actions are proposed." Basis/Justification: Document clarity.	Explain if any administrative or closeout costs are included in the event of selecting Alternative 1, No Action Alternative.	9	9-15/21	No change	The Superfund program generally requires that the "no action" alternative be evaluated to establish a baseline for comparison. Under this alternative no action, including administrative or closeout actions, would be taken at the site to prevent exposure to the soil and ground water contamination, i.e., literally "walk away" from the site. A No Action decision is recommended when it is determined that no action is necessary to protect public health or welfare or the environment. If EPA and DOE determine in the ROD that ICs (only) shall be required, the proposed plan includes sufficient information, including cost of Programmatic Institutional Controls, to support that decision.	Yes - 8/28/2013
DH-507	Comment: What is meant by "the containment of the plume along the river that is observed at 2012 is lost, as can be seen in the model"? Explain. Basis/Justification: Unclear what is meant by "is lost".	Clarify what is meant by "is lost".	9	9-15/25-27	Accept	Text was modified to identify that extraction wells along the river are turned off and no longer provide containment of inland contamination from migrating and reaching the river.	Yes - 8/28/2013
DH-508	Comment: Consider previous comments about using highest concentrations (rather than averaged concentrations) of chromium and chromium +6 for "baseline" plume maps/figures and re-model Figures 9-4a, 9-4b, 9-4c, and 9-4d. Basis/Justification: Accuracy.	Consider previous comments about using highest concentrations (rather than averaged concentrations) of chromium and chromium +6 for "baseline" plume maps/figures and re-model figures 9-4a, 9-4b, 9-4c, and 9-4d.	9	9-16 - 9-19	Accept	A sensitivity study for the initial concentrations used in the model will be developed, conducted, and documented and summarized in Chapter 5 to evaluate the impact of using maximum measured concentrations as the basis for the initial groundwater contaminant condition. The results of this analysis will be presented to Ecology and a path forward defined for disposition of the remaining assumptions in this comment regarding remedy impacts. A technical memorandum was prepared that evaluated differences in initial plume representations from using a maximum concentration basis contrasted with average concentration basis. This information was provided with ECY. ECY agreed, based on review and discussion of this information, that the average basis was appropriate for establishing initial conditions for modeling.	Yes - 4/21/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-509	Comment: Consider previous comments about using highest concentrations (rather than averaged concentrations) of nitrate and strontium-90 for "baseline" plume maps/figures and re-model Figures 9-5a, 9-5b, 9-5c, 9-5d, 9-6a, 9-6b, 9-6c, and 9-6d. Basis/Justification: Accuracy.	Consider previous comments about using highest concentrations (rather than averaged concentrations) of nitrate and strontium-90 for "baseline" plume maps/figures and re-model Figures 9-5a, 9-5b, 9-5c, 9-5d, 9-6a, 9-6b, 9-6c, and 9-6d.	9	9-21 - 9-28	Accept	A sensitivity study for the initial concentrations used in the model will be developed, conducted, and documented and summarized in Chapter 5 to evaluate the impact of using maximum measured concentrations as the basis for the initial groundwater contaminant condition. The results of this analysis will be presented to Ecology and a path forward defined for disposition of the remaining assumptions in this comment regarding remedy impacts. A technical memorandum was prepared that evaluated differences in initial plume representations from using a maximum concentration basis contrasted with average concentration basis. This information was provided with ECY. ECY agreed, based on review and discussion of this information, that the average basis was appropriate for establishing initial conditions for modeling.	Yes - 4/21/2014
DH-510	Comment: Add modeling figures (e.g., 3, 18, 38, and 68 year periods) for Alternative 1 for all COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc). Figures should be generated using the highest concentration observations (during the last 6 years) as the "baseline" plume map/figure. Basis/Justification: Completeness.	Add modeling figures (e.g., 3, 18, 38, and 68 year periods) for Alternative 1 for all COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc). Figures should be generated using the highest concentration observations (during the last 6 years) as the "baseline" plume map/figure.	9	S. 9.2.1	No change	Figures were not developed for the analytes listed in this comment because they do not show consistent measureable results. Instead, these analytes are generally associated with erratic detections above a standard or cleanup level (i.e. not associated with a upward or downward trend) or do not report any concentrations above a standard or cleanup level. The results of Chapter 4 groundwater nature and extent evaluation identify that analytical methods for some analytes (mostly metals) used for historical samples cannot accurately measure concentrations at or near the standard or cleanup level. This data quality issue will be addressed in the associated remedial design work plan. Sampling to evaluate whether or not the analytes identified to have uncertain status is included in the Remedy Performance Monitoring section (Section 9.2.2.7).	Yes - 1/30/2014
DH-511	Comment: The text describes the evaluation of MNA application. At a minimum, the text should clearly identify that MNA cannot be used as a groundwater remediation until active remediation is no longer occurring. Basis/Justification: OSWER Directive 9200.4-17P	Either delete Section 9.2.2.3 or re-write it to clearly identify that MNA cannot be used as a groundwater remediation until active remediation is no longer occurring.	9	9-30 - 9-31/S. 9.2.2.3	Need Discussion	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493.	Yes - 7/17/2013
DH-512	Comment: Strontium-90 is discussed as using the 100:0 profile in monitoring and was simulated, based on my understanding, as a Kd of 0 because of how deep it was discovered in the vadose zone. Is this correct. If so, why is sorption of constituents being discussed for strontium-90? Basis/Justification: Justification has been previously provided that discussed how strontium-90 will be treated differently, yet here it is treated as a sorptive constituent.	Provide clarification why strontium-90 is being treated differently here than in the modeling effort in Chapter 5.	9	9-31/27-36	Justification Added	Explanation will be added.	Yes - 1/30/2014
DH-513	Comment: How will you determine if the findings are not as expected thus inadequate? How can you determine that current groundwater monitoring is sufficient? If to implement an MNA technology at 100-D/H will require evaluation of groundwater monitoring systems, how can one determine if the groundwater monitoring systems are adequate? Basis/Justification: This paragraph makes several statements that are not directly supported. But leaves several unanswered questions as to what determines an adequate groundwater monitoring system if more information is needed.	Explain why the current groundwater monitoring system is sufficient. Why is it required that an evaluation of groundwater system is needed for implementation of MNA technology? How does one know that the alternative is not adequate?	9	9-31/37-44	Accept	Text will be edited to clarify that current groundwater monitoring system is sufficient for determining the extent of contamination for remedial alternatives. The remedial design for the selected alternative will include an evaluation to identify specific monitoring points to monitor that attenuation process are taking place and are effective.	Yes - 1/27/2014
DH-514	Comment: Is this ion exchange designed just for chromium or for nitrate and strontium-90? The way the text reads it is designed for all three contaminants. Basis/Justification: The text gives the impression that nitrate and strontium-90 will be treated by ion exchange technology, but in other chapters (chapter 8) it stated only chromium will be treated. Clarification is needed on this concern.	Clarify whether the ion exchange will be designed and implemented to treat nitrate and strontium-90 or just hex chromium.	9	9-32/17-20	Accept	Modify text to clarify IX for Cr(VI) removal and strontium-90 and nitrate controlled through hydraulic containment and MNA, as applicable. Modifications will be consistent with responses to previous comments regarding strontium-90 and nitrate treatment (such as comments DH-496 and DH-504)	Yes - 2/12/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-515	Comment: Vadose zone impacts can already be identified in several locations to impact groundwater. What is meant by the term "potential" in the sentence "groundwater monitoring indicates potential residual contamination in the vadose zone that may contribute to groundwater contamination". Discuss and conduct sensitivity modeling using a more robust graded approach to address current vadose zone modeling that is impacting groundwater. Basis/Justification: Groundwater impacts are occurring from residual contamination in the vadose zone. It is not being carried forward in the FS and fully addressed.	Provide a 2-D model and the transport of these contaminants that impact groundwater. Several of these waste sites Ecology has shown do not meet 2007 MTCA Method B cleanup levels in the past and provided comments to this effect.	9	9-32 and 9-33/25-7	Accept with Modification	The term "potential" was removed and text revised to clarify that pumping near a waste site (i.e., 100-D-100) helps alleviate the contribution to the Cr(VI) plume during remediation. Modeling of a source which has been removed to groundwater is not expected to be necessary. No modeling is proposed to determine how the current remediation activities affect the plume, instead monitoring wells are relied upon to detect changes in the plume and determine the appropriate P&T response.	Yes - 4/8/2014
DH-516	Comment: The text states: "The objectives of the existing systems are to provide hydraulic containment of the Cr(VI) from reaching the river, and to begin remediation of the entire plume." The text also states: "Remedy performance monitoring, described in Section 9.2.2.7, will evaluate effectiveness of pump-and-treat at the locations with uncertainty for potential residual contamination in the vadose zone." As compliance monitoring is a component of groundwater pump-and-treat components, it should be acknowledged on Table 9-5. Basis/Justification: Completeness.	Add compliance monitoring to Table 9-5 as a component of the groundwater pump-and-treat remediation and identify how many wells are used for compliance monitoring.	9	9-32/S. 9.2.2.4	Accept with Modification	Add to table 9-5 bullet for "performance and compliance monitoring wells", but not number of wells which is a design detail that is not appropriate for the RI/FS.	Yes - 9/9/2013
DH-517	Comment: A number of data gaps have been identified in the FS (e.g., the need to determine the nature and extent of contamination in the confined aquifer, etc.). In addition, maintenance needs/requirements have also been identified in the FS (e.g., corroded well screens, pond decommissioning, 182-D Reservoir maintenance/re-configuration causing pump-and-treat system re-configuration, pump-and-treat system reconfiguration, etc.). As such, sub-sections should be added to Section 9.2.2 which address actions to be taken to address data gaps and necessary maintenance. Note: Statements on page 9-33 (e.g., "Further calculations to provide information necessary for the design or scaling for groundwater extraction from the RUM water-bearing unit will be conducted as part of the remedial design phase.", "The analysis presented in the ECF also evaluated use of additional extraction wells to capture the contamination plume in the RUM.", etc.) are insufficient as the extent of the RUM contamination has not been adequately characterized and it is unknown if 4 extraction wells (i.e., 2 additional wells) will be sufficient to prevent Cr+6 from reaching the river. Note: Due to the high costs associated with pump-and-treat system reconfiguration, reservoir reconfiguration/maintenance/decommissioning/etc., well replacement, pump-and-treat system expansion, etc., the operations and maintenance text in Section 9.2.2.6 is insufficient to address this comment. Basis/Justification: Completeness.	Add sub-sections to Section 9.2.2 which address actions (i.e., commitments) to be taken to address data gaps and necessary maintenance that are common to Alternatives 2, 3, and 4. The text (and supporting cost estimates) should clearly acknowledge costs associated with maintenance and remediation system reconfigurations and expansions.	9	S. 9.2.2	Accept with Modification	Discussion will be added to Section 9.2.2, "Common Elements" to include necessary maintenance for common elements that are included in the cost estimates for alternatives 2, 3, and 4. Reference to ECE-100HR311 -0004 will be added to identify costs associated with maintenance and remediation system reconfigurations and expansions for each alternative are included in the cost estimates for each alternative. The contribution of 182-D reservoir leaks has already been considered in the groundwater model so no text change. Section 4.9.4.1 provides discussion on nature and extent of Cr(VI) contamination in the RUM water bearing unit. The analysis conducted in ECF-100HR3-12-0025 included sensitivity analysis to evaluate bounding cases for contamination in the RUM water bearing unit and is adequate for the purposes of comparing alternatives in the FS. Clarification will be added that further calculations will be developed to provide information necessary for the design or scaling for groundwater extraction and monitoring to verify hydraulic containment from the RUM water-bearing unit as part of the remedial design phase.	Yes - 4/21/2014
DH-518	Comment: Information needs to be provided for the implementation, cost, and groundwater extraction design in this document to provide the necessary information for the Record of Decision. Basis/Justification: This document determines the feasibility of doing certain alternatives. These alternatives are required to be complete. If no plan is made to how it will be done, the cost associated with that activity, and the time it will take, then the alternative is incomplete.	It is required that all information be provided so that a decision can be made. Provide the information to implement, the cost and what the design would represent and how long it will take to meet remedial action levels in the RUM.	9	9-33/17-28	No change	The alternative and the cost estimate include the four extraction wells described in this paragraph and provides sufficient information to support decision-making. The specific location and capacity of the wells are design details that are properly established in the RD/RAWP.	Yes - 6/3/2013
DH-519	Comment: What is the expected operational duration of the ISRM barrier? Basis/Justification: Even though this is a passive unit with no cost associated with it, how it will be used, and its expected duration and where it is still effective is needed here in the text.	Provide the information here in the text that explains how long the ISRM barrier will continue to function, where it is currently failing, and what are the plans to use it as part of the remedy.	9	9-33/29-32	Accept	Text was revised to provide requested clarification. The ISRM is not actively maintained and effectiveness is expected to continue to decrease before completion of the P&T remediation time frame. Therefore, the groundwater simulations do not include Cr(VI) reduction by the ISRM barrier.	Yes - 8/28/2013
DH-520	Comment: The text speaks to MNA. For groundwater remediation, MNA is not an option while pump-and-treat remediation is occurring. Basis/Justification: OSWER Directive 9200.4-17P	Delete references to MNA during pump-and-treat operation.	9	9-34/4 and 30	Need Discussion	MNA can be used for nitrate and Cr(VI) following active remediation (by P&T). MNA by radioactive decay for strontium-90 is applicable and is not dependent on the active remediation of groundwater. Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493.	Yes - 7/17/2013
DH-521	Comment: Provide a pointer to where this information is presented. Is it in chapter 8, Chapter 9 or Chapter 10? As currently written, it could be in any of these chapters. Basis/Justification: Clarification of where the O&M costs are presented is required to understand operational costs of the various alternatives.	Provide a directional pointer to where the information is presented, either by Section or Chapter.	9	9-34/8	Accept	The text has been revised to refer to the relevant sections.	Yes - 8/28/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-522	Comment: Identify "Frequency" of what? I know the heading of this section says remedy performance monitoring, but it is not clear what this actually is. I assume it is groundwater monitoring of wells located in an area of concern – but this is not discussed anywhere in this section. Basis/Justification: I tis unclear what remedy "performance monitoring" is being conducted. It is unclear what type of monitoring is being conducted	Provide here in this portion of this section as well as elsewhere in the section what is being monitored, justification for semiannual and/or annual monitoring,	9	9-34/36-38	Accept	Text has been revised to clarify that this is frequency of sampling. Bullets have been revised to identify sampling frequency will be defined in the RD/RAWP for the selected remedy.	Yes - 8/28/2013
DH-523	Comment: Provide in the text where the O&M costs for the alternatives is discussed in detail. I would expect to see the common components to all systems presented in this section, but it is not. Point to where this information can be found or provide it here. Basis/Justification: No O&M cost is provided to understand the costs on the uniform components for all alternatives.	Provide the common O&M costs for all similar components for all of the alternatives. Show this component information again in the Alternative discussion.	9	9-34/39-40	Accept with Modification	Reference to the Environmental Cost Estimate (ECE) prepared for the alternatives was added to this section. The ECE contains basis and detail for the O&M costs. A summary rollup of costs is provided in chapter 9 for each alternative.	Yes - 5/13/2014
DH-524	Comment: Add "in Appendix F" after "(ECF-100HR3-11-0114)" in the Pump and Treat System box and the Bioinjection box. Basis/Justification: It needs to be cited that this document is in Appendix F of this document.	See comment.	9	9-37/ Table 9-6, GW components	Accept	The text has been revised as suggested.	Yes - 5/2/2013
DH-525	Comment: Table 9-6 does not include data gap characterization and certain maintenance components. Due to the high costs associated with characterization, well installation, well repair/replacement, facility decommissioning, facility re-configuration, pump-and-treat system reconfiguration, etc. these components should be acknowledged. Basis/Justification: Completeness.	Include high-costing characterization and specific maintenance components.	9	9-37	Accept with Modification	Specific maintenance components will be provided in changes to Section 9.2.2.6 on common elements in response to comment DH-517 and will be referenced in Table 9-6, 9-8, and 9-10 for Alternatives 2, 3, and 4, respectively. Section 4.9.4.1 provides discussion on nature and extent of Cr(VI) contamination in the RUM water bearing unit. The analysis conducted in ECF-100HR3-12-0025 included sensitivity analysis to evaluate bounding cases for contamination in the RUM water bearing unit and is adequate for the purposes of comparing alternatives in the FS. Clarification will be added that further calculations will be developed to provide information necessary for the design or scaling for groundwater extraction and monitoring to verify hydraulic containment from the RUM water-bearing unit as part of the remedial design phase.	Yes - 4/21/2014
DH-526	Comment: Table 9-6 describes MNA. For groundwater remediation, MNA is not an option while pump-and-treat remediation is occurring. Basis/Justification: OSWER Directive 9200.4-17P	Delete references to MNA during pump-and-treat operation.	9	9-38	Need Discussion	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493.	Yes - 7/17/2013
DH-527	Comment: Under the Groundwater components in the Monitoring Requirements row, the identification of constituents in the monitoring program is not provided – or is provided as a "go look here" and then is referenced to another section in the document. Currently you only have 3 COCs and approximately 11 COPCs. I do not understand why the 11 COPCs cannot be listed in this table and I sure cannot comprehend why three COCs cannot be stated in this table instead of referred back to a section in the document that refers you to another section. List the 3 COCs here in the table. More words were used to referencing to another location in the document instead of providing me the information. Basis/Justification: Trying to find information in this voluminous document is difficult. It is not aided for the ease of readability that 3 simple CoCs (4 words) cannot be added to this table.	See comment and justification.	9	9-38/ Table 9-6	Accept	Table was revised as suggested.	Yes - 8/28/2013
DH-528	Comment: Add to section 9.2.3.1 to include applying an epoxy type fixative to the outfall structures and filling them with sand. Basis/Justification: This would immobilize the contaminants present and void fill the boxes, but be much less expensive. Update all cost estimates, text, etc.	Add to section 9.2.3.1 to include applying an epoxy type fixative to the outfall structures and filling them with sand.	9	9-40/10-on	Not Accepted	This section is intended to describe the remedial actions to be taken as part of Alternative 2. The technology retained in Chapter 8 to immobilize contaminants in large spaces was void fill/grouting. Grouting is a commonly used and a cost-effective technology. The onshore structures associated with the 116-H-5 Outfall Structure were demolished and filled with clean soil as part of the interim actions in accordance with the IROD. The site has been evaluated in the RI/FS where it was determined that no further action is required.	Yes - 8/28/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-529	Comment: Add to section 9.2.3.2 to include only injection (no extraction) of biostimulation additives from a skid apparatus. Basis/Justification: Routine monitoring, proper placement, and flushing should prevent fouling of the Pump and Treat systems.	Add to section 9.2.3.2 to include only injection (no extraction) of biostimulation additives from a skid apparatus.	9	9-41/21-on	Accept with Modification	Bioinjection is performed as a closed loop injection-extraction system. This is done, in part, to keep groundwater amended with the organic substrate from reaching an ion exchange treatment plant and potentially fouling the ion exchange resin. Also, the closed loop injection-extraction helps with distributing the organic substrate within the targeted treatment area. If extracted groundwater were all sent to the P&T facility, then redistribution of organic substrate through the P&T effluent injection wells would be to areas not requiring treatment. Added text regarding the location of the nitrate plume and concentrations, in relationship to the Cr(VI) plume.	Yes - 10/2/2013
DH-530	Comment: Define the frequency of "a regular basis". Is this yearly, monthly, every two years, every 5 years? Basis/Justification: Term "on a regular basis" provides no indication on the frequency being addressed and needs to be provided.	See comment.	9	9-42/14	Accept with Modification	This is a design detail that will be specified in the O&M plan for the selected remedy. As such, reference to "regular basis" is removed and text modified to identify what activities would be performed that would later be specified in the design.	Yes - 8/28/2013
DH-531	Comment: Identify which "COCs" are being discussed. It is as if this section was written independent of knowing what the contaminants of concern were and oriented solely on technology. It could use refreshing in light of the minimal COCs and does not do an adequate job of addressing how nitrate and strontium-90 will actually be addressed. Basis/Justification: No CoCs are addressed, so it is difficult to understand why certain technologies will not be applied to remediate them.	See comment.	9	9-42/27-31	Accept	COCs will be clearly identified. Discussion of how specific COCs, including nitrate and strontium-90, will be addressed will be added by the remedial technologies will be added.	Yes - 4/8/2014
DH-532	Comment: This sentence provides little to no information, "RPO activities will be conducted throughout the life of the project to deal with the uncertainty in groundwater modeling simulations". Provide what these "RPO activities" are. What is the "life of the project". Which "project" are we referring to? What are the "uncertainty in groundwater modeling simulations" that are trying to be addressed? The other option is to delete the sentence. Basis/Justification: This sentence provides more questions than information. It is unclear what the purpose of this sentence is with terms that have not been clearly identified.	See comment. Provide answers to the questions that this sentence creates or delete the sentence.	9	9-43/17-19 9-63/6-8 9-78/11-12	Accept	The sentence has been deleted.	Yes - 8/28/2013
DH-533	Comment: This is an interesting sentence following the sentence on "uncertainty in groundwater modeling simulations". What confidence are these calculations based on the uncertainty in the groundwater modeling simulations? Rewrite this sentence and address the regulations that will be used to determine compliance. Basis/Justification: EPC calculations are the calculations to determine completion of groundwater remedial actions is not justifiable based on the regulations that state the pump and treat cannot be affecting contaminant levels. The basis of determining completion is turning off the pump and treat and taking groundwater samples and analyzing them. Not calculations.	See comment and justification.	9	9-43/20 9-63/9 9-78/13	Accept	This sentence will be rewritten to address the regulations that will be used to determine compliance.	Yes - 2/4/2014
DH-534	Comment: What does "maximum encountered" mean? How is this different than "maximum". Basis/Justification: Clarification of terms.	See comment.	9	9-43/22 9-63/11 9-78/15	Accept	There is no difference. The text has been revised to delete "encountered".	Yes - 5/2/2013
DH-535	Comment: The regulations call for 95% UCL, not 90th percentile. Correct to meet the WAC 173-340-720(9) requirements. Basis/Justification: Need to meet WAC 173-340-720(9).	Make corrections.	9	9-43/22 9-63/11 9-78/15	Accept with Modification	This paragraph is listing which summary statistics are being provided; it is not identifying which of these statistics (such as the 90th percentile) as the basis for meeting requirements. The paragraph will be revised to clarify this.	Yes - 4/21/2014
DH-536	Comment: Why not cleanup to less than 10 ug/L all throughout the aquifer, not just along the river, then we would be in a "no worry" situation and would not need continuing pump and treat system in effect any longer. Basis/Justification: If the system reached groundwater cleanup of 10 ug/L for hexavalent chromium throughout the aquifer, then the pump and treat system would no longer be required meeting both RAO and MTCA cleanup standards.	See comment and justification.	9	9-43/4-8 9-63/9-13 9-78/13-17	Not Accepted	The entire aquifer is not the point of compliance for the AWQS; if the pump and treat system can be shown to meet the AWQS at the point of compliance (along the river), this is sufficient to meet regulatory requirements.	Yes - 8/28/2013
DH-537	Comment: Cleanup is achieved without the influence of pump and treat system. Therefore, compliance monitoring at the end of effective cleanup will require the pump and treat to be turned off and the groundwater would need to equilibrate before determining if it meets cleanup standards. Basis/Justification: Need to meet WAC 173-340-720(9).	See comment.	9	9-43/25-37 9-78/13-17	Accept	Modified first sentence in previous paragraph to clarify completion following shut down of the P&T systems to evaluate for rebound conditions within the unconfined aquifer. (note that a further revision to the sentence modified for this comment is still pending in response to comment DH-533.)	Yes - 8/28/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-538	Comment: Indicate what technology (Pump and Treat, biostimulation, or both) would treat other heavy metals in the vadose zone that continue to residually drain into the groundwater. Basis/Justification: Other heavy metals beside Cr (VI) are present according to data presented in Chapter 4.	Indicate what technology (Pump and Treat, biostimulation, or both) would treat other heavy metals in the vadose zone that continue to residually drain into the groundwater.	9	9-43/25-on	Accept with Modification	Uranium in groundwater is retained as a COPC for further monitoring. However, no further technology application is required and remedial action alternatives are not developed for uranium in groundwater. For other vadose zone contamination, fate and transport modeling in chapter 5 did not identify unacceptable groundwater risks through infiltration of vadose zone contamination to groundwater so evaluation of technologies to treat other heavy metals from the vadose zone is not required.	Yes - 5/13/2014
DH-539	Comment: Consider previous comments about using highest concentrations (rather than averaged concentrations) of chromium and chromium +6 for "baseline" plume maps/figures and re-model Figures 9-8a, 9-8b, 9-8c, 9-8d, and 9-8e. Basis/Justification: Accuracy.	Consider previous comments about using highest concentrations (rather than averaged concentrations) of chromium and chromium +6 for "baseline" plume maps/figures and re-model Figures 9-8a, 9-8b, 9-8c, 9-8d, and 9-8e.	9	9-44-9-48	Accept	A sensitivity study for the initial concentrations used in the model will be developed, conducted, and documented and summarized in Chapter 5 to evaluate the impact of using maximum measured concentrations as the basis for the initial groundwater contaminant condition. The results of this analysis will be presented to Ecology and a path forward defined for disposition of the remaining assumptions in this comment regarding remedy impacts. A technical memorandum was prepared that evaluated differences in initial plume representations from using a maximum concentration basis contrasted with average concentration basis. This information was provided with ECY. ECY agreed, based on review and discussion of this information, that the average basis was appropriate for establishing initial conditions for modeling.	Yes - 4/21/2014
DH-540	Comment: Consider previous comments about using highest concentrations (rather than averaged concentrations) of nitrate and strontium-90 for "baseline" plume maps/figures and re-model Figures 9-9a, 9-9b, 9-9c, 9-9d, 9-9e, 9-10a, 9-10b, 9-10c, and 9-10d. Basis/Justification: Accuracy.	Consider previous comments about using highest concentrations (rather than averaged concentrations) of nitrate and strontium-90 for "baseline" plume maps/figures and re-model Figures 9-9a, 9-9b, 9-9c, 9-9d, 9-9e, 9-10a, 9-10b, 9-10c, and 9-10d.	9	9-49-9-57	Accept	A sensitivity study for the initial concentrations used in the model will be developed, conducted, and documented and summarized in Chapter 5 to evaluate the impact of using maximum measured concentrations as the basis for the initial groundwater contaminant condition. The results of this analysis will be presented to Ecology and a path forward defined for disposition of the remaining assumptions in this comment regarding remedy impacts. A technical memorandum was prepared that evaluated differences in initial plume representations from using a maximum concentration basis contrasted with average concentration basis. This information was provided with ECY. ECY agreed, based on review and discussion of this information, that the average basis was appropriate for establishing initial conditions for modeling.	Yes - 4/21/2014
DH-541	Comment: Add modeling figures (e.g., 3, 12, 18, 48, 56, etc. year periods) for Alternative 2 for all COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc). Figures should be generated using the highest concentration observations (during the last 6 years) as the "baseline" plume map/figure. Basis/Justification: Completeness.	Add modeling figures (e.g., 3, 12, 18, 48, 56, etc. year periods) for Alternative 2 for all COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc). Figures should be generated using the highest concentration observations (during the last 6 years) as the "baseline" plume map/figure.	9	S. 9.2.3.3	Not Accepted	COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs. .	Yes - 6/26/2013
DH-542	Comment: Table 9-8 describes MNA. For groundwater remediation, MNA is not an option while pump-and-treat remediation is occurring. Basis/Justification: OSWER Directive 9200.4-17P	Delete references to MNA during pump-and-treat operation.	9	9-60-9-61	Need Discussion	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493.	Yes - 7/17/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-543	Comment: Under groundwater component of the pump and treat, It would seem that the performance requirements would be listed in the ROD and not the RDR/RAWP. The RDR/RAWP provides the overall design and the work plan on how the performance requirements will be met that will be defined in the ROD. Basis/Justification: The RAOs in the ROD will provide the performance requirements.	See comment.	9	9-60/ Table 9-8	Accept with Modification	The ROD will identify the contaminants of concern, cleanup levels, ARARs, scope and role of response action, and the remedy selected for cleanup. The RD/RAWP provides the Remedial Design Report (RDR) where the technical specifications for cleanup remedies and technologies are designed. The technical specifications in the remedial design will include the performance requirements for the remedial system. To clarify the intent of the information,Tables 9-6, 9-8, and 9-10 have been revised to refer to ROD requirements instead of performance requirements defined in the RD/RAWP (as agreed in review meeting with Ecology on 8/28/13). See http://www.epa.gov/superfund//cleanup/index.htm	Yes - 8/28/2013
DH-544	Comment: Under the Groundwater components in the Monitoring Requirements row, the identification of constituents in the monitoring program is not provided. Currently you only have 3 COCs and approximately 11 COPCs. I do not understand why the 11 COPCs cannot be listed in this table and I sure cannot comprehend why three COCs cannot be stated in this table instead of referred back to a section in the document that refers you to another section. List the 3 COCs here in the table. More words were used to referencing to another location in the document instead of providing me the information. Basis/Justification: Trying to find information in this voluminous document is difficult it is not aided for the ease of readability that 3 simple CoCs (4 words) cannot be added to this table.	See comment.	9	9-61/ Table 9-8 9-77/ Table 9-10	Accept	The monitored constituents have been listed. Note that similar changes made in Tables 9-6, 9-8, and 9-10.	Yes - 9/9/2013
DH-545	Comment: Consider previous comments about using highest concentrations (rather than averaged concentrations) of chromium and chromium +6 for "baseline" plume maps/figures and re-model Figures 9-12a, 9-12b, 9-12c, and 9-12d. Basis/Justification: Accuracy.	Consider previous comments about using highest concentrations (rather than averaged concentrations) of chromium and chromium +6 for "baseline" plume maps/figures and re-model Figures 9-12a, 9-12b, 9-12c, and 9-12d.	9	9-64-9-67	Accept	A sensitivity study for the initial concentrations used in the model will be developed, conducted, and documented and summarized in Chapter 5 to evaluate the impact of using maximum measured concentrations as the basis for the initial groundwater contaminant condition. The results of this analysis will be presented to Ecology and a path forward defined for disposition of the remaining assumptions in this comment regarding remedy impacts. A technical memorandum was prepared that evaluated differences in initial plume representations from using a maximum concentration basis contrasted with average concentration basis. This information was provided with ECY. ECY agreed, based on review and discussion of this information, that the average basis was appropriate for establishing initial conditions for modeling.	Yes - 4/21/2014
DH-546	Comment: Add modeling figures (e.g., 2, 3, 5, 12, 18, 48, 56, etc. year periods) for Alternative 3 for all COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc). Figures should be generated using the highest concentration observations (during the last 6 years) as the "baseline" plume map/figure. Basis/Justification: Completeness.	Add modeling figures (e.g., 2, 3, 5, 12, 18, 48, 56, etc. year periods) for Alternative 3 for all COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc). Figures should be generated using the highest concentration observations (during the last 6 years) as the "baseline" plume map/figure.	9	9-61 - 9-66	Not Accepted	COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs. .	Yes - 6/26/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-547	Comment: Consider previous comments about using highest concentrations (rather than averaged concentrations) of nitrate and strontium-90 for "baseline" plume maps/figures and re-model Figures 9-13a, 9-13b, 9-13c, 9-14a, 9-14b, 9-14c, and 9-14d. Basis/Justification: Accuracy	Consider previous comments about using highest concentrations (rather than averaged concentrations) of nitrate and strontium-90 for "baseline" plume maps/figures and re-model Figures 9-13a, 9-13b, 9-13c, 9-14a, 9-14b, 9-14c, and 9-14d.	9	9-69 - 9-75	Accept	A sensitivity study for the initial concentrations used in the model will be developed, conducted, and documented and summarized in Chapter 5 to evaluate the impact of using maximum measured concentrations as the basis for the initial groundwater contaminant condition. The results of this analysis will be presented to Ecology and a path forward defined for disposition of the remaining assumptions in this comment regarding remedy impacts. A technical memorandum was prepared that evaluated differences in initial plume representations from using a maximum concentration basis contrasted with average concentration basis. This information was provided with ECY. ECY agreed, based on review and discussion of this information, that the average basis was appropriate for establishing initial conditions for modeling.	Yes - 4/21/2014
DH-548	Comment: Table 9-10 describes MNA. For groundwater remediation, MNA is not an option while pump-and-treat remediation is occurring. Basis/Justification: OSWER Directive 9200.4-17P	Delete references to MNA during pump-and-treat operation.	9	9-77 - 9-78	Need Discussion	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493.	Yes - 7/17/2013
DH-549	Comment: Consider previous comments about using highest concentrations (rather than averaged concentrations) of chromium and chromium +6 for "baseline" plume maps/figures and re-model Figures 9-16a, 9-16b, 9-16c, 9-16d, 9-16e, and 9-16f. Basis/Justification: Accuracy.	Consider previous comments about using highest concentrations (rather than averaged concentrations) of chromium and chromium +6 for "baseline" plume maps/figures and re-model Figures 9-16a, 9-16b, 9-16c, 9-16d, 9-16e, and 9-16f.	9	9-80 - 9-85	Accept	A sensitivity study for the initial concentrations used in the model will be developed, conducted, and documented and summarized in Chapter 5 to evaluate the impact of using maximum measured concentrations as the basis for the initial groundwater contaminant condition. The results of this analysis will be presented to Ecology and a path forward defined for disposition of the remaining assumptions in this comment regarding remedy impacts.	Yes - 4/21/2014
DH-550	Comment: Consider previous comments about using highest concentrations (rather than averaged concentrations) of nitrate and strontium-90 for "baseline" plume maps/figures and re-model Figures 9-17a, 9-17b, 9-17c, 9-17d, 9-18a, 9-18b, 9-18c, and 9-18d. Basis/Justification: Accuracy	Consider previous comments about using highest concentrations (rather than averaged concentrations) of nitrate and strontium-90 for "baseline" plume maps/figures and re-model Figures 9-17a, 9-17b, 9-17c, 9-17d, 9-18a, 9-18b, 9-18c, and 9-18d.	9	9-87 - 9-94	Accept	A sensitivity study for the initial concentrations used in the model will be developed, conducted, and documented and summarized in Chapter 5 to evaluate the impact of using maximum measured concentrations as the basis for the initial groundwater contaminant condition. The results of this analysis will be presented to Ecology and a path forward defined for disposition of the remaining assumptions in this comment regarding remedy impacts. A technical memorandum was prepared that evaluated differences in initial plume representations from using a maximum concentration basis contrasted with average concentration basis. This information was provided with ECY. ECY agreed, based on review and discussion of this information, that the average basis was appropriate for establishing initial conditions for modeling.	Yes - 4/21/2014
DH-551	Comment: Add modeling figures (e.g., 2, 3, 5, 12, 18, 48, 56, etc. year periods) for Alternative 4 for all COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc). Figures should be generated using the highest concentration observations (during the last 6 years) as the "baseline" plume map/figure. Basis/Justification: Completeness.	Add modeling figures (e.g., 2, 3, 5, 12, 18, 48, 56, etc. year periods) for Alternative 4 for all COCs (i.e., technetium-99, tritium, carbon tetrachloride, tetrachloroethene, chloroform, fluoride, nitrite, sulfate, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, uranium, vanadium, and zinc). Figures should be generated using the highest concentration observations (during the last 6 years) as the "baseline" plume map/figure.	9	S. 9.2.5.1	Not Accepted	COCs/COPCs will not be retained based solely on measured concentrations above background. There is no basis in EPA guidance, or in the MTCA, for identifying COPCs in groundwater based solely on concentrations exceeding background. The methodology for identification of COCs/COPCs for this RI/FS follows EPA risk assessment guidance for Superfund (RAGS Part A). Chapter 4 includes a discussion of groundwater contaminant concentrations relative to background when it is available (in Sections 4.4.1.2 and 4.4.1.3). Hanford Site background concentrations are generally available for dissolved concentrations of metals and radioisotopes. Background concentrations for unfiltered water groundwater samples have not been established. Unlike the evaluation of vadose zone soils, comparison of groundwater concentrations to background is not a common practice for identification of groundwater COPCs. .	Yes - 6/26/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-552	Comment: Neither alternatives 2, 3, or 4 meet the TPA groundwater cleanup requirements in Milestone M-016-110-T02 by 2020. Basis/Justification: Re-optimize the pump-and-treat system to provide additional extraction from hot spots to treat more contaminated groundwater, faster. (This comment also applies to page 3, lines 13-15 of the Proposed Plan.)	Re-optimize the pump-and-treat system to provide additional extraction from hot spots to treat more contaminated groundwater, faster.	10	General	No change	M-016-110-T02 states that "DOE shall take actions necessary to remediate hexavalent chromium groundwater plumes such that hexavalent chromium will meet drinking water standards in each of the 100 Area NPL units." by 12/31/2020. This target date, along with other targets were approved by the Tri-Parties in 2009 as goals, in an overall strategy to restore Hanford groundwater along the Columbia River to beneficial use. Operation of the high capacity P&T system along with removal of more than one million tons of soil and other wastes from 100-D/H Area waste sites contaminated with Cr(VI) has contributed to the significant reduction in the Cr(VI) plume to date. The modeling described in the Draft A RI/FS indicates that DWS for Cr(VI) will be met in 11 years for Alternatives 2 and 4 and 6 years for Alternative 3. The actual date when DWS are achieved will be dependent on many factors that influence the response times in the aquifer. It was acknowledged during the TPA milestone negotiations that there was no way to definitively know exactly what the aquifer response would be to a proposed remedial action until the system was built and operated for a period of time. This fact was a contributing reason as to why the statements were phrased as "take actions" versus "achieve" and are target dates rather than enforceable milestones. Optimization of the P&T systems is an ongoing activity that will continue to occur until the plumes are fully remediated.	8/28/2013
DH-553	Comment: Why is the pump and treat only running for 25 years (2012 to 2037)? Provide the justification here in the document. Basis/Justification: Justification why only 25 years is needed for this alternative for groundwater pump and treat.	Provide justification per comment.	10	10-7/15-17	Accept	Clarifying sentence added to paragraph to identify cleanup time frames from groundwater model results to achieve groundwater and surface water criteria.	Yes - 8/28/2013
DH-554	Comment: A treatment system is required for nitrate, it currently exceeds drinking water standards and treatment will be necessary or a contingency treatment is needed with cost and CERCLA balancing criteria applied. Basis/Justification: A treatment system for nitrate and the associated costs and balancing criteria is required to meet an exceeding constituent in the groundwater.	Provide a treatment system for nitrate and the associated costs and balancing criteria applied.	10	10-7/22-26	Accept with Modification	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493. The nitrate plumes are within the Cr(VI) pump-and-treat capture zone and are hydraulically contained during operations. Current measurements at the treatment plants in the 100-D and 100-H areas show that influent and effluent concentrations for nitrate are well below the drinking water standard (see details in response to Comment DH-494).Observed concentrations and modeling results indicate that these concentrations will continue to decline over the next 10 to 20 years. Based on these measurements and expected future conditions, it is not expected that nitrate will exceed their MCLs at the treatment plants and no treatment is expected to be required. Text will be added to Chapter 9 to summarize recent influent measurements and the basis for future predictions and plume containment during Cr(VI) pump-and-treat operation.	Yes - 7/17/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-555	Comment: Strontium contamination that exceeds its MCLs exists from the end of the pump and treat (2037) to 2068 (31 years after the end of pump and treat) before it is cleaned up to below MCLs. This will require the pump and treat to remain available until this time in case this scenario is not realized. How will the pump and treat system be maintained and ready to be restarted? Has this cost and contingency been addressed in the overall alternative? Basis/Justification: Justification is needed to ensure the pump and treat system is fully maintained and operational ready if strontium-90 and nitrate exceed their MCLs after the pump and treat is turned off in 25 years (2037) and MNA is allowed to proceed for strontium-90.	Provide a contingency costs (capital and maintenance) along with the balancing criteria for maintaining the groundwater pump and treat.	10	10-7-10-8/27-4	Accept with Modification	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493. Groundwater modeling shows strontium-90 concentrations will remain elevated in the 100-D area after the completion of hexavalent chromium remediation. Remaining strontium-90 contamination is inland in 100-D within a relatively small area and not expected to migrate before levels decay to less than MCL because of low mobility of Sr-90. P&T would not appreciably accelerate cleanup time since most of the Sr-90 is bound to the aquifer sediments and not readily removed through P&T of the aquifer. As stated in response to Comment DH-493, text will be added regarding the role of MNA and decay following the pump-and-treat operations ceasing. Text will clarify that MNA may be used to address residual contamination in groundwater after pump-and-treat operations have ceased for hexavalent chromium; with radioactive decay as the major attenuation mechanism. In 100-H, Sr-90 is expected to decay to below the MCL at the shoreline and inland within about 20 years. No Sr-90 above the MCL has been found in the horn area. Strontium-90 concentrations will continue to drop after completion of hexavalent chromium through radioactive decay. Because of the lack of effect of the P&T system on strontium-90 contamination, contingency costs will not be prepared for maintaining the groundwater P&T if strontium-90 exceed the DWS after the P&T is turned off. The text will modified to state that MNA will be employed after cessation of pumping.	Yes - 7/17/2013
DH-556	Comment: Table 10-3 under Long-term Effectiveness and Permanence appear to contradict with the text (p. 10-7, line 16). It states in the table that treatment for groundwater will last operate "for more than 25 years to achieve AWQC". Basis/Justification: In one place it states 25 years in another table its states more than 25 years.	Address this discrepancy or fix it to read 25 years.	10	10-9/ Table 10-3	Accept with Modification	Will modify to clarify that P&T systems will operate beyond design life and may require major system renovation or replacement.	Yes - 8/28/2013
DH-557	Comment: Why is the pump and treat only running for 12 years (2012 to 2024)? Provide the justification here in the document. Basis/Justification: Justification why only 12 years is needed for this alternative for groundwater pump and treat.	Provide justification.	10	10-12/8-11	Accept	Clarifying sentence added to paragraph to identify cleanup time frames from groundwater model results to achieve groundwater and surface water criteria.	Yes - 8/28/2013
DH-558	Comment: A treatment system is required for nitrate, it currently exceeds drinking water standards and treatment will be necessary or a contingency treatment is needed with cost and CERCLA balancing criteria applied. Basis/Justification: A treatment system for nitrate and the associated costs and balancing criteria is required to meet an exceeding constituent in the groundwater.	Provide clarification.	10	10-12/12-17	Accept with Modification	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493. Current measurements at the treatment plants in the 100-D and 100-H areas show that influent and effluent concentrations for nitrate are well below the drinking water standard (see details in response to Comment DH-494). Observed concentrations and modeling results indicate that these concentrations will continue to decline over the next 10 to 20 years. Based on these measurements and expected future conditions, it is not expected that nitrate will exceed their MCLs at the treatment plants and no treatment is expected to be required. Text will be added to Chapter 9 to summarize recent measurements at the treatment plants and the basis for future predictions.	Yes - 7/17/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-559	Comment: Strontium contamination that exceeds its MCLs exists from the end of the pump and treat (2024) to 2068 (44 years after the end of pump and treat) before it is cleaned up to below MCLs. This will require the pump and treat to remain available until this time in case this scenario is not realized. How will the pump and treat system be maintained and ready to be restarted? Has this cost and contingency been addressed in the overall alternative? Basis/Justification: Justification is needed to ensure the pump and treat system is fully maintained and operational ready if strontium-90 and nitrate exceed their MCLs after the pump and treat is turned off in 12 years (2024) and MNA is allowed to proceed for strontium-90.	Provide justification.	10	10-12/18-24	Accept with Modification	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493. Text will be included to clarify P&T does not need to remain operational for treating remaining strontium-90 contamination following completion of Cr(VI) remediation. Observed concentrations and modeling results shows strontium-90 concentrations will remain elevated in the 100-D area after the completion of hexavalent chromium remediation. Remaining strontium-90 contamination is inland in 100-D within a relatively small area and not expected to migrate before levels decay to less than MCL because of low mobility of Sr-90. P&T would not appreciably accelerate cleanup time since most of the Sr-90 is bound to the aquifer sediments and not readily removed through P&T of the aquifer. In 100-H, Sr-90 is expected to decay to below the MCL at the shoreline and inland within about 20 years. No Sr-90 above the MCL has been found in the horn area. As stated before, MNA is expected to be employed for strontium-90 after cessation of Cr(VI) pumping.	Yes - 7/17/2013
DH-560	Comment: Why is the pump and treat only running for 39 years (2012 to 2051)? Provide the justification here in the document. Basis/Justification: Justification why only 39 years is needed for this alternative for groundwater pump and treat.	Provide justification.	10	10-16/4	Accept	Clarifying sentence added to paragraph to identify cleanup time frames from groundwater model results to achieve groundwater and surface water criteria.	Yes - 8/28/2013
DH-561	Comment: A treatment system is required for nitrate, it currently exceeds drinking water standards and treatment will be necessary or a contingency treatment is needed with cost and CERCLA balancing criteria applied. Basis/Justification: A treatment system for nitrate and the associated costs and balancing criteria is required to meet an exceeding constituent in the groundwater.	Provide clarification.	10	10-16/11-16	Accept with Modification	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493. Current measurements at the treatment plants in the 100-D and 100-H areas show that influent and effluent concentrations for nitrate are well below the drinking water standard (see details in response to Comment DH-494). Observed concentrations and modeling results indicate that these concentrations will continue to decline over the next 10 to 20 years. Based on these measurements and expected future conditions, it is not expected that nitrate will exceed their MCLs at the treatment plants and no treatment is expected to be required. Text will be added to Chapter 9 to summarize recent measurements at the treatment plants and the basis for future predictions.	Yes - 7/17/2013
DH-562	Comment: Strontium contamination that exceeds its MCLs exists from the end of the pump and treat (2051) to 2068 (17 years after the end of pump and treat) before it is cleaned up to below MCLs. This will require the pump and treat to remain available until this time in case this scenario is not realized. How will the pump and treat system be maintained and ready to be restarted? Has this cost and contingency been addressed in the overall alternative? Basis/Justification: Justification is needed to ensure the pump and treat system is fully maintained and operational ready if strontium-90 and nitrate exceed their MCLs after the pump and treat is turned off in 39 years (2051) and MNA is allowed to proceed for strontium-90.	Provide justification.	10	10-16/17-23	Accept with Modification	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493. Text will be included to clarify P&T does not need to remain operational for treating remaining strontium-90 contamination following completion of Cr(VI) remediation. Observed concentrations and modeling results shows strontium-90 concentrations will remain elevated in the 100-D area after the completion of hexavalent chromium remediation. Remaining strontium-90 contamination is inland in 100-D within a relatively small area and not expected to migrate before levels decay to less than MCL because of low mobility of Sr-90. P&T would not appreciably accelerate cleanup time since most of the Sr-90 is bound to the aquifer sediments and not readily removed through P&T of the aquifer. In 100-H, Sr-90 is expected to decay to below the MCL at the shoreline and inland within about 20 years. No Sr-90 above the MCL has been found in the horn area. As stated before, MNA is expected to be employed for strontium-90 after cessation of Cr(VI) pumping.	Yes - 7/17/2013
DH-563	Comment: Provide contingency plans if "successful source area remedial action" has not occurred. Provide discussion on RTD or pump-and-treat for source areas that will be investigated after the final ROD(s), and may not meet groundwater 2020 TPA Milestones. Basis/Justification: A contingency plan for how to remediate the source areas, should they have not been successfully remediated, needs to be discussed here in Chapter 10 and elsewhere in the document.	Provide a contingency plan that will address ongoing source area contamination that affects both the vadose zone and groundwater past any milestone commitments.	10	10-20/10-11	No change	Contingency plans are not utilized at this phase in the CERCLA process. Rather, the process includes a thorough review every five years after the ROD to evaluate the effectiveness of the remedies selected. If it is determined during the five-year review that a remedy is not performing as designed, actions will be identified to achieve or adjust remedial action objectives. An ESD or ROD amendment will be developed as appropriate to obtain the required approval of the modifications.	Yes - 8/28/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-564	Comment: The pump and treat systems would need to stay operational ready in case strontium-90, nitrate and any other constituent exceeds its drinking water standard after the pump and treat has been turned off and during the period when MNA is being employed on strontium-90. Modify the text to address this uncertainty. Basis/Justification: Pump and treatment systems will be needed 56 years out form 2012 as a contingency of ongoing treatment should strontium-90 and nitrate not meet the DWS and MTCA cleanup values for groundwater in that period of time.		10	10-21/22-26	Accept with Modification	Comment closed per continuing discussion of hydraulic containment and monitored natural attenuation on comment DH-493. Alternatives are developed only for COCs. Identified COCs include chromium, hexavalent chromium, strontium-90, and nitrate. Observed concentrations and groundwater modeling shows nitrate contamination will be cleaned up before completion of hexavalent chromium remediation and remaining strontium-90 concentrations will continue to decline after completion of hexavalent chromium remediation through radioactive decay in a relatively small inland area within 100-D. No strontium-90 contamination is predicted to remain above the MCL in the 100-H area are within the horn area. Therefore, contingency costs will not be prepared for maintaining the groundwater P&T if strontium-90 and nitrate exceed the DWS after the P&T is turned of. Instead, the text will clarify that MNA is expected to be employed for strontium-90 after cessation of Cr(VI) pumping.	Yes - 7/17/2013
DH-565	Comment: This whole section needs to be rewritten. The writing presents inaccurate interpretation of NEPA and NEPA values, non-up-to-date references, and lack of effective or realistic relationship with related information. In addition, there are multiple run-on sentences, incomplete sentences, and sentences with unrelated activities jammed into one sentence/paragraph. Several requirements such as alternative analysis are already required under EPA CERCLA guidance. See the Modifications Needed for the rewrite, and replace everything in section 10.4 with this language. Basis/Justification: Consistency, clarity, and accuracy.	Replace the existing text for 10.4 with the following text: "This section addresses the incorporation of NEPA values into applicable CERCLA documents. Compliance is consistent with the National Environmental Policy Act Compliance Program (DOE O 451.1B, Change 3), which requires NEPA values be incorporated into applicable CERCLA documentation for DOE remedial actions. These NEPA values may address and evaluate potential socioeconomic, cultural, ecological, offsite, and cumulative effects, and alternative analysis in applicable CERCLA documents to the extent practicable. Effectively applying NEPA values into this CERCLA project is reflected in the manner in which the CERCLA documentation complies with applicable ARARs. For example, evaluating and complying with applicable aspects of the National Historic Preservation Act of 1966 or Native American Graves Protection and Repatriation Act of 1990 is accomplished through compliance with the most recent version of the Hanford Cultural Resources Management Plan (DOE/RL-98-10). Complying with applicable ecological concerns including the Endangered Species Act of 1973 and the Migratory Bird Treaty Act of 1918 is accomplished through compliance with the most recent version of the Hanford Site Biological Resources Management Plan (DOE/RL 96-32). Chapters 9 and 10 of this RI/FS address alternative analysis for remediation of contamination in the 100-D/H Areas of the Hanford Site: Alternative 1 (No Action [as required by the NCP]); Alternative 2 (RTD and Grouting for Waste Site and Pump-and-Treat with Biological Treatment for Groundwater); Alternative 3 (RTD and Grouting of Waste Site and Increased Capacity	10	10-23 and 10-24/all	Accept with Modification	The section has been revised to incorporate many of the suggested revisions. The references to the ERDF documentation has been retained to be consistent with previous Ecology comments requesting that specific documentation be cited where it is identified. The primary focus of the Integrated Vegetation Management EA is management of existing vegetation, such as control of noxious weeds and invasive species. This EA has limited applicability to revegetation of remediated waste sites and was not included in the revised text.	Yes - 8/28/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-565 (Cont'd)		Groundwater Pump-and-Treat for Groundwater); and Alternative 4 (RTD for Waste Sites and Pump-and-Treat for Groundwater). The No Action Alternative would not mitigate the environmental impacts from contaminated waste sites and groundwater. All other alternatives would mitigate the environmental impacts to various degrees associated with the affected waste sites and groundwater within the scope of this RI/FS. The net anticipated effect from implementation of Alternatives 2, 3, or 4 would be a positive contribution to cumulative environmental effects at the Hanford Site. For alternatives with waste sites that require RTD as the selected remedial action, DOE expects that the primary facility to receive contaminated material will be the ERDF facility (which has its own NEPA documentation) on the Central Plateau. DOE has included the combined effects anticipated from ongoing CERCLA/TPA response actions (Ecology et al., 1989a), and Hanford sitewide groundwater analysis as part of the cumulative impact analysis in the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (DOE/EIS-0391). In addition, borrow material that will be used during remediation in support of alternatives within this RI/FS was analyzed in Draft Environmental Assessment for Expansion of Borrow Areas on the Hanford Site (DOE/EA-1934). Revegetation issues would be guided by compliance with the Environmental Assessment Integrated Vegetation Management on the Hanford Site (DOE/EA-1728) and DOE/RL 96-32. These and additional NEPA documentation have been prepared by DOE for other Hanford Site projects that may interface with the scope of this RI/FS."					
DH-566	Comment: It is stated, "In order for these actions to be consistent with the final action remedy selection, the current interim action RD/RAWPs will be modified using the TPA (Ecology et al., 1989a) change notice process to include the cleanup levels specified in the final action ROD." The above statement is not the correct process for changes to decisions that have been made in a ROD in this instance, the interim ROD. The CERCLA process for changes in cleanup values in a ROD requires, at a minimum, an Explanation of Significant Difference (ESD) and maybe a ROD amendment. The TPA cannot circumvent the required CERCLA process. Basis/Justification: EPA "A guide to preparing superfund proposed plans, Records of Decisions, and other remedy selection decision documents." 40 CFR 300.430 and 40 CFR 300.435	Change sentence in the RI/FS to be consistent with the federal regulations.	10	10-24/36-38	Accept with Modification	A strategy for interim to final action transition throughout the River Corridor is being developed by RL in conjunction with EPA and Ecology. The text was revised to reflect the process and is consistent with the 300 Area ROD language. Note that the ROD prepared as a result of this RI/FS and the associated proposed Plan will serve to amend or supersede appropriate sections of the existing Interim Action RODs. No further ESD or ROD amendment will be required.	Yes - 1/30/2014
DH-567	Comment: Several NEPA value topics within this table omit mention of certain potential impacts that either need further discussion, or point to other required guidance for further evaluation that should be detailed in this RI/RS or applicable CERCLA documentation following this RI/FS. Add discussion for the following NEPA values subsections: Transportation – provide discussion for added transportation due to watering/backfilling/revegetation, for getting more borrow material, and for follow-on inspections; Natural, Cultural, and Historic Resources – Replace 'Natural' of this topic 'title' with 'Ecological'. For the second sentence of the first paragraph under Evaluation, add the following language, "Such effects, as well as backfilling and revegetation would be mitigated in accordance with…." Replace the second paragraph with the following language, "Effects to cultural and historical resources will be minimized through implementation of mitigation as detailed in Hanford Cultural Resources Management Plan (DOE/RL-98-10). As needed, consultation with area Tribes would follow the protocol that is being developed for the 100-K Area RI/FS as it concerns tribal burial grounds and/or digging up tribal artifacts." In the last sentence of this paragraph, replace 'natural' with 'historic.' Delete the third paragraph, as it is not needed; Cumulative Effects (Direct and Indirect) – Replace 'Effects' of this topic 'title' with 'Impacts.' Add language concerning the positive effects of revegetation of the landscape back to pre-Hanford conditions in support of the natural ecology of the area. Place this 'Cumulative Impacts' section as the last topic within this table; and Irreversible and Irretrievable Commitment of Resources – Start the first sentence with the following, "As detailed in Draft Environmental Assessment for Expansion of Borrow Areas on the Hanford Site (DOE/EA-1934), borrow materials that would be used as backfill waste sites…." Basis/Justification: Consistency, clarity, and accuracy.	Modify the text as recommended in the Comments section.	10	10-25 through 10-28/ Table 10-7	Accept with Modification	The table has been revised to incorporate the suggested revisions.	Yes - 8/28/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-568	Comment: It is stated, " If necessary, a separate TSD unit closure plan that meets the requirements specified in "Dangerous Waste Regulations," "Closure and Post-Closure" (WAC 173-303-610) and the Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste (WA7890008967) will be prepared and submitted to Ecology." The above statement is inaccurate. Ecology and EPA attorneys have stated that closure plans for TSDs are necessary for integration. This authority comes from the Site-wide permit not the RI/FS. Basis/Justification: Section 5.5 of TPA and EPA/Ecology legal guidance.	A separate TSD unit closure plan that meets the requirements specified in "Dangerous Waste Regulations," "Closure and Post-Closure" (WAC 173-303-610) and the Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste (WA7890008967) will be prepared and submitted to Ecology for approval.	10	10-26/ Para 4 & 5	Accept	Text has been revised to clarify.	Yes - 8/28/2013
DH-569	Comment: It is stated, "The TPA (Ecology et al., 1989a) states the intent of the Tri Parties' CERCLA remediation at the Hanford Site is to fulfill the corrective action requirements for the Site as a facility containing permitted TSD units." The above sentence is incorrect or not written clearly. Corrective action (WAC-173-303-64620) is for past practice units and not for Treatment, Storage, and Disposal units (TSDs). TSDs use WAC 173-303-610 for closure not corrective action (-64620). Basis/Justification: Incorrect statement regarding corrective action for TSDs.	The TPA (Ecology et al., 1989a) states the intent of the Tri Parties' CERCLA remediation at the Hanford Site is to fulfill the corrective action requirements at the Site for past practice units remediated under CERCLA authority.	10	10-29/2-4	Accept with Modification	The text was revised to use the language directly from Article IV, "Statutoryt Compliance and RCRA/CERCLA Integration and Coordination", paragraph 17.	Yes - 8/28/2013
DH-570	Comment: It is stated, "In particular, "Overview of Cleanup Standards" (WAC 173-340-700) through "Sediment Cleanup Standards" (WAC 173-340-760) functions as ARAR standards for CERCLA remedial actions on the Hanford Site." The above statement is misleading as the corrective action ARARs for cleanup are the list provided in IIY.1.a,b,c,d,e,f,g. Basis/Justification. Sitewide Permit II.Y.1 corrective regulatory citations. Statement is also on pg. 8-5, Section 8.1.2.3, lines 31-33.	Change sentence for accuracy to: In particular, "Overview of Cleanup Standards" (WAC 173-340-700) through "Sediment Cleanup Standards" (WAC 173-340-760) functions as cleanup standards for corrective actions on the Hanford Site and therefore are an ARAR under CERCLA.	10	10-29/23-25	Accept with Modification	Because specific ARARs are identified in Section 8.1.2 and Appendix N, this sentence is superfluous to this section and has been deleted.	Yes - 8/28/2013
DH-571	Comment: It is stated, " In addition, the final disposition of any remaining TSD units will address both CERCLA remedial action and RCRA TSD closure requirements." This statement makes an assumption about how TSD will be closed via the Sitewide permit. The authority for TSD closure comes from the Sitewide permit so this statement is presumptive and may not be accurate. Basis/Justification: Sitewide permit is the authority for TSD closure not RI/FS.	In addition, the final disposition of any remaining TSD units may address both CERCLA remedial action and RCRA TSD closure requirements. The Hanford Facility Dangerous Waste Permit is the authority for TSD closure requirements.	10	10-29/26	Accept with Modification	Text has been revised to clarify.	Yes - 8/28/2013
DH-572	Comment: "If necessary, a separate TSD unit closure plan that meets …WAC 173-303-610 and Revision 8C… will be prepared and submitted to Ecology." Basis/Justification: WAC 173-303-610, Closure and post-closure	Identify the potential ('remaining') RCRA TSD units that could be included in this closure plan. Describe why one closure plan would be justified versus several different closure plans in the context of Section 10.6, CERCLA and RCRA Correction Action and TSD Unit Closure.	10	10-29/31	Accept with Modification	Text has been revised to clarify.	Yes - 8/28/2013
DH-573	Comment: The map does not show all wells (e.g., 199-D5-143, 199-D5-134, 199-D5-140, etc.). Basis/Justification: Accuracy and completeness.	Include all wells on the map.	Appendix A	Base Map A-1	Accept	The data table used to generate the 100-D/H base maps was from January 2011. The 3 wells identified were drilled in January, April, and May 2011. The figure will be updated as part of the final document revision and the more recently constructed wells will be shown.	Yes - 4/21/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-574	Comment: See Appendix F comments regarding the Cr (VI) Kd. Basis/Justification: See justifications associated with Appendix F comments.	For any modeling that assumes that some portion of the vadose zone is not currently contaminated with Cr (VI), use a Kd value of 0 mL/g in the absence of sorption data for Cr (VI). Adjust the text in this appendix accordingly.	Appendix F	C-2 - C-3/10-11	Justification Added	Will add justification to explain conservatism and site-specific context of data used to develop the Kd value for Cr(VI) and note that Cr(VI) is simulated using the 100:0 initial contaminant condition (as are all COPCs with Kd < 2.0, as explained elsewhere in the RI and supporting documentation). A sensitivity case demonstrating the SSL and PRG values are insensitive to an alternative conceptual model will be included in ECF-HANFORD-11-0063. A sensitivity case was proposed by an Ecology staff member during a comment resolution meeting and included in the analysis. This senstivity case uses a one-off test simulation performed using the most conservative column for 100-D that resulted in the PRG values in the analysis. In this sensitivity case, chromium migration is simulated with Kd = 0.8 over an upper 70% contaminated soil column range and with Kd = 0 over the lower 30% clean range and aquifer nodes. The peak concentration resulting from both the original model and the one-off analysis are plotted and compared. The original model yielded a higher peak groundwater concentration (the basis of PRG and SSL values) : 50.2 g/m3 for the original case versus 46.7 g/m3 for the sensitivity case. The same test is repeated for the SSL values (based on irrigation recharge rates); for SSL values the peak differences were closer, differing by only 0.2 percent between the original and sensitivity case, indicating that SSL values would not differ meaningfully under the alternative model posited in the sensitivity case. This sensitivity analysis is included in the revised ECF-HANFORD-11-0063.	Yes - 4/9/2014
DH-575	Comment: All of the entries under the column “Cleanup Verification Data” should be N/A, with the exception of hexavalent chromium. Basis/Justification: As written on page 4-17 of the RI/FS, the only COPC analyzed for Cleanup Verification Package CVP-1000-00016 was hexavalent chromium.	Change 9 instances of “ND” to N/A.	Appendix D	Table 72	Accept with Modification	Table 72 has been revised per modification requested.	Yes - 1/30/2014
DH-576	Comment: The year of the WAC 173-340 citations is needed throughout this entire RI/FS. Basis/Justification: The regulations changed significantly in 2001, and the latest regulation is 2007. The use of the 1996 regulation for interim work in the 100 Areas creates some confusion about which version of the regulation is being considered.	Use the latest amendment of WAC 173-340, which is 2007. Include the year in all citations.	Appendix F	F-209-F-252/General	Accept	ECF-HANFORD-12-0023, REV. 2 has been revised to include year in WAC citations. NOTE: ECF-HANFORD-10-0442 was replaced with the above-mentioned ECF.	Yes - 4/8/2014
DH-577	Comment: The WAC 173-340-720 citation does not give the year of the regulation. Basis/Justification: See an earlier comment about citing the year of the regulations.	Use the latest amendment of WAC 173-340, which is 2007. Include the year in all citations, such as these footnotes.	Appendix F	F-225/Footnotes a and b	Accept	ECF-HANFORD-12-0023, REV. 2 has been revised to include year in WAC citations. NOTE: ECF-HANFORD-10-0442 was replaced with the above-mentioned ECF.	Yes - 4/8/2014
DH-578	Comment: The references associated with the Table 4-2 have not been provided in this portion of the appendix. Basis/Justification: If these references are used for development of site-specific SSLs they should be included in this document, rather than forcing the reader to get them from DOE/RL-96-17.	Include the full citations for the references given in Table 4-2, either in table footnotes or in the reference list at the end of this portion of Appendix F.	Appendix F	F-226-231/ Table 4-2	Accept	ECF-HANFORD-12-0023, REV. 2 has been revised to include the full references for the citations in Table 4-2. NOTE: ECF-HANFORD-10-0442 was replaced with the above-mentioned ECF.	Yes - 4/8/2014
DH-579	Comment: The cadmium Kd value is very large and has not been supported with a site-specific reference. Basis/Justification: The Ames and Serne (1991) reference does not provide a value that can be traced to Hanford-specific measurements for cadmium. Additionally, the Ames and Serne (1991) reference provides a range of values, rather than the value of 30 mL/g.	Use a site-specific Kd value for cadmium and provide the reference for the value to Ecology. If there is no site-specific Kd value, use 6.7 mL/g from CLARC.	Appendix F	F-226/ Table 4-2	Accept	Cadmium value will be changed to use the CLARC value and the SSL and PRGs adjusted accordingly.	Yes - 4/9/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-580	Comment: The uranium Kd value of 2 mL/g does not appear to be site specific for this portion of the 100 areas and does not address WAC 173-340-747(8)(b)(i) or meet the burden of proof in WAC 173-340-702(14). Basis/Justification: It is significantly larger than the lower 10th percentile of values in PNNL-13895 (Rev.1), which Ecology has used to select 0.3 mL/g in the absence of site-specific values.	Use uranium Kd values measured for waste sites in the vicinity of each waste site of interest, and/or use a Kd value of 0.3 mL/g for uranium in the absence of site-specific data.	Appendix F	F-226 and F-239/ Table 4-2 and 4-3	Accept with Modification	The selected Kd value for uranium will be identified as "No value required" (NVR) with a note that identifies that uranium is not a COC for the 183-H solar evaporation basin area or other 100-D/H locaitons, therefore modeling is not required and a Kd value is not required. CLARIFICATION: the "NRV" will be applied in Chapter 5 (in a new table of selected Kd values required to resolve other comments) and in ECF-HANFORD-11-0063 where the Kd values are applied in the calculation of SSL and PRG values. It will be applied to ECF-HANFORD-12-0023, which identifies Kd values for all River Corridor units, using a footnote to distinguish treatment of Kd in 100-D/H and 100-N (NVR) from values applicable to other River Corridor decision units, consistent with agreement with Ecology.	Yes - 10/2/2013
DH-581	Comment: The titles of the tables need to be modified, since not all of the values are 'fixed parameter' values. Basis/Justification: Several of the values in the Fixed-Parameter Three-Phase column do not match values that would be calculated with the CLARC default values. The regulations allow for use of other values calculated using site-specific parameters. However, in cases where the defaults are not used, the method is the Variable Parameter Three-Phase model.	Change the table titles to remove the words 'Fixed Parameter', and just make reference to Three-Phase Soil Values for Groundwater Protection. Also, modify Table 7-1 to be consistent with the changes needed for tables 4-2 and 4-3.	Appendix F	F-232-240 and F242-250/ Table 4-3 and 7-1	Accept	These tables have been removed from the ECF.	Yes - 2/26/2014
DH-582	Comment: The paragraph lists general assumptions. However, the specific equations and the order in which they have been used, as well as the parameters, are not provided in the document. Basis/Justification: Ecology needs to evaluate this 1-D STOMP modeling effort to see that it complies with the requirements in WAC 173-340-747(8). It is not possible to evaluate this modeling effort without the specific equations, the order in which the equations were used, and the inputs. Also, readers should be able to use the equations and parameters to duplicate the outputs in this document.	Provide in the document all of the specific equations and the order in which they have been used for the 1-D STOMP modeling, as well as the input parameters used in the 1-D STOMP modeling. [Note: referencing PNNL-12030 or any secondary document is not specific enough for this comment and does not meet the burden of proof requirement in WAC 173-340-702(14), an evaluation criterion given in WAC 173-340-747(8)(c)].	Appendix F	F-260/ 3rd	Not Accepted	DOE/RL-2011-50 Rev. 1 provided the regulatory basis for use of the STOMP code to implement alternative fate and transport models. Use of alternative fate and transport models is one method permitted under WAC 173-240-747 for establishing Method B soil cleanup levels or Method C soil cleanup levels. DOE/RL-2011-50 Rev. 1 documents DOE's demonstration that the software (STOMP) meets the WAC requirements for implementation of alternative fate and transport models and provides the graded approach to be used, while leaving parameterization for specific applications including the 100-D/H RI/FS. The governing equations STOMP solves for water and solute mass conservation and momentum, as well as the constitutive relationships between primary and dependent variables, are well documented in the cited STOMP Theory Guide (PNNL-12030). STOMP solves a set of nonlinear partial differential equations that are variable in time and space using iterative techniques; direct solution using a pen-and-paper solution is not feasible.	Yes - 9/4/2013
DH-583	Comment: The document references the Regulatory Basis and Implementation of a Graded Approach to Evaluation of Groundwater Protection (DOE/RL-2011-50) as providing the regulatory basis for the STOMP approach used here. This is not appropriate. Basis/Justification: DOE/RL-2011-50 generated many comments from Ecology that were never addressed. Ecology's comments specifically state how DOE/RL-2011-50 does not meet the requirements in WAC 173-340-747(8). In addition, the last sentence of the signature page for this document states in part, "….but justification of specific parameters and assumptions for a given application of the graded approach is to be presented in application-specific documents."	Include in this document the regulatory basis for the 1-D STOMP modeling approach used here, discussing each element in WAC 173-340-747(8). Also, as requested in a separate comment, provide all of the specific equations and the order in which they have been used, as well as the input parameters used in the 1-D STOMP modeling so that Ecology can verify an adequate regulatory basis for the modeling approach used in this document.	Appendix F	F-261/1st paragraph of section	Not Accepted	DOE/RL-2011-50 Rev. 1 provided the regulatory basis for use of the STOMP code to implement alternative fate and transport models. Use of alternative fate and transport models is one method permitted under WAC 173-240-747 for establishing Method B soil cleanup levels or Method C soil cleanup levels. DOE/RL-2011-50 Rev. 1 documents DOE's demonstration that the software (STOMP) meets the WAC requirements for implementation of alternative fate and transport models and provides the graded approach to be used, while leaving parameterization for specific applications including the 100-D/H RI/FS. The governing equations STOMP solves for water and solute mass conservation and momentum, as well as the constitutive relationships between primary and dependent variables, are well documented in the cited STOMP Theory Guide (PNNL-12030).	Yes - 9/4/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-584	Comment: The CPK parameter used in equation 1b for setting PRGs is not accepted. Therefore, the PRGs are not accepted. Basis/Justification: This equation sets the PRGs using a CPK based on a native vegetation recharge scenario, which is not appropriate for the disturbed soils on the backfilled waste sites (see Gee et.al, 2005, Vadose Zone Journal, 4:32-40 (see Table 3 for sand and sandy gravel) and Gee et al., 2005, Vadose Zone Journal, 4:72-78). Recharge will not drop to 3 mm/y or less until steady-state and soil horizonation returns to the pre-disturbed condition. The soils used to backfill the site are not the same as their pre-disturbed counterparts, since topsoil has been mixed with subsoil (or lost entirely) and the material has no soil horizons. The time period for an A horizon of the Entisols (Burbank and Rupert) and the Aridisol (Ephrata) to develop, as existed prior to disturbance of the soil, would be at least 100 years (Birkeland, P.W., 1984, Soils and Geomorphology, p. 223-225). The assumption that the site will be mature shrub-steppe in the time periods given in Table 5 on p. F-273 is not accepted. [Furthermore, if cheatgrass establishes after backfilling, it may take much longer for shrub steppe vegetation to develop (Norton et al., 2004, J. of Arid Environments 57:445-466)]. There are no references cited that establish the recharge rates and time periods in Table 5 on p. F-273 for development of mature shrub-steppe (which will parallel A horizon development) for Hanford soils. The burden of proof for establishing that recharge (equivalent to infiltration in WAC 173-340), has been derived in a defensible manner has not been met, as required by WAC 173-340-747(8)(b)(vii) and -702(14).	Use an irrigation scenario or use an infiltration rate of no less than 50 mm/y (in all time periods) if site-specific modeling can be justified.	Appendix F	F-263/Eqn 1b	No change	RESOLUTION: ECY stated that the recharge and revegetation comments are resolved due to the use of irrigated PRGs proposed as CUL, and that the non-irrigated model will remain in the RI as a point of comparison. RESPONSE: Recharge rates will be revised to use the disturbed conditions values cited in PNNL-14702 Rev 1 per Comment DH-243. No separate change planned as a result of this comment. In comment resolution meeting discussions, it was recommended that the native vegetation recharge scenario be revised to use only bare-soil recharge rates because of uncertainty regarding re-vegetation. However, restoration of surface soils and native vegetation conditions are part of the restoration activities; DOE does not plan to leave these sites in disturbed conditions. Revegetation is occurring in accordance with the *Hanford Biological Resources Management Plan* . Revegetation is considered in the remedial design for the waste sites and is included in the cost estimates of the remedial action. Ecology staff were hosted on a site visit to revegetated sites to demonstrate this program. PRG values are based on the native vegetation scenario, which is reasonably based on re-vegetation as noted. However, the SSL values are used first for screening purposes. SSL values are based on the irrigation recharge scenario. Consequently, only those sites that fail an irrigation recharge rate scenario are compared to PRG values. In 100-D/H, none of the sites failed the (irrigation-based) SSL screening level. Thus, utilizing a native vegetation recharge scenario based on only bare-soil recharge rates for the PRG basis would not change the results of the EPC evaluation.	Yes - 4/9/2014
DH-585	Comment: The natural vegetation recharge scenario assumptions for the PRG calculations are not conservative. Basis/Justification: See prior comments about recharge assumptions and PRGs.	List the natural vegetation recharge scenario as a nonconservative assumption.	Appendix F	F-291/last 2 bullets	Not Accepted	RESOLUTION: ECY stated that the recharge and revegetation comments are resolved due to the use of irrigated PRGs proposed as CUL, and that the non-irrigated model will remain in the RI as a point of comparison. RESPONSE: Recharge rates will be revised to use the disturbed conditions values cited in PNNL-14702 Rev 1 per Comment DH-243. No separate change planned as a result of this comment. In comment resolution meeting discussions, it was recommended that the native vegetation recharge scenario be revised to use only bare-soil recharge rates because of uncertainty regarding re-vegetation. However, restoration of surface soils and native vegetation conditions are part of the restoration activities; DOE does not plan to leave these sites in disturbed conditions. Revegetation is occurring in accordance with the Hanford Biological Resources Management Plan. Revegetation is considered in the remedial design for the waste sites and is included in the cost estimates of the remedial action. Ecology staff were hosted on a site visit to revegetated sites to demonstrate this program. PRG values are based on the native vegetation scenario, which is reasonably based on re-vegetation as noted. However, the SSL values are used first for screening purposes. SSL values are based on the irrigation recharge scenario. Consequently, only those sites that fail an irrigation recharge rate scenario are compared to PRG values. In 100-D/H, none of the sites failed the (irrigation-based) SSL screening level. Thus, utilizing a native vegetation recharge scenario based on only bare-soil recharge rates for the PRG basis would not change the results of the EPC evaluation.	Yes - 4/9/2014
DH-586a	Comment: The document should point out that the dilution factors from the 1-D STOMP modeling effort are roughly 1000 to 10,000 times higher for the base case (and 10 to 1000 times higher for irrigation) than the default assumption in WAC 173-340-747(4) of 20. Consequently, the base case PRGs (and irrigation SSLs) end up orders of magnitude higher than WAC 173-340-747 default soil cleanup levels. Basis/Justification: In the absence of the modeling equations, readers (and Ecology) have no way of checking and defending the very large SSLs and PRGs being proposed in this document for the leaching pathway.	586a - [Provide a comparison of the default values to the values obtained with the modeling in this document.] Also, provide in this document all of the equations, the order in which the equations were used, and all of the input parameters used in the modeling.	Appendix F	F-294/Figure 8	Accept with Modification	The document will be revised to compare and contrast default dilution factors under the WAC with those resulting from site-specific values simulated within the STOMP-implemented models.	Yes - 9/5/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-586b	Comment: The document should point out that the dilution factors from the 1-D STOMP modeling effort are roughly 1000 to 10,000 times higher for the base case (and 10 to 1000 times higher for irrigation) than the default assumption in WAC 173-340-747(4) of 20. Consequently, the base case PRGs (and irrigation SSLs) end up orders of magnitude higher than WAC 173-340-747 default soil cleanup levels. Basis/Justification: In the absence of the modeling equations, readers (and Ecology) have no way of checking and defending the very large SSLs and PRGs being proposed in this document for the leaching pathway.	Provide a comparison of the default values to the values obtained with the modeling in this document. 586b - [Also, provide in this document all of the equations, the order in which the equations were used, and all of the input parameters used in the modeling.]	Appendix F	F-294/Figure 8	Accept with Modification	The document will be revised to compare and contrast default dilution factors under the WAC with those resulting from site-specific values simulated within the STOMP-implemented models.	Yes - 9/5/2013
DH-587	Comment: This section does not address the adjustments in dilution factors, as needed in cases where groundwater is contaminated, as required in WAC 173-340-747(8)(vi). Basis/Justification: There are cases where waste sites are located near contaminated wells and/or groundwater plumes. Examples have been given in previous comments.	Adjust SSLs and PRGs downward in areas of existing groundwater contamination. Discuss these adjustments in this document.	Appendix F	F-294/General	Not Accepted	RESOLUTION: Ecology has determined (K. Welsch Email, 12-16-13) that no dilution factor adjustments are needed in the alternative fate and transport modeling for the following reasons: • WAC language allows for dilution factor adjustment, but does not require it. • The soil PRGs for protection of groundwater/surface water for hexavalent chromium is not based on the results of alternative fate and transport modeling, but on the values from the interim cleanup actions (originally based on the "100 times rule"). • The fate and transport modeling results show no migration of vadose zone contaminants to groundwater within 1000 years. With no migration to groundwater, the value of the dilution factor is irrelevant. Note that the "100 times rule" used as the basis for the interim cleanup actions produced a more conservative limit for hexavalent chromium than did the alternative fate and transport modeling. RESPONSE: This is a matter of separation in time; the SSLs and PRGs are developed to measure future groundwater protectiveness from residual contamination; combining future protectiveness with present day upgradient contamination is not a coherent approach to this calculation. In addition, with a pump-and-treat system in place, upstream contamination is addressed through that action. Finally, the PRGs are based on impacting groundwater at the lowest identified action level. The most relevant contaminant for the D and H areas in chromium. The groundwater protection PRG is based on protecting the aquifer immediately under the waste site from reaching the ambient water quality standard (10 ug/L). While it can be demonstrated that attenuation will occur during the travel distance between the waste site and the point of discharge in the Columbia River, this is not taken into consideration when the groundwater protective value is calculated. The same approach is used for all groundwater protection calculations.	Yes - 4/21/2014
DH-588	Comment: It is not clear why contaminants with Kds of 2 to 8 mL/g are treated differently than those with Kds of 1 to 2 mL/g and those with Kds greater than 8 mL/g. Also, it is not clear what is done for contaminants with Kds from 0 to 1 mL/g. Basis/Justification: It appears that a "fitted linear regression equation created by performing a linear regression of STOMP simulated peak concentrations against Kd values…" is described in #1 and #3, but a different approach is used in #2.	Use the same regression approach for all Kd ranges, and describe what approach is used for contaminants with Kd values less than 1 mL/g.	Appendix F	F-295/#1-#3	Accept with Modification	An overview will be added to explain with greater clarity how a discrete set of Kd values are simulated to predict the resulting peak groundwater concentrations, which are in turn used to backcalculate SSL and PRG values as a function of these discrete Kd values. From this relationship, the SSL and PRG values are then derived as a function of their Kd by interpolation. CLARIFICATION: Use of a regression relationship to interpolate SSL and PRG values from a set of discrete simulated Kd values has been dropped; instead, every COPC's Kd value is now directly simulated. This greatly simplifies the presentation of the calculational approach.	Yes - 5/6/2014
DH-589	Comment: The text states "Where soil concentrations specific sites fail the screening step and exceed PRGs, site-specific modeling using more detailed information is permitted under the graded approach (DOE/RL-2011-50) to consider if more realistic (less bounding) consideration can remove a site from further consideration." This approach is not acceptable. Basis/Justification: Ecology had numerous comments on DOE/RL-2011-50 that remain unresolved, leading to the conclusion that the modeling did not meet the requirements in WAC 173-340-747(8). Also, given that the PRGs are several orders of magnitude above those predicted by conservative models, sites that exceed the large PRGs calculated here would certainly require a remedy.	Include remedies for sites that fail the large SSLs calculated with the irrigation scenario.	Appendix F	F-298/1st para of section	Accept with Modification	Waste sites with measured concentrations above the irrigation scenario SSL will be carried into the Feasibility Study.	Yes - 5/21/2014
DH-590	Comment: Concentrations given for SSLs and PRGs are not accepted until the necessary changes are made to resolve comments related to modeling. Basis/Justification: This effort has not met, at a minimum, the burden of proof and quality of information requirements in WAC 173-340-747(8), as indicated in other comments.	Provide the documentation and revise the modeling as indicated in other comments.	Appendix F	F-309-F-334/Tables A-1 and B-1	Accept with Modification	A crosswalk will be provided to show compliance with the requirements in WAC 173-340-747(8).	Yes - 5/7/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-591	Comment: The document does not indicate where the samples were taken and does not provide leachate concentrations for the samples. It is not possible to tell if the samples are representative of the D and H area without this information. Basis/Justification: The location of the samples relative to waste sites and relative to each other is important information about the materials used. This will help the reader determine if the samples are representative of the D and H areas and the river corridor in general. The leachate concentrations tell the reader how the leachate compares with concentration standards for groundwater and surface water.	Provide a map of the sample locations used in the Kd determination for hexavalent chromium. Also, provide the hexavalent chromium concentrations in the leachates for each dilution that was used in the determination of the hexavalent chromium Kd.	Appendix F	F-575-F-597	Accept	A map will be added to show the locations of samples used to develop the leachate concentrations. Map will show the range of leachate concentrations and calculated Kd values in the D and H areas as well as throughout the River Corridor.	Yes - 5/6/2014
DH-592	Comment: The Kd value of 0.8 mL/g for Cr (VI) is given as a desorption value. Basis/Justification: Sorption (uptake) was not measured. For any modeling that assumes that some portion of the vadose zone is not contaminated, sorption Kd values are needed and they are not provided.	For any modeling that assumes that some portion of the vadose zone is not currently contaminated with Cr (VI), use a Kd value of 0 mL/g in the absence of sorption data for Cr (VI).	Appendix F	F-575-F-597	Accept with Modification	The Kd value for Cr(VI) applies to the desorption of residual remaining in the vadose zone (the other 5%) - not the leachable fraction. In response to a sensitivity case proposed by an Ecology staff member during a comment resolution meeting, a one-off test simulation was performed using the most conservative column for 100-D that resulted in the PRG values in the analysis. In this sensitivity test, chromium migration was simulated with Kd = 0.8 over an upper 70% contaminated soil column range and with Kd = 0 over the lower 30% clean range and aquifer nodes. The peak concentration resulting from both the original model and the one-off analysis were plotted and compared. The original model yielded a higher peak groundwater concentration (the basis of PRG and SSL values) : 50.2 g/m3 for the original case versus 46.7 g/m3 for the sensitivity case. The same test was repeated for the SSL values (based on irrigation recharge rates); for SSL values the peak differences were closer, differing by only 0.2 percent between the original and sensitivity case, indicating that SSL values would not differ meaningfully under the alternative model posited in the sensitivity case. This analysis will be included in revised ECF-HANFORD-11-0063.	Yes - 4/9/2014
DH-593	Comment: The table states that certain waste sites are not included in the RI/FS evaluation because soil data were not collected. However, these sites were reclassified to Interim Closed Out. The site codes for these criteria are, 132-D-2, 132-D-3, 132-D-4, 132-DR-1, and 132-DR-2. Explain how the sites were reclassified to Interim Closed Out without an evaluation of soil data. Basis/Justification: Clarification and accuracy.	Explain how waste sites 132-D-2, 132-D-3, 132-D-4, 132-DR-1, and 132-DR-2 were reclassified to Interim Closed Out without an evaluation of soil data.	Appendix G	G-78/Table 6-2	Accept	The risk assessment provided in the RI/FS report focuses on the achievement of remedial action objectives of waste sites with soil data. Waste sites without soil data were reclassified as interim closed out based on non-soil media (paint, concrete, pipelines). A risk evaluation was also conducted on the allowable residual contamination level (ARCL) sites that collected concrete data which is presented in ECF-Hanford-12-066. A qualitative risk evaluation was performed for the river pipelines which is discussed in Section 6.4.3 of the RI/FS. The environmental calculation will be revised to clarify how the sites were reclassified to interim closed out when it did not have soil data by indicating these were non-soil media and to include reference to the WIDS reclassification forms.	9/9/2013
DH-NSJ17 (ECY numbering)	Comment: The table states that certain waste sites are not included in the RI/FS evaluation because soil data were not collected. However, these sites were reclassified to Interim Closed Out. The site codes for these criteria are, 132-H-1 and 132-H-2. Explain how the sites were reclassified to Interim Closed Out without an evaluation of soil data. Basis/Justification: Clarification and accuracy.	Explain how waste sites 132-H-1 and 132-H-2 were reclassified to Interim Closed Out without an evaluation of soil data.	Appendix G	G-83/Table 6-3	Accept	The risk assessment provided in the RI/FS report focuses on the achievement of remedial action objectives of waste sites with soil data. Waste sites without soil data were reclassified as interim closed out based on non-soil media (paint, concrete, pipelines). A risk evaluation was also conducted on the allowable residual contamination level (ARCL) sites that collected concrete data which is presented in ECF-Hanford-12-066. A qualitative risk evaluation was performed for the river pipelines which is discussed in Section 6.4.3 of the RI/FS. The environmental calculation will be revised to clarify how the sites were reclassified to interim closed out when it did not have soil data by indicating these were non-soil media and to include reference to the WIDS reclassification forms.	9/9/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-594	Comment: It is observed that many of the waste sites have "Composite" listed as the Sample Type. Compositing is only acceptable to Ecology under conditions of screening. It is not acceptable to use in site characterization and may not be used after remediation to determine whether cleanup standards have been met. When reporting compositing to Ecology, the report must explain the reasons for using compositing and how it was used. In light of this, explain the basis of the composite sampling used for the waste sites specified in Table 6-4. Basis/Justification: Guidance on Sampling and Data Analysis Methods, January 1995, Publication No. 94-49.	Explain the basis of Composite sampling used for the waste sites specified in Table 6-4.	Appendix G	G-85-G-167/ Table 6-4	No change	The purpose of this ECF is to explain how analytical results obtained from closeout documentation were verified for accuracy and use in the RI/FS report. It does not provide a discussion of sampling methods but confirms that the information transmitted is correct. The basis of composite sampling used for waste sites is described in the approved sampling and analysis plans. All verification samples were in collected accordance with DOE/RL-96-22, 100 Area Remedial Action Sampling and Analysis Plan and DOE/RL-2001-35, Rev. 3, 100 Area Burial Grounds Remedial Action Sampling and Analysis Plan. Composite sampling methods are described in both approved documents.	9/9/2013
DH-595	Comment: It is not apparent where footnote c has been referenced in the table. Review Table 6-4 to ensure that this reference is needed. Basis/Justification: Clarification and accuracy.	Review Table 6-4 to ensure that footnote c is needed.	Appendix G	G-167/ Table 6-4	Accept	Table 6-4 in ECF-100DR1-11-0003 will be revised. Footnote c should be associated with the shallow decision unit for the 118-D-1 Burial Ground. The table will be revised to assign the footnote.	9/9/2013
DH-596	Comment: It is observed that many of the waste sites have "Composite" listed as the Sample Type. Compositing is only acceptable to Ecology under conditions of screening. It is not acceptable to use in site characterization and may not be used after remediation to determine whether cleanup standards have been met. When reporting compositing to Ecology, the report must explain the reasons for using compositing and how it was used. In light of this, explain the basis of the composite sampling used for the waste sites specified in Table 6-5. Basis/Justification: Guidance on Sampling and Data Analysis Methods, January 1995, Publication No. 94-49.	Explain the basis of Composite sampling used for the waste sites specified in Table 6-5.	Appendix G	G-167-G-210/ Table 6-5	No change	The purpose of this ECF is to explain how analytical results obtained from closeout documentation were verified for accuracy and use in the RI/FS report. It does not provide a discussion of sampling methods but confirms that the information transmitted is correct. The basis of composite sampling used for waste sites is described in the approved sampling and analysis plans. All verification samples were in collected accordance with DOE/RL-96-22, 100 Area Remedial Action Sampling and Analysis Plan and DOE/RL-2001-35, Rev. 3, 100 Area Burial Grounds Remedial Action Sampling and Analysis Plan. Composite sampling methods are described in both approved documents.	9/9/2013
DH-597	Comment: The table does not show any units of measure for the minimum and maximum detected concentrations. Edit the table to include this necessary information. Basis/Justification: Clarification and accuracy.	Edit the table to include the units of measure for the minimum and maximum detected concentrations.	Appendix G	G-238-G-242/ Table 4-6	Accept	Table 4-6 in ECF-100DR1-11-0004 will be revised to include the units of measure.	9/9/2013
DH-598	Comment: Provide definitions for the acronyms HH, GWP/SWP and MFP. Basis/Justification: Clarification and accuracy.	Provide definitions for HH, GWP/SWP and MFP.	Appendix J	J-23/ Table J-1	Accept	The table has been updated to provide acronym definitions as noted: HH = Human Health GWP/SWP = groundwater protection/Surface water protection MFP = mixed fission products Note that there are other acronyms without definitions as well that will be corrected when the final document revision is compiled.	9/9/2013
DH-599	Comment: For waste site 100-D-86:3, the table list "WCH to complete" as the WIDS Site Type. Include the correct site type on the table. Basis/Justification: Clarification and accuracy.	Include the correct WIDS Site Type for 100-D-86:3.	Appendix J	J-25/ Table J-2	Accept	Text was revised to show that the site type is Process Sewer.	9/9/2013
DH-600	Comment: The Appendix N is missing some ARARs. Basis/Justification: Washington Administrative Code WAC 173	Add the following ARARs. WAC 173-400-113 WAC 173-460-090 WAC 173-460-120	Appendix N	Table N-1	No change	WAC 173-400-113 (New sources in attainment or unclassifiable areas) is not included because the substantive requirements are contained in WAC 173-400-040 (General standards for maximum emissions). WAC 173-460-090 (Second tier review) is not listed because the remedial actions proposed in the 100 D/H Area will demonstrate compliance with WAC 173-460-070 (Ambient impact), so no further review is needed. WAC 173-460-120 (Scientific review and amendment of acceptable source impact levels and lists) was repealed by WSR 09-11-131 (Order 05-19), filed 5/20/09, effective 6/20/09.	Yes - 2/12/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
DH-601	Comment: In listing potential ARARs in Table N-1, Federal Clean Air Act (FCAA) is not listed. Basis/Justification: The Washington Clean Air Act and other Washington Administrative Code (WAC) rules are listed, but gain authority from the FCAA.	It appears that sections of the FCAA are ARAR and should be included in Table N-1	Appendix N	Table N-1	Accept with Modification	As noted in Section N6.1, "The state implementing regulation "Ambient Air Quality Standards and Emission Limits for Radionuclides" (WAC 173 480) sets standards that are as stringent or more so than the standards under the federal Clean Air Act of 1990 and amendments." The same is true for criteria/toxic emissions. As a result, only the state regulations are cited in the ARAR table for both rad and toxic air emissions. The federal Clean Air Act is cited as the ARAR for emissions related to asbestos. A statement was added to section N6.2 to mirror the note in Section N6.1.	Yes - 10/22/2013
DH-602	Comment: New emission standards have been promulgated by EPA in regards to compression ignition (CI) and spark ignition (SI) engines. These are not presented in Table N-1 as ARARs Basis/Justification: 40 C.F.R. 60 subpart IIII, 40 C.F.R. 60 subpart JJJJ, 40 C.F.R. 63 subpart ZZZZ are required federal rules.	Need to add the following to Table N-1: 40 C.F.R 60 subpart IIII 40 C.F.R 60 subpart JJJJ 40 C.F.R. 63 subpart ZZZZ	Appendix N	Table N-1	Accept	These regulations previously applied to engines greater than 500 HP. Starting May 3rd, they will apply to all engines. ARAR language has been developed for these regulations and incorporated into the table.	9/9/2013
DH-603	Our technical person sent me the following ARAR that should have been listed in chapter 10, and is an additional comment for inclusion in the RI/FS: Compliance Monitoring WAC 173-340-720(9)(a) through (f) Comment received via email 08/15/2013		Appendix N	Table N-1	Accept with Modification	WAC 173-340-720(9)(b) and (c) are identified as ARARs in Table N-1. The remaining sections were not deemed to be substantive requirements and are therefore not listed as ARARs. This is generally consistent with the recently published 300 Area RI/FS which identifies WAC 173-340-720(9)(b) as an ARAR. Changed to reeference b through f in response to Comment DH-603, consistent with 300 Area ROD.	Yes - 6/25/2014
DH-604	Please note that reference ECF-100HR3-10-0469 does not appear to be within Appendix G of the draft 100-D/H RI/FS. Comment received via email 08/29/2013	Per previous agreement, this should be: 1) added to Appendix G as referenced in page 6-126, 2) added to the Administrative Record, and 3) a copy sent to Ecology for review/reference (an electronic copy would suffice).	Appendix G		Accept	This ECF has been "overcome by events" through subsequent comment responses. This ECF does not contain any calculations and the content is entirely presented in Section 6.3.	Yes - 5/21/2014
CW-General A	When responding within the Crosswalk, response to each individual question within the 'box' or bullet <u>separately,</u> and <u>within</u> the RESPONSE Box next to the question (rather than pointing to responses 'below' the Response Box, so that it is clear what response goes to which question).		General		Accept	Crosswalk structure will be revised to respond to individual questions separately and bring detailed information supporting the responses inside the tabular format. The crosswalk will provide a pointer to the body of the RI for specific values and information.	Yes - 2/12/2014
CW-General B	<u>Never</u> respond with anything similar to, "It's covered by the Graded Approach, or it's in the Graded Approach." Instead, respond with a reasonable explanation. If further details need to referenced from the Graded Approach or any other reference, then be very specific as to the page/section/line #'s from the reference where the additional information of how/why and/or in what context for answering the question can be found. This also applies to <u>all</u> referencing within the RI/FS or PP.		General		Accept	Uses of the term "graded approach" in the crosswalk will be evaluated and revised: DOE/RL-2011-50 Rev. 1 is the basis for acceptance of STOMP as a computational code to implement alternative fate and transport models, and does provide the graded approach followed for calculating SSL and PRG values. DOE/RL-2011-50 Rev. 1 was approved by Ecology. DOE/RL-2011-50 Rev. 1 does not cover application-specific model development and parameterization; the changes requested in this comment (addition of more specific references into cited documents) will be provided in the revised crosswalk. The crosswalk will provide a pointer to the body of the RI for specific values and information.	Yes - 2/27/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
CW-1	Provide additional, specific information of how the periodically rewetted zones (PRZs) are calibrated and modeled in the Graded Approach document using 1D –STOMP modeling approach. NOTE: The PRZ front has 3 dimensional impacts.		General		Justification Added	Justification will be added to explain the following: Conditions from summer months are used in the 1D STOMP models. This parameterization provides the simplest and most conservative evaluation of conditions under a waste site. By providing the shortest travel distance from the contaminated source to groundwater and assuming that this short distance persists indefinitely, the impact on groundwater is maximized and a larger peak concentration is calculated than if water table is simulated as fluctuating. The effects of the PRZ will be handled internally within STOMP and the three-dimensional nature cannot result in greater impact on groundwater than the one-dimensional assumption which considers no lateral diffusion of contaminants where the only possible direction for contaminant movement is down.	Yes - 2/12/2014
CW-2	How and in what specific context does the Graded Approach maintain 'conservatism' for contaminants that have advective or non-advective transport in the PRZ and in other environments (also applicable for the GW transport-MODFLOW)?		General		Justification Added	With the clarification, this question appears related to the previous comment. Both Cr(VI) and Sr-90 are assumed to exist uniformly throughout the vadose zone (100:0 contaminant source model). The PRZ is not explicitly modeled (rise and fall of the water table is not assumed) to provide a bounding calculation. A fluctuating water table will provide additional attenuation distance between the source area and groundwater for six months every year. Clarification: Clarification with specific example: Provide adequate explanation how contaminants like hexavalent chromium (~advective transport) and Sr-90 will behave in the rewetted zone addressing your concept of "conservativeness"? (from K. Welsh email on 6/5/13) It is agreed that if a CSM shows a continuum of contamination across the vadose zone, PRZ, and saturated zone, then a different set of tools is needed to address protection than was developed and applied for calculation of soil protection levels (SSL and PRG) for 100-D/H. This was done, for example, to address strontium-90 and TPH contamination in the 100-N Area, and uranium contamination in the 300 Area. The conservatism of the graded approach in those instances was preserved by recognition that the CSM of the 1-D vadose zone model was not represenative, and therefore such cases were elevated in the graded approach to site-specific modeling to address the continuum of contamination across the vadose zone, PRZ, and saturated zone. In the case of hte 100-D/H Area, however, the CSM for 100-D/H waste sites did not include such a condition.	Yes - 2/27/2014
CW-3	In absence of adequate or defensible site specific information, provide adequate justification of the use of non-Hanford published information and justify its applicability.		General		Justification Added	Justification will be added where non-Hanford published information on model parameterization is used. Also see the response on the use of CLARC values where no Hanford site-specific information is available for contaminant Kd values.	Yes - 2/12/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
CW-4	Provide adequate explanations of how/why and in what context the 'conservatism approach' is maintained in presence of other, existing phenomena such as biodegradation, decay, presence (expected to be present in the future) of any daughter product(s) in the predictive modeling.		General		Justification Added	Justification will be added to the crosswalk as follows: No radionuclide is simulated that has significant daughter products (no significant daughter/decay products associated with the alpha, beta, and gamma emitters that are present at 100-D/H. The gamma emitters don't have any decay products). It is true that some volatiles are simulated with no biodegradation which can have more toxic daughter products. While this could generate lower PRGs and SSLs for these volatiles, other conservatisms allow for the calculated values to remain protective. The most notable conservatism for these volatiles is that their cleanup levels are based on the lowest applicable water quality standard. The groundwater protection levels are calculated calculation based on meeting all applicable standards immediately under the waste site; including meeting ambient water quality standards with no credit for attenuation of organics as they travel from the waste site and interface with oxic water conditions. This additional conservatism covers the potential for biodegradation products to be generated while keeping the calculations as simple and transparent as possible. This is further supported by groundwater data collected from the OU which indicate that biodegradation products, such as 1,1-DCE and vinyl chloride, have not been detected in groundwater.	Yes - 2/12/2014
CW-5	Will the 1-D Model resolve any issues on lateral transport in the vadose zone? Provide detailed explanation of how/why the 1-D Stop Modeling addresses any future lateral transport in the vadose zone.		General		Justification Added	The 1-D model construct does not address lateral transport. These models attempt to maximize peak concentration in groundwater. However, if lateral transport occurs the location and timing of peak concentration in groundwater could be significantly different. Local site-specific information has not indicated that significant lateral transport of mobile contaminants is occurring. If lateral transport must be evaluated, then an alternate conceptual site model would be required.	Yes - 2/27/2014
CW-6a	Rather than specifically explaining the how/why/context of all aspects of modeling equations used in the draft 100-D/H RI/FS, DOE inadequately responded with reference to equation 2 from section 3 of the Graded Approach. SGW-50776 was provided and does not specifically answer the following: **a. SGW-50776, page 8, uses but does not define the C1 term as the initial contaminant concentration associated with the rock matrix;**		General		Accept with Modification	The term is defined ("the initial contaminant concentration associated with the rock matrix in the VZ [typically contaminant mass or activity/mass of soil]") in the list of equation terms that follows the equation on page 8. The response to comment DH-283 commits to providing an improved overview in Chapter 5: "An overview will be added to explain how unit concentrations are modeled forward to predict a peak groundwater concentration, which is scaled to the MCL and then used to back-calculate the SSL or PRG value (which represents the concentration that would result in the MCL value, and hence the maximum allowable concentration that would not exceed the MCL). This will be coupled with additional discussion that emphasizes that the uniform concentration profile is used to conservatively bound the SSL/PRG value (by assuming the maximum concentration occurs throughout the soil profile range, 100:0 or 70:30 as appropriate). References to the model package report (SGW-50776) documenting the model development and to the environmental calculation file (ECF-HANFORD-11-0063) documenting the model application to 100-D/H will be added to the text to point to the detailed presentation of this approach."	Yes - 2/12/2014
CW-6b	Rather than specifically explaining the how/why/context of all aspects of modeling equations used in the draft 100-D/H RI/FS, DOE inadequately responded with reference to equation 2 from section 3 of the Graded Approach. SGW-50776 was provided and does not specifically answer the following: **b. SGW-50776, page 78, uses but does not define how the C1 term was applied as 1 mg/kg in the entire vadose zone, and for lower kd's;**		General		Accept with Modification	An improved explanation of how CI (initial concentration) is modeled forward with a unit value (1 mg/kg), then used in Equation 2 from Section 3 of the Graded Approach to backcalculate the PRG (representing the maximum value of CI that would not result in exceedance of the protection level in groundwater) will be added to the RI.	Yes - 2/12/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
CW-6c	Rather than specifically explaining the how/why/context of all aspects of modeling equations used in the draft 100-D/H RI/FS, DOE inadequately responded with reference to equation 2 from section 3 of the Graded Approach. SGW-50776 was provided and does not specifically answer the following: **c. SGW-50776, page 106, 2nd bullet, states PRGs are selected by taking the minimum soil concentration values;**		General		Accept with Modification	SGW-50776 page 106, 2nd bullet is merely pointing out the conservatism of using the lowest possible PRG or SSL calculated for all of the potential representative columns and surface soils. This bullet will be revised to say "• PRG and screening values are selected by taking the minimum SSL or PRG value calculated for all of the representative columns simulated for the particular area" to clarify and remove the impression something less than conservative was applied here.	Yes - 2/12/2014
CW-6d	Rather than specifically explaining the how/why/context of all aspects of modeling equations used in the draft 100-D/H RI/FS, DOE inadequately responded with reference to equation 2 from section 3 of the Graded Approach. SGW-50776 was provided and does not specifically answer the following: **d. SGW-50776, page 121, a 1 mg/kg soil concentration is used as the input to the model; and**		General		Accept	The use of C_I = 1 mg/kg soil concentration is a computational convenience that has no impact on the calculated SSLs or PRGs; this value is used in a forward calculation, then the resulting peak concentration in groundwater is compared in a ratio to the groundwater or surface water protection criteria. That ratio is then used in a back-calculation to determine the highest value that C_I could be without causing the peak groundwater concentration to exceed the groundwater or surface water protection criteria. More background on this approach was included in the presentation provided to Ecology at the May 29 comment resolution meeting. An improved explanation of how C_I (initial concentration) is modeled forward with a unit value (1 mg/kg), then used in Equation 2 from Section 3 of the Graded Approach to backcalculate the PRG (representing the maximum value of CI that would not result in exceedance of the protection level in groundwater) will be added to the Chapter 5 of the RI.	Yes - 2/12/2014
CW-6e	Rather than specifically explaining the how/why/context of all aspects of modeling equations used in the draft 100-D/H RI/FS, DOE inadequately responded with reference to equation 2 from section 3 of the Graded Approach. SGW-50776 was provided and does not specifically answer the following: **e. The use of these terms and the context in which they are applied is not clear. Why are background values, detection limits, or values less than 1 mg/kg not used?**		General		Accept	The use of CI = 1 mg/kg soil concentration is a computational convenience that has no impact on the calculated SSLs or PRGs; this value is used in a forward calculation, then the resulting peak concentration in groundwater is compared in a ratio to the groundwater or surface water protection criteria. That ratio is then used in a back-calculation to determine the highest value that CI could be without causing the peak groundwater concentration to exceed the groundwater or surface water protection criteria. More background on this approach was included in the presentation provided to Ecology at the May 29 comment resolution meeting.	Yes - 10/3/2013
CW-S-1	**Page 1. WAC 173-340-747(4)(c)(ii).** It seems that this requirement used subsection (5) for some of the Kd values. If this is true, then the response column should be yes. With the explanation at the bottom as was provided. Change the "No" to "Yes".		1		No change	The variable parameter three-phase partitioning model was not used.	Yes - 7/10/2013
CW-S-2	**Page 2, WAC 173-340-747(5)(b)(i) through iv.** Please provide a response for each bulleted item and which contaminates it apples to. This response will aid in understanding what the Yes means and where it does not apply.		2		Accept	Crosswalk structure will be revised to respond to individual questions separately and bring detailed information supporting the responses inside the tabular format.	Yes - 2/11/2014
CW-S-3	**Page 2, WAC 173-340-747(5)(b)(ii).** All Kd values from site data were not approved by the department.		2		Accept	DOE will change the analysis to use Kd values derived from the CLARC tables for contaminants listed in that source, to the value to be specified in the forthcoming Ecology policy on arsenic for that contaminant, and to improve referencing to basis for Kd values for all other contaminants in response to other comments.	Yes - 2/11/2014
CW-S-4	**Page 2, WAC 173-340-747(5)(b)(iii).** All Kd values from batch tests were not approved by the department. NOTE: this comment overlaps with DH-369.		2		Justification Added	The following justification will be added: Ecology approved the Batch Leach testing with the approval of the D/H SAP DOE/RL-2009-40 Rev 0. Page 2-127 describes the procedure. It was also modified by TPA-CN-368 signed by Ecology on 8/26/2010 to allow for removing the requirement for pH adjustment of demineralized water.	Yes - 2/11/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
CW-S-5	**Page 2 and 3, Explanation.** Provide the Kd value used for each metal listed under the bullet Metals. Provide arsenic Kd value and the hexavalent chromium value in the text.		2		Accept with Modification	It was confirmed with Ecology during the May 29 comment resolution meeting that the purpose of the crosswalk was to provide pointers to where the information could be found in the RI document, and not for the crosswalk to be a complete compendium of parameter values. The references to where this information can be located in the RI will be made as specific as possible (Chapter, Section, Section Header, Paragraph/Table/Figure). All metals will be revised to use CLARC table values in response to other comments on the RI/FS document. Arsenic will be revised based on the forthcoming Ecology policy on arsenic as agreed to with Ecology in the May 29 comment resolution meeting.	Yes - 2/11/2014
CW-S-6	**Page 3, Explanation, Using Method 4(c) default value**. For certain metals (beryllium and vanadium) Table 747-3 does not provide a Kd value. Please specify the source for these default values, if not from Table 747-3.		3		Accept with Modification	It was confirmed with Ecology during the May 29 comment resolution meeting that the purpose of the crosswalk was to provide pointers to where the information could be found in the RI document, and not for the crosswalk to be a complete compendium of parameter values. The information requested was in the referenced document Appendix F, ECF-HANFORD-11-0442 (which will now be replaced by ECF-HANFORD-12-0023). The references to where this information can be located in the RI will be made as specific as possible (Chapter, Section, Section Header, Paragraph/Table/Figure). For contaminants with no Kd value in Table 747-3, site-specific information was used whenever available, and where not available, literature sources are used. Documentation of all the sources of all values will be provided in the above ECF. In addition, a table of Kd values for all COPCs will be added to Chapter 5 in response to comment DH-260. Values are listed in the CLARC tables for the metals beryllium and vanadium, and these are the values used in this RI.	Yes - 2/12/2014
CW-S-7	**Page 3, Explanation, Bullet Inorganic Anions and TPH.** Provide the Kd value next to the constituent.		3		Accept with Modification	It was confirmed with Ecology during the May 29 comment resolution meeting that the purpose of the crosswalk was to provide pointers to where the information could be found in the RI document, and not for the crosswalk to be a complete compendium of parameter values. The information requested was in the referenced document Appendix F, ECF-HANFORD-11-0442 (which will now be replaced by ECF-HANFORD-12-0023). The references to where this information can be located in the RI will be made as specific as possible (Chapter, Section, Section Header, Paragraph/Table/Figure).	Yes - 2/11/2014
CW-S-8	**Page 3, Explanation, Bullet Inorganic Anions and TPH.** Remove the phrase, "and all others are conservative assumption based values." This phrase is subjective and does not provide valuable information; or explain how/why something is 'conservative' and in what specific context this applies.		3		Justification Added	It is noted where conservative assumptions are used; in all cases except TPH the conservative assumption is there is no retardation (zero Kd); there can be no more conservative assumption made for a contaminant with respect to calculation of peak groundwater concentration. In the case of TPH, the Kd assigned was 50, listed as a conservative value; this will re-evaluated and justification included in the crosswalk. TPH declared a "representative" value; conservative basis claimed in DOE/RL-96-17 could not be substantiated. TPH value was revised to present values for TPH ranges based on ECF-100NR2-12-0053.	Yes - 2/11/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
CW-S-9	**Page 3, Explanation, Bullet Inorganic Anions and TPH.** Provide the reference and discussion of the site data for chloride Kd and provide the actual value next to chloride as: Using Method (5)(ii) site data: chloride (X ml/g).		3		Accept with Modification	It was confirmed with Ecology during the May 29 comment resolution meeting that the purpose of the crosswalk was to provide pointers to where the information could be found in the RI document, and not for the crosswalk to be a complete compendium of parameter values. The information requested was in the referenced document Appendix F, ECF-HANFORD-11-0442 (which will now be replaced by ECF-HANFORD-12-0023 Rev. 2). The references to where this information can be located in the RI will be made as specific as possible (Chapter, Section, Section Header, Paragraph/Table/Figure).	Yes - 2/26/2014
CW-S-10	**Page 3, Explanation, Bullet Inorganic Anions and TPH**. Provide how the value of 50 was chosen for TPH.		3		Justification Added	Basis will be provided in the revised crosswalk. TPH declared a "representative" value; conservative basis claimed in DOE/RL-96-17 could not be substantiated. TPH value was revised to present values for TPH ranges based on ECF-100NR2-12-0053.	Yes - 2/11/2014
CW-S-11	**Page 3, Explanation, Bullet Semi-Volatile Organics.** For values obtained from ORNL (2009), explain that they do not exist in the CLARC database and provide the actual value used for each constituent.		3		Accept	This explanation will be added to the revised crosswalk.	Yes - 2/11/2014
CW-S-12	**Page 3, Explanation, Bullet Semi-Volatile Organics.** For values with <u>No Kd value available</u>, explain that they do not exist in the CLARC database and provide the actual value used for each constituent and why this meets WAC 173-340-702(14), (15), and (16).		3		Accept with Modification	Explanation regarding that values do not exist in the CLARC database will be added. It was confirmed with Ecology during the May 29 comment resolution meeting that the purpose of the crosswalk was to provide pointers to where the information could be found in the RI document, and not for the crosswalk to be a complete compendium of parameter values. The information requested was in the referenced document Appendix F, ECF-HANFORD-11-0442 (which will now be replaced by ECF-HANFORD-12-0023). The references to where this information can be located in the RI will be made as specific as possible (Chapter, Section, Section Header, Paragraph/Table/Figure).	Yes - 2/11/2014
CW-S-13	**Page 4, Explanation, Bullet <u>Using Method (5)(iv), scientific literature using WAC Equation 173-340-747</u>.** Provide the equation number used. In addition, provide the reference to the scientific literature used before incorporating it into the equation.		4		Accept	Specific references to equations and scientific literature will be added to the revised crosswalk.	Yes - 2/11/2014
CW-S-14	**Page 4, Explanation, Bullet Radionuclides**. Provide the references for both site data and scientific literature. Provide the Kd values for all the constituents listed in the site data and scientific literature.		4		Accept with Modification	It was confirmed with Ecology during the May 29 comment resolution meeting that the purpose of the crosswalk was to provide pointers to where the information could be found in the RI document, and not for the crosswalk to be a complete compendium of parameter values. The information requested was in the referenced document Appendix F, ECF-HANFORD-11-0442 (which will now be replaced by ECF-HANFORD-12-0023). The references to where this information can be located in the RI will be made as specific as possible (Chapter, Section, Section Header, Paragraph/Table/Figure).	Yes - 2/12/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
CW-S-15	**Page 7. WAC 173-340-747(8)(b)(vi), Explanation**. Using the upper 5 m of the aquifer, although allowed by the regulations, does not match site-specific conditions in 100-H where across the horn area and in certain portions of 100-D Area the aquifer thickness is less than 5 m. The thinner aquifer would provide a higher concentration rather than the one obtained. Please address how this will be addressed in these areas.		7		Accept	Consideration of aquifer thicknesses less than 5 meters will be incorporated into the revised crosswalk. Clarification: Ecology has determined that no dilution factor adjustments are needed in the alternative fate and transport modeling for the following reasons: • WAC language allows for dilution factor adjustment, but does not require it. • The soil PRGs for protection of groundwater/surface water for hexavalent chromium is not based on the results of alternative fate and transport modeling, but on the values from the interim cleanup actions (originally based on the "100 times rule"). • The fate and transport modeling results show no migration of vadose zone contaminants to groundwater within 1000 years. With no migration to groundwater, the value of the dilution factor is irrelevant. Include the text above to the 'Crosswalk' in the appropriate section relating to WAC 173-340-747(8)(b)(vi). (from K. Welsch 12/16 email)	Yes - 2/11/2014
CW-S-16	**Page 7. WAC 173-340-747(8)(b)(vi), Justification, 2nd sentence**. Please place a period (.) after concentrations. From "because (1)" onward is subjective and debatable. Upgradient groundwater contamination is present and should be more effectively evaluated.		7		Accept	Changed as recommended. Clarification: Ecology has determined that no dilution factor adjustments are needed in the alternative fate and transport modeling for the following reasons: • WAC language allows for dilution factor adjustment, but does not require it. • The soil PRGs for protection of groundwater/surface water for hexavalent chromium is not based on the results of alternative fate and transport modeling, but on the values from the interim cleanup actions (originally based on the "100 times rule"). • The fate and transport modeling results show no migration of vadose zone contaminants to groundwater within 1000 years. With no migration to groundwater, the value of the dilution factor is irrelevant. (K.Welsch email 12-16-13)	Yes - 2/11/2014
CW-S-17	**Page 10, <u>Documented,</u> Limitations and uncertainty associated with recharge scenarios and rates.** As previously commented upon, limitations are not adequately discussed in Section 5.9.4 of the RI/FS.		10		No change	This is addressed in the comments in Chapter 5, no change to the crosswalk is necessary.	Yes - 7/10/2013
CW-S-18	**Page 10, WAC 173-340-702(14)(b)**. In places default values were not used, therefore a "Yes" response is most appropriate.		10		Accept	Response will be changed to "Yes" and information added to identify where non-default values were used.	Yes - 2/11/2014
CW-S-19	**Page 11. WAC 173-340-702(14)(d), Explanation, Point of Compliance**. <u>The conditional point of compliance requires Ecology's approval</u>. The context presented is not acceptable. Dilution occurs in the first 16 feet of the aquifer and is a misrepresentation for the concentration values of the default point of compliance [soils throughout the site, WAC 173-340-740(6)(a)]. Using a conditional point of compliance is an assumption <u>other than</u> the default value. Provide the burden of proof that this conditional point of compliance is protective of human health and the environment. NOTE: this comment overlaps with DH-368, 369, 272, and 373.		11		Accept with Modification	The term "point of compliance" was misused in discussing alternative fate and transport model application with regard to the use of this term in the WAC. The point of compliance, as used in the WAC, refers to the soil concentration protection level (SSL or PRG) being calculated. The point where calculation of peak groundwater concentration is calculated is used to determine that protection level for soil. Because the WAC allows for groundwater dilution in the calculation, it is clear that the point where the peak groundwater concentration is determined is in the groundwater, and the methodology used selected the most conservative location in groundwater (at the downgradient boundary of the facility, where peak concentration would occur). ECF-Hanford-11-0063, SGW-50776, the crosswalk, and Chapter 5 will all be revised to make use of term "point of compliance" consistent with the WAC usage, and redefine the point of calculation to be where peak groundwater concentration is calculated. Further justification will be added to the crosswalk to explain that the point of calculation is where peak groundwater concentration occurs.	Yes - 2/11/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
CW-S-20	**WAC 173-340-702(15).** Both the Cr+6 batch test and certain recharge rates are based on new scientific information and needs to be address accordingly.		General		Accept with Modification	The development of a 100 Area site-specific conservative estimate of Kd for Cr+6 will be considered to constitute new scientific information. The crosswalk will be revised to reflect this and address accordingly. All recharge rates used in the model were obtained from prior published reports, and accordingly are not be considered to constitute new scientific information.	Yes - 2/11/2014
CW-S-21	**General comment on WAC 173-340-702.** Graded approach is the response for numerous explanations and justifications. This response is unacceptable. Provide the specific information required to fulfill the burden of proof, use of new scientific information (batch test for hexavalent chromium Kd), and the criteria for quality of information. This may include references to specific section(s) for STOMP theory documents and other similar documents (and part of the Administrative Record) to meet this obligation.		General		Accept	Specifics will be included, by reference, in the crosswalk. Use of alternative fate and transport models is one method permitted under WAC 173-240-747 for establishing Method B soil cleanup levels or Method C soil cleanup levels. DOE/RL-2011-50 Rev. 1 documents DOE's demonstration that the software (STOMP) meets the WAC requirements for implementation of alternative fate and transport models and provides the graded approach to be used, while leaving parameterization for specific applications including the 100-D/H RI/FS.	Yes - 2/11/2014
CW-A-1a	1. Regarding Infiltration pages 8-10: Why are Hanford Barrier and Integrated Disposal Facility references listed as documents used to make decisions about infiltration, when the project acknowledged in the Table 8(b)(vii), on page 8 that Site specific "conditions without surface caps or other structures that would control or impede infiltration" were used. Also, the Hanford Barrier studies are not applicable for many reasons including, but not limited to: **a. Hanford Barrier is manicured and maintenanced on an annual basis from the "normal wear and tear" of bugs, bunnies, wind and water erosion, etc.**		General		Accept	The primary reference for infiltration rates is PNNL-14702 Rev. 1. To be comprehensive, we provided the primary source references used to prepare that compendium of results. Inclusion of these secondary source references is unnecessary and these will be removed from the crosswalk. Infiltration studies from the IDF and the Hanford Barrier were reported in PNNL-14702 Rev 1, but these data did not contribute to the estimate of recharge rates used for 100-D/H soils and vegetation covers. Recharge rates for the Hanford Barrier are reported in PNNL-14702 Rev. 1, but these recharge rates were not used in the recharge scenarios simulated (either the native vegetation or irrigation recharge scenarios); no barriers were implied or assumed in the recharge scenarios simulated to calculate SSL or PRG values.	Yes - 2/26/2014
CW-A-1b	1. Regarding Infiltration pages 8-10: Why are Hanford Barrier and Integrated Disposal Facility references listed as documents used to make decisions about infiltration, when the project acknowledged in the Table 8(b)(vii), on page 8 that Site specific "conditions without surface caps or other structures that would control or impede infiltration" were used. Also, the Hanford Barrier studies are not applicable for many reasons including, but not limited to: **b. The Hanford Barrier contains a top layer of pea-gravel admix to armor the top 3 feet of Silt Loam…which has a much, much higher field capacity or water collection rate as compared to sands.**		General		Accept	The primary reference for infiltration rates is PNNL-14702 Rev. 1. To be comprehensive, we provided the primary source references used to prepare that compendium of results. Inclusion of these secondary source references is unnecessary and these will be removed from the crosswalk. Infiltration studies from the IDF and the Hanford Barrier were reported in PNNL-14702 Rev 1, but these data did not contribute to the estimate of recharge rates used for 100-D/H soils and vegetation covers. Recharge rates for the Hanford Barrier are reported in PNNL-14702 Rev. 1, but these recharge rates were not used in the recharge scenarios simulated (either the native vegetation or irrigation recharge scenarios); no barriers were implied or assumed in the recharge scenarios simulated to calculate SSL or PRG values.	Yes - 2/26/2014
CW-A-1c	1. Regarding Infiltration pages 8-10: Why are Hanford Barrier and Integrated Disposal Facility references listed as documents used to make decisions about infiltration, when the project acknowledged in the Table 8(b)(vii), on page 8 that Site specific "conditions without surface caps or other structures that would control or impede infiltration" were used. Also, the Hanford Barrier studies are not applicable for many reasons including, but not limited to: **c. The Hanford Barrier was tested by fire, however, a portion of that area was "re-seeded" after the fire, thus making its results not directly comparable to what would naturally occur for succession of plants at 100-N.**		General		Accept	The primary reference for infiltration rates is PNNL-14702 Rev. 1. To be comprehensive, we provided the primary source references used to prepare that compendium of results. Inclusion of these secondary source references is unnecessary and these will be removed from the crosswalk. Infiltration studies from the IDF and the Hanford Barrier were reported in PNNL-14702 Rev 1, but these data did not contribute to the estimate of recharge rates used for 100-D/H soils and vegetation covers. Recharge rates for the Hanford Barrier are reported in PNNL-14702 Rev. 1, but these recharge rates were not used in the recharge scenarios simulated (either the native vegetation or irrigation recharge scenarios); no barriers were implied or assumed in the recharge scenarios simulated to calculate SSL or PRG values.	Yes - 2/26/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
CW-A-1d	1. Regarding Infiltration pages 8-10: Why are Hanford Barrier and Integrated Disposal Facility references listed as documents used to make decisions about infiltration, when the project acknowledged in the Table 8(b)(vii), on page 8 that Site specific "conditions without surface caps or other structures that would control or impede infiltration" were used. Also, the Hanford Barrier studies are not applicable for many reasons including, but not limited to: **d. Plant succession by wild fire is drastically different than plant succession by excavation and reseeding mechanisms.**		General		Accept	The primary reference for infiltration rates is PNNL-14702 Rev. 1. To be comprehensive, we provided the primary source references used to prepare that compendium of results. Inclusion of these secondary source references is unnecessary and these will be removed from the crosswalk. Infiltration studies from the IDF and the Hanford Barrier were reported in PNNL-14702 Rev 1, but these data did not contribute to the estimate of recharge rates used for 100-D/H soils and vegetation covers. Recharge rates for the Hanford Barrier are reported in PNNL-14702 Rev. 1, but these recharge rates were not used in the recharge scenarios simulated (either the native vegetation or irrigation recharge scenarios); no barriers were implied or assumed in the recharge scenarios simulated to calculate SSL or PRG values.	Yes - 2/26/2014
CW-A-1e	1. Regarding Infiltration pages 8-10: Why are Hanford Barrier and Integrated Disposal Facility references listed as documents used to make decisions about infiltration, when the project acknowledged in the Table 8(b)(vii), on page 8 that Site specific "conditions without surface caps or other structures that would control or impede infiltration" were used. Also, the Hanford Barrier studies are not applicable for many reasons including, but not limited to: **e. Also, I have not reviewed the vegetation plan for the 100-D/H area and compared it the vegetation plan developed for the Hanford Barrier. Different plants, plan populations, etc. mean different rates and mechanisms to control infiltration via uptake of moisture and transpiration.**		General		Accept	The primary reference for infiltration rates is PNNL-14702 Rev. 1. To be comprehensive, we provided the primary source references used to prepare that compendium of results. Inclusion of these secondary source references is unnecessary and these will be removed from the crosswalk. Infiltration studies from the IDF and the Hanford Barrier were reported in PNNL-14702 Rev 1, but these data did not contribute to the estimate of recharge rates used for 100-D/H soils and vegetation covers. Recharge rates for the Hanford Barrier are reported in PNNL-14702 Rev. 1, but these recharge rates were not used in the recharge scenarios simulated (either the native vegetation or irrigation recharge scenarios); no barriers were implied or assumed in the recharge scenarios simulated to calculate SSL or PRG values.	Yes - 2/26/2014
CW-A-2	The plants in the 200 Areas differ from those in the 100-D/H Area. Many studies exist that document this fact. We are surprised that these studies were not used. Much of this work was done under the ERC contract 10-15 years ago by Dr. Pam Doctor, Ken Gano, and Jenifer Linville.		General		No change	Recharge rates appropriate to these sites based on disturbed site conditions are being adopted in response to other comments. DOE does not plan to leave these sites in disturbed conditions. Revegetation is occurring in accordance with the Hanford Biological Resources Management Plan. Revegetation is considered in the remedial design for the waste sites and is included in the cost estimates of the remedial action.	Yes - 7/10/2013
CW-A-3	What is meant by the catch phrase "follows the graded approach" used for explanations and justifications through-out the cross-walk. This catch phrase does not provide a basic understanding of what assumptions, decisions, or technical basis that were used for modeling, COPC screening, development of PRGs, etc. The layman should (with limited knowledge) be able to read how the model has formulated this information and understand how these values were derived. However, based on DOE responses in the crosswalk this cannot be done. Page 11 of the crosswalk does a good job explaining how the graded approach is applied in general, but the other portions/topics discussed referencing application of the graded approach do not. Actual explanation, justification, and technical reasoning behind equations for modeling are needed.		General		Accept with Modification	All mention of following the graded approach will be removed from the crosswalk. Instead, DOE-RL-2011-50 will be referenced strictly as providing the regulatory basis for using STOMP as a computational code to implement the numerical model for calculation of SSL and PRG values, while referencing the application-specific model construction and parameterization that is presented in this RI/FS (Chapter 5) and supporting documents (Appendix F; ECF-Hanford-11-0063 and Appendix F; SGW-50779).	Yes - 2/26/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
CW-A-4	All of the uncertainty discussion is severely lacking! Has this modeling effort been compared to the that done for the DOE/EIS-0391? Was the 100-D.H RI/FS uncertainty analysis within the ballpark of those results or drastically different from the EIS? Has this modeling effort been compared to that performed for the 100 K and 300 Area efforts? What improvements or changes were made? If so, Why? What are the specific assumptions employed by the model used for 100-D/H RI/FS that ensure the proposed results err on behalf of human health and the environment? There has to be more than the 3 provided on page 14 of the crosswalk…especially for the more sensitive parameters involved in the modeling effort. The uncertainty of the model and where it could "fall short" was not adequately addressed in this crosswalk or in the 100-D/H RI/FS.		General		Justification Added	The modeling effort has not been directly compared to the EIS work because model transition from the EIS team to DOE-RL is still in progress. The purpose of the modeling for River Corridor sites in the EIS was to provide a cumulative estimate to add to the various alternatives analysis; as such, the EIS models lack sufficient resolution for use in detailed site-scale evaluation. It was not the objective of the EIS models to provide an evaluation of soil protection levels at these sites. We have examined the documented assumptions for the EIS models. The EIS recharge rates are comparable to those used in the analysis for this RI. For example, the EIS used 3.5 mm/yr for recharge site-wide for long-term conditions at sites not protected by an infiltration barrier. In the calculations for this RI/FS, the recharge rates used for the three surface soil types under long-term (shrub steppe) conditions were 1.5, 3.0, and 4.0 mm/yr, with the most conservative result obtained from these rates used to set SSL and PRG values. The EIS modeling did not evaluate irrigation scenarios, as the assessment for this RI does. This information (comparing and contrasting to EIS assumptions) can be added, with context of the differing modeling objectives for these models, to the uncertainty discussion. Sensitivity analyses are documented for sensitive parameters in the model package report (SGW-50776). This modeling effort is directly aligned to 100-K and 300 Area modeling efforts; in fact, the calculation brief (ECF-HANFORD-11-0063 in Appendix F) covers 100-D, 100-H, and 100-K in the same analysis. All of these efforts use the same model set, documented in SGW-50776 (the model package report). Differences in model application specifics are documented in the specific area environmental calculation files (ECFs).	Yes - 7/31/13
SGW-1	Cheatgrass is presented as dominating the understory and grass-dominated communities, provide a cheatgrass recharge rate for the transient period from 2015 to 2045 in the vadose zone model. Based on the reference document used, this recharge rate would be 31.5 mm/yr.			Pg 9, 2nd Para Pg 24, 1st and 2nd Para	Accept	Cheatgrass will be represented in the revised native vegetation recharge scenario as a transitional plant community using the recharge rate 31.5 mm/yr. Identified in Table 4-1.	Yes - 1/28/2014
SGW-2	The sentence "If the thickness of the SZ was greater than 5 m, then the representative thickness of the SZ was used in STOMP simulations" is in disagreement with ECF-Hanford-11-0063 and the presentations presented on conservatism and vadose zone modeling on May 29, 2013. Modify this sentence to read "If the thickness of the SZ was greater than 5 m, then 5 m thickness of the SZ was used in STOMP simulations in accordance with WAC 173-340-747(5)(f)(i) and equation 747-4 for A, aquifer mixing zone."			Pg 15, Last Para	Accept	The first sentence is in error, and will be modified as suggested.	Yes - 1/28/2014
SGW-3	This figure supports using a cheatgrass recharge rate of 31.5 mm/yr. for the period of time of 2015 to 2045.			Pg 25 Fig 3-6	Not Accepted	This figure primarily shows the disturbed condition for the areas of waste sites considered in the D/H areas; because these will be subject to revegetation, inferences from this figure regarding cheatgrass are not appropriate. See response to comment SGW-1 with regard to inclusion of cheatgrass in the native vegetation recharge scenario.	Yes - 1/28/2014
SGW-4	What does each of the colors on these figures represent? Some of them are red, dark blue, yellow and light blue. A legend is needed for the colors.			Pg 36, Fig 3-11 Pg 39, Fig 3-12 Pg 42, Fig 3-13 Pg 44, Fig 3-14 Pg 46, Fig 3-15	Accept	Color legends will be added to these figures.	Yes - 1/28/2014
SGW-5	Provide the definition of contaminants of interest before moving into the geographic area-specific distribution of contaminants discussion for each OU.			Pg 48, Sec 3.3.1, 1st para	Accept	The term "contaminants of interest" will be defined to show that it is used to anticipate the most likely contaminants of potential concern that were considered to aid in the development of this model, but that this model package report does not define contaminants of potential concern since this is properly done in the Remedial Investigation Report.	Yes - 1/28/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
SGW-6	The contaminants listed under these two OUs indicate that these are the CoCs. However these are not the CoCs represented in the RI/FS. I recommend that a sentence be included to clarify what "other contaminants that are potential risks to human health and ecological receptors mean.			Pg 49, 100-K and 100-D,H	Accept with Modification	COCs are not designated in this model package report; this would be inappropriate as that function properly belongs to the Remedial Investigation Report. However, to develop a model to support the RI, it was necessary to consider likely contaminants that would be evaluated in the RI; the term "contaminants of interest" is used to identify those contaminants we anticipated would be simulated for the purpose of assisting in development of the model. A sentence will be added to clarify.	Yes - 1/28/2014
SGW-7	The listed contaminants, other than Cr(VI), all have Kds of greater than 1 and do not migrate downward. Provide a discussion about nitrate, tritium, technetium-99, and other contaminants that have a Kd of less than 1 in this paragraph and their location within the vadose zone.			Pg 50, 1st para for 100-D, H	Accept	Discussion will be added to SGW-50776 to clarify that the high-mobility contaminants are discussed in this section because the modeling is directed towards residual contamination, and those contaminants with high mobility (e.g., Kd < 1) have, in most circumstances, already migrated to groundwater.	Yes - 1/28/2014
SGW-8	If this table needs to be revised to reflect the contaminants being analyzed under the RI/FS reports, then for 100-D Source Exposure Area, strontium-90 needs to be added; for 100-H, nitrate and uranium need to be added; for the horn area, nitrate needs to be added. Delete the 2nd nitrate row. Add a uranium row for 100-H Area. Please define in the text what a contaminant of interest represents in the context of this document.			Pg 52, Table 3-14. Cont. of Interest in 100 Area GW OUs	Accept with Modification	Table 3-14 will be revised to indicate Strontium-90 is a contaminant of interest in 100-D exposure area. Second nitrate row is a typo; this is actually nitrite (corrected per comment SGW-TT-S4).	Yes - 10/2/2013
SGW-9	Strontium-90 is presented in this figure for 100-D, yet is not recognized as a contaminant on interest on Table 3-14. Please add strontium-90 to Table 3-14.			Pg 55, Fig 3-18	Accept	Table 3-14 will be revised to indicate Strontium-90 is a contaminant of interest in 100-D exposure area.	Yes - 1/28/2014
SGW-10	Based on the information presented in this section and acknowledgement of more studies are needed to understand long-term hydrology, geological influences and spatial distribution, a Kd of 0 ml/g or 0.3 ml/g seems more appropriate than 0.8 ml/g based on 10 samples from 4 locations. Explain this represents the residual component.			Pg 64, Sec 3.3.4, Cr(VI) Leachability	Accept with Modification	The 90th percentile exceedance probability value of 0.8 mL/g was selected to provide a conservative estimate given the noted information. That is, 90 percent of the distribution developed from these data had higher sorption values; this represents an adequate conservative basis. Explanation that this represents the residual component of Cr(VI), which is present in the soil column today, and not the more mobile component that has already migrated into the aquifer in most circumstances, will be added to this text.	Yes - 1/28/2014
SGW-11	Change the recharge rates to represent the new comment resolution for of 63 mm/yr for all disturbed soils. In addition a new row for 100-D/H may be needed to show that historic irrigation occurred on these 100-D/H and horn area Source Exposure Areas.			Pg 76, Table 4.1	Accept	As agreed with Ecology, recharge rates for the native vegetation recharge scenario will be revised to use the disturbed soil rates given in PNNL-14702 Rev. 1; this will address this comment as well.	Yes - 1/28/2014
SGW-12	Show disturbed soil recharge rate of 63 mm/yr under base case.			Pg 77, Fig 4-4	Accept	As agreed with Ecology, recharge rates for the native vegetation recharge scenario will be revised to use the disturbed soil rates given in PNNL-14702 Rev. 1; this will address this comment as well.	Yes - 1/28/2014
SGW-13	Missing from 0 to 0.5 or 1.0 ml/g description of how these Kd values were calculated.			Pg 89, Sec 5.1, Num 1	Accept	Description will be added.	Yes - 1/28/2014
SGW-14	Editorial. Missing a reference source for a section call-out.			Pg 90, Sec 5.1, 1st para	Accept	This physical upper bound is developed within this same section (5.1), and text will be revised to correct.	Yes - 1/28/2014
SGW-15	Please explain why DOE/RL-2009-41, Rev. 0, *Sampling and Analysis Plan for the 100-K Decision Unit Remedial Investigation/Feasibility Study* and DOE/RL-2009-40, Rev. 0 *Sampling and Analysis Plan for the 100-K Decision Unit Remedial Investigation/Feasibility Study* was the document chosen for EQLs. These two documents have the same title.			Pg 94, Sec 5.2, last sentence	Accept	EQLs are provided by laboratory measurement, and the SAPs are the only published source available. The title of the second document requires correction: it should be "Sampling and Analysis Plan for the 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 Operable Units Remedial Investigation Feasibility Study."	Yes - 1/28/2014
SGW-16	Change title of DOE/RL-2009-40 to *Sampling and Analysis Plan for the 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 Decision Unit Remedial Investigation/Feasibility Study.*			Pg 94, Sec 5.2, last sentence	Accept	The title of DOE/RL-2009-40 is incorrect, and will be revised to "Sampling and Analysis Plan for the 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 Operable Units Remedial Investigation Feasibility Study".	Yes - 1/28/2014
SGW-17	Update this table to represent 100-BC, 100-F and 100-IU. In addition, 100-N is not represented. Provide 100-N information.			Pg 97, Table 5-2	No change	100-N information is scheduled to be included in a future revision of this document.	10/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
SGW-18	Based on Table 5-3, Burbank Loam is a lower SSL and PRG values than Rupert Sand. Explain this difference in the text on Page 96.			Pg 96, Sec 5.2 and Table 5-3	No change	This is a function of the differing recharges rates between the bare soil and the immature shrub steppe rates for these two soils as well as the relative mobility of the contaminants involved.	Yes - 10/2/2013
SGW-19	It is impossible to understand what is stated. Please state, "Kd values higher than 25 ml/g result in non-representative (NR) values (**i.e., do not reach groundwater**) based on simulations within 1,000 years for 100:0 initial distribution." Bolded to note change only.			Pgs 98 and 99, Sec 5.3, 3rd para (p. 98)	Accept with Modification	Will change to indicate that "Kd values higher than 25 mL/g result in non-representative (NR) values (i.e., do not breakthrough to groundwater at numerically significant levels) based on simulations within 1,000 years for 100:0 initial distribution." Note: this comment pertains to a section that is being removed because it is duplicative of content in ECF-Hanford-11-0063, and properly belongs only in this ECF for D/H. This comment was applied to the same text as it appears in the ECF.	Yes - 1/28/2014
SGW-20	If the peak groundwater concentration is less than the MCL does not represent the most stringent standard for comparisons. Use the most stringent regulatory standard for comparison. In some cases, the MCL will be the most stringent, but not always.			Pg 99, Sec 5.3, 2nd full para, 2nd bullet	Accept	The term MCL will be changed to "protectiveness criterion (applicable groundwater or surface water protection standard)" Note; this comment pertains to a section that is being removed because is is duplicative of content in ECF-Hanfrod-11-0063, and properly belongs only in this ECF for D/H. This comment was applied in the same text as it appears in the ECF.	Yes - 1/28/2014
SGW-21	Explain why two 100-D (Ringold) are present on the figure. Explain what the differences are between set 1 and set 2 of the 100-K (Hanford).			Pg 104, Fig 5-7	Accept	Explanation will be added for these aspects of Figure 5.7; one of the legend entries requires correction (typo) and the set-1 and set-2 refer to different conductivity values in the Hanford (legend will be revised to reflect).	Yes - 1/28/2014
SGW-22	100-N has been left out of discussion.			Pg 104, Sec 5.5, last sentence	No change	100-N information is scheduled to be included in a future revision of this document.	Yes - 10/2/2013
SGW-23	On the 2nd line change "were to "where" to read, "result for analytes where breakthrough…".			Pg 105, Table 5-6, note. Editorial	Accept	Requested modification will be made.	Yes - 10/2/2013
SGW-24	Explain where in the code that allows for the aquifer to only be 5 m thick to meet WAC 173-340-747(5)(f).			Pg B-6, Appx B	Accept	This is not implemented in the code itself; rather, the user input that specifies the gridding is used to constrain the aquifer to an effective 5-meter thickness. In this annotated STOMP input example (Appx B), the aquifer is comprised of 29 nodes with rock/soil type "RS" (declared in the ~Rock/Soil Zonation Card). The dimension of these 29 nodes (declared in the ~Grid Card) is a uniform 0.25 meters apiece); thus, 0.25 x 29 = 7.25 m; however, this is the full aquifer, not the portion used for extracting results for the SSL/PRG determination. For that, note the ~Surface Flux Card for the post-2010 model (see Page B-20), where output is specified to be extracted from nodes 10 through 29 inclusive (20 nodes x 0.25 m = 5.0 m) on the east face of the model; this represents the upper 5.0 meters of the aquifer. The flux rate across these node faces is used for the determination of the SSL/PRG values in this example. Additional notations will be added to the annotated STOMP input files in Appendix B to explain.	Yes - 1/28/2014
SGW-25	PNNL-12030, p. 2.4, indicates that there is an optional dynamic domain feature for setting inactive nodes. This document (SGW-50776) should state whether or not this feature was used. PNNL-12030, p. 2.4 also indicates that there are 2 operational modes, one assuming a continuously wet surface and the other assuming that the surface is wetted in proportion to aqueous saturation. This document (SGW-50776) should discuss which was chosen and why.			General	Accept	Inactive nodes were not used in this model implementation. This feature is most commonly applied in multi-dimensional models to represent non-uniform surfaces (e.g., land surface) or relatively impermeable regions (e.g., basalt). A sentence will be added to Section 4.3 to indicate that the inactive node feature was not used in this model. The optional dynamic domain feature was not utilized because the 1-D model is not computationally demanding so no advantage was offered by activating this feature. A statement will be added to Section 4.1 to note this.	Yes - 1/28/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
SGW-26	The document describes two approaches for simulating water balance. The first is to incorporate the parameters that control water balance into the numerical model, while the other would be to use an effective net recharge value based on Hanford references. The first approach is used by common vadose zone modeling software, such as SESOIL, which directly incorporates local meteorological data into the model. The second approach requires a variety of assumptions about water balance, and was the approach used for the river corridor modeling. A comparison of the two approaches would indicate whether or not the assumptions about recharge are conservative, and is strongly encouraged. Note: Later in the document (p. 77, Eqn. 4-9) a water balance equation from RESRAD is discussed. It is not clear why it was necessary to use a RESRAD water balance equation for this modeling.			Pg 29, Sec 3.2.2, last para of sec.	No change	Recharge rates are taken from a compendium of recharge measurements and simulation results (PNNL-14702 Rev. 1). Simulations of recharge (deep drainage) have been performed for a variety of Hanford Site surface soil and vegetation cover conditions used the UNSAT-H model (PNNL-13249) which directly simulates land-surface energy exchange using daily and hourly meteorological data as well as surface soil hydraulic parameters. This code is more mechanistic than SESOIL, which relies on many default data sets rather than site-specific information. UNSAT-H results provide the basis for site-wide recharge rates used to define recharge boundaries for groundwater models, and are consistent with the recharge rates used in this analysis. The water balance equation is used in the derivation of the additional recharge rate attributable to irrigation, as necessary to develop total irrigation recharge rates consistent with WDOH guidance. It is not used beyond the purpose of developing the irrigation "adder" rate.	Yes - 4/21/2014
SGW-27	It is not clear how STOMP-W was used as a 1-D model, when it is designed to accommodate 3 dimensions. This document should discuss this. (If Section 4.4.1 is intended to describe this it is not clear).			Pgs 65-88, Sec 4, General	Accept	Section 4.4.1 will be revised to clarify how no-flow boundaries are assigned in the north-south direction, rendering the three-dimensional grid into an effective 1-D vertical node column.	Yes - 1/28/2014
SGW-28	The document refers to this equation as the Advection-Dispersion equation. However, PNNL-12030 refers to it as the Solute Mass Conservation Equation. Include text that indicates how these equation names are related.			Pg 66, Sec 4.1.1, Eq 4-3	Accept	These terms are used interchangeably, and the equivalence will be explicitly stated in Section 4.1.1 where these equations are introduced.	Yes - 1/28/2014
SGW-29	The figure gives boundary conditions for flow and solute transport conditions. Please discuss the purpose of these boundaries. Also give the size of the 'aquifer grid blocks' mentioned just prior to the figure.			Pg 74, Sec 4.4.1, Fig 4-3	Accept	The discussion in Section 4.1.1 will be expanded to explicitly state the purpose of the boundary assignments. The revision will clarify the relationship to grid blocks (or nodes) to the figure. Figure 4-3 will be revised and updated for additional clarity.	Yes - 1/28/2014
SGW-TT-G1	Overall, the modeling approach is reasonably conservative. SSLs and PRGs presented in Attachments A and B of the ECF-Hanford-11-0063, STOMP 1-D modeling report appear to be reasonable and protective of groundwater (except for instances where aquifer thickness is considerably less than 5 meters (see Specific Comment 11 for details).				No change	Thank you. See response to Comment SGW-TT-S11 concerning aquifer thickness issue.	Yes - 10/2/2013
SGW-TT-G2	The SGW-50776 modeling package report is 209 pages long and the ECF-Hanford-11-0063, STOMP 1-D modeling report is 110 pages long. Although in tandem, both reports provide a wealth of information on the modeling, assumptions used, and results obtained, the text and examples chosen to demonstrate overall conservatism of the modeling effort could be improved and enhanced. For example, the SGW-50776 modeling package report mentions several times that "*The median hydraulic gradient value for each source area may be too small for waste sites near the Columbia River and may be several times too large for waste sites that are far inland from the river.* " However, no examples are provided to qualify the effects of minimum and maximum gradient values on modeling outcomes (see also Specific Comment 14).				Accept with Modification	Discussion will be augmented to address the range of hydraulic gradients in these areas, as well as the temporal variability (both aquifer thickness and hydraulic gradient change throughout the year primarily as a function of river stage, in ways that are typically offset to some degree; higher gradients coincide in time with reduced aquifer thickness). This model couples a maximum annual aquifer thickness (the result of deliberately choosing the high water times to chart the stratigraphic columns and conservatively minimize the vadose zone thickness) with median gradients (to be representative of annual conditions). It will be noted that consideration of minimum or maximum gradient alone, without also addressing the changing aquifer thickness, would not quantify the effects sufficiently.	Yes - 1/28/2014
SGW-TT-G3	The Subsurface Transport Over Multiple Phases (STOMP) simulator software was developed at Pacific Northwest National Laboratory in the early 1990s and has been subject to extensive use and improvement since that time. The fundamental purpose of the STOMP simulator software is to produce numerical predictions of thermal and hydrogeologic flow and transport phenomena in variably saturated subsurface environments, which are contaminated with volatile or non-volatile organic compounds. Auxiliary applications include numerical predictions of solute transport processes including reactive transport (*PNNL-12030: Theory Guide, March 2000*). The STOMP software does not appear capable of simulating geochemical reactions. Therefore, for example, to simulate hexavalent chromium (Cr [VI]) fate and transport, evaluation of STOMP outputs with other codes capable of geochemical reaction modeling may be necessary.				No change	Among the improvements to the STOMP code since the issue of PNNL-12030 is the introduction of the STOMP-W-R (reactive transport) operational mode. This was applied, for example, in the evaluation of uranium transport in the 300 Area RI/FS. Thus, other codes capable of geochemical reaction modeling may be applied as suggested in this comment, but there is also a direct STOMP simulation option as well. STOMP-W-R was not needed, and hence was not used, for D/H area modeling.	Yes - 10/2/2013

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
SGW-TT-G4	Based on the example of input files presented in the SGW-50776 modeling package report, some values used for the STOMP-1D input parameters do not appear to match those cited in the text (see Specific Comment 9 for details).				Accept	The annotated STOMP input file in Appendix B will be replaced with contents from an updated STOMP input file prepared to implement resolution of comments DH-243, DH-247, DH-248, DH-251, DH-277, DH-372, and DH-375b. Using an example from the latest QA/QC checked files for the annotated STOMP example input file in Appendix B will provide for the parameter consistency noted in this comment.	Yes - 10/2/2013
SGW-TT-G5	Uncertainty associated with some input parameters of the model requires additional evaluation (see Specific Comment 11).				Accept	See response to Comment SGW-TT-S11.	Yes - 10/2/2013
SGW-TT-G6	Statements in the documents appear to match code inputs/outputs except where indicated (see Specific Comment 9 for details). The input files provided for stratigraphic column 3 of 100-D indicate that correct thicknesses of vadose zone layers were used in the model, and equations to be run in the model were specified as appropriate.				Accept	Thank you.	Yes - 10/2/2013
SGW-TT-S1	**The SGW-50776 modeling package report, Section 2:** The text states that the "*groundwater is not expected to remain contaminated above cleanup levels (or discharge to the Columbia River above ambient water quality standards) any longer because former waste sites are closed with the screening values or PRGs calculated using this methodology* ." This statement requires either further support or rewording. Chemicals remaining in the vadose zone may continue leaching for decades-that is, the vadose zone will act as a continuing source of groundwater contamination.				Accept with Modification	The sentence in question will be struck out, as it is not an accurate restatement of the preceding sentences and is not necessary.	Yes - 1/28/2014
SGW-TT-S2	**The SGW-50776 modeling package report, Tables 3-4 and 3-6:** Considering that hydraulic conductivity of Hanford formation exceeds that of Ringold E formation by orders of magnitude, the selected representations of the saturated zone (SZ) do not appear conservative for Area 100-K, column 1 and for Area 100-BC, column 3. SZ composition of 10% Hanford and 90% Ringold E will be more conservative than 100% Ringold E for Area 100-K, column 1. SZ composition of 5% Hanford and 95% Ringold E will be more conservative than 100% Ringold E for Area 1 00-BC, column 3.				No change	The purpose of the stratigraphic columns is to present a range of representative (not conservative) soil profiles; the conservatism is introduced by simulating this range of representative columns and selecting the highest impact (peak groundwater concentration) from among the range of results. The basis for these representative columns is actual stratigraphies from this area.	Yes - 10/2/2013
SGW-TT-S3	**The SGW-50776 modeling package report, Section 3.2.1:** The text states that *"during 1995, the wettest year on record, 31.3 cm (12.3 in.) of precipitation was measured.* " It is not clear how this wettest year on record relates to 2008, which was chosen to represent the annually occurring highest water table (see Specific comment 10). Please provide additional evaluation and comparison of 2008 precipitation conditions to 1995 and other wet years on record (to support conservative thickness of the vadose zone defined by the 2008 water table). Moreover, the text mentions that snowfall accounts for nearly 40% of annual precipitation. Clarification thus seems necessary as to whether snowmelt can result in greater recharge rate than currently assumed under the native vegetation recharge scenario.				Accept	Information will be added to clarify: specifically the context that precipitation for 2008 was 14.0 cm (5.49 in.). Clarification that recharge rates are based on measurements at the Hanford Site that inherently include the impacts of snowfall on recharge will be added.	Yes - 1/28/2014
SGW-TT-S4	**The SGW-50776 modeling package report, Section 3.3.1:** Nitrate is mentioned for Area 100-BC, but is not included in Table 3-14. Manganese (Mn) is mentioned as a contaminant of interest for the 1 00-F Area. Presence of Mn in vadose soils and aquifer materials may favor Cr(VI) mobility or oxidation of trivalent chromium (Cr[III]) to Cr(VI). Some discussion in the text of potential conversion of Cr [III]) to Cr(VI) in presence of Mn (manganese dioxide, in particular) will be helpful.				Accept with Modification	Nitrate is mentioned in Table 3-14, with check mark indicating an contaminant of interest in 100-D Source Exposure Area. However, it "Nitrate" was listed twice in Table 3-14 through a typographical error (second instance should be "Nitrite") - this will be corrected. Manganese will be added to the list and checked as a contaminant of interest in 100-FR-3. Consideration will be given to adding discussion of Mn in vadose zone soils and aquifer materials.	Yes - 1/28/2014
SGW-TT-S5	**The SGW-50776 modeling package report, Section 3.3.4:** The units for Cr(VI) cited at the end of second paragraph on page 61 should be micrograms per liter, not milligrams per liter as stated.				Accept	Checking the source document (PNNL-17674), this is correct; SGW-50776 will be revised to correct these units.	Yes - 1/28/2014
SGW-TT-S6	**The SGW-50776 modeling package report, Section 4.4.1:** Provide justification for using only linear equilibrium sorption isotherm to describe sorption behavior of chemicals of interest.				Justification Added	The requested justification will be added to Section 3.2.5, *Modeling Assumptions.*	Yes - 1/28/2014
SGW-TT-S7	**The SGW-50776 modeling package report, Section 4.3.2:** The 1,000-year-long second stage simulation does not take into account potential climate changes (for example, within next 50 years, site conditions may become relatively more wet).				Not Accepted	Accounting for climate change in this calculation is speculative and not required under the WAC.	Yes - 10/2/2013
SGW-TT-S8	**The SGW-50776 modeling package report, Section 5.2, Figure 5-3:** The text states that *"Observation of the breakthrough curves in Figure 5-3 reveals that for the distribution coefficients <2 mL/g the peak concentration occurs within 1000 years* ." It is not clear whether this statement relates to the early peaks on the graphs for Kd = 0.9 and Kd = 1.0 mL/g.				Accept	This statement speaks to the peak concentration; revision to this text will be made to clarify that in the cases of K_d = 0.9 and K_d = 1.0, the peak occurs before 1000 years in Figure 5-3 (what the commenter terms the "early peaks") - these early peaks are the peak concentration and are higher than the values that occur thereafter (post 1000 years); whereas for the higher K_d cases, the "early peaks" are lower than the values that occur after 1000 years.	Yes - 1/28/2014

Tracking ID	Ecology Comment	Ecology Modification Needed	Chpt	Pg/Line	DOE-RL Disposition	DOE-RL Response to Comment	Ecology Concurrence
SGW-TT-S9	**The SGW-50776 modeling package report, Appendix B:** Several values of STOMP-1D input parameters provided for stratigraphic column 3 of 1 00-D are inconsistent with values cited in the report (Table 4-5) (symbols used below are: HF=Hanford unit [unsaturated]; RU =Ringold E unit [unsaturated]). a. Mechanical Properties Card: Particle density is 2.68 g/cm^3 (a value of2.65 g/cm^3 or 2650 kg/m^3 is discussed in the report [page 90] for both soil and contaminant; for many contaminants, particle density likely would be smaller than that of a quartz grain). b. Hydraulic Properties Card: Saturated hydraulic conductivities (Kh and Kv) for HF and RU differ from those cited in Table 4-5 of the SGW-50776 report or Table 9 of the ECF-Hanford-11-0063 report (2 times smaller for HF and >20 times greater for RU). c. Saturation Function Card: For HF and RU, the values of van Genuchten parameters *a* and **n**, and residual saturation are for the saturated zone instead of the vadose zone (per Table 4-5).				Accept	a. The presentation of the calculation of the maximum PRG for non-radionuclides on page 90 that uses an assumed particle density of 2650 kg/m^3 will be revised to use the same particle density applied in the calculations (2680 kg/m^3); this will change the maximum PRG value slightly, from 3.84×10^5 mg to 3.88×10^5 mg, but will make the use of particle density values consistent. b. and c. The annotated STOMP input file in Appendix B will be replaced with contents from an updated STOMP input file prepared to implement resolution of comments DH-243, DH-247, DH-248, DH-251, DH-277, DH-372, and DH-375b. Using an example from the latest QA/QC checked files for the annotated STOMP example input file in Appendix B will provide for the parameter consistency noted in this comment.	Yes - 1/28/2014
SGW-TT-S10	**The ECF-Hanford-11-0063, STOMP 1-D modeling report, Section 2.2:** The text states that "*Using the June 2008 water table elevation to represent the annually occurring highest water table, conservative (smaller) thickness of the vadose zone was computed for each well and borehole.* .." More information is required to support this statement-provide additional support for using 2008 data as representative of wettest year conditions based on comparison to long-term precipitation data.				Accept with Modification	The text in question is not asserting that the June 2008 water table is the highest of any year; it is only asserting that the June 2008 is selected as representative (not bounding) of high water within the annual cycle. This sentence will be rephrased to clarify this point and remove any suggestion that June 2008 is the highest of all years of data.	Yes - 1/28/2014
SGW-TT-S11	**The ECF-Hanford-11-0063, STOMP 1-D modeling report, Section 3.1 and Section 3.7:** The text states that *"If the thickness of the <saturated zone> SZ was larger than 5 m, thickness of SZ was considered as 5 m in the model, because the thickness above 5 m does not influence the peak concentration in the top 5 m of the aquifer. This was tested by running a simulation with full aquifer thickness and 5 m aquifer thickness (not presented here). If the thickness of SZ was less than 5 m, then the thickness of SZ was assumed to be 5 m so that a 5-m-long monitoring well screen could be simulated..."* No evaluation is provided to justify use of 5-m-thick aquifer for cases of SZ thickness less than 5 m. Predicted peak concentrations are expected to be larger in such cases (especially if actual aquifer thickness is only 1 or 2 meters, as some well logs listed in Tables I and 2 indicate), which would result in lower SSLs and PRGs. In Section 3.7, the text states that "*The assumption of a five-meter-thick aquifer may or may not be conservative for those 100 Area locations with aquifer thicknesses less than five meters.* " The influence of aquifer thickness less than 5 meters on predicted peak concentration should be evaluated to minimize the uncertainty, for example, treating the cases with less than 2 meters aquifer thickness as requiring a more detailed evaluation.				Accept	Discussion will be added to SGW-50776 regarding the relationship between aquifer thicknesses (variable during the year) and hydraulic gradient (variable during the year) in 100-H and the net impact of these two variables, which must be evaluated together when considering aquifer dilution rates. (Related response: Comment SGW-TT-G2)	Yes - 1/28/2014
SGW-TT-S12	**The ECF-Hanford-11-0063, STOMP 1-D modeling report, Figure 5**: Graphs illustrating observed contaminant distribution in the vadose zone could benefit from reversing the depth axis.				No change	Figure 5 does not have a depth axis; it plots K_d against the inverse of the peak groundwater concentration (1/CPK). If the comment refers to Figure 7 (Vertical Profile from RI Well) which shows observed contaminant distributions, the depth is already plotted vertically downward, per convention.	Yes - 10/2/2013
SGW-TT-S13	**The ECF-Hanford-11-0063, STOMP 1-D modeling report, Table 12 and Figure 5**: Example with neptunium-237 indicates that 70:30 initial concentration distribution can result in later arrival times for contaminants with high Kd as opposed to the scenario with the actual concentration distribution, which would effectively put them beyond the 1000-year cutoff time. Although for actual neptunium-237 distribution in the vadose zone the predicted 1000-year peak concentration is much less than the groundwater standard, this example indicates that 70:30 representation of some high Kd contaminants may turn out to be nonconservative.				No change	The Neptunium-237 result for the 70:30 initial concentration (bounding assumption) is non-conservative with respect to peak groundwater concentration for time periods longer than 1000 years in this example. However, the conservatism test being presented here is for the timeframe for calculation of SSL and PRG values, which is to 1000 years based on agreement with regulators. The results show that the 70:30 initial concentration model is conservative in this timeframe. The predicted peak concentration for the 1000-year timeframe is also much less than the groundwater protection standard.	Yes - 10/2/2013
SGW-TT-S14	**Editorial comment**: The ECF-Hanford-11-0063, STOMP 1-D modeling report appears to be in better shape than the SGW-50776 modeling package report, which could benefit from tightening/streamlining the text and an editorial review. For example, the SGW-50776 modeling package report contains some repetitive pieces of text on some of the conservative modeling assumptions that appear in various sections of the report verbatim.				Accept	The model package report (SGW-50776) is a work in progress, meant to address application of this model to all of the 100 and 300 Areas (River Corridor), and hence is still subject to continued improvement and additions. This comment will be taken into consideration in upcoming revisions.	Yes - 10/2/2013

CH2MHILL
Plateau Remediation Company

Project	(CHPRC-00784: Tier 1 Risk-Based Concentrations Protective of Ecological Receptors at the Hanford Site)
Reviewer	Washington State Department of Ecology

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
Comments on Appendix H, 100-K RI/FS Report					
146	Appendix H, ECF-100KR-11-0010, p H-337, para 6.	CHPRC-00874 does not propose Tier 1 values for plants and invertebrates (although it lists generic screening levels for plants and invertebrates). Provide ECF-Hanford-11-0060.			As discussed in CHPRC-00784, that document discusses the uncertainties associated with developing Tier 1 values for plants and soil invertebrates, and did not attempt to recommend literature-based Tier 1 values. CHPRC-00784 also states that other lines of evidence, particularly site-specific information should be identified for developing soil values for plants and soil invertebrates. The reference to ECF-Hanford-11-0060 will be replaced with a reference to CHPRC-00784. That ECF, which contains the same information as CHPRC-00784, had been prepared for use in RI/FS documents prior to the publication of CHPRC-00784. CHPRC-00784 supersedes ECF-Hanford-11-0060.
147	Appendix H, ECF-100KR-0010, p H-338, para. 1.	Consider using the NOAEL-based Tier 1 wildlife values in CHPRC-00784 (rather than LOAEL-based values) as SSLs. Consider using NOAEL-based Tier 1 wildlife values.			The wildlife PRG values in the 100-K RI/FS, which are derived with TRVs based on LOAELs, are presented with the understanding that the concept of the LOAELs and NOAELs have limitations for characterizing biologically relevant thresholds. These uncertainties with NOAELs and LOAELs

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
					and suggestions for alternative methods in toxicological assessment have been published for close to twenty years (e.g., Hoelkstra and Ewijk,1993[1]; Laskowski, 1995[2]; Chapman, Caldwell and Chapman, 1996[3]). It is also understood there are emerging calls for change in the technical approaches for the toxicological assessment of ecological risks (Landis and Chapman, 2011[4], Allard et al, 2010) [5]. However, the use of NOAELs/LOAELs in assessing ecological risks reflects the currently accepted regulatory practice. The use of the LOAELs for wildlife PRGs in the RI/FS reflects the assessment endpoints for protection of communities and populations as proposed in CHPRC-00784. As discussed below in the response to Comment 37, these assessment endpoints are consistent with agency guidance, and reflect the application of threshold levels to populations as described in the literature (Allard et al., 2010). Additional text will be presented in CHPRC-00784 which will discuss the limitations in using NOAELs/LOAELs for TRVs and will introduce the emerging concepts in toxicological assessment for developing screening levels

[1] Hoekstra JA, Van Ewijk PH. 1993. *Alternatives for the no-observed-effect level*. Environ Toxicol Chem 12:187–194.

[2] Laskowski R. 1995. *Some good reasons to ban the use of the NOEC, LOEC and related concepts in ecotoxicology*. Oikos 73:140–144.

[3] Chapman PM, Caldwell RS, Chapman PF. 1996. *A warning: NOECs are inappropriate for regulatory use*. Environ Toxicol Chem 15:77–79.

[4] Landis, W. and P. Chapman, *Well Past Time to Stop using NOELs and LOELs*, Integrated Environmental Assessment and Management, 7(4):6-8.

[5] Allard, P. et al. 2010. Recommendations for the development and application of wildlife toxicity reference values. *Integrated Environmental Assessment and Management*. 6(1): 28-37.

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
Comments on CHPRC-00784					
37	p. 1-3, para 2	*In contrast to the text, EPA's "RAGS "recommends the more conservative NOAELs, instead of LOAELs, are used to determine a screening exposure level that is unlikely to adversely impact populations" (p. 1-9 to 1-12 in EPAI54O-R-97-006). EPA's SLERAP for Hazardous Waste Combustion Facilities also advocates NOAELs over LOAELs for TRV identification (p. 5-26 to 5-27 in EPA 530-D-99-001A). In addition, EPA's Guidance for Developing EcoSSLs for wildlife preferentially use NOAELs when available (p. 4-16 in OSWER Directive 9285.7-5 5). Finally, Ecology prefers NOAELs for substitute receptor species (WAC 173-340-7493 [7] [f][i]), as proposed in this report for the Hanford Site. Suter (1996. HERA 2:331-347) has noted, "Even at NOELs, effects commonly occur that would be considered severe by most observers." The magnitude of the biological effect that NOECs typically cause is 10-30% (Wame and van Damn. 2008. Autstral J Ecotoxicol 14:1-5). NOEC and LOEC values are controlled by the concentrations of the test chemical used in the treatments, variability in the*			For purposes of developing PRGs for remedial alternatives analysis, EPA's risk management principles, which recommends making decisions on risk characterization and thresholds protective of populations and communities, are used (*Ecological Risk Assessment and Risk Management Principles for Superfund Sites*, OSWER Directive 9285.7-28P). In addition, Ecology's Terrestrial Ecological Evaluation (TEE) procedure, WAC 173-340-7493(4)(a) was consulted in determining that LOAELs should be considered for developing TRVs used in PRG development. TRVs that are based on the LOAEL are appropriate thresholds that are protective of populations and communities (National Academies, *Superfund and Mining Megasites: Lessons from the Coeur d'Alene River Basin*, 2005; *Preliminary Remediation Goals for Ecological Endpoints*, ES/ER/TM-162/R2). NOAELs would be appropriate for COPEC identification, but LOAELs were considered appropriate for risk characterization and PRG development; note that COPEC identification in the RI/FSs was not based on comparison to screening levels. As discussed in the response to Comment 147 (above), the wildlife PRGs presented in the 100-K RI/FS have been based on TRVs developed using LOAELs. LOAELs/NOAELs have been used for TRV development with regard to their limitations. Also as discussed in the response to Comment 147,

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		data, selected significance level, and sample size.			text will be incorporated into CHPRC-00784 that acknowledges the limitation of the LOAEL/NOAEL approach and acknowledges emerging approaches in toxicological assessment. Ecology has not provided specific written comments suggesting that there is uncertainty in the level of protection provided to substitute species described in CHPRC-00784. Discussion of two of the topics under WAC 173-340-7493 [7] [f]that have been part of ongoing discussion with Ecology , DOE and their contractors, will be added to CHPRC-00784 including: extrapolating from toxicity studies with laboratory species to field conditions and but has suggested that DOE consider using TRVs based on NOAELs,. It is not proposed that PRGs based on NOAELs be incorporated into the RI/FS documents, and as stated in the response to comment 147, rationale will be provided. Likewise, uncertainty factors to account for extrapolation between species in toxicity or exposure parameters will not be included. Discussion of these topics will also be added to CHPRC-00784.
38	p. 1-3, para 5	OSWVER Directive 9385.7-28P should be 9285.7-28P.			Accept. This will be revised
39	p. 2-1, para 1	An EPC may be better represented by 95UCL, rather than max soil concentration.			The text will be changed to note that the maximum concentration values are suggested for screening purposes to help focus the baseline risk assessment, as recommended by ERAGs (OSWER 9285.7-25). Text will be added to this paragraph to note 1) the

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
					WAC guidance specifying the use of the EPC and 2) that EPCs are being used to compare to the resulting PRGS in the RI/FS documents.
40	p. 2-3, para 1	Note that EcoSSLs for plants and invertebrates, based on MATC, are based on both NOAECs and LOAECs (since MATC is the geometric mean of NOAEC and LOAEC).			Text will be added to further specify that MATCs are derived as the geometric mean of the NOAEL and LOAEL, and that plant and invertebrate EcoSSLs for many contaminants incorporate the MATC.
41	p. 2-6, para 3, bullet 1	The MTCA citation looks slightly off. Perhaps it is WAC 173-340-7493(1)(c).			Accept. This will be revised.
42	p. 2-7, para 1	Note that Ecology prefers NOAELs for substitute receptor species (WAC 173-340-7493 [7] [f] [i]), as proposed here.			Section (f) states, *"[t] o account for uncertainties in the level of protection provided to substitute receptor species and toxicologically sensitive species, the department may require any of the following: (i) Use of toxicity reference values based on no observed adverse effects levels"*. This reflects a preference, rather than a portion of the procedure that may come into play if there is evidence that the substitute receptor species are less toxicologically sensitive compared with the default species (American Robin, shrew, and vole). Text will be added to discuss the adequacy of the lvel of protection provided by the surrogate species presented in CHOPRC-00784.
43	p. 2-7, para 4	WAC 173-340-7493(f) should be WAC			Accept. This will be revised.

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		173-340-7493(3)(f).			
44	p. 2-8, para 1	The rad limit sentence is poorly stated (limit for aquatic animals and terrestrial plants is 1 rad/d, while limit for terrestrial animals is 0. 1 rad/d). More recently, the EU has proposed a generic screening value (PNEDR) of 10 [uGy/h (0.024 rad/d) for nonhuman biota (Anderson et al. 2009. JER 100:1100-1108).			The text will be reworded to clarify that the limit for terrestrial plants is 1 rad/day and that the limit for terrestrial animals is 0.1 rad/day. In its graded approach for evaluating radiation doses to aquatic and terrestrial biota (DOE-STD-1153-2002), DOE adopted dose limits corresponding to expected safe levels of exposure of populations based on reviews of the data of acute and chronic effects to populations of terrestrial plants and animals. DOE's levels incorporated the UNSCEAR 1996 report assessing radioecological impacts to plants and wildlife. In 2008, UNSCEAR revisited those findings, and has not altered its view from the previous comprehensive 1996 report http://www.unscear.org/docs/reports/2008/11-80076_Report_2008_Annex_E.pdf. The dose limits in this technical standard are consistent with the intent of DOE Orders 5400.1 and 5400.5, and are appropriate for the purpose of calculating Tier 1 ecological values for radionuclides in soil for wildlife. It is proposed that these limits be retained in CHPRC-00784 for calculating ecological values.
45	p. 3-2, Figure 3-1	An external radiation pathway from rads in shallow soil is not shown. Another potential pathway that has been omitted is exposure to contaminants in groundwater that has been pumped to the surface for			External exposure is included as a pathway in calculating screening levels using RESRAD-Biota, and was considered in developing Tier 1values for radionuclides. The figure will be revised accordingly.

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		irrigation of crops.			Groundwater use is not considered to be part of the future land uses for the Hanford Site. However, text and figure revisions will be incorporated to acknowledge that irrigation, should it occur, would represent a potentially complete exposure to ecological receptors, but is not considered for development of Tier 1 values.
46	p. 3-3. Para 1	Provide a citation for the statement, "The maximum acceptable adverse effect levels generally selected for population and community level assessment endpoints are LOECs or LOAELs." Other references note the use of NOAELs for wildlife (e.g., p. 438 in Suter, 2007).			As described in *Preliminary Remediation Goals for Ecological Endpoints*, ES/ER/TM-162/R2), NOAELs give no indication as to the levels at which adverse effects begin to occur, and LOAELs for effects observed in individual wildlife are expected to correspond to no-effect or negligible effect levels on wildlife populations. Most risk assessments have the inherent assumption that population-level effects will be absent if no effects are predicted for individual organisms (Allard et al., 2010) – and the exposure modeling and TRV comparison used for Tier 1 development is based on estimating exposure to an individual organism – it is incorrect to suggest that the converse is true; that is, effects on individuals do not always result in changes in population density or age/sex structure due to many compensatory mechanisms that are present in ecological systems (see Allard et al., 2010). EPA has accepted the use of a LOAEL in developing cleanup levels in soil for protection of songbirds from lead in soil in the Coeur d'Alene basin, as part of a ROD for the Bunker Hill Superfund Site (Sample et al., 2011)[6]. As discussed

[6] Sample, B. et al. 2011. Assessment of risks to ground-feeding songbirds from lead in the Coeur d'Alene Basin, Idaho, USA. *Integrated Environmental Assessment and Management* 7(4): 596-611.

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
					in responses to Comments 147 and 37, discussion will be added regarding the limitations with the LOAEL/NOAEL approach for TRV development including mention of the emerging approaches for toxicological assessment. This additional information will be incorporated into the document to better support the use of LOAELs in Tier 1 value development.
47	p. 3-6, para 1	Provide a citation to support the statement, "Additionally, a wildlife receptor's exposure to contaminants by inhalation and dermal contact usually contributes little to its overall exposure." Note possible exceptions (e.g., airborne tritiated water vapor may be absorbed dermally in burrowing mammals).			Accept: methods and data necessary to estimate wildlife inhalation exposures are poorly developed (EPA/600/R 93/187) or limited; in addition, according to the EcoSSL guidance (OSWER Directive 9285.7-55), inhalation exposures are significant only for VOCs. For assessing inhalation exposures, some data for mammals are available through the IRIS database, and a limited set of inhalation benchmarks for wildlife have been developed (Gallegos et al., 2007, "Wildlife Ecological Screening Levels for Inhalation of Volatile Organic Chemicals"). If the CSM had indicated that VOCs are a significant COPEC, focused analyses of the inhalation pathway may have been warranted, but VOCs were not significant at 100-K. The EcoSSL guidance (OSWER Directive 9285.7-55) provides supporting statements regarding the limited contribution of dermal exposure to total exposure. This additional information will be incorporated into the report.
48	p. 3-6, para 3	Although ingestion of contaminated			This was addressed as a limitation in the report.

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		water may contribute to exposure, it is not addressed in this analysis. As result, Tier 1 soil concentrations may underestimate exposure.			Further evaluation of the potential contribution to total exposure from ingestion of contaminated water has been addressed in the risk assessments conducted as part of the RI/FSs. Large mammalian wildlife utilizing the upland waste site areas can and do move down to the Columbia River riparian area and drink from the freshwater seeps and from the more abundant Columbia River. Bats and birds frequenting or residing in these areas also can use the seeps along the Columbia River to meet their daily needs. A semi-quantitative evaluation of the ingestion of seep water has been performed in the ecological risk assessments and is discussed with the risk characterization of the RI/FS reports. The results have shown no significant contribution. Estimates are not included for small mammals as they maintain water balance through excreting concentrated urine, obtaining water from food and water generated during metabolism (Verts and Kirkland, 1988, "*Perognathus parvus*"). This additional information will be incorporated into the report, including presentation of a sample calculation in an appendix to CHPRC-00784. It is not proposed that the Tier 1 values be recalculated to incorporate water ingestion.
49	p. 3-8, para 1	Re equation definitions, "sediment EPC" should be "soil EPC."			Accept: this will be revised in the report.
50	p. 3-9 para 4, bullet 3	BAFs for rads are in Table 6-4 (not Table 6-3).			Accept: this will be revised in the report.
51	p. 3-9, para 5	The assumption of 100% site use does			Accept: this statement applies to wildlife. The

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		not overestimate exposure for plants (i.e., non-mobile biota).			report will be revised accordingly.
52	p. 3-11, para 4	Please explain why NOECs were excluded from measures of effect for plants, and soil invertebrates			Accept: evaluation of soil ecological values for plants and soil invertebrates incorporated EcoSSLs (which incorporate MATCs), and ORNL and Ecological Soil Indicator Concentration values (which incorporate LOAELs). Text will be added to note the basis for these agency-developed values. As discussed in the report, uncertainties with literature-based soil values for plants and soil invertebrates precluded their use for PRG development. Using the available data in the published literature to develop PRGs would still leave uncertainty and not improve confidence that surrogate values would be any more reflective of conditions at Hanford than those in WAC 173-340 table 749-3 or the EPA EcoSSLs. Soil toxicity bioassays have been performed to support development of PRGs for plants and soil invertebrates (see ECF-Hanford-11-0158). As discussed in the response to Comment 40, additional text will be provided in the document specifying that the MATC is derived from the NOAEL and LOAEL.
53	p. 3-12	Equation is incorrect. SSL term should be grouped with Ps. Please see EPA EcoSSL Attachment 4-1 (p. 1-1 in OSWER Directive *9285.7-55),* Also, the equation is inverted (more typically, HQ=exposure/effects).			The equation in the text will be edited as suggested.
54	p. 4-6, para 2	Text states, "Developing a screening level for inorganic mercury based on			Given the lack of a methylating environment found in shallow terrestrial soils at Hanford, mercury

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		methyl mercury toxicity represents an uncertainty in that value." Tier 1 values for inorganic Hg should use a TRV for inorganic Hg, rather than methyl Hg (e.g., Heinz, 1979; Verschuuren et al, 1976). Tier 1 values could be developed specifically for methyl Hg (using TRVs and BAFs for methyl Hg). MTCA Table 749-3 provides wildlife soil concentrations for both inorganic and organic forms of Hg.			species present in soil would primarily be inorganic mercury. The text in the report states that using methyl Hg TRV to develop an inorganic Hg screening level is an uncertainty, but one that provides a conservative (i.e. lower) Tier 1 ecological soil value. A TRV specifically for inorganic mercury will be developed and presented alongside the existing value. The table references will be revised to distinguish the screening values for inorganic and methyl mercury.
55	p. 4-7, para 2	Re uranium (U) and citing Sheppard et al (2005), text states, ". ..a dose of 1.3 mg/kg BW/d was recommended as an NOAEL for renal damage to small mammals (e.g., 1 kg in mass)." However, the Summary (Section 10.3) of Sheppard et al (2005) indicates that renal damage occurs at 0.06 mg/kg BW/d (for a 1 kg body mass), while growth and development effects occur at 1.3 mg U/kg BW/d (for a 1 kg body mass). Therefore, 1.3 mg U/kg BW/d represents a LOAEL (not a NOAEL) for growth and development for small mammals. This value is divided by a 10 fold safety factor to derive a PNEC (0. 1 mg U/kg BW/d) for small mammal growth and development.			We confirm that the 1.3 mg U/kg BW-d value cited by the authors is a LOAEL for growth and reproductive effects. This “intake rate” cited in section 10.3 is reflective of the results of two studies (on growth and development conducted by the same laboratory (Ortega et al., 1989; Paternain et al., 1989; and Domingo et al, 1989 were all published work of the same lab in Spain) as noted in section 10.1 of Sheppard et al. (2005) on page 76: “The next series of papers use rats and mice (Ortega et al., 1989; Paternain et al., 1989; Domingo et al., 1989a). Despite the rather different animals, dosage methods and endpoints, the effect concentrations were quite similar. These effects are more clearly related to ecological function, because they deal with growth and development rate.” Of these two studies, the Paternain et al. (1989) study was selected over the Domingo et al. (1989) because it was a long term study during a critical life stage on dosed pups versus a shorter term study with the

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
					noted effect being pup weight. Also, discussion will be added to CHPRC-00784 noting that the 2.8 mg/kg-bw-d dose cited in Sheppard et al. (2005) should be considered a NOEC not LOEC as the only measured effect at that level represented just an 8% decrease in pup body weight relative to controls which is not an level of reduction that is considered significant. Because of these concerns regarding the mammalian toxicology discussion in Sheppard et al., 2005, this specific text in CHPRC-00784 will be revised to remove mention of the Sheppard et al., 2005 and will update the discussion of the uncertainties in the toxicological data to refer directly to the primary studies. A safety factor (or uncertainty factor) was not used in the TRV development because both a LOAEL and NOAEL could be obtained from the available toxicological data. As discussed in the responses to Comments 147 and 37, additional text will be provided that describes the limitations of LOAEL/NOAEL approach for assessing thresholds. However, it is not proposed that TRV development for uranium employ safety factors, as was done in Sheppard et al., 2005 for purposes of developing a PNEC.
56	p. 4-7, para 3	Text indicates that uncertainty factors are not typically applied in ERAs in the United States. However, both EPA's ERAGS (p. 1 -10 in E 'PA/540-R-97-006) and SLERAP for Hazardous Waste Combustion Facilities (p. 5-29			The text will be revised to more clearly state the application of uncertainty factors in TRV development. Guidance for TRV development provided in CHPPM, 2000 discusses use of uncertainty factors for extrapolation from short-term to chronic exposure durations, and extrapolation

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		in EPA 530-D-99-O0lA) state otherwise.			from LOAELs to NOAELs. Whenever possible, the TRVs presented in the Tier 1 document were based on both NOAELs and LOAELs obtained directly from chronic toxicity studies to limit the need for application of uncertainty factors. In other cases, particularly for organic contaminants where TRVs were developed from values in IRIS, uncertainty factors have been applied to develop TRVs. Additional discussion regarding the use of uncertainty factors will be incorporated into the document.
57	p. 4-8, para 2	Re uranium *(U),* text recommends 2.8 mg/kg BW/d (Patemain et al, 1989, as cited in Sheppard et al, 2005) as the LOAEL (for growth) to develop Tier 1 U values for mammals. This contradicts the LOAEL (1.3 mg U/kg BW/d), recommended by Sheppard et al (2005) in their Summary (Section 10.3), for small mammal growth and development. Furthermore, this latter value is divided by a 10 fold safety factor to derive a PNEC (0. 1 mg U/kg BW/d) which could be used to derive Tier 1 U values for mammals.			See the response to Comment 55. This paragraph will be revised and will incorporate a discussion drawn directly from the source literature rather than a summary drawn from Sheppard et al., 2005.
58	p. 4-8, para 4	Text notes that Tier 1 values for uranium (U), based in part on Sheppard et al (2005) and BAFs from USACHIPPM (2004), ES/ERITM-220, and ORNL-			The uncertainty discussion provided here will be broaded to note both the over- and understatement of exposures and risks associated with the assumptions and data used in the development of

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		5786, may be overly protective. However, the possibility exists that Tier 1 values may also be under protective (e.g., text in the preceding paragraph notes that BAFs may either overestimate or underestimate actual tissue concentrations found at Hanford).			the uranium screening levels in soil.
59	Table 6-2	Units for soil ingestion look goofy (should be kg/kg BW/d?).			Accept: the units will be revised (these should be kg/kg-day).
60	Table 6-4	It would be useful to list P values for regression models. Column heading for "Soil to Terrestrial Invertebrates" did not carry over on p. 6-15 to 6-17. Similarly, column heading for "Soil to Small Mammals" did not carry over on p. 6-18 to 6-2 1.			Accept. P value will be incorporated into Table 6-4 when available. The table headings will be edited.
61	App A	Looks like there is a duplication of tables in this file (i.e., pages A-53 to A-112 are duplicated). Also, the horizontal alignment is off a bit in some of the Tables, making it difficult to read (e.g., Table A-i1 for Sb). When there is no TRV (e.g., Table A-i for Sb), it looks like "1.00" (in Soil PRG column) represents no PRG calculated. Please clarify.			Accept: the table headings will be edited.
62	App B, Table B-2	Explain why the RAIS reference is given when these DCFs are calculated with RESRAD-Biota. Provide units for DCFs.			Accept: RAIS reference will be deleted.

CH2MHILL
Plateau Remediation Company

Project	(ECF-Hanford-11-0158: Tier 2 Terrestrial Plant and Invertebrate PRGs for Nonradionuclides for use at the Hanford Site)
Reviewer	Washington State Department of Ecology

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
1	p. 4	List Appendices, Tables, and Figures in Table of Contents.			Noted. Table of contents will be updated.
2	p. 5, para 1	Re the first sentence, it is noted that this document pertains only to non rad COPCs. Please describe Tier 2 efforts for rad COPCs for plants and invertebrates (or state that there is no need, since generic BCGs are sufficient for plants and BCGs for invertebrates are unavailable, if this is the case).			Noted: will be added.
3	p. 6, para 5	Provide ECF-Hanford-11-006.			Reference to this ECF will be removed – it is superseded by CHPRC-00784.
4	p. 7, para 1	Because generic screening levels are now here recommended as Tier 1 PRGs, please clarify this in CHPRC-00784 during its next revision.			The language will be added.
5	p. 7, para 4	List pros and cons of a non-statistical sampling design in			The following text will be added "Historical information about range of metal concentrations were used to guide the

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		relation to a statistically based approach.			sampling in order to obtain a broad range of concentrations for the dose response relationships."
6	p. 8, last bullet	If available, provide information on the sensitivity of Sandberg bluegrass (relative other Hanford plant species) that makes it suitable for a –bioassay test species. Data on species sensitivity distributions with Hanford species and COPCs would be ideal to guide bioassay design and inform eco risk at Hanford.			Discussion will be added regarding the benefit of such data and acknowledging that was not available.
7	p. 9, para 3	Table 2-3 is cited but does not appear to be included.			Table 2-3 will be included.
8	p. 10, para 2	Similar to pesticide and background screening, describe how bioassay samples were screened for radioactivity.			This will be added.
9	p. 11, para 3	Describe "laboratory and field-collected negative control samples." In particular, note if the lab control is comprised of artificial soil and describe its composition.			This will be added – incorporate from the SAP or contact ASL for the information.
10	p. 12, para 3	List criteria for outlier designation. Describe pros and cons of eliminating data for statistical analysis. It is unclear why high values are eliminated.			This analysis observed changes in a regression as the highest concentrations were removed sequentially. Here, outliers were defined as the highest concentrations. The following text will be added. "The p value of 0.05 was selected as

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
					it is the most commonly used p value in biological statistics (Zar 1983)."
11	p. 12, para 4	Please clarify why correlation analysis is performed prior to regression analysis (since regression analysis also provides correlation information). With a large number of correlation analyses, it would be prudent to reduce the statistical significance level (from alpha=-0.05) to minimize experimental-wise error (e.g., Bonferroni method) and avoid spurious correlations, as performed by Ingersoll et al (2009). This type of Bonferroni correction should also be applied to other sets of multiple tests (i.e., Wilcoxon, regression).			Correlation analysis was used as an exploratory analysis; regression analysis was used for quantification of concentration-response. Reduction of the statistical significance would reduce the possibility of relating soil concentration to an effect – in essence it would be a less ecologically-protective approach.
12	p. 13, para 1	Although regression analysis is performed, a true concentration-response function for a given analyte/response combination can only be obtained from testing a dilution series of a single soil sample (resulting sub-samples have same co-contaminants), rather than testing multiple independent soil samples (having different co-			Noted. This can be noted as a limitation to the PRG study design in the document. Additional explanation will be provided regarding how bioassay responses were normalized to the median control response. Additional information on the history of the waste sites where samples were collected and maps of the sites, including OSCA, was included in a new Appendix E. the waste sites

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		contaminants). Note this limitation. Please explain how "Bioassay responses were scaled to the median of the laboratory and field control samples that comprised the reference envelope."			information is primarily comprised of the WIDS reports for each of the waste sites.
13	p. 14, para 1	Table 1-2 is cited but does not appear to be included (maybe should cite Table 2-1 here).			Table reference will be corrected.
14	p. 14, para 4	Text states, "The final recommended PRG represented the most appropriate value which was usually the highest value. The highest value was selected because all site-specific thresholds were no effect concentrations. Therefore, the role of EC20 is unclear (since it signifies a 20% effect). Please provide rationale for deriving a PRG, clarifying selection of EC20 vs. NOEC data.			The rationale will be provided.
15	p. 15, para 5	Provide rationale for using EC20 as a PRG, considering the relatively large effect.			The rationale will be provided.
16	p. 15, para 7	The boron analytical problem in waste site samples should be regarded as an uncertainty, rather than an assumption.			Text has been revised to acknowledge uncertainty.

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
17	p. 16, para 3	Note that cumulative frequency distributions (CFDs) for analyte soil concentrations (Figures A-1 to A-33) are contained in Appendix A, and nonparametric Spearman correlations are contained in Appendix B.			Noted. Will be revised.
18	p. 16, para 4 bullet 5	Note that plant dose response scatterplots (Figures C-l to C-33) are contained in Appendix C.			Noted. Will be revised.
19	p. 17, para 1 bullet 5	Note that invertebrate dose response scatterplots (Figures D-1 to D-33) are contained in Appendix D.			Noted. Will be revised.
20	p. 20, para 2	The first sentence in the "Plant Weight" section should refer to Table 5-5 (not Table 5-6).			Noted. Will be revised.
21	p. 20, para 7	Refer to Table 5-10 for "Invertebrate Reproduction" results.			Noted. Will be revised.
22	p. 20, para 8	Under first paragraph of "Spearman' s Rank Correlation," cite Tables 5-6, 5-*10,* and 5-11 (in addition to Table 5-5).			Noted. Will be revised
23	p. 21, para 7	Under "Invertebrate Reproduction," refer to Table 5 -10.			Noted. Will be revised.
24	p. 22-23. Section 6.2.3	Under "Regression Analysis," refer to relevant data tables.			Noted. Will be added.
25	p. 22, para 3	For clarity, revise the sentence "Slopes of the significant regressions were mostly insignificant (orders of magnitude			Noted. Will be revised.

Comment Number	Reference Page/Sheet No.	Review Comment, Basis, and Recommendation	Comment Type	Responsible Responder	DOE-RL Response
		below 1.."to "Slopes of the statistically significant regressions were mostly biologically insignificant (orders of magnitude below 1.."This comment for regression analysis for plant germination also applies to regressions for other responses below (plant height, plant weight, invertebrate survival).			
26	p. 23, para 1	Re first sentence, replace "germination" with "survival."			Noted. Will be revised.
27	p. 23-24, Table 6-3	Delete "NOEC" under "Plant" and Invertebrate" columns, because not all of these PRGs are NOECs. For example, Ecology and ORNL value 's are based primarily on LOEC values (e.g., plant PRGs for Ba, Be, Hg, Mo, TI). Also, 3 significant figures for PRGs seems unrealistically optimistic.			Noted. NOEC will be removed and the provenance of each value noted in the table. Significant figures will not be changed. While DOE does not disagree with the implication that the level of specificity is not necessarily supported, a change is not needed and to do so would create a significant amount of updating to existing documents that would not change the risk management decisions. In application of these numbers, when exceeded significant discussion of many other factors is used to make decisions, rendering the exact specificity of significant figures less relevant to the outcome.
28	p. 23-32, Table 6-3 and Text	Several PRGs are inconsistent, as specified in Table 6-3 vs. text (B [invertebrates], Cd [invertebrates],			Noted. Additional text will be included to discuss the basis for selecting NOECs. Inconsistencies will be resolved and the

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		Sn [text specifies 2 PRGs). Describe the uncertainty, inherent in PRGs which are unbounded NOECs (Sb, As, Ba [invertebrates], B, Cd, Cr, Cu [invertebrates], Pb [plants], Mn, Hg [invertebrates], Mo [invertebrates], Se [plants], Ag [invertebrates], TI [invertebrates], Sni, V [invertebrates], Zn [invertebrates]).			uncertainty with unbound NOECs will be added.
29	p. 27, para 4	The plant PRG selected for Pb is 9090 mg/kg. This soil concentration appears high, relative to the EPA EcoSSL for plants (120 mg/kg), Ecology recommended values for plants *(50* mg/kg, MTCA Table 749-3; 390 mg/kg, Ecology Pub. No. 11-03-006), as well as the RCBRA PRG (125 mg/kg). These data are listed in Table *5-8.* Although the current study (9090 mg/kg) is site-specific (Sandberg bluegrass), EPA (120 mg/kg) considered multiple species with a systematic process, Ecology (390 mg/kg) was partly site-specific (soil but not test organism), and RCBRA (125 mg/kg) was site-specific (Sandberg bluegrass). Given the variability in soil and plant factors, a weight of evidence approach argues for a			DOE acknowledges that 9090 mg/kg is high relative to other values cited, the result of no significant toxicity at this level was not an anomaly. In addition to this 9090 mg/kg concentration, no effects on plant germination were observed in any of the 14 samples with lead concentrations ranging from 1000 mg/kg to 7970 mg/kg. The previous site-specific bioassay work presented in the RCBRA resulted in a plant NOEC of 125 mg/kg, which was the PRG recommended in the RCBRA. The current 2011 study was able to collect samples at concentrations higher than those measured in the RCBRA bioassay work and resulted in a higher no-effect concentration. Both studies have shown that there is no significant relationship between lead and biological response in the plant bioassays conducted. Thus, the highest concentration tested from the current2011 study of 9090 mg/kg is recommended as the PRG. Ultimately,

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		lower plant PRG for Pb.			the wildlife PRGs for lead, all with high confidence assigned, are lower than this plant value, and as such, the wildlife PRG will drive risk decisions. Given the number of high concentrations in the test range of the 2011 study and the value of the other PRGS available for wildlife, the plant value presented was retained. Ecology will rely on the wildlife PRG results (CHPRC-01311) to set the terrestrial ecological PRG for lead for the 100-D and H areas. Ecology reserves the right to require additional lead plant bioassay measurements in the future, with Hanford soil, for other Hanford operable units.
30	p. 31, para 1	The first sentence specifies 838 mg/kg as the PRG for Sn (for both plants and invertebrates), while the last sentence specifies 1260 mg/kg.			The misprint of 1260 was corrected to match the value of 838 shown in tables 5-8, 5-13, and 6-3.
31	Figure 2-2	Re Spearman box on right (second and third bullets for $p<0.05$), text states null hypothesis is "accepted" (should state null hypothesis is "rejected").			Noted. This will be edited.
32	Tables 5-5, 5-6, 5-10, 5-11, 6-2	Define color shading.			Noted. Footnote will be added to 6-2 for the shading. Shading for the other tables will be removed as it is not pertinent to understanding the table.

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33	Table 5-7 footnotes	Regression models should all include scaled y variable (germination, height, weight), consistent with description on p. 13. Re "Notes," text states "p-value *<0.05* is not significant." (should state "p value<0.05 is significant"). Re "NA" acronym, text states, "P-value was <0.5 indicating relationship between chemistry and median measure (germination, height, weight) is not significant...." Looks like text should state, "P value was >0.0 5...”).			Scaled y-variable will be included. Significance value reference will be edited.
34	Table 5-9	Include "invertebrate" in table title.			Noted. Will be edited.
35	Appendix C	Y axis in bottom panel of scatterplots should be labeled "Weight" with appropriate mass units (not "Height").			The change will be made.
36	Appendices C and D	Clarify legends for scatterplots (i.e., explain symbols in more detail).			See #35