YN ERWM Comments on Remedial Investigation/Feasibility Study for the 100-NR-1 and 100-NR-2 Operable Units (DOE/RL-2012-15, Rev. 0 Draft, 2023)

General Comments

1. The Yakama Nation (YN) Environmental Restoration/Waste Management (ER/WM) has been told informally by all of the Tri-Parties that the 100-N proposed plan will remove permeable reactive barrier (PRB) injection from all the cleanup alternatives. While we appreciate the heads up, we expect that this drastic change from the current RI/FS will be provided in writing as a complete revision or an addendum to the RI/FS. Adequate time must be given for review and comment on this material.

   The proposed plan should not proceed until all information on alternatives, especially the removal of PRB from the remediation, is presented, reviewed, and commented on by the regulators and the Yakama Nation. The National Contingency Plan (NCP) states, "Feasibility study. (1) The primary objective of the feasibility study (FS) is to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented to a decision-maker and an appropriate remedy selected. The lead agency may develop a feasibility study to address a specific site problem or the entire site. The development and evaluation of alternatives shall reflect the scope and complexity of the remedial action under consideration and the site problems being addressed. Development of alternatives shall be fully integrated with the site characterization activities of the remedial investigation described in paragraph (d) of this section. The lead agency shall include an alternatives screening step, when needed, to select a reasonable number of alternatives for detailed analysis." It would be inconsistent with the NCP to present a draft proposed plan that does not include PRB when the current RI/FS includes PRB in every alternative except the no action. In addition, it is not possible for YN ER/WM to provide complete comments on this document knowing that such a dramatic change is planned.

2. It appears that some applicable or relevant and appropriate requirements (ARARs) have not been fully considered in the document. We believe that there are solutions to the issues we are noting but the concerns must be addressed if the final remedy at 100-N is going to meet the CERCLA threshold criteria.
   a. Section 404 of the Clean Water Act – EPA put out guidance in 1988 titled, *CERCLA Compliance with Other Laws Manual: Interim Final* (https://semspub.epa.gov/work/HQ/174076.pdf). Section 3.4 details why section 404 of the CWA is an ARAR that has substantive requirements that must be met if remedial actions require the dredging or filling of waters of the US. As YN ER/WM has already detailed to the Tri-Parties (January 17, 2023 meeting & July 24, 2023 email) the actions taken at the N shoreline constitute filling of the Columbia River and there has been no mitigation offsetting these actions. Section 1.5.3.5 also provides some information on shoreline fill. Avoidance of further filling and mitigation for the actions already taken must be completed. The Yakama Nation ER/WM would be willing to work on developing a special environmental project (SEP) funded by DOE as part of the solution to this issue.
   b. Washington State's groundwater cleanup standards and point of compliance, WAC 173-340-720. As was agreed to at 100-BC, Washington State laws on groundwater cleanup standards and point of compliance are an ARAR. The discussion at 100-BC was focused on hexavalent chromium and it appears that this needs to be expanded at 100-N. In our

specific comments below we discuss why it appears the Cr(VI) plume is connected to the Columbia River.

100-N also has Sr-90 that needs to be considered. Currently the drinking water standard is not being applied at the shoreline wells and aquifer tubes. Washington has designated this section of the Columbia River as a drinking water source under the CWA. In addition, this standard needs to be applied throughout the plume to be consistent with the MTCA ARAR. This either needs to be explained better or the adjustments need to be made to the RI/FS before going to the proposed plan.

c. Section 106 of the National Historic Preservation Act – The Yakama Nation has sent several sets of detailed comments on the importance of this area and the requirement to comply with section 106 of the NHPA. We have attached to those comments again because the requirements are still the same. In addition, it is not possible to complete the 106 process when an entire portion of the remedy is going to be removed (PRB).

3. Protection of human health and the environment- Another CERCLA threshold criterion is the protection of human health and the environment. We have concerns with information/analysis being used for both the human and ecological risk evaluations.
    a. The YN does not believe that current federal and state cleanup levels are fully protective of traditional practices on the site. The YN is currently in discussions with EPA regarding the Yakama Nation Risk Scenario and how differences can be resolved with the original scenario. The current area of focus is the sweat lodge scenario and the proper inputs to be used for evaluating risks of this traditional practice. There is the potential that the results of this work could inform how to better evaluate risks to Yakama people when developing potential remedial goals and cleanup levels.
    b. The evaluation of risks to benthic receptors living in the areas of release from 100-N is inadequate. The 2005 field studies were conducted in a way that no conclusions can be made because the methodology is not based on any standard EPA procedure. According to the report on the work (DOE/RL-2006-26, Rev. 1) the samples were taken like this: "Aquatic macroinvertebrates were sampled during September and October 2005 in the near-shore regions at three locations at the 100-N Area (SDA, immediately downstream of the SPA, and EMA). Macroinvertebrates were also collected at three reference sites: two of these were upstream of the Vernita Bridge (at both the Benton and Franklin County shorelines), and the third was approximately 0.8 km (0.5 mi) downstream of the bridge on the Benton County shoreline. Invertebrates were collected by randomly placing three 0.1 m2 (1.1 ft2) plot frames within a 10-m (32.8-ft) section of shoreline. Samples were collected just below and adjacent to the elevation where periphyton is persistent (green line). River elevation was low during all sampling activities and river flows were 50 to 65 thousand cubic feet per second (kcfs).

    All substrates were placed in a Tutrox square aquatic kick net (45 cm by 22 cm by 25 cm deep [17.7 in. by 8.7 in. by 9.8 in. deep], 800 µm mesh) held downstream of the plot frames. Plots were excavated to a depth of 10 cm (3.9 in.). All substrates were then placed into white plastic sorting trays, and all invertebrates were gathered from the sample using plastic forceps and placed in jars filled with 70 percent isopropyl alcohol. Asiatic clams from each plot were counted according to size class. Any occurrences of crayfish or sculpin also were recorded. Water-quality variables measured included dissolved oxygen, water temperature, and specific conductivity, along with observations

of dominant and subdominant substrates, substrate embeddedness, and presence of macrophytes. Invertebrates were identified in the laboratory using a dissecting scope with keys to order and family (An Introduction to the Aquatic Insects of North America [Merritt and Cummins, 1996]; Fresh-Water Invertebrates of the United States [Pennak, 1978])."

The placing of the contents of the dipnet into a tray and field sorting invertebrates will bias the samples to have only taxa that can be seen easily with the naked eye. While macroinvertebrates are not microscopic, EPA requires samples to be sorted using magnification in a lab because so many taxa get missed in the field. The results of the study appear to confirm that the field sorting missed lots of taxa. Samples had total abundance numbers of 20-74, which is extremely low for the Columbia River. In addition, the low abundance of taxa like oligochaetes is suspicious. Finally, the identification of taxa to only order or family level suggests that the firm conducting the work had little to no taxonomic expertise. Any conclusions from this study should not be used. In addition, the work done in RCBRA did not help resolve if there are risks to benthic invertebrates at 100-N due to the way the studies were done.

YN has provided detailed comments to the Tri-Parties about concerns with the existing PRB injections to the benthos. The ESA Section 10 documentation provided by DOE also revealed similar concerns. The 100-N area of contaminated groundwater upwelling should be investigated using standard accepted biomonitoring tactics so a true understanding of ecological risk can be gained.

Specific Comments

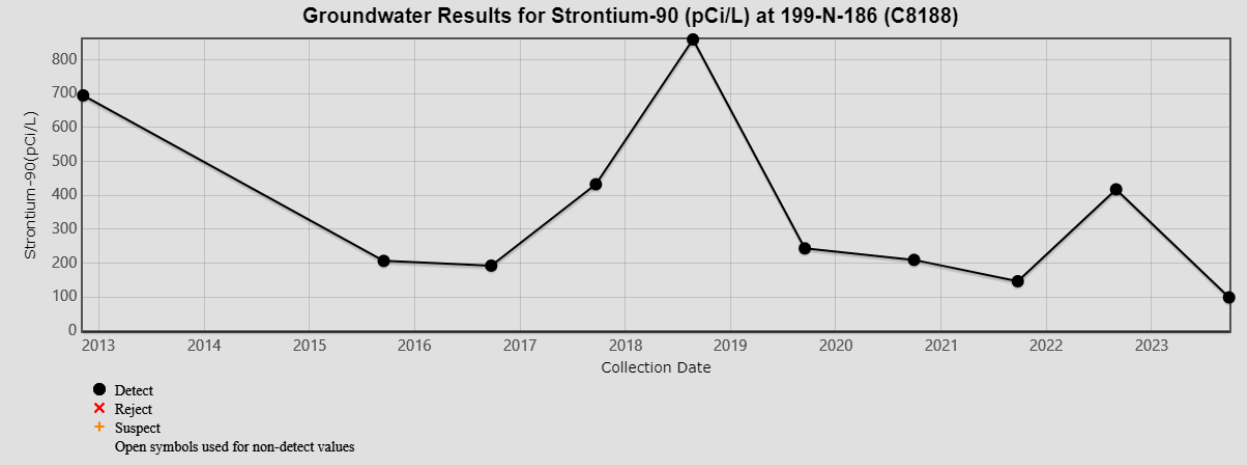
1. Page xxv, Table ES-1. (i) Under Balancing Criteria, Row of "Waste site cleanup timeframe (years)", should the "(100-N-18)" be "(100-N-108)"? (ii) Under Balancing Criteria, Row of "*C*max groundwater cleanup timeframe in the aquifer". Why do Alternatives 1 (No Further Action) and 2 (ICs, MNA, and PRB) share the same cleanup timeframe?
2. Page 1-23, Lines 17–18. Edit "between August 1995 and September 1966" to "between August 1965 and September 1966" (DOE/RL-2017-29, Rev. 0, 2017).
3. Page 1-63, Lines 17–21, Section 1.5.5.4. Would injection of phosphate solution in the vadose zone mobilize the Sr-90? What is the percentage of the vadose zone Sr-90 that will be mobilized due to the phosphate injection? How much more Sr-90 will flux to the Columbia River with injection of phosphate vs. no injection?
4. Page 2-29, Table 2-7, Row of Well "199-N-182", Column of "Depth to Top of RUM, m (ft) bgs". Edit "341.1" to 31.1".
5. Page 3-18, Table 3-3. The Rwie, Rwic, Rwib, Rlm, and Rwia are all named as part of the "*member of Wooded Island*". The Rwic is within the RUM, and the RUM is in between the Rwie and the Rlm. Why is the RUM not named as part of the "*member of Wooded Island*"?
6. Page 3-125, Lines 7–8. "*Chapters 3 through 7 present the setting, contaminants, and pathways for contact with human health and the environment and potential harm though relevant exposure scenarios.*" Since Chapters 4–7 are summarized separately already (Pages 3-124–3-125), there is no need to repeat them.

7. Page 4-41. Lines 39–44. §4.3.1.3. '*As identified in CVP-2006-00004, a protectiveness comparison was made based upon the fixed parameter three-phased contaminant leaching model identified in WAC 173-340-747(4), "Deriving Soil Concentrations for Groundwater Protection." This model predicted that a Cr(VI) concentration of 7.7 mg/kg in soil was protective of the Columbia River. Thus, the maximum detected Cr(VI) in soil of 2.96 mg/kg was determined to be protective of the Columbia River based on this model.*' In the cited reference, Cr(VI) concentration of 20 µg/L was used for the Columbia River protection (CVP-2006-00004, Rev. 1, 2009). This conclusion needs to be updated based on the Cr(VI) concentration of 10 µg/L water quality standard.

8. Page 4-41. §4.3.1.3. This section described Sr-90 verification sampling and the evaluation results on groundwater protection. Based on CVP-2006-00004 (Rev. 1, 2009, Page 12):

> *The 116-N-1 cleanup verification models as described in the 100-NR-1 RDR/RAWP (DOE-RL 2001) comprise three depth intervals: (1) the shallow zone and overburden, (2) the contaminated deep zone, and (3) the uncontaminated vadose (deep) zone. Based on the assumption that residual contaminant levels in the deep zone data set extend uniformly to groundwater (as discussed in the 100-NR-1 RDR/RAWP [DOE-RL 2001]), residual activities of americium-241 , cobalt-60, cesium-137, nickel-63, plutonium-239, plutonium-240, and strontium-90 would result in groundwater concentrations that exceeded the groundwater RAGs. Because the assumption that the deep zone contaminant concentrations extend uniformly to groundwater is too conservative in the case of these contaminants, the three-layer model (based on boreholes 199-N-107A and 199-N-108A) was applied to the 116-N-1 site.*

By using the three-layer model, the report (CVP-2006-00004, Rev. 1, 2009) concludes that radionuclides except for tritium in the soil of this site would not reach groundwater in 1,000 years. However, the monitored groundwater Sr-90 concentrations below (Well 199-N-186) and downgradient (199-N-67) of this site indicate continuing sources from the vadose zone (Figure 1 below). The citation to report CVP-2006-00004 (Rev. 1, 2009) should be modified based on the recent data with discussions on why the monitored data contradict the model results.



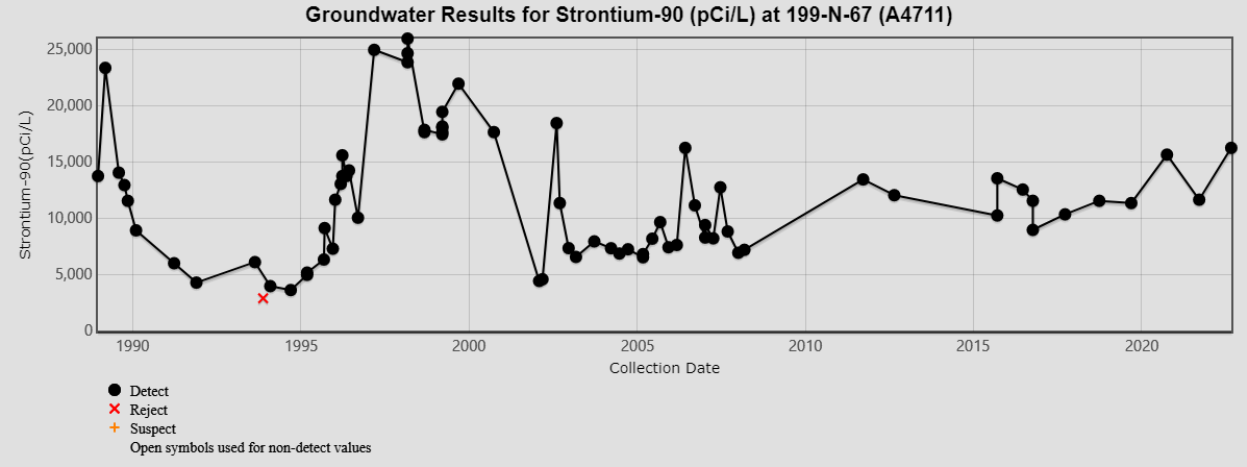


Figure 1. Groundwater Sr-90 Concentration at Wells 199-N-186 and 199-N-67. Source: HEIS.

9. Page 4-58. Lines 15–18. §4.3.1.4. "*Several boreholes have been installed in this area to characterize the vadose zone associated with 116-N-3. Boreholes installed as a part of this RI are shown as green symbols. Several LFI boreholes were also installed in this area in 1995. The LFI boreholes that are discussed in this section are shown as magenta symbols.*" There are only three boreholes shown in Figure 4-20. The RI borehole (C8190) is marked with a red symbol. The LFI boreholes (A9989 and B2539) are marked with black symbols. Please verify the number of boreholes and symbol colors.

10. Page 4-62. Lines 1–11. From the soil sampling profile of Borehole B2539 (Well 199-N-109A) (Figure 4-22 in the report), the soil concentrations of Cs-137, Co-60, and Sr-90 are all the highest at the depth of 10 ft bgs, much higher than those reported in Table 4-16 for deeper samples. The waste site was excavated six years after the borehole was drilled, but the radionuclides might have been mobilized to deeper areas after the well drilling by precipitation or due to dust suppression during excavation. The original borehole sampling data for deeper depths may not reflect the post-remediation field condition any more. (i) Please clarify whether dust suppression was used during the excavation, and whether there were significant precipitation events after the borehole was drilled. (ii) The highest concentrations (which are closer to the post-remediation sampling results as shown in Figure 4-23) from all depths should be used for this borehole for groundwater protection evaluation.

11. Page 4-64. Lines 26–30. "*These data provided the basis for a three-layer model of the deep zone at 116-N-3 (CVP-2002-00002). A site-specific model was used to determine whether residual contaminant concentrations were protective of groundwater and surface water. Based on the model results, prevention of future irrigation at the site allowed the residual radionuclide concentrations to meet groundwater protection standards.*" The following is a description of the modeling (CVP-2002-00002, Rev. 0, 2002, Pages 19–20):

    > *Modeling was done because initial RESRAD runs showed that based on the conservative assumption outlined in the RDR/RAWP (DOE-RL 2000), the Deep Zone Level I contaminant statistical value concentrations would extend uniformly to groundwater. Based on this, RESRAD predicted that the concentrations of americium-241, cobalt-60, cesium-137, nickel-63, plutonium-239, plutonium-240, and strontium-90 in Deep Zone Level I would result in groundwater concentrations that exceeded the groundwater RAGs. Because the assumption that the Deep Zone Level I contaminant concentrations extend uniformly to groundwater is too conservative in the case of these contaminants, contaminant depth distributions were obtained using the data*

reported from Borehole 199-N-109A. The borehole data was used to construct a three-layer model providing RESRAD concentration inputs.

The conclusion of soil cleanup for groundwater protection was based on a method that ignored the high concentration points from the post-remediation verification sampling and used the deeper part of pre-remediation sampling data from borehole 199-N-109A. As described in the last comment, radionuclides might have been mobilized to deeper zones post well drilling, and the original deeper part of the sampling data from the borehole 199-N-109A may not reflect the post-remediation field condition any more. The high groundwater Sr-90 concentration at well 199-N-188 (located within the 116-N-3 extent) (Figure 2 below) is proof that the results of the interim closure of the 116-N-3 site were based on wrong information or the wrong method. The citations to the report (CVP-2002-00002, Rev. 0, 2002) should be modified to include discussions on why the monitored data contradict the model results.

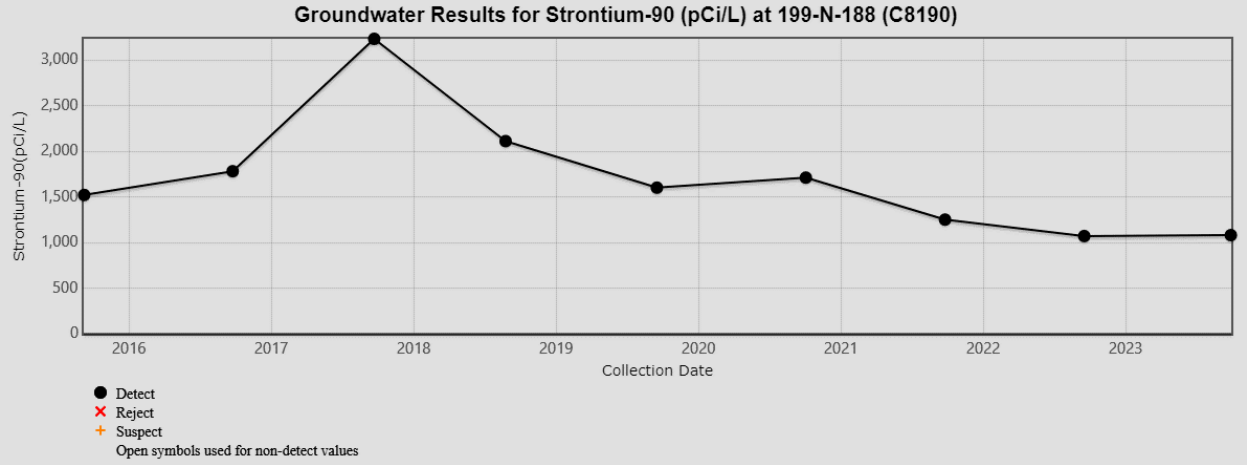


Figure 2. Groundwater Sr-90 Concentration at Well 199-N-188. Source: HEIS.

12. Page 4-169, Figure 4-51. From this cross-section view, the groundwater table between Wells 199-N-123 and 199-N-93A was in the Hanford formation, which usually has much higher permeability than the Ringold formation. The Sr-90 concentration was also high migrating through this cross-section area. Would the PRB work in this area?

13. Pages 4-250. Lines 5–10. §4.4.4.6:

    Total chromium and Cr(VI) concentrations in the confined aquifer monitored by well 199-N-80 were above the groundwater quality criteria in all samples in the RI groundwater dataset. The chromium detected in well 199-N-80 is likely the result of high-volume past disposal of chromium-bearing liquid waste into the nearby 116-N-1 waste site that was driven into this relatively shallow, confined interval when the water table in the unconfined aquifer was high. The contamination remains trapped and relatively stagnant in the locally confined interval.

The Cr(VI) concentration at RUM Well 199-N-80 had reached nearly 200 µg/L in 2011, and has been above 100 µg/L since 2006 (Figure 3 below). High hydraulic head in the unconfined aquifer is only one of the reasons causing the high Cr(VI) concentration at Well 199-N-80. If the Cr(VI) concentration in the confined RUM water-bearing zone reached 200 µg/L at some time, the Cr(VI) concentration in the source (the discharge) and the groundwater mound that spread through portions of the current vadose zone and the unconfined aquifer upgradient of the confined aquifer should have also reached 200 µg/L or higher for a period of time, considering the plume attenuation as it migrates downgradient. The maximum Cr(VI)

concentration monitored at Well 199-N-67 shown in Figure 4-103 (of the report) is much lower than that from the RUM well. Have Cr(VI) concentrations of ≥200 µg/L been observed at any of the unconfined aquifer wells near Well 199-N-80 or between this well and the 116-N-1 waste site?

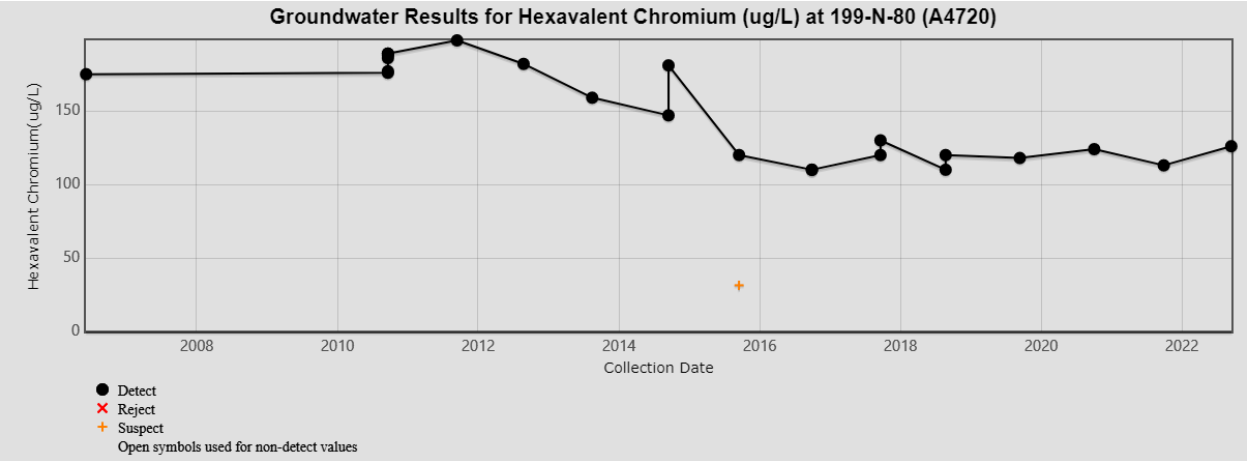


Figure 3. Groundwater Cr(VI) Concentration at Well 199-N-80. Source: HEIS.

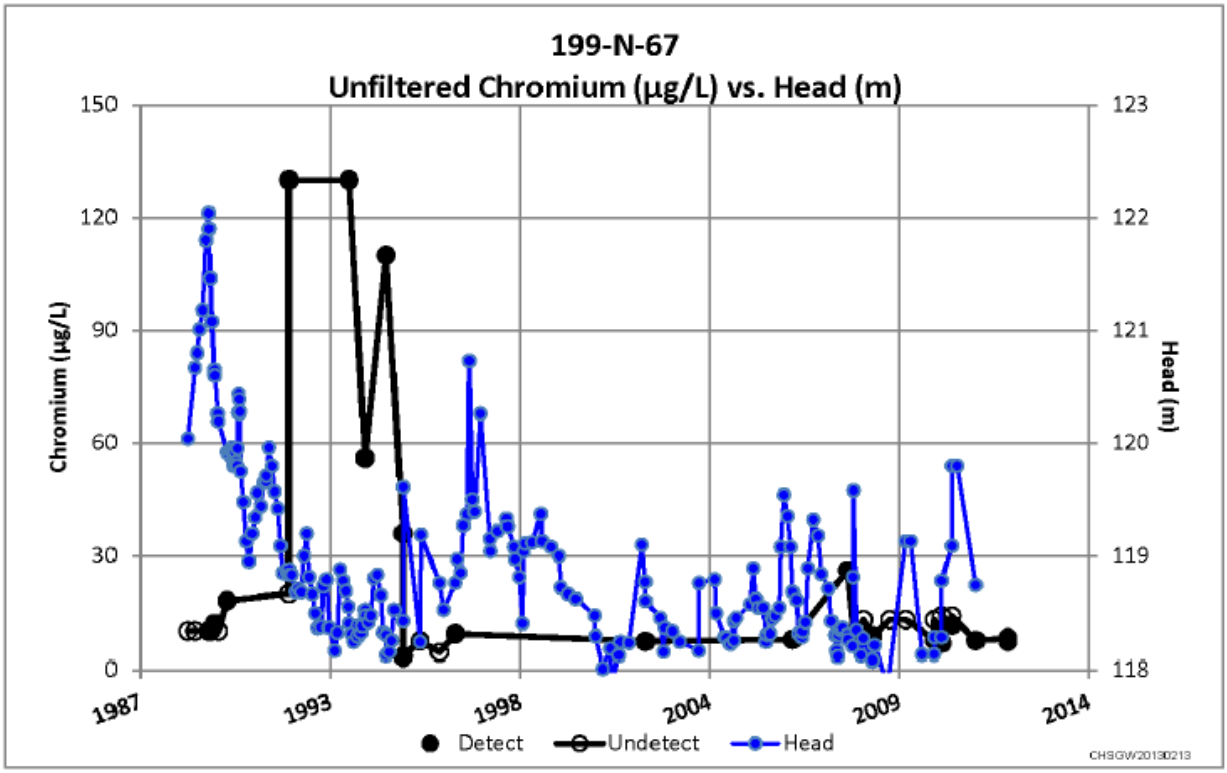
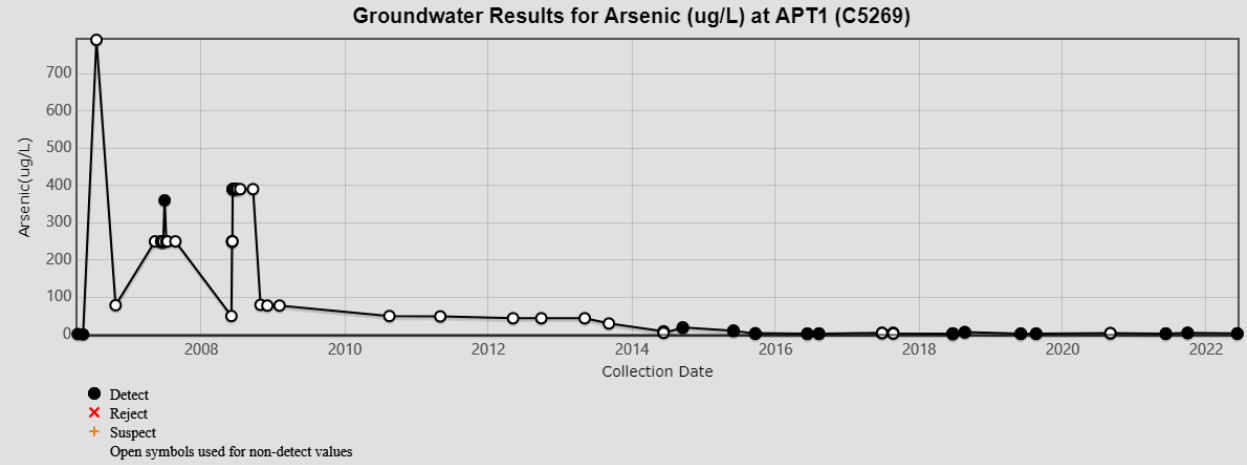
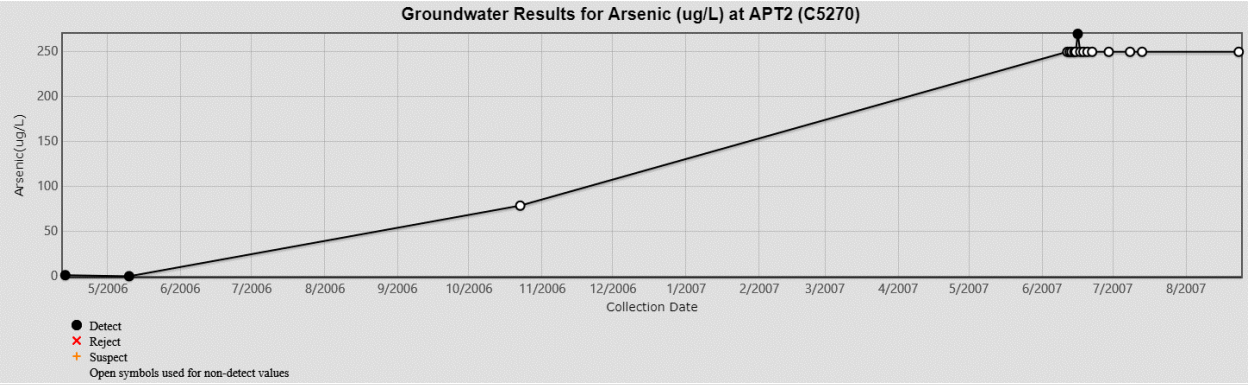


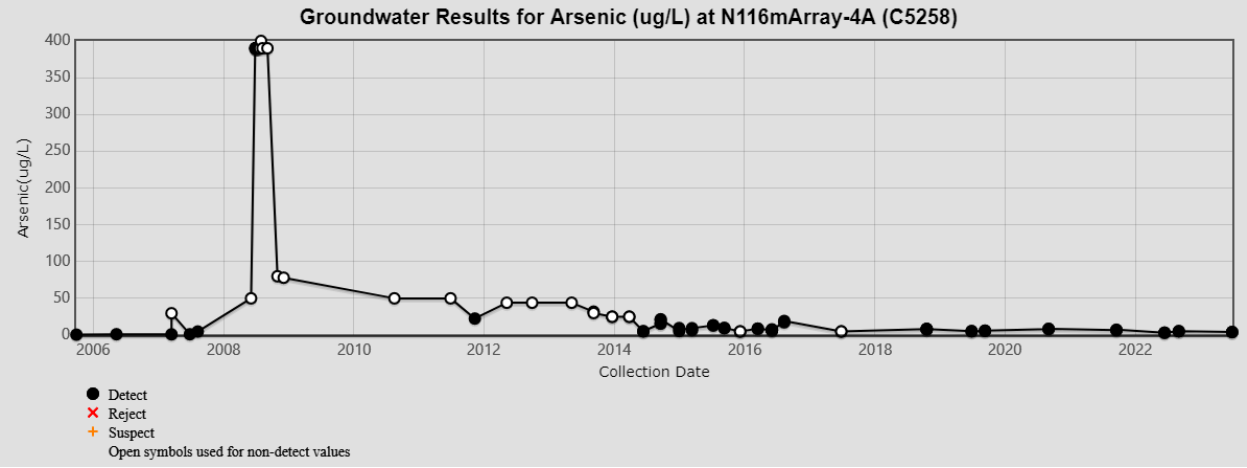
Figure 4-103. Comparison of Water Table Elevations and Chromium Concentrations Over Time at Well 199-N-67

14. Page 4-263, Lines 21–23. §4.5.2. "*However, aluminum, chloride, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, strontium, and zinc exceeded their associated drinking water standards or water quality levels in some wells within the apatite treatment zone (some by several*

orders of magnitude)." Arsenic and Sr-90 concentration also exceeded the drinking water standards (10 µg/L and 8 pCi/L for arsenic and Sr-90, respectively) in many aquifer tubes and groundwater wells due to the apatite injection (e.g., Figure 4 below for arsenic and Figure 8-18 from this report for Sr-90). Please note that some data points in the arsenic plots are marked as "Non-detect" due to high practical quantitation limits (PQLs) of the analyses methods. Please add arsenic and Sr-90 to the list.







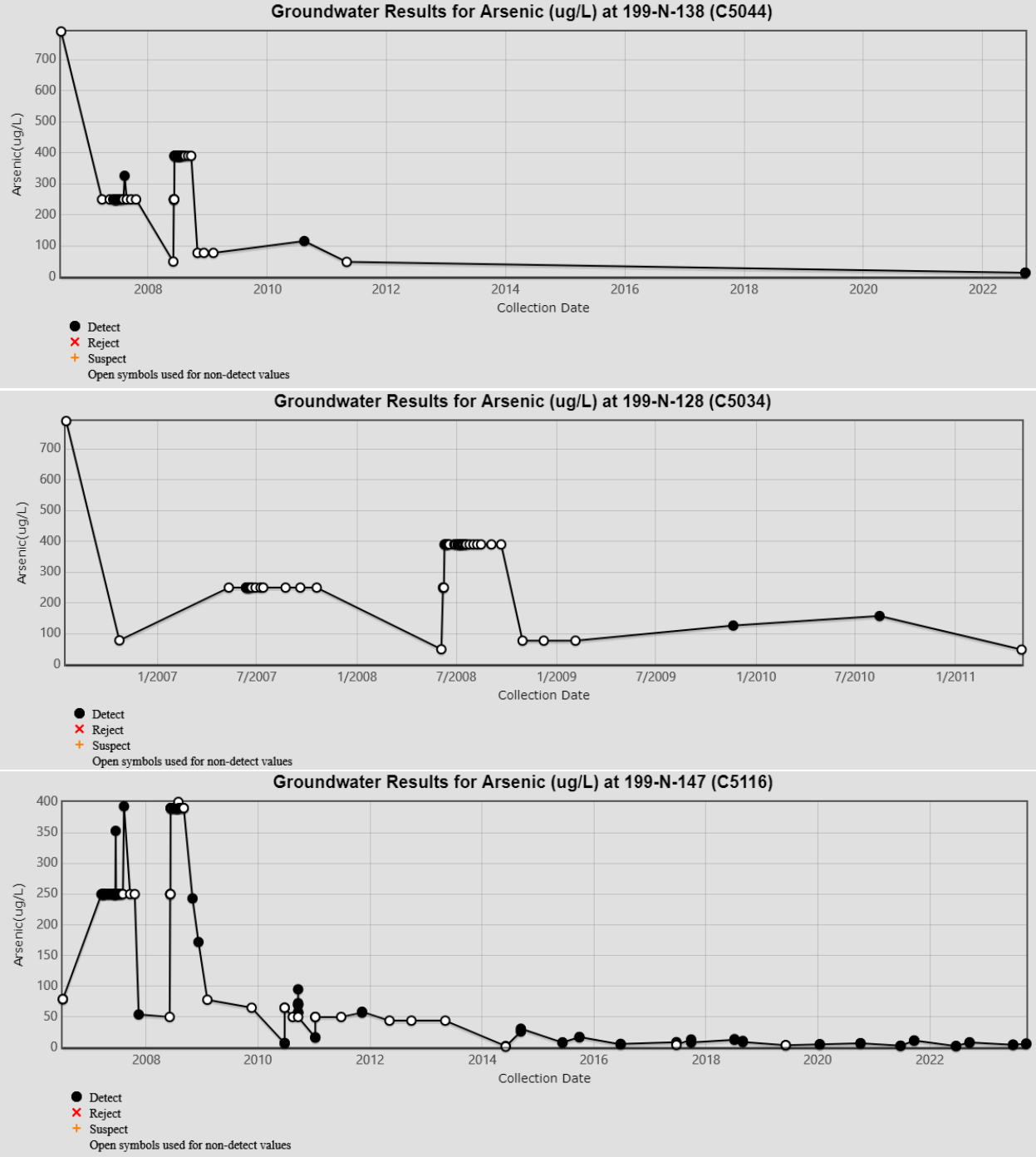
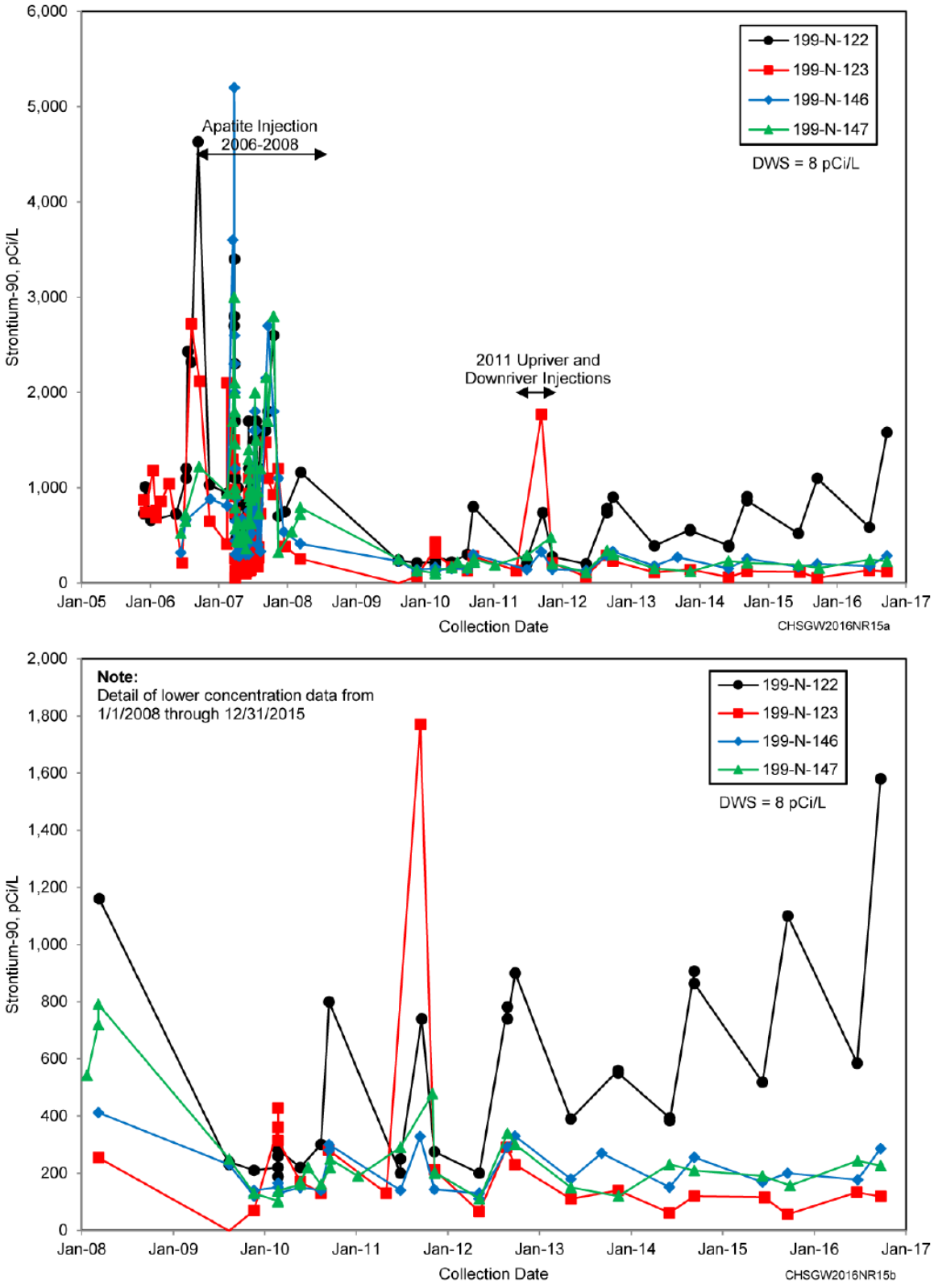


Figure 4. Groundwater Arsenic Concentration at Some Aquifer Tubes and Groundwater Monitoring Wells. Source: HEIS.



Source: Figure 6-24 in DOE/RL-2016-67, *Hanford Site Groundwater Monitoring Report for 2016*.

Figure 8-18. Strontium-90 Data for Performance Monitoring Wells Along the Central Segment of the Apatite PRB

15. Pages 5-46–5-47, Table 5-11. Editorial. Footnotes *g* and *h* should be switched to reflect the correct radionuclides in the table.

16. Page 5-67, Figure 5-11. There are two gaps between the Specific Head boundary and the River boundary (River Cell). Should the Specified Head boundary be extended further towards the River boundary to close the gaps?

17. Page 5-68, Lines 37–39. §5.5.1.2. "***Lower Boundary Condition.*** *The lower boundary of the model is a no-flow boundary in keeping with the stratigraphy selected as relatively impermeable units (e.g., Columbia River basalt and RUM) to serve as the lower boundary. For the 100NSFT Model, the lower no-flow boundary corresponds to the top of the RUM.*" There should be analyses or discussions on the uncertainties of this lower boundary condition in §5.5.3, because the no-flow assumption conflicts with the monitoring results that the so-called confined RUM water-bearing zone well 199-N-80 has been contaminated (this report, Pages 8-12–8-14, §8.1.1.4.1).

18. Page 5-86, Line 6. The porosity definition in the brackets would lead to a porosity value of greater than 1. Please verify.

19. Page 5-89, Lines 13 and 31. The recharge velocity values of 1.624E-05 m/d (Line 13) and 1.64E-05 m/d (Line 31) are inconsistent with ECF-100NR2-15-0127 (Rev. 0, 2018, Pages 17–18), or ECF-100NR2-15-0128 (Rev. 0, 2018, Page 18), where the value is 6.14E-05 m/d, over three times greater. Please verify.

20. Pages 5-119–5-121, Figures 5-38–5-40; and Pages 5-125–5-127, Figures 5-43–5-45. The figure titles say "(20 ft Radius Limit)", but the figure legends for both (a) and (b) panels indicate "(30ft. Radius)" or "(30ft. no Inc.)". Please clarify what scenarios are simulated.

21. Page 5-128, §5.6.2.5 and Figure 5-46. (i) Please add the No-PRB (best estimate) and the full-scale-PRB (best estimate) scenarios to compare with the 1000-ft-PRB scenarios. (ii) Please clarify whether the temporarily elevated Sr-90 discharge into the Columbia River due to the apatite injection are considered or not in the simulations. (iii) The "30 ft" in the figure legend is inconsistent with the text for Alternative Conceptual Models 3 and 4 which assume a "20 ft" radius. Please clarify.

22. Page 5-139, Lines 18–22. "*The simulated peak groundwater tritium concentrations (shown in Figure 5-59 for maximum initial conditions and in Figure 5-60 for best-estimate initial conditions) show the simulated distribution of tritium in groundwater at the times of 0, 1, 5, 10, 15, and 20 years. The results show a secondary peak around 10 years before concentrations decline again; this reflects the inclusion of a vadose zone continuing source in the simulation.*" (i) It is hard to visualize the secondary peak in the cited Figures 5-59 and 5-60. Please cite Figures 5-61–5-63 for the description of dual peaks. (ii) The simulated cumulative tritium activity trends in Figure 5-64 are nearly straight lines between Year 7 and Year 15. Shouldn't the slope steepen a little bit to reflect the second peak?

23. Pages 5-148–5-155, §5.6.6. (i) The state water quality standard of 10 µg/L should also be marked in Figure 5-70 to be consistent with Table 8-3 on Page 8-7: "*Groundwater containing hexavalent chromium may migrate from upland areas and discharge to surface water in the future; therefore, the 10 µg/L state water quality standard is considered for the upland plume for protection of surface water per WAC 173-340-720(4)(b)(ii).*" (ii) The terms "shoreline aquifer" and "shoreline groundwater" are used in this subsection and the figures, which are different from the descriptions and figures in previous subsections within the §5.6, where three subregions are shown including the aquifer, the shoreline, and the river adjacent subregions (this report, §5.6.1.1, Page 5-101). Please make them consistent.

24. Page 5-157, Table 5-33. (i) Please clarify whether the "*No Action Scenario*" for Sr-90 is the No-PRB Scenario or one of the 1000-ft-PRB Scenarios. (ii) Please remove the units "(kg/Ci)" from the Column title "Cumulative Mass/Activity (kg/Ci)", since there is already a separate "Units" Column.

25. Page 6-14, Table 6-6. Row of "Inhalation rate", the 3rd Column. Edit "20 me/d" to "20 m^3/d".

26. Page 6-254, Table 6-205. The Well Name under the subtitle "Monitoring Well 199-N-185 Screened in the RUM" is listed as "199-N-80" which must be a typo. Edit it to "199-N-185".

27. Pages 6-227–6-228, §6.3.6.5. The Subsections §6.3.2.2.1, §6.3.3.3.2, and §6.3.3.3.3 are either the wrong numbers or in the wrong places. Please verify.

28. Page 8-14, Lines 16–17, §8.1.1.4.1. "*Concentration trends at well 199-N-80 are stable and not influenced by river stage effects, unlike nearby monitoring wells in the unconfined aquifer.*" The well was only sampled for Cr(VI) once outside the low river stage season (June 2006). Since 2010, Well 199-N-80 has only been sampled for Cr(VI) during low river stage period (August through October each year) (Figure 5 below). Please present evidence to support the statement that Cr(VI) at this well is not influenced by river stage effects.

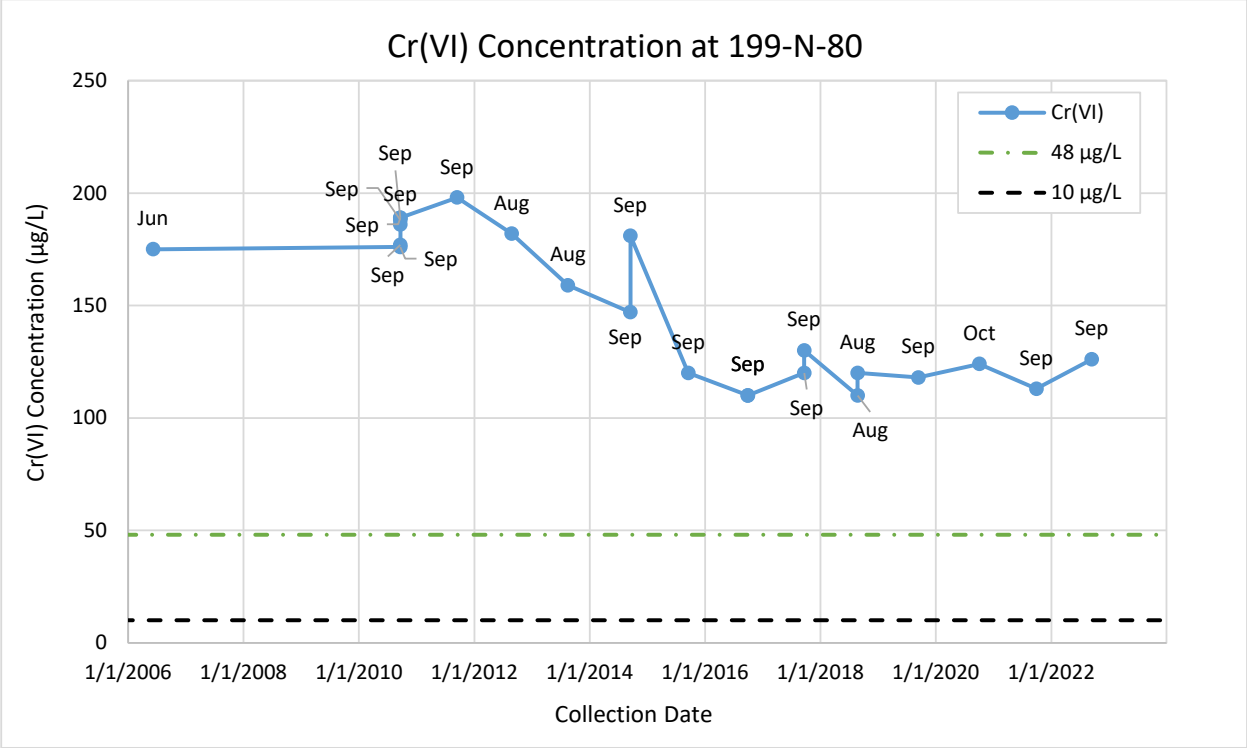


Figure 5. Groundwater Cr(VI) Concentration at 199-N-80 Showing Sampling Season. Source: HEIS.

29. Page 8-14. Lines 25–26. §8.1.1.4.1. "*Additionally, the observed river-stage effect on nitrate and sulfate concentrations in unconfined aquifer wells 199-N-2 and 199-N-103A does not occur at well 199-N-80.*" It is hard to see from Figure 8-4 of this report what effect the river-stage has on nitrate and sulfate concentrations. As shown in Figure 6, peaks of nitrate concentration at 199-N-2 occurred in February (1995), March (1986, 1998, 2004), September (2000, 2001, 2010), and December (2016); and the nitrate concentration in September varied from a high of 224 mg/L on 9/16/2010 to a low of 50 mg/L on 9/7/2012, all in September. Please clarify what the observed river-stage effect is.

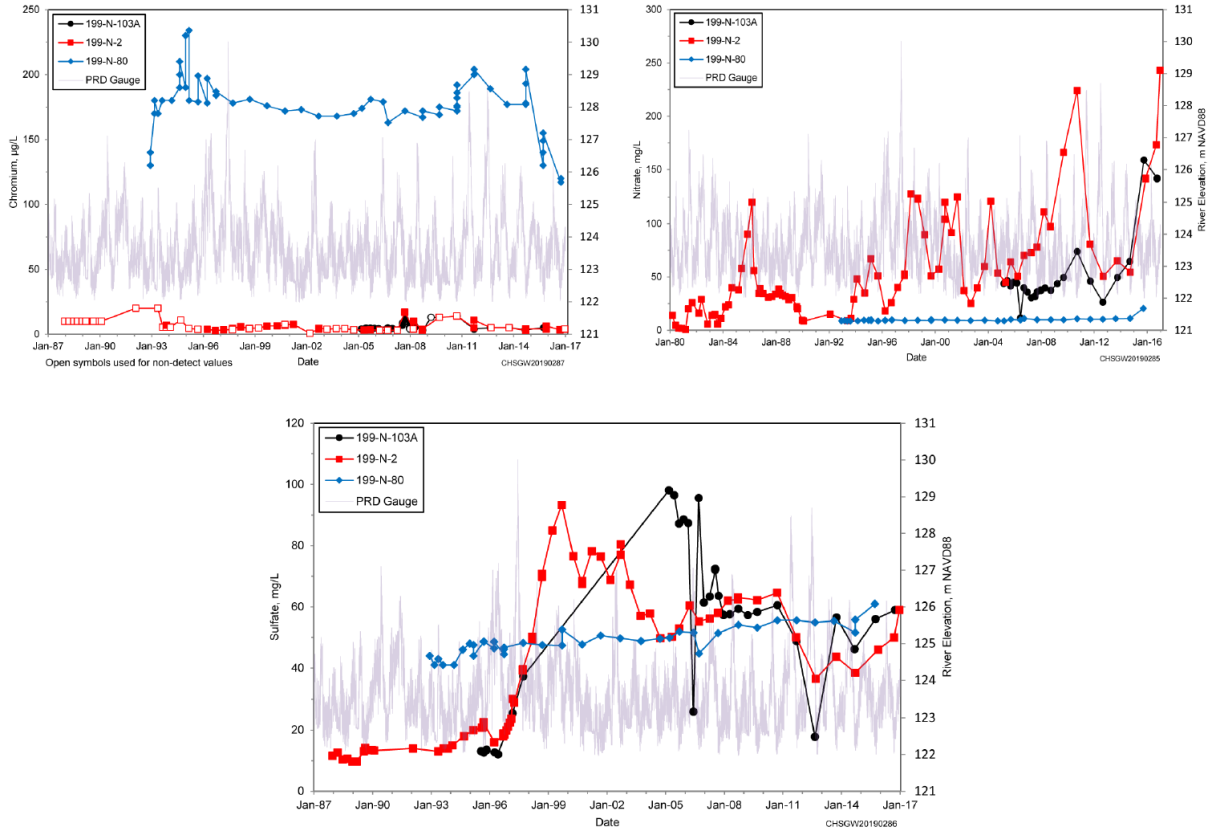


Figure 8-4. Concentration Trend Comparison for Well 199-N-80 to Unconfined Aquifer Wells 199-N-2 and 199-N-103A

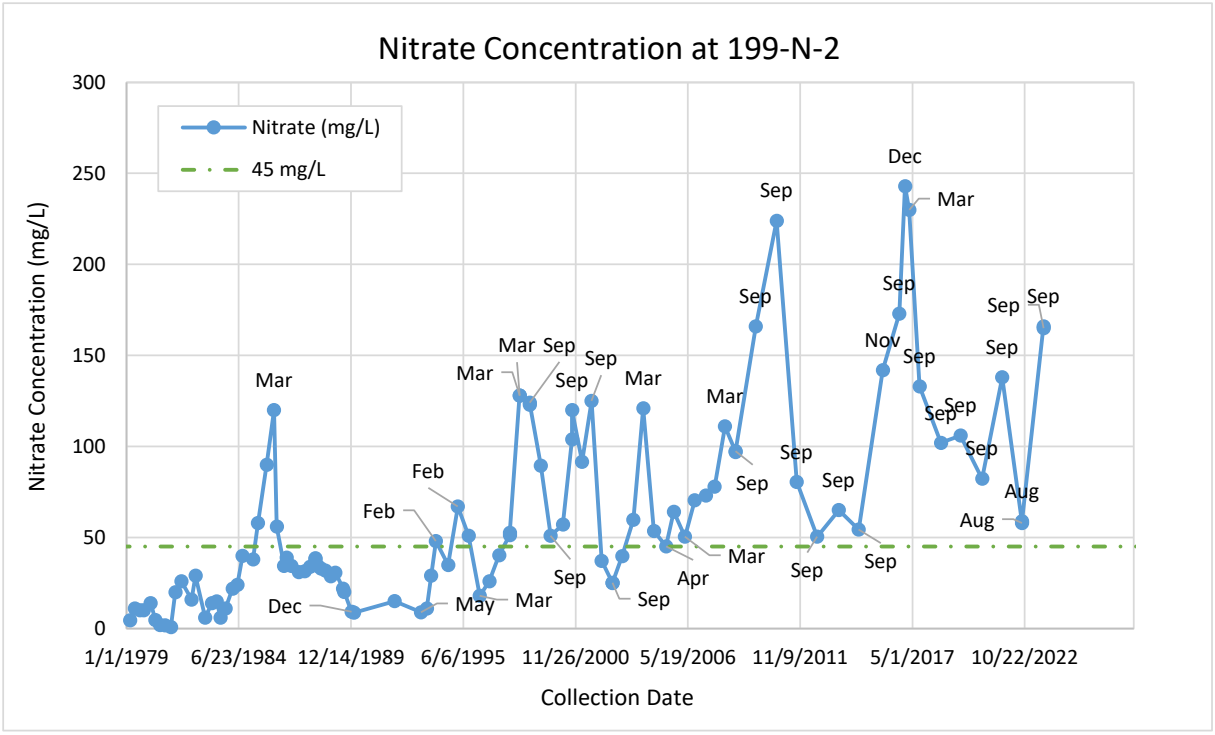


Figure 6. Groundwater Nitrate Concentration at Well 199-N-2. Source: HEIS.

30. Page 8-14, Lines 28–31. §8.1.1.4.1. "*The cause appears to be associated with high river periods experienced in 2011 and 2012 that resulted in the water table increase near LWDF operational water levels causing increased drainage of high nitrate/low chromium water from the unconfined aquifer into RUM water-bearing zone at well 199-N-80.*" (i) Is there a preferential flow zone between the unconfined and the confined aquifers during the high-water-table periods? (ii) If there is an "*increased drainage*" from the unconfined aquifer into the confined aquifer, should there be an increased drainage out of the confined aquifer?

31. Page 8-14, Lines 31–34, §8.1.1.4.1. "*This observation is indicative of the chromium CSM (Section 4.4.5.6 in this RI/FS) that contamination entered this relatively shallow, confined interval when the water table in the unconfined aquifer was high during operation of the LWDFs. Cr(VI) concentration trends in the overlying aquifer do not indicate that there is bidirectional communication.*" (i) How much has Cr(VI) contaminated water from the unconfined aquifer entered the confined aquifer for the mixed groundwater Cr(VI) concentration in the confined aquifer to increase to over 170 µg/L (Filtered Cr concentration in 1993, or Cr(VI) concentration in 2006)? (ii) What would the water pressure be in the confined aquifer after this amount of contaminated water from the unconfined aquifer entered the "localized" (this report, Page 8-14, Line 35), no-bidirectional communication confined aquifer, if the groundwater from the confined aquifer did not discharge into the Columbia River?

32. Page 9-14, Lines 29–31. "*Along the shoreline, the C90 concentration decreases below the 278 pCi/L BCG in about 10 years, while the Cmax concentration decreases below the 8 pCi/L PRG in about 230 years.*" Figure 9-3 (Bottom) shows that the red line crosses the solid green line at about Year 223, not 230. Please verify.

33. Page 11-20, Lines 34–41. Both Rev. 0 (2007) and Rev. 1 (2009) are included in the reference list here for DOE/RL-2006-26, but the version numbers (or year of the report) are not specified in the citations in the text. Please delete one from the list or clarify which one is cited for all the citations to these two references.

34. Page B-68, Line 9; Page G-33, Line 13; and Page N-19, Line 33. Edit "CVP-2006-00004, 2006" to "CVP-2006-00004, 2009".

35. Pages D-232–D-243, Table D-36. (i) The table title "*Individual Aquatic Tube Summary Statistics for Wells Screened Above the Below Table*" is confusing. Please clarify. (ii) This table shows only two detects above the action level of 2.4 µg/L for silver, which is inconsistent with Table D-35 (four times). The results listed for N116mArray-1A should include silver concentration of 5.98 µg/L on 9/6/2013; and the results for N116mArray-11A should include silver concentration of 5.6 µg/L on 1/27/2012.

36. Page D-253, Lines 3–4. "*As shown in Table D-36, dissolved silver was above than the AWQC of 2.4 µg/L at three aquifer tube locations.*" This is inconsistent with Tables D-36 and D-35. Please see last comment for details.

References

CVP-2002-00002, Rev. 0, 2002, Cleanup Verification Package/Clean Closure Report for the Soil Column of the 116-N-3 Trench, Crib, and 100-N-63:1 Pipeline. Bechtel Hanford, Inc., Richland, Washington. Available at: https://pdw.hanford.gov/document/D9215249.

CVP-2006-00004, Rev. 1, 2009, Cleanup Verification Package for the Soil Column of the 116-N-1 Crib and Trench. Washington Closure Hanford, Richland, Washington. Available at: https://pdw.hanford.gov/document/0905200847.

DOE/RL-2017-29, Rev. 0, 2017. Annual Operations and Monitoring Report for UPR-100-N-17: March 2016 - February 2017. U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: https://pdw.hanford.gov/document/0068215H.

ECF-100NR2-15-0127, Rev. 0, 2018. Simulation of Contaminant Migration for the 100-N Remedial Investigation. CH2M HILL Plateau Remediation Company, Richland, Washington. Available at: https://pdw.hanford.gov/document/0064802H.

ECF-100NR2-15-0128, Rev. 0, 2018. Simulation of Contaminant Migration for the 100-N Feasibility Study. CH2M HILL Plateau Remediation Company, Richland, Washington. Available at: https://pdw.hanford.gov/document/0064801H.

1222650

Confederated Tribes and Bands
of the Yakama Nation ERWM

Established by the
Treaty of June 9, 1855

October 28, 2013

Jane Hedges
Washington State Department of Ecology
Port of Benton Blvd.
Richland, WA 99354

Tifany Nguyen
U.S. Department of Energy
Richland Operations Office
P.O. Box 550, A7-75
Richland, WA 99352

Subject: Review of the Proposed Plan and Remedial Investigation/Feasibility Study for the 100-NR-1 and 100-NR-2 Operable Units (DOE/RL-2012-15, Draft A) and Propose Plan (DOE/RL-2012-68, Draft A).

Dear Ms. Hedges and Nguyen:

The U.S. Environmental Protection Agency (EPA) anticipates issuing the Record of Decision (ROD) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for the 100-NR-1 and 100-NR-2 Operable Units early next year. The Confederated Tribes and Bands of the Yakama Nation appreciate the opportunity to review and provide comments on these documents.

The Confederated Tribes and Bands of the Yakama Nation is a federally recognized sovereign pursuant of the Treaty of June 9, 1855 made with the United States of America (12 Stat. 951). The U.S. Department of Energy Hanford site was developed on land ceded by the Yakama Nation under the 1855 Treaty with the United States. The Yakama Nation retains reserved rights to this land under the Treaty.

The Hanford Reach is one of the most cultural resource-rich areas in the western Columbia Plateau. Pre-Hanford uses of the area included agriculture and use by Native American tribes. Archaeological evidence demonstrates the importance of this area to Native American tribes, whose presence can be traced for more than 10,000 years. The near-shore area of the rivers (Columbia, Snake, and Yakima) contained many village sites, fishing and fish processing sites, hunting areas, plant-gathering areas, and religious sites. Upland areas were used for hunting, plant gathering, religious practices, and overland transportation.

Chinook salmon, sockeye salmon, coho salmon, and steelhead trout use the river as a migration route to and from upstream spawning areas and are of economic importance. The Treaties of 1855 provide for the peoples of three Nations to "live along" and fish the River Corridor.

The Yakama Nation's vision for the cleanup and closure of the Hanford Site includes meeting the following objectives:

100-NR-1 & 100-NR-2

1. Compliance with Yakama Nation Treaty Rights, including full access to cultural (and natural) resources by the Yakama Nation and its members within its ceded land and aboriginal territory, including on the Hanford Site.
2. Official recognition that Native Americans living near the Hanford site are the most vulnerable people to environmental contaminants, as underscored by EPA's Columbia River Fish Contaminant Survey.
3. Protection of the health of Yakama Nation tribal members and the environment so that the Hanford Site and all its resources (including the Columbia River, its islands, other surface waters, geologic resources, groundwater, air, and biological resources such as plants, fish, and wildlife) are safe for all exposure scenarios and tribal uses.

The Yakama Nation supports cleanup actions that are complete, permanent, and are based on proven technology. We do not support remedial actions that leave large quantities of long-lived radionuclides or dangerous waste in place and rely on long-term stewardship or institutional controls to address future potential exposure scenarios. Long-term stewardship and institutional controls will not be effective for wastes that remain dangerous for hundreds or thousands of years. Assuming that contaminants remain in place implies that a Long-Term Stewardship Program Plan must be implemented which will remain effective longer than any human institution has ever existed.

The Yakama Nation further supports the following key principles for all remedial actions that are completed on the Hanford Site:

1. Cleanup decisions that follow the CERCLA RI/FS process and requirements through the finalization and approval of CERCLA documents (including risk assessments and supporting secondary documents) prior to development of Proposed Plans and final RODs.
2. Cleanup decisions based on adequate site-specific characterization, including for the vadose zone and groundwater.
3. Cleanup actions that comply with all applicable or relevant and appropriate federal and state regulatory requirements.
4. Cleanup actions that are compatible with clean closure criteria.

As mentioned above, the Yakama Nation does not support remedial actions that leave significant quantities of contamination in place at the Hanford Site, nor do we support remedial actions which would preclude clean closure.

We look forward to discussing our vision of cleanup and our concerns regarding the current cleanup plans for Hanford with you further.

Sincerely,

Russell Jim

Russell Jim
Yakama Nation ERWM Program Manager

cc:
Matt McCormick, Manager, US Department of Energy
Ken Niles, Oregon Department of Energy
Stuart Harris, CTUIR

Gab Bohnee, Nez Perce
Marlene George, YN ERWM
Administrative Record

Attachments:
Note these comments do not reflect a detailed description of all our concerns.

Attachment #1:

Yakama Nation ERWM Comments on the

100-N Area Proposed Plan & Remedial Investigation / Feasibility Study:

1. **Protection of Yakama Nation treaty rights, including full access to cultural resources on the Hanford Site by the Yakama Nation:** Ensuring Treaty compliance is a critical intergovernmental concern. By and through this document, USDOE supports the participation of Yakama Nation in activities related to remediation and restoration of resources affected by Hanford and implements its trust responsibility and enforceable obligations to the Yakama Nation. From the YN ERWM's perspective, efforts to include the tribal program in the development of the RI/FS/PP were weak.

    a. The Treaty, which reserves specific rights and resources for the Yakama Nation, should be acknowledged as an ARAR or a "must comply" standard for cleanup decisions. This includes the right to practice full subsistence activities in Yakama Nation usual and accustomed use areas. All future Interim and Final Record(s) of Decision(s) should be in harmony with treaty rights of the Yakama Nation under the Treaty of 1855 including upland treaty rights.

    b. All statements (see page 266, section 3.8.3) included in the Proposed Plan and RI/FS documents that convey the USDOE's "beliefs" or "positions" regarding the extent of tribal treaty rights, including statements that it is the USDOE's position that Hanford is not "open and unclaimed land," should be removed from the documents.

    c. All potential impacts to treaty-reserved rights and resources should be thoroughly evaluated and considered in a revised RI/FS and Proposed Plan and supporting documents. The preferred alternative should be consistent with the USDOE's American Indian Policy, with the federal trust responsibility, and with the terms of the Treaty of 1855.

    d. The YN ERWM Program believes Preferred Alternative is not protective; does not meet ARARs; is inconsistent with anticipated (*and feasible*) future land and groundwater use; and does not represent the maximum extent possible a permanent solution in a cost effective manner.

2. **Land Use:** Language in the Proposed Plan and selected Preferred Alternatives indicates that DOE is not considering cleanup to unrestricted use and is striving toward a less stringent cleanup based on the Comprehensive Land-Use Plan (i.e. use of Method A-Industrial Standards vs. Method B-Unrestricted Standards). While cleanup decisions may ultimately be defined by management boundaries, the risk assessment should be based upon actual human behaviors.

    a. Contrary to statements in the Propose Plan describing the CLUP (page 31), (i.e., "In consideration of these land-use decisions and associated Tribal and public input, DOE and Ecology propose a cleanup strategy supporting residential

exposures), use of a TI Wavier for Sr-90 does not support residential use cleanup levels for the groundwater. Furthermore, the final CLUP did not include any suggestions, or address any concerns provided by the Yakama Nation.[1]

b. All potential impacts to treaty-reserved rights and resources should be thoroughly evaluated and considered in a revised RI/FS and Proposed Plan and supporting documents, including use of the Yakama Nation Risk Scenario as the basis for setting cleanup levels.

c. The preferred alternative should be consistent with the USDOE's American Indian Policy, with the federal trust responsibility, and with the terms of the Treaty of 1855.

d. The CLUP was a Federal undertaking that determined what type of activities could occur within the Hanford landscape, yet traditional cultural properties (TCP) were never addressed. Areas designated for industrial use, research and development, and conservation mining could have significant impacts on the landscape, and adversely affect a TCP should one be present.

3. **Cultural Resources & Institutional Controls**: There is the assumption of, and over-reliance on, the use of Institutional Controls to ensure protectiveness rather the primary objective which is protectiveness of the environment and human health through selection of remedies that employ treatment technologies that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, or contaminants.

The philosophy underlying the cleanup of Hanford should be guided explicitly by the goal of allowing Native Peoples to safely live the lifestyle to which they are entitled. This way of thinking will be particularly important when considering how to incorporate non-quantitative elements into the Preferred Alternative such as the spiritual or cultural value of a site.

The Yakama Nation has previously expressed deep concern in leaving in place large quantities of hazardous radiological and chemical wastes on the site with the long-term use of institutional controls as protective measures. DOE has acknowledged Sr-90 is present throughout the vadose zone in the 100 Area, and it will continue to impact groundwater quality until the residual contamination is removed through radioactive decay. Within the timeframes that are realistically applicable to this scenario (estimated to be approximately 300 years) institutional controls will almost inevitably fail and allow some exposure to human health and the environment.

The YN expects a discussion of the culturally sensitive areas with reference to both historic and prehistoric Native American use within the Proposed Plan.

---

[1] Yakama Nation letter to John Wagoner, Manager, Department of Energy, Richland Operations Office, June 30, 1998.

Implied agreement with implementation of a ROD change rather than an MOA or outlining actions within the ROD is misleading to the public. The YN requests consultation with DOE on this issue.

Use of institutional controls must be addressed in light of, and with appropriate deference to, Yakama Nation treaty rights which guarantee use of the land for specific purposes which are considered inseparable from the Yakama way of life.

a. Regarding the use of institutional controls at DOE waste sites, the National Research Council pointed out: "While there is typically a tacit recognition that engineered barriers and waste stabilization approaches have limited periods of effectiveness, these technologies are frequently employed with inadequate understanding of, or attention to, the factors that are critical to their success. These include the need for well-conceived plans for performance monitoring that identify and correct potential failures and plans for maintenance and repair, including possible total system replacement." (NRC, 2000). This level of planning, both technical and financial does not appear to have been included in the analysis of alternatives.

b. Currently, there are several projects and major decisions that will be made that affect the entire Hanford Site, yet still a comprehensive Traditional Cultural Property (TCP) study has not been performed. Site wide undertakings and decisions such as clean up levels, restoration, vegetation management, land use plans, the use of barriers and institutional controls need to take into consideration their effects on TCPs. It is the obligation of DOE under the National Historic Preservation Act (NHPA), Section 110, to inventory and evaluate properties to determine eligibility under the agency's jurisdiction.

c. Cultural resources have not been adequately addressed in either of the 100-N documents (RI/FS and PP). Please refer to the EPA document, *CERCLA Compliance with Other Laws Manual: Part II*[2] (hereafter referred to EPA Guidance), where it details out how to be in compliance with the NHPA during the CERCLA process in Section 4. Section 4.1.3 clearly states efforts should be made to identify cultural resources. Generally DOE carries out these efforts during the Section 106 process for each project, however between 2003 and 2011, 115 projects were carried out under the "no potential to cause effect" classification in the 100-N Area. This means these projects were completed without proper Tribal consultation, and did not have a full Section 106 cultural review.

d. As outlined in the EPA Guidance document Section 4, once cultural properties are identified it needs to be determined if they are eligible and if the proposed actions will have an adverse effect on the eligible properties. In the 100-N Area there is a known TCP, which it is mentioned in the document. Further the EPA Guidance states any **adverse effects to eligible properties must be mitigated, "this mitigation plan should be included in**

[2] EPA, CERCLA Compliance with Other laws Manual: Part II. Clean Act and Other Environmental Statues and State Requirements, EPA/540/G-89/009, OSWER Directive 9234. 1-02, August 1989.

an MOA signed by the consulting parties (page 4-10)". EPA Guidance 4.1.4.2 states "The remedial design process should provide for scheduling and funding of the development and implementation of a detailed cultural resources mitigation plan".

e. The EPA Guidance 4.1.5 (page 4-11) details proper documentation, "Compliance with the NHPA requirements should be documented in the RI/FS report, describing, as appropriate, the determination of whether cultural resources are or are not present; the results of the Cultural resource survey (CRS) process and recommendations on the eligibility of the identified cultural resources for the national Register; the impact, if any, on such resources; and the associated mitigation measures to minimize potential "no adverse" or "adverse" effects. When cultural resources are present, the ROD should identify the NHPA as an ARAR. For each alternative, the ROD should identify whether the alternative will comply with substantive NHPA requirements. **For the selected remedy, the ROD should also include a brief statement describing what compliance with NHPA entails, e.g. "that there will be no impact on cultural resources or what mitigation measures will be required."**

f. The 40 CFR 300.435(b)(2) states; "During the course of the RD/RA, the lead agency shall be responsible for ensuring that all federal and state requirements that are identified in the ROD as applicable or relevant and appropriate requirements for the action are met."

g. It is evident the RI/FS and Proposed Plan documents do not meet EPA guidelines. DOE has not performed the necessary tasks to determine effects to cultural resources, **in consultation with the YN to determine effective avoidance, minimization, and/or mitigation measures.** The **final ROD must reflect compliance with NHPA,** which will be impossible with current data.

h. YN ERWM request EPA and DOE to complete the necessary task of **"describing what compliance with NHPA will entail" and completing the necessary MOA to mitigate for adverse effects to the Mooli Mooli TCP, in consultation with YN.**

i. Although the report speaks of ethnographic studies by PNNL, there has been no attempt to identify new cultural properties or traditional cultural properties in many years, as mandated under Section 110 of the national Historic Preservation Act. The Hanford Cultural Resource Management Plan outlined a process for identifying one TCP per year; however this has not been done. DOE has not been meeting their Section 110 obligation of identifying cultural properties on the Hanford site. There are known TCP that have not been evaluated that include:

    i. White Bluffs
    ii. Coyote Rapids
    iii. Columbia River
    iv. Wahluke Slope
    v. Other potentially unknown TCPs in the Hanford area.

Cultural properties are only being addressed through the Section 106 process,

on a project by project basis, which is entirely ineffective. This piecemeal method does not allow for a comprehensive landscape study and does not allow for proper consultation with YN. None of the Alternatives were evaluated against the nine balancing criteria based on effects on a TCP. The YN ERWM Program request this be done.

j. It is unclear as to what is in place to ensure compliance with the Antiquities Act of 1906. Under the Antiquities Act of 1906, the Hanford Reach National Monument (HRNM) was created by Proclamation 7319 in 2000. The Proclamation lists the resources that are to be protected including: riparian, aquatic and upland shrub stepped habitats, native plant and animal species as well as archaeological, historic and sacred sites throughout the monument. While the majority of the HRNM is managed by USFWS, the river corridor lands underlying the Hanford reactors and operational areas are managed by DOE. These lands contain high levels of contamination and significant cultural resources.

k. It is recognized in the Proclamation that DOE has the responsibility to clean up hazardous substances and the restoration of natural resources. The Proclamation further states, "As Department of Energy and US Fish and Wildlife Service determine that lands within the monument managed by the Department of Energy become suitable for management by the US Fish and Wildlife Service, the US Fish and Wildlife Service will assume management by agreement with the Department of Energy." Clearly it was the intent of the President that the HRNM land would be cleaned, restored and then managed by the USFWS.

The entire HRNM would then be managed according to the mission of the USFWS guided by the HRNM Comprehensive Conservation Plan (CCP), which states a primary purpose of, "Protect and restore biological, cultural, geological and paleontological resources." Areas in the River Corridor 100 Areas are some of the most contaminated, and it remains the obligation of DOE to clean and restore these areas within the HRNM and areas that could affect the HRNM in consultation with the Department of Interior. Anything other than complete cleanup and restoration of the HRNM would be in direct conflict with the Antiquities Act, Proclamation 7319, and the HRNM CCP.

l. Full compliance with government-to-government requirements are not fulfilled by the vague statements found in the Proposed Plan (page 13, Table 10-10, RI/FS): "*During preparation of this Proposed Plan, DOE and Ecology invited the Tribes to formal consultation on this proposed cleanup action. In addition to these formal activities, DOE and Ecology have worked with Tribal staff during the RI/FS process*" or "Effects *to other cultural values will be minimized through implementation of Hanford Cultural Resources Management Plan* (DOE/RL-98-10), *Revised Mitigation Action Plan for the Environmental Restoration Disposal Facility* (DOE/RL-2005-27), *and consultation with area tribes, as needed. This will help ensure appropriate mitigation to avoid or minimize any adverse effects to natural and cultural resources and address any other relevant concerns.*"

- The Proposed Plan and decision documents do not adequately explain how cleanup meets the National Historic Preservation Act consultation process, including, for example, the specific and concrete steps for how cleanup in the

cultural areas will proceed in a manner that prevents disturbances (e.g., specific soil sampling designs to protect artifacts).

m. The Preferred Alternative for groundwater with ICs for extended time periods is inconsistent with the CLUP (It is stated that cleanup actions will support reasonably anticipated future land uses consistent with the Hanford Reach National Monument and "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (the "CLUP') (HCP EIS) (64 FR 61615). CLUP is designated for 50 years operational and 100 years for institutional controls. Beyond that time period, the site could be used for any and all types of land use; including irrigation. It is known that there will be continued releases above cleanup levels for over 100 years.

n. Yakama Nation ERWM remains concerned that any remedy reviews (i.e. 5 year ROD reviews) will not include appropriate sampling actions or technological systems review to confirm performance of these IC.

4. **Evaluation of Alternatives: Key Concerns/Comments:**

a. DOE should develop cleanup plans that are protective of human health and the environment, and allow **safe unrestricted** Tribal uses.

b. Discussion of the "Shoreline site" is misleading to the public. Correctly stated "The "Shoreline Site" is not listed in WIDS; it was defined in *Corrective Measures Study for 100-NR-1 and 100-NR-2 Operable Units* (DOE/RL-95-111) as a single, unique waste site containing the 100-N-Springs (riverbank seeps) along the eastern shore of the Columbia River, as well as associated contaminated soil from strontium-90 contaminated groundwater discharge from the 1301-N and 1325-N cribs and diesel fuel-contaminated soil from waste site 100-N-65 (*Corrective Measures Study for 100-NR-1 and 100-NR-2 Operable Units* [DOE/RL-95-111]) none the less it must be remediated.

None of the alternatives presented propose a remedy for the "Shoreline site". Long-term use of ICs (~ 225 years) is unwarranted based on the statement "Because of its proximity to the existing apatite PRB, intrusive remedial actions (i.e., RTD) of the shoreline site (including the trench) would compromise the integrity and effectiveness of the apatite barrier" (page 8-57, RI/FS). Apparently nearly 5 Curies of the 100-N Area strontium-90 inventory remains in this riparian zone without a proposed remedy.

c. The Proposed Plan for cleanup of the 100-N Area and the associated RI/FS Report does not support an adequate cleanup of the area groundwater or soils. While identified waste sites were heavily contaminated, the fact remains that significant quantities of strontium (and other contaminants of concerns, including hexavalent chromium, cadmium, cobalt, manganese, nitrates) will remain unaddressed under the current Preferred Alternative. In order to achieve long-term protection of the Columbia River, contaminants will need to be removed from the vadose & riparian zones in the 100-N Area.

- The riprap cover consisting of large boulders that was placed over the N-Springs seeps in 1984 to minimize the accessibility of the seeps to both human and faunal

contact cannot ensure restricted access for the required time period of approximately 230 years.

- Strontium-90 inventory discussions are not consistent. There appear to be discrepancies between total curies discussed in chapter four (page 4-263) and chapter eight (page 8-56). These discrepancies should be examined and resolved in both the Proposed Plan and RIFS documents.
- Page O-19 states Srtontium-90 will continue to desorb from saturated sediments & the PRZ at levels which exceed cleanup PRGs.

d. Exposure pathways to contaminated media have been documented to be complete. Both the Proposed Plan and the RI/FS assert that there are "no complete exposure pathways for risk to human populations" based on the formally designated land use and existing institutional controls. However, this statement is contradicted by DOE's own description of the 100-N Area "Groundwater carrying mobile radioactive contaminants enters the Columbia River via a series of riverbank seeps, referred to as the N-Springs, which are also considered a contaminant source in the 100-N Area (*Westinghouse Hanford Company Environmental Surveillance Annual Report – 100 Areas* [WHC-EP-0161] RI/FS, PG 4500).

Natural seeps are observed along the shoreline, in the riparian zone, associated with the early summer drop of the Columbia River water levels. These seasonal seeps represent secondary contaminant sources to the riparian zone." The seeps are monitored by the DOE's Public Safety and Resource Protection Program. None of the Alternatives address remediation of this complete pathway.

e. Assumptions and Inputs: Appendix K, Section 4.1, of the RI/FS indicates cost calculations included the assumption of ICs. EPA guidance (OSWER Directive 9283.1-33) states "While ICs related to groundwater or surface use may be used as part of a response action, the NCP preamble indicates that ICs generally are not to be included when evaluating whether a CERCLA remedial action is appropriate in the first place."

Without ICs, none of the proposed remedial alternatives are appropriate, and therefore should be considered deficient and removed from the Proposed Plan in favor of alternatives that permanently and verifiably remove contamination from the 100-N Area.

f. Statements in Appendix K, section 4.1 (RI/FS) also indicate additional IC maybe included through closure reclassifications. All potential costs estimates must be identified within the remedy selected for each waste site. It is assumed that ICs will be maintained for 5 years beyond the time that the cleanup goals are initially achieved. Clarification should be added regarding to how IC will be incorporated into the RCRA TSD permits.

g. The Yakama Nation ERWM Program supports use of technologies that reduce or eliminate contamination from source terms on the Hanford Site. The apatite permeable reaction barrier does not meet these criteria. It may contain it, but for how long? At some point it will saturate.

h. Statements are made implying that the decision to deploy apatite sequestration techniques at additional locations will be made through a process without public involvement. This approach is inappropriate -- to prospectively decide future remedy selection or imply the approval of use of a "plug-in approach" without public

comment -- within the context of the Proposed Plan. DOE should revise the Proposed Plan to remove this text from the document.

Should DOE be considering application of the "plug-in approach" to waste site remediation, the YN ERWM program request DOE to develop a separate document and subject it to the public review process. Application of apatite to locally elevated areas of Sr-90 outside the PRB would require an Amendment to the ROD and public review opportunities. See page 42, line 33 of the PP.

i. It is unclear how consideration of the adequacy and reliability of controls were evaluated for Long-term Effectiveness and Permanence of the alternatives. Was there an assessment of the reliability of management controls for providing continued protection from residuals? Did the evaluation include the assessment of the potential need to replace technical components of the alternatives, such as a cap, a slurry wall, or treatment systems (e.g., Sr-90 barrier, groundwater wells/treatment systems, and additional application of apatite to the vadose zone and groundwater outside of the PRB) and the potential exposure pathway and risks posed should the remedial action need replacement? How long before the barrier saturates with Sr-90. The barrier is like a filter and all filters plug eventually. What action will DOE take when this occurs? Where will future Sr-90 contaminated be disposed of at – when all Hanford waste sites are closed?

   The DOE should revise the Proposed Plan to address these deficiencies and include detailed cost information for each alternative.

   - Installation of an additional 1000 foot apatite barrier through jet injection of 305 borings to a depth of 20 feet is an inefficient use of funds. Remove, treat, and dispose (RTD) would permanently remove the majority of Sr-90 contamination in this portion of the PRZ that provides a continuing source of contamination to groundwater.
   - See our previously identified and relevant concerns regarding use of the Apatite Barrier.[3]

j. The Proposed Plan's Preferred Alternative 3 does not include all the required information: The Preferred Alternative does <u>not</u> include the required description of contingency measures that will be implemented should the remedial alternative monitoring show that the alternative is meeting remedial action objectives and performance criteria.

   Conditions that would trigger the contingency should also be specified (e.g., continued plume migration or contaminant levels are well above levels predicted for a specified time) (EPA 540-R-98-031). The Proposed Plan and Preferred Alternative should incorporate remedial actions that will meet these thresholds and state explicitly the contingency measures and additional actions that will be taken should CERCLA monitoring demonstrate the Preferred Alternative has not worked as planned. YN ERWM requests DOE update the Proposed Plan to provide details for public review including cost of implementation of contingency measures.

   - Use of natural attenuation as a component of a groundwater remedy requires contingencies for additional or more active remedial actions to be incorporated

[3] Yakama Nation letter to Shirley Olinger, Manager, Department of Energy, Office of River Protection, David Brockman, Manager, Richland Operations Office, Dennis Faulk, Manager, USEPA, Richland, Jane Hedges Program Manager, WA Department of Ecology, July 20, 2010.

that are triggered by specific contaminant concentration levels in the site groundwater monitoring network (or other criteria as appropriate).[4] These contingencies were not developed or included in the RI/FS or the Proposed Plan.

l. DOE needs to evaluate soil flushing as an alternative. Clarify reason for not considering it.

m. The Feasibility Study did not consider focused RTD of Sr-90 to reduce the source term mass at the most highly contaminated liquid disposal sites to an appropriate level (such as MTCA Method-B Unrestricted Use Standards). Such an approach is the only method that definitively and permanently removes contamination from the vadose zone and periodically rewetted zone. The analysis provided by the DOE instead provided only a cursory evaluation of RTD over the entire 100-N Area which was deemed to be infeasible. Such intentionally deficient analysis does not constitute an appropriate evaluation of RTD technology, and is deficient for the purposes of the Proposed Plan and RIFS.

RTD remediation would reduce the quantity of strontium that is released to groundwater at from focused source areas and significantly improve the effectiveness of the apatite PRB located at the Columbia River's edge. Even partial removal of contamination sources can greatly reduce the long-term reliance on both active and passive groundwater remediation. This more aggressive strategy to remove upland Sr-90 contamination sources would also result in significantly shorter use (and cost) of ICs and a shorter groundwater restoration timeframe.

Detailed analysis of focused RTD would likely result in an overall rating that is higher than the Preferred Alternative in all of the Threshold & Balancing Criteria analysis factors. The YN ERWM program believes it would be under the cost of Alternative #5 with the public assurance that a significant portion of the source of Sr-90 contamination has been removed.

Focused RTD could be implemented in conjunction with local apatite PRBs to reduce or eliminate the mobilization of strontium-90 contamination during the RTD process. Such an approach would prove dramatically more effective than that which has been proposed in the Preferred Alternative.

At the very minimum YN ERWM Program recommends this approach as the Preferred Alternative.

n. Design elements for Alternatives selection should be described in sufficient detail in the Proposed Plan so that the public can evaluate and comment on the proposal (EPA 540-R-98-031). The Proposed Plan provides the foundation for the ROD to defer the final technology selection to the remedial design phase.

- (See Proposed Plan Table 4) Note: Although the remedial alternatives developed for evaluation do not have specific provisions for sustainable elements, those values can be incorporated during the remedial design phase.

o. None Alternatives were evaluated against the nine balancing criteria with recognition of what happens with transition to Long-term Stewardship prior to completion of remediation under the Record of Decision (e.g., was a cost benefit analysis of remedy costs including long-term stewardship costs done?) The environmental consequences of doing this action or not doing it have not been evaluated. It is unclear how any of

[4] EPA; Directive 9234.2-25

the Alternatives can ensure compliance with the balancing criteria with transition into Long-term Stewardship. These analyses should be done as this action will clearly need to be reflected and integrated into the final ROD.

p. Alternatives 2 thru 5 incorporate use of a Technical Impracticability Wavier (TI) for the Drinking Water Standard (DWS) ARAR. The TI waiver should not be granted for the 100-N Area upland Strontium -90 groundwater plume for several reasons that include:

- CERCLA TI Waivers based on "engineering perspective" implies that a TI determination should primarily focus on the technical capability of achieving the cleanup level, with cost playing a subordinate role. The NCP Preamble states that TI determinations should be based on: "...engineering feasibility and reliability, with cost generally not a major factor unless compliance would be inordinately costly."[5] RCRA Subpart S (Corrective Action) has similar guidance.[6] However, in both instances *the role of cost (or scale) of the action is subordinate to the goal of remedy protectiveness* (EPA Guidance; Directive 9234.2-25). Cost is indicated as the primary consideration and should not be.

- IT description does not include an evaluation of impacts on the performance of each *Balancing Criteria* (e.g., will there be less reduction in toxicity, mobility or volume through treatment because of the wavier?).

- A demonstration that ground-water restoration is technically impracticable generally should be accompanied by a demonstration that contamination sources have been, or will be, identified and removed to the extent practicable.[7]

- EPA Guidance (Directive 9234.2-25)(Final RODs) states where site characterization is very thorough and there is a moderate to high degree of certainty that cleanup levels can be achieved, a final decision document should be developed that adopts those levels.

- Use of an apatite barrier has been proven effective in attainment of cleanup levels. Guidance indicates a TI wavier is not warranted in the case of the 100-N Area Sr-90 upland groundwater plume.

- The requested TI Wavier fails to demonstrate that no other remedial technology could reliably or feasibly attain the cleanup levels at the site within a reasonable timeframe. Removal actions are appropriate where contamination poses an actual or potential threat to drinking water supplies or threatens sensitive ecosystems. Removals of source material (hot spots) and containment of migrating zones of high levels of contamination in groundwater all fall under this category. [8]

- TI Wavier based on the infeasibility of an upgradient apatite permeable reactive barrier for Sr-90 does not satisfy the requirement to have an adequately designed groundwater restoration remediation system design and implementation. Failure to achieve desired cleanup standards resulting from inadequate system design or

---

[5] See NCP Preamble, 55 FR 8748, March 8 1990

[6] See Proposed Subpart S; 55 FR 30830, July 27, 1990 & TI discussion in Section 264.525(d)(2) and 264.531 of the Proposed Subpart S rule.

[7] EPA; Directive 9234.2-25

[8] EPA; Directive 9234.2-25

operation is not considered by EPA to be a sufficient justification for a determination of TI of ground water cleanup.[9]

q. Current apatite barrier design should be optimized and/or enhanced to ensure operating capacity can handle any additional flux of strontium-90 from the upland plume.

r. Use of a TI wavier denies the basic premise of (WAC 173-303-645) application of alternative requirements for groundwater monitoring which requires the integration of monitoring networks and a single point of compliance (throughout the entire groundwater operable unit). Groundwater cleanup is based on the highest beneficial use. Ecology, through the Model Toxics Control Act (MTCA) has determined that use of groundwater as a source of drinking water is the beneficial use requiring the highest quality of groundwater. The effectiveness of the RCRA corrective action groundwater monitoring program should be based on achievement of MTCA Method B groundwater cleanup levels throughout the entire groundwater operable unit for all constituents. To be able to provide a defensible and technically sound determination, the RCRA TSDs dangerous waste constituents should include all constituents listed for the SWMUs and other areas of concern, and the well monitoring network enlarged.

- Clarify how any reduction in the number of ground water monitoring wells (as indicated in Appendix K, Attachment #1 for all alternatives) will ensure use of protectiveness of human health and the environment and compliance with WAC 173-303-610, 645, and 650.

5. **General Comments on the Analysis of the Alternatives:**

a. Alternative design details (i.e., specific provisions for sustainable elements) are to be identified in the RDR/RAWP to be prepared after the ROD is issued. EPA guidance (EPA 540-R-98-031) states this information should be included in both the Preferred Alternative Section of the Proposed Plan and the Selected Remedy Section of the ROD, not in the workplan.

b. Summary of Comparative Analysis of Alternatives (Proposed Plan Table 4): YN ERWM program believe the weight applied to ranking of the effectiveness of the alternatives to be incorrect. There is obvious discrepancy in the rating of Alternatives 4 and 5 as having less *Long-term effectiveness and permanence* and less *Reduction of toxicity, mobility, or volume through treatment* or *Short-term effectiveness and time to achieve RAOs* in comparison with Alternative 3. While cost for waste sites is less under Alternatives 3, Alternatives 4 and 5 take less time, remove a greater portion of the source waste, and have better reduction of mobility of a specific area than Alternative 3. Both Alternatives 4 and 5 take less time to achieve PRGs for nitrate and strontium in the GW than Alternative 3.

- The evaluation of the long-term effectiveness and permanence afforded by alternatives assesses the effectiveness an alternative will have in eliminating exposure pathways or reducing levels of exposure identified in the baseline risk assessment. Both Alternatives 4 and 5 should rank higher than Alternative 3 as both have additional design elements to remove and/or capture contaminants in the groundwater pathways.

[9] EPA; Directive 9234.2-25

- The statement that effects of injecting apatite and organic substrate treatment in the same area may have unintended consequences is not supported by Hanford site treatability study data. Injection of apatite and bioventing have the virtually the same potential. Alternative 3 should rank equal with Alternative 2 in this comparative analysis criteria.
- Clarification is needed in the Proposed Plan support statement that co-treatment of nitrates and emplacement of an apatite barrier in the upland areas is so technically challenging to warrant given ranking for implementability criteria. Statement that there are potential concerns with placement within the Mooli Mooli cultural resource area does not preclude the need for additional needed remediation. (See our comments regarding Cultural Resources.)

c. The Preferred Alternative eliminated in-situ biological treatment for nitrates citing possible clogging of and reduction in the effectiveness of the apatite barrier. Ex-situ treatment for nitrates (bioreactors) was similarly dismissed. However, its effectiveness (>99%) is documented in a Hanford study.

- Proposed in situ bioremediation has been described as potentially biofouling the apatite PRB injection wells and the saturated zone. Cost estimates and further consideration should be given to inclusion of ex-situ nitrate treatment in the preferred alternative.
- Allowing up to 508 pounds of nitrates to enter the Columbia River is not acceptable. Data cited in the PP/RI/FS for mass of nitrate entering the river from offsite sources is outdated and irrelevant. DOE has the responsibility to remediate the contamination in the groundwater and the river that is the result of its operations on the Hanford site.
- Caution is appropriate if young children might be exposed, such as in the Nonresident Tribal scenario, because they are particularly at risk for methemoglobinemia, the critical effect for nitrate exposure (IRIS 2009). Nitrates should be remediated.

d. The Propose Alternative states biosparging will reduce TPH-D concentrations throughout the plume to less than the groundwater cleanup level in three (3) years. With the uncertainties expressed regarding the efficiency of the bioventing system (WCH-370, 2009, *Bioremediation Well Borehole Soil Sampling and Data Analysis Summary Report for the 100-N Area Bioremediation Project (UPR-100-N-17)*, Rev. 0, Washington Closure Hanford, Richland, Washington.), this statement seems optimistic. What contingencies are planned should the selected groundwater remediation remedy not meet RAOs as described?

- Clarify if short-term effectiveness evaluations for all alternatives were based on only the time to build/implement the remedy or if it includes the time to achieve all remedial action PRGs.

6. **Comments Regarding 100-N Groundwater Remedial Alternatives:**

a. The PRB has not been proven to be effective in the conditions present in the Hanford 100-N area: All the action alternatives identified in the Proposed Plan rely on the construction of a PRB to intercept and immobilize strontium-90 contaminated groundwater prior to reaching the Columbia River. Previous tests of this remedial process technology in the 100-N area have failed to demonstrate the technology is

effective and reliable at performing these two actions (USDOE, 2010; Williams et al., 2008).

The recent publication by Pacific Northwest National Labs *Apatite Treatability Test: High-Concentration Calcium-Citrate-Phosphate Solution Injection for In-Situ Strontium-90 Immobilization: Final Report* (2010) gives cause for additional concern that this technology is inadequate since even in locations where monitoring showed the greatest reductions in strontium-90, Federal drinking water standards for beta-emitting radionuclides were not met.

A partially functioning or dysfunctional PRB provides little to no protection against the ongoing release of strontium-90 contaminated hyporheic water and groundwater. This technology therefore fails to reduce the volume, toxicity, or mobility of the contaminant it is designed to remediate. The remedial alternative is deficient, and feasible alternatives be considered instead.

The YN ERWM Program request DOE revise the Proposed Plan action alternatives to incorporate proven treatment technologies, or technology that is supported by a full CERCLA Feasibility Study as the best alternatives to reduce volume, toxicity, and mobility of the strontium-90 contaminated groundwater.

b. Permeable Reaction Barrier construction is unreliable: Construction of the PRB relies on observing specific criteria in wells proximate to the injection sites to demonstrate surrounding soils have been fully treated with adequate reactive solution to create a continuous reactive barrier. Previous injection attempts have failed to meet the required criteria at "a significant number of well locations" (Vermeul et al., 2010).

   Subsequent PRB construction details have not resolved the problems associated with ensuring proper placement of reactive agents in the soil column. Utilizing construction methods that are known to have not previously met performance criteria without modification constitutes a deficient approach to remediating strontium-90 contamination in the 100-N Area.

   The YN ERWM Program request DOE perform, document, and publish additional feasibility testing for construction of a PRB or alternate remedy that demonstrates construction specifications can be met to ensure adequate performance. If these criteria cannot be consistently achieved and documented in field tests, the PRB should not be considered in the Proposed Plan.

c. Construction of the permeable reaction barrier results in unacceptable impacts to the Columbia River: Construction of existing portions of the PRB resulted in significant, measurable, and distinct increases in metals and radionuclide concentrations measured in groundwater adjacent to injection wells (Williams et al., 2008, Vermeul et al., 2009). No remediation measures have been proposed to address the potentially large release of strontium-90 into the Columbia River that will occur during construction of the new PRB sections or supplemental injections described in all of the action alternatives of the proposed plan for strontium in groundwater.

   Simulated impacts to the Columbia River based on the USDOE groundwater fate and transport modeling show strontium-90 breaking through the PRB. The predicted impact includes a cumulative total activity of approximately 0.077 curies entering the river. The RI/FS describes this activity as "a small percentage" of the total mass of radiostrontium in the upland aquifer. Such logic is unacceptable when viewed in the appropriate context for the 100-N area, which includes groundwater contamination by strontium-90 at concentrations as high as 8,000 picocuries per liter. At this

concentration, consumption of only 2 liters of contaminated water result in a committed dose of 20 millirems, approximately five times the annual allowable dose (4 mrem) under current Federal regulations (40 CFR 141.66). Selected remedial actions must provide consistently dependable performance for the duration of the period in which remediation is necessary.

The YN ERWM Program requests DOE revise the proposed action alternatives to address the mobilization of strontium-90 and other metals that has been observed following the injection of calcium-phosphate-citrate solutions. Any contamination that is mobilized as part of the proposed remedial actions should be contained, containerized, and disposed of according to the applicable legal requirements. Revise the Proposed Plan and RI/FS to incorporate design criteria for the PRB or alternate remedy which include long term maintenance and monitoring which maintain a minimum factor of safety of 2 or greater for PRB groundwater remediation performance over the next 300 years.

d. General Groundwater Comments (e thru o): It is unclear how remediation of the Strontium-90 contamination will achieve RAOs for all groundwater COCs. Clarification requested within PP and RI/FS documents.

e. It is unclear how remediation measures for TPH-d in the vadose zone and groundwater (bioventing and biosparging) will also remediate any total chromium or cobalt, present. Both of these actions are designed to create a redox zone which may allow release of metals.

   However, elevated metal levels may indicate a relationship between the geologic environment and other waste sources and not active biodegrading of total petroleum hydrocarbons (TPHs). Regardless of cause, there is no system in place (or suggested) to capture these contaminants. The YN ERWM Program requests more clarification (see RI/FS page 8-53) and consideration of remedy design changes to ensure capture of flushes of contamination to the groundwater and river at levels exceeding cleanup standards.

f. By their inter-connectedness, to ensure continuity of the Hanford site groundwater remediation efforts, treatment of hexavalent chromium should also be included in the 100-NR-2 ROD GW remediation plan. Discussion is need to demonstrate (using travel times, etc) that the contamination reportedly originating from the 100-K-1 OU is prevented from exceeding the DWS, MCLs, AWQS downstream and/or reaching the river. Otherwise, the ROD must include a remedy for all these constituents.

g. The YN ERWM Program requests DOE provide a reference document to support the statement that hexavalent chromium detected in the 100-N area groundwater is being addressed through the 100-K interim actions.

   The 100-N area chromium needs to be addressed. The Work Plan[10] reported chromium sampling at 100-N as "inconsistent and discontinuous in frequency and location" and chromium was not a "typical analyte" in much of past 100-N well sampling. Chromium occurs widely across 100-N and at concentrations above action levels in at least one well (199-N-80).

[10] 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) and Sample Analysis Plan for the 100-NR-2 Operable Units RI/FS (DOE/RL-2009-42).

- Well 199-N-80 should be in the RCRA TSD groundwater monitoring network for the 1301-N unit as it is closely associated and down-gradient.
- YN ERWM Program requests the following well to be included in the 1301-N groundwater monitoring network: N-1/-2/-2/-14/-16/-18/-19/-21/-26/-27/-28/-29/-34/-50/-56/-57/-64/-74/-80/-96A/-106A/-173.
- Minimum Standards for Construction and Maintenance of Wells" (WAC 173-160 & -162), should be the ARAR regulations for the location, design, construction, and abandonment all 100-N Area wells.
- Ecology letter (April 16, 2009) to Mark French stated "Chromium concentrations in groundwater at wells located near and immediately downgradient to the 116-N-1 (1301-N) surface impoundment (e.g. 199-N-80, 199-N-56, and 199-N-3) have exceeded and continue to exceed the 48ug/L groundwater cleanup level (WAC 173-303-720(4))."
- Ecology has consistently requested use of hexavalent chromium K_d=0 mL/g, based on field observations of chromium mobility and results of site-specific leaching and batch sorption tests. The Proposed Soil cleanup levels for Hexavalent Chromium to ensure protection of groundwater should be set at 0.2 mg/kg.

  This value is found using a K_d value of 0 mL/g and more accurately depicts movement of this contaminant through soils. Fate and transport simulations presented in DOE/RL-2010-98 should be recalculated using 0.0 K_d value. The YN ERWM Program requests the use of 0.0 K_d value and that concentrations in the groundwater and along the shoreline and the subsequent timeline should be re-evaluated for decline in concentration.

h. Groundwater is not generally considered a primary source, yet the YN ERWM Program is concerned that any remedy reviews will not include appropriate sampling actions or technological systems review to confirm performance or to consider missing source area contaminants (i.e. the 100-N reactor/fuel basin plume).
   - Clarify how and demonstrate (using travel times, etc) that contamination from these COCs will be prevented downstream and/or from reaching the river in exceedence of the DWS, MCLs, AWQS

i. The YN ERWM Program request EPA use of the new RfD value (0.0006) for Uranium by EPA's Office of Drinking Water as the basis of the Maximum Contaminant Level for drinking water is noted in the Tri-Party approved comment resolution document attached to DOE letter (13-AMRP-0041) to EPA and Ecology, 11/21/2012.

j. The YNERWM Program disagrees with the application of several footnotes identified in Table A-1 & A-2:
   - Table A-1, footnote (j) indicates the hexavalent chromium PRG is based on IROD cleanup levels (DOE/RL-96-17). The YN ERWM Program request DOE change the PRG to 0.19.
   - Footnote 'e' (see footnote-Table A-1) states "In instances where verification sampling exceeds irrigated PRGs but achieves non-irrigated PRGs, the Tri-Party Agencies may elect to apply ICs to ensure protectiveness rather than continue excavation". The purpose of verification sampling is to determine if cleanup levels have been met or if further excavation is required. The PRGs listed are the

proposed cleanup levels to be met are they not? This is an over-reliance on the use of ICs rather than appropriate RTD or other remediation.

- Footnote 'g' (see footnote-Table A-1) states "The SSL or PRG value for groundwater or surface water protection is considered nonrepresentative because there is no breakthrough of the analyte simulated within 1,000 years for the majority of the soil columns (breakthrough is defined as concentrations above 1E-04 µg/L, or 1E-04 pCi/L)." Point of departure is defined by EPA as $1X10^{-6}$. MTCA risk is $1X10^{-6}$. The YN ERWM Program request DOE to calculate PRGs for all analytes noted with footnote (g).
- Footnote 'f' (see footnote-Table A-1) states "Should site-specific data during remediation indicate that the PRG is not representative of site conditions, additional protectiveness evaluations may occur." The YN ERWM Program request details of these evaluations are included within the Proposed Plan and available for public review.

k. The Preferred Alternative (or Proposed Plan) does not include the required description of the contingency measures that will be implemented should the monitoring show that natural attenuation is unable to achieve the cleanup goals. Conditions that would trigger the contingency should also be specified (e.g., continued plume migration or contaminant levels are well above levels predicted for a specified time) (EPA 540-R-98-031). Update and provide details in the Proposed Plan for public review including cost of implantation of contingency measures.

   The Proposed Plan should include a detailed description of quality assurance measures that will be implemented as part of the preferred alternative's use of an apatite PRB for strontium-90 sequestration. The description should include a program of subsurface testing to ensure placement of reagents, as well as identify performance standards which the alternative must achieve before the reagents are applied in the field.

l. The YN ERWM Program believes there are some noted incorrect applications of regulations which need correction and re-evaluation of risks to the groundwater (e.g. Text in the Proposed Plan states "For sites in the Columbia River…protect aquatic life in the Columbia River by achieving …state water quality standards at groundwater discharge points to the river." It is noted that aquatic water quality criteria are only directly applicable where groundwater discharges to surface water." 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.) We believe the aquatic water quality criteria do apply to the ground water because the property abuts the surface water and should be applied at 100-N.

m. Monitor wells are assumed to have a design life of 30 years yet monitoring will continue for hundreds of years. Clarification is needed to ensure that cost estimates include replacement of wells over time.

7. **Comments Regarding Human Health Risks:**

a. Accumulated scientific evidence demonstrates that Native Americans are, as a statistical cohort, subject to the highest risk of disease and cancer from exposure to environmental contaminants. The Columbia River Basin Fish Contaminant Survey is a technical report that assesses the amount of chemical pollution in certain species of fish, and the potential health risks from eating fish those fish. The study is based on fish samples collected between 1996 and 1998 from tribal fishing waters in Washington, Oregon and Idaho. EPA funded the study which was coordinated by the four member tribes of the Columbia River Intertribal Fish Commission (CRITFC).

   - Official recognition that Native Americans living near the Hanford site are the most vulnerable people to environmental contaminants, as underscored by EPA's Columbia River Fish Contaminant Survey. Adults in CRITFC's member tribes who eat fish frequently (48 meals per month) over a period of 70 years may have cancer risks that are up to 50 times higher than those in the general public who consume fish about once a month.

b. Tribal risk information from the Remedial Investigation/Feasibility Study basically indicates ranges of over ten times the allowed risk for cancer and fifty times the noncancer health effects (Appendix G Table G-59) throughout the 100-N groundwater plume areas. Tribal risk from groundwater use in a Sweat Lodge indicates ranges of unprecedented risk (ranging from over a hundred times the allowed risk for both nonradionuclide and radionuclide cancer causing analytes to over 13,000 times the noncancer health effects (HI) for some exposure routes (Appendix G Table G-60). However, this information was not used to develop cleanup levels or make cleanup decisions.

   - Hexavalent Chromium, Strontoium-90, tritium, and arsenic are some of the major contributors to risk for the Native American scenarios.

   - These cancer risks are greater than the maximum allowable EPA risk threshold of 1×10^{-4} (1 in 10,000 people) The Hazard Index (HI) is greater than the EPA target HI of 1.0.

c. There remains unacceptable risk to the YN tribal members from both chemical and radiological contaminants. Much of the risk assessments are based on the RCBRA and other supporting documents. In the Introduction (page xxvii), PRGs are described as "PRGs are more specific than RAOs and establish acceptable exposure levels for specific contaminants and exposure pathways that are intended to be protective of HHE.." However, since PRGs were not developed for any tribal scenarios they do not represent levels that are protective of tribal health.

d. The methodology used to assess risks for the RI/FS uses PRGs developed in the RCBRA (DOE/RL-2007-21).

   - The YN has outstanding issues with the use of River Corridor Baseline Risk Assessment and its 'sub-documents'[i.e. Tier 1 document for wildlife or the Tier 2 document for plants and invertebrates] as a major supporting document in cleanup decisions for the River Corridor Areas. These documents are not finalized or approved nor have our comments and concerns been addressed.[11]

   - RCBRA (River Corridor Baseline Risk Assessment Volume II, Part 1: Human Health Risk Assessment August 2011): Volume II, Part 1: Human Health Risk

[11] See our February 28, 2011 letter to the Tri-Party Agencies (DOE-Matt McCormick, EPA-Dennis Faulk, and Ecology- Jane Hedges

Assessment August 2011pg 7-34: For the Nonresident Tribal scenarios, the total cancer risk estimates exceed 10^{-4} and HIs exceed 1.0 for all ROD areas.

e. Conservation/mining land use is as a part of the basis for the preliminary remediation goals (PRGs). YN ERWM program disagrees with this land use designation to develop PRGs. Yakama Nation Treaty rights guarantee (among other rights) use of groundwater for sweat lodge activities. Groundwater is to be restored to its most beneficial use, which is drinking water standards (i.e. Method B, unrestricted land-use values). All PRGs should be calculated based on unrestricted land-use (at the very minimum.) YN ERWM has submitted previous comments on the development of the PRGs. We join with Ecology in questioning the development of the PRGs. See footnote #2.

f. Calculation of radionuclide PRGs based on use of a risk ELCRs of a 1 in 10,000 risk or radionuclide dose (15 mrem/year) is in opposition the EPA guidance which states the point of departure for risk is 1 in a million. The allowable target risk range is $1X10^{-4}$ to $1X10^{-6}$ but DOE continues to drive cleanup with the lowest level rather than initially striving to meet the highest standard of 1 in a million (1X10-6). $1X10^{-6}$ is consistent with MTCA (WA States regulations) and it should be DOE's cleanup goal.[12] As MTCA explicitly defines radionuclides as hazardous substances, the combined limit for radionuclides and chemicals should correspond to a lifetime cancer risk of $1 X 10^{-5}$ or less at the minimum.

- Clarify the need for an additional evaluation of HH ELCR and hazards were performed when MTCA Method B would suffice.
- Exposure Point Concentrations (EPCs) were used to calculate the ELCRS and noncancer hazards. Frequently these EPCs resulted in deletion of COPCs when used to compare COCs against the applicable standard or risk-based concentration. What was the process used to validate the results from which the EPCs were derived? Please refer to our prior discussions of EPCs in response letter to Hanford Risk Assessments, etc.
- Years to attain mature plant revegatation is more correctly identified as a range of 80 to 100 years. Recalculate infiltration rates using this more appropriate range of years. Adjust Alternatives to incorporate these values to reflect a more accurate timeline in achieving remediation goals.
- Many PRGs have been inappropriately developed and uncertainties remain as these documents still require revision. Our concerns remain regarding the methodology used to calculate the EPCs. EPA's ProUCL methods were identified yet in some instances a 95UCL was not calculated (a maximum value used instead). 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

[12] The 15 millirem per year (mrem/yr) dose limit used by DOE in the past is not protective enough; this dose equates to a lifetime cancer risk of 3×10^{-4}, which is three times the maximum allowable value under CERCLA. Note: If the EPA's own risk coefficients for radiation are used, it equates to a fatal cancer risk of more than 5×10^{-4} and a cancer incidence risk of 1×10^{-3}, which is well outside the CERCLA target range of 10^{-4} to 10^{-6}.)

compute defensible statistics.[13] Collection of additional samples was not done. Some unremediated waste sites may have exceedances of PRGs, which would provide the basis for remedial action or further evaluation. EPA review of YN comments on these issues in our earlier correspondence on the RCBRA, etc would provide further clarification.

g. A review of CVP documents (most dating 2001-2008) for a number of waste sites raised concerns. Several indicate the use of outdated standards or as of yet agreed to (by the Tri-Parties) values (i.e. the 100 Area Analogous Sites RESRAD Calculations (BHI 2005a) to calculate non-radiological COCs, [e.g. copper, lead, selenium, TPH; Aroclor-1254]. Many state use of MTCA 1996 values or soil RAGs based on "100 time groundwater cleanup rules and 100 times dilution attenuation factor times surface water quality criteria. Provide a more detailed explanation of the review of all CVPs including the comparison process and whether additional characterization and/or sampling was performed for those CVPs where filtered sampling results, etc where utilized. Adjust the need for addition site-specific remediation as warranted.

   - The YN ERWM Program does not support "backsliding" on any of the more stringent IROD cleanup values.

h. Text (and Table A-1) within the document identifying 20 mg/kg for arsenic as an unrestricted land use clean up value is misleading. It implies Washington State Department of Ecology concurrence with use of this value on the Hanford site as background. The 20mg/kg cleanup level is the WAC 173-340 (1996) Method A value.

   - The YN ERWM Program believes it is incorrect to apply Method A on the complex Hanford site as it is used for sites which contain a small number of hazardous substances.

   - Its application has resulted in residual levels for arsenic which do not reflect the Unrestricted Land Use Soil Cleanup Standards WAC 173-340-740(3)]) 2007 Method B value (0.67 mg/kg) and the MTCA ("Deriving Soil Concentrations for Groundwater Protection" [WAC 173-340-747(3)(a)]), groundwater protection value (0.00737 mg/kg) cleanup values (which would default to site background levels of 6.5mg/kg). The proposed 20 mg/kg value for arsenic exceeds the 1×10^{-6} individual cancer risk based on the MTCA.

   - In simple terms, the risk analysis showed that casual users of the River Corridor as it is have low enough risk to be safe. However, all of the residential user scenarios have unacceptably high risk. Some of the risk was associated with uranium,

---

[13] quotes from EPA sources, supporting use of the 95% UCL:1) Dec 2002 OSWER 9285.6-10 (http://www.hanford.gov/dqo/training/ucl.pdf) "It is important to note that defaulting to the maximum observed concentration may not be protective when sample sizes are small, because the observed maximum may be smaller than the population mean..... The use of the maximum as the default EPC is reasonable only when data samples have been collected at random from the exposure unit and sample size is large" (p. 20). 2) ProUCL Ver. 3.0 (Singh et al, 2004) (http://www.epa.gov/nerlesd1/tsc/images/prouc13apr04.pdf)

"It is recommended that the maximum observed value NOT be used as an estimate of EPC....It should be noted that for highly skewed data sets, the sample mean indeed can even exceed the upper percentiles (e.g., 90%, 95%), and consequently, a 95% UCL of the mean can exceed the maximum. This is especially true when dealing with log normally distributed data sets of small sizes" (page 55).

mercury, chromium, cadmium, and radiological contaminates. But a major part of the high risk levels found in the residential scenarios is from consumption of arsenic contaminated plants, animals and water. A large proportion of Nonresident Tribal cancer risk and HI is related to arsenic soil concentrations that are approximately equivalent to levels in areas unaffected by Hanford Site activities. When cancer risk estimates are calculated without the contribution of arsenic, the total cancer risk estimates still exceed 10^{-4} for all six ROD areas.

- While much of the arsenic is assumed to be from pre-Hanford agricultural practices, there was a portion that could be attributed to Hanford operations. That amount of the Hanford process arsenic load should be determined, and the cleanup of that arsenic should be a part of the Hanford cleanup plan.

i. The Proposed Soil cleanup levels for Hexavalent Chromium to ensure protection of groundwater should be set at 0.2 mg/kg. This value is found using a Kd value of 0 mL/g and more accurately depicts movement of this contaminant through soils. Fate and transport simulations presented in DOE/RL-2010-98 should be recalculated using 0.0 Kd value. Concentrations in the groundwater and along the shoreline and the subsequent timeline for decline in concentration re-evaluated.

j. The YN ERWM Program disagrees with the statement "As a result, risks are overstated because the UCL and the EPC do not take credit for the existing clean backfill that covers the remediated waste site." Risk from remaining contamination is what is supposed to be evaluated; delete text.

k. YN ERWM has reviewed in detail the comments of the Washington State Department of Ecology submitted on the 100-N Area RI/FS documents and join in their comments (with the exception of phyto-remediation), as supplemented by this submission. We particularly highlight and join the comments regarding human health and ecological risk and groundwater modeling.[14]

8. **General Comments on Principal Threat Wastes & Current and Future Exposure Scenarios:**

   a. It is unclear in the discussion of the Alternatives why there is no treatment included for long-lived the identified TRU radionuclides of plutonium and americium and cesium-137. Clarify in this section and also in the Alternatives discussions.

   b. Principal Threat Waste Approach: Delete text referencing $1X10^{-3}$. This is very misleading to the public. EPA guidance states point of departure is $1X10^{-6}$.

   c. Scope and Role:

      A holistic approach would ensure that protective decisions are made for the site in its entirety. We disagree with exclusion of contaminants emanating from offsite. The Preferred Alternative does not include an evaluation of contribution from other sources (i.e. the N Reactor plume) nor does it include upgradient contaminant sources from the 100-K area.

---

[14] Ecology letter 13-NWP-107 to Jonathan Dowell, DOE-Richland Operations Office dated October 2, 2013 regarding the *Remedial Investigation/Feasibility Study for the 100-NR-1 and 100-NR-2 Operable Units,* DOE/RL-2012-15, Draft A.

- YN ERWM Program recommends the 100-N Area ROD includes a detailed schedule for completion of the reactor removal, and the event that removal does not occur, a contingency to address the remaining soil contamination.
    i. DOE/RL-2005-93; Following removal action, drill one borehole (complete as a groundwater monitoring well under work scope) in the boundary of the 118-N Reactor Fuel Storage Basin. Future documentation will cover this work scope. This work is a remaining data gap for 100-N Area final ROD.
    ii. Clarify how the railroad tracks between 100-N & 100-K were remediated.

9. **General Comments on the Remedial Action Objectives:**
    a. The purpose of Remedial Action Objectives (RAOs) is to explain and address site risks and to include an action (and specifics/details) to be taken achieve the objective. RAOs are the measurement tools for evaluating the success of the ROD remedy during the CERCLA 5 year review process. Without a specific action, the metrics for measurement are filled with subjectivity and uncertainty.
        - Four of the five (5) RAOs do not have a definitive task or standard to be met. An Example of a specific action to include using RAO#3: Prevent COCs migrating and/or leaching through the soil that will result in groundwater concentrations exceeding federal and state standards and risk-based thresholds for protection of surface water and groundwater *by treatment of the contaminated soils or RTD.*
            i. Clarify all RAOs with specific action(s) to be performed and/or standard(s) to be met.
    b. Calculation of radionuclide PRGs based on use of a risk ELCRs of a 1 in 10,000 risk or radionuclide dose (15 mrem/year) is in opposition the EPA guidance which states the point of departure for risk is 1 in a million. The allowable risk range is $1X10^{-4}$ to $1X10^{-6}$ but DOE continues to drive cleanup with the lowest level rather than initially striving to meet the highest standard of 1 in a million(1X10-6). $1X10^{-6}$ is consistent with MTCA (WA States regulations) and it should be DOE's beginning remediation point and ultimate cleanup goal.
    c. Cleanup levels (i.e., PRGs) should reflect the current MTCA Method B standards and in cases where they are less stringent than before, there should be no back-sliding from previous cleanup commitments in the Proposed Plan or RI/FS.
        - YN ERWM Program requests the following edits to Table A-1of the Proposed Plan and in RI/FS: Note Table needs to define concentration units. Delete the column titled "No Irrigation", cleanup should be to unrestricted (including irrigation) use:
            1. Arsenic = 6.5mg/kg (direct contact)
            2. Barium=1,600mg/kg (soil protective of groundwater)
            3. Hexavalent Chromium=0.19 mg/kg (soil protective of groundwater)
            4. Nitrogen in Nitrate=40 mg/kg (soil protective of groundwater)
            5. Mercury=2mg/kg (soil protective of groundwater)
            6. Pu-239/240=23.5*
            7. Thorium-228=2.2*

8. Thorium-232=2.2*
9. Tritium=241*

* Note: Proposed PRG "backslides" from current IROD for RCRA TSD.

- YN ERWM Program requests the following edits to Table A-1 Proposed Groundwater and Surface Water Protection Cleanup Levels (PRGs) values(mg/kg): Note Delete the column titled "No Irrigation", cleanup should be to unrestricted (including irrigation) use:
  i. Strontium-90=0.35 pCi/L[15]

- Include the following RCRA TSD COCs/PCOCs*:
  i. Carbon tetrachloride
  ii. Hydrazine
  iii. Iron
  iv. Magnesium
  v. Phosphate
  vi. Tetrachloroethene
- Include the following radionuclide:
  i. Ruthenium-106

*DOE/RL-2000-16

d. The YN disagrees with footnote 'e' (see footnote-Table A-1) which states "In instances where verification sampling exceeds irrigated PRGs but achieves non-irrigated PRGs, the Tri-Party Agencies may elect to apply ICs to ensure protectiveness rather than continue excavation". The purpose of verification sampling is to determine if cleanup levels have been met or if further excavation is required. The PRGs listed are the proposed cleanup levels to be met are they not? This is an over-reliance on the use of ICs rather than appropriate RTD or other remediation.

e. More clarification is needed on how cleanup levels will be adjusted to account for waste site-specific residual contaminations and for sites with multiple residual contaminants. The same is needed for evaluation of groundwater exceedances.

f. Clarification and inclusion of information is need in the Proposed Plan and analysis of the appropriate alternatives in several areas:

- Table 4 (PP-Summary of Comparative Analysis of Alternatives) cost explanation columns do not reconcile with *explanation boxes* adjacent to each Alternative. Clarification is requested.
- Cost analysis for required well-conceived plans for performance monitoring that identify and correct potential failures and plans for maintenance and repair, including possible total system replacement is missing (NRC, 2000). This level

[15] Nez Perce Tribe' July 15, 2010 letter to Matt McCormick regarding DOE/RL-2009-54, Rev O; Proposed Plan for Amendment of 100-NR-1/NR-2 Interim Action Record of Decision

of planning, both technical and financial (i.e., costs, does not appear to have been included in the Proposed Plan or the analysis of alternatives).

- The Preferred Alternative (or Proposed Plan) does not include the required description of the contingency measures that will be implemented should the monitoring show that natural attenuation is unable to achieve the cleanup goals. Conditions that would trigger the contingency should also be specified (e.g., continued plume migration or contaminant levels are well above levels predicted for a specified time) (EPA 540-R-98-031). Update and provide details in the Proposed Plan for public review including cost of implantation of contingency measures.
- Are remediation costs for waste sites whose remediation was expected to begin under the Interim ROD for the 100-NR-1/NR-2 fixed and will not increase? What would be an estimate of increase in costs should these identified sites not have remediation under the Interim ROD?
- Removal or disposition of pipelines is not included in the RDT discussion. If they are, more clarification is needed.
- Design elements for Alternatives selection should be described in sufficient detail in the Proposed Plan so that the public can evaluate and comment on the proposal (EPA 540-R-98-031). The Proposed Plan provides the foundation for the ROD to defer the final technology selection to the remedial design phase. Implied design changes (e.g., through the RD/RA work Plan) or design studies for implementation of the remedy need more discussion within the Proposed Plan. Any associated costs should be included in the Proposed Plan.
- It is unclear if any of the Alternatives were evaluated against the nine balancing criteria based on what happens with transition to Long-term Stewardship prior to completion of remediation under the Record of Decision (e.g., Was a cost benefit analysis of remedy costs including long-term stewardship costs done?) The environmental consequences of doing this action or not doing it have not been evaluated. It is unclear how any of the Alternatives can ensure compliance with the balancing criteria with transition into Long-term Stewardship. These analyses should be done as this action will clearly need to be reflected and integrated into the final ROD.

10. **General Comment on Removal, Treatment, and Disposal at Waste Sites:**

a. Clarify in this section's discussion that RCRA TSD pipelines are to be RTD as this is a comment element to all Alternatives. Clarify if there are pipelines at deeper depths which will not be removed and how they are/were dispositioned.

- The raw water 102" headers (pipes) from the 182-N Building to the 109-N Building need to be removed. These lines are 102" in diameter. In the future, if these pipes remain, they will degrade and collapse creating a long and deep trench; a hazard for the future.

- The radioactive drain lines from the 109-N Building and 105-N Building handled primary water that included fission products. These lines need to be removed. The radioactive drain line near on the east side of the 105-N Building had a

major leak in the 1980s. The soils around the radioactive drain line along the 105-N building must be sampled.

b. Discussion regarding mitigation of culturally sensitive sites is inadequate. See previous comments.

11. **General Comments on Temporary Surface Barriers and Pipeline Void Filling:**

a. Design of surface barriers and discussion of pipeline void fillings should be included in the ROD per EPA guidance and the RCRA permit not within the RDR/RAWP. Include this statement in the Proposed Plan for clarification.

b. Clarify if there are pipelines at deeper depths which will not be removed. Include this information in the Proposed Plan.

12. **General Comments on NEPA**:

a. The relationship of NEPA and NEPA values to related information is not clearly presented. While Table 10-10 identifies the NEPA Values evaluated in relationship to the Alternatives presented, more clarity and discussion in need to clarify that some of the required assessments supporting NEPA values that are not yet made until after the RI/FS is approved.

b. The statement, "NEPA values were incorporated into the assessment conducted as part of the FS" gives the impression that NEPA values were done in the FS, and that is the end of NEPA values. Many of NEPA values are incorporated and enforce implementation of applicable laws and regulations into later phases of the CERCLA documentation process, including the ROD and RD/RAWP. Correct text and provide reference in RI/FS where these applicable laws and regulations are to be discussed and how they will be applied.

13. **General Comments on Future Interim ROD changes:**

a. Future Interim ROD changes: Incorrect statement made: "There will be a period of time between when the final action ROD is approved and the required RD/RAWP is prepared and issued. During this period, DOE-RL plans to continue remedial activities, such as waste site RTD. 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 final cleanup levels specified in the final action ROD when it is issued."

- 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. We expect review opportunities.

14. **Corrective Action:**

a. Text throughout the Section (an elsewhere in document) poorly communicates closure requirements for RCRA TSD units and the proper integration of corrective action for past practice units. 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).

b. Rewrite text to more clearly state 1) closure plans for TSDs are necessary for integration. This authority comes from the Site-wide permit not the RI/FS, and 2) 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. Include citation referencing Sitewide Permit II.Y.1 corrective regulatory citations in text discussions.