Department of Energy
Richland Field Office
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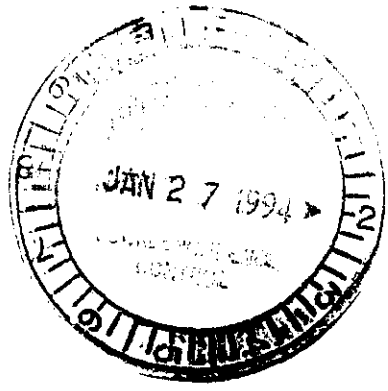
SEP 16 1993



93-ERB-217

Mr. Douglas R. Sherwood
Acting Hanford Project Manager
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99352

Mr. Roger F. Stanley, Director
Tri-Party Agreement Implementation
State of Washington
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Dear Messrs. Sherwood and Stanley:

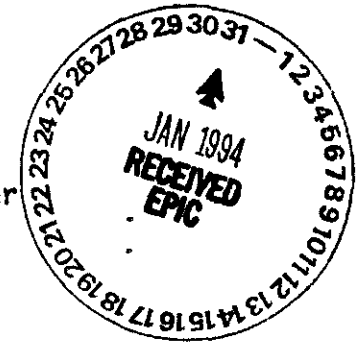
DISPOSITION OF REVIEW COMMENTS ON THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT FOR THE 1100 AREA NATIONAL PRIORITIES LIST (NPL) SITE, HANFORD

The subject document is enclosed for your information. This document is also being placed in the Administrative Record for the 1100 Area NPL Site.

If you have any questions regarding the enclosed document, please contact Mr. Walter D. Perro at (509) 372-3704.

Sincerely,

Steven H. Wisness
Hanford Project Manager



ERD:WDP

Enclosure

cc w/encl:
D. R. Einan, EPA
D. Goswami, Ecology (2)
M. K. Harmon, EM-442
R. Hibbard, Ecology
D. R. Sherwood, EPA
D. D. Teel, Ecology
L. C. Treichel, EM-442
T. M. Wintczak, WHC
Admin Record, H6-08

Tom M. Wintczak

SEP 20 1993

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Route_____ File_____

DISPOSITION OF 1100 AREA RI/FS COMMENTS

The comments received from EPA and Ecology on December 1992, draft of the 1100 Area RI/FS were dispositioned at discussions during February and March of 1993. Any changes to the text as a result of those comments were made in conjunction with the person and/or organization that provided the comment.

I. The following comments were accepted "as is" and incorporated into Draft C of the 1100-EM-1 RI/FS Volumes I, II and III, and Draft B of the 1100-EM-2, EM-3 and IU-1 LFI/FFS Volume IV (April 1, 1993). These comments generally consist of specific suggested changes and/or clarifications to text and tables. Therefore there is little or no listing of the disposition of these comments in the attached listing of Comments and Dispositions.

General Comment on statements indicating level of validation, comments # 1, 4, 6, 7, 8, 9, 12, 14, 17, 22, 25, 26, 27, 30, 36, 37, 38, 40, 43, 45, 47, 51, 53, 55, 67, 68, 69, 70, 71, 72, 74, 81, 82-a, 86, 87, 89, 92, 94, 95, 125, 126, 128, 129, 131, 133, 134, 135, 136, 137, 138, 140, 142, 143, 144, 145, 146, 151, 156, 159, 161, 163, 164, 165, 166, 170, 171, 172, 173, 176, 177, 179 through 197, 199, 200, 202, 203, 204, 205, 206, 208, 209, 213, 214, 215, 217 through 239.

II. The following comments were withdrawn or determined that no further action would be required after further review and discussion among all parties. Therefore there is little or no listing of the disposition of these comments in the attached listing of Comments and Dispositions.

General Comments on potential QA/QC inconsistencies, comments # 3, 11, 16, 24, 29, 31, 33, 35, 39, 42, 44, 48, 49, 52, 64, 65, 66, 73, 75, 78, 80, 85, 88, 99, 105, 106, 107, 108, 110, 111, 112, 114, 115, 116, 118, 119, 124, 130 (1,3,4), 139, 148, 149, 150, 154, 160, 168, 211, 212.

III. After discussion among all parties, the following comments were addressed through revisions to text, tables, data interpretations, regulatory framework etc. The agreed to dispositions of these comments and necessary changes that were made to the RI/FS and LFI/FFS text are summarized in the attached complete listing of Comments and Dispositions. Comments # 2, 5, 10, 13, 15, 18, 19, 20, 21, 23, 28, 32, 34, 41, 46, 50, 54, 56, 57, 58, 59, 60, 61, 62, 63, 76, 77, 82, 83, 84, 90, 91, 93, 96, 97, 98, 100, 101, 102, 103, 104, 109, 113, 117, 120, 121, 122, 123, 127, 130 (2), 132, 141, 147, 152, 153, 155, 157, 158, 162, 167, 169, 174, 175, 178, 198, 201, 207, 210, 216.

IV. Comments received on the draft Proposed Plan were used as guidelines during the joint rewrite with EPA of that document.

V. Comments received by Seimens Nuclear power were addressed at the February, 1993 1100 Area Unit Managers Meeting. Comments on text revisions were addressed to extent possible.

GENERAL COMMENTS

In general, data validated according to EPA (1988a, 1991b) functional guidelines appears to be adequate; however, these protocols were not precisely adhered to. Qualification of data based on blanks analyses should be revised to be consistent with data qualification procedures of EPA (1988, 1991b). The text also contains definitions of a number of qualifiers to identify data associated with various quality control processes that have been shown to be beyond established control limits. To the analytical chemist, the implication of various quality control processes may be obvious, but to the reader, the implication for data quality may not be so apparent. In general, positive sample results that require qualification should be qualified as estimated (J) or unusable (R). Likewise, qualification of non-detected sample results should indicate that the associated numerical value is an estimated quantitation limit or detection limit (UJ), or that the data are unusable (R). If additional information regarding the nature of the qualification is to be included with the qualifier, a subscript definition may be included for the reader's information. Information concerning the implication of data qualification may be of greater use to the reader; rather than indicate which quality control (QC) process requires the data to be qualified, subscripts could be developed to show:

- The potential bias (high or low) indicated by the QC process
- No bias or unknown bias indicated by the QC process
- Questionable quantitative precision indicated by the QC process
- Potential source of bias or imprecision (that is, matrix, elemental, method, or instrumental effects)

Such information would be helpful to the reader not well versed in laboratory analyses quality control procedures, but who needs to know how useable the data are.

It is apparent that the data presented have been qualified using guidelines from both EPA and Westinghouse Hanford Company (WHC) sources. Use of different validation guidelines may result in inconsistencies within the data validation process that will become apparent when data usability is assessed. Data of equal usability may not be qualified as such by separate validation guidelines. All project data for a given analysis should be validated using the same guidelines. For example, a portion of the inorganics data presented was validated by EPA (1988) guidelines, while the remaining data have been validated using WHC (1990) guidelines. From studying the data, it is apparent that a significantly greater percentage of data has been rejected by validation using the WHC (1990) document. While this may be a function of the data quality, such concerns have previously arisen with regard to validation by WHC (1990) guidelines. Regardless, validation of the data using different standards will inevitably result in inconsistent treatment of the data. Therefore, all data presented in

Appendix D that has been validated with WHC (1990) guidance should be revalidated using EPA (1988) guidelines to eliminate any inherent inconsistencies.

While the validation guidelines used are referenced, the level of data validation is not. The text of each appendix should indicate the percentage of sample results that have been confirmed by the validator's recalculation from the raw data, thus providing the level of validation achieved. A statement indicating the level of validation achieved and any gross errors encountered during validation will enable the reader to assess whether potential transcription errors, incorrect algorithms, or other calculation errors have been eliminated.

SPECIFIC COMMENTS

1. **Comment: Section 1.0, page 1-1, second paragraph**

The introduction does not explain the reasons for obtaining the highest priority for 1100-EM-1 Operable Unit.

Recommendation: Explain why 1100-EM-1 received highest priority among all operable units of the NPL sites.

2. **Comment: Section 1.3, page 1-3, first paragraph**

The results of the Preliminary Resource Survey completed by NOAA is missing. Results should be reported in the text.

Disposition: A one sentence summary of the results of the PRS will be inserted into the text.

3. **Comment: Section 2.1, page 2-1, third paragraph**

Estimates for annual average precipitation at Hanford should be made with the most recent information. Greater than 12 years of recent data is missing from the reports HMS data.

4. **Deficiency: Section 2.1, page 2-1**

Disposition: Withdrawn, UMM, 2/25/93.

The statement that annual actual ET typically approximates the rate of annual precipitation is probably true for vegetated areas. However, this report addresses waste sites where vegetation can be sparse or completely absent, in which case actual ET may be much less than precipitation.

Recommendation: Be more specific in this statement and note that it applies to undisturbed and/or vegetated semi-arid lands.

Disposition: Added..."for vegetated sites"... after..."the rate of annual precipitation".

5. **Deficiency: Figures 2-3 through 2-6, pages 2-7 through 2-6**

Throughout the text of Section 2, the importance of the Upper Ringold Silt Aquitard is emphasized. The stratigraphic borehole data also incorporated the information. However, none of the figures reveal this important stratigraphy. Why?

Recommendation: The stratigraphic sections depicted in Figures 2-3 through 2-7 must define the silt aquitard separately. This will help readers to follow several conclusions made in the text.

Disposition: Resolved through phonecon with Ecology on 1 March 93. Stratigraphy representation adequate.

6. **Comment: Figure 2-5, page 2-8**

Well 699-S32-E13A is shown on cross section B'-B". This well is not along the trace of the section (as shown on figure 2-3). Either the well should be removed from the section or it should be indicated that the well is projected onto the section (with the projected distance indicated). Also, it would be helpful to project well 699-S29-E12 onto the section (this well is used to help delineate the maximum downgradient extent of the TCE plume and is central to much of the interpretation of the groundwater modeling).

Disposition: Added..."Projected 1000 feet north"...to well 699-S32-E13A on section B'-B" and added well 699-S32-E12.

7. **Comment: Section 2.2.2.2.2.2, page 2-19, second paragraph**

The text mentions about the presence of an upper unconfined aquifer in the area. Is there any lower unconfined aquifer?

Recommendation: The word "upper" should be removed from the text. The silty aquitard separates the overlying unconfined aquifer from the underlying confined aquifer.

Disposition: Deleted words "upper" and "lower" from text.

8. **Comment/Recommendation: Section 2.2.2.2.2, page 2-19, third paragraph**

The terms "formation" and "facies" are not used together. Both the terms have different meaning. Ringold is a Formation, not a facies. Remove the word facies from the text.

9. **Comment/Recommendation: Section 2.2.2.2.2, page 2-19, fourth paragraph**

The word "fabric" is not used for primary sedimentary structures like bedding. Remove the word "fabric" from the text.

10. **Comment/Recommendation: Section 2.4**

This section should contain a least one figure showing a representative hydrogeologic cross-section of the area. This will act as a reference to various groundwater related studies described in the subsequent chapters.

Disposition: Discussed disposition with commentor through a phonecon on 1 March 1993. "Lower Silt Aquitard" is included in figure 2-9 and is adequately discussed in paragraph 2.4.3.5.

11. **Comment/Recommendation: Section 2.4.2, page 2-25**

The text does not give any reference to various potentiometric surface maps as mentioned in the paragraph. Give appropriate reference to the related figures to follow.

12. **Comment: Section 2.4.2, page 2-25, third line**

The "monthly" potentiometric maps should be better defined. Indicate the time period over which measurements were made (e.g., March 12-19, 1992). Also, the range of river stages for the period of measurement for each map should be indicated.

Disposition: Figure titles in Appendix B were changed to include the specific sampling days. The water levels in the wells located near the river adequately reflect the impact of Columbia River stage elevations on groundwater table elevations.

13. **Comment: Section 2.4.2, page 2-25, second paragraph, fourth line**

It is stated that flow is orthogonal to the contours. It should be pointed out that this is based on the assumption that the aquifer is isotropic.

Disposition: Noted

14. **Comment: Table 2-5, page 2-26**

The list of Phase II wells does not match figure 2-8. Well MW-18 is not on the figure, and wells MW-7A and -8A are labeled W-7 and -8 on the figure.

Disposition: Well MW-18 was added to the figure and the appropriate well labels for MW-7A and MW-8A were added.

15. **Comment: Figure 2-9, page 2-8**

The heavy black lines in the hydrogeologic section appear to indicate changes in lithology. However, there are two lines (one in the Unconfined Aquifer and one in the upper part of the Confined Aquifer) that occur where there are no apparent lithologic changes.

Disposition: Vertical arrows were added to column to identify formational changes and clarified sandy silt symbol in the unit located adjacent to the "Confined Aquifer" label.

16. **Comment/Recommendation: Section 2.4.3.2.3, page 2-31**

This part of the section needs more clarification on how far the river fluctuations influence the area and how the steepness of the surface gradient correlates with the water table. It will be appropriate to illustrate the influence of fluctuation with a figure. The reference to various figures must appropriately be made using volume number of the text and the appendix number.

Disposition: The text was clarified, complete with references to specific water table surface figures.

17. **Comment: Section 2.4.3.2.2, page 2-31, second line**

It is indicated that irrigation losses from farmland west of the operable unit are likely a "minimal contributor", but no supporting evidence is given. A rough calculation of such recharge (assuming deep percolation of 7.9 in./yr over square mile of irrigated land) yields a rate of about 1.2 cfs. This value should be compared to an estimated upstream inflow (from gradient, hydraulic conductivity, and saturated thickness estimates).

Disposition: The text was changed to reflect the results of attempts to estimate total up-gradient recharge from irrigation, precipitation, the Yakima River, and regional deep recharge.

18.

Comment: section 2.4.3.2.2, page 2-31, second paragraph

The volume of recharge from infiltrating precipitation is stated to be small relative to the westward inflow. Estimates of these numbers should be presented to reinforce the statement.

Disposition: Estimates were added.

19. **Comment: Section 2.4.3.2.3, page 2-31, first paragraph**

It is stated that the lowest observed water levels were in April 1992. However, from examination of the potentiometric maps, it appears that levels in February (figure B-15) and March 1992 (figure B-16) were lower than in April 1992. Also, water levels in September 1990 (figure B-3) appear to be lower than in April 1992 (at least along the Columbia River and in the 300 Area). The set of water-level maps seem to indicate three influences: (1) the Columbia River, (2) the North Richland recharge basin/well field, and (3) the inflow from the west which is probably related to the Yakima River (and possibly irrigation). -

Disposition: Text was changed to reflect that the September 1990 data set had the lowest overall elevations.

20. **Comment: Section 2.4.3.2.3, page 2-31, first paragraph**

It is not clear what is meant by the statement that the extent of the river influence does to reach as far inland "because of the steepness of the surface gradient".

Disposition: The unclear statement was removed from text.

21. **Deficiency/Recommendation: Section 2.4.3.2.4, page 2-32, first line**

It is stated that "no reasonable scenario" was found that would allow for groundwater flow from the SPC/HRL area to the North Richland well field. All of the available head maps show the influence of the recharge basin; if recharge were terminated and/or pumping increased, a different scenario might exist. A head map for April 30, 1952 (-105m) is substantially below that in the SPC/HRL area. Given this head distribution, a case could be made for flow from the SPC/HRL area to the well field. With the presently available data on flow and contaminant plumes, the ultimate conclusion that contaminants from SPC/HRL will not travel to the well field is probably accurate. However, the statement of "no reasonable scenario" is definitely too strong and should be removed.

Disposition: The 1952 map does not support the hypothesis of potential pathways from the HRL/SPC area to the North Richland well field and is now included in Appendix B. The words "no reasonable scenario" were replaced with more accurate text.

22. **Comment: Section 2.4.3.2.4, page 2-32, second paragraph**

A flow region is defined based on latitude (46 degrees 20 seconds N), however, none of the figures show latitude.

Disposition: Deleted text referencing latitudes and referenced Phase I report which have maps which identify latitudes.

23. **Deficiency/Recommendation: Section 2.4.3.2.4, page 2-32, second paragraph**

It is stated that (based on 1990-92 observations) flow from the SPC/HRL area to the well field is not possible (see comment on Section 2.4.3.2.4). Some comments on the head maps:

(1) Figure B-1 6/25-27/90:

-there are no data to support the contours as drawn in the vicinity of the well field, therefore, flow directions from the MW-7 and MW-5 are basically unknown.

(2) Figures B-4 3/91, B-13 12/91, and B-14 1/92:

-heads at the well field are less than those at MW-7 and MW-5, therefore, a component of flow existed from MW-7 and MW-5 toward the well field at each of these times.

Also, all assumptions of flow directions are based on the overall assumption of an isotropic aquifer. This has not been proven. All statements regarding flow of contaminants from the SPC/HRL area to the well field as being "not possible" or "not reasonable" should be softened to some degree, to "unlikely".

Disposition: Comments noted. The discussion on potential pathways from the HRL/SPC area to the North Richland well field area was reworded to more accurately reflect study findings. The text states that there was no indication found that the contamination in the unconfined aquifer could flow from the SPC/HRL area to the North Richland well field area. The new text was found to be adequate in subsequent meetings with the commentor.

24.

Comment/Recommendation: Section 2.4.3.2.6, page 2-33, first paragraph
The rationale for providing a range from transmissivity data from a single pump test is not clear. Did you carry out a number of pump tests in the same well? How did you arrive at a range of transmissivity?

Disposition: The reported range reflects the uncertainty in the pump test analysis. The commentor was referred to the pump test analysis performed for SPC.

25. **Comment: Section 2.4.3.2.6, page 2-33, last paragraph**

The decrease in hydraulic gradient in the 300 Area is attributed to the presence of high hydraulic conductivities. The gradient change could also be due to a decrease in flux or an increase in cross-sectional area of flow.

Disposition: Noted. Text was added to reflect comment.

26. **Comment: Section 2.4.3.3.1, page 2-34, first paragraph**

It is stated that no wells extend through the silt aquitard in the area of the well field. Two well logs (from the USGS well files) apparently show full penetration of the silt aquitard in the well field area:

(1) Well 10/28-23P01 (1199-40-16A or 3000-6):

-aquitard (yellow clay) from 83-90 ft (elevation ~306-299ft)

(2) Well 10/28-26C01 (1199-39-16B or 3000-5):

-aquitard (yellow clay) from 63-75 ft (elevation ~308-296 ft)

Disposition: Added reference to these wells in text.

27. **Comment: Section 2.4.3.3.1, page 2-35, second paragraph**

It is indicated that vertical head differences would be approximately the same across the site if the silt layer were "continuous). It should be pointed out that the vertical head differences depend not only on the presence or absence of the silt layer, but on the thickness of the layer.

Disposition: Deleted the sentence.

28.

Comment: Section 2.4.3.3.1, page 2-35, third paragraph

A compromised well seal would probably not result in a reversal of the vertical head gradient. The vertical gradient would presumably still be upward, although potentially greatly reduced.

Disposition: Added..." which could account for a portion of the observed anomaly"...after the next to last sentence in the paragraph.

29. **Comment/Recommendation: Section 2.4.3.3.2, page 2-35, last paragraph**

The text mentions zero potential at MW-17. However, an evaluation of stratigraphic sections suggests that the zero potential may extend further north to the location of MW-15. MW-15 does not show the presence of silt aquitard. Investigate the result of MW-15 and incorporate the related information in the text.

30. **Comment: Section 3.0, General Comment**

The geophysical data interpretation was used in various waste unit to describe the waste investigations, volume, etc. The text mentions various types of geophysical surveys, such as GPR, EMI, metal detector, and magnetometry. However, except for GPR interpretations/results, nothing is mentioned about the findings of the other geophysical surveys. The text does not provide any appropriate reference of the analytical chemical data for the contaminants identified in each waste units.

Recommendation:

The text should be modified to incorporate some of the relevant information of all the geophysical surveys. Proper reference of the chemical data must be provided in the text.

Disposition: See response to comment # 41.

31. **Deficiency/Recommendation: Section 3.0, page 3-1, first paragraph**

The text indicates that subunits UN-1100-5 (radiation contamination incident), and Pit No. 1 were eliminated from further consideration for remediation because contamination detected at these sites was not substantial. It should be clarified whether contaminants were detected above cleanup levels or risk-based concentrations at these sites, and how these sites were eliminated from the RI/FS process.

32. **Deficiency/Recommendation: Section 3.0, page 3-1, third paragraph**

UTLs are used as the project-specific background level, and contaminants are defined as those analytes detected at concentration above the UTL. Since UTLs are used to screen contaminants, the background locations, size of the background sample set, and statistical approach used to calculate the UTLs for surface and subsurface soils should be specified. Discrepancies between UTLs for surface and subsurface soils, such as chromium UTLs of 12.94 mg/kg surface soils and 47.3 mg/kg for subsurface soils, should be explained.

Disposition: Text clarified for readability and appropriate references were included.

33. **Comment: Figures 3-2 and 3-3**

Clearly mark the boundaries of various pits in the figure 3-2, and 3-3.

34. **Deficiency/Recommendation: Table 3-1, page 3-2; Table 3-2, page 3-6**

Tables 3-1 and 3-2 show the maximum concentrations for detected compounds compared to UTLs for surface and subsurface soils. The detection limits of the laboratory analyses performed for each compound should be included to ensure that the analytical methods provided data that could be used for identifying contaminants of concern. Also, footnote (a), "concentration less than detect limit after blank-adjustment," should be explained in the text. In addition, the tables should include data qualifiers to identify data quality.

Disposition: Footnote and text modified to clarify meaning and sample quantitation limits (SQLs) were inserted to the tables.

35. **Comment: Section 3.2.3, page 3-14, first paragraph**

To what does DOE attribute the elevated readings of tetrachloroethene?

Recommendation: Revise the text to justify the anomaly found in the paint and solvent pit sites.

36. **Deficiency/Recommendation: Section 3.5.1, page 3-19, first paragraph**

At the discolored soil site, UN-1100-6, surface soil sampling (0 to 2 feet) indicated that several inorganic and organic contaminants were detected above UTLs; however, no subsurface soil samples were collected to determine the vertical extent of soil contamination. It should be explained why subsurface soil samples were not collected. Also, Section 3.53, Summary of Investigations, should clearly state that the subsurface has not been characterized at UN-1100-6.

Disposition: Added to paragraph 3.5.1: "The original work plan for the RI/FS stated soil sampling of this subunit would be performed for the purpose of identifying potential contaminants. After a thorough review of analytical results from the surface sampling and a field examination of the site, it was deemed to be an inefficient use of time given the project schedules and not cost effective to perform sampling of subsurface soils. The vertical extent of contamination will be determined during remediation by soil sampling and analysis (see chapters 7 and 8)."

Added to paragraph 3.5.3: "The vertical extent of contamination will be determined during remediation."

37. **Deficiency: Section 3.7, page 3-23, first paragraph**

This paragraph makes several unsubstantiated statements (e.g. that the HRL "was repeatedly used for unauthorized dumping by non-Hanford staff...." DOE refers to records indicating the types of debris deposited in the landfill. These records have not been summarized and listed in other reports and are not included in the Administrative Record. Reference to these records is inappropriate.

Recommendation: Either provide substantial evidence or modify the paragraph by ending the second sentence with the phrase "...the 1970's as an uncontrolled landfill." and delete the remainder of the second sentence and the paragraph.

Disposition: Deleted sections of the text as recommended.

38. **Deficiency: Section 3.7.1.1, pages 3-23 and 3-25.**

This paragraph discusses the Phase I boreholes in the HRL. It notes that the boreholes were intentionally sited to avoid known waste deposits. It further states that the locations were determined during scoping meetings and the decisions were made jointly by DOE and the regulatory agencies. This is incorrect. DOE made the siting decisions unilaterally.

Recommendation: State that the locations, which were determined by DOE, place substantial limitations on the representativeness of the data and the that these limitations were considered when performing the Disposal Trench characterization described is Section 3.7.4.

Disposition: Deleted sections of the text referencing regulatory agency discussions concerning borehole siting.

39. **Deficiency/Recommendation: Section 3.7.1.1, page 3-25, third paragraph**

This section identifies the contaminants detected at concentrations above UTLs in surface and subsurface soils at the Horn Rapids landfill (HRL). The depths or range of depths at which

these contaminants were detected should be provided to determine the vertical extent of contamination.

40. **Deficiency/Recommendation: Section 3.7.2.2, page 3-28, last paragraph**

Delete the sentence that states that details of the geophysical investigations performed at the HRL are included in the minutes of the unit managers meetings held in the summer and early fall of 1991 as it provides no useful information.

41. **Deficiency: Section 3.7.2.2, page 3-29**

The description of the Phase II RI geophysical surveys is not entirely accurate. In the third paragraph, it is stated that "there were no geophysical signatures obtained from any area investigated consistent with an interpretation indicating the presence of 10 or more drums in the subsurface at the HRL." The 10-drum limit was agreed to as a target signal for the EMI and MAG surveys and forward modeling was done to identify an expected geophysical response to such an anomaly. The EMI and MAG surveys indeed showed the presence of several such anomalies within the HRL. Based on prior agreement between regulators and DOE, GPR surveys were conducted to further refine the location of test pit sampling, and test pits were installed to conclusively investigate the nature of the identified anomalies. We agree that the results of the GPR surveys were chaotic, but we do not agree that the EMI and MAG surveys alone provided results that allow the conclusion that the anomalies identified at the disposal trenches were "caused by an abundance of shallow deposits of metallic debris buried within the features." The GPR surveys and trenching activities were required to firmly draw this conclusion.

Recommendation:

Reword both this section and Section 3.7.4 to more accurately reflect the purpose, scope, and results of the Phase II HRL geophysical surveys.

Disposition: Revised text based on language provided in comment per commentor suggestion at 2/25/93 UMM.

42. **Deficiency/Recommendation: Section 3.7.3.1, page 3-29, first paragraph**

This section describes the delineation of the groundwater contaminant plume using soil-gas surveys. Soil-gas extraction points were installed to depths of 3.5 to 4 feet during soil-gas investigations. The text should describe how the soil-gas survey results are attributed to contaminants present in groundwater and the vadose zone, and should include the static groundwater level and indicate if soil-gas measurements were profiled by depth at the HRL.

Disposition: References provided in the text adequately identify the original test reports which include the data requested.

43. **Deficiency/Recommendation: Section 3.7.3.1, page 3-30, second paragraph**

The second stage of RI sampling is described in this section. The depth of the additional 53 soil-gas sampling probes should be included.

Disposition: Added to section 3.7.3.1: "... installed to an approximately 1.2 m (4.0 ft) sampling depth." after the word "temporary" in the second sentence.

44. **Deficiency/Recommendation: Section 3.7.3.2, page 3-30, second paragraph**

The text states that the soil-gas survey results strongly suggest that a vadose zone source for TCE or any volatile organic compound is not present within the HRL or the south pit because the TCE concentrations [ranging from 5 to 394 parts per billion by volume (ppbv)] are less than the concentration expected as a free source, approximately 7 percent TCE vapor. It is not valid to compare a VOC source adhered to the soil matrix with a VOC source as free liquid. Also, the spacing of the soil-gas probes would affect the measured concentrations if the sampling locations were not directly in a source area. Finally, a soil-gas survey provides only screening data; source designation or elimination requires conformational soil sampling and laboratory analyses to produce quality data.

Disposition: Text states that the discussion is in regards to the presence of a free source of contaminant. The disposition of this comment was discussed with the commentor by phonecon. No action required.

45. **Deficiency/Recommendation: Section 3.7.4.2.5, pages 3-34 and 3-35**

Several comments on this section:

A. The section is titled "Medical Debris," but the text throughout the section refers to "medical waste." Refer to the materials consistently.
B. A further indicator of the nature of the materials is the "Health Operation Medical Services" sign which was found nearby.
C. The regulators did not "ultimately direct" that the materials be reburied in the trench. The regulators concurred that this was an acceptable step in the interim while awaiting final retrieval and analysis (see Meeting Minutes, October 31, 1991, from J. Stewart, USACE, to R. Stewart, DOE)

Disposition:
A. Changed all references to "medical waste" to "medical debris".
B. A reference to the metal medical services sign was included in the text.
C. Changed the wording "... ultimately directed..." to "...concurred with a proposal to...".

46. Deficiency/Recommendation: Section 3.7.4.2.6.1, page 3-35, third paragraph

This section states that laboratory results for samples of white crystalline powder were qualified because the chain of custody seal was broken. It should be explained why the chain of custody seal was broken, and any data qualifiers should be included.

Disposition: Word "qualified" in text changed to "are limited". Added sentence "This was a routine laboratory analysis not performed under CLP protocols." to section.

47. Deficiency: Section 3-9, page 3-38

In the second paragraph, it is stated that "no new monitoring wells would be constructed within the operable unit for the purposes of this final RI/FS-(EA) report," and on page 46 it is stated that "Groundwater contamination is not an issue at the remaining six subunits of the 1100-EM-1 Operable Unit." This is not strictly true. The Phase I RI report (DOE/RL 90-18) pointed out the uncertainty of the quality of water downgradient of the 1100-2 Site and the RI Phase 2 Supplemental Work Plan (DOE/RL 90-37) on page 3-6 identified a task to install a groundwater monitoring well downgradient of the 1100-2 subunit to determine if VOC's were detected at elevated concentrations. Monitoring well 18 was installed for this purpose and four rounds of water quality sampling were conducted.

Monitoring wells 19, 20, 21, and 22 were also installed at HRL as a Phase II RI task.

Recommendation:

The statement in Section 3.9 should be reworded to indicate the installation of wells 18-22. The simple hydrogeologic investigation at 1100-2 should be noted in Section 3.9, and the results of Phase II groundwater sampling at wells 4,5,6, and 18 should be briefly described in Section 4.2.

Disposition:
A. Added references to wells in section 3.9.
B. Added note explaining groundwater sampling of well MW-18.
C. Added a statement regarding the results of the limited groundwater testing program undertaken at well MW-18 during Phase II investigations.

48. Comment: Section 3.9.1, page 3-40, first paragraph

It is indicated that water-level data were used from the 300 Area Operable Unit and from Siemens. Were any elevation checks made between the well networks?

Disposition: Commentors question answered during the 2/25/93 UMM. Survey checks were performed between the 1100 and 300 Area wells but not with wells located on the Siemens facility.

49. **Deficiency/Recommendation: Section 3.9.2, page 3-40, last paragraph**

The text states that groundwater "contaminants having an obvious anomalous concentration during a single round of sampling, while all other rounds either did not detect the contaminant or detected the contaminant at the analyte's Sample Quantitation Limit," were screened from the contaminant list. The purpose of the RI is to collect data, not to screen and eliminate anomalous concentrations. All contaminant data should be included and screened only during the risk assessment using methods approved by all parties.

50. **Comment: Section 3.9.2, page 3-40**

It is noted that all groundwater data were compared to site-wide groundwater UTLs. No reference for the source of these UTL's is given. There is presently a "Hanford Site Background Study" underway. We assume that the UTL values used here are not derived from that study, but rather are those developed as an "operable unit" background as described in the Phase I report.

We also question the 54.4 mg/L UTL for nitrate. At 5 times the MCL, this value seems very high, and we suspect that the UTL was derived from nitrate reported as NO_3 data, but is identified here as nitrate (as N).

Recommendation:

We suggest changing the phrase "site-wide groundwater UTLs" to "operable unit-wide groundwater UTLs" and to reference DOE/RL 90-18 as the data source. We also suggest checking the nitrate UTL as noted above.

Disposition:
A. Recommendation to change "site-wide" to "operable unit-wide" incorporated into text.

51. **Comment: Table 3-7, page 3-43**

Does the UTL column represent background? If so, please describe the process for, and the data used to calculate this unapproved area background.

Recommendation:

Provide the information requested above. Also, state the intended purpose of using the background UTL number.

Disposition: See response to comment # 32.

52. **Deficiency/Recommendation: Section 3.9.2, page 3-45, second paragraph**

The text states that elevated levels of nickel in groundwater are questionable on several grounds, including comparison of filtered and unfiltered samples and potential well construction/groundwater sampling complications; therefore these levels are not carried through to the risk assessment screening. The potential well construction and groundwater sampling complications should be described since questionable nickel results could call all groundwater sample results into question. It should also be explained why the nickel groundwater data were biased high by these complications.

53. **Deficiency/Recommendation: Figure 4-3, page 4-11; Figure 4-4, page 4-12; Figure 4-5, page 4-13; and Figure 4-6, page 4-14**

These figures show the UN-1100-6, discolored soil site, and identify areas of contaminant concentrations above screening criteria for bis(2-ethylhexyl)phthalate (BEHP), alpha-chlordane, gamma-chlordane, and heptachlor distribution. The areal extent of contamination for these contaminants is limited to the northeastern depression even though the next closest clean sampling location in the depression area is approximately 100 feet to the southwest. The rationale for eliminating so much of this area from the areal extent of contamination should be provided.

Disposition: Added to paragraph 3 of section 4.5: "The aerial extent of contamination indicated on the figures were based on soil analytical analyses and a field examination of the site. Uncertainties in the extent of contamination in a westerly direction are addressed in chapter 7 where the area to be remediated is extended westward to include the nearest sampling point where a non-detect reading was obtained (figure 7-1)."

54. **Comment: Section 4.4, page 4-8, second paragraph**

Beryllium and arsenic were detected at a maximum of 0.93 pm and 5.8 pm respectively. The MTCA soil cleanup level for beryllium and arsenic is 0.23 pm and 0.59 pm respectively. What justification was used to drop this site from further consideration?

Recommendation:

Expand the text to describe the reasons for no longer addressing potential risks associate with site.

Disposition: Explanation of rationale is contained in the risk assessment portion of the report.

55. **Deficiency/Recommendation: Section 4.6, page 4-15, first paragraph**

The text indicates that subsurface soils were not sampled at the ephemeral pool site and that it was assumed that both PCB and chlordane contaminants are restricted to near-surface soil because of their relative immobility in soil and water systems. The rationale for limiting the vertical extent of contamination should be explained in more detail since it is not supported by the sampling data.

Disposition: Added to the end of the first paragraph: "Because of their relative immobility, it was deemed an ineffective use of time given the project schedules and not cost effective to perform sampling of the subsurface soils at the Ephemeral Pool. The vertical extent of contamination will be determined by soil sampling and analysis during site remediation (see chapters 7 and 8)."

56. **Comment: Section 4.7.1.6, page 4-26**

In the last sentence of this section, it is noted that copper appeared to be randomly distributed within these disturbed deposits. In reviewing figures 4-9 to 4-17, we would agree that Beryllium appears to be randomly distributed, however, copper, chromium, zinc, and barium all appear in similar locations in the eastern part of the landfill. These metals do not appear to be randomly distributed, but rather appear to be associated at a number of locations at the landfill in relatively low concentrations.

Disposition: Language in text deleted.

57. **Comment: Section 4.7.2.1, page 4-41, fifth paragraph**

Groundwater velocities for the Hanford formation are given, but are not supported in any way.

Disposition: Text was added to include gradient and porosity estimates to fully support the velocity estimates.

58. **Comment: Section 4.7.2.1, page 4-41, fifth paragraph**

The second sentence ends in the phrase "except for the unlikely case where the second source was located directly down-gradient of the SPC source." The HRL is directly down-gradient of SPC and therefore, based on the investigation to date, DOE cannot support the statement that the possibility of a down-gradient source is "unlikely".

Disposition: The text referred to was replaced with a discussion on potential TCE sources that was more detailed and includes the statement that a potential source at the HRL cannot be entirely ruled out.

59. **Comment: Section 4.7.2.1, page 4-41, fifth paragraph**

Comparing the data obtained from well 699-S29-E12 with the data from the HRL monitoring wells poses a potential problem. The HRL wells are screened over relatively short intervals at the water table. Well S29-E12 is apparently perforated for 22 feet and screened for another 20 feet. The nature and condition of the open zones are apparently unknown. The construction of this well could easily lead to TCE concentrations that are not representative of the upper part of the unconfined aquifer (i.e., the fully penetrating nature of the well, combined with the assumed upward head gradient, could lead to flow into the well through the bottom screen and out the upper perforations; or the perforations may not allow significant flow into the well and obtained samples, therefore, reflect the concentration from the deeper part of the aquifer).

Disposition: The discussion of TCE migration was expanded to include wells 699-S28-E12, 699-S31-E13, and 699-S32-E13A in additional to well 699-S29-E12. The new migration discussion was thus not solely reliant upon 699-S29-E12 data. Although the potential exists for the 699-S29-E12 data to be unrepresentative, this is not necessarily the case. The proposed plan for the 1100 Area recommends additional monitoring wells be established in this area.

60. **Comment: Section 4.7.2.1, page 4-42, second paragraph**

It is stated that groundwater velocities are not sufficient to carry the 1987 TCE spike to MW-12 by 1990. This needs to be supported. Calculate needed velocity and show why this is not possible.

Using reasonable estimates of the necessary parameters, a velocity of about 3.6 ft/d is calculated. For porosities of 0.2-0.3, the resulting hydraulic conductivities would be about 2,800 to 4,200 ft/d. This is possible for the Hanford Formation (or for reworked Ringold Formation). It should be kept in mind that the Ringold gravels are identified primarily on the basis of rock-type differences from the Hanford; there are places where the Ringold materials were apparently reworked (by the glacial floods?) before the Hanford materials were deposited (see Brown, 1979). Where this occurred, the "Ringold" materials may have the rock types of the Ringold Formation and the hydraulic properties of the Hanford Formation.

It is not clear what the reference to paragraph 6.4.5 is meant to convey.

Disposition: See response to comment #57. The reference to paragraph 6.4.5 was removed.

61. **Comment: Section 4.7.2.2, page 4-42**

Nitrate values as high as 1800 ppm are indicated in the text. The greatest value in the table in Appendix F is 99.

Disposition: The high levels referred to occurred prior to the RI/FS data gathering efforts. These levels are reported in "Exxon Nuclear Company, Inc., 1992", referenced in Section 10.

62. **Comment: Section 4.7.2.2, page 4-43**

Does "the work plan" refer to the Geraghty and Miller report?

Disposition: Added: "... Geraghty and Miller ..." before "work plan".

63. **Comment: Section 4.7.2.2, page 4-43**

Should the reference to paragraph 4.8.2.1 be 4.7.2.1?

Disposition: Corrected.

64. **Comment: Section 4.7.2.3, page 4-44**

The second paragraph discusses the vertical distribution of contaminants within the unconfined aquifer and states that "without discreet screens set at different elevations within the upper aquifer, no data were available for determining a vertical distribution." It should be noted that some appropriate data are available to address this issue. According to table 2-1 of the Phase I RI report, MW-13 is screened between 343-358 ft amsl at the top of the aquifer, and adjacent well MW-14 is screened between 329-339 ft amsl at the bottom of the aquifer. The TCE concentrations measured in these two wells indicate that although the peak concentration occurred approximately 1 year earlier and at a slightly higher concentration in MW-13, by rounds 6,7, and 8, the TCE concentrations measured in these two wells differed by no more than 10 percent. In addition, nitrate concentrations in these wells are nearly identical.

65. **Deficiency/Recommendation: Figure 4-8, page 4-22**

The figure shows the distribution of antimony concentrations above the UTL, and identifies two separate areas of contamination with no sampling locations between the areas. The delineation of two distinct areas of contamination should be explained.

66. **Deficiency/Recommendation: Section 4.7.2.1, page 4-42, third paragraph**

The total volume of TCE-contaminated groundwater is estimated at 132,000 cubic meters or 0.5 billion gallons. The aquifer thickness used to calculate the contaminated groundwater volume should be stated.

Disposition: Assumptions of porosity of 33 percent and thickness of 30 feet were added to the text.

67. **Deficiency/Recommendation: Section 5.0, page 5-1, first paragraph**

This paragraph describes the contaminants of concern for the industrial and residential scenarios. Beryllium is not, but should be listed.

68. **Deficiency/Recommendation: Section 5.1, page 5-4, first paragraph; Section 5.2, page 5-6, fifth paragraph**

The text states that the only contaminant associated with a risk greater than 1×10^{-6} is chromium; however, polychlorinated biphenyls (PCBs) should also be included.

69. **Deficiency/Recommendation: Section 6.2, page 6-1, first paragraph**

This paragraph lists the contaminants of concern at the 1100-EM-1 operable unit, but does not list chlordane, arsenic, and beryllium, which should be included. These are contaminants of concern in the residential risk assessment. In addition, beryllium is not discussed along with the other contaminants of concern in Section 6.2.1 through 6.2.7. These omissions should be corrected.

70. **Comment: Sections 6.2.2 and 6.2.5, page 6-2**

These two sections discuss contaminants that are not included in Section 6.2 "Contaminants of Concern".

71. **Deficiency/Recommendation: Section 6.3.1.4, page 6-15**

It appears that this section was meant to continue on to additional pages, however no additional text could be found. Provide the rest of the text for this section as well as any additional sections between Section 6.3.1.4 and Section 6.4.

72. **Comment: Section 6.4, page 6-34**

It is stated that Figure 6-12 shows plume delineations for March 1992, however, the figure caption says Spring 1992.

Disposition: "March" was added to the figure title.

73. **Comment: Section 6.4.1, page 6-34, first paragraph**

See earlier comment regarding North Richland well field (Section 2.4.3).

Disposition: See response to comment # 21.

74. **Comment: Section 6.4.1, page 6-34, first paragraph**

The discussion of the possible effects of the North Richland well field is limited to mounding at the well field (from the recharge basin). An additional possible effect is significant drawdown from the well field should recharge be discontinued at some future time.

Disposition: As discussed in 2.4.3.2.4, p 2-31, no historical evidence or realistic physical conceptualization exists that suggests potential drawdown at the North Richland well field could capture the groundwater flowing beneath the HRL/SPC area. In addition, future planned operation of the well field stipulates maintaining a groundwater mound.

75. **Comment: Section 6.4.1, page 6-34, second paragraph**

The discussion about river-induced water table fluctuations does not indicate the time frame of the indicated ranges (2.0 miles near the river and 0.3 miles near the upgradient boundary). Are these daily or seasonal?

Disposition: Withdrawn.

76. **Comment: Section 6.4.1, page 6-35, first paragraph**

Velocity estimates are given for flow in the unconfined aquifer, but the source of these estimates is not indicated. From the modeling? From estimated properties, observed gradients, and Darcy's Law?

Disposition: The source of the velocity estimates was added to the text.

77. **Comment: Section 6.4.1, page 6-35, last paragraph**

It is indicated that groundwater velocities are dependent upon hydraulic conductivity and pressure gradient. Porosity is also a factor.

Disposition: Hydraulic conductivity, porosity, and the pressure gradient were listed as the factors determining groundwater velocities.

78. **Deficiency: Section 6.4.1, page 6-35**

Although nitrate concentrations in groundwater at the Horn Rapids Landfill exceed the MCL over a very large area, and currently have been measured to be five times greater than the MCL in some wells, the report dismisses the importance of nitrate and includes only a brief description of its distribution, fate, and transport. In Section 6.4.1 on page 6-35, paragraph 4, it is stated that "the extent of the nitrate plume could not be completely defined. Therefore, only limited simulation of nitrate transport...has been performed to date." Difficulties in defining the nitrate plume likely result from the fact that not all available data were considered. Nitrate data are available from several wells downgradient of the HRL, but are not included in figure 4-26. We suggest plotting nitrate data for wells S29E12, S28E12 (W8A), S27-E9A (W7A), and 300 Area monitoring wells 5-1, 6-1, and 3-2 and drawing appropriate contours on figure 4-26. These data allow for a better definition of the nitrate plume downgradient of the HRL, and they indicate that nitrate concentrations greater than the MCL extend into the 300 Area.

Paragraph 4 on page 6-35 also states that because "current nitrate levels are only five times greater than the nitrate MCL compared to TCE levels that are ten times greater than the TCE MCL, it was estimated prior to the detailed contaminant transport analysis that nitrate levels would be reduced to cleanup levels much faster than TCE." In light of the discussion in the previous paragraph and the fact that no detailed transport analyses for nitrate were conducted, we disagree with this statement. the size of the nitrate plume exceeding the MCL is much greater than the TCE plume and, therefore, will not be as greatly affected by dispersion and dilution. A smaller plume of higher concentration is expected to dissipate much more quickly than a larger plume of lower concentration. In addition, nitrate in groundwater is relatively conservative and will not be removed from solution by sorptive processes that will tend to reduce the concentration of TCE in solution. We, therefore, conclude that the nitrate plume may not dissipate or "attenuate" to levels below its MCL before TCE reaches its MCL. This conclusion potentially is supported by the groundwater quality data measured in MW-12 and MW-13 where TCE concentrations have decreased from a peak of 91-110 ppb to 63-69 ppb between sampling rounds 2 and 8 while nitrate has remained relatively constant between 45-50 ppm.

Recommendation:

We recommend that the nitrate plume be further evaluated with all of the available data and that the fate and transport of nitrate be further evaluated particularly with respect to the groundwater remedial action alternatives, GW-1 to GW-4.

Disposition: Additional nitrate data were added to figure 4-26. The accompanying nitrate discussion in section 4.7.2.3 was expanded to discuss these data. The discussion in section 6.4.1 was also expanded to reflect that modeling of the nitrate plume was not considered essential for analysis of remediation alternatives.

79. **Comment: Figure 6-12, page 6-36**

The figure shows no nitrate value for well 699-S29-E12. However, Table E-3 has a value of 6.2 for this round of sampling. Including this value would increase confidence in the 10-ppm contour as drawn. Also, the method of reporting nitrate should be indicated (NO_3-as N).

Disposition: The nitrate value was added to figure 4-26. Figure 6-12 was changed to include only the TCE data.

80. **Comment: Section 6.4.1, page 6-38, last paragraph**

There is a great deal of uncertainty in drawing the TCE plumes with the available data. Mass calculations of the plumes should be compared to test the reasonableness of the contouring.

Disposition: Figures showing concentration vs time at key well locations were added (figures 6-28a and 6-28b).

81. **Comment: Section 6.4.3, page 6-38, first paragraph**

Should the version of PORFLOW used be shown as "2.40.1"? Also, on line four, "...this is modeling..." should be "...this modeling..."

Disposition: Text was changed to reflect comment.

82. **Comment: Table 6-10, page 6-40**

For the Feasibility Study:

(1) PORFLOW version should be 2.40.1?
(2) The closest grid spacing horizontally was 30.5x30.5 M. Also indicate the closest grid spacing vertically (1 M).
(3) There were no truly "variable" boundaries used. Some boundaries were changed for different steady-state runs, but all boundaries were fixed for any particular run.
(4) The indication that source correlates to TCE use is misleading. An estimate of the source was made using the observed plume behavior in conjunction with many assumptions regarding other possibly important factors.

Disposition: Table was changed to reflect comments, except for item (2) which was withdrawn by the commentor.

83.

Comment: Table 6-12, page 6-51

When the upper and lower surface recharges are both increased and decreased, the total pressure head decreases at the first two nodes. This does not appear correct. One would expect eh pressure heads to increase with an increase in recharge and decrease with a decrease in recharge if all other factors are held constant as was observed in the third node.

Disposition: Table values were replaced with correct values.

84. **Comment: Section 6.4.2.1, page 6-41**

The reader is referred to paragraph 6.2.5 for discussion of geohydrologic zones. Paragraph 6.2.5 deals with arsenic.

Disposition: Text correct to show proper reference.

85. **Deficiency/Recommendation: Section 6.4.3, page 6-41, second paragraph**

It is stated that "total water budget" is a "peripheral issue" with "minimal significance" to the model simulation. The total flux (water budget) of water through the system has equal significance to hydraulic conductivity, saturated thickness, and hydraulic gradient:

$$Q = - KA(dh/dl)$$
$$dh/dl = - Q/KA$$

In process of calibrating the model, all emphasis was put on matching heads (dh/dl) by adjusting hydraulic conductivity (K) while assuming a saturated geometry (A) and ignoring the values of flux (Q) produced by the model. In the calibration process, the fluxes produced by the model should be compared to pre-modeling estimates and the "best-fit" hydraulic conductivities should be chosen with consideration to both head-matching and flux-matching.

Disposition: Up-gradient recharge estimates were made and compared with modeled recharge in section 6.4.5.1.

86. **Comment: Section 6.4.3.1, page 6-41, line four**

"...(100.1 by 100.1 by 400.3 ft)..." should be "...(100.1 by 100.1 to 400.3 by 1000.7 ft)..."

87. **Comment: Section 6.4.3.2, page 6-43, fourth paragraph**

The vertical recharge is stated as "1.0E-4 m/d (0.12 inches/year)". These values are inconsistent: 1.0E-4 m/d = 1.4 inches/ year. Previous statements by ACE indicated 1.0E-5 m/d vertical recharge was being used.

88. **Deficiency/Recommendation: Section 6.4.3.2, fourth paragraph**

It is stated that no attempt was made to match total water budget (see comment on Section 6.4.3). If the total water budget calculated by the model is significantly different than the real world, then the hydraulic conductivities used in the model are probably in error and, therefore, the velocity field calculated by the model is probably in significant error. The model should be calibrated to flows as well as heads.

89. **Comment: Section 6.4.3.2, page 6-43, last paragraph**

The calculation of upward flux requires a gradient across the silt aquitard. Only a head difference is given; a distance (aquitard thickness) is also required. It appears from the values given that a thickness of about 100 feet was used. State the thickness value used and indicate its degree of reasonableness.

90. **Deficiency/Recommendation: Table 6-12, page 6-51**

The hydraulic flow sensitivity analysis was based on the changes observed in total pressure head as selected parameters were varied. The selection of boundary conditions for the flow model (constant heads upgradient and downgradient) resulted in a severely constrained system in which the sensitivity of total pressure heads is minimal. However, the velocities determined by the model (as well as the fluxes) are probably very sensitive to many of the parameters. See comment on Section 6.4.3. The model should be calibrated using heads and fluxes, and the sensitivity of the velocity field should be tested relative to the selected parameters. The velocity field is the key element in transport simulation.

Disposition: Further sensitivity analyses will be deferred until additional data are gathered and it is determined that additional modeling is necessary.

91. **Comment; Table 6-12, page 6-51**

Why was sensitivity of heads to porosity tested? In a steady-state simulation porosity is not a factor regarding heads. However, velocities are very sensitive to porosity (sensitivity analysis should use the velocity field instead of heads; see above comment on Table 6-12).

Disposition: Withdrawn.

92. **Comment: Table 6-12, page 6-51**

The Base Case values of each of the parameters should be indicated.

93.

Deficiency/Recommendation: Table 6-13, page 6-52

The parameter that transport is probably most sensitive to is velocity; this was not tested. Also, the velocity field used (as produced from the flow model) is highly suspect due to the nature of the calibration of the flow model. The flow model should be recalibrated (using flows and heads) and the sensitivity of the transport model to velocities should be tested.

Disposition: Response to comment # 90 adequately addressed this comment. in addition, the statement "velocity field used is highly suspect " was withdrawn.

94. **Comment: Table 6-13, page 6-52**

The Base Case values of each of the parameters should be indicated. Also, the parameters should be defined.

95. **Comment: Section 6.4.4.1, page 6-53, first paragraph**

The XY nodes used in the calibration are indicated, but the layer is not.

Disposition: Layer reference was added.

96. **Comment: Section 6.4.4.1, page 6-53, first paragraph**

It is stated that the model was only slightly sensitive to horizontal flux across the southern boundary and to vertical hydraulic conductivity. Neither of these parameters is listed in the table on sensitivity analysis (Table 6-12). Was vertical hydraulic conductivity varied with horizontal (as a ratio)? If so, vertical hydraulic conductivity was not really tested; the horizontal to vertical ratio will probably drive the system, not the absolute values.

Disposition: Values are listed, the table that was in error was corrected.

97. **Comment: Section 6.4.4.1, page 6-53, first paragraph**

It is stated that the model (and most flow models) is most sensitive to horizontal hydraulic conductivity. Looking at the flow equation written in terms of dh/dl (see comment on Section 6.4.3), it is apparent that flow and saturated geometry are as important as conductivity.

Disposition: The words "of the parameters tested" were added to clarify statement.

98. **Comment: Section 6.4.4.2, page 6-53, first paragraph**

It is stated that the model was most sensitive to total and effective porosity. However, Table 6-13 shows only one tested variation of total porosity and it showed identical maximum concentrations to the Base Case.

Disposition: Text was changed to clearly reflect sensitivity analysis.

99. **Comment: Section 6.4.5.1, page 6-54, second paragraph**

The exercise of calibrating the model resulted in a set of "calibrated hydraulic conductivities". However, by doing the calibration without considering the fluxes (see comment on Section 6.4.3), the reasonableness of the calibration is unknown.

Disposition: See disposition of comment #85.

100. **Comment: Section 6.4.5.2, page 6-54, first paragraph**

It is not clear how the simulated and observed concentrations were compared. The best approach is to compare calculated concentrations through space (3-D) and time with measured concentrations (i.e., calculated concentrations at a node should be compared with a sample taken from a well that is represented accurately by that node). A general comparison of the calculated plume shape with a plume drawn from a few observed data points is not a sufficient method of comparison.

Disposition: Breakthrough curves at selected wells were inserted as figures 6-28b and 6-28c.

101. **Deficiency/Recommendation: Section 6.4.5.2, page 6-54, first paragraph**

The calibration of the transport model was based on the assumption that the velocity field supplied from the flow model was accurate. Due to the problems associated with the calibration of the flow model (see comment on Section 6.4.3) the lack of sensitivity testing to velocity, and uncertainties with respect to the source terms, the transport model can only be assumed to be one possible scenario of many.

Disposition: The basis for this comment was resolved in #85.

102. **Comment: Section 6.4.5.2, page 6-54, second paragraph**

Comparing the simulated with observed plumes (as shown in figures 6-25 and 6-14) is very difficult (with the figures as drawn). How was the "match" between simulated and observed made; general shape of plume? (See comment on Section 6.4.5.2). It should be kept in mind that the "observed" plume was not really observed, ut is an estimate of the plume from observed points.

Disposition: See disposition to #100.

103. **Comment: Section 6.4.5.2, page 6-54, second paragraph**

It is stated that a "match" was not possible with only a single source term. Would a single source term give a reasonable "match" if the groundwater velocities were significantly greater? (See comment on Section 6.4.3.2). If the plume could be reasonably simulated with a single source term and greater velocities, the ultimate extent of the plume (i.e., 5-ppb contour) would probably be much greater than predicted.

Disposition: Additional text discussing the physical constraints relating to the possibility of a single source release in 1987 were provided in 6.4.5.2.

104. **Comment: Table 6-15, page 6-58**

The ratios of kh/kv (calculated from the kh and kv values in the table) are all within a range of 10 to 30, except for zone 10 (Hanford, near river), which has a ratio of 100. Some explanation for this difference should be given. Is this simply a needed factor obtained from calibration? If this ratio is reflective of the real world, a possible explanation would be lowering of vertical conductivity due to "river-bed" effects (silting).

Disposition: Because there is no vertical gradient in this part of the model grid, this parameter is a dummy parameter who's value has no bearing on model results. This was discussed in a meeting with the commentor subsequent to the comment being made with the result being that no further action was necessary.

105. **Comment: Figure 6-1, page 6-59**

Matching computed and observed contours are shown for all values except the 103.5 and 104.0 contours (only observed contours are shown). Can these contours be drawn, or are the minimum computed heads greater than 104.0? Also, the 103.5 and 104.0 observed contours are not labeled.

Disposition: Withdrawn

106. **Comment: Figure 6-11, page 6-60**

The computed 104.5 contour is missing.

Disposition: Withdrawn

107.

Comment: Figure 6-24, page 6-62

Why was the source curve terminated at 450? The available data only indicate a minimum value (420). The source curve could presumably be drawn to almost any value greater than 420. Would a single source term that was much greater than 450 produce a reasonable "match" with the observed data?

Disposition: Withdrawn

108. **Comment: Figure 6-26, pages 6-65/66**

Is there any evidence (other than plume matching) for the greater source concentration (1000 vs 500) used for the proposed earlier event?

Disposition: Withdrawn

109. **Comment: Figure 6-27, page 6-68**

The lower end of 1983 source decay curve has an unreasonable slope (approaching the x-axis in almost straight-line fashion). This curve should presumably be like the other two, with an asymptotic approach to the x-axis.

Disposition: The graphic representation was changed to more accurately reflect the data.

110. **Comment: Figure 6-14, pages 6-69/70**

The "double-high" nature of the computed plumes is not apparent in the "observed" plumes shown in Figure 6-14. This may be very important in regard to our evaluation of the modeling results. If the source assumptions input to the model result in a "double-high" which we cannot confirm from the observed data, then a case can be made that the observed data resulted from a single source event (with greater groundwater velocities than those calculated by the flow model).

Disposition: Withdrawn

111. **Comment/Recommendation: Section 6.4.6.2, page 6-74, last paragraph**

The proposed locations of pumping wells in the capture zone analysis seem to ignore the effect of well interference. For example, in Scenario 3 (figure 6-34), 10 wells were placed close to each other which will definitely cause severe well interference. There is no justification of installing 10 wells since the same purpose could be achieved by increasing the pumping rate in coupe of wells. Also, indicate the total pumping rate and well diameter(s) used to create various scenarios of capture zone delineation.

Disposition: The total pumping rate is indicated in the text. The results of the analysis agree with the commentor that an extraction system with many closely spaced wells is inefficient.

112. **Comment: Section 6.4.6.2, page 6-74, last paragraph**

How are the "capture zones" determined? Was some sort of particle tracker used with the model or are these zones drawn (estimated) from computed head maps?

Disposition: Withdrawn

113. **Comment: Section 6.4.6.2, page 6-80**

It needs to be emphasized that the "smaller source amount" (although most likely true) is largely an educated guess. The model, which was constructed with the "small" source as an assumption, cannot be used to prove the size of the source.

Disposition: Text was changed to "smaller amount of TCE."

114. **Comment: Figure 6-35, pages 6-85/86**

Comparing the 2005 plume in this extraction-infiltration scenario with the 2005 plume in the "no-action" scenario (figure 6-26) leads one to the conclusion that things are worse under the treatment scenario (the area within the >5 ppb contour appears to be much greater under the treatment scenario). Presumably this appearance is due to the plume being very concentrated in the treatment scenario and very widespread in the no-action scenario. Perhaps if the 1 ppb contour was drawn in each figure this apparent discrepancy would disappear.

Disposition: Withdrawn

115. **Deficiency/Recommendation: Section 7.1.1, page 7-2, second paragraph**

This paragraph describes the subunits at the 1100-EM-1 operable unit that contribute to risk. The 1100-3 subunit evaluated under the residential scenario should be mentioned because the maximum detected arsenic concentration led to a risk of 9×10^{-6}. The text in Appendix K states that this risk may contain a significant contribution from background; this explanation should also be included in this section.

Disposition: Text rewritten to address commentor concerns.

116. **Deficiency/Recommendation: Section 7.1.1, page 7-2, third paragraph**

This paragraph lists the contaminants of concern at the 1100-EM-1 operable unit. This list does not, but should include chlordane, arsenic, and beryllium; these are contaminants of concern in the residential risk assessment. In addition, the text states that no maximum

detected concentration results in a hazard quotient greater than 1. This statement is incorrect and should be deleted.

Disposition: Added PCOC's from BRSRA and deleted reference to no HQ's less than 1 as a result.

117. **Comment: Section 7.1.1, page 7-2 and 7-3**

The first paragraph of this section generally describes incremental risks (ICR) and hazard quotients (HQ) and includes the statement "if MCL's or non-zero MCLG's are exceeded, action generally is warranted." In the second to last paragraph in this section, it is noted that nitrate in groundwater has a hazard quotient of 0.8 and it is concluded that "remedial actions addressing it would not be justified under this scenario." It is also should be noted in this paragraph that nitrate exceeds the MCL, and on this basis, there would be some discussion as to whether exceeding the MCL for nitrate warrants some action.

Disposition: Added statement that nitrate is present above MCL's. However, it is not considered a risk driver at this OU because of the uncertain future land use, the fact that there are no current users of the groundwater. In the event there are users in the future, it is of note that risks associated with nitrate would be to a specific segment of the population (children under 6 months old).

118. **Comment: Section 7.1.1, page 7-2, last paragraph**

The text does not identify the uncertainties associated with potential contamination of the Richland water supply.

Recommendation: Expand this section to discuss the types of institutional controls in place at the well field. Also, state that in the event of a loss of institutional controls, the well field would be contaminated.

Disposition: Revised to state that the Richland well field is not impacted by the "HRL" plume. This is further discussed in section 2.

(NOTE: second sentence in recommendation was withdrawn as an inaccurate statement)

119. **Deficiency/Recommendation: Section 7.1.2.1, page 7-3, first paragraph**

The paragraph describes the potential exposure routes. The garden pathway is not, but should be included.

120.

Deficiency: Section 7.1.5.1, page 7-6, second paragraph

Ecology objects to the industrial designation of the 1100-EM-1 Operable Unit. See comments in Appendix M.

Recommendation: Revise this section to address the discussion in Appendix M comments.

Disposition: Text revised per discussions with Ecology.

121. **Deficiency: Section 7.1.5.1, page 7-6, third paragraph**

Ecology does not accept the WAC 173-340-745 Method C industrial designation for the HRL.

Recommendation: Replace the 17 mg/kg cleanup level with the value calculated as a result of WAC 173-340-740 Method C.

Disposition: Text revised per discussions with Ecology.

122. **Deficiency: Section 7.1.5.1, page 7-6, fourth paragraph**

Ecology disagrees with the conclusion that the groundwater is disqualified as a potential source of drinking water.

Recommendation: Text revised per discussions with Ecology.

Delete the sentence. It serves no useful purpose.

Disposition: Text revised per discussion with Ecology.

123. **Deficiency: Section 7.1.6, page 7-7, third bullet**

Ecology concurs with the concept of preventing ingestion of PCBs at the HRL. The cleanup, however, should be set at WAC 173-340-740 Method C. It is important to note that capping appears to be the best mechanism to achieve this goal. It will be necessary to discuss further the type and size of cap.

Recommendation: Revise this section to address the above cleanup scenario.

Disposition: Text revised per discussion with Ecology.

124. **Deficiency: Section 7.1.7, pages 7-7 and 8**

Ecology disagrees with the proposed groundwater RAO. Page 55 of The Future for Hanford: Uses and Cleanup, December 1992 states that "Groundwater will be cleaned up to unrestricted use in the 1100 Area" in Option A. Option B on Page 56 states that "Outside the 300 Area, this cleanup scenario assumes the surface, subsurface and groundwater would be cleaned up to "unrestricted" status". The conclusions in the Future Uses report should be addressed in this section.

Recommendation: Revise the text to be consistent with the deficiency above.

Disposition: Withdrawn at meeting 25 February 1993 because it was decided that the RAO is appropriate as written.

125. **Deficiency/Recommendation: Section 7.2.1, page 7-12**

In the discussion of the occurrence of PCB's at boring HRL-4, it is stated that "PCB's were not detected in the next sample interval that was taken at depths greater than 1.52 m (5 ft)." This is not strictly true. Appendix I of the Phase I RI (DOE/RL-90-18) reported on page I-17-44 that Arochlor 1248 was detected in soil samples taken at a depth of between 5.4-8.0 ft. Although the concentration was less than the calculated UTL for all PCB's reported in Phase I RI (1,510 ug/Kg), it was detected above the UTL for arochlor 1248 (170 ug/Kg noted in figure 4-24) and should be noted here.

Disposition: Revised to note these samples.

126. **Deficiency/Recommendation: Section 7.2.1, page 7-12, first paragraph**

This section states that the northern boundary of PCB contamination is chosen as the point in the depression that is equal in elevation to that of the southern boundary. This section should clearly state how elevations are used to determine the extent of contamination, and should state that the width of the contaminated area is 7.1 meters. Figure 7-2 shows this area to be 6.1 meters, which should be corrected.

127. **Comment: Table B-1, page B-1**

Average, minimum, maximum, and standard deviation values should not be given for those parameters where only a single value was available.

Disposition: Text revised to show correct values.

128.

Comment: Table B-2, page B-3

Transmissivity and hydraulic conductivity values are apparently presented as they were in the original references (either in ft-day units or gal-day units). It would be easier to compare values if they were all converted to one set of units (preferably ft-day units). Also, the method used to obtain the values should be indicated (were they from pumping tests, specific-capacity tests, estimated, etc).

Disposition:
A. Table values converted to ft/day and sq ft/day, as appropriate.
B. The method used portion of the comment was withdrawn by the commentor (Brian Drost, USGS) in a 3/2/93 phonecon with Jim McBane.

129. **Comment: Tables B-4, B-5, and B-6, pages B-7, B-9, and B-11**

See comment on Table B-1

Disposition: See resolution to comment 127.

130. **Comment: Figures B-1 through B-19, pages B-13 through B-50**

(1) The range of river stage should be given for the time period of each map.
(2) The contours drawn in the southeastern part of the maps (between the well field and the river, and further to the south) are based on essentially no data and should, therefore, be terminated farther to the north.
(3) Most of the maps have data points which do not agree with the contours as drawn. these data points should be highlighted in some way; and some explanation for their lack of correlation with the contours should be given.
(4) Are any stage or recharge rate data available for the recharge basin? Are any pumping rate data for the well field available? If so, these data should be examined for possible correlation with the head maps.

Disposition: (1) Withdrawn, (2) text was added as appropriate to clarify and/or correct passages, (3) Withdrawn, (4) Withdrawn.

131. **Comment: Table C-1, page C-2**

The indicated depth to the Hanford/Ringold contact for well MW-7A is 45 feet. On the log on page A-4, the depth to the contact is given as 33.2 feet.

132. **Comment: Figure C-1, page C-5**

Wells MW-6, -7, -17, and -18 are listed as being used in developing the contours on the figure. However, these wells are not in the map area. Also, well MW-12 is listed, but is not shown in the figure. Also, well MW-8A is listed twice.

Disposition: Added text to the introduction of appendix C to explain the points listed as used in the development of the maps but not included in the map area were used to estimate contour positioning along map boundaries. Deleted second MW-8A and added borehole location MW-12 to all maps.

133. **Comment: Figure C-1, pages C-7/8**

(1) Well W-7A shows an elevation of 355 feet. In table C-1 the elevation is listed as 343 feet.
(2) In the vicinity of wells MW-13, -14, -15, and -21, there are only three well symbols to match the four labels.
(3) What do the dashed circles indicate? Why is well MW-22 represented by one of these symbols?
(4) The contours do not agree with many of the data points (assuming the values from table C-1 were used); i.e., wells MW-8, -11, -10, -14, and -15.

Disposition:
(1) Table C-1 corrected.
(2) Missing well symbols added.
(3) Changed screened well symbols to bold.
(4) Contour lines checked and corrected to reflect data presented in table C-1.

Also added text to introduction for figure C-1 to explain the difference between table C-1 and figure C-1 for wells MW-11 and MW-21.

134. **Comment: Figure C-2, page C-9**

(1) Does "top of silt" (in title and in first line) refer to the tope of the upper silt aquitard?
(2) On what basis is the assumption regarding the 335-foot contour made?
(3) Wells MW-6, -7, 699-S36-E12A, -B, -C are indicated as being used in the construction of the contours, but these wells are not in the map area.
(4) Well 699-S30-E14 is not shown on the map.
(5) Well 699-S30-E15C is on the list, but -A is on the map.

Disposition:
(1) Added silt "aquitard" to text.
(2) Deleted left-most 335 foot contour line from map.
(3) See response to comment #135.

(4) Well 6-S30-E14 added to maps.
(5) Well 6-S30-E15C added to maps.

135. **Comment: Figure C-2, pages C-11/12**

(1) With the data shown, the last contour in the northwest should be 340 feet, not 335 feet.
(2) Only those wells which are actually data points should be shown (as drawn, the figure implies a lot more available data than exists).
(3) The contours do not agree with the point value for well MW-19 (table C-1).
(4) A label indicating where the silt is not present would add clarity.

Disposition:
(1) Contour line deleted.
(2) Wells listed as data points are listed in the text. Changing the base map would affect all the figures and separate base maps for each figure would be an unneeded effort.
(3) Map corrected.
(4) Added a symbol to indicate areas on map where no silt is present.

136. **Comment: Figures C-3 and C-4, page C-13**

Well MW-12 is listed as being used in contour construction, but is not shown on the map.

137. **Comment: Figure C-3, pages C-15/16**

(1) On what basis was the limit of the volcanic ash determined? Only well MW-2, -9, and -19 indicate no ash present. Well MW-20, which is shown as being outside of the area of ash occurrence, has a value for top of the ash in table C-1.
(2) The contours do not match the data for wells MW-10, -14, and -21.
(3) What does the dashed circle indicate as well MW-22?

Disposition:
(1) Text added to introduction explaining the basis for the limits of the volcanic ash. Contours corrected around the data point for well MW-20.
(2) Contour line 325 moved to provide a correction.
(3) Well symbol for MW-22 corrected.

138. **Comment: Figure C-5, page C-19**

(1) Wells 699-S36-E12A, -B, and -C are listed as being used in contour construction, but are outside of the map area.
(2) Well 699-S32-E13B is listed, but -A is on the map. Well 7C is listed, but W-7A is on the map.

Disposition:
(1) Explanatory text added to introduction.
(2) Well 6-S32-E13B added to maps.
(3) Well 7C is outside of map area - see response to comment #132.

139. **Comment: Figure C-6, pages C-25/26**

Well MW-9 is enclosed by the 35-foot contour, but has a value of 33 feet in Table C-1

140. **Comment: Figure C-7, page C-27**

(1) "Elevations away from the data points is..." should be "Elevations away from the data points are..."
(2) Well 699-S30-E14 is on the list, but not on the map.
(3) Well 699-S30-E15C on the list is shown as -A on the map.

Disposition:
(1) Text changed from "is" to "are".
(2) Well -E14 added to the maps.
(3) Well -E15C added to the maps.

141. **Comment: Table F-2, page F-5**

The text indicates that nitrate data have been collected at Siemens since 1973. Where are the 1973-1981 data?

Disposition: A reference for the document that contains that data was inserted to the text.

142. **Comment: Figure H-5, page H-11**

Zone 10 on the figure is shown as Zone 7 on the model input (page H-68).

Disposition: Error in graph was corrected.

143. **Comment: Figure H-15, page H-31**

Part of what is shown as Zone 8 on the figure is shown as Zone 7 in the model input (page H-79).

Disposition: Error in graph was corrected.

144. **Comment: Figure H-16, pages H-33/34**

It appears that the source curves (as indicated in the explanation) differ from those used in the Base Case. If this figure is part of the sensitivity testing, then only a single parameter (in this case retardation) should be changed at a time

Disposition: The source curves are appropriately modified in these separately calibrated runs. A main purpose of these additional computer runs was to test the sensitivity of the overall results, not just a single parameter.
145.

146. **Comment: Figures H-17 and H-18, pages H-35/36 and H-37/38**

See comment on Figure H-16.

147. **Comment: Figure H-20, pages H-41/42**

The computed nitrate plumes should be compared with the observed plumes. The March 1992 plume (based on meeting notes with the 300 Area Operable Unit staff), shows a significant extent of the plume (at concentrations > 15 mg/L) into the southwest part of the 300 Area. This observed plum is much different than the calculated plume. The nitrate units in the explanation appear to be in error.

148. **Comment: Page H-45**

The input instructions to the model include reading a file (hedstrt.dat) that contains starting heads. In reviewing the model input, an area of very high (non-realistic) heads were discovered along the southern boundary. These heads were reportedly corrected and the model has since been rerun. Did these head changes result in any significant changes in model results?

Disposition: This boundary condition anomaly was corrected without any significant change in results.

149. **Comment: Page H-86**

The output concentrations shown are for the final time step of the model (the year 2020). At this point, the model has computed a plume which has almost entirely dissipated, therefore, the output are not very instructive. The output for an earlier stage of the plume (1992) would be more useful. Also, the head distribution should be shown (at least for selected layers).

Disposition: Additional output files were provided to the commentor.

150. **Deficiency/Recommendation: Table 7-3, page 7-19**

This table presents the initial screening of soil technologies and process options. Horizontal barriers, vertical barriers, in situ vitrification, and in situ surfactant enhanced soil washing are said to be not feasible because of the small soil volume or the extent and depth of contamination at the 1100-EM-1 operable unit. The text or the table should provide information on the cost, effectiveness, and implementability of these technologies before declaring them to be not feasible.

151. **Comment: Table 7-3, page 7-23**

Other sites have selected ISV as a form of treatment for semi-volatile and PCBs. It may not be the preferred option at the HRL, but it should not be eliminated as not feasible.

152. **Deficiency/Recommendation: Table 7-5, page 7-27**

For "No Action" under the general response action column, the table states that contaminated groundwater will be attenuated naturally by dispersion, diffusion, and dilution. Additional processes such as sorption, desorption, and chemical or biochemical reactions act as mechanisms for contaminant concentration distributions and attenuation. These processes should also be included in the description of no action as a general response.

The reverse osmosis process option is said to be potentially feasible. It is not clear whether reverse osmosis is potentially feasible for removal of nitrates only, or for removal of both TCE and nitrates. This ambiguity should be clarified and the text changed accordingly. This comment is applicable for the initial screening of reverse osmosis under "physical treatment technology" on page 7-31.

Disposition: Sorption and desorption are properties that effect diffusion and are not included. Biochemical reaction is added. Reverse osmosis is potentially feasible for both contaminants and is now so noted.

153. **Deficiency/Recommendation: Table 7-5, page 7-28**

Ozonation, ultraviolet radiation, and electrodialysis are considered as process options for point of entry/point of use treatment technology. It is doubtful whether point of entry/point of use treatment units for these process options are commercially available. This should be explained. Only applicable and commercially available process units should be included. This comment is applicable wherever appropriate (for example, Table 7-6).

Disposition: Table revised to address commentor concern.

154.

Deficiency/Recommendation: Table 7-5, page 7-34

The discussion of biological treatment states that aerobic, anaerobic, and aerobic/anaerobic process options are potentially feasible. It is not clear whether these process options are potentially feasible only for removal of TCE, or for removal of TCE and nitrates. This concern should be addressed and the text changed accordingly. It should also be remembered that the aerobic process is not appropriate for nitrate removal. This comment is also applicable to biological treatment under the in situ treatment response action, as well as to Table 7-6, for biological treatment under ex situ and in situ treatment.

Denitrification is another advanced biological treatment process where facultative heterotrophic organisms perform denitrification by reducing nitrates and nitrites to nitrogen gas under anaerobic conditions. This process option should be considered as potentially feasible for nitrates removal under the biological treatment category.

Disposition: Table revised to reflect commentor concern in first paragraph. In addition, denitrification is discussed in the text, as well as references to bench scale testing of denitrification as a value engineering option in the event pumping and treatment of groundwater is undertaken.

155. **Deficiency/Recommendation: Table 7-5, page 7-35**

The comment on the off-site sewage treatment plant process option states that it is "Not feasible due to low concentration of TCE. Diluted waste water could potentially upset system." This is not adequate justification to screen out the off-site sewage treatment plant process option. Federal laws and regulations, such as the Resource Conservation Recovery Act (RCRA) and the domestic sewage exclusion rule, allow a hazardous waste to be mixed with domestic sewage in the pipeline and than passed through a publicly owned treatment works (POTW); the combined waste is not legally considered to be hazardous (EPA 1986). This exclusion may make it feasible to treat the extracted groundwater at an off-site POTW.

The extracted groundwater amounts to 144,000 and 432,000 gallons per day for proposed groundwater extraction scenarios 1 and 2, respectively (Section 8.3.2). The average concentrations of TCE and nitrate in the extracted groundwater are expected to be less than 75 μg/L and 50 mg/L respectively (Appendix E). Mixing the extracted groundwater with off-site domestic sewage will reduce the levels of TCE to 11 μg/L and 33 μg/L (assuming 1 million gallons per day as the capacity of the POTW) for extraction scenarios 1 and 2, respectively; nitrate levels will be reduced to 7 mg/L and 21 mg/L for scenarios 1 and 2, respectively. This combined sewage can be safely treated at the POTW, thus meeting the POTW discharge standards as well as the groundwater cleanup standards. Hence, biological treatment using an off-site POTW is another option that can be considered for treatment of extracted groundwater.

Treated water discharge to the sanitary sewer is screened out on the assumption that diluted wastewater could upset the off-site sewage treatment system. It is not clear how groundwater treated to below the cleanup standards will upset the off-site sewage treatment system. This should be clarified and the text changed accordingly.

Disposition: Withdrawn at meeting 25 February 1993. As discussed at that time, the Richland POTW is not willing to accept wastewater.

156. **Comment: Table 7-6, page 7-38**

Bio-denitrification is proposed by DOE for use in the 100 Areas as the preferred remedial technology for nitrate/nitrogen remediation. In fact, a treatability test has been schedule to optimize the percent removal and cost in the near future. Also, adsorption on activated carbon has been shown to be successful in the removal of TCE.

Recommendation:

Revise this table to include bio-denitrification as a remedial technology for treatment in the 1100 Area.

Disposition: Added a statement in paragraph 7.6.3 discussing that because nitrate is not a risk driver only one feasible method will be carried forward in the evaluation of alternatives. The method carried forward will be one that is effective, implementable, and one for which costs are easily quantified. It is the intent to conduct a value engineering study on nitrate removal methods in the RD/RA stage to identify the most cost effective method. This strategy was chosen to reduce the number of possible alternatives requiring detailed evaluation.

FS guidance states that only one process option representative of a technology type need be carried forward for detailed evaluation. Carbon adsorption, which is proven effective in removing TCE, is in the same process technology type grouping as air stripping. As stated in paragraph 7..6.3.2.6, air stripping has proven to be more cost effective over a wider variety of concentrations and flows and was therefore carried forward as the process option for physical treatment.

157. **Comment: Section 7.5.3, page 7-41, third bullet**

The converted percolation rate for 1 X 10^7 cm/sec is incorrect. The correct conversion is 3 feet in 30 years.

158.

Deficiency: Section 7.5.3, page 7-41, fifth paragraph

All references to the Washington Administrative Code should include specific citations. It is also inappropriate to evaluate the use of a Chapter 173-304 WAC solid waste landfill requirements on a facility that contains waste regulated be Chapter 173-303 WAC (WAC 173-305-015(3).

Recommendation: Revise the text to identify this requirements.

Disposition: First citation added, second withdrawn since there are no DW wastes.

159. **Deficiency: Section 7.6.5, page 7-59, second paragraph**

See comment on Table 7-6, page 7-38 above.

Disposition: Disposition covered by text changes to address comment # 153.

160. **Deficiency/Recommendation: Section 7.6.5, page 7-59, second paragraph**

Elimination of a denitrification process option for biological nitrate removal is not adequately justified. Denitrification is commonly used for nitrate removal from municipal and industrial wastewaters. It may be a cost-effective process compared to other processes such as reverse osmosis and ion-exchange. As stated in this paragraph, a pilot-scale study at Hanford has demonstrated that denitrification reduces the influent nitrate concentration to below the drinking water standard [10 mg/L as nitrate-nitrogen (NO_3-N)]. This process should therefore be considered in the development of alternatives for nitrate removal.

Disposition: Disposition covered by text changes to address comments # 155 and 158.

161. **Deficiency/Recommendation: Section 7.5.6., page 7-50, last paragraph**

This section discusses biotreatment of PCB-contaminated soils. Even though bench-scale studies have proven effective in removing PCBs under aerobic and anaerobic conditions, this section does not include consideration of this technology since successful PCB degradation in field studies has not been documented. This technology should be considered further since bench-scale studies proved its effectiveness. If selected, this technology should be tested in the field to examine its effectiveness at the 1100-EM-1 sites.

Disposition: Comment noted and withdrawn due to uncertainties and unlikely technology availability in 1100-EM-1 remediation timeframes. Furthermore, DOE has other sites with larger volumes of PCB's and plans to evaluate these methods further.

162. **Deficiency/Recommendation: Table 7-10, page 7-77**

Ion exchange is retained as a process option in the development of alternatives for nitrate removal; however, it is screened out for nitrate removal in Table 7-9. Also, reverse osmosis is retained for nitrate removal in Table 7-9, but is not included in this table. These discrepancies should be rectified and the appropriate tables should be corrected.

Disposition: This table is corrected to show reverse osmosis as retained and ion exchange has been removed.

163. **Deficiency/Recommendation: Section 8.2.1.2, page 8-5, second paragraph**

This section states that although costs are not prohibitive, removal and treatment of Horn Rapids landfill soils is not considered further, and alternatives S-1A, S-1C, S-2A, S-2C, S-3A, S-3C, S-4A, S-5A, and S-5C are also dropped from further consideration. This section should explain the rationale for not removing and treating HRL soils, and should describe S-1A, S-2C, and other alternatives before they are discussed in this section.

Disposition: Text revised to include discussion on risk reduction versus cost increases.

164. **Deficiency/Recommendation: Section 8.2.1.3.1, page 8-5, first paragraph**

This section states that the cap would be designed to have a 2 percent positive drainage slope. Positive slopes should be defined.

Disposition: Positive is deleted so as not to confuse readers. Now stated that cap will have a minimum 2-percent drainage slope.

165. **Deficiency/Recommendation: Section 8.2.1.3.3, page 8-6, first paragraph**

This section describes the asbestos cap option, which includes placement of two 15-cm layers of fill material over the landfill. The total thickness of the added fill material will be 30 cm. However, Section 7.5.3 (page 7-42, second paragraph) indicates that a compacted 60-cm soil cover will be used. This discrepancy should be resolved.

Disposition: Clarified to indicate total cap thickness is 60-cm.

166. **Deficiency/Recommendation: Section 8.2.1.4, page 8-7, first paragraph**

This section describes off-site disposal of PCB-contaminated soil from the ephemeral pool site, and states that the objective is to remove all material to below 1 mg/kg. This section further states that if any PCBs (< 1 mg/kg) remain after removal of 250 cubic meters of contaminated soil, on-site institutional control will be implemented. The rationale for implementation of institutional controls even though PCB levels are below cleanup levels

should be explained. If "< 1 mg/kg" is a typographical error and the actual PCBs remaining on site after removal of 250 cubic meters of soils are greater than 1 mg/kg, additional soils should be removed to achieve cleanup levels.

167. **Deficiency/Recommendation: Section 8.2.5.1, page 8-10**

This section describes off-site incineration and capping options S-3B and S-3D, which include excavation and transfer of contaminated soil to an off-site facility where soils would be incinerated and disposed of at a controlled landfill. These alternatives also include capping at the HRL site. This section should discuss regrading of the excavated areas, and indicate if estimated costs include regrading of excavated areas.

Disposition: Statement that the area would be regraded and covered with 15 cm clean soil is added. Costs for these were included in the estimate (see appendix N).

168. **Deficiency/Recommendation: Section 8.2.6.2, page 8-11, second paragraph**

This section explains the rationale for not considering super-critical carbon dioxide extraction as an alternative at the 1100-EM-1 site. Lack of available equipment and small soil volume are cited as the reasons for omitting this alternative. The text indicates that bench-scale studies have shown 97 percent and 99 percent removal efficiencies through this process for BEHP and PCBs, respectively. This technology has successfully removed contaminants from the discolored soil site and the HRL site. The possibility of obtaining the necessary equipment to implement this technology should be considered. The small soil volume at these sites may be advantageous for testing and implementing this innovative technology. Additional consideration should be given to this alternative.

Disposition: Additional discussion was added to the text regarding the fact that this technology has yet to be manufactured at the scale/size required to undertake remediation of the contaminated soils.

169. **Deficiency/Recommendation: Section 8.3.2.2, page 8-15, first paragraph**

A sump and a one-half horse power (hp) pump are proposed to recharge the treated water under the extraction-infiltration scenario 1 [extraction rate of 100 gallons per minute (100 gpm) under scenario 1]. The adequacy of the sump and pump capacity is not demonstrated. For continuous extraction treatment of groundwater, either a large storage tank may be required for the treated water to recharge with a one-half hp pump, or a pump with increased capacity and an adequately designed recharge system may be required to handle the 100-gpm treated water flow rate. This concern should be addressed. This comment is also applicable to Sections 8.3.2.3 and 8.3.2.4.

Disposition: The pumps were sized according to the hydraulics of the recharge piping network at a level of design appropriate for an FS in order to estimate costs with a reasonable degree of accuracy. Further design refinements may be done at the RD stage.

170. **Deficiency: Section 8.3.3.1, page 8-16**

The no-action alternative incorrectly monitoring. A true no-action alternative requires NO-ACTION.

Disposition: Comment noted.

171. **Deficiency/Recommendation: Section 8.3.4.2, page 8-17**

This section indicates that the costs of alternative GW-1 include the construction of six additional monitoring wells. However, in the previous section, three new monitoring wells are proposed for alternative GW-1. This discrepancy should be rectified and the text changed wherever appropriate. This comment is also applicable to Section 9.3.2.

Disposition: Six wells will be installed and text is clarified.

172. **Deficiency/Recommendation: Section 8.3.5.1.1, page 8-18, first paragraph**

Multi-media filters and sedimentation ponds are included as pretreatment units for alternatives GW-2A through GW-33. However, the following concerns need to be addressed.

- Sizing is provided for filters, but not for sedimentation ponds.
- Backwash water may be contaminated with TCE because of sorption of TCE to solid particles. If contaminated, sedimentation ponds may fall under RCRA regulations. Overflow from settling ponds may also need to be monitored before discharging to a drain field. Provision for removal and disposal of sediments from settling ponds is required. All these items may increase the total project capital and operation and maintenance costs.
- It appears from Appendix N that costs are not estimated for pretreatment units. Further, it is not clear whether costs for pretreatment units are included in the groundwater remedial alternative costs (shown in Table 8-4).

Disposition: The system has been revised to include settling tanks. The tanks are capable of storing the anticipated sludge loading for the life of the treatment system. Overflow out of the backwash settling tanks will be pumped back to the head end of the treatment train for treatment. At the conclusion of operations the sludge would require treatment prior to disposal. Cost of the filters was included in the original estimate (Culligan quote was for

filters and RO units). Additional cost of the settling tanks and return pump are minimal and are well within the estimates contingency.

173. **Deficiency/Recommendation: Section 9.2.2.3, page 9-6**

This section discusses the long-term effectiveness of alternative S-1B at the discolored soil site. This section should describe long-term effects if BEHP in soil is not cleaned up to Washington state Model Toxics Control Act (MTCA) levels through bioremediation.

Disposition: Revised to indicate that if goals are not met through bioremediation additional actions may be required (treatment, disposal or containment).

174. **Deficiency/Recommendation: Section 9.2.10.3, page 9-11, first paragraph**

This section states that for alternatives S-3B and S-3D, soils containing residuals would be disposed of on site. However, these alternatives include off-site incineration and disposal of the contaminated soil. This discrepancy should be resolved.

Disposition: Changed to S-2B and S-2D (onsite incineration options).

175. **Deficiency: Section 9.3.1.5, page 9-15**

This option has no short-term effectiveness. The justification is biased and incorrect.

Recommendation: Revise this section to include the hazards associated with short-term effectiveness.

Disposition: Modified to state that there will be no additional risks because no action is taken.

176. **Deficiency: Section 9.3.2.5, page 9-15**

See comment on Section 9.3.1.5, page 9-15 above.

Disposition: See response to comment # 174.

177. **Deficiency/Recommendation: Section 9.3.3, page 9-16, first paragraph**

The text states that six additional monitoring wells would be installed under alternative GW-2A. The reason for these six additional wells and their tentative locations are not provided, but should be. This comment is also applicable to Section 9.3.5.

Disposition: This is only a summary of the alternative. Detailed explanation is given in paragraph 8.3.2.5 and are not repeated here.

178. **Deficiency/Recommendation: Section 9.3.3.3, page 9-16**

This section states "while case studies have shown pump and treat options to be effective in controlling contaminant migration, it is less effective in cleaning up an aquifer to MCL's." The text should explain why pumping and treating is less effective in cleaning up an aquifer to MCL's. A reference should also be provided for this statement.

179. **Deficiency: Section 9.3.3.5, page 9-17**

See comment on Section 9.3.1.5, page 9-15 above.

Disposition: See response to comment # 174.

180. **Deficiency/Recommendation: Appendix D, Section 2.0, page D-2**

The definitions provided for data qualifiers are inconsistent with EPA guidelines (EPA 1988a, 1991b). The qualifier (B) for inorganics data is defined in the text to indicate that the associated concentration is above the instrument detection limit (IDL), but below the contract required detection limit (CRDL). While laboratories assign the (B) qualifier to indicate reported inorganic analyte concentrations to be greater than the IDL but less than the CRDL, it is the job of the data validator to determine the usability of the data and convey this information to the reader. Concentrations reported above the IDL but below the CRDL should be considered by the data validator to be estimated and should be qualified with a (J) to indicate this. If additional information regarding the nature of this qualification need be conveyed to the reader, a subscript may be defined as such and added to the "J" qualifier.

This comment also applies to the definition of the (B) qualifier in Appendix E, Section 3.1, pages E-8 and E-9.

181. **Deficiency/Recommendation: Appendix D, Section 2.0, page D-2**

The text has defined the (B) qualifier for validation of organics data to indicate the presence of contamination in an associated blank sample. The text further defines the (J_1) qualifier as also indicating blank contamination. Neither of these qualifiers is consistent with the EPA (1991b) data validation guidance for the qualification of organics data based on the presence of contamination in an associated blank sample. EPA (1991b) data validation guidelines qualify sample results with associated blank contamination as nondetects, (U), if the sample result is less than five times (ten times for common laboratory contaminants) the contract required quantitation limit. Therefore, both the (B) qualifier and (J_1) qualifier are inappropriate for the qualification of sample results based on associated blank contamination, and should be eliminated from the text.

This comment also applies to the definition of the (B) qualifier in Appendix E, Section 3.2, page E-9.

182. **Deficiency/Recommendation: Appendix D, Section 2.0, page D-2**

The text defines the data qualifier (E) to indicate sample result concentrations that exceed the calibration range. Since sample results that exceed the instrument calibration range are normally diluted and reanalyzed, the (E) qualifier would rarely be appropriate. However, reported sample results that are determined to exceed the calibration range should be qualified as estimated quantities (J). Since calibration range exceedances normally result in a lack of analytical precision, a subscript could be appropriately defined and added to the (J) qualifier to indicate this.

183. **Deficiency/Recommendation: Appendix D, Section 2.0, page D-3**

The text defines data qualifiers (W), (*), and (+) to indicate that control limits have been exceeded for atomic absorption post digestion spike analysis, duplicate analysis, and method of standard additions linearity, respectively. Each of these quality control measures indicates that associated data may be of questionable accuracy or precision; associated sample result concentrations should be qualified as estimated quantities (J) by the data validator. If additional information specifically indicating the nature of qualifications is necessary, subscripts may be appropriately defined and added to the (J) qualifier.

This comment also applies to the definitions for the (E), (M), (N), (w), (*), and (+) qualifiers defined in Appendix E, Section 3.2, page E-9.

184. **Deficiency/Recommendation: Appendix E, Section 1.0, page E-1**

The text fails to identify the set of guidelines used to validate the data. The text should indicate guidance documents used for data validation and provide a complete reference for each.

185. **Deficiency/Recommendation: Appendix E, Section 3.1, page E-8 and E-9**

The text defined the qualifier (Q) for organics analyses to indicate that no analytical result is available. This is also the symbol used to indicate the qualifier column on data tables and may lead to confusion. Since the absence of a result will suffice, the table should be revised to reflect this. This comment also applies to the definition of the (Z) qualifier provided in Appendix E, Section 3.2, page E-9 for inorganics analyses.

186. **Deficiency/Recommendation: Appendix E, Tables E-4 and E-5**

Gross alpha and gross beta sample results have been provided in terms of a $\pm$ confidence interval. The statistical nature of this confidence interval is not defined; such a definition should be included in either the text or the tables.

187. **Deficiency/Recommendation: Appendix F, Section 3.0, page F-1**

The text states that the groundwater monitoring program has changed since its inception, indicating that beginning in November 1991, groundwater samples were collected from monitoring wells GM-1 through GM-12. The text further indicates that before November 1991, groundwater samples were collected from monitoring wells TW-1 through TW-30. However, the text does not describe the methods used for laboratory analysis before or after November 1991. The text should describe the methods used for analytical programs in place before and after November 1991.

188. **Deficiency/Recommendation: Appendix F, Section 3.0, page F-1**

Results for TCE in samples collected after November 1991 indicate that data were validated in some form. However, a reference for the validation guidelines and a definition of data qualifiers are not provided. The text should identify the data validation guidelines used and should define all data qualifiers.

189. **Deficiency/Recommendation: Appendix K, Section 3.4, page K3-4, first paragraph**

This paragraph states that dermal exposure to tetrachloroethene and 1,1,1-trichloroethane is insignificant according to EPA 1985 and ATSDR 1988. These documents are not, but should be listed in the reference section. In addition, it appears that "tetrachloroethane" is a typographical error; the text should be corrected to read "tetrachloroethene." This occurs in several areas of Appendices K and L.

190. **Deficiency/Recommendation: Appendix K, Table 3-6, page K3-20, and Table III-1, page KIII-2**

This table is a summary of residential scenario exposure factors. The permeability coefficient for trichloroethene is listed as 4×10^{-1} cm/hr, but should be 2×10^{-1} cm/hr (EPA 1992b). This discrepancy should be corrected. In addition, the incorrect value of 4×10^{-1} cm/hr is used throughout the document in various calculations (for example, Table 5-6). This error does not significantly affect the risk characterization, but should be corrected to be consistent with previous text.

191. **Deficiency/Recommendation: Appendix K, Section 5.3.2.1, page K5-28, first paragraph**

This paragraph discusses risks resulting from exposure to arsenic in subunit 1100-3 for the residential scenario. It is stated that the risk is based on a maximum concentration of 3.4 mg/kg and that much of this risk is the result of background concentrations. The upper tolerance limit for arsenic from the industrial scenario background screening should be mentioned to support this conclusion.

192. **Deficiency/Recommendation: Appendix K, Section 6.8.1, page K6-9, second paragraph**

This paragraph discusses the incremental cancer risks (ICRs) for PCBs at the ephemeral pool subunit. The total subunit ICR, as shown in Table 6-1, is 6×10^{-5}, not 3×10^{-5}. This error should be corrected.

193. **Deficiency/Recommendation: Appendix K, Section 5.1, page K5-2, second paragraph**

The text states that no hazard quotients were determined for any of the contaminants of potential concern for the inhalation pathway. A hazard quotient was in fact developed for barium. This discrepancy should be corrected.

194. **Deficiency/Recommendation: Appendix K, Section 5.3, page K5-21, first paragraph**

The text states that no maximum detected concentrations result in a hazard quotient greater than 1 for the industrial or residential pathways. This statement is incorrect, based on Tables 5-3 and 5-4, and should be deleted.

195. **Deficiency/Recommendation: Appendix K, Appendix III, Section 3.1.2, page KIII-13**

This section presents the intake equation for the inhalation of volatiles. The following typographical error should be corrected: the value and units for the volatilization factor ($0.54\ m^3$) should be changed to $0.5\ L/m^3$.

196. **Deficiency/Recommendation: Appendix L, Section 2.0**

A conceptual site model is not, but should be included in the problem definition of the ecological risk assessment.

197. **Deficiency/Recommendation: Appendix L, Section 2.3, page L-7, second paragraph**

The text states that there is no vegetative growth in the discolored soil site except for a clump of grass and that this is evidence of ecological damage. Phytotoxic effects of contaminants, however, are not addressed in this assessment. On-site vegetation should be considered as a receptor in the ecological risk assessment or the exclusion of plants that are exposed and affected by contaminants of potential concern should be explained.

198. **Deficiency/Recommendation: Appendix L, Section 2.4, page L-7**

It should be explained why the chosen endpoints (long-billed curlew and Swainson's hawk) are representative of the ecosystem as a whole. Both species chosen as endpoints are carnivorous animals. A rationale should be provided as to why plants that were noted to be affected by contaminants, and possibly the herbivores ingesting them, were not chosen as endpoints.

199. **Deficiency: Appendix M, General Comments**

This section is missing several state ARAR's. For your convenience those ARAR's are listed as chemical specific, action specific, and location specific:

1. CHEMICAL SPECIFIC

WAC 173-490 Emission Standards and Controls for Sources Emitting Volatile Organic Compounds (VOC) **APPLICABLE**

Chapter 173-490 WAC establishes technically feasible and reasonable attainable standards for sources emitting VOC's.

Soil Cleanup/Remediation at Hanford February 1992 **To Be Considered**

The Department of Ecology Nuclear and Mixed Waste Management Program Soil Cleanup Policy became effective February 5, 1992. The purpose of this policy is to provide a basis for consistent cleanups, remediations, and closures at the Hanford Site.

Disposition: Withdrawn.

2. ACTION SPECIFIC

RCW 18.104 Water Well Construction **RELEVANT AND APPROPRIATE**

This regulation establishes authority for Ecology to require the licensing of water well contractors and operators and for the regulation of water well construction.

RCW 70.94 Washington Clean Air Act **APPLICABLE**

Chapter 70.94 RCW directs the state to secure and maintain levels of air quality that will protect human health and prevent injury to plant and animal life.

RCW 70.95 Solid Waste Management **RELEVANT AND APPROPRIATE**

Chapter 70.95 RCW establishes a state wide program for solid waste handling, and solid waste recovery and/or recycling which will prevent land, air, and water pollution and conserve the natural, economic and energy resource of this state.

RCW 70.98 Nuclear Energy and Radiation **RELEVANT AND APPROPRIATE**

Chapter 70.98 RCW establishes a program to establish procedures for assumption and performance of certain regulatory responsibilities with respect to byproduct, source, and special nuclear materials.

RCW 70.105 Hazardous Waste Management **APPLICABLE**

The purpose of Chapter 70.105 RCW is to establish a comprehensive state-wide framework for planning, regulation, control, and management of hazardous waste which will prevent land, air, and water pollution and conserve the natural, economic, and energy resources of the state.

RCW 70.105D Hazardous Waste Cleanup, Model Toxics Control Act (MTCA) **APPLICABLE**

Chapter 70.105D RCW provides Ecology with the authority to investigate and conduct remedial actions upon releases of hazardous substances.

RCW 90.44 Regulation of Public Ground Water **RELEVANT AND APPROPRIATE**

This chapter gives Ecology the authority to regulate and control ground water of the state.

RCW 90.48 Water pollution Control **APPLICABLE**

Chapter 90.48 RCW provides authority to regulate discharges of any pollutant to waters of the state (including surface and ground water, direct and indirect discharges).

RCW 90.52 Pollution Disclosure Act **RELEVANT AND APPROPRIATE**

Chapter 90.52 RCW describes the authority of the state to regulate reports for any commercial or industrial discharge, other than sanitary sewage, into waters of the state.

RCW 90.54 Water Resources Act **RELEVANT AND APPROPRIATE**

Chapter 90.54 RCW gives the state authority to implement water related resources programs.

WAC 173-480 Ambient Air Quality Standards and Emission Limits for Radionuclides **APPLICABLE**

Chapter 173-480 WAC establishes a 25 mrem/y whole body or 75 mrem/y critical organ dose to any member of the public. The point of compliance is all portions of the site.

WAC 246-221 Radiation Protection Standards **APPLICABLE**

Chapter 246-221 WAC establishes standards for protection against radiation hazards.

WAC 246-247 Radiation Protection -- Air Emissions **APPLICABLE**

Chapter 246-247 WAC establishes a 25 mrem/y whole body or 75 mrem/y critical organ dose to any member of the public. It also, requires registration of the source with Ecology.

Disposition: RCW 70.98, WAC 173-480, and WAC 246-221 withdrawn. All others added.

3. **LOCATION SPECIFIC**

RCW 90.03 & RCW 90.14 State Water Code and Water Rights **RELEVANT AND APPROPRIATE**

Water code and water rights laws specify conditions for extracting surface water or ground water for non-domestic uses. In essence, the laws provide that water extraction must be consistent with beneficial uses of the resource and must not be wasteful.

WAC 296-62 Washington Industrial Safety and Health Act Occupational Health Standards--Safety Standards for Carcinogens **RELEVANT AND APPROPRIATE**

State health and safety regulations are generally similar to those espoused by the federal regulations (i.e., OSHA), and are applicable to all remedial actions involving potential human exposure to hazardous materials.

WAC 173-154 Protection of Upper Aquifer Zones **RELEVANT AND APPROPRIATE**

Chapter 173-154 WAC provides for protection of the upper aquifers and upper aquifer zones to avoid depletions, excessive water level declines, or reductions in water quality. State regulations for upper aquifer zones are applicable to remedial alternatives that involve treating ground water or presenting risks of ground water contamination.

WAC 173-220 National Pollutant Discharge Elimination System Permit Program **RELEVANT AND APPROPRIATE**

The purpose of this chapter is to establish a state permit program, applicable to the discharge of pollutants and other wastes and materials to surface waters of the state.

WAC 173-434 Solid Waste Incinerator Facilities **RELEVANT AND APPROPRIATE**

This regulation defines emission standards and design and operation of solid waste incinerator facilities.

WAC 248-54 Public Water Supplies **RELEVANT AND APPROPRIATE**

Chapter 248-54 WAC identifies the requirements of public water supply systems.

Recommendation: Revise the ARAR's in this report to reflect the comment above.

Disposition: WAC 173-220 withdrawn. All others added.

200. Deficiency: Section 3.3, page M-4, first paragraph

The reference to WAC 173-340-745 is incorrect. Also, Chapter 173-340 WAC set the acceptable level of risk at 1 X 10^{-5} to 1 X 10^{-6}. This range is more stringent than the federal requirement.

Recommendation: When selecting action and cleanup levels, it is important to evaluate more stringent standards and processes. This section must be modified to reflect the discussion above.

Disposition: Reference is now made to 173-340. This difference in acceptable risk is now noted in the text.

201. Deficiency/Recommendation: Appendix M, Section 3.3, page M-4; Table M-2, page M-19

Section 3.3 and Table M-2 do not identify the proposed RCRA corrective action rule, 40 CFR 264 Subpart S, as a to-be-considered (TBC) standard. These proposed regulations should be included as a TBC.

202. Deficiency/Recommendation: Appendix M, Section 3.3, page M-5; Table M-2, page M-9

DOE appears to be confusing WAC 173-340-740 Method C and WAC 173-340-745 Method C. Review this section and revise as appropriate.

Disposition: Text revised per discussion with regulators.

203. **Deficiency: Section 3.3, page M-6, second paragraph**

In order to select cleanup scenarios other than unrestricted (as identified by Method B), WAC 173-340-706, sections (1)(a), (b), (c), and (d) must be complied with. The DOE has not proven that "all practicable methods of treatment have been utilized".

Recommendation: Expand this discussion to address this deficiency.

204. **Deficiency: Section 3.3, page M-6, number III**

This section is missing three pieces of significant information: 1) Within one-eighth mile of the operable unit (OU), agricultural uses include potato crops for human consumption. 2) The City of Richland well field is within two miles of the operable unit and occasionally the groundwater gradient changes direction. 3) Residences are located across the street from the southern portion of this operable unit. Ecology does not concur with the evaluation presented here.

Recommendation: Revise this section to reflect the discussion above.

205. **Deficiency: Section 3.3, page M-7, number V**

Revise the text to reflect the language in WAC 173-340-440(2) which states that "Institutional controls shall not be used as a substitute for cleanup actions that would otherwise be technically possible."

206. **Deficiency: Section 3.3, page M-7, third paragraph**

Ecology cannot support the overall designation of industrial use for reasons stated above. Ecology recommends that this site be designated as unrestricted. However, WAC 173-340-740 Method A and Method C may be used in the ephemeral pool and HRL respectively.

Recommendation: Revise the report to change the operable unit land use designation.

207. **Deficiency: Section 3.3, page M-8, first bullet**

Asbestos was not found in the large PCB-contaminated area. Additionally, worker health concerns can be addressed by utilizing personal protective equipment.

Recommendation: The appropriate ARAR is WAC 170-340-740 Method C. Removal of the PCB's is practicable and should be part of the proposed plan.

Disposition: PCB's removal above 50 ppm is now included. ARAR is changed to 173-340-740 Method C.

208. **Comment: Section 3.3, page M-8, number I**

It is important to note that if existing wells in the vicinity are used for irrigation, then the groundwater designation should be that of an unrestricted use.

Disposition: Text revised for clarity.

209. **Comment: Section 3.3, page M-9, first paragraph**

Hardness is not one of the criteria used when determining the potential use of groundwater. Please provide a reference to verify the suitability of the groundwater for domestic use.

210. **Deficiency/Recommendation, page M-9, second paragraph**

The City of Richland does not always maintain a recharge/withdrawal ratio of 2 to 1. The water table maps provided in this report show that the apparent mound under the City well field dissipates in the March time-frame. Any ratio maintained by the City, if relied upon to mitigate any risk from a release or potential release from this operable unit must be considered an "Institutional Control". Also, the statement that "It is inconceivable that ...." is unsubstantiated and should be deleted.

Disposition: A reference is made to section 2 where this is discussed in detail. It is unlikely even with the loss of institutional control that contaminants from the HRL plume would impact the well field and this is a valid statement.

211. **Comment: Section 3.3, page M-9, third paragraph**

The reference should be changed to Method B. The corresponding cleanup standards for nitrate and TCE should be 10 mg/l and 4 ug/l (WAC 173-340-720) respectively.

Disposition: Withdrawn on 3 March 1993.

212. **Comment: Table M-1, page M-9**

Due to the recommended changes above, the values in this table no longer represent the correct proposed cleanup levels.

Recommendation: Revise the table to replace the HRL soil cleanup level with the Method B 71 mg/kg and groundwater cleanup level for TCE with 4 ug/l.

Disposition: Revised table to change HRL PCB's cleanup level.

213. **Deficiency: Section 5.9, page M-15**

The RCRA regulations for the treatment or storage of hazardous chemicals are APPLICABLE. Also, Chapter 173-304 WAC is not applicable to solid waste that is defined as a Dangerous Waste (WAC 173-304-015(2).

Recommendation: Revise the text to reflect this deficiency.

Disposition: RCRA regulations are specified as applicable in section 5.5. PCB's in HRL are not present at levels constituting a dangerous waste (regulators agreed on 3 March 1993).

214. **Deficiency/Recommendation: Appendix M, Table M-2, page M-25**

Section 2.0 on this table does not include the 167 USC 1271 Wild and Scenic Rivers Act as an applicable or relevant and appropriate requirement (ARAR), nor does it include WAC 296-62 Washington Industrial Safety and Health Act Occupational Health Standards as relevant and appropriate. These requirements should be added to the table.

Section 2.1.2 on the table identifies the Endangered Species Act, 50 CFR 17, as a TBC. As discussed in the Rationale section, several federal- and/or state-listed species are common migrants in this area. The classification of this regulation should be changed to relevant and appropriate.

Disposition: This OU not affected by Wild and Scenic Rivers Act. WISHA added. ESA citation changed as noted.

215. **Deficiency/Recommendation: Appendix M, Table M-2, page M-26**

Section 3.0 on Table M-2 does not include the Minimum Standards for Construction and Maintenance of Wells, WAC 173-160, as relevant and appropriate. Since monitoring wells will be installed in this area, this requirement should be added to the table.

Disposition: See 3.2.2, ARAR is already in table.

216. **Deficiency/Recommendation: Appendix M, Table M-2, page M-29**

Section 3.8 on Table M-2 lists several land disposal standards that are ARARs. The rationale following the identification of 40 CFR 268.44, Land Disposal Restrictions, states that there are pretreatment standards for BEHP that are applicable. While this may be true, these treatment standards are only applicable if the waste is first a RCRA hazardous waste and then if the specific type of hazardous waste has a treatment standard for BEHP as listed in 268.44. This should be clarified in the text.

Disposition: Clarification made with regard to TCLP analyses, lack there of, and expected results from high concentration of BEHP.

217. **Deficiency/Recommendation: Appendix M, Table M-2, page M-30**

Section 3.8.3 of this table identifies 40 CFR 264.90-109 as relevant and appropriate. However, these groundwater monitoring requirements would also be applicable if a new landfill is constructed as an alternative or if an existing situation constitutes disposal. Applicable should be added to the table.

Disposition: Changed to applicable.

218. **Deficiency/Recommendation: Appendix M, Table M-2, page M-30**

Section 3.9 should also include the requirements of 40 CFR Parts 257 and 258, Solid Waste and Disposal Facility Criteria. These requirements would be relevant and appropriate for closure of the existing landfill and should be added to Table M-2.

Disposition: 40 CFR 257 added.

219. **Deficiency/Recommendation: Appendix M, Table M-2, page M-31**

Section 3.11 of Table M-2 should also include the state standards in WAC 173-303-670 for incinerators. These requirements would be applicable for on-site incineration and should be added to the table.

MISCELLANEOUS COMMENTS

220. **Recommendation: Section 1.1, page 1-1, last line**

Remove the words "threats to". They were repeated in the next page.

221. **Comment: Figure 2-3, page 2-6**

The west end of x-section B-B' is labeled "MW-10". It appears that this should be "MW-9". No label is given for the north end of A-A'. This should be labeled "10/28-10G1".

222. **Comment: Figure 2-8, page 2-17**

Wells "W-7" and "W-8" on the figure are referenced in several different ways through the report. In Appendices A and C they are listed as "MW-7A" and "MW-8A". A single

reference should be used throughout the report. Well MW-18 (as Phase II well) is not shown on the figure.

223. **Comment: Section 2.2.2.2.2, page 2-20, paragraph 3, line 2**

"depth of 99 m" should probably be an "elevation of 99m".

224. **Comment: Section 2.4.1.2, page 2-24, first line**

It is indicated that seven wells were installed during Phase II. However, only six are shown in figure 2-8 (apparently MW-18 is missing).

225. **Comment: Table 3-1, page 3-2**

The maximum lead value reported for the ephemeral pond (54.2) exceeds the surface soil UTL (12.64) and should, therefore, be highlighted in the table.

226. **Comment: Section 3.2.1, page 3-13**

It is noted that "Soil sampling was not performed at 1100-2...during the Phase II RI". Yet in table 3-2 on page 3-7, tetrachloride is footnoted as being detected in Phase II data.

227. **Comment: Section 3.7.4.2.6.1, page 3-5, last bullet**

"When the heated..." should be "When heated..."

228. **Comment: Section 3.4.1, page 3-18**

Ethylene glycol is noted as being detected in subsurface samples, yet we do not find ethylene glycol listed in Table 3-1 or 3-2.

229. **Comment: Section 3.7.1, page 3-25**

The decision to locate boreholes to intentionally avoid drilling through known and suspected waste deposits was made unilaterally by DOE, without the concurrence of the regulatory officials.

230. **Comment: Section 3.9, page 3-38**

WHC 1990 is reference, but it is not included in the list of references.

231. **Comment: Section 4.1, page 4-2**

COPC should be added to the list of acronyms on page xiii.

232. **Comment: Table 4-6, page 4-17**

The Soil Concentration as Oral ICR for Heptachlor (0.014) is exceeded by the maximum detected soil concentration and should be shaded.

233. **Comment: Figures 4-4, -5, and -6**

In the legend of each figure, BEHP is noted rather than the contaminant that the figure addresses.

234. **Comment: Section 4.7.1.2**

The conversion of 1.0 m (10 feet) is not correct.

235. **Comment: Table 6-1, page 6-7**

The units for sample depth are not noted and the sign convention for matrix potential should be (-).

236. **Comment: Table 6-4, page 6-18**

The units for Soil Head and Saturated Hydraulic Conductivity are not noted.

237. **Comment: Section 6.4.1., page 6-35, line 2**

131 ft/d should probably be 1,312 ft/d - i.e., conversion from 400 m/d to ft/d.

238. **Comment: Section 6.4.1, page 6-35, paragraph 4**

Section 4.8.2.3 is noted. There is no such section. Section 4.7.2.3 is likely the proper reference.

239. **Comment: Appendix J, page J-1. paragraph 2**

At the end of the paragraph, "January 1992" should be January 1993." The same error occurs on page J-23 in the opening paragraph of section 7.2.1.

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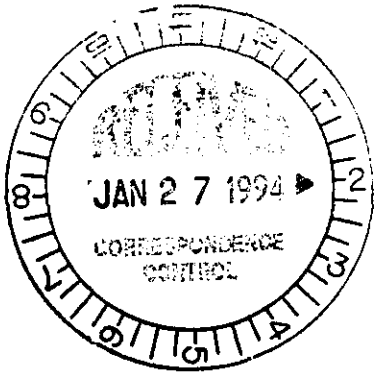

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