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U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10

Hanford Project Office
Federal Building, Rm. 178
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Richland, Washington 99352

REPLY TO ATTN OF: A7-70

March 17, 1989 (Hand Delivered)

MAR 17 1989

Elizabeth A. Bracken
Acting Director
Environmental Restoration Division
U.S. Department of Energy
P.O. Box 550, A6-50
Richland, Washington 99352

Re: Comments on Remedial Investigation / Feasibility Study Work Plan for the 1100-EM-1 Operable Unit

Dear Ms. Bracken:

The U.S. Enviromental Protection Agency (EPA), as the lead regulatory agency for the 1100-EM-1 operable unit, has completed its review of the RI/FS Work Plan which was dated December 1988. EPA received the Work Plan from the U.S. Department of Energy (DOE) on January 31, 1989. The comments are enclosed. As you will note on the distribution list, a copy is being provided to you for transmittal to the Administrative Record file.

In accordance with the schedule for primary document review specified in the Draft Action Plan, your response to comments and resubmittal are due to EPA and the Washington Department of Ecology (Ecology) by close of business on May 1, 1989.

We have scheduled a meeting to discuss and clarify these comments on March 24, 1989, in Richland. EPA (and contractors), Ecology, and DOE (and contractors), will be at the meeting. Additionally, we are available to your staff at any time if they have questions. I can be reached at (509)376-6623 or FTS 444-6623.

Paul T. Day
Paul T. Day
Hanford Project Manager

Enclosure

cc: (with enclosure)
R. Stewart, DOE/RL
✓R. Freeberg, DOE/RL
R. Stanley, Ecology
A. Boyd, EPA
E. Pimentel, PRC
W. Staubitz, USGS
Administrative Record File

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1.0 INTRODUCTION

1. Section 1.1 p. 1-1 2nd para.
The RI/FS process includes an analysis of remedial alternatives. The analysis discusses environmental issues pertaining to implementation impacts of the No Action and Action Alternatives. The topics of discussion normally include the following:

- public health
- socioeconomy
- transportation
- esthetics
- natural resources
- public services

It is incorrect to state that the EIS will address environmental factors that are normally not relevant to the RI/FS process when it implies that the implementation impacts relevant to the above factors are not considered. The need for a supplemental document to satisfy NEPA must be carefully considered to avoid duplicate or excessive discussion pertinent to implementation impacts of alternatives. The issue of how the NEPA process will be coordinated with the RI/FS process is still the subject of discussion between DOE and EPA. This comment is offered for information purposes only, at this time. No response is required.

2. Section 1.2 p. 1-2 1st para.
The last sentence indicates that the operable units report is "now being prepared". This report is now complete, although it may be updated over time, as needed. Reword the last sentence.

3. Section 1.2 p. 1-5 1st para.
The title "consent order and compliance agreement" has been superceded by the present title, "Hanford Federal Facility Agreement and Consent Order" (or the Agreement). Update all references in the Work Plan to reflect this change.

4. Section 1.3 p. 1-5 2nd para.
Clarify in a sentence that the RI/FS should meet requirements and guidelines established by EPA, Ecology and DOE.

5. Section 1.3 p. 1-5 3rd para.
The phrase "terminating the RI/FS process" needs clarification and expansion. Explain how the termination includes documentation in the file and how it is addressed in the Feasibility Study Phase III/Proposed Plan and in the decision document (record of decision).

6. Figure 1-2 p. 1-6
This figure should does not identify all of the units listed for the 11-EM-1 operable unit. Units must always be identified consistent with WIDS terminology and with the text. The Horn Rapids Landfill and the Discolored

Soil Site are not shown as part of 1100-EM-1. It is recommended that this figure be carefully checked for accuracy and revised.

Also, it appears that there is a provision to move directly from the Endangerment Assessment/Decision Document to public comment and a Record of Decision. This process is inconsistent with Section 7 of the Action Plan.

7. Figure 1-3 p. 1-7
This figure needs to be revised in accordance with the comment provided in Section 7.0 Technology Plan regarding the phased approach of the RI/FS.

8. Section 1.3 p. 1-8, 2nd para.
Again, the term "decision document" is confusing. Describe the process by which a unit at which there is no contamination is to be dispositioned in the CERCLA process. Such a unit will be described, with documentation, in the RI Report and the FS Phase III Report and will summarized in the Proposed Plan and further described in the Record of Decision. The use the phrase "if contamination is not present" is potentially confusing. This concept should be fully explained here or referenced to a more technical section of the Work Plan.

2.0 SITE DESCRIPTION

9. Section 2.0, pp.2-1 & 2-2
The last paragraph on page 2-1 and the first paragraph on page 2-2 are redundant and confusing. Please combine the thought and describe the geology in concise, accurate terms.

10. Section 2.0, p. 2-2, Table 2-1
As stated above, ensure that the name (and the number, where applicable) of all units is consistent with WIDS. The Discolored Soil Site was not in WIDS at the time of Work Plan submittal to EPA. Any unit referenced in a Work Plan must be included in WIDS in order to maintain consistency in unit identification.

11. Section 2.0, p. 2-2, Table 2-1
The table indicates that units 1100-2 and 1100-3 received hazardous wastes or hazardous constituents regulated under RCRA and the State Hazardous Waste Management Act until 1985. If this is the case, these units are RCRA TSD units, rather than past practice units. Verify whether such wastes were placed in these two units after November 19, 1980. If such wastes were not placed after this date, correct the dates on Table 2-1 and the narrative description in Section 4.1.1.2 on page 4-2. If RCRA hazardous wastes were disposed after this date, correct the Work Plan to identify 1100-2 and 1100-3 as RCRA TSD units and initiate action to process these units as TSD units.

12. Section 2.0, p.2-3, Figure 2-1
This figure contains several mistakes and inconsistencies. Provide a legend for this figure and provide quality control for next submittal.

3.0 PROJECT MANAGEMENT PLAN

13. Section 3.0 General Comment

The Project Management Plan contains numerous inconsistencies with the current version of the Action Plan (an attachment to the Hanford Federal Facility Agreement and Consent Order). These inconsistencies are the result of two general problems:

1) This Work Plan was written several months ago and referenced the version of the Action that was drafted at that time. The Action has undergone several revisions since. The Action Plan specifies the procedures that must be followed in the CERCLA process. If there are inconsistencies between the Work Plan and the Action Plan, the Work Plan must be changed to conform to the Action Plan. It is recommended that the majority of the Project Management Plan simply reference the Action Plan by the appropriate section. In this way, most of the narrative portion of the Project Management Plan can be deleted and inconsistencies will be totally avoided.

2) In many cases, the narrative and figures in the Project Management Plan have been paraphrased from wording in the Action Plan, resulting in a slightly different meaning. Again, the recommendation for referencing the Action Plan, as stated above, will correct this problem. For any narrative content or figure that must be left in the Project Management Plan for clarity and for which there is a comparable section in the Action Plan, the specific language of the Action plan must be stated verbatim.

The inconsistencies noted are numerous and therefore, have not been enumerated here. The particular sections of the Work Plan that should reference the Action Plan are as follows: 3.2.1, 3.2.2 as related to project and unit managers, 3.3.1, 3.3.2, Figure 3-8, 3.3.3, 3.3.4, 3.3.5, 3.3.6, Table 3-1, Figure 3-10, 3.4.1 (last paragraph), and 3.4.2.

14. Section 3.2.2, p. 3-4, 5th para.

Apparent typo: "Figures 3-3 <u>and</u> 3-7" should read "Figures 3-3 <u>through</u> 3-7".

15. Section 3.3.2.1 p. 3-11, last para.

EPA will not be using a review comment record as shown on Figure 3-9. Delete the reference in the narrative and delete Figure 3-9 on page 3-11.

16. Section 3.5 p. 3-20

General Comment: The subject of this section, work plan schedules, requires extensive revision. The schedule presented in the work plan does not reflect that the 1100 Area under consideration, for the most part, consists of fairly well defined waste disposal or spill incident areas which are anticipated to be limited in their nature and extent of contamination.

The schedule presented in the Work Plan proposes a multi-phase RI/FS and NEPA document to be completed in June 1993. However, based on the existing

information for this site, this lengthy schedule is unwarranted. The nature and extent of this contamination is such that the RI/FS must be completed in significantly less time. A recommended schedule is presented below. However, adherence to this schedule would require a reduction in the production of phased reports and greater flexibility in the use of interim or secondary documents to address acquisition of new data. Secondary documents could provide interim results of field data and outline additional data collection plans. This approach would minimize preparation of multi-phase RI and FS documents which would otherwise require extensive, formalized review processes. Furthermore, a revision of the schedule takes into consideration recommendations for a reduced scope of work.

- First, some field investigation tasks are redundant and unnecessary given the limited potential for contamination in some areas, or unlikely to yield significantly better results compared to the other field tasks proposed.

- Second, the current scope of work for the RI/FS is based primarily on a conservative estimate of the type of contamination expected at the 1100 Area. Consequently, it presents potential plans for extensive modeling needs and consideration of several remedial technology options requiring treatability studies. The conservative scope of work approach to the RI/FS process, should be balanced with a best judgement estimate of what is most likely to be present on the site based on the known information.

Remedial Investigation

The present RI schedule has a conservative time frame for the preparation of an RI phase I and an RI phase II. Each of these is anticipated to take 1 3/4 years plus a 3 month review period. However, this schedule is unnecessarily long even if all the proposed surveys are performed and all wells are installed. The preliminary site screening activities and data analyses can be completed within a six-month period and should generally be done prior to approval of the Work Plan (anticipated on July 31, 1989. Well installation and ground water sample collection can be performed within approximately two months after Work Plan approval. This is reasonable given there are no adverse site features; no radiation hazards; site access is easy; the area is small and a limited number of monitoring wells are planned; and the groundwater is relatively shallow.

If an RI phase II is required, the following activities will have to be conducted:

- quantify volume estimates from a lateral and vertical extent

- predict contaminant migration rate and direction in a vadose or ground water zone

- conduct treatability investigations, as necessary (see below)

The need to perform an RI phase II should be known prior to submittal of the RI Phase I Report and as such provisions to prepare and finalize a scope of work should be available at the time the RI phase I is completed. So unlike the proposed schedule for in the 1100-EM-1 Area, an RI phase II, if necessary should begin immediately upon submittal of the RI phase I Report.

The Action Plan has provisions to expedite the RI/FS process when minimal activity will be involved. At this time there is no reason to believe an extended treatability investigation schedule is necessary. The types of wastes that are known or suspected to have been disposed are relatively common chemicals for which extensive data on management and treatment already exists.

The actual schedule for phase II may vary depending on the amount of additional field or modeling work needed. If additional time is necessary for completion of phase II the Work Schedule can be modified to reflect the actual amount of time needed. At this time, there is no basis to justify the proposed 2-year RI phase II schedule consisting of a 1 year drilling schedule, 1 year sampling schedule, and 1 1/2 year treatability investigation schedule.

Feasibility Study

The current FS schedule proposes a totally sequential schedule for the FS phase I, FS phase II and FS phase III processes. Given the waste disposal history and existing contaminant data there is no present reason to prepare three separate deliverables. The Action Plan specifies that phases I and II of the FS are to be done concurrently and that the documentation is to be submitted to EPA (or lead regulatory agency) as a single document -- the FS phase I and II Report. The Work Plan does not clearly state that the FS will be conducted in this manner. The basis for this recommendation is discussed below.

An initial review of remedial action goals and requirements (ARARs) is conducted during phases I and II of the RI. The FS phase I considers the information obtained during the RI and, in addition, requires further consideration of technology implementation ARARs as remedial technologies are identified and screened in the FS phase II. It is generally useful to combine the preparation of the FS phase I and FS phase II because of the interdependencies of the two processes and because much of the information incorporated into the FS phase I is directly available from the RI phase I and the RI phase II.

Recommendation for Revised RI/FS Schedule

The following is a realistic schedule for completion of the RI/FS process at the 1100-EM-1 operable unit. All dates are end of month dates (e.g., August 1989 equals August 31, 1989). A graphic presentation of this schedule is included on Figure 1. Given the site specific characteristics of the operable unit, this schedule is achievable through incorporation of the comments in this document.

RI	
Phase I	August 1989 -- March 1990
Review period (secondary)	March 1990 -- June 1990
Phase II	March 1990 -- November 1990
Review period (primary)	November 1990 -- March 1991
FS	
Phase I/Phase II	December 1989 -- January 1991
Review period (primary)	January 1991 -- May 1991
Phase III & Proposed Plan	May 1991 -- January 1992
Review period (primary)	January 1992 -- May 1992

17. Section 3.5 p. 3-21, Figure 3-11

Refer to comment #1 regarding NEPA. The NEPA timeline indicates that a separate NEPA process is going on parallel to the RI/FS process. Without a tie to the RI/FS, one would assume that an independent record of decision could be reached under NEPA. EPA's objections to the NEPA process at Hanford Superfund operable units is that 1) there is a potential for a different remedy selection between the records of decision under CERCLA and NEPA, and; 2) the use of NEPA on an operable unit basis creates a redundancy and duplication of effort that we hope to avoid with the CERCLA investigations. The response to this comment can be incorporated into comment #1, as appropriate.

18. Section 3.5 p. 3-21, Figure 3-11

The figure shows the RI phase I starting in October 1988. Although some of the preliminary site screening work may have begun at that time, technically the RI does not begin until RI/FS Work Plan approval. If everything proceeds on schedule, such approval is anticipated around July 31, 1989. Revise the figure accordingly.

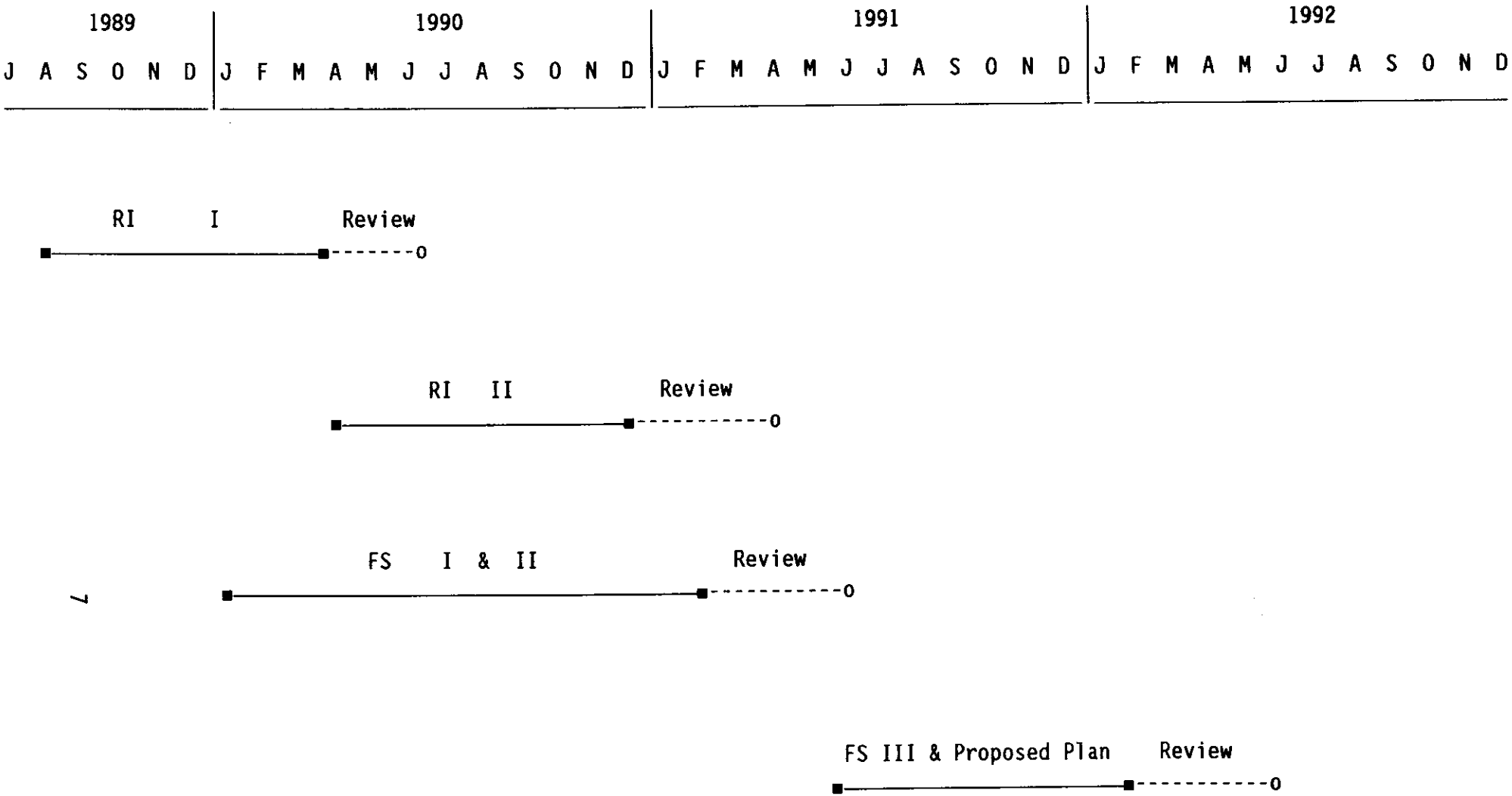

Figure 1. RI/FS Schedule for 1100-EM-1 Operable Unit

4.0 SAMPLING AND ANALYSIS PLAN

19. General Comment
The tendency in this scope of work is to present an all-encompassing approach to handle any range of data and analysis needs at any hazardous waste site. This approach overburdens the RI/FS process by not having made certain best judgement analyses of anticipated site-specific needs.

20. Section 4.1.1.2 p.4-2, 1st para.
A previous comment has been made regarding Table 2-1 and the dates of disposal (through 1985) in this unit. The response in regard to RCRA TSD applicability must be consistent with the correction made in Table 2-1.

21. Figure 4-1 p. 4-3
The legend needs to be changed to indicate "proposed groundwater monitoring well", rather than "well".

22. Section 4.1.1.4 p. 4-5
The depth to the bottom of the tank and the sample locations with respect to the tank must be specified to provide assurance that such sampling would have detected a leak from the tank. The three dimensional sampling location(s) and the analytical results must be provided to determine what further investigation is necessary. Furthermore, there is no discussion of why the tank was suspected of leaking and there is no estimate of how much product may have leaked over time. Include a physical assessment or description of the tank from field notes taken during removal, if such documentation is available.

23. Section 4.1.1.5 p. 4-5
It would appear that given the incident is considered 'highly unlikely' to have resulted in contamination, the area was probably 'carefully checked' for contamination as a matter of routine, and the area of potential concern was probably no greater than 'one foot in diameter', the 1100-5 site should be rechecked as a matter of routine and not be incorporated into the RI/FS process. The radiological survey should be performed as a routine health and safety procedure. In the unlikely event contamination was discovered in the estimated one foot in diameter area it could be readily removed and disposed or even temporarily stored until a determination of the final disposition of all wastes on the 1100-EM-1 site is made. The potential for ground water contamination could be assessed from the monitoring wells to be installed.

24. Section 4.1.2 p. 4-7, 2nd & 3rd para.
Paragraphs two and three indicate that the units in 1100-EM-2 and 1100-EM-3 are to be managed under the RCRA process (presumably as RCRA TSD units). This is the first indication that EPA has received that there are TSD units in the 1100 Area. Appendix B of the Action Plan lists all TSD units on the Hanford Site, with the exception of those used for generator accumulation (less than 90-day storage or treatment). Appendix C of the Action Plan cross references all known TSD units which are to be investigated as part of an operable unit. Neither Appendix B or Appendix C identify any RCRA TSD units in the 1100 Area.

Verify whether such units are to be regulated under the RCRA program as TSD units and revise these paragraphs as necessary. If they are TSD units, enter into the data base and initiate the process for managing the units as TSDs.

25. Section 4.1.3 p. 4-8 2nd para. & p. 4-9 1st partial para.
The term "preliminary ARARs" is confusing. The Action Plan does not use this term. It would be better stated if reference is made of the specific standard against which the trihalomethane sampling results are being compared. In addition, this section must either specify the concentrations of those parameters detected or reference a section or appendix of the Work Plan which contains the actual analytical data.

26. Section 4.1.3 p. 4-9 1st full para.
Failure to detect methylene chloride in subsequent sampling could be the result of the sampling process or, more likely, the analysis process. Methylene chloride is a common lab contaminant. Verification of such an artifact must be made by comparison to sample blanks, not just to subsequent samples. Provide a discussion of the sample blank results as well as a more detailed discussion of the subsequent sampling results (i.e., how many samples, sampling dates, and parameters analyzed).

27. Section 4.1.3 p. 4-9 2nd para.
The concentration of PCB arochlor 1254 should be provided. Since it was only detected in one sample at a 'measurable' concentration, it may well fall in the category of background concentrations given their ubiquitous nature. It's important to begin to identify what contaminants are really of concern; and this can be done in part by considering what are characteristic background concentrations of certain ubiquitous organic and inorganic constituents in the surrounding community. When describing potential contamination, avoid general terms such as 'measurable'. Such terminology introduces subjectivity by the reader. Provide a description of the actual concentration measured and the detection and practical quantification limits.

28. Section 4.1.3 p. 4-9 3rd para.
The sample with phthalates is another example of detected contaminants which may possibly be attributed to background, as phthalates are also ubiquitous contaminants and have also been found to be introduced during sampling as certain phthalates are used as plasticizing agents. A more complete discussion of this issue is needed. As stated above, avoid general terms such as 'measurable', unless further definition is provided.

29. Section 4.2 p. 4-15 1st para.
This paragraph states that there is no definitive evidence of contamination in the 1100 area. It should state based on the discussion from the preceding paragraph, that contaminants have been detected in the 1100 Area. However, a preliminary analysis of the limited amount of soil and ground water data indicates that federal and state ARARs have not been exceeded, and as such there is no evidence to suggest the contamination is posing an adverse risk to public health or the environment. Further sampling will provide additional data upon which to determine whether a remedial action is warranted based on an evaluation of ARARs, TBC's and potential public health risks via relevant exposure pathways. In the event further analysis continues to indicate there

is no adverse risk to public health and the environment, then the only applicable alternative would be no action and the RI/FS process would terminate upon formalized acceptance of this conclusion in a ROD.

30. Section 4.2 p. 4-17
Rephrase 3rd set of bullets as follows:

- o Obtain sufficient data to conduct risk assessments and assess the threat to public health.
- o Obtain sufficient data to identify and perform preliminary screening of candidate remedial action technologies.
- o (No change in 3rd bullet)
- o Obtain sufficient data to estimate the resource costs and time frame required to implement the recommended remedial measures.

31. Section 4.3.3 p. 4-21 1st bullet (set)
Add the following bullet as it is important to consider this early in the sampling process to begin to establish knowledge of contaminants ubiquitous to the surrounding community:

- o Determine data representative of background to establish baseline parameters.

32. Section 4.4.1.1 p. 4-28 1st para.
The statement is made that vadose borings will be completed as piezometers ... where appropriate ... Specify the criteria under which such completions would be appropriate and under which conditions it would be inappropriate.

33. Section 4.4.1.1 p. 4-29 2nd para.
The narrative lacks a concise description of the existing and proposed groundwater monitoring wells. Provide a table listing the existing monitoring wells and proposed monitoring wells. For existing wells, the table should show completion depth and installation date at a minimum.

34. Section 4.4.1.1. p. 4-29 3rd para.
Background soil samples are not to be confused with blanks. The QA/QC lab blanks for any soil sample should consist of distilled water samples in a VOA vial and are shipped to the lab for analysis. A background sample may serve as a baseline background sample, but not as the QA/QC lab blank.

35. Section 4.4.1.2 p. 4-29 1st para.
In contrast to most uncontrolled hazardous waste sites, the history of waste generation and waste disposal practices at the 1100-Area is actually fairly well documented (e.g., battery acid pit, UST, and solvent degreasers. Therefore, while the term 'poorly known' is relative, it is inappropriate to state that the history at this operable unit is poorly known. Rephrase the third sentence as follows:

"The waste disposal history at the site is fairy well documented, but because of incomplete records of additional undocumented contaminants that may have been disposed, a conservative analytical approach will be taken to ensure that a broader range of contaminants are not present."

36. Section 4.4.1.3 p. 4-43 4th full para.
This paragraph implies that there are still existing sampling results from the antifreeze tank that will be further evaluated. All existing data from soil sampling in this area should have already been evaluated and included in the Work Plan. This issue must be clarified.

Unless the existing data indicate, with an adequate level of confidence, that there is no soil contamination from the antifreeze tank, further sampling will be necessary to determine whether a leak(s) did occur and, if so, the extent of leak. Reliance on data from a single proposed groundwater monitoring well to determine whether the soil column may be contaminated is not considered adequate. It is recommended that if further soil sampling is necessary, a vadose zone borehole be constructed with continuous sampling or sampling at five foot intervals directly through the location of the excavated tank. The borehole could either be properly closed or finished as a piezometer or groundwater monitoring well.

As a final point, the list of parameters during previous sampling may have been restricted to ethylene glycol. Since this was a "waste tank", located in a equipment maintenance area, it is recommended that any future sampling effort include at least one sample analyzed for the target compound list as specified on Table 4-9. It is reasonable to assume that over the years, this tank may have received waste other than antifreeze, either intentionally or unintentionally.

37. Section 4.4.1.3 p. 4-43 4th full para.

The concrete floor does not have to be removed to obtain 'higher level of data quality', nor does it have to cause significant disruption. Revise the text as follows:

"Additional samples can be routinely taken with minimal disruption to the facility operations, by drilling through the concrete floor."

38. Section 4.4.1.3 p. 4-43 5th full para.
The text states that a geophysical survey will be performed to determine the extent of the battery acid pit. Although it may be easily performed given that the surveyors are planning to survey other areas on the 1100 Area, a geophysical survey followed by a soil-gas survey for a suspected small area appears to be excessive given that soil boring samples and possibly test pit samples will be collected. Although this cannot be considered a deficiency, it could needlessly impact the schedule and place an additional burden in the RI/FS because of the additional data management and review needed. Two criteria should be met to justify the use of these procedures: 1) the use of geophysics and soil-gas survey is necessary to locate the pit with a reasonable degree of accuracy, and 2) the use of geophysics and soil-gas

survey will occur prior to the anticipated date for Work Plan approval, so that the RI is not delayed and the acquired data can be used to refine the RI.

If the two criteria specified above are not met, the following more expedient and practical approach should be considered: collect soil samples via boring or test pit collection methods in the area most likely to have been used for disposal. This approach is justified because of the area's limited size. Even if geophysical survey techniques were used, they still would not have guaranteed results without field confirmation consisting of boring or test pits to obtain visual evidence of potentially buried objects. Furthermore, test pits will probably be required because the soil is very sandy to gravelly, thus boring will not always yield recoverable samples. The primary objective of the RI is to determine whether contamination is present and to estimate the extent within some acceptable margin of error. There already is a reasonable estimate of the minimum and maximum boundaries based on the history of operations and site features. It is important to realize that during a remedial design/remedial action phase the site boundaries will be better defined.

39. Section 4.4.1.3 p. 4-48 1st para. (partial)
Wells should always be placed with regard to interference of operations, to the extent that it is practical, while still meeting the primary objectives of the RI. Therefore, the last two sentences of this paragraph should be rewritten as follows:

"Placement of wells in areas where they will minimize interference with facility operations will be considered to the extent that it is practical. However, in all cases, wells shall be placed in locations suitable to meet the intent of the investigation."

40. Section 4.4.1.4 p. 4-49 2nd para.
This section discusses how 'nil' the possibility is for contamination to exist near the 1171 parking lot. However, the text implies that further investigation of survey records and personnel interviews may provide additional reason to dispute or confirm the presence of contamination at the site. It is recommended that existing survey records and personnel interviews be considered prior to any proposed survey. However, a survey as part of a routine health and safety procedure is still recommended in the interest of minimizing any unnecessary RI/FS data tracking prior to having legitimate reason to include it in the remedial track process.

41. Section 4.4.1.5 p. 4-49 1st para.
There is currently no evidence of contaminant migration to ground water; therefore, the last sentence should be rewritten as follows:

"Each site is thought to consist of localized areas from which contaminants may have percolated down to the unconfined aquifer."

42. Section 4.4.1.5 p. 49, last para. & p.50, 1st full para.
As stated in earlier comments, research the issue of whether 1100-2 and 1100-3 are RCRA TSD units, based on dates of disposal of RCRA regulated wastes.

43. Section 4.4.1.5 p. 4-50 1st para.(partial)
If the volume estimate of disposed paint thinner and other solvents is a maximum conservative estimate, this should be stated. If this is the case, the last sentence in this paragraph should be modified to state the following:

"The maximum volume of paint thinner..."

44. Section 4.4.1.5 p. 4-51 1st para.(partial)
The word constituent should be added to the phrase acid-base neutral to complete the sentence in which it appears.

45. Section 4.4.1.5 p. 4-51 2nd para.
Is the truck-mounted radiological survey described in the text being performed as a conservative investigatory measure or as a matter of routine health and safety policy? There is no evidence or reason to suggest radioactive material was disposed and as such a more practical and appropriate approach is recommended as follows:

> Field scan samples with a pan-cake type model gamma probe at the time soil boring or trench pit samples are collected.

Again, this is not a deficiency, but these additional procedures can delay the RI/FS schedule and can unnecessarily burden the data management and review process.

46. Section 4.4.1.5 p. 4-51 3rd para.
The 1100 Area is still an active operating facility, and unless there is reason to believe the natural resources in the area have changed or should be managed differently, there is no justification for a special biological field survey. A routine geological survey can be performed as a matter of course during the identification of soil and boring sampling locations. Therefore, it is recommended that a special biological and geological field survey not be performed, unless this step requires only a minimum of effort and expense and does not otherwise delay the RI process once the Work Plan is approved.

47. Section 4.4.1.5 p. 4-53 3rd para.
The performance of a geophysical, soil-gas survey, collection of approximately 24-36 near-surface soil samples from a depth of 10 feet, and collection of vadose zone samples from three locations is an excessive number of tasks for the 1100-2 and 1100-3 sites. Given the small size and shallow depth of the potentially impacted area, it would be sufficient to collect the near-surface soil samples, and the vadose-zone samples. Limited soil trenching would be appropriate because of the shallow depth and limited area of disposal. It could be performed at the same time that soil samples are collected to substantiate any visual or suspected evidence of buried wastes and be used to justify further need for data collection. The rationale for this recommendation is provided below:

Geophysical Surveys:
Field experience suggests that geophysical surveys are useful in areas with minimal interference and uniform hydrogeological conditions. However, even under the best of conditions, the sample locations following a

geophysical survey are routinely placed in areas with contrasting readings, because of the need to correlate geophysical readings with site conditions. The proposed number of soil samples alone are sufficient to provide data to assess contamination at these two sites, even taking into consideration a very conservative estimate of impacted area. Trenching would provide a better opportunity to visually confirm the presence of buried wastes or debris.

Soil Gas Surveys

The 1100-Area consists of fairly sandy to gravel type soil, which has had ample opportunity for natural flushing. Given the time frame of disposal activity and the shallow depth of suspected waste disposal, there is limited reason to believe that the soil gas survey would provide better results than the proposed near-surface and vadose zone sample results.

The recommendation to limit the investigation to near-surface and vadose zone sampling (in addition to the proposed monitoring wells) is made in the interest of maintaining a reasonable schedule and minimizing the collection of unnecessary data. Again, the intent is to ensure that resources are used most efficiently and that the RI is not delayed once the Work Plan is approved.

48. Section 4.4.1.5 p. 4-53 4th para.

Please clarify how many samples are to be collected for analyses of physical parameters. A limited number should be necessary until such time as there is a need to perform hydrogeological modeling or identification of remedial technologies.

49. Section 4.4.1.6 p. 4-54 1st para.

Add the word 'other' as provided below to clarify that carbon tetrachloride is a hazardous material and other hazardous materials may be present:

"...possibly other hazardous materials."

50. Section 4.4.1.6 p. 4-56 2nd para.

Clarify what the primary concern and purpose is for conducting a biological survey at the Horn Rapids Landfill. If the reason is due to its use as a curlew nesting ground it should be stated, as well as defining the specific concerns.

51. Section 4.4.1.6 p. 4-56, 2nd para.

Soil-gas sampling points have been set on a 100 foot grid line for the Horn Rapids Landfill, rather than the 40 foot grid line used for 1100-2 and 1100-3. The rationale is that the Landfill is too large to justify the denser spacing. This results in over six times as many samples being taken at the 1100-2 and 1100-3 units as would be taken in the Landfill over a comparable spacial area. The spacing for soil-gas monitoring should be based on a best scientific judgment of what is necessary to obtain the required information at a given site.

Assuming the geology between these two areas is generally similar and that the types of waste disposed may be similar, the grid spacing should also be similar. If 100 foot grid spacing is appropriate for the Landfill, it should also be appropriate for the other units. Specify the appropriate grid spacing

for all three units. If different spacing is proposed, substantiate with criteria other than size of the units.

52. Section 4.4.1.6 p. 4-56 5th para.
The last sentence in this paragraph should be rewritten as provided below to clarify that refinement of grid nodes can be performed while conducting the soil-gas survey:

"If field data warrants, a fine grid of 20 foot nodes may be taped off from the 100 foot surveyed nodes to provide greater spatial detail in the soil-gas analyses at the time of the survey."

53. Section 4.4.1.6 p. 4-57 1st para.
State how many samples 20 percent of grid nodes represent? The point of performing geophysical and soil-gas surveys is to map an area based on the presence of contamination. For both the geophysical and soil gas surveys, confirmatory soil samples must be taken to correlate numerical survey data to chemical-specific concentrations in soil. If these surveys are performed, then only a limited number of samples should be taken for confirmatory analysis of either one of the surveys.

54. Figure 4-12, p.4-58
Miscellaneous comments, as follows:

a) Clearly designate legend and label as such. Presently it could be confused with the location of actual monitoring wells or vadose zone borings.

b) The grid diagram overlaying two disposal units (asbestos disposal site and marked burial site) is apparently based on 20 foot spacing, but there is no narrative to support the denser grid at this location versus the rest of the Horn Rapids Landfill.

c) It is assumed that the site designated as "marked burial site" is the location of the potentially disposed carbon tetrachloride drums. If this is the case, it should be clearly designated as such.

d) Indicate the estimated direction of flow of the unconfined aquifer. An estimated range of flow direction is preferred over a single direction.

55. Section 4.4.1.6 p. 4-59 5th para.
Sewage sludge is a solid waste, not a hazardous waste and should not be considered under the CERCLA/SARA jurisdiction. Standards or other criteria for E. coli in soil are generally not available and are difficult to interpret particularly if taken from an area where wildlife contributes to the E. coli count. The concern with sewage sludge is generally associated with its potential for drinking ground water contamination, therefore it is recommended that ground water samples be collected and analyzed for conventional bacterial including E. coli in lieu of the soil samples.

56. Section 4.4.1.7 p. 4-60 1st para.
The first sentence should be clarified as follows:

"If the RI phase data identifies contamination of concern to the extent that modeling is required, then additional data may be obtained during the RI to determine contaminant release behavior."

57. Figure 4-13 p. 4-62
The symbol identifying Well No. 3600-N as an existing well needs to be added to this figure. The eleven wells referenced in table B-2 Appendix B will then correspond to this figure. This figure contains numerous other inconsistencies, primarily with the use of symbols and unit designations. Please subject this useful figure to rigorous QA and make all necessary corrections.

58. Section 4.4.3
The purpose for conducting a biotic survey at the Horn Rapids Landfill as a necessary step in the Superfund process is unclear. Visual surveys to identify weakened, necrotic, or chloritic plants is generally performed as part of a visual reconnaissance survey when the site is first identified for the NPL. At this stage of the investigation with several surveys and sampling efforts proposed to quantify and qualify contamination it would appear not to be very useful for an RI/FS.

There already appears to be sufficient reference or verbal information from state/federal agencies pertaining to the vicinity areas, upon which to generally define the type of biota, including threatened or endangered species present or potentially present at the site. Unless there is reason to believe this area has special features or has insufficient data to evaluate remedial alternatives, then only a very limited, if any, biota survey is recommended. Again, this is not a deficiency in the Work Plan, but a recommendation for making the most efficient use of available time and funds. The biota survey should not cause any delay in the RI once the Work Plan is approved.

5.0 QUALITY ASSURANCE PLAN

59. Section 5.3.5 p. 5-5
The work plan should specify what procedures will be taken to collect a field blank. In this project, background soil samples should not be used in lieu of distilled 'contaminant-free' water field blanks. Background soil will very certainly contain some contaminants common to the 1100-Area (e.g., naturally occurring constituents such as metals) and should be collected to provide baseline data on such constituents present in the vicinity.

60. Section 5.8.1.1 p. 5-13
The following sentence should be added to clarify the types of activities falling in this category:

"An audit may involve the review of documents or data management systems, laboratory or field equipment, and laboratory or field procedures."

6.0 HEALTH AND SAFETY PLAN

61. General Comment

The HSP is general and has limited site-specific concerns relative to the entire 1100 Area. As a result, the tone of the HSP is very broad and similar to a reference book, rather than a detailed plan for use by field personnel at the 1100-EM-1 operable unit. It is to be supplemented by a pre-job safety plan (PJSP) which will be site-specific and activity-specific in nature. However, without the more-specific PJSP, the HSP is currently not an appropriate field document.

62. Section 6.2.4 p. 6-5

This section states that personnel will be prepared to cease operations when the PID or OVA detect volatile organics at 3 ppm above background; and that personnel will evacuate at 5 ppm above background. It appears that identification of the "potentially hazardous substance" would follow evacuation. No mention of level "C" protection is made.

With these action levels, a worker could be chronically exposed to 1,1,2,2 - tetrachloroethane, for example, at concentrations five times greater than the TLV (1 ppm). Site entry and regular monitoring may include pulling colorimetric tubes for this compound and any other compound (e.g. carbon tetrachloride, benzene, vinyl chloride...). If the presence of compounds with low TLVs is suspected, attempts should be made to identify them before concentrations increase beyond their TLVs.

63. Table 6-3 p. 6-6

Methyl ethyl ketone (MEK) and 2-butanone are both listed; however, they are one in the same (i.e. synonyms). Chemical Abstract System (CAS) numbers should be used to avoid confusion.

64. Table 6-3 p. 6-6

If methyl chloride and carbon tetrachloride are listed as suspected human carcinogens, then trichloroethene, tetrachloroethene, and 1,1,2,2 - tetrachloroethane should also be. NIOSH recommends treating them as "potential human carcinogens".

65. Table 6-3 p. 6-6

Are the compounds listed here known contaminants or suspected contaminants? If suspected, benzene, chloroform or other compounds with low TLVs or ones with confirmed carcinogens should be added.

7.0 TECHNOLOGY PLAN

66. **General Comment**: The discussion in Section 7.0 is generally too broad with some exceptions where it is prematurely specific. Two areas where the workplan can be streamlined are provided in the discussion given below.

A significant part of the section describes the FS process. It is not a discussion specific to the 1100 Area. While it is appropriate to go into the FS requirements, the work plan should only provide a brief outline, summary, and reference to specific guidance documents for further explanation of the different processes. In fact, the reference list provided is fairly comprehensive. For example, the more lengthy discussions on the FS process came directly from the EPA (1988) Guidance for Conducting RI/FS under CERCLA. Therefore, it would have been sufficient and preferable to refer to that document.

The latter part of this section discusses technology selection, development of alternatives, and analysis of alternatives. Several technologies are identified, and because of the conservative approach taken, a technology to address all chemical contaminant categories and medias are presented. Therefore, the technology discussion should, at this point, be general and as such consist of an outline, brief summary, and reference to specific guidance documents. In some sections, the Work Plan begins tasks that should really be performed as part of the RI and/or FS process. A case in point is the discussion on the potential containment options and alternative options in the event a technology is not developed at the time a ROD is signed.

These kinds of detailed general discussions unreasonably burden the RI/FS process due to the time involved in preparing, reviewing and revising the documents. When the information provided is not necessary, yet presented incorrectly or inappropriately, additional time is spent on revisions of issues which are not pertinent to this stage of the RI/FS process.

The term 'technology plan' is too restrictive and not altogether appropriate as a title for this section given that the plan discusses the three phases of the feasibility study (FS) process listed below:

- Cleanup Objectives and Requirements (Phase I) - Section 7.1
- Technology Identification and Development of Alternatives (Phase II) - Sec. 7.2.1, 7.2.2, 7.2.3)
- Initial Screening (Phase II) - Section 7.4
- Detailed Analysis of Alternatives (Phase III) - Section 7.4

The FS involves institutional, regulatory, technical and community issues and as such the term technology does not reflect these broader issues. It is recommended that the title for Section 7.0 be changed to either "Feasibility Study Plan" or "Remedial Alternatives Plan".

The titles for the sections listed below should be changed as provided below. These changes would better reflect the discussions within these particular sections and provide for consistent title format within the text. Presently, some section titles state the specific phases of the FS, while others do not even though it is the section topic of discussion.

Cleanup Objectives and Requirements (Section 7.1) change to:
Cleanup Objectives and Requirements (Phase I)

Analysis of Alternatives (Section 7.2) change to:
Technology Identification and Development of Alternatives (Phase II)

Analysis of No-Action Alternative (Section 7.2.1) change to:
No-Action Alternative

Analysis of Containment Alternative (Section 7.2.2) change to:
Containment Alternative

Analysis of Remedial Action Alternative (Section 7.2.3) change to:
Treatment Alternatives

Add a new section as follows:
Section 7.2.4 Institutional Controls Alternative

Initial Screening (Phase II) (Section 7.3): no change to existing title

Feasibility Study Phase III (Section 7.4) change to:
Detailed Analysis of Alternatives (Phase II)

67. Section 7.0 p.. 7-1 1st para.
As of the March 1988 guidance (EPA, 1988), the referencing of three phases in the FS process was deleted for institutional concerns. One of the concerns was to maintain an interactive approach to conducting the RI and FS. One particular example of this is the identification of ARARs. Chemical- and location-specific ARARs identification should commence during the RI and be revised as necessary throughout the FS development. Action-specific ARARs should be identified early in the FS process and be revised throughout the FS development. Additional information to complete the ARARs identification process can be obtained during the RI development if necessary. However, for purposes of understanding the FS process, the FS is discussed with regard to these three phases. These phases can be presented as a single report, or as separate reports if the complexity of the site warrants it.

68. Section 7.0 p. 7-1
The first paragraph in this section should be rewritten as provided below to clarify the following issues:

- o ARARs
- o Justification for No Action
- o Differentiation of FS Phase I, II and III processes

This section describes the process by which the FS is conducted to identify and evaluate remedial alternatives. The identification of appropriate remedial responses can be divided into three phases. In Phase I, the RI findings on the nature and extent of contamination are used to perform a baseline risk assessment. This risk assessment is used to evaluate the impacts of a No Action alternative. In the FS, additional ARARs and TBCs from those listed in the RI are defined and further evaluated to determine what additional technology-related ARARs should be addressed with respect to their implementation. If risks are not identified in baseline No Action assessment, then further analyses will not be performed. If potential adverse risks are identified, the FS will proceed. In Phase II, treatment technologies are identified and formulated into conceptual remedial alternative, and screened to eliminate inappropriate, duplicative or undemonstrated remedial alternatives. A detailed evaluation and comparative analysis of the alternatives passing the screening phase is conducted in Phase III. These analyses provide the basis for selection of the remedial alternatives by the decision-makers during the ROD process.

69. Section 7.1 p. 7-1 1st para.
A methodology for screening does not have to be developed as stated in the text, as the EPA already provides this guidance. The first and last sentence in this paragraph should be rewritten to clarify this statement as follows:

"In order to identify appropriate technologies for remedial action, the remedial action goals must be defined."

This section provides a brief overview of the regulatory requirements that will form the basis for developing the remedial action goals, identifying appropriate technologies, and performing screening and detailed analysis of remedial alternatives for the 1100-EM-1 operable unit.

70. Section 7.1 p. 7-1 3rd para.
No mention has been made that alternatives are developed in part by combining technologies or process options; therefore, the first part of the paragraph should include the following sentence:

"Alternatives are developed by use of technologies alone or in combination as necessary to meet the multi-phase media, site characteristics and contaminants encountered at a site."

71. Section 7.1 p. 7-2 1st para.
The first sentence should be deleted and the first paragraph and pertinent bullets rewritten to clarify the Phase I process relevant to identification of ARARs and 'to be considered' (TBCs) criteria as follows:

"Some of the regulatory requirements that need to be considered in the development of remedial alternatives including the following:

- o Identification of ARARs
- o Identification of 'to be considered'(TBC) criteria

- o Definition and development of RA objectives
- o Identification of site-specific locations subject to remedial action in accordance with the ARAR, TBCs or RA objectives."

72. Table 7-1 p. 7-4

This comment applies to the table in general and to the narrative where applicable. The use of the term acceptable daily intake (ADI) is no longer used by EPA. The new term is "reference dose" (RfD). From a technical standpoint, only the name changed and the numbers stayed the same. The term carcinogenic potency factor (CpF) is still used, but the CpF has now been incorporated into a formula using assumed exposure rates to calculate the risk specific dose (RSD) for a carcinogen. This section of the Work Plan should be updated to reflect these current terms.

A very good description of the terms, their usage, and actual tables is presented in the following EPA guidance document: "RCRA Facility Investigation (RFI) Guidance (DRAFT)", Volume 1, Section 8, dated July 1987. (OSWER Directive 9502.00-6C, EPA 530/SW-87-001). A revised copy (interim final) of this document, dated February 1989, is scheduled to be available in three to four weeks.

73. Section 7.1.2 p.7-12

This paragraph discusses the nonpromulgated advisories or guidance documents. Per the March 1988 and October 1988 EPA guidance, these are referred to as "To Be Considered" (TBCs). This term should be used to reflect consistency with the guidance document and with the Action Plan, Section 7.5.

74. Section 7.1.2 p. 7-12 2nd para.

The first sentence in this paragraph should have the word 'alternate' inserted as follows:

"alternate concentration limits (ACL)"

The term 'ACL' is a regulatory term which has relevance, whereas 'concentration limits' alone does not.

75. Section 7.2 p. 7-16

Section 7.2 should be titled "Development of Alternatives". To this point in the text, no mention has been made to how alternatives are to be developed (i.e., by combining technologies or process options).

76. Section 7.2.1 p. 7-16 1st para.

There appears to be a misunderstanding of terminology. No Action, Containment, and Treatment are technologies or technology types, not alternatives. For example, while a tumulus may be a process option under the containment technology, it is not necessarily an alternative. A tumulus would probably require institutional controls to keep access restricted (i.e., fencing and warning signs). The institutional controls in combination with tumulus would become the alternative. To carry this example one step further, assume fixation would be required prior to the construction of the tumulus. In this case, the alternative would be a combination of fixation, the tumulus, and institutional controls.

Using the above reasoning, it is highly unlikely that No Action, Containment and Treatment would be the only alternative groupings. Additional technologies should be identified such as Institutional Controls and Disposal. Disposal should be separated to more efficiently evaluate alternatives and combinations of technologies to be considered.

77. Section 7.2.1.2.1 p. 7-19
The public health and environmental risk assessment requires consideration of three exposure pathways as follows:

- o inhalation
- o dermal
- o ingestion

Models to evaluate the exposure pathways listed above require consideration of the following transport media pathways:

- o soil (surface or subsurface)
- o air
- o water (surface or ground water)
- o biota (primary or secondary in food chain)

The third sentence in this section should be rewritten to clarify between the exposure and transport medias pathways. As written, the term direct contact is not appropriate, therefore rewrite the sentence as follows:

These models are capable of computing health effects resulting from exposure to organic and inorganic (includes radioactive) contaminants via air, biota, soil, ground water, or surface water pathways.

78. Section 7.2.1.2.3 p. 7-20
Same comment as 7.2.1.2.1 on p. 7-19

79. Section 7.2.1.3 p. 7-20
Same comment as 7.2.1.2.1 on p. 7-19

80. Section 7.2.1.5 p. 7-20
The last sentence should be rewritten for clarity as follows:

"The sensitivity analyses will provide an indication of the level of confidence (uncertainty) association with the predictions."

81. Section 7.2.2 p. 7-21 3rd full para.
The phrase "greater confinement disposal facility located within the operable unit" in the first sentence is confusing. Clarify what is meant by this concept as it applies to the 1100-EM-1 operable unit.

82. Section 7.2.2.1 p. 7-21
Off-site disposal should be considered in addition to in-situ containment and on-site containment or disposal. If the decision has been made to not use off-site disposal, provide a rationale/justification for that decision.

Also, consolidation of wastes within the 1100-EM-1 Operable Unit should be considered as well as 1100-EM-1 wastes with other operable units.

83. Section 7.2.2.2 p. 7-23
The emphasis of the alternatives evaluation should be on effectiveness and implementability with costs being secondary in accordance with EPA guidance.

84. Section 7.2.2.2 p. 7-24
It is inappropriate and premature to begin any sort of formal discussion on evaluation of alternatives in the RI/FS Work Plan. It is recommended that reference pertaining to evaluation of alternatives be reserved for the RI document. Accordingly, it is recommended that the remaining portion of the paragraph beginning with the 4th sentence (i.e., However, the time needed...) be deleted.

85. Section 7.2.3.1 p. 7-25 2nd para.
The last sentence implies that biological processes for remediation of hazardous waste involve "generic" conventional activated sludge type procedures. This is not the case. Several kinds of biological treatment are being used and developed. Biological processes for biodegradation of chlorinated versus nonchlorinated chemicals are generally considered to be different. The sentence should be rewritten to acknowledge the different approaches that may be required to address chlorinated versus nonchlorinated chemicals, as follows:

"Biodegradation processes would also apply to aromatic hydrocarbons, and this may require different approaches to address chlorinated versus nonchlorinated chemicals based on the composition of each group in a batch. Biodegradation technologies include conventional activated sludge, in situ soil/aquifer, and above ground processes."

86. Section 7.2.3.2 p. 7-26
The range of options to manage wastes include one or a combination of the following:

Destruction - generates by-products (e.g. ash, gases)
Transformation - generates non-toxic to less-toxic by-products
Reduction - generates consolidated waste extract and reduced volume
Containment - reduces migration and exposure

The second sentence in this paragraph should be rewritten to clarify and fully identify them as waste management categories, as follows:

"This range of options includes destruction, transformation, reduction, and containment."

87. Section 7.2.3.3 p. 7-26 2nd para., continuing to p. 7-27
The third and fourth sentence in the second paragraph should be rewritten to indicate why certain medias are not expected to require remediation. The suggested rewrite is as follows:

"The sites are covered with soil and have been inactive for a number of years. Therefore, air quality is not considered to be currently impacted and as such remediation is not considered to be necessary. Surface water bodies or ephemeral streams are not present in the immediate vicinity of the sites. Therefore, surface water remediation is not relevant."

88. Section 7.2.3.5 p. 7-28 3rd para.
Again, it is premature to define in a work plan contaminant streams, identify treatment technologies and to begin linking technologies into combinations.

89. Tables No. 7-4 through 7-15 p. 7-29, 7-40
The information provided in these tables is not site-specific and is readily available in a number of Hazardous Waste Remedial Technology reference documents. For example, although the contaminants are individually listed, the state of hazardous waste treatment is such that remedial technologies as discussed with regard to their application to a treatability class of chemical compounds. Such information is readily available in standard reference documents including:

- o EPA 1983 Handbook for Evaluating Remedial Action Technology Plans. Table 4-1: Treatment Process Applicability Matrix (p. 217)

Existing reference materials regarding remedial technologies provide more specialized matrixes for mobile technologies and innovative technologies including the following:

- o EPA 1986. Mobile Treatment Technologies for Superfund Wastes, Table 1-3 Suitability Screen of Potential Mobile Technologies (p. 1-13)

- o EPA The Superfund Innovative Technology Evaluation (SITE) Program Table 1.

At the RI/FS Work Plan level, the purpose is not to begin the technology screening process, but rather to provide overall guidance. This could have been accomplished by identifying a list of potentially suitable technologies and reference documents to begin the screening process.

90. Section 7.3.1.1 p. 7-42 2nd para.
EPA guidance states that the criteria for the evaluation of effectiveness of each alternative is on the ability to reduce toxicity, mobility, and volume. These concepts must be clearly presented. The narrative tends to minimize the emphasis on volume reduction, in favor of mobility and toxicity reduction. The three concepts must be balanced.

91. Section 7.3.12 p. 7-43 1st para.
An activity such as an operation of an air stripping tower or incineration unit which normally requires a permit, does not need to have one if it operates within the boundaries of a designated NPL site. However, per CERCLA/SARA requirement, while a permit is not required, the activity must meet the substantive requirements of a permitted unit (e.g., emission rates).

92. Section 7.0 p. 7-43 1st para.
Land Disposal Regulations (LDRs) must be considered in accordance with 40 CFR Parts 264, 265, 266, 268, and 271. EPA guidance on LDRs is pending. Include discussion on how the LDRs will be complied with in regard to storage or disposal of wastes from the 1100-EM-1 operable unit.

93. Section 7.3.1.3 p. 7-44 1st para.
Cost should not be the basis for eliminating a remedial technology. It is suggested that the following clarification on this issue be presented as a last paragraph in this section:

"Costs may be used to screen a remedial technology if the technologies are among one of a range of remediation categories such as:

- o Destruction
- o Transformation
- o Reduction
- o Containment

However, cost may not be used to eliminate technologies from different remediation categories."

94. Section 7.3.2.1 p. 7-44 1st para.
The current EPA RI/FS guidance refers to 'treatability investigations', rather than 'treatability studies. The objective of treatability investigations for the RI/FS should not be to support detailed design, but rather conceptual design sufficiently to estimate costs, effectiveness and implementability. The detailed design data is for the remedial design/remedial action (RD/RA) phase. The data upon which cost is estimated should provide an accuracy of +50% to -30%.

8.0 DATA MANAGEMENT PLAN

95. General Comment

A. A list of data bases with abbreviations and a summary of their purpose should be provided at the end of this section.

B. Project data management should standardize chemical nomenclature in accordance with the following:

- o Use standardized IUPAC nomenclature used by the American Chemical Society
- o List chemicals by their Chemical Abstracts Service (CAS) number

This recommendation is made to preclude errors pertaining to the following:

- o faulty health and safety recommendations (see comments from Table 6.3)

- o faulty regulatory data interpretation (see comments in Appendix B Sec. 4.0)
- o Duplicative or missing database storage

9.0 COMMUNITY RELATIONS

The Community Relations section indicates the subject document is scheduled for release, and as such no further comment on this subject is provided.

10.0 REFERENCES

96. General Comment
The references cited in the Work Plan generally include current and applicable documents relative to the protocol for remedial action at Federal Superfund facilities. These references are generally adequate for this Work Plan.

Additional references have been cited as part of the comments provided. These references should be added to the list of references.

APPENDIX A

97. Section 3.0 p. A-7 2nd para., last sentence
"... available data suggest that ..." -- need to clarify what data. Preceding sentence said that no direct measure of hydrogeologic properties exist at the 1100 Area. Is the "available data" from the 300 Area? Is extrapolating hydrogeologic properties of the 1100 Area from the 300 Area valid? The 300 Area lies directly along the Columbia River, and is almost 2 miles away from the 1100 Area.

98. Section 3.0 p. A-9, bullets
Second bullet needs clarification. What about the river stage? Variations in the river stage?

99. Section 3.0 p. A-9, bullets
Third bullet needs clarification. What sources does "irrigation" cover (private, commercial, natural). What scale of irrigation is being considered?

> NOTE: Figure 4-4 (page 4-11) details two methods of recharge: from the Yakima River and from irrigation. Does "recharge from irrigation" include the artificial recharge from the Columbia River? If not, another box might need to be added to account for this.

100. Section 5.1 p. A-12 4th para.
This paragraph should be moved to and incorporated into Section 5.0. This paragraph is more an introduction and does not directly relate to Section 5.1, which concerns "near-surface winds."

APPENDIX B

101. Section 1.0 p. B-2
This section should have a hydrogeological discussion in which a presentation of known well fields, relative location, and potable or other uses are described.

102. Section 2.0 p. B-2 1st para.
When was the Public Health lab sample from the North Richland and Duke well field analyzed? The Natural Primary Drinking Water Regulations (40 CFR Parts 141 and 142) have new annual monitoring requirements for 60 compounds. These monitoring requirements should be considered and data generated from this effort should be used in the RI/FS process.

103. Section 3.0 p. B-1
The 'P' on preliminary is missing from this title.

104. Table B-2 p. B-8
The term VOA refers to volatile organic analysis. The term VOC refers to volatile organic compounds. The VOC abbreviation should be used in the table since it is the more standardized and appropriate abbreviation given that contaminants and not analyses are being reported in the table.

105. Section 4.0 p. B-9 3rd para.
The first sentence should be rewritten to be consistent with the classes of compounds being discussed. The suggested rewrite is as follows:

"Samples were analyzed for volatile organic compounds (VOC), semi-volatile (ABN) organic compounds, and/or herbicide and pesticides."

106. Section 4.0 p. B-9 3rd para.
This section indicates that a series of wells in the 1100 area were selectively analyzed for volatiles, semi-volatiles, and/or herbicides and pesticides. The VOA & ABN analyses constitute a significant percentage of the hazardous substance list (HSL) constituents analyzed for at a site with potentially a large spectrum of contaminants. Some constituents detected as part of a VOA or ABN analysis are petrochemical components as stated in the text. However, it is not correct to state that petrochemicals, along with pesticides and herbicides were <u>not</u> detected. It is too broad of a statement given the following:

- The text does not state which constituents from the VOA/ABN list were analyzed.
- Only sample No. 4902 was analyzed for ABN

- o All the VOA samples were below detection limit
- o The total organic halogen analysis results do indicate the presence of possibly some chlorinated or brominated compounds.

When discussing contaminant results, it would be useful to list at minimum the appropriate ARAR (e.g., federal drinking water standard). It would be useful to reference background concentrations for metal constituents detected in soil.

107. Section 4.0 p. B-10 5th para.
Perchloroethene is a listed EPA and Washington Dept. of Ecology hazardous constituent, contrary to what is stated in the text. The standardized term for perchloroethene according to the American Chemical Society (ACS) is tetrachloroethylene, the former is the more common industrial synonym. In any case, it is a commonly investigated chemical compound. It is part of the EPA Hazardous Substance List of constituents analyzed under the Contract Laboratory Program. Although there is no MCL for perchloroethene, it is commonly monitored by federal and state agencies. This chemical probably would not have been overlooked as one of concern had it been referenced with its CAS No. and listed under its more common usage. (See the general comments provided in Section 8 Data Management Plan.)

108. References
The two references listed below are missing from Appendix B. The two Work Plan copies reviewed had only 11 pages (i.e. B-1 to B-11). Should there have been another page?

- o Newcomb et al 2972 (p. B-6)
- o Price et al 1985 (p. B-9)

APPENDIX C

109. General Comment
The absence of the procedures referenced as Environmental Investigation Instructions is a significant deficiency in the Work Plan. It is understood that these documents are in the final stages of clearance by DOE. Until these documents are included in the Work Plan, EPA approval of the Work Plan can not be given. Please transmit these documents to EPA and Ecology immediately upon obtaining clearance. The failure to include these documents in the original Work Plan may result in a delay in the anticipated Work Plan approval date of July 31, 1989.

APPENDIX D

110. General Comment
All analytical labs and procedures used must be consistent with those required by the EPA Contract Laboratory Program. This should be stated in the text. If this is not the case, then an explanation of what deviations exist should be discussed.

111. p. D-8 mid-page
Correct the spelling of "cyanide"

APPENDIX E

No Comments

APPENDIX F

112. Introduction p. F-2 1st para.
The first sentence should be revised to reflect that Appendix F discusses technologies and 'process options' not just technologies (e.g., activated carbon absorption vs. encapsulation).

113. Introduction p. F-2 2nd para.

The first sentence should be replaced to clarify the type of technologies discussed. A suggested revision is as follows:

"A discussion of conventional landfill storage, earth-moving, and new or innovative technologies was not included."

These technologies should be discussed in the FS. However, the emphasis here is on treatment technologies and process options. A list of new or innovative treatment technologies to be considered can be identified from EPA's Superfund Innovative Technology Evaluation (SITE) Program. The new or innovative technologies may have a greater impact on budgeting and scheduling than the more proven technologies.

114. Section 1.1 p. F-2 (3rd sentence)
The narrative states that "GAC can then be regenerated or incinerated." There are several forms of regeneration, including: thermal heat desorption with destruction of adsorbed organics (incineration), thermal steam desorption with destruction of adsorbed organics, solvent extraction of adsorbed organics, and biological degradation. Thermal destruction is the most common method. For clarification, a rewrite of the sentence is recommended as follows:

"GAC units can then be regenerated most often by thermal desorption of adsorbed organics or destroyed by incineration of carbon with adsorbed organics".

115. Section 2.3 p. F-5
The oxidation of trivalent chromium to the more toxic hexavalent chromium should be included as a potential "other effect".

116. Section 3.1 p. F-7
Clarification is needed regarding pH level. It is mentioned that a probe is used to monitor pH level during oxidation/reduction. Another sentence might be added stating that neutralization may be required to adjust the pH to acceptable discharge levels.

117. Section 3.2 p. F-7
What does the parameter "reactor configuration" imply? Does this refer to the choice of either batch or continuous flow systems? Other parameters which might be included here include tank size and wastewater flow rate.

118. p. F-9
Add new Section 4.3, "Other Effects". A suggested inclusion is as follows:

> "Liquid effluent: the liquid effluent from sludge dewatering may contain hazardous materials that require treatment before disposal.
>
> Filter: the variety of solids may cause clogging in the filter."
>
> or state: "No other effects were noted."

119. Section 4.3 p. F-9
Variables "R" and "m" need to be defined, even if they are constants.

120. Section 4.4 p. F-10
Are the buildup rates accurate? Compare the medium buildup rate with the slow buildup rate.

121. Section 5.0 p. F-10
The relevance of mentioning the availability of pilot-scale data for bis (2-ethylhexyl) phthalate should be given. (See comment for Appendix F, Section 6.0.)

122. Section 5.0 p. F-10
The heavy metals may have an adverse impact on the trickling filters.

123. Section 5.2 p. F11
Add sludge generation rate (gal/Mgal) as variables. This parameter is needed to properly design post-treatment facility.

124. Section 5.3 p. F-11
Add new Section 5.3, "Other Effects". A suggested inclusion is as follows:

> "Operating conditions: Trickling filters are considered fairly reliable as long as variations in operating conditions (such as flow rate and composition) are minimized and temperature remains above 13 degrees C.
>
> Odors and flies may be a problem.
>
> Hydraulic flow rates: inadequate hydraulic flow rates may prevent normal sloughing of the biological slime, leading to clogging and surface ponding."
>
> or state: "No other effects were noted."

125. Section 5.3 p. F-11
All variables need to be defined.

126. Section 6.0 p. F-12
The word contactor as in "rotating biological contactor", is misspelled as "contractor."

127. Section 6.0 p. F-12
The relevance of mentioning availability of pilot-scale data for bis(2-ethylhexyl) phthalate should be given, such as whether or not potential success is offered by these types of systems for single- or mixed-chemicals.

128. Section 6.2 p. F-12
Add sludge generation rate (gal/Mgal) as a variable. This parameter is needed to properly design a post-treatment facility.

129. p. F-12
Add new Section 6.3, "Other Effects". It might include:

> "Temperature: removal efficiencies decline with temperatures below 20 degrees C.
>
> pH level: reactor bioorganisms are sensitive to pH and some toxic metals and organisms which may be present in the wastewater."
>
> or state: "No other effects were noted."

130. Section 6.3 p. F-12
All parameters need to be defined.

131. Section 7.0 p. F-13
State the advantages/disadvantages of air vs. steam process (i.e., steam enhances the process, steam is more energy-intensive, etc.).

132. Section 7.2 p. F-13
Add the following parameters for air stripping:

air flow (m^3/L)
operating temperature (degrees C)

133. Section 8.4 p. F-16
First equation is typeset incorrectly. It should read as:

$$k = koe^{(-E/RT)}$$

134. Section 8.5 p. F-17
Delete last sentence. This is an irrelevant statement to describe the technology since it only promotes PNL.

135. Section 10.0 p. F-19
Add the following sentence:

"Organic contaminants are generally volatilized or thermally destroyed as part of the process."

136. Section 10.2
Add the following parameters:

Soil composition (sand, silt, clay)
Moisture content of soil (%)

Vitrification is more successful in soils with a high concentration of quartz sand soils, but its effectiveness diminishes with increasing concentrations of water in soil.

137. Section 12.5 p. F-25 (last sentence)
Delete sentence. This is an irrelevant statement to describe the technology since it only promotes PNL.

138. p. F-26
Add new Section 13.3, "Other Effects". This might include:

"Incomplete combustion: incomplete combustion may result in the release of toxic products to the atmosphere."

or state: "No other effects were noted."

139. p. F-28
Add new Section 14.3, "Other Effects". This might include:

"Biological sensitivity to pH level, toxic metals, and organisms which may be present in the wastewater

Effects of temperatures, specifically low temperatures"

or state: "No other effects were noted."

140. Section 14.4 p. F-28
Variables need to be defined.

141. Section 14.4 p. F-28
Are these two steps the complete process? It appears that page F-28, which contains the rest of Section 14.4 and all of Section 14.5 is missing.

APPENDIX G

142. General Comment:
The inclusion of this appendix is somewhat redundant given the discussion and proposed revisions for Section 7.0 Technology Plan.

143. Section 2.4 p. 6-5
State that costs represent an accuracy of -30/+50 percent of anticipated actual construction costs, in accordance with EPA guidance.

COMMENTS REGARDING GEOLOGY AND HYDROGEOLOGY

The following comments pertain only to geological and hydrogeological issues that were noted during review of the 1100-EM-1 Work Plan. In some cases, there may be some overlap with the comments previously listed. In such cases, if a full response has been provided for an earlier comment, that response can simply be referenced.

The remainder of the comments have been organized into three parts. **Part 1** contains comments that concern the technical approach of the proposed investigation; **Part 2** contains comments that are site specific such as the placement of individual wells or collection and analysis of individual samples or constituents; and **Part 3** contains miscellaneous comments such as omissions, typographical errors, or inconsistencies within the document.

Part 1

144. Deficiency: The conceptual model acknowledges the north Richland well field as the most significant potential receptor of contaminants from the 1100 area. However, the Work Plan contains little information on the well field and its construction. This makes it difficult to evaluate the potential groundwater flow paths to the well field and the adequacy of the 1100 area monitoring network to sample these flow paths.

Recommendation: Include a description of the north Richland well field in an appendix. This description should include information on the number of wells, the depth to which they are installed, the screened interval, well logs similar to Fig. 4-11, the long-term average pumping rates and recharge amounts by month, and a summary of available water level measurements. Local groundwater level contour maps would also be desirable if available. Paleochannels within the Pasco gravel section have also been noted to exist in the Richland area, and an examination of topographic maps indicates that the north Richland well field may be located in a north-south trending paleochannel. The existence of such a channel may have significant influence on determining groundwater flow paths to the well field and defining the well field catchment area. Information on the existence of paleochannels in the vicinity of the 1100 area and the north Richland well field would be desireable to include in the description of the well field.

145. Deficiency: The definition of the water table aquifer and the identification of the confining layer is critical to understanding ground water and contaminant flow paths and designing the ground water monitoring network. The conceptual model (p. 4-14) indicates that the lower blue clay member of the Ringold Formation (depth of 175', Fig. 4-11) constitutes an aquitard and defines the lower boundary of the overlying unconfined aquifer. However the design of the monitoring network assumes that the "brownclay" (depth of 85', Fig. 4-7) "probably acts as an aquiclude, defining the lower boundary of the unconfined aquifer," (p.4-43). This apparent inconsistency should be resolved.

Recommendation: The existence of the brown clay and its role as a confining layer should be addressed in the conceptual model. Additional information should be included to support the statement that "the silt/clay layer in the Ringold Formation appears to be laterally extensive", (p.4-43). This information should include the logs from wells shown in Fig 4-13, including wells 1 through 5, the 3000 Area wells, and the north Richland well field and information on the thickness, mineralogy, hydraulic properties, depositional environment, and other unique characteristics of the "brown clay" layer. If information from the well logs appears to be inconclusive, surface geophysical surveys using soil resistivity sounding techniques should be conducted along transects between the 1100 area and the north Richland well field. These transects will indicate the depth and thickness of the "brown clay" layer and whether it has been breached in the intervening area. If the "brown clay" layer is not found to be laterally extensive or is found to be breached at some location, the conceptual model must be changed, and the bore holes used in installing all 1100 area monitoring wells should be drilled through the "brown clay" to define its lateral extent in the immediate vicinity of the individual waste sites. Also, please note that S.H. Hall in "Ground water monitoring compliance projects for Hanford site facilities annual progress report for 1987" (p. 9, Fig. 5) shows the "brown clay" to be a discontinuous silt lense at the 300 area.

146. Deficiency: The measurement and analysis of groundwater level data are critical to determining the direction of groundwater flow and the location of potential contaminant plumes. Complete and accurate groundwater level data are particularly important at the 1100 area because of the natural variations of groundwater levels resulting from change in stage of the Columbia and Yakima rivers and artificial perturbations from near by recharge and pumping centers. However, little or no discussion of water level measurement and analysis is included in the sampling and analysis plan (Section 4.0) until a very brief mention on p. 4-60.

Recommendation: The potential effects of the Columbia River on groundwater levels and groundwater flow direction (Newcomb, 1972, p. 27) should be acknowledged in the conceptual model (p. 4-14, paragraph 2), and the frequency of water level measurements from the 1100 area monitoring wells should be described in detail in Section 4.4.1.2 and included in Table 4-5. Additional measurements of water levels in wells surrounding the 1100 area should be made to fully assess the influence of the north Richland well field on groundwater levels and flow direction at the 1100 area. As a minimum, water levels in all 1100 area monitoring wells and a geographically diverse selection of surrounding wells (such as those shown on Fig. 4-13) should be measured quarterly; the stage of the Columbia River and water levels from a subset of 10-12 wells should be measured monthly; two monitoring wells in the vicinity of the well field (such as wells 1 and 2, Fig. 4-13) and one away from this pumpage should be equipped with continuous water level recorders. From this data, quarterly groundwater level contour maps should be drawn and the spatial and temporal variability of groundwater levels should be evaluated for the intervening period, as necessary.

147. Deficiency: Additional recharge and pumping centers are listed on pages 4-14 and 4-15 (Lamb-Weston Processing Plant, PNL irrigation wells, etc.) but are not located on a figure.

Recommendation: Plot the locations of the recharge and pumping centers on Fig. 2-1 or equivalent, and provide data on seasonal or monthly pumping rates so that their potential influence on groundwater flow in the 1100 area may be evaluated.

148. Deficiency: The presumtive indicator parameters listed on p. 4-31 are useful indicators of contaminant plumes resulting from municipal solid waste landfills. Municipal landfills tend to have wastes with a high concentration of organic carbon that contribute to an anaerobic and highly reducing environment within the landfill. The leachate resulting from these municipal landfills tends to be consistent in having high concentrations of the constituents listed in Table 4-6. The wastes spilled or disposed of at the 1100 area are likely to be very different than those disposed of at a municipal solid waste landfill. The resulting contaminant plume is likely to be very waste specific and may not contain appreciable concentrations of the indicator parameters listed in Table 4-6. The presumptive indicator parameters therefore may not be very useful in identifying site specific contaminant plumes at the 1100 area.

Recommendation: Very little weight should be put on the results of sampling for the presumptive indicator parameters listed on Table 4-6. Rather, more waste specific constituents should be used such as TOX where halogenated solvents are suspected, and sulfate where battery acid is suspected, as described on page 4-31.

149. Deficiency: On page 4-8 the 1100-EM-2 and 1100-EM-3 units, the Advanced Nuclear Fuels plant, the Lamb-Weston processing plant, and the Richland landfill are all noted as potential sources of contamination in the vicinity of the 1100-EM-1 unit and that "this must be accounted for in conducting the investigation". However, the approach for accounting for these sites is not discussed in the work plan and the location of the Lamb-Weston processing plant and the Richland landfill are not shown.

Recommendation: Locate these potential waste sites on a map and develop an inventory of wastes that were (or are) stored or disposed of at these sites including (1) the type of waste, (2) the amount of waste, (3) dates of storage or disposal, and (4) the results of soil or water sampling done in the vicinity of these waste sites. Incorporate this information into the RI.

150. Deficiency: Soil gas analyses will be used for source and plume identification of volatile organic and volatile halogenated compounds. As described in Table 4-8 (p. 4-34), soil gas will be analyzed only for the potential source compounds. However, the source compounds may be broken down or oxidized in the subsurface to yield methane or carbon dioxide gases, the concentrations of which have been shown to be elevated in soils above groundwater contaminated with organic compounds. (Kerfoot and others, Groundwater Monitoring Review, Spring 1988, p. 67-71).

Recommendation: Analyze soil gas samples for methane and carbon dioxide, in addition to potential source compounds, as indicators of contamination. Also, take soil gas samples from nearby areas upgradient from the expected direction of groundwater flow to characterize background levels of methane and carbon dioxide.

151. Deficiency: Section 5.0 serves as a good general discussion of quality assurance procedures; however it is not specific enough to be an acceptable quality assurance plan. The plan discusses broad issues of precision and accuracy but neglects individual procedures such as well construction, aquifer testing, field sampling, calibration and maintenance of equipment, etc. Much of this information is likely to be available in the Environmental Investigations Instructions to be included in Appendix C and in "appropriate Westinghouse Hanford quality assurance manuals" alluded to in Section 5.8 (p.5-13). However, this information is not clearly and specifically referenced in Section 5.0.

Recommendation: A separate, detailed quality assurance plan should be developed for all RI/FS work to be done at Hanford. This document should include the general concepts of quality assurance described in Section 5.0, the appropriate existing Westinghouse Hanford quality assurance manuals, and new quality assurance manuals for unique procedures to be carried out specifically under CERCLA investigations. The quality assurance plan for

individual RI/FS work plans should be relatively brief in describing the quality assurance protocols for individual procedures to be used in conducting the investigation and should reference the comprehensive quality assurance plan for more detailed information. This would be analogous to the development of the methods section contained in Appendix C and referenced throughout the work plan.

152. Deficiency: The overall schedule for installation of groundwater monitoring wells during RI Phase I in this operable unit is unsatisfactory. A total of 17 wells have been proposed, at depths ranging from approximately 30 feet to 85 feet. Radiological hazards have not been identified as a concern at this operable unit, so more options should be available for utilizing faster drilling methods than cable tool.

Recommendation: On the average, there is no reason why a well can not be installed within a full two day period. Therefore, installation of at least two wells per week is a very reasonable and achievable rate. At this rate, all wells are installed within a period of eight to ten weeks, as compared to the nine month schedule proposed in the Work Plan. Options to speed the installation of wells include:

- Use of different drilling methods (other than cable tool). If detailed description of lithology is facilitated by the cable tool method, then the cable tool could be used to drill certain wells (e.g., MW-1, MW-2, MW-3, MW-5, MW-6, MW-7, MW-10 [deep well], MW-11, MW-12, and MW-15 [deep well]). Air rotary, as an example, could then be used for the remaining wells (plus two additional piezometers or wells that are recommended below, in Part 2), correlating the logs with the cable tool logs for consistency. Hollow stem auger has been proposed for use in vadose drilling. It may also prove to be an efficient method of drilling at this operable unit.

- Use of multiple drilling rigs. The schedule in the Work Plan must plan for only one drilling rig at the operable unit. Since there is no suspected radiation contamination at 1100-EM-1, availability of commercial drilling rigs should not be a problem as it might be in the 200 areas.

It is also recommended that careful thought be given to planning the sequence of drilling. The placement of the initial wells in a three-point configuration at the 1100-2 / 1100-3 units and at the Horn Rapids Landfill should provide valuable groundwater elevation data as a basis for optimal placement of the remaining wells.

Part 2

153. p. 4-29, paragraph 2
Geologic samples should be taken at lithologic changes as well as at 5 foot intervals. Sampling at lithologic changes is noted elsewhere in the work plan and should be stated here as well.

154. p. 4-45, Figure 4-8
One more soil-gas sampling point due east of the battery acid pit is needed. This is in the approximate expected direction of groundwater flow. The soil-gas sampling points to the northeast and southeast of the battery acid pit are relatively close to the pit and a contaminant plume emanating from the pit may not spread laterally far enough to be intercepted by these soil-gas sampling points.

155. p. 4-48 and Figure 4-8
The monitoring wells MW-2 and MW-3 are to be "located consistent with the regional gradient and between the battery acid pit (source) and the north Richland well field (receptor)". The north Richland well field is located east north east of the battery acid pit and the antifreeze tank site. However, MW-2 and MW-3 are shown in Figure 4-9 to be located east south east of the waste site. The monitoring well locations should be changed to be in alignment with the expected direction of groundwater flow.

156. p. 4-42 and 4-43
Very little sampling is proposed for the Anti-freeze Tank site (1100-4). This minimal effort may be justified because it is assumed that little or no anti-freeze leaked from the tank based on the analyses of the soil samples taken at the time the tank was removed. However, the results of these analyses are not included in the Work Plan, so the validity of the assumption of no leakage cannot be evaluated. Information on the number and location of samples taken at the 1100-4 area and the results of the analyses should be listed in Appendix B.

157. p. 4-42, Table 4-10
Add analysis for total organic carbon as a parameter for all soil samples. This data will provide important information for determining the potential transport of organic wastes through the soil column and also may be helpful in explaining anomalies observed in soil gas sampling.

158. p. 4-53, last paragraph
Recommend including water level measurements from one of the S36-E wells (Figure 4-13) located northeast of 1100-2 and 1100-3 sites if the well is completed in the upper aquifer.

159. p. 4-53, last paragraph and Figure 4-10
The proposed monitoring well configuration on Figure 4-10 is too linear to describe the flow direction of the unconfined aquifer. At least two additional piezometers or monitoring wells at sites 1100-2 and 1100-3 are needed to give a better two dimensional definition of the piezometric surface.

One piezometer should be located approximately 600 feet south of MW-7 and approximately 600 feet west of MW-6 (upgradient of 1100-3).

Another monitoring well or piezometer should be located approximately 800 feet due east of the proposed DP6 vadose bore hole (generally down gradient of 1100-3). If completed as a monitoring well, this well could serve as a potential downgradient well for 1100-3 and the rail road storage yard/tank farm area. It would also serve as an upgradient well for 1100-2.

160. p. 4-56, paragraph 2
The use of the fine grid spacing in the vicinity of the marked burial site (particularly if this is the area where drums of carbon tetrachloride may have been disposed) as shown in Figure 4-12 for the soil gas sampling survey.

161. p. 4-57, paragraph 2
At least one additional surface soil sample should be taken from within the burning cage area.

162. p. 4-57, 2nd full paragraph and Figure 4-12
The proposed well configuration at the Horn Rapids Landfill, shown on Figure 4-2 can be modified to obtain better information, without adding more wells at this time. It is recommended that MW-11 be relocated to the east of the landfill, shifting MW-12, MW-13, MW-14, and MW-15, as necessary to ensure that optimum downgradient locations are maintained. This will result in the advantage of more tightly spaced downgradient wells, while maintaining adequate upgradient monitoring.

Part 3

163. Abbreviation List - p. iii
Add IRA (interim remedial action) from p. 3-2 and HEHF (Hanford Environmental Health Foundation) from p. B-2.

164. Figures 1-1 and 1-2
Provide a scale for these figures.

165. p. 2-2
First paragraph is repetitious of preceding paragraph on p. 2-1.

166. Figure 2-1
Provide an explanation of symbols.

167. p. 4-1, paragraph 4
Change "six probable waste disposal sites" to "seven probable spill or waste disposal sites" - seven sites are listed in Table 2-1.

168. p. 4-1 and p. 4-8
City of Richland Landfill, Battelle Farms irrigation well, Lamb-Weston processing plant, etc., are mentioned in the text, but their locations are not shown on a figure.

169. p. 4-2 and p. 4-42
Battery Acid Pit dates of operation are listed as 1957 to 1977, but also as 1954 to 1977 in Table 2-1. The dates should be consistent.

170. p. 4-5
The location of the radiation contamination site is not shown on Fig. 2-1 or Fig. 4-1. If exact site location is unknown, state this on p. 4-5.

171. p. 4-5
State the dates of operation of Horn Rapids Landfill.

172. Figure 4-2 and Figure 4-3
Provide units on the scale for Fig. 4-2. Provide the scale for Fig. 4-3.

173. p. 4-7
Reference Figure 1-2 in discussion of 1100-EM-2 and 1100-EM-3 operable units.

174. p. 4-8 and p. B-2
State when (month and year) samples were taken by State of Washington from Richland Well Field.

175. p. 4-9
The results of November 1988 sampling of five new monitoring wells are not in Appendix B as stated in the text. Please include this data.

176. Figures 4-5 and 4-6
The location of geologic cross sections should be shown on Fig. 2-1 or Fig. 4-13 or equivalent.

177. Figure 4-5
Identify water table symbol and dotted line (facies change?) on the explanation.

178. Figure 4-6
Note "Looking North" below figure as done on Fig. 4-5.

179. Table 4-5
Seventy one soil samples are listed to be taken from the battery acid pit. This is an inordinate number of samples, considering only two borings will be made at this site (Fig. 4-8). Twenty soil samples are listed for the anti-freeze tank. Were these taken and analyzed at the time of tank removal? If so, the results should be listed in Appendix B. If not, sample collection should be described on p. 4-48. Only one water sample is listed for each monitoring well. As water samples are to be taken quarterly, these numbers should be increased.

180. p. 4-31, paragraph 4
Sulfate is already included as an indicator parameter in Table 4-6.

181. Table 4-9, p. 4-40, footnotes b, c, and d
Some explanation of the significance and difference between medium soil/sediment CRQL's and low soil/sediment CRQL's would be helpful.

182. Figure 4-13 -

a) Several wells listed in the tables of Appendix B are not shown in Figure 4-13 including 3000 G, 6 ORV4898, S 31-1, 1100-8, S29-E12, 536-13B, etc.

b) The explanation notes "wells proposed under site-wide monitoring program." According to the text, wells 1 through 5 have already been drilled.

c) Monitoring well 16 at the Horn Rapids Landfill is shown as a cluster well on Figure 4-B, but as a single well in Figure 4-12. Monitoring wells 13, 14, and 15 should be noted as cluster wells. Monitoring wells 4 and 5 should also be noted as cluster wells.

d) Include "Discolored Soil Site" on Figure 4-13 as was done on Figure 2-1. Include "Radioactive Spill Site" (1100-5) as well, if location is known.

e) Note athletic well complex as 6-ATHC-4899 as it is listed in appendix.

e) Page "4-62" (Figure 4-13) is not noted.

183. Figure A-4 - Explanation
"Forset" is misspelled as "Forest."

184. Appendix B
Newcomb, 1972 and Prill, 1985, are referenced in the text, but not included in the list of references.

185. Table 7-1
Page 7-4 is noted as "sheet 4 of 5" in the title to Table 7-1 while, in fact, it is sheet 1 of 5.

186. Tables B-1 and B-2 -

a) Nitrate (NO_3) is usually reported in units of mg/l as N. If this is the case for Tables B-1 and B-2, the units "mg/l as N" should be noted as a footnote.

b) Table B-1 uses the words "nitrate", "sulfate", "fluoride", "chloride", and "phosphate" while Table B-2 used the chemical formula or elemental notations "NO_3, SO_4, F, Cl, and PO_4" for the same respective constituents. The notation should be consistent.

187. General Comment
Are the sampling points proposed in the Work Plan going to retain their current designations over time? For example, monitoring wells are designated MW-1, MW-2, etc.. Is this consistent with the designations for all monitoring wells to be installed under the CERCLA/RCRA program at Hanford? How will such designations fit into the Environmental Data Management System? This comment applies to other designations (vadose borings, surface samples, etc.) as well as groundwater monitoring wells.