



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY  
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June 15, 2006

Mr. Keith Klein  
Richland Operations Office  
United States Department of Energy  
P.O. Box 550, MSIN: A7-50  
Richland, Washington 99354

Re: Comprehensive Environmental Response, Compensation, and Liability Act of 1980  
(CERCLA) Five-Year Review

Dear Mr. Klein:

The Department of Ecology reviewed the draft CERCLA Five-Year Review Report for the Hanford Site (DOE/RL-2006-20). Our technical review comments are enclosed.

Ecology concludes that the draft report does not include the minimum requirements for technical assessments of a remedy. The report does not include accurate and complete answers to these questions<sup>1</sup>:

- Question A – Is the remedy functioning as intended by the decision documents?
- Question B – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
- Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

The enclosed comments show how the report is not accurate and complete. Three particular areas of concern are:

- The protectiveness evaluation did not consider new information such as the 2001 amendments to Washington Administrative Code 173-340, and the changes to the City of Richland comprehensive plan (relative to the 300 Area).
- The protectiveness evaluation incompletely addressed the Hanford Past Practice Strategy<sup>2</sup>, specifically, the expectation of additional investigation after interim actions.
- The protectiveness evaluation incompletely addressed the Treatment, Storage and Disposal Unit and Past Practice Units Interface (Section 5.5 of the Hanford Federal Facilities Agreement and Consent Order).

Based on our conclusions, we recommend that the United States Department of Energy's (USDOE) protectiveness statement for most operable units should be that the protectiveness determination is deferred<sup>1</sup>:

“A protectiveness determination of the remedy at OU X cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions (describe the actions). It is expected that these actions will take approximately (insert time frame) to complete, at which time a protectiveness determination will be made.”

Ecology requests that USDOE revise its draft Five-Year Review to emphasize:

- Additional characterization of many operable units is required or planned. Protectiveness of interim actions will be re-evaluated using the additional characterization data.
  - USDOE has partially evaluated protectiveness for primary contaminants of concern (e.g., Strontium-90 at 100-N Area). Additional characterization of potential contaminants of concern and/or “secondary” contaminants is required. Protectiveness of interim actions will be re-evaluated using the additional characterization data.
- Human health and ecological risk assessments are in progress or planned across the Hanford Site. Those assessments may support the conclusion that existing clean-up levels are protective, or could redefine cleanup levels and remedial action objectives. USDOE's protectiveness statement should be “deferred pending the outcome of the risk assessments.”
- Innovative technologies will have to be deployed or developed for many operable units (e.g., 100-NR-2, 300-FF-5, 200 Area vadose zone). The protectiveness evaluation for affected operable units should be deferred pending technology development, treatability investigations, and feasibility studies.
- The integration of treatment, storage, disposal (TSD) unit closure, and Resource Conservation and Recovery Act (RCRA) corrective action, with CERCLA remedial actions is an integral part of the Hanford Federal Facility Agreement and Consent Order (HFFACO). The protectiveness evaluation for many operable units should be deferred pending additional progress on closure and corrective action.
- New information calls into question the protectiveness of the 300 Area remedy. The new information includes the City of Richland reuse study and changes to the City's comprehensive plan. The protectiveness evaluation for the 300 Area is deferred, pending USDOE re-evaluation of risk assessment exposure scenarios.

1. U.S. Environmental Protection Agency, “Comprehensive Five-Year Review Guidance,” EPA 540-R-01-07, June 2001.
2. U.S. Department of Energy, Hanford Site Past Practice Investigation Strategy, DOE/RL-9104, August 1991.

Mr. Keith Klein  
June 15, 2006  
Page 3

If you have any questions regarding this letter or the enclosed comments, contact John Price at (509) 372-7921.

Sincerely,

A handwritten signature in cursive script that reads "Jane A. Hedges". The signature is written in black ink and is positioned above the typed name.

Jane A. Hedges  
Program Manager  
Nuclear Waste Program

JBP:lkd

Enclosure: Review Comments

cc: Nick Ceto, EPA  
Stuart Harris, CTUIR  
Gabriel Bohnee, NPT  
Russell Jim, YN  
Todd Martin, HAB  
Ken Niles, ODOE  
Hanford Natural Resource Trustee Council c/o Dana Ward  
Greg Hughes, USFWS  
Admin Record: 100 Area, 200 Area, 300 Area  
Environmental Portal

Number	Page	Comment
1.	Executive Summary, page iii, 1 <sup>st</sup> paragraph	<p>The second sentence states: “During the period the site produced nuclear material to be used in the national defense, many activities resulted in the disposal of wastes containing hazardous constituents and/or radioactive materials.”</p> <p>It is recommended that the second sentence be revised to read: “During the period the site produced nuclear material to be used in the national defense, many activities resulted in the disposal and/or release of wastes containing hazardous constituents and/or radioactive materials.”</p>
2.	Executive Summary, page iii, 1 <sup>st</sup> paragraph	<p>The last sentence states: “Adverse impacts on the environment from those activities are being remediated to the extent possible.” Adverse impacts on the environment from all activities are not being remediated to the extent possible. This sentence needs to be written to more accurately reflect Hanford Site remediation.</p> <p>It is recommended that the following be considered: “Some adverse impacts on the environment from those activities are being remediated to the extent possible while other adverse impacts are either being characterized or are being scheduled to be characterized.”</p>
3.	Pg. iii para 3	Editorial error – A key requirement is to conduct reviews of the status of response actions no less frequently than once every five years...”
4.	Executive Summary, page iii, 3 <sup>rd</sup> paragraph	The word “year” should be plural in the 2 <sup>nd</sup> sentence.
5.	Executive Summary, page iii, 5 <sup>th</sup> paragraph	During the December 2005 CERCLA 5-year ROD review public presentation, the following two additional scope questions were identified: 1) What corrective measures are required to address any identified deficiencies? and 2) Are there opportunities to optimize the long-term performance of the remedy to reduce life-cycle costs? As these were identified as scope, it is recommended they be included in the Executive Summary.
6.	Executive Summary, page iii, 5 <sup>th</sup> paragraph	It is recommended that question number 3 be modified as: “Has any other information, including the identification of needed information, come to light that could call into question the protectiveness of the remedy?”
7.	<u>Page iii last paragraph:</u>	USDOE claimed that USDOE met interim actions for the groundwater operable units across the Hanford Site except for 300FF5 and 100-NR-2 which is not correct. The interim actions are carried out only at selected portions of the operable units which usually does not cover the entire unit (e.g. the D and H interim action does not cover the entire OU which contain contaminants above the remedial action

Number	Page	Comment
		objectives on the ROD).
8.	Executive Summary, page iv, 1 <sup>st</sup> paragraph	In the first sentence, the term “monitored attenuation” is used to describe the selected remedy. Terms used in the ROD are “institutional controls” and “groundwater monitoring and natural attenuation”. It is noted that the term “monitored natural attenuation” was not in use until after the institutional control remedy for groundwater was chosen (via the ROD). Therefore, it is recommended that the sentence use a term used in the ROD – either “institutional controls or “groundwater monitoring and natural attenuation”.
9.	Executive Summary, page iv, 1 <sup>st</sup> paragraph	<p>The paragraph is silent about organic contamination. The ROD addressed organic contamination by the following: “Trichloroethene and dichloroethene may remain in a very small region of the water table aquifer at concentrations around the MCL. Because of attenuation, trichloroethene and dichloroethene would not reach the Columbia River in concentrations exceeding the MCLs or surface water quality standards. Monitoring would continue until remediation goals are met.” Chlorinated hydrocarbons have been present in groundwater since the mid-1980s and concentrations above DWS have occurred in well 399-1-16B since the start of monitoring in 1987. Chlorinated hydrocarbons are present at the bottom of the aquifer in the vicinity of the 300 APT and the extent and maximum concentrations within the plume are unknown. A reasonable conceptual model for the fate and transport of the chlorinated hydrocarbons includes chlorinated hydrocarbon contaminants entering the Columbia River off shore where the Ringold mud intersects the river bed.</p> <p>It is recommended that the Executive Summary acknowledge chlorinated hydrocarbon contamination emanating from the 300 Area.</p>
10.	Executive Summary, page iv, 1 <sup>st</sup> paragraph	<p>The paragraph is silent about contaminants from the 300 Area that are seeping directly into the river. While the paragraph states that institutional controls are in place to prevent use of the groundwater, it does not indicate if controls are in place to address contaminants seeping into the Columbia River.</p> <p>It is recommended that the paragraph identify what controls are in place to address contaminants seeping directly into the Columbia River.</p>
11.	Executive Summary, page iv, 2 <sup>nd</sup> paragraph	<p>The paragraph is silent about contaminants from the N Area that are seeping directly into the river. While the paragraph states that institutional controls are in place to prevent use of the groundwater, it does not indicate if controls are in place to address contaminants seeping into the Columbia River.</p> <p>It is recommended that the paragraph identify what controls are</p>

Number	Page	Comment
		in place to address contaminants seeping directly into the Columbia River.
12.	Executive Summary, page iv, 5 <sup>th</sup> paragraph	<p>The paragraph is silent about 1100 Area institutional controls and/or monitoring.</p> <p>As the summary indicates that contamination was left in place and that the 1100 Area will continue to be included in future five-year reviews, it is recommended that the paragraph identify what controls and/or monitoring are in place and/or performed.</p>
13.	Executive Summary, page v, table	<p>In the "100/300 Crosscutting" column, an additional item that should be identified is the collection of additional characterization information to support completion of interim response actions.</p> <p>It is recommended that the following row be added to the table: "Issue 3. Additional contamination characterization information is needed to support completion of response actions prescribed within the TPA and the records of decision to develop final cleanup decisions and to support final cleanup actions."</p>
14.	Executive Summary, page v, table	<p>In the "100/300 Crosscutting" column, an additional action that should be identified to support the collection of additional characterization information is development of schedule, workscope, and plan implementation associated with primary characterization documents (i.e., RI/FS, RFI/CMS, LFI, FFS, IRM, etc.).</p> <p>It is recommended that the following row be added to the table: "Action 3-1. Submit a five-year characterization master plan for the 100 and 300 Areas which identifies additional characterization information needs and provides a schedule for beginning the administrative process of obtaining the information."</p>
15.	Executive Summary, page v, table	<p>In the "Issue 1" row of the "100/300 Crosscutting" column, under "Affects Current Protectiveness" the table indicates "No". Unless all of the data has been collected and evaluated, this cannot be answered as "No".</p> <p>It is recommended that the table indicate that it is unknown at this time.</p>
16.	Executive Summary, page vi, table	In the "100-N Area" column, it is recommended that the additional row be added to the table: "Issue 8. Additional characterization information is needed to support development of an FFS to support completion of interim response actions for the 100 N Area."
17.	Executive Summary, page vi, table	In the "100-N Area" column, it is recommended that the additional row be added to the table: "Action 8-1. Submit a characterization plan for approval and implementation to provide additional characterization information to support a FFS for N Area units for which it is known that contaminated waste,

Number	Page	Comment
		vadose zone, and/or groundwater exists and/or will remain (i.e., 1324-N/NA, 1301-N LWDF, and 1325-N LWDF).”
18.	Executive Summary, page vi, table	General comment. Issues and actions that will be added to the review as a result of comments should also be added to the table.
19.	Executive Summary, pg.iv, 6 <sup>th</sup> ¶	To this (“DOE Richland ...protectiveness concerns.”) add the following: All response or corrective actions, excluding situations where there is an imminent threat to the public health or environment will be conducted in a manner which ensures compliance with the technical requirements of the Hazardous Waste Amendment Act (Chapter 70.105 RCW and its implementation regulations).
20.	Introduction, pg. xvi, 6 <sup>th</sup> ¶	Add as last sentence; Although the closure and corrective action were integrated with the CERCLA remedial action, Ecology retains post-closure authority over the TSD units.
21.	Page 1.3, Section 1.1, 1 <sup>st</sup> paragraph	<p>The text indicates four categories of contamination. The four categories may not adequately represent contamination that is a result of contaminated biological material.</p> <p>It is recommended that a fifth category be included which identifies contaminated biological materials.</p>
22.	Page 1.7, Section 1.3, 3 <sup>rd</sup> paragraph	<p>The text differentiates between “contaminant sources” and the “underlying groundwater” but does not describe or indicate which operable unit addresses contaminated vadose zone remaining under liquid disposal sites.</p> <p>It is recommended that the text acknowledge contaminated vadose zone underlying (and mounded around) the liquid disposal sites and provide an explanation of how this contamination is addressed by the RODs.</p>
23.	Section 1.4.1 Pg 1.4.1 Para 2	Editorial error – “...is more stringent than the 100 µg/L drinking water standard...”
24.	Section 1.4.1, page 1.14,	<p><b>1999 ROD for 100-NR-1 and 100-NR-2:</b> The text states the following:</p> <p>“The remedial action for unplanned releases (past-practice site) for 100-NR-1 consists of a remove, treat, and dispose remedy for 37 radioactive sites, 6 inorganic waste sites, 6 burn pits, and 9 surface solid waste and miscellaneous source waste sites. The actions include excavate and treat soil using ex situ bioremediation and dispose of the treated soil for 20 near-surface petroleum sites; in situ bioremediation for two deep petroleum sites; and institutional controls for one shoreline site...(see following paragraph, 2000 ROD for 100-NR-1)”</p> <p>Based on the text, 100-NR-1 consists of a total of 58 unplanned releases. However the planned actions have only been presented for 23 of these waste sites. Please include a table within the</p>

Number	Page	Comment
		CERCLA Five-Year ROD Review which specifies the Waste Information Data System (WIDS) designation for each of the unplanned release sites within the 100-NR-1 Operable Unit. Include the planned action for each site within the table, and the anticipated date for each final remedy to occur.
25.	Section 1.4.1, page 1.15	<p><b>2000 ROD for 100-NR-1:</b> The text states the following:</p> <p>“The remedy for the three waste sites in the 100-NR-1 ROD is remove, treat if necessary, and dispose. Remediation of these sites began in July 2000 and is continuing. Expected completion is December 2006. Portions of the 1301-N treatment, storage, and disposal unit piping are deferred to future remedial actions in the 100-NR-1 area under the 100-NR-1 and 100-NR-2 ROD.”</p> <p>Please revise the text to specify which portions of 1301-N are being deferred, the anticipated date for remediation, and the basis for the deferral. In addition to the additional language, please include a complete map of 1301-N, which shows the location (i.e., coordinates) of the deferred portion.</p>
26.	Page 1.15, Section 1.4.1	Include a documentation reference at the end of the sentence stating: “Portions of the 1301-N treatment, storage, and disposal unit piping are deferred to future remedial actions in the 100-NR-1 area under the 100-NR-1 and 100-NR-2 ROD.”
27.	Section 1.4.1, p. 1.21, paragraph after #4	Modify the second sentence of the paragraph as follows: The principal cleanup levels for surface soil to 4.6 meters (15 feet) below ground surface <del>are</del> <u>were</u> 15 millirem above background for radionuclides and <u>the direct contact exposure levels in the Washington State Model Toxics Control Act (WAC 173-340) Method B for chemicals calculated using chemical toxicity values available at the time of the remediation, plus protection of groundwater and the Columbia River as evaluated using methods and toxicity values available at the time of remediation.</u>
28.	1.4.3.2, pg.1.22, 3 <sup>rd</sup> ¶	Change: hexavalent to <b>total</b> chromium is 100 µg/l.
29.	Section 1.4.5	Innovative technology Demonstration: Both USDOE and Ecology agreed to demonstrate two technologies: apatite sequestration and phytoremediation. The document failed to mention about the phytoremediation and the corresponding action items.
30.	Section 1.4.5.4, Pg. 1.30	Wells in 100-N Area monitor a 300,000 L petroleum spill that occurred along the shoreline in the 1960's. Elevated concentrations of TPH-diesel and floating product are observed in monitoring wells. Recommendations for improving the 100 Area groundwater remediation recently made in <i>Calendar Year 2005 Annual Summary Report for the 100-HR-3, 100-KR-4, and</i>

Number	Page	Comment
		<p><i>100-NR-2 Operable Unit Pump-and-Treat Operations</i> (DOE/RL-2006-08, Rev. 0) include an evaluation of water-quality impacts related to the spill.</p> <p>A draft report on ecological impacts at the 100-N Area was transmitted to Ecology in June 2006. It evaluates biological impacts of spilled petroleum, but the report has not been reviewed and approved by Ecology.</p> <p>Add issue: "The extent of shoreline water quality impacts related to the diesel spill that occurred circa 1963 are not well known."</p> <p>Add action: "Provide previously collected data and coordinate with River Corridor sampling efforts to collect additional pore water data from new and existing aquifer tubes along the 100-NR-2 shoreline in order to assess water quality impacts."</p> <p>Action Due: 12/2007</p>
31.	Section 1.4.5.4, Pg. 1.30	<p>The recently published <i>Calendar Year 2005 Annual Summary Report for the 100-HR-3, 100-KR-4, and 100-NR-2 Operable Unit Pump-and-Treat Operations</i> (DOE/RL-2006-08, Rev. 0) identifies several changes that are possible following standby of the 100-N Area strontium pump-and-treat system. These changes may include increases in shoreline tritium, increases in specific conductance, and increases in extraction well concentrations of Sr-90. The report recommends action to actively monitor these changes.</p> <p>Add: "Issue: The Sr-90 pump-and-treat system will be in standby during the apatite treatability test. Water level and water-quality parameters are expected to change during this time."</p> <p>Add: "Action: Expand (i.e. increase the frequency of sampling) the near-shore water level monitoring and sampling efforts to document changes during and after pump-and-treat system standby."</p> <p>Action Due: During and after system standby.</p>
32.	Section 1.4.5.4, p. 1.30, Issue 7	<p>Issue 7 identifies a deficiency related to risk assessment. State the effect this deficiency has on the current protectiveness, and give expected improvements. Also state the work that will be conducted (i.e. the questions that will be answered with the 100-N area ecological risk assessment), and provide any associated milestones for the risk assessment.</p>
33.	Section	Change text as follows:

Number	Page	Comment
	1.4.6.1, Pg. 1.30	<p>“Due to groundwater contamination in the 100-HR-3 Operable Unit, Ecology requested DOE to perform additional 100-D source characterization in soil at the rail line that runs east west from the sodium dichromate station. The investigation included 12 test pits and <del>nearly</del> <u>approximately</u> 116 soil samples. The sampling did not identify a <u>shallow</u> vadose source of hexavalent chromium <u>in this area</u>.”</p> <p>The samples collected for this study were taken from the shallow zone to a depth of 12 ft. Hexavalent chromium was found at greater depth during sampling at railway tracks in the 100-B/C Area.</p>
34.	Page 1.28, Section 1.4.5.1, 1 <sup>st</sup> paragraph	<p>The last sentence states: “The 120-N-1 and 120-N-2 waste sites (chemically contaminated; no radionuclides) were also completely remediated, backfilled, and re-vegetated.” Remediation has not been completed at the waste management unit as contaminated vadose zone and groundwater remain. Therefore, the statement should be re-written to reflect this.</p> <p>Recommended wording is: “Remediation of the 120-N-1 and 120-N-2 waste sites (chemically contaminated; no radionuclides) has been initiated with waste removal, backfilling, and re-vegetation; however, contamination remains.”</p>
35.	Page 1.30, Section 1.4.5.3 or 1.4.5.4	<p>The text describes the inefficiencies of the pump-and-treat system (Section 1.4.5.3). The date of the review is May 2006 and the “issues and actions” section (1.4.5.4) does not identify an action of changing the pump-and-treat system. It is either recommended that in Section 1.4.5.3 that it be identified that the pump-and-treat system has been placed in “cold stand-by” or that Section 1.4.5.4 identify an action of the pump-and-treat system having been placed in “cold stand-by”.</p> <p>Recommended wording for Section 1.4.5.4, Action 6-1 is: “Implement the treatability test plan.... As the barrier is designed to operate as a natural gradient passive reactive barrier, the pump-and-treat system has been placed in a “cold stand-by” configuration.”</p>
36.	Page 1.30, Section 1.4.5.4	<p>After the success and/or effectiveness of the apatite barrier has been determined, the treatability plan identifies an intent to extend the barrier’s length and to perform a “secondary polishing treatment” if necessary. Also, a project workplan entitled <i>100-N Area Strontium-90 Treatability Demonstration Project: Phytoremediation Along the 100-N Columbia River Riparian Zone</i> has been generated which describes the secondary polishing treatment under consideration. Therefore, in the event that the apatite barrier is determined to be effective and the secondary treatment is necessary, it is recommended that an</p>

Number	Page	Comment
		<p>additional issue be included which achieves these objectives.</p> <p>The following wording is recommended for an additional action: "Issue 8-1. In the event that the apatite barrier is determined to be effective, an expansion of the barrier is necessary. Furthermore, during the evaluation of the apatite barrier, it may be determined that a secondary polishing treatment is necessary."</p> <p>The following wording is recommended for an additional action: "Action 8-1. Evaluate the effectiveness of the apatite barrier as a primary remediation. Based on the evaluation, make recommendations regarding the expansion of the barrier, the potential need for a secondary remediation, and/or the need to evaluate an alternative remediation.</p>
37.	Page 1.30, Section 1.4.5.4	<p>Due to the configuration of groundwater monitoring wells in relation to the 116-N-1, 116-N-3, 120-N-1, and 120-N-2 waste sites and the current groundwater monitoring program, it is unknown if 1) the remedies are protective of groundwater resources and 2) if the soil and groundwater remedies are meeting groundwater protection standards of WAC 173-303-645. In addition, by a recent letter (dated April 11, 2006), Ecology has communicated the necessity of accumulating data and determining minimum data needs. The letter states: "The results of the additional field investigations, and the previously accumulated data, will have to be evaluated in a Focused Feasibility Study (studies) as shown in Figure 1 of DOE/RL-91-40."</p> <p>Therefore, it is recommended that an additional issue be included which addresses the need for a FFS. The following wording is recommended for an additional issue: "Issue 9. Data needs to be accumulated and a determination made regarding additional data needs."</p> <p>The following wording is recommended for an additional action: "Action 9-1. Submit a plan for Ecology approval that specifies how it will be determined which additional data is needed, how that data will be obtained, and the schedule for obtaining the additional data. Implement the approved plan."</p>
38.	Page 1.30, Section 1.4.5.4	<p>Due to the configuration of groundwater monitoring wells in relation to the 116-N-1, 116-N-3, 120-N-1, and 120-N-2 waste sites and the current groundwater monitoring program, it is unknown if 1) the remedies are protective of groundwater resources and 2) if the soil and groundwater remedies are meeting groundwater protection standards of WAC 173-303-645. The 100-NR-2 groundwater OU selected remedy #6 (page 53) states: "DOE will continue to monitor the network of wells within the 100-N Area groundwater system..... The continued</p>

Number	Page	Comment
		<p>monitoring will: (1) assess the performance of the chosen interim action;....(4) further define the extent and nature of contaminant plumes for the other contaminants of concern;...”.</p> <p>Considering the N Area groundwater monitoring networks and programs associated with the 4 waste sites, it can be argued that the deficiencies of the networks and programs do not allow the specified remedy to be achieved. In addition, the deficiencies associated with the networks and programs are evidenced by Ecology’s draft permit conditions for these 4 waste sites.</p> <p>Therefore, it is recommended that an additional issue be included which addresses the deficiencies associated with the groundwater monitoring networks and programs. The following wording is recommended for an additional issue: “Issue 10. Groundwater monitoring well networks and programs are not adequate to monitor waste site contamination impacts to groundwater.”</p> <p>The following wording is recommended for an additional action: “Action 10-1a. Submit a groundwater monitoring plan for Ecology approval that specifies network and program monitoring that will satisfy groundwater protection standards of WAC 173-303-645.”</p> <p>The following wording is recommended for an additional action: “Action 10-1b. Submit a groundwater monitoring well installation plan for 116-N-1 and 116-N-3 that satisfies groundwater protection standards of WAC 173-303-645. Upon Ecology’s approval, implement the groundwater monitoring well installation plan as per the schedule specified in the plan.”</p>
39.	Section 1.4.5.1, Page 1.28:	<p>The text states the following:</p> <p>“The 116-N-1 and 116-N-3 sites were remediated; at the time of this review was in process, and 116-N-3 had been backfilled and revegetated. Backfilling and re-vegetation of the 116-N-1 waste site is scheduled to occur in 2006...and revegetated.”</p> <p>Please revise the text to accurately state that the Cleanup Verification Package (CVP) for 116-N-1 has not been approved by Ecology, and therefore the site is not considered remediated. Also, state that the 116-N-1 site includes a deferred portion for future remediation. Verify if the deferred portion is UPR-100-N-31, which was initially planned to be on the same remediation schedule as the 116-N-1 Trench and Crib.</p>
40.	Section 1.4.5.1, Page 1.28	<p><b>last sentence, spelling error:</b> Please correct “intuitional” to “institutional”.</p>
41.	Section	<p>Please include the following as “Issue 8”</p>

Number	Page	Comment
	1.4.5.4, page 1.30:	<p><b>Issue 8.</b> The lists of non-radionuclide contaminants of concern (COCs) for the 100-NR-1 Trenches and Cribs (116-N-3 and 116-N-1) were not adequate; and therefore not protective of the environment. Since the Cleanup Verification Package (CVP) has yet to be completed for UPR-100-N-31 Unplanned Release, there is an opportunity to rectify this inadequacy, and re-evaluate the COCs for the site.</p> <p><b>Action 8.</b> The non-radionuclide list of contaminants of concern (COCs) which has been identified for UPR-100-N-31 Unplanned Release will be expanded to include the following constituents: antimony, arsenic, barium, boron, cadmium, calcium, chromium (total), chromium (VI), lead, magnesium, mercury, selenium, silver, sodium, strontium, tin, zinc, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate. These are also the COCs which Ecology has identified (via draft permit conditions) to be monitored for in the groundwater for the 1301-N site.</p>
42.	Section 1.4.5.4, page 1.30:	<p>Please include the following as "Issue 9":</p> <p><b>Issue 9.</b> The next steps in the Hanford Past Practice (HPP) Strategy, DOE/RL-91-40, Revision 0, for the 1301-N site are to assess the accumulated data and determine minimum data needs. Ecology's assessment of the accumulated data is that additional field investigations will be required at 100-N Area.</p> <p><b>Action 9.</b> The requirement for the Focused Feasibility Study (FFS) will be incorporated into the 1301-N chapter of the Hanford Facility Resource Conservation and Recovery Act Draft Permit (Site-Wide Permit). The FFS will have to consider the alternative of capping the unit if necessary to protect human health and the environment. Administratively, a permit modification is necessary to support completion of Hanford Federal Facility Agreement and Consent Order Milestone M-16-55, "Complete the interim response actions for the 100 Area" (12/31/2012).</p>
43.	Section 1.4.6.1 Pg. 1.30	<p>Add text:</p> <p>"An extensive effort was recently made to conduct historical research review of documents, photographs, and construction drawings to investigate sodium dichromate use in the 100-D/DR Reactor Area. This investigation identified at least 31 potential point source locations for sodium dichromate contamination, including ten primary potential sources."</p>
44.	Section 1.4.6.4, Pg. 1.33	<p>Issue 8: Change text to, "Groundwater monitoring data indicate there is an unidentified chromium vadose source in the 100-D Area, near <u>possibly in the vicinity</u> of the demolished 190-DR clear wells."</p>

Number	Page	Comment
45.	Section 1.4.6.4, Pg. 1.33	Action 8-1: Change text to: "Aggressively search for the vadose zone source of chromium in the 100-D area by conducting field investigations, which include follow-up on information gathered through the historical research investigation."
46.	Section 1.4.6.4 Pg. 1.33	<p>DOE recently received \$10 million from Congress to address contaminant migration to the Columbia River. One of the proposals submitted involved refining the location of the chromium source through geophysical methods. The peer review panel rejected this proposal, but in order to aid the search for chromium suggested research to define the geologic and geochemical vadose zone environment in the 100-D Area.</p> <p>Add Action 8-2: "Perform additional geologic and geochemical investigation of the vadose zone in the 100-D Area."</p> <p>Action Due: 12/2007</p>
47.	Section 1.4.7.1	<p>The text states, "Additional site characterization activities for the remaining soil sites and solid waste burial grounds will be initiated in 2006". Follow this up with an issue and associated action:</p> <p>Add Issue: "The remaining soil sites and solid waste burial grounds in the 100-H Area have not been adequately characterized."</p> <p>Add Action: "Initiate additional site characterization activities in 2006 for the remaining soil sites and solid waste burial grounds."</p> <p>Action Due: 12/2006</p>
48.	Section 1.4.7.2, Pg. 1.34, Para 2	<p>The recently published report on the efficiency of the pump-and-treat systems (<i>Calendar Year 2005 Annual Summary Report for the 100-HR-3, 100-KR-4, and 100-NR-2 Operable Unit Pump-and-Treat Operations</i>, DOE/RL-2006-08, Rev. 0) indicates that uranium concentrations were above the MCL in two wells and nitrate concentrations were above the MCL in four wells.</p> <p>Change text to: "Secondary contaminants uranium, technetium-99, and nitrate have also declined, and now only a single well adjacent to the 183-H basins exceeds the maximum contaminant limits with only a few wells now exceeding the maximum contaminant limits."</p>
49.	Section	Add issue: The Washington State Ambient Water Quality

Number	Page	Comment
	1.4.7.2 Pg. 1.34	<p>Standard for chronic exposure to chromium changed from 11 µg/L to 10 µg/L for chromium. This is a change in a standard that was identified as an ARAR in 100 Area decision documents (1995 ROD as Amended in 1997, 1996 ROD for Groundwater at 100-HR-3 and 100-KR-4). The first CERCLA 5-year review report states that this change is not believed to call into question the protectiveness of the groundwater pump-and-treat remedy. However, comments responses in the first 5-year review refer to studies indicating potential injury to fall Chinook salmon at hexavalent chromium concentrations between 11 µg/L and 24 µg/L.</p> <p><u>Add</u> – “Action: DOE shall revisit this issue by providing scientific justification or conducting scientific review to determine if 11 µg/L is insignificantly different from 10 µg/L and address whether the previous standard of 11 µg/L is protective of the health of aquatic organisms”.</p> <p>Action Due: 12/2006</p>
50.	Section 1.4.7.4, Pg. 1.36	<p>Data collected at the H-Area pump-and-treat system show that wells screened in the deeper Ringold aquifer are significantly elevated in chromium (above the RAO and as high as 96 µg/L) compared to shallow wells screened in the Hanford Formation Aquifer. Recommendations for improving the 100 Area groundwater remediation were recently made in <i>Calendar Year 2005 Annual Summary Report for the 100-HR-3, 100-KR-4, and 100-NR-2 Operable Unit Pump-and-Treat Operations</i> (DOE/RL-2006-08, Rev. 0), and specify that action must be taken to assess the communication between the Ringold and Hanford aquifers. Add action under Issue 12:</p> <p>“Action 12-2: Conduct aquifer/tracer test in a well cluster to assess communication and flux between the deep Ringold confined aquifer and the upper Hanford Formation aquifer.”</p> <p>Action Due: 12/2007</p> <p>“Action 12-3: Remediate chromium in the deep aquifer to the established remedial action objective.”</p> <p>Action Due: 09/2009</p>
51.	Section 1.5, p. 1.40, 1 <sup>st</sup> bullet and related statements	<p>Delete the statement: The exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the time of remedy selection are still valid for all operable units.</p> <p>Replace the statement with: Evaluation of changes in exposure assumptions, toxicity data and cleanup levels has not been</p>

Number	Page	Comment
		<p>completed. A newer version of the Model Toxics Control Act (WAC 173-340) was promulgated in 2001, after the last 5-year ROD review and after remediation of many of the 100 Area sites. The WAC 174-340 regulations changed significantly in 2001 with regard to (1) calculation of soil cleanup levels; (2) consideration of the risk posed by additional potential pathways of exposure: dermal, inhalation, and terrestrial ecological; and (3) requirements associated with the use of site-specific parameters, alternate fate and transport models, and empirical demonstrations. The 1996 WAC 173-340 did not specify the requirements for assessing protection of groundwater with alternate approaches. The application of the amended WAC 173-340 frequently results in more practicable soil cleanup levels than the 1996 WAC 173-340, alleviating the need for site-specific fate and transport modeling. The newly promulgated requirements are necessary for protecting terrestrial ecological receptors from the impacts of contaminated soil.</p> <p><u>Action:</u> Re-examine all Cleanup Verification Packages (CVPs) from remediated (or interim remediated) sites in the 100 areas; compare verification data, from samples taken prior to backfilling, with default values for soil calculated using the methods in sections WAC 173-340-720 through -750 of the 2001-amended WAC 173-340. Also, compare CVP data with ecological protection values given in WAC 173-340-7490 through -7494. Present the comparison to Ecology and EPA prior to completion of the River Corridor Baseline Risk Assessment (RCBRA), to obtain regulatory approval of the conclusions of the RCBRA.</p> <p>This comparison will allow consideration of the many revisions in toxicity values since the time of remediation, as well as provide a comparison with revised ARARs.</p>
52.	Section 1.5, p. 1.40, 2 <sup>nd</sup> bullet and associated statements	<p>Delete the statement: No new information has come to light that could call into question the protectiveness of the remedy for all operable units except for 100-NR-2.</p> <p>This statement cannot be true, because there is currently a River Corridor Baseline Risk Assessment in progress to address this very issue. Note also that this 5-y ROD review document does not mention the RCBRA by name or provide a description of the risk assessment.</p> <p>Replace the statement with: The River Corridor Baseline Risk Assessment (RCBRA) is in progress to evaluate protectiveness of remediation activities in the 100 and 300 areas. The RCBRA will evaluate post-remediation contaminant concentrations with regard to protection of human health and the environment, as well as provide support for final cleanup levels for interim-remediated and unremediated sites.</p>
53.	Table 1.5	There is no action item to carry out groundwater

Number	Page	Comment
		remediation once the characterization of the “horn area” is complete. There is also possibility of conducting both remediation and characterization simultaneously. There fore appropriate action items to remediate the “horn area” must be identified.
54.	Table 1.5	<p>There is no action item to carry out groundwater remediation once the characterization of the “horn area” complete. There is also possibility of conducting both remediation and characterization simultaneously. There fore appropriate action items to remediate the “horn area” must be identified.</p> <p>Also identify any presence of deep Cr. Contamination in the area and action items to address it.</p>
55.	Pages 1.41 – 1.43, Table 1.5	General comment. Issues and actions that will be added to the review as a result of comments should also be added to the table and renumbered.
56.	Section 1.7, page 1.44, last paragraph:	<p>Please revise the paragraph as follows:</p> <p>“For the 100-NR-2 Groundwater Operable Unit, the remedial action objectives for the strontium-90 contaminant in the groundwater established in the ROD are being met. Alternative remedies are being tested. Institutional controls are in place to prevent use for the groundwater. Therefore, for this operable unit, the remedy is considered protective in the short-term because institutional controls are in place. <u>However, in order for the remedy to be determined to be protective in the long-term, a Focused Feasibility Study must be completed, and a final remedy must be selected.</u>”</p>
57.	Page 1.15, Section 1.4.1	<p>Revise text to include “Maintain Ecology approved groundwater monitoring well networks to monitor pump and treat operations and impacts to groundwater” in the description of the 100-NR-2 OU selected remedy.</p> <p>The following is recommended text: “The remedy for 100-NR-2 is the continuation of a pump-and-treat system for strontium-90, which was begun as a removal action in 1995, the disposal of free-floating petroleum from any monitoring wells, removal of petroleum contaminated solid waste (including necessary treatment and disposal to ERDF), and maintenance of Ecology approved groundwater monitoring well networks to monitor pump and treat operations and impacts to groundwater.”</p>
58.	Page 1.28, Section 1.4.5.1, 1 <sup>st</sup>	The first two sentences state: “The 116-N-1 and 116-N-3 sites were remediated; at the time of this review was in process, and 116-N-3 had been backfilled and revegetated. Backfilling and

Number	Page	Comment
	paragraph	<p>re-vegetation of the 116-N-1 waste site is scheduled to occur in 2006.” Remediation has not been completed at either unit as contaminated vadose zone and groundwater remain associated with each unit. Therefore, the statement should be re-written to reflect this.</p> <p>Recommended wording is: “Remediation of the 116-N-1 and 116-N-3 sites has been initiated. While the 116-N-3 site has been backfilled and revegetated, contamination remains (i.e., vadose zone and groundwater) and thus remediation is not complete. At the time this review was in process, backfilling of the 116-N-1 site has been initiated and is scheduled to be completed in 2006.”</p>
59.	Page 1.33, Section 1.4.7.1	<p>The text states: “All of the high-priority 100-H Area liquid waste sites, including cribs, ditches, trenches, and retention basins, have been remediated and backfilled with clean soil.” Remediation has not been completed at the 183-H Solar Evaporation Basin as contaminated vadose zone and groundwater remain associated with the unit. Therefore, the statement should be re-written to reflect this.</p> <p>Recommended wording is: “Remediation of all the high-priority 100-H Area liquid waste sites, including cribs, ditches, trenches, and retention basins has been initiated. While the all the high-priority units have been backfilled, contamination remains (i.e., vadose zone and groundwater) associated with the 183-H Solar Evaporation Basins and post-closure maintenance of the unit is required.”</p>
60.	Page 1.33, Section 1.4.6.4	<p>Recommendations for improving the 100 Area groundwater remediation were recently made in <i>Calendar Year 2005 Annual Summary Report for the 100-HR-3, 100-KR-4, and 100-NR-2 Operable Unit Pump-and-Treat Operations</i> (DOE/RL-2006-08, Rev. 0). Specifically, one recommendation was for the existing pump-and-treat system to be expanded and an electrocoagulation system to be applied which is capable of treating high flow rates.</p> <p>Therefore, it is recommended that an additional issue and action be included in the review. Recommended wording for the issue is: “Issue 12: Contaminant sources are currently unknown and chromium concentrations remain well above the remedial action objective. A proposal has been developed to conduct a field test to apply an electrocoagulation system to accelerate remediation of the northeastern chromium plume.”</p> <p>Recommended wording for the action is: “Action 12-1: Propose and implement an Ecology-approved treatability test plan for expanding the existing pump-and-treat system and applying an electrocoagulation system which is capable of treating high flow rates.”</p>

Number	Page	Comment
61.	Page 1.33, Section 1.4.6.4	<p>Recommendations for improving the 100 Area groundwater remediation were recently made in <i>Calendar Year 2005 Annual Summary Report for the 100-HR-3, 100-KR-4, and 100-NR-2 Operable Unit Pump-and-Treat Operations</i> (DOE/RL-2006-08, Rev. 0). Specifically, one recommendation was for immobilizing chromium mass in the ISRM plume by circulating a strong reductant, calcium polysulfide, in the aquifer.</p> <p>Therefore, it is recommended that an additional issue and action be included in the review. Recommended wording for the issue is: "Issue 13: Chromium mass in the ISRM plume is mobile and chromium concentrations remain well above the remedial action objective."</p> <p>Recommended wording for the action is: "Action 13-1: Propose and implement an Ecology-approved treatability test plan for immobilizing chromium mass in the ISRM plume by circulating a strong reductant (e.g. calcium polysulfide), in the aquifer."</p>
62.	Page 1.36, Section 1.4.7.4	<p>Due to the configuration of groundwater monitoring wells in relation to the 183-H Solar Evaporation Basin and the current groundwater monitoring program, it is unknown if 1) the remedies are protective of groundwater resources and 2) if the soil and groundwater remedies are meeting groundwater protection standards of WAC 173-303-645. The deficiencies associated with the unit's groundwater monitoring network and program are evidenced by Ecology's draft permit conditions for this unit. Therefore, it is recommended that an additional issue be included which addresses the deficiencies associated with the groundwater monitoring networks and programs.</p> <p>The following wording is recommended for an additional issue: "Issue 13. The groundwater monitoring well network and program are not adequate to monitor waste site contamination impacts to groundwater."</p> <p>The following wording is recommended for an additional action: "Action 13-1. Submit a groundwater monitoring plan for Ecology approval that specifies network and program monitoring that will satisfy groundwater protection standards of WAC 173-303-645."</p>
63.	Page 1.36, Section 1.4.7.4	<p>At least two wells were constructed in 1962 in the area known as the "horn". Wells 699-97-43 and 699-96-49 were constructed with perforations extending across the Ringold/Hanford formation contact that separates the confined and unconfined aquifers. Well 699-96-49 was remediated in 1977 by cementing across the contact. Well 699-97-43 was remediated in 1976 by installing a cement plug from 83-100 ft. depth. However, the conduit from the Hanford unconfined aquifer to the deeper aquifer remains open. It is recommended that an additional issue</p>

Number	Page	Comment
		<p>be included which completes the remediation of well 699-97-43.</p> <p>The following wording is recommended for an additional issue:  “Issue 14. Remediation of groundwater well 699-97-43 has not been completed (i.e., the conduit from the Hanford unconfined aquifer to the deeper aquifer remains open).”</p> <p>The following wording is recommended for an additional action:  “Action 14-1. Complete remediation of groundwater well 699-97-43.”</p>
64.	Page 1.36, Section 1.4.7.4	<p>At least two wells were constructed in 1962 in the area known as the “horn”. Wells 699-97-43 and 699-96-49 were constructed with perforations extending across the Ringold/Hanford formation contact that separates the confined and unconfined aquifers. Well 699-96-49 was remediated in 1977 by cementing across the contact. However, considering water level measurements, there is concern that the remediation (cement plug) may not be providing an effective seal between aquifers. Therefore, it is recommended that an additional issue be included which evaluates the effectiveness of the remediation of well 699-96-49.</p> <p>The following wording is recommended for an additional issue:  “Issue 15. Remediation of groundwater well 699-96-49 occurred in 1977 by cementing across the confined and unconfined aquifer contact. Based on water level measurements, the effectiveness of the remediation is unknown.”</p> <p>The following wording is recommended for an additional action:  “Action 15-1. Evaluate the effectiveness of the 1977 remediation of well 699-96-49.”</p>
65.	Page 1.36, Section 1.4.7.4	<p>Well 699-99-42 may be an old farm well. The information provided in the Hanford Well Information System (HWIS) database indicates the well is a 12” pipe, the depth to bottom is 35 feet, and the well is dry. The HWIS also indicates that construction design is unknown. It is unknown if this well is providing a conduit for contaminant migration. It is recommended that this well be evaluated for decommissioning priority.</p> <p>The following wording is recommended for an additional issue:  “Issue 16: Well 699-99-42 should be evaluated to determine its decommissioning priority.”</p> <p>The following wording is recommended for an additional action:  “Action 16-1. Decommission well 699-99-42 as prioritized.”</p>
66.	200-1 4 <sup>th</sup> ¶	<p>To this ¶ (“This five-year review . . . not included in this review.”) add the following two sentences:  “The Tri-Parties are integrating the closure of inactive treatment</p>

Number	Page	Comment
		storage, and disposal facilities with waste site cleanup [note: derived from TPA, but could also refer to the 1998 200 Areas RI/FS Implementation Plan]. The Tri-Parties are also applying a strategy for groundwater cleanup that integrates the authorities and requirements of the AEA, CERCLA and RCRA [ref. to Hanford Groundwater Strategy].”
67.	Pg. 2.4 Pg. 2.5	The operable unit designations in the Figures 2.1 and 2.2 appear to be archaic designations, and should be updated. Also, it is generally difficult to display the [process-based] 200 Area operable units w/o color-coding them.
68.	Table 2.2 Pg. 2.8 – 2.12	There are 2+ pages discussing the canyon processes, which can be appropriate because these were the central waste generating processes. However, there should be (and there is no) corresponding description of the operable units. For example, the non-Hanford reader will not know what a “Scavenged Waste” (200-TW-1) is. A concise description of the different types of waste sites (cribs, chemical sewers, ponds, unplanned releases, etc.) would be helpful. Also note that despite the 2+ pages discussing the canyons, they are not the focus of the 5-year review. It would also be appropriate to relate the groundwater operable units: especially the 2 that have RODs: to the canyons, waste sites/types, and operable units.
69.	200-ZP-1	Although Table 2.5 acknowledges other sources of contamination, and other contaminants, the entire focus of the section is on carbon tetrachloride. This is the largest groundwater concern in the 200-ZP-1 operable unit. This focus, however, leads to an incomplete protectiveness evaluation. A DQO supplement to address high Tc-99 (as well as Cr, NO3) is underway, but is only briefly mentioned. The evaluation should be revised to increase the emphasis on the DQO.
70.	200-ZP-1	The entire emphasis is on characterization, with little to no attention paid to remediation of the [other] contaminants and what specific technology development might be needed to effectively treat all the contaminants in 200-ZP-1. Pump & Treat was an Expedited Response Action (ERA) agreed to by parties in ~1995, but the part of that agreement to develop more effective technologies to replace the P&T has been ignored and shouldn't be. Characterization has shown that a P&T that addresses only the top 50 ft. of an aquifer that is over 200 ft. thick ignores CCl4 that is present deeper in the aquifer and all the way to its base in certain areas. Remediation of [potential contaminant source] metals in soils, especially radioactive isotopes of these metals in the deep vadose zone like in the 200 Areas, has not been studied to the extent it should have been. The text should be revised to give greater emphasis to

Number	Page	Comment
		technology development.
71.	200-ZP-1	<p>No mention is made of vadose zone characterization being conducted under the RFI/CMS program for tank farms which are sources of contaminants in the groundwater in 200-ZP-1. Although this characterization is being done under RCRA regulations, that are outside of the scope of the Five-year ROD review, the Hanford Tri-Party Agreement gives major emphasis to the CERCLA-RCRA interface. The text should be revised to integrate into the technical assessment, the RCRA characterization program.</p> <p>One specific element that should be emphasized in the text is the use of high resolution resistivity/surface geophysics (HRR/SGE). It could be helpful in identifying sources in and surrounding tank farms and it should probably be at least mentioned. The T Farm demonstration of HRR/SGE included not only tanks, but several liquid disposal sites surrounding this farm.</p>
72.	200-ZP-1	<p>Given the vertical distribution of contaminants in the aquifer that is just now being discovered (pg. 2.22) , further characterization of the deeper aquifer is needed to revise the conceptual model that forms the basis for any computer modeling that might be performed. This should be added to the Recommendations (pg. 2.46).</p>
73.	2.4.3.3	<p>The Technical Assessment Summary of 200-PO-1 incompletely integrates the previous actions under the Resource Conservation and Recovery Act (RCRA).</p> <p>Where the text states that “Remediation of the contaminated groundwater” has not been evaluated since then, it would be appropriate to provide the background:</p> <ul style="list-style-type: none"> <li>• Because this OU is designated as a RCRA Past Practice OU, a RCRA CMS was prepared (and approved) in 1996.</li> <li>• A draft permit modification was prepared by DOE in 1997 and submitted to Ecology, but was never incorporated in the Hanford Facility RCRA Permit.</li> <li>• The recommended action in the draft permit modification was continued monitoring and institutional controls for iodine-129 and tritium</li> <li>• Since the draft permit modification was submitted there have been several technical and non-technical developments that potentially impact recommendations for the 200-PO-1 operable unit: <ul style="list-style-type: none"> <li>• Both EPA and DOE have released guidance documents for developing monitored natural attenuation remedies (give ref).</li> <li>• EPA has released guidance on institutional controls</li> <li>• DOE has prepared and submitted TPA-required</li> </ul> </li> </ul>

Number	Page	Comment
		<p>reports on the available technologies to treat tritium (M-26) and iodine [don't have the milestone #]</p> <ul style="list-style-type: none"> <li>• Continued monitoring and characterization of the groundwater and vadose zone have contributed to a better conceptual site model of the sources and migration of contamination overlying and within the 200-PO-1 OU</li> <li>• The groundwater "divide" under the B Pond, that originally distinguished between the 200-PO-1 and 200-BP-5 OUs, has disappeared</li> </ul> <p>It might also be worth noting that although nitrate was dropped as a COC in the 1996 CMS, it would probably be considered in a current assessment.</p>
74.	2.36	<p>2<sup>nd</sup> to last ¶: the fact that in 1998 the <i>Screening Assessment and Requirements for a Comprehensive Assessment</i> concluded that there is no adverse impact, is of little significance to this CERCLA 5-year review. We recommend deleting the sentence (which is a 1-sentence ¶).</p>
75.	2.3.6	<p>Given the regulatory and technical history for 200-PO-1, especially that there is no remedial decision, the protectiveness evaluation should be "deferred."</p>
76.	2.52	<p>We recommend adding text to the Protectiveness Evaluation: "Ecological risk at the Columbia River is not being addressed in an integrated manner, at least to the satisfaction of stakeholders. This has surfaced as comments on the Columbia River Corridor Baseline Risk Assessment and during 2005 workshops on risk integration."</p> <p>The recommended action should be for DOE to prepare an integration plan, and present it through public processes.</p>
77.	Table 2.10	<p>Add a heading and a bullet for <b>200-UP-1</b>:</p> <ul style="list-style-type: none"> <li>• "Take advantage of the current pump and treat system at 200-UP-1 to address the revised, current MCL of 30 ug/L for uranium. Better integrate the interim measure for technetium-99 at S/SX Tank Farm, and evaluate other opportunities for pumping to remediate technetium-99."</li> </ul>
78.	Table 2.10	<p>Add a heading and a bullet for <b>200-PO-1</b>:</p> <p>"Develop data quality objectives, and prepare a plan to update the analysis of alternatives included in the 1996 CMS and 1997 draft permit modification. Reconsider the original recommendations considering more recent guidance and a conceptual site model that has improved because more recent characterization and monitoring."</p>
79.	Page 3.3, Section 3.3	<p>The first complete paragraph identifies uranium as the "primary contaminant" in many of the waste sites and "additional contaminants such as plutonium, beryllium, metals, and petroleum". The 300-FF-1 and 300-FF-5 Operable Unit ROD identifies organics (trichloroethene, chloroform, 1,2-</p>

Number	Page	Comment
		dichlorethylene (cis), 1,2-dichloroethylene (total), dichloroethene (trans), etc.) as groundwater contaminants. It is recommended that this paragraph identify chlorinated organics as contaminants.
80.	Page 3.5, Table 3.2	<p>The table identifying the 300-FF-1 and FF-5 operable unit RAOs appears to have been formatted as Table 4 from the 300-FF-2 operable unit ROD (page 32). However, the position of the regulatory citation in the 5 year review has been changed and could thus be interpreted to change the meaning of the RAO.</p> <p>Specifically, the ROD RAO description states: "This RAO will be achieved through compliance with the MTCA cleanup values for organic and inorganic chemical constituents in soil to support industrial land use (WAC 173-340-745), and the Draft EPA and the draft Nuclear Regulatory Commission proposed protection of human health standards of 15 mrem/year in soils above background for radionuclides." It is recommended that the wording in Table 3.2 be changed to the exact language used in the ROD.</p>
81.	Page 3.5, Section 3.4.1.3	<p>The last sentence on the page states: "Institutional controls are required as part of the remedy because the cleanup will leave waste in place and not allow for unrestricted use." It is recommended that context be provided. In particular, it is recommended that a statement be added which identifies the remediation timeframe as specified by the ROD by the following: "Preliminary estimates for the waste sites in 300-FF-1 indicate that the sites could be cleaned up in approximately 4 to 7 years. Modeling of the 300-FF-5 groundwater indicates that remediation time frames vary from 3 to 10 years."</p>
82.	Section 3.5.3, p. 3.15, 2 <sup>nd</sup> bullet and associated statements	<p>Delete all of the statements: No, no new information has come to light that would call into question the protectiveness of the remedy.</p> <p>Replace with: Yes; land use changes, including some residential use, have been proposed by the city of Richland.</p> <p><u>Actions:</u></p> <p>A. Compare contaminant concentrations in source units and remediated areas with 2001 WAC 173-340 soil cleanup levels for direct contact, protection of groundwater, and protection of ecological receptors; use default values for soil as specified in sections WAC 173-340-720 through -750 and -7490 through -7494 of the 2001-amended WAC 173-340.</p> <p>B. Develop revised exposure scenarios consistent with the City of Richland plan changes, and evaluate the risk for protectiveness.</p>
83.	Page 3.7, Table 3.3	The table identifying the 300-FF-2 operable unit RAOs appears to have been taken from the 300-FF-2 operable unit ROD (Table

Number	Page	Comment
		<p>4, page 32). It is recommended that exact wording from the ROD be used in Table 3.3.</p> <p>For example, in the first row describing RAO 1, it is recommended that the WAC citation placed after <i>Model Toxic Control Act</i> be deleted as that particular regulation was not specified in Table 4, row 1 of the 300-FF-2 operable unit ROD.</p> <p>As another example, it is recommended that in the second row describing RAO 2, the first sentence read as follows (and as stated in the 300-FF-2 operable unit ROD): “Prevent migration of contaminants through the soil column to groundwater and the Columbia River such that concentrations...”.</p>
84.	Page 3.8, Section 3.4.2	<p>The second sentence states: “The seeps and the pore water are routinely monitored by DOE and Washington Department of Health.” The sentence can be interpreted to imply that all seeps and pore water carrying contaminated discharges to the river are monitored. This is not the case. For example, chlorinated hydrocarbons that are very likely discharging into the river at the base of the aquifer are not being monitored as they are very likely being discharged into the river well beyond the shoreline.</p> <p>Recommended re-wording is: “Near-shore seeps and pore water are sampled at a number of locations and are scheduled for regular monitoring. Monitoring is condition dependent (i.e., aquifer tubes cannot be sampled during high river levels) and performed by DOE and Washington Department of Health.”</p>
85.	Page 3.8, Section 3.4.2	<p>The third sentence states: “Neither agency has identified any actual or potential acute or chronic effects from contaminant discharges to the Columbia River and its shoreline.” Monitoring of the base of the unconfined aquifer at the groundwater and surface water interface (which likely occurs in the river where the river bed intersects the Ringold lower mud and not at the shore-line) is not being conducted. The statement should more accurately put the observation in context.</p> <p>Recommended re-wording is: “From the near-shore seeps and pore water monitoring conducted, neither agency has identified any actual or potential acute or chronic effects from contaminant discharges to the Columbia River’s shoreline.”</p>
86.	Page 3.8, Section 3.4.2	<p>Regarding potential acute or chronic effects from contaminant discharges to the Columbia River’s shoreline, the text should identify that off-shore monitoring is not being conducted and therefore, it is unknown if there are any potential acute or chronic effects from contaminant discharges to the Columbia River.</p> <p>Note: Chlorinated hydrocarbons in well 399-1-16B have exceeded drinking water standards since construction in 1987.</p>

Number	Page	Comment
		The chlorinated hydrocarbon contaminant source is apparently associated with the 300 Area Process Trenches (300 APT).
87.	Page 3.8, Section 3.4.2.1	<p>The first sentence of the 3<sup>rd</sup> paragraph states: "The remedy selected was monitored natural attenuation with institutional controls to prevent human exposure to groundwater." The use of the term "monitored natural attenuation" is inappropriate. At the time this ROD was made, the remedy and term "monitored natural attenuation" (MNA) did not exist. Furthermore, when the remedy and term MNA was developed, it is doubtful that the 300 Area groundwater contamination would have met MNA criteria and would therefore, not have been selected as the remedy.</p> <p>It is recommended that the sentence be re-worded as: "The remedy selected was natural attenuation with continued groundwater monitoring and institutional controls to prevent human exposure to groundwater."</p>
88.	Page 3.8, Section 3.4.2.1	<p>The first sentence of the 3<sup>rd</sup> paragraph states: "The remedy selected was monitored natural attenuation with institutional controls to prevent human exposure to groundwater." The last paragraph on the page states: "The interim remedy selected as part of the initial ROD for the 300 Area NPL site remains appropriate for the operable unit. The remedial action objectives for the operable unit also remain appropriate for the foreseeable future."</p> <p>From the way the text is written, it is not understood if the statements reflect current positions/conclusions/determinations or if they reflect positions/conclusions/determinations made in 1996. The text should be clarified. Furthermore, if the text reflects current positions/conclusions/determinations, it is not understood how the selected remedy has ensured protection of ecological receptors when the ecological assessment has not been completed.</p>
89.	Page 3.9, Section 3.4.2.1	The section does not identify observed (from groundwater monitoring) impact of all of the source removals in the mid-90s. Groundwater contamination concentrations not only didn't decline as predicted, but elevations were observed. Such observations were likely the result of source removals combined with surface- and ground-water mobilizing contaminants in the vadose zone.
90.	Page 3.10, Section 3.4.4	<p>The fourth bullet regarding "installation of new groundwater monitoring facilities" includes an identification of the installation of 8 additional aquifer tubes along the 300 Area shoreline. The text describes the shoreline monitoring as providing "comprehensive coverage for monitoring groundwater as it passes across the groundwater/river water interface".</p> <p>Recommended re-wording is: "...providing comprehensive</p>

Number	Page	Comment
91.	Section 3.5, General Comment	<p>near-shore coverage for monitoring groundwater as it passes...".</p> <p>A new section needs to be added to Section 3.5 which addresses chlorinated hydrocarbons. The section should include the following information and observations. Chlorinated hydrocarbons in well 399-1-16B have exceeded drinking water standards since construction in 1987. The chlorinated hydrocarbon contaminant source is apparently associated with the 300 Area Process Trenches (300 APT) and has a potential for releasing vinyl chloride to the Columbia River.</p>
92.	Page 3.14, Section 3.5.3	<p>The first bullet (related to protectiveness determination criteria) uses the term "monitored natural attenuation". It is recommended that this term not be used as the remedy did not exist when "groundwater monitoring and natural attenuation" with institutional controls was selected as the remedy.</p> <p>The following wording is recommended: "No, natural attenuation is not functioning as planned."</p>
93.	Page 3.14, Section 3.5.3	<p>The 300-FF-5 ROD selected remedy includes institutional controls. Currently, it is unknown if institutional controls are functioning as intended in relation to protectiveness of ecological receptors.</p> <p>It is recommended that an additional item be listed under the first bullet which states: "- 300-FF-5 ROD Unknown whether institutional controls are protective of ecological receptors".</p>
94.	Page 3.15, Section 3.5.3.	<p>The 3<sup>rd</sup> sentence in the paragraph states: "In addition, confirmation that access and institutional controls are in place and successfully prevent exposure." The sentence needs to indicate that the controls prevent exposure to humans.</p> <p>Recommended wording is: "In addition, confirmation that access and institutional controls are in place and successfully prevent human exposure."</p>
95.	Page 3.15, Section 3.5.3	<p>The second bullet addresses validity of exposure assumptions, toxicity data, cleanup levels, and remedial action objectives. Since the last 5 year ROD review, EPA decreased the MCL for uranium. Also since the last 5 year ROD review, the technical community has acknowledged (through publication) a lack of understanding of uranium fate and transport. Also since the last 5 year ROD review, there has been an acknowledgement that uranium has not attenuated as previously modeled. Also since the last 5 year ROD review, the City of Richland has identified the need for re-evaluation of the cleanup.</p> <p>At a minimum, for the reasons listed above, supporting assumptions, cleanup levels, data, and remedial action objectives, the answer associated with the three RODs should be "no".</p>

Number	Page	Comment
96.	Page 3.15, Section 3.5.3	<p>On page 3.14, it is acknowledged that natural attenuation isn't functioning as planned. This acknowledgement is based on new information (i.e., monitoring data). Since the last 5 year ROD review, EPA decreased the MCL for uranium. EPA's basis for the change can be considered to represent new information. Therefore, significant additional information has come to light that could call into question the protectiveness of the remedies chosen for all three RODs. Therefore, the answer associated with the three RODs should be "yes".</p>
97.	Page 3.16, Table 3.4	<p>On the first row under the column entitled "Affects Current Protectiveness", the answer should be "unknown" for issue 1 and action 1-1.</p>
98.	Page 3.16, Table 3.4	<p>The issue associated with characterization and remediation of chlorinated hydrocarbons should be added to the table.</p> <p>The following wording is recommended: "Issue 3. Additional characterization of the chlorinated hydrocarbon groundwater contamination is needed to support remedy selection for this contamination."</p> <p>The following wording is recommended: "Action 3-1. Implement the CERCLA characterization process that will allow development of a conceptual model, evaluation of human and ecological exposure, and evaluation of treatment and/or remedy alternatives."</p>
99.	Page 3.16, Table 3.4	<p>A Project Work Plan entitled <i>300 Area Uranium Plume Treatability Demonstration Project: Uranium Stabilization Through Polyphosphate Injection</i> (April 2006, PNNL-SA-49954) has been posted on the EM-21 website. Prior to the implementation of this demonstration, it is recommended that the proposal be submitted to EPA for review and approval.</p> <p>Therefore, the following is recommended for an additional issue and action: "Issue 5. Uranium stabilization through polyphosphate injection is currently being considered as a potential groundwater remediation.</p> <p>The following is recommended: "Action 5-1. After the LFI findings and conclusions have been evaluated and if uranium stabilization through polyphosphate injection is recommended for groundwater remediation, propose and implement an EPA-approved treatability test plan."</p>
<p><b>END</b></p>		