

DISTRIBUTION

**Unit Managers' Meeting: Remedial Action Unit/Source Operable Units
100, 200, and 300 Areas**

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Dennis Faulk.....	100 Aggregate Area Manager, EPA (B5-01)
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F. M. Corpuz.....	BHI (X9-06)
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G. E. Van Sickle.....	BHI (T2-05)
R. A. Carlson.....	BHI (L6-06)
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A. P. Goforth.....	BHI DCC (H0-09)
T. M. Wintczak.....	BHI (H0-02)

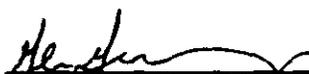
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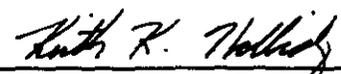
MEETING MINUTES TRANSMITTAL/APPROVAL

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Unit Managers' Meeting: Remedial Action and Waste Disposal Unit/Source Operable Unit
3350 George Washington Way, Richland, Washington

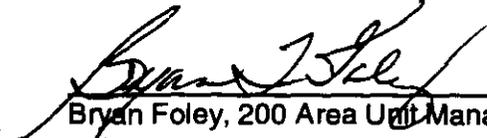
March 19, 1998

FROM/APPROVAL:  Date 4/23/98
Glenn Goldberg, 100 Area Unit Manager, RL (H0-12)

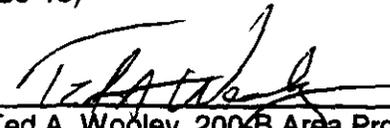
APPROVAL:  Date 4/23/98
Wayne Soper/Keith Holliday, 400 Aggregate Area Unit Manager, Ecology (B5-18)

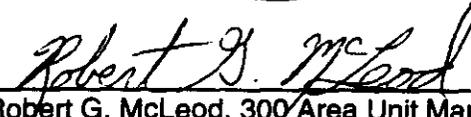
APPROVAL:  Date 4-23-98
Dennis Faulk, 100 Aggregate Area Unit Manager, EPA (B5-01)

APPROVAL:  Date 5-4-98
David Olson, 100-N Area Unit Manager, RL (H0-12)

APPROVAL:  Date 4/16/98
Bryan Foley, 200 Area Unit Manager, RL (H0-12)

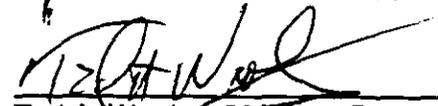
APPROVAL: N/A (did not attend) Date _____
Joan Bartz/Shri Mohan, 200 Aggregate Area Unit Managers, Ecology (B5-18)

APPROVAL:  Date 4/16/98
Ted A. Wooley, 200-B Area Project Manager

APPROVAL:  Date 4-16-98
Robert G. McLeod, 300 Area Unit Manager, RL (H0-12)

APPROVAL: N/A (did not attend) Date _____
Jeanne Wallace, 300 Area Aggregated Area Unit Manager
WA Dept of Ecology (B5-18)

APPROVAL:  Date 16 Apr 98
David R. Einan, 300 Area Aggregated Unit Manager, EPA (B5-01)

APPROVAL:  Date 4/16/98
Ted A. Wooley, 300 Area Process Trenches Subproject Manager

Meeting minutes are attached. Minutes are comprised of the following:

Attachment #1 -	Agenda
Attachment #2a, 2b, and 2c	Attendance Records
Attachment #3-	Meeting Minutes
Attachment #4	Status Package
Attachment #5-	116-C5 Lateral Plumes
Attachment #6	Meeting Minutes – 116-C5 and 116-C1/EPA 3/24/98 Site Visit to 100-BC
Attachment #7	Meeting Minutes – 100 Area Remedial Action – Site Closeout Process and Details
Attachment #8	Meeting Minutes – 116-C-1 Sample Results Meeting Minutes
Attachment #9	Meeting Minutes – 100-D Remedial Action/100 Area Remedial Action
Attachment #10	Replacement Table III-3 for 100 Area RDR/SAP Update
Attachment #11	Revision of Appendix E for 100 Area RDR/SAP Update
Attachment #12	216-B-2-2 Ditch Borehole Geophysical Loggin Data for Man-Made Gamma-Emitting Radionuclides

Prepared by:

Michelle Peterson Date 5/4/98
Michelle Peterson (H0-10)/Tamen Rodriguez (H0-17)

Concurrence by:

Vern Dronen Date 5/4/98
Vern Dronen, BHI Remedial Action and Waste Disposal Project Manager
(H0-17)

UNIT MANAGERS' MEETING AGENDA
3350 George Washington Way, Room 1B45
March 19, 1998

1:00 p.m. – 300 Area

300-FF-1:

Remedial Action Status

- Process Trenches
 - Headworks sediment contained-in
 - Verification Package
 - Closure by Removal Package
 - Inspection, Monitoring, and Maintenance Plan
 - Regrading Plan

Process Trenches Permit Modification Status

- Class 3 to 1 Package

Landfill 1D

- Lead-contaminated soil treatment variance
- Anomalies processing

Burial Ground 618-4

- Excavation update
- Anomalies summary

300-FF-2:

- 300 Area revitalization
- FFS scope

2:30 p.m. – 200 Area

- Status of 216-B-2-2 Ditch Borehole Characterization
- Status of 200 Area Implementation Plan

3:00 p.m. – 100 Area

Remedial Action

- Revision to 100 Area Remedial Action milestones

100-B/C

- 116-C-5
 - Completion of subcontract excavation and removal of engineered structure
 - Status and remaining contaminated lateral plumes in vicinity
 - Status on technical consultation from Argonne National Laboratory (authors/originators of RESRAD computer code) on application of 116-C-1 vadose test pit data to 116-C-5
- 116-C-1
 - Feedback from EPA on ARARs for time period for compliance for groundwater and Columbia River RAGs
 - Status on technical consultation from Argonne National Laboratory on 116-C-1 closeout analyses for lead and mercury
 - Concurrence on backfill schedule for 116-C-1
- Concurrence on recent meeting minutes

100-DR

- 107-D-5 Closeout Verification Package status
- Concurrence on recent meeting minutes

100 Area Assessments

- 100 Area Remaining Sites AR Document/Proposed Plan – status of regulatory agency reviews
- 100 Area Remaining Sites – concurrence on path forward
- Status of Appendix C update
- Partial Delisting of 100-IU-1 and 100-IU-3 – EPA status report
- 100-D Area chromium characterization work startup planned for late April

100 Area RDR/SAP

- 100 Area RDR/SAP update
- Grouping of quality control samples
- Debris identification, characterization, handling, and disposal

**Remedial Action and Waste Disposal Unit Manager's Meeting
Official Attendance Record - 100 Areas
March 19, 1998**

Please print clearly and use black ink

PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
DENNIS FAWK	EPA	Project Man	
Greg Mitchem	BHI	100 ASSES TASK LEAD	372-9632
Mark Donche	BHI	Task Lead	531-0854
Keith Holliday	Ecology	100-D	736-3036
ALVIN LANGSTAFF	ERC	AREA ENGINEER	373-5876
FRED ROECK	BHI	Environ head	372-9086
Wancy Wardel	DOE	100-BC	376-5500
FRANK CORPUZ	BHI	100BC/p Project Engineer	373-1661
Glenn Goldberg	DOE	OU Manager	376-9552
Clarence Briveman	BHI		372-9565
Kelly Cooke	ERC	100 Area	372-9363
Jon Fumher	ERC	100 Area RA	373-5598
WALTER RENSEN	ERC	11	2-9620
Chuck Hedel	ERC	100 Area	2-9637
Michelle Peterson	BHI	RAWD Editor	372-9516

**MEETING MINUTES
REMEDIAL ACTION AND WASTE DISPOSAL
UNIT MANAGERS' MEETING – 100 AREA
March 19, 1998**

Attendees: See Attachment #2a.

Agenda: See Attachment #1 for copy of meeting agenda.

Topics of Discussion:

Remedial Action

1. Revision to 100 Area Remedial Action Milestones — Volume calculations are currently being worked on by R. Donahoe for the 100 Area so the milestones can be associated with the calculations. Working on formulating the next work plan was discussed, as also was the need to incorporate the 100-N and Remaining Sites.

A meeting is scheduled to be held on March 25, 1998, at EPA on Vision 2006.

100-B/C

1. 116-C-5 – Closeout is scheduled for the ^{OK} end of FY 1998. It is proposed to catch Plumes 1 and 2 now and to later catch Plumes 3 and 4 during remediation of the 60-in.- and 66-in.-diameter steel pipeline in the vicinity of Plumes 3 and 4 (a handout was provided [see Attachment #5] on the location of the 116-C-5 lateral plumes). EPA provided final concurrence with this approach, as discussed in a subsequent meeting with EPA at the 116-5-C site on March 24, 1998 (see summary meeting minutes, Attachment #6).

The technical consultation with Argonne National Laboratory on the applicability of the 116-C-1 groundwater and river analysis was held, but the results are not yet available. EPA indicated that they would consider the 116-C-1 groundwater and river protection analysis and conclusions to be directly applicable to 116-C-5, and the other liquid effluent sites at the 100-BC-1 Operable Unit, with no further groundwater or river protection analysis.

2. 116-C-1 – Status on the 116-C-1 is unchanged from last month's UMM. Lead and mercury exceed MCLs in groundwater in a time period of less than 1,000 years. Regarding EPA's action item to provide feedback on ARARs for the time period for compliance for groundwater and the Columbia River RAGs, EPA indicated that based upon EPA internal discussions, there is EPA concurrence that the 116-C-1 analysis is adequate enough to demonstrate that the intent of the groundwater and river RAGs have been attained, considering the uncertainties of the RESRAD analysis and modeling. Further, EPA stated that other supposed more accurate vadose zone transport models should not be explored right now.

BHI inquired how this would be stated in the closeout verification packages and offered to initiate a position paper on the uncertainties of the RESRAD vadose zone model and impact to the analysis and conclusions.

BHI will target for preparing a draft position paper by next month's UMM to cover the following:

- Attainment of groundwater and river RAGs at 116-C-1 via existing RESRAD and related analyses, supported by documented uncertainties on the input parameters, modeling analysis, and conclusions. Copies of the draft will be distributed to RL, EPA, and Ecology for discussion at the next UMM.
- Inclusion of the 116-C-5 groundwater and river protection analysis by way of reference to the 116-C-1 analyses.

The contents of the final position paper will be essentially the language in the verification packages for 116-C-1 and 116-C-5.

EPA stated that after the verification package is received on 116-C-1, EPA would provide a verbal concurrence on backfilling 116-C-1.

3. Concurrence on Recent Meeting Minutes – F. Corpuz presented meeting minutes for concurrence from December 1997 meetings, final version dated January 13, 1998 (100 Area Remedial Action [Attachment #7]), and from a February 19, 1998 meeting, final version dated February 20, 1998 (116-C-1 Sample Results Meeting [Attachment #8]).

100-DR

1. 107-D-5 Closeout Status – The 107-D-5 verification closeout package was transmitted to Ecology, and a courtesy copy was provided to EPA via RL. Regulator comments were requested at the earliest possible time so the comments can be considered/implemented for other site closeouts that are currently in process.
2. Concurrence on Recent Meeting Minutes -- F. Corpuz presented meeting minutes from a February 19, 1998 meeting, final version dated March 9, 1998 (100-D Remedial Action/100 Area Remedial Action [Attachment #9]) for concurrence.

100 Area Assessments

1. 100 Area Remaining Sites AR Document/Proposed Plan – EPA and Ecology met on March 12, 1998, to review and compile regulatory agency comment on the AR Document/Proposed Plan. A meeting was scheduled for March 31, 1998, for EPA and Ecology to present regulatory agency comments to RL. EPA indicated that the agency is considering adding several 200 Area waste sites to the Remaining Sites ROD. This topic will be discussed in greater detail at the March 31 meeting.

BHI indicated that there were several other topics that should also be addressed at the March 31 meeting. Examples include dispositioning of the 20 sites listed in the "Pending" category and discussion of whether the structures planned for D&D actions must be added to the Remaining Sites documentation.

2. 100 Area Remaining Sites – BHI has nearly completed cost estimating for the 100-KE and 100-KW fuel storage basins. Additionally, cost re-estimating for the Remaining Sites planned for remediation and confirmation sampling is nearly completed using model updates made since costs were originally estimated during 1997 for Draft A of the AR Document/Proposed Plan. BHI reported that total costs are expected to be in the \$50 to \$60 million range.
3. Status of Appendix C Update – RL indicated that the TPA Change Control Package for updating Appendix C will be discussed at the March 24, 1998, IAMIT meeting at the same time that the TPA Management Procedure MP-14 is approved by the Tri-Parties. EPA indicated, however, that the agency will not be prepared to sign the Appendix C Change Control form at the March 24 meeting.
4. Partial Deletion of the 100 Area NPL Site for the 100-IU-1 and 100-IU-3 Operable Units – EPA is nearing completion of Region 10 review of the partial deletion documentation. The documentation will then be sent to EPA Headquarters for their review. A 30-day review of the documentation in the *Federal Register* will be necessary and is planned for the first part of May 1998. Following the review period, the partial deletion from the National Priorities List will be finalized.
5. 100-D Area Chromium Characterization Work Startup – Plans remain firm to mobilize to the 100-D Area in late April 1998, pending favorable outcome of the field trials of recently re-designed equipment. The field trials will be held during the week of March 23, 1998, and will be witnessed by BHI. An assessment of the feasibility of deploying this emerging technology in the 100-D Area will be made at the conclusion of the field trials.

100 Area RDR/SAP

1. 100 Area RDR/SAP Update – Two SAP issues remain to be solved: (1) batching of the QA samples, and (2) looking at the debris sampling writeup in the SAP. After BHI finalizes the comment responses, BHI will issue Revision 1 of both documents (time frame for issuance is estimated to be within the next two weeks). A handout was provided (Attachment #10) to show the new table that replaces a table that had been struck out of a previous version, and another handout was provided (Attachment #11) of Appendix E of the SAP (which has been made into a summary and includes detail from meeting to describe debris, sample analysis, etc., in response to regulatory comments).

**REMEDIAL ACTION AND WASTE DISPOSAL
UNIT MANAGERS' MEETING -- 200 AREA
March 19, 1998**

Attendees: See Attachment #2b.

Agenda: See Attachment #1 for copy of meeting agenda.

Topics of Discussion:

1. Status of 216-B-2-2 Ditch Borehole Characterization – RL and Ecology discussed the Borehole Summary Report (draft annotated outline) that was sent out for review. BHI responded to Ecology's concerns that there are currently no plans for a formal Ecology review of the report since an Ecology review is not part of the BHI document review process. Ecology will look at the 200-BP-11 dispute resolution language to see if a formal report is needed to close out the dispute resolution and will review the annotated outline previously provided. If Ecology does not respond within 2 weeks, BHI will continue and issue the report as an official BHI document. The report is scheduled to be issued at the end of April 1998.

A handout was provided (Attachment #12) to show the preliminary analytical results to date from the 216-B-2-2 Ditch Borehole characterization. Detection levels are listed for Sr-90, Cs-137, Eu-154, and U-total. Attachment #12 also lists the spectral gamma geophysical logging data for the characterization.

The characterization has so far matched up with the conceptual site model. The chemical results are not yet available. Metals data still remains to be put out, and BHI will forward the data to Ecology as soon as it is available. Ecology asked to receive a courtesy copy of the Borehole Summary Report.

2. Status of 200 Area Implementation Plan – The Waste Control Plan has been revised based on two items:
 - In October 1997, BHI was working on the Waste Control Plan in parallel with ERDF receiving authorization to dispose of future IDW waste. A letter from EPA was issued specifying that new IDW can be disposed at ERDF as long as a document signed off by the regulators is in place that addresses ERDF disposal. Thus, a paragraph has been added to the Waste Control Plan on the final disposition regarding the waste to be sent to ERDF.
 - Information in the Waste Control Plan listed waste designation services to be provided by Fluor Daniel. This section has been revised to allow BHI Field Support Waste Management to provide the waste designation review.

Ecology was provided with a redline/strikeout copy of the Waste Control Plan for their review of the changes that have been made. Ecology reviewed the plan and wanted more specific language added about the use of MTCA Method B levels. This was done during the UMM, and the Waste Control Plan was signed.

**REMEDIAL ACTION AND WASTE DISPOSAL
UNIT MANAGERS' MEETING -- 300 AREA
March 19, 1998**

Attendees: See Attachment #2c.

Agenda: See Attachment #1 for copy of meeting agenda.

Topics of Discussion:

300-FF-1

Remedial Action Status

1. **Process Trenches**

- **Headworks Sediment Contained-In:** Only six drums of waste remain at the site and await final disposition. A finalized copy of a letter will come from Ecology by March 20, 1998. The only choice beyond contained-in could be the Central Waste Complex, and the best solution will be outlined in the letter from Ecology.
- **Verification Package:** A rough draft for verification was sent to Ecology and EPA for review and comment. The RESRAD sheets and power curves are done and will be forwarded next week to RL and then sent out officially.
- **Closure by Removal Package:** A draft of the package is being prepared, and the data tables are still being worked on (the package is currently about 80% complete). It currently looks like the process trenches have been remediated sufficiently to justify clean closure instead of a modified closure. Ecology will review the completed package to determine if clean closure criteria have been met.
- **Inspection, Monitoring, and Maintenance Plan:** The Inspection, Monitoring, and Maintenance Plan captures the concept of what will be looked at during post-closure, assuming that Ecology agrees that clean closure has been achieved. The existing post-closure plan with the permit was based on the anticipated "modified" closure. RL is proposing that the Inspection, Monitoring, and Maintenance Plan be used for post-closure purposes until a revised post-closure plan is incorporated into the permit in December 1998.

Ecology stated that clean closure versus other closure will be dependant upon how the data results look. BHI will send the draft "closure by removal" package to Ecology by March 31, 1998, and then the Permit modifications can be drawn up, as appropriated. The current deadline for obtaining Ecology's approval of all permit modification documents is June 1, 1998.

- **Regrading Plan:** The regrading plan has not been prepared. Ecology would like to ensure that the plan meets Tribal expectations. EPA does not expect to need to review the regrading plan. When the plan is prepared, it will likely include drawings with contours identified. Preparation of the revegetation plan will then follow, which will be an area of interest/concern to the Washington State Department of Fish and Wildlife.

Process Trenches Permit Modification Status

1. Class 3 to 1 Package – The package is currently being worked on, and a draft letter will be written and sent to Ecology within the next week. RL would like to see a response from Ecology as a record of Ecology's approval.

Landfill 1D

1. Lead-Contaminated Soil Treatment Variance – A draft letter will be sent from RL to EPA, formally requesting a variance to the land disposal restrictions. Provided in the letter will be an estimate of treatment cost and a comparison of what the funding could otherwise be used for. EPA will forward the letter to Region 10 and will respond with comments.

Much of the lead-contaminated soil is below the radiological cleanup standards. However, even if the soil was not lead-contaminated, the soil would still be destined for ERDF disposal due to the large quantities of debris mixed in with the soil.

2. Anomalies Processing – Various barrels remain at the waste site that contain acids, lead-contaminated liquids, solid lead, etc. It was initially thought to mix the acidic and caustic liquids and send them to the TEDF; however, because of the extensive safety procedures required for mixing acids and bases at the project site, it was decided that the waste would be shipped to the ETF instead. ETF is also evaluating the lead-contaminated liquids for acceptance.

Macroencapsulation will be necessary for the lead solid waste. It will be set aside for now, to be shipped later than the Burial Ground 618-4 lead materials will be sent to ERDF for treatment and disposal. The ERDF has capacity available in the next two macroencapsulation containers for this debris. The other solid debris meets the ERDF waste acceptance criteria and will be shipped to ERDF for disposal.

Burial Ground 618-4

1. Excavation Update – Excavation is approximately 35% complete. A drum with a label dated 1957 and stamped with "D-38" has been excavated, and there may be 200 to 300 barrels in this spot. BHI hopes not to have to sample each barrel in order to disposition each one. BHI will look to see if there are records existing to indicate if there was a historic campaign to send these barrels to the burial ground for disposal, hopefully providing some indication of the contents of the barrels. It was indicated by BHI that perhaps then random sampling could be used on the barrels and then a determination could be made on how to dispose of the barrels and their contents.

Trace amounts of asbestos have been found in soils at the burial ground. Since Level B personal protective equipment is currently being used, only minor modifications are needed to address safe-handling issues. Very little of the asbestos is friable. BHI has notified the Washington State Department of Health of their intent to handle this material and will allow the requisite 10 days before proceeding. Procedures are being revised to allow for bulk shipments of the asbestos-containing materials to ERDF.

300-FF-2

1. 300 Area Revitalization – A meeting will be held by early April 1998 with RL, Ecology, and EPA to discuss 300 Area Revitalization. RL will contact the Tribes to see if they are interested in attending the meeting.
2. FFS Scope – BHI is developing the schedule and budget assessment relative to the FFS scope strategies. Interfaces with other 300 Area work, principally the RCRA TSDs, also need to be addressed. Future meetings will be held to further discuss these issues.

STATUS PACKAGE
UNIT MANAGERS' MEETING - APRIL 1998
SOURCE OPERABLE UNITS

100-B/C, 100-K, 100-D, 100-H, 100-F

200 AREAS

300 AREA

Prepared by DOE-RL

04/16/98

100 AREAS

100 Area Burial Ground Focused Feasibility

Feasibility studies are underway. Current activities involve development and internal review of draft report sections for Sections 1 through 5 on background information and the nature and extent of contamination, as well as technology screening and alternative development.

100 Area Remaining Sites

Draft A of the AR Document and the Proposed Plan for the Remaining Sites project were submitted to EPA and Ecology on December 23, 1997, for a 45-day technical review period. The agencies' reviews have been concurrent with the RL review cycle. Draft written review comments from the regulatory agencies were provided to RL on April 1 and were discussed at meetings held with Ecology and EPA on April 1 and 7, respectively. Formal transmittal of the regulatory agencies' review comments is planned during April 1998. RL and ERC are in the process of responding to the comments, and a comment resolution meeting is anticipated to be held in late April. Several issues remain open, including the possible addition of seven waste sites in the 200 Areas, dispositioning of waste sites on the "Pending" and "Continued Dispositions" lists that were provided to the regulatory agencies, and review of the Proposed Plan by EPA Region 10 staff.

Informal comments that were received from EPA on February 12, 1998, requested that RL revise the methodology used to develop total costs presented in the AR Document and Proposed Plan. Revised costs have now been completed and indicate that the total remediation cost is under \$60 million. The possible addition of seven waste sites from the 200 Areas and other potential modifications to site dispositions will likely increase costs, but the total cost should be less than \$75 million.

100-D Area Soil Sampling

Laser-induced breakdown spectroscopy (LIBS), an emerging technology for characterizing subsurface soils, had been planned for use in the 100-D Area to detect chromium in the vadose zone. ERC's attendance in March 1998 at field trials for final proving of LIBS for use in field applications indicated that the technology requires additional development before field applications are feasible. As a result of the field trials, the LIBS contractor has elected to delay mobilization to the Hanford Site, pending results of additional field trials.

In response to this change in plans, RL is considering abandoning the LIBS for use in the 100-D Area until the technology is more fully developed. In lieu of LIBS, plans for soil sampling using cone penetrometer tools are being considered, with mobilization to Hanford being targeted for late April or early May 1998. However, prioritization of remaining FY 1998 budget for the ERC may result in scaling back or eliminating this work for FY 1998. A final decision on the future of the project is expected in late April.

100-D Ponds Closure Plan Revision

Ecology's written comments to RL on the revised closure plan were received on March 9, 1998. RL anticipates transmittal of a response table and the final revised closure plan to Ecology in mid-April. The submittal supports Ecology's request to have all final documents supporting Modification D to the RCRA Sitewide Permit submitted no later than June 1, 1998.

Partial Deletion of the 100 Area NPL Site for the 100-IU-1 and 100-IU-3 Operable Units

EPA is performing activities for partial deletion of the 100-IU-1 and 100-IU-3 operable units from the National Priorities List with support, as requested, from RL. The draft deletion document was submitted to EPA Headquarters for review on March 24, 1998.

Remedial Design Report/Remedial Action Work Plan

The SAP for debris sampling and quality assurance sampling features was presented at the March UMM. Regulatory comments have now been resolved. Accordingly, Revision 1 of the RDR and SAP, with complete comment resolution packages and transmittal letters, are being prepared, and both documents are being finalized for issuance.

100-B/C Remedial Action

Baseline excavation at the 116-C-5 retention basins is completed. Remedial action excavation work on previously identified lateral vadose plumes at the northern and western limits of the basins is nearly ready to commence. As agreed with EPA, the plume area to the south will be remediated and closed out, concurrent with remediation of the 60-in.- and 66-in.-diameter effluent pipelines in the vicinity, separate of the 116-C-5 closeout and verification package.

ERC technical staff are currently working on the final evaluation of 116-C-1 site closeout and verification package issues, to include evaluation of uncertainties in the RESRAD analyses and associated input parameters. Current ERC target dates for 116-C-1 are the submittal of the closeout verification package to RL by May 1998, and backfilling the site in June 1998. These efforts, as well as the 116-C-5 site closeout (also scheduled in FY 1998) are subjects for discussion at the April 1998 UMM.

100-DR Remedial Action

Remedial excavation of overburden and concrete basin construction debris at the 116-D-7 and 116-DR-9 basins is ongoing and will continue through approximately the end of FY 1998, and beyond 1998 for 116-DR-9. A meeting is scheduled with RL and Ecology for April 16, 1998, to discuss elevation datum for the 116-D-7 waste site, in particular regarding with lateral plumes to the north of the waste site.

The 107-D-5 closeout report has been completed and submitted to RL and Ecology for review/comment and concurrence, with a courtesy copy submitted to EPA. Review comments are needed at the earliest time so the comments can be considered/incorporated into the upcoming closeout packages planned for the remainder of the fiscal year:

- 107-D1, 107-D2, and 107-D3 Sludge Pits
- 1607-D2 Abandoned Tile Field.

100-N Area Remedial Action Decision Documents

The five 100-N Area Remedial Action documents (the 100-NR-1 TSD CMS/CL and Proposed Plan, the 100-NR-1 and 100-NR-2 CMS and Proposed Plan, and the 100-N Area Ancillary Facilities EE/CA) were submitted to Ecology and EPA on March 6, 1998. RL, Ecology, and EPA initiated the public comment period on the proposed plans (including the remaining three documents) for cleanup of the 100-N Area on March 16, 1998. The public comment period will be from March 16 to April 29, 1998. A public hearing was held at Ecology's office on April 2, 1998.

200 AREAS

200 Areas Implementation Plan

The TPA Change Package has been signed by all signatories. The Implementation Plan draft is being developed and is on schedule for team review starting May 11, 1998.

200-BP-1 Operable Unit

The barrier-testing program continues to provide data on water infiltration, vegetation growth, and biointrusion associated with the Hanford Site barrier.

200-CW-1 Operable Unit

The analytical results have been received and the data validation step is being finalized. The summary report is being prepared and will undergo internal review the later part of April 1998. The IDW waste disposal profiles are being generated, and the IDW waste is planned to be disposed of at the ERDF by the end of April 1998.

300 AREA

300-FF-1 Operable Unit

Process Trenches

The verification package was finalized and submitted to RL for transmittal to EPA and Ecology. This package documents that "modified" closure to the MTCA C industrial cleanup standards has been met. Work also continues on the "closure by removal" package and the monitoring and maintenance plan. These documents will recognize that residual soils actually meet MTCA B residential standards for RCRA contaminants. Accordingly, modifications to the RCRA post-closure permit are being drafted to reflect the "as remediated" site conditions. The current plan is to include the necessary changes in the next formal modification of the RCRA Permit, which is scheduled for December 1998. In the meantime, it is proposed that the monitoring and maintenance plan be used for post-closure purposes. A regrading plan is also being prepared and will be forwarded to Ecology for review.

Landfill 1D

A letter requesting a treatability variance has been sent to EPA for the lead-contaminated soils excavated from the landfill. Approximately 3,000 tons of soil and debris are currently restricted from land disposal. Collection of verification samples has been deferred until after the stockpile of lead-contaminated soil is removed from the unit.

Burial Ground 618-4

Excavation at the burial ground is continuing. Along with the expected miscellaneous debris, a considerable amount of contaminated soil has been excavated. Some of this soil contains high levels of asbestos, which has necessitated a change in personnel safety procedures. Additionally, there has been a large amount of soil that contains high concentrations of lead and barium. Due to the potential for exceeding land disposal restrictions, the soil is being loaded into ERDF transport containers. A large cache of drums has also been uncovered, which are suspected to contain uranium mill cuttings covered with mineral oil. Each drum is being exhumed individually and staged for further characterization. The eventual process of treating and disposing of these drums represents a considerable scope increase for the project. Handling the drums and the contaminated soil have caused a slowing of production rates, which will extend the project completion schedule.

300-FF-2 Operable Unit

Analytical results from the January groundwater sampling at wells 699-S6-E4A and 699-13-3A were received on March 10, 1998. Evaluation of the data indicates a decrease in the concentration of radioactive constituents and the continued presence of tributyl phosphate at well 699-S6-E4A. Sampling at this well will be performed again in July 1998. Results from well 699-13-3A continue to follow previous trends.

Discussions are continuing regarding the July and December 1999, 300 Area Tri-Party Agreement milestones. A rough order-of-magnitude estimate of cost and schedule impacts for several alternatives has been developed. An overall Tri-Party Agreement milestone plan addressing the 100, 200, and 300 Area issues is being developed and will be discussed with the regulators at a meeting on April 13, 1998.

116-C5 LATERAL PLUMES

Four lateral plumes have been identified at the 116-C5 waste site, shown in plan view on the attached. 116-C5 is scheduled for site closeout by the end of this fiscal year.

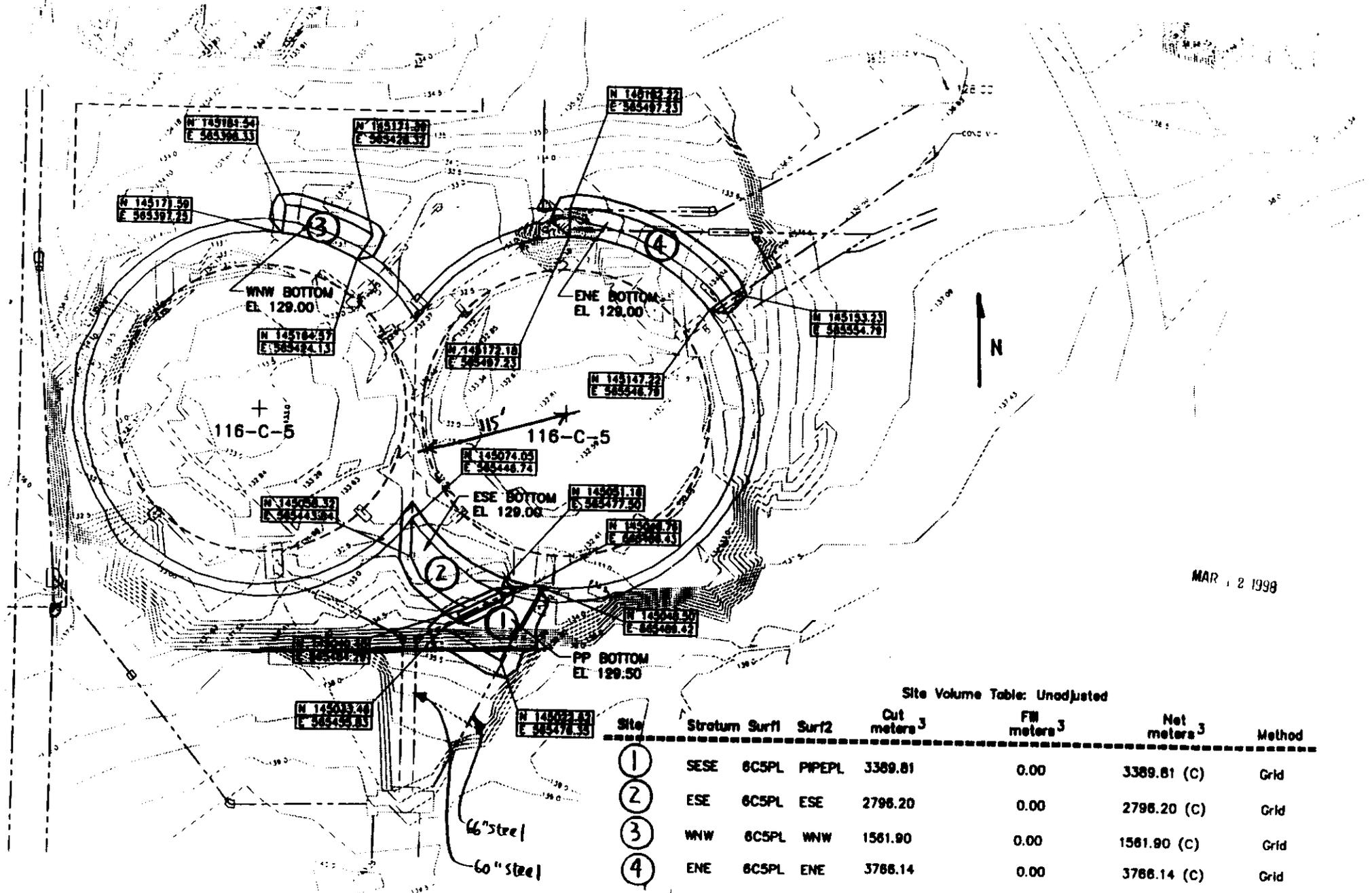
- Plume No. 1 is located in between two reactor effluent steel pipelines (66-inch and 60-inch diameter), and were previously identified from potholing/exploratory pits.
- Plume Nos. 2, 3 and 4 were recently identified from MRDS radiation detection (NaI, gamma) surveys.

Plume Nos. 1 and 2 are in close proximity and/or within the remediation limits of the reactor effluent pipelines, not scheduled for remediation this fiscal year.

At the current RA production rate (containers per day), and assuming constant budget and other resource constraints, if Plume Nos. 1 and 2 are required to be remediated with the 116-C5 closeout, this would result in a schedule deferral of about 1 month of other scheduled activities, and probable schedule slippage of the 116-C5 site closeout package to next year.

If Plume Nos. 1 and 2 could be remediated with the reactor effluent pipelines, this would result in a higher probability of 116-C5 site closure by the end of FY98, as currently scheduled.

Based upon current draft revisions to the SAP, 116-C5 and the 100 BC pipelines have the same COCs, with 116-C5 additionally having Ni63, Cr, Cr6+, Hg and Pb.



MAR 12 1998

Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut meters ³	FW meters ³	Net meters ³	Method
①	SESE	6C5PL	PIPEPL	3389.81	0.00	3389.81 (C)	Grid
②	ESE	6C5PL	ESE	2796.20	0.00	2796.20 (C)	Grid
③	WNW	6C5PL	WNW	1561.90	0.00	1561.90 (C)	Grid
④	ENE	6C5PL	ENE	3766.14	0.00	3766.14 (C)	Grid

Author: Franklin M Corpuz at ~BHI007

Date: 3/30/98 11:24 AM

Priority: Normal

Receipt Requested

TO: Dennis A Faulk at ~HANFORD02A

TO: Glenn I Goldberg at ~HANFORD16C

CC: Richard L Donahoe at ~BHI013

CC: Alvin L Langstaff at ~BHI013

CC: Franklin M Corpuz

CC: Jonathan D (Jon) Fancher at ~BHI016

CC: Mark H Sturges at ~BHI001

CC: Bill J (Jack) Howard at ~BHI019

CC: R C (Randy) Havenor at ~BHI017

CC: Michelle R Peterson at ~BHI002

CC: J A (Mickey) Fernandez at ~BHI017

CC: Richard B Kerkow at ~BHI019

CC: Randy T Coffman at ~BHI019

CC: Steven R Durfee at ~BHI002

CC: Kelly E Cook at ~BHI001

CC: Pamela G Doctor at ~BHI012

CC: Frederick V Roeck at ~BHI003

Subject: 116-C5 and 116-C1/EPA 3/24/98 Site Visit to 100 BC

~

----- Message Contents -----

To: Dennis Faulk/EPA

Copy: Glenn Goldberg/DOE-RL

~

Dennis -

~

~

As a follow up to your subject site visit, and to advise/update Glenn Goldberg/RL, the following items were discussed, agreements made and action items assigned:

- 1) Regarding 116-C5, upon site viewing, you provided final EPA concurrence with the approach to include remediation of the identified plumes to the south of 116-C5 (Plumes identified as Plumes 1 and 2 in the 3/98 UMM meeting minutes), separate of the 116-C5 verification package. The elevation datum, and top of backfill for these plumes (determination of deep/shallow zone interface) will be essentially the existing grade in the area, as this area is well outside of the engineered structure, and the ground surface is higher than top of 116-C5 backfill at El. 133.5 m (NGVD 29). As discussed in prior meetings, backfill details such as the need for a transitional grade between these two areas will be looked at in closer detail with RL and EPA closer to the time of backfill.
- 2) Regarding the lateral plumes to the north of 116-C5 (Plumes identified as Plumes 3 and 4 in the 3/98 UMM meeting minutes), the elevation datum and top of backfill will be the top of 116-C5 backfill, at El. 133.5 m with a minimum 15 feet of backfill over all areas. These plumes will be remediated and included as part of the 116-C5 site closeout and verification package.

- 3) Isolated higher radiation areas in the shallow zone side walls at 116-C5, or elsewhere, are subject to the same decision rules for direct exposure, as any other areas. The decision for excavation or attainment of direct exposure remedial action goals are made by statistical evaluation of data from specified decision and sampling unit sizes as currently provided in the SAP and FIG.
- 4) Regarding the 116-C1 vadose zone test pit, it was agreed to not include the groundwater grab sample analysis test results from the bottom of the test pit in the upcoming vadose zone clean up verification package. EPA was already advised by Ecology of the Ecology split sample results, which were generally the same order of magnitude as the ERC results for Sr-90. The results are consistent with known information about existing groundwater conditions in the vicinity being above MCLs for Sr-90.
- 5) EPA requested that the outfalls related to the Group 1 sites be included in the upcoming pipeline remediation work at the 100 BC Area. Alvin Langstaff/BHI responded that this could possibly be accomplished via Change Order to the existing subcontract documents or by inclusion in future subcontracts. Langstaff will discuss with Donahoe/BHI and Goldberg/RL and report back to Faulk.

If you have any comments on the above, please advise at your earliest convenience. If you take no exception to the above, this cc:mail message will be included as an attachment to the upcoming April 1998 UMM Minutes for your formal concurrence. Alternatively, they can be provided in the current March `98 UMM Minutes, currently in ERC draft review.

Regards,

Frank Corpuz/BHI
531-0625

Environmental
Restoration
Contractor

ERC Team

Meeting Minutes

Job No. 22192

Written Response Required? NO
Closes CCN: N/A
OU: RAWD PROJECTS
TSD: N/A
ERA: N/A
Subject Code: 4170

SUBJECT 100 AREA REMEDIAL ACTION - SITE CLOSEOUT PROCESS AND DETAILS

TO Distribution

FROM F. M. Corpuz

DATE January 13, 1998

ATTENDEES

K. E. Cook H9-02
F. M. Corpuz X9-06
P. G. Doctor H0-02
R. L. Donahoe X9-06
V. R. Dronen H0-09
J. D. Fancher X3-40
B. H. Ford H0-21
D. A. Faulk B5-01
L. E. Gadbois B5-01
G. I. Goldberg H0-12
K. K. Holliday B5-18
R. Jacquish B5-18
L. M. Johnson H9-03
A. J. Knepp H0-19
A. L. Langstaff X3-40
W. E. Remsen H0-17
F. V. Roeck H0-17
A. C. Tortoso H0-12
N. A. Werdel H0-12
M. A. Wesselman X0-23

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Attendees
J. W. Darby H0-18
A. R. Michael H0-17
O. C. Robertson H0-12
Project Files X9-06
Document and Info Services H0-09

Meetings on the above subject were held on December 9, 10 and 16, 1997, with Project Managers from the U.S. Department of Energy, Richland Operations Office (RL), Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology), and Environmental Restoration Contractor (ERC) Staff, at 3350 George Washington Way, Richland, WA. The purpose of the meeting was to present, discuss and agree upon technical details of the site closeout process for 100 Area Remedial Action (RA) sites. Presenters cited existing in-progress site closeouts as examples:

THE FOLLOWING TOPICS WERE DISCUSSED, WITH BACKGROUND AND DETAILS PROVIDED IN HANDOUTS:

The site closeout requirements for 100 Area RA sites include the attainment of Remedial Action Goals (RAGs) for protection of Groundwater, the Columbia River and Direct Exposure. The closeout verification is reached through both field data and numerical modeling of residual soil to include closure site conditions having 30 inches per year of irrigation, for 1,000 years.

For Fiscal Year (FY) 98, RL and ERC have commitments for Site Closeouts/Verification at eight waste sites in the 100 B/C and D, Remedial Action Sites.

The preliminary results of the site closeout process (revised later, see page 3 & 4) and status of the 116-C-1 Test Pit was summarized:

- Direct exposure RAGs are met.
- Presence of data gaps and uncertainties, deeper part of vadose zone.
- With conservative estimates for vadose zone residual soil contamination, Groundwater and River RAGs are not met in full. Ni-63 exceeds individual Maximum Contaminant Levels (MCLs) for Groundwater within 1,000 years; also, Groundwater and/or River RAGs are not met for lead, mercury, chromium, cadmium, and zinc.
- Sensitivity analysis of the calculations indicates that Groundwater and River RAGs are met with ambient rainfall and no irrigation; or deep vadose zone materials at or near background concentration levels.
- A test pit to groundwater is planned for 116-C-1 site, with completion January 1998.

The preliminary evaluation and status at 107-D5 was summarized:

- Direct Exposure RAGs are met.
- No evidence of underlying residual soil contamination at depth, contributed from this waste site, supporting a "clean" lower vadose zone analysis model.
- Groundwater and River RAGs are met.

For the 100 B/C and HR groundwater operable units, groundwater constituent results of recent sampling events were presented. The only groundwater contaminants of concern that are above MCLs are Sr-90 at 100 B/C, and Cr6+ at 100 HR. At 100 B/C, wells situated both upgradient and downgradient of 116-C-1 demonstrate groundwater concentrations are at, or near, detection limits for lead and mercury.

The process for analysis and verification of soil cleanup was presented and discussed in detail for attainment of Direct Exposure, Groundwater and River RAGs. The specific processes were also discussed for the groupings of radionuclide and metal/chemical contaminants of concern (COCs). For each of these combinations of analyses, there are contributions from the excavation sidewalls, overburden/backfill materials, and bottom of excavation/vadose zone. These combinations of analyses result in voluminous analyses per waste site, and all parties agreed to work towards agreement on a more streamlined approach.

From the above discussions, the following "parking lot" list was made for issues requiring resolution:

- Application of analogous sites.
- Sidewall thickness of contamination model.
- Modeling of overburden: thickness of layer and background issues.
- Significance of contribution of sidewalls and overburden for groundwater protection analysis.

Page 4

- Determining groundwater protection levels for non-radionuclide constituents – use of the 100 times rule.
- Addressing protection of groundwater that is already impacted.
- Modeling movement of metals/chemicals to the Columbia River – Mobility.
- Validity of distribution coefficient (K_d) values in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL-96-17, Rev. 0) (RDR/RAWP) for Residual Radioactivity computer model (RESRAD) analyses.
- Rationale for vadose zone assumption for sludge pits.
- Addressing additive effects of dose from the bottom, sidewalls and overburden.

THE FOLLOWING KEY DECISIONS/CONCLUSIONS WERE MADE:

For each waste site, remediation data from other site closeouts will be reviewed and the analogous waste site approach closeout purposes will be evaluated and applied if technically justified.

Several RESRAD computer runs were made to evaluate sensitivity of sidewall contamination thickness on Direct Exposure results. The sensitivity analysis indicates the assumption of contamination sidewall thickness does not impact Direct Exposure results.

The bottom of excavation is modeled using the “basement” scenario, in which a residential basement could be constructed 12 feet down, with 3 feet of underlying clean fill. The contamination source will be the concentration in the bottom of the excavation, overlain by the clean fill.

For Direct Exposure evaluation of shallow (<15 ft) and overburden soil the sum of the fractions of individual radionuclide COCs will be evaluated to check against the 15mrem/yr lookup criteria. If the sum of the fractions of the 95th upper confidence level of the mean of the individual sample populations (shallow and overburden populations) is less than 15mrem/yr, then no further direct exposure analysis is required. If either population exceeds the lookup criteria, then the two populations will be combined and the 95th upper confidence level of the mean of the of the combined data set will be evaluated via the sum of the fractions against the 15 mrem/yr lookup criteria. If this data set is less than 15 mrem/yr, then no further direct exposure analysis is required. If this data set exceeds the lookup criteria then a RESRAD run for direct exposure using the combined data set will be performed to determine if direct exposure RAGs have been met.

For radionuclide COCs, both natural and anthropogenic background will be subtracted from overburden soils. For shallow and deep soils, only naturally occurring radionuclides will be subtracted prior to data evaluation.

For purposes of evaluating groundwater protection, contribution from shallow and overburden soil can assume to be below groundwater RAGs if the more stringent direct exposure (15 mrem/yr) criteria have been met. An exception to this assumption would be where relatively high concentrations of metals/chemicals remain in the shallow and overburden soil, via Model Toxic Control Act (MTCA B) Direct Exposure cleanup criteria.

For non-radionuclide contaminants of concern, text in the RDR/RAWP will be modified to reflect that the “100 times” rule will be applied as the first “test” for protection of groundwater, and if not passing on the “100 times” rule, a RESRAD analyses could be performed as a secondary evaluation.

For evaluation of Groundwater and River protection, the presence and concentration of existing groundwater contamination is disregarded in the analyses.

For River protection, transport for 1,000 years will be evaluated, starting from site closeout. Retardation time will consider transport in both the soil column to groundwater, and in transport through groundwater to the

Page 4

River. The distance to river will be the distance from the 100-year flood elevation at the river to the center of the waste site. Dilution factors higher than those already used at the Groundwater-River interface will be evaluated on a constituent-specific basis using Hanford Site data.

The K_d values currently in use in the RESRAD analyses are those previously agreed to in the RDR/RAWP and will not be changed at this time.

Laboratory testing results from soil and groundwater at the bottom of the 116-C-1 Test Pit will be used to calculate selected K_d values using RESRAD, for comparison to those currently in use in the RDR/RAWP.

Review of 100 Area process information, current remediation data from the 107-D1 and 107-D5 Sludge Trenches, and historical data from the 116-B-14 Sludge Trenches indicates that:

- These trenches received sludge only, and no liquid effluent volumes that could have resulted in a hydraulic driving force of any significance to drive contaminants to any great depths in the vadose zone underlying the sites.
- Maximum contaminant concentration occurs at the bottom of the established engineered structure, decreasing with depth to contaminant laboratory detection limits, at depths no greater than 15 feet below the engineered structure. Use of this profile distribution for most sludge trenches would be conservative.
- Vadose zone contaminant profile distribution for sludge trenches will be based upon technically justified methodologies and assumptions, including the above findings for 107-D1, 107-D5 and 116-B-14, as applicable.

The 100 Area Remedial Action Group 4 Design Package was presented. No comments were received.

THE FOLLOWING ACTIONS WERE ASSIGNED:

ERC staff (Frank Corpuz) will present the details of the site closeout process in an appendix to the RDR/RAWP, for placement in the next RDR/RAWP revision (date to be determined).

EPA (Dennis Faulk) will regroup with EPA staff and management for consideration of using radionuclide MCLs that are derived consistently with the 4mrem/yr cumulative radionuclide dose limit in groundwater (decision due by mid-January, 1998).

For the 116-C-1 river protection analyses, ERC staff (Jon Fancher and Frank Corpuz) will provide a site-specific measurement for the distance from the site to the river.

Laboratory testing results from soil and groundwater at the bottom of the 116-C-1 Test Pit will be used to calculate selected K_d values using RESRAD (Jon Fancher and Mike Wesselman).

**Environmental
Restoration
Contractor**

ERC Team

Job No. 22192

Written Response Required? NO
Closes CCN: N/A
OL: RAWD PROJECTS
TSD: N/A
ERA: N/A
Subject Code: 4170

Meeting Minutes

SUBJECT 116-C-1 SAMPLE RESULTS MEETING MINUTES

TO Distribution

FROM F. M. Corpuz

DATE February 20, 1998

ATTENDEES

K. E. Cook	H9-02
F. M. Corpuz	X3-40
P. G. Doctor	H0-02
R. L. Donahoe	X9-06
J. D. Fancher	X3-40
D. A. Faulk	B5-01
G. I. Goldberg	H0-12
K. K. Holliday	B5-18
R. Jacquish	B5-18
L. M. Johnson	H9-03
A. L. Langstaff	X3-40
W. E. Remsen	H0-17
F. V. Roeck	H0-17
J. W. Yokel	B5-18

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Attendees	
B. H. Ford	H0-02
N. A. Werdel	H0-12
M. A. Wesselman	X0-23
Document and Info Services	H0-09

Attachment: Summary of Preliminary Results, 116-C-1
Groundwater and River Protection Analyses
Utilizing Results From the 116-C-1 Vadose
Zone
Test Pit

A meeting was held on February 9, 1998 at 3350 George Washington Way, conference room 2B59, to present preliminary results of the 116-C-1 Residual Radioactivity (RESRAD) computer model analyses using recent Vadose Zone Test Pit data. Additionally, the attendees discussed related topics on remedial action site closeout processes and the Remedial Design Report/Remedial Action Work Plan (RDP/RAWP) and Sample Analysis Plan (SAP) revisions in progress. These minutes provide a summary of the discussion topics, the key actions and conclusions, and of the action items assigned.

THE FOLLOWING TOPICS WERE DISCUSSED:

1. The Environmental Restoration (ER) Committee meeting has been rescheduled for March 12, 1998.
2. Environmental Protection Agency (EPA) and Washington Department of Ecology (Ecology) comments on the RDR/RAWP and SAP revisions have been transmitted to Environmental Restoration Contractor (ERC). A few of the comments were discussed in detail at this meeting as they relate specifically to current site closeouts and production.
3. The administrative logistics for approving closeout/verification packages was discussed.

4. A draft of the December, 1997 Meeting Minutes (Department of Energy – Richland Operations (DOE-RL), EPA, Ecology, ERC) regarding the details and refinements of the site closeout analysis processes, is currently with DOE-RL in review.
5. Preliminary results of the RESRAD/other analyses for the 116-C-1 site for groundwater and river protection were presented. In summary:
 - For radionuclides, Remedial Action Goals (RAGs) for cumulative dose and individual Maximum Contaminant Models (MCLs) in groundwater, and individual MCLs at the river, are attained.
 - For metals and chemicals:
 - 1) Based upon the 100 times rule for Contaminants of Concern (COCs) lead and mercury, and for non-COCs cadmium and antimony, soil concentration values exceed groundwater RAGs. RESRAD surrogate radionuclide runs are in progress.
 - 2) Pending Quality Assurance/Quality Control (QA/QC) evaluation in progress, with regard to river RAGs, with a distribution coefficient (K_d) of 30 for lead, mercury, and cadmium contaminant travel time to River is > 1,000 years. At a K_d of 1.4 for antimony, travel time to River is < 1,000 years.

As discussed in the December, 1997 meetings with EPA and Ecology, a 1,000 year compliance period would be utilized for evaluation of protection of the River (see further discussion/action below).

- Analytical points of discussion and interest on metal/chemicals evaluation were tabled:
 - 1) The non-COCs were evaluated as part of the full ICP suite of testing from the 116-C-1 Test Pit, as agreed, to provide information for future remediation projects and analyses.
 - 2) Cadmium and antimony were initially eliminated from the SAP as a 116-C-1 COC due to anticipated low field values compared to Direct Exposure RAGs. Additionally, in the generic 50-50 vadose zone model from the RDR/RAWP, these constituents did not occur in the groundwater.
 - 3) Mass balance is currently not considered in the RESRAD evaluations. "Non-dispersion" is the selected feature, as per approved parameters provided in the RDR/RAWP. If mass balance is not accounted for when using the irrigation scenario over a 1,000 year period, the concentrations from residual soils may be significantly overstated for estimated groundwater, and thus the concentrations for the River.
 - 4) Remaining lab samples from the 116-C-1 Test Pit are being re-run for antimony, using lower detection limit methods.
6. EPA requested evaluation of 100N's proposed plan for consistency with ERC Remedial Action processes.
 7. The start up for lead macroencapsulation is still in progress for the both the 100 B/C and D remedial action sites. This operation will be centralized at 100 B/C. A temporary hold was in place during consideration of centralized treatment at Environmental Restoration Disposal Facility (ERDF), which did not come to fruition.

THE FOLLOWING DECISIONS/AGREEMENTS/CONCLUSIONS WERE MADE:

1. When the RESRAD analyses for 116-C-1 are completed, a meeting will be held to present the results and assist EPA for the March, 1998 ER Committee meeting.
2. Regarding the RDR/RAWP and SAP:
 - With regard to the comment on Land Disposal Restriction (LDR) update, the comment was to simply note that LDR has been encountered, and is being treated (lead waste stream at 100 B/C and D areas).
 - With regard to the comment on use of Hatch Kits for Chromium +6 in process testing at radioactive hot spots, placement of the resulting field screening data in the project database, accessible by Ecology, is adequate for information sharing purposes. This information need not be reported in the site closeout reports, which was not intended to cover in process field screening and waste streams disposed of at ERDF.
 - With regard to the December, 1997 Meeting Minutes (see above), these need to be finalized and signed off, as they cover updated, agreed upon processes for site closeouts. These processes are not reflected in the RDR/RAWP with as much detail. It was agreed that the contents of the 12/97 Meeting Minutes would not be captured in this current revision to the RDR/RAWP, but would be incorporated into a later revision, in an Appendix. EPA and Ecology want to get the 12/97 Meeting Minutes approved and signed off before finalizing RDR/RAWP.
 - Other EPA/Ecology comments were briefly discussed.
 - It was noted that Revision 0 for the RDR/RAWP and SAP, are the only approved versions, that were in place at the time of start of remediation for the current and recently completed 100 Area Remedial Action sites. The requirements outlined in these Revision 0 versions were used as guidance, with consideration only, for the upcoming revisions. EPA/Ecology took no exception to this approach.
3. The 107-D5 Closeout Verification package is in progress. The package transmittal to DOE-RL is targeted for March, 1998 timeframe. Regarding verification packages in general:
 - For 107-D5, Ecology is the lead regulatory agency, and Glenn Goldberg is DOE-RL Project Manager. Courtesy review copies will be transmitted through Glenn Goldberg to both EPA and to Nancy Werdel, DOE-RL Project Manager for the 100 B/C Remedial Action sites.
 - The National Priority List (NPL) form will be used for regulator approval and sign-off for the lead regulatory agency. The non-lead regulatory agency will be marked as non-applicable, or N/A.
4. Completion of the December, 1997 EPA/Ecology/DOE-RL and ERC Meeting Minutes is a high priority.

5. Finalized 116-C-1 RESRAD runs are targeted for completion by the end of this week, and will include consideration of:
- Mass balance option in RESRAD, and initial evaluation of level of effort to determine if more complex mass balance modeling and analyses are warranted. The more complex modeling would not commence without the approval and concurrence from DOE-RL.
 - As a supplement to the December, 1997 Meeting Minutes (draft in review), EPA requested evaluation of established precedence and regulatory guidance for the 1,000 year compliance period for protection of groundwater and the River, for non-radioactive COCs.
 - Updated laboratory testing results for antimony, using lower detection limits.
 - ERC target will be to present final analyses results at the Unit Manager Meeting (UMM) February 19, 1998 meeting.
 - Although non-COCs for 116-C-1, EPA and Ecology concurred that antimony and cadmium needed to be evaluated for completeness.

THE FOLLOWING ACTION ITEMS WERE ASSIGNED:

1. EPA presentation support for ER Committee Meeting. **Date is To Be Determined (TBD).**
2. **Walter Remsen**, BHI, will hold a meeting to evaluate EPA and Ecology comments on the RDR/RAWP and SAP revisions. Walter will then determine at that level of effort and schedule for comment disposition and issuance of RDR/RAWP and SAP. **Priority: Urgent**
3. **Glenn Goldberg and Nancy Werdel**, need to complete the DOE-RL review of the December, 1997 Meeting Minutes (see above.) **Priority: Urgent**
4. **Linda Johnson** will research regulatory guidance and other precedence for the compliance period for River protection, with respect to residual metals and chemicals in soils. **Priority: High**
5. **Pam Doctor** will take the lead on efforts to finalize 116-C-1 RESRAD runs, to include mass balance considerations, for reporting back to EPA and Ecology by the **February 19 UMM meeting (target date)**.
6. **Kelly Cook** will look into consistency issues on the 100N Proposed Plan. **Priority: Medium/Low**
7. **Frank Corpuz** will provide EPA and Ecology with courtesy copies of the lead macroencapsulation design calculations. These calculations will provide information such as the methods and sequence. **To EPA/Ecology by Feb 12.**

Environmental
Restoration
Contractor

ERC Team

Meeting Minutes

Job No. 22192
Written Response Required NO
Due Date: N/A
Actionee: N/A
Closes CCN: N/A
OU: RAWD PROJECTS
TSD: N/A
ERA: N/A
Subject Code: 4170

SUBJECT 100 D REMEDIAL ACTION/100 AREA REMEDIAL ACTION

TO Distribution

FROM F. M. Corpuz

DATE March 9, 1998

ATTENDEES

F. M. Corpuz X9-06
F. D. Fancher X3-40
D. A. Faulk B5-01
J. M. Frank X9-06
G. I. Goldberg H0-12
G. G. Hamilton X9-06
K. K. Holliday B5-18
A. L. Langstaff X3-40
M. T. Stankovich X9-06

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Attendees
J. E. Auten H9-03
R. D. Belden X9-06
R. T. Coffman X3-40
K. E. Cook H9-02
R. L. Donahoe X9-06
R. B. Kerkow X3-40
Document and Information Services H0-09

A meeting on the above subject was held on February 19, 1998, at the 100-DR-1 Remedial Action Project conference trailer, to discuss specific issues regarding the 100-DR-1 Remedial Action (RA) Project, and possible application to other 100 Area RA sites. Attendees included Environmental Restoration Contract (ERC) personnel, and representatives from the Environmental Protection Agency (EPA), Washington Department of Ecology (Ecology), and the U. S. Department of Energy (DOE), Richland Operations (RL). These minutes provide a summary of the discussion topics, the key actions and conclusions, and the action items assigned.

THE FOLLOWING TOPICS WERE DISCUSSED:

1. Closeout of the 107-D4 Sludge Trench was discussed. The 107-D4 site is located within an identified northern plume of the 116-D7 Effluent Retention Basin, and at the southern limits of a 60" diameter steel Effluent Pipeline waste site. An ERC proposal was made to approach 107-D4 site closeout by evaluating solely those Contaminants of Concern (COCs) that are unique to 107-D4. The unique COCs to the 107-D4 site include Chromium +6, polychlorinated biphenyls (PCBs), and Strontium 90. With the 107-D4 site COCs being evaluated using a site specific list, both the 116-D7 plume and the effluent pipeline closeout would be handled separately.

The 107-D4 location represents the situation of a waste site within a waste site. This situation is likely to occur in many remedial action sites where lateral plumes are involved.

2. During remedial action around the perimeter of 116-DR-9, seven (7) 8-inch diameter, steel vertical standpipes were encountered around the perimeter of the basin. Research of the as-built drawings revealed that these 35 feet long, vertical standpipes were used for monitoring of soil saturation around the basins. This monitoring was to provide early indicators of potential structural damage to the basins.

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An alternate remediation method to completely removing the standpipes was made to Stan Leja, the Ecology lead representative on these matters (communicated to Stan Leja through John Auten, ERC). This alternative method would be used if completely pulling out the standpipes was not feasible. The alternate proposal would be to cut off the tops of the wells at approximate 15 foot depth, and placing concrete plugs scribed with an identification number over the top of the wells. This would be followed by subsequent placement of backfill over the wells. Mr. Leja has given verbal concurrence to this proposal, and will provide a concurrence letter to ERC.

3. The upcoming revision to the Sampling and Analysis Plan (SAP) will included new language requiring field screening for Chromium +6 in radiological hot spots that occur around the perimeter limits of the excavated waste sites.

The need for quality assurance and quality control (QA/QC) of the waste site testing and data, and subsequent placement of the data in Hanford Environmental Information System (HEIS), was discussed. The gathering of in-excavation field screening data was discussed as a way to establish database trending of Chromium +6 in correlation with the presence of high radiation zones. This approach would be used when dictated by both site conditions and best engineering judgement. This sampling method would be used to support and supplement composite testing requirements at completion of the excavation.

Additional ERC cost would be incurred in performing this field screening. The sampling would include data management and tracking support, QA/QC oversight, and handling of the bi-product waste stream from the field test.

4. Final drafts of the meeting minutes from the December, 1997 meetings with EPA and Ecology on Remedial Action site closeout processes and analyses have been finalized. The finalized minutes including review from Glenn Goldberg and incorporation of minor comments from Nancy Werdel, both RL representatives. This final version has been transmitted to Nancy Werdel.

THE FOLLOWING DECISIONS/AGREEMENTS/CONCLUSIONS WERE MADE:

1. RL and BHI noted that the driver for the proposal is the need to demonstrate progress in remedial action to DOE-Headquarters. While EPA/Ecology acknowledge the need to demonstrate progress, they could not concur with the approach for the 107-D-4 waste site due to the inability to differentiate between COCs. **See Action Items below.**
2. Ecology representative, as lead regulatory agency for the 100-DR-1 project, took no exception to the approach, as the Washington Administrative Code well closure procedures are not applicable. **See Action Items below.**
3. ERC will proceed with the request for Chromium +6 field screening, pending finalization of the SAP (documentation of the scope), and RL concurrence on the level of effort and additional costs. **See Action Items below.**

THE FOLLOWING ACTION ITEMS WERE ASSIGNED:

1. Glenn Goldberg, RL will discuss with Owen Robertson, also of RL, to see if other avenues exist other than the verification packages in which the RA team could take credit for excavation and remediation of completed waste sites. Among other avenues suggested include modifications to the Waste Identification Data System (WIDs) closeout process (in progress). The modifications would include a "definition" section describing status of site, and that a verification package would follow to include closeout and verification of adjoining contaminated sites. In the case of 107-D4, this would mean that the verification package for 107-D4 would need to await completion of remedial action for 116-D7, 116-D7 plumes, and the effluent pipelines to the north. ERC will take no action until Glenn Goldberg provides feedback.
2.
 - A) Keith Holliday, Ecology will discuss with his hydrogeology counterparts at Ecology, and if there are any issues, they will contact John Auten, ERC directly to resolve any concerns.
 - B) It was advised that Stan Leja's forthcoming concurrence letter not include the wording "variance" on WAC procedures, since the determination is that the WAC well closure procedures are not applicable.
 - C) Keith Holliday, Glenn Goldberg, and Frank Corpuz need to be copied on the Stan Leja letter.
3. Jon Fancher, ERC, will put together a cost, schedule, and other impacts resulting from the currently proposed Chromium +6 field screening, to transmit to Glenn Goldberg and Nancy Werdel for review.

Table III-3. Field Quality Control Sampling Requirements Summary.

QC Sample Type	Application	Large, Medium, and Ungrouped Small Waste Site Frequency Reference	Grouped Small Waste Site Frequency Reference ^a
Trip blanks	Volatile organic sampling only.	5% of all samples or a minimum of one sample per sampling unit.	5% of all samples or a minimum of one sample per sampling unit.
Equipment rinsates (blanks)	All sampling.	One sample per waste site. ^b	One sample per SDG
Field source water blanks	Not applicable. Field water or steam cleaning equipment only.	--	--
Field duplicates	All sampling.	5% of all samples or a minimum of one sample per sampling unit. ^c	5% of all samples or a minimum of one sample per sampling unit. ^c
Field splits	All sampling.	5% of all samples or a minimum of one sample per sampling unit. ^c	5% of all samples or a minimum of one sample per sampling unit. ^c
Co-located samples	Volatile organic sampling only.	5% of all samples or a minimum of one sample per sampling unit.	5% of all samples or a minimum of one sample per sampling unit.
Field blanks	All sampling.	One sample per waste site. ^b	One sample per SDG

^a Small waste sites (<10,000 ft² area) may be grouped for QC sampling. No more than 5 waste sites may grouped. all of the candidate sites must be in the same sample delivery group, and QC sampling must be performed within 2-4 weeks.

^b Work sites as described in Section I-1.

^c Sampling unit is the decisional unit, such as the overburden/layback, deep zone, or shallow zone.

QC = quality control

SDG = Sample Delivery Group.

Table III-3. Field Quality Control Sampling Requirements Summary:

QC Sample Type	Application	Frequency Reference
Trip blanks	Not applicable. Volatile-organic sampling only.	5% of all samples or a minimum of one sample per sampling unit
Equipment rinsates (blanks)	All sampling.	One sample per waste site. ¹
Field source-water blanks	Not applicable. Field-water or stream cleaning equipment only.	-
Field duplicates	All sampling.	5% of all samples or a minimum of one sample per sampling unit. ²
Field splits	All sampling.	5% of all samples or a minimum of one sample per sampling unit. ²
Co-located samples	Not applicable. Volatile-organic sampling only.	5% of all samples or a minimum of one sample per sampling unit. ²
Field blanks	All sampling.	One sample per waste site. ¹
Blind samples	To ensure data integrity.	Determined by field management.

¹Work sites as described in Section 1.1.
²Sampling unit is the decisional unit, such as the overburden/layback, deep zone, or shallow zone.

Table III-2. Field Quality Control Sampling Requirements Summary:

QC Sample Type	Application	Frequency Reference	Frequency Reference
Trip blanks	Volatile-organic sampling only.	5% of all samples or a minimum of one sample per sampling unit.	5% of all samples or a minimum of one sample per sampling unit.
Equipment rinsates (blanks)	All sampling.	One sample per waste site. ¹	One sample per SDG
Field source-water blanks	Not applicable. Field-water or stream cleaning equipment only.	-	-
Field duplicates	All sampling.	5% of all samples or a minimum of one sample per sampling unit. ²	One sample per SDG
Field splits	All sampling.	5% of all samples or a minimum of one sample per sampling unit. ²	One sample per SDG

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Table III-3. Field Quality Control Sampling Requirements Summary

<u>QC Sample Type</u>	<u>Application</u>	<u>Ungrouted Small Waste Site Frequency Reference</u>	<u>Grouted Small Waste Site Frequency Reference¹</u>
<u>Co-located samples</u>	<u>Volatile organic sampling only</u>	<u>5% of all samples or a minimum of one sample per sampling time</u>	<u>5% of all samples or a minimum of one sample per sampling time</u>
<u>Field blanks</u>	<u>All sampling</u>	<u>One sample per waste site</u>	<u>One sample per SDG</u>

¹ Small waste sites (<10,000 ft² area) may be grouped for QC sampling. However, no more than 6 waste sites may be grouped; all of the candidate sites must be in the same sample delivery group, and QC sampling must be performed within 2-4 weeks.

² Work time is defined in Section 1-1.

³ Sampling unit is the decisional unit, such as the overburden/eyebank, deep zone, or shallow zone.

QC = quality control

SDG = Sample Delivery Group

Table III-4. Size of Decision Units Relative to Size of Waste Sites¹

<u>Zone</u>	<u>Small Site Decision Unit Size</u>	<u>Medium Site Decision Unit Size</u>	<u>Large Site Decision Unit Size</u>
<u>Shallow zone</u>	<u>Entire site</u>	<u>1/2 930 m² (10,000 ft²)</u>	<u>1/3 3,700 m² (40,000 ft²)</u>
<u>Deep zone</u>	<u>Entire site</u>	<u>1/3 930 m² (10,000 ft²)</u>	<u>1/2 3,700 m² (40,000 ft²)</u>

¹ Small site is one in which the excavation footprint square footage is less than 930 m² (10,000 ft²), medium sites are greater than 930 m² (10,000 ft²) and less than 3,700 m² (40,000 ft²), large site are greater than 3,700 m² (40,000 ft²). Field instruction guide will further define number of decision units based on size of footprint.

III.3 SAMPLING METHODS

Sampling methods are shown in Table III-1. Sampling will follow SOPs per BHI-EE-01, *Environmental Investigation Procedures*. Further detail will be provided in the field instruction guide.

III.4 FIELD QUALITY CONTROL SAMPLING

Field QC sampling requirements are summarized in Table III-3. As noted in the table, small waste sites (<10,000 ft² area) may be grouped for QC sampling. However, no more than 6 waste sites may be grouped, all of the candidate sites must be in the same sample delivery group (SDG), and QC sampling must be performed within 2-4 weeks (a reasonable time frame from QP/QC standpoint).

APPENDIX E
DEBRIS IDENTIFICATION, AND SAMPLING STRATEGY

APPENDIX E

DEBRIS IDENTIFICATION, AND SAMPLING STRATEGY

E.1 Summary

The following debris identification and handling approach applies only to manufactured objects that are anomalous or unexpected and discovered during remediation of liquid waste disposal sites covered by this Sampling and Analysis Plan (SAP).

As liquid waste disposal soil sites are excavated, anomalous materials could be encountered that may qualify as hazardous debris. In order to ensure compliance with the ERDF Waste Acceptance Criteria (BHI-00139), Supplemental Waste Acceptance Criteria (000X-DC-W0001), and regulatory requirements, the excavation effort must include practices to prevent placement of restricted debris in the Environmental Restoration Disposal Facility (ERDF).

At liquid waste disposal units and associated sites, remediation waste is expected to consist predominately of the following items:

- Contaminated soil, with a much smaller percentage of non-soil debris such as scrap metal.
- Miscellaneous construction materials not associated with the waste site structure.
- Piping and associated construction materials identified for removal (steel, concrete, vitrified clay).
- Concrete with steel reinforcing and other miscellaneous construction materials from associated junction boxes, manholes, thrust blocks, and other structures.

Reasonable efforts will be made to identify unexpected materials during the normal course of waste processing by application of the observational approach at the visible and discernible face of the excavation, at the surface of interim storage stockpiles, and at the visible and discernible surface of materials within containers at the frisking station or queue. In the event that unexpected wastes are observed, such as the sighting of a lead brick in soil waste matrix, the matrix shall be designated as outlined in section E.4.

Sampling and analysis will be based on the form of waste encountered, taking into account process knowledge with emphasis on compliance with the ERDF waste acceptance criteria. Analyses may include additional parameters (radiological and other) outside of the onsite contaminants of concern (COCs). Based on test results, the material will be sent to ERDF or stored for treatment and disposal. All sampling and testing will follow best engineering judgement and be in compliance with appropriate procedures contained in BHI-EE-01, *Environmental Investigation Procedures*, and Part III of this document.

E.2 Background

The EPA has defined debris as "solid material exceeding 60 mm (2.5 inch) particle size that is: (1) a manufactured object; or (2) plant or animal matter; or (3) natural geologic material (e.g., cobbles and boulders), except that any material for which a specific treatment standard is provided in Subpart D, part 268, is not debris [e.g., lead acid or cadmium batteries have specific treatment standards]. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection" (57 FR 37194). The EPA further defines "solid material" as a material that retains its volume at room temperature without the need for support by a container. Examples of solid materials are glass, concrete, crushed drums, tanks, pipes, scrap metal, cobbles, boulders, paper, plastic, and rubber. Mixtures of debris with other materials are subject to regulation as debris if debris is the primary material present (i.e., at least 50 % by volume). This determination may be done by visual inspection.

Various waste sites in the 100 Areas contain hazardous debris mixed with a matrix of non-hazardous debris or soil. Often, these debris materials are integral parts of the overall waste matrix so that separation of the material from the matrix is difficult or impossible from the worker radiation exposure, safety and cost standpoint. This appendix provides guidance for determining the practicality of separating hazardous materials and the recommended procedures for characterizing and profiling the waste.

E.3 Scope

This Appendix shall be used by Remedial Action Projects as a guide in determining the appropriate method for characterization and disposal of debris, which contains toxicity characteristic hazardous waste.

E.4 Designation of the waste matrix

The entire matrix needs to be assessed as to whether or not it is hazardous and requires treatment before being disposed in ERDF. The determination of whether or not the matrix is hazardous is, conceptually, based on taking the matrix as a whole, homogenizing it, and taking samples of the matrix for TCLP analysis. This conceptual approach is generally not feasible in practice, however. In such instances, the methodology to be employed is to sample and analyze individual components of the matrix, and to combine the results, using an appropriate weighting, to represent the matrix as a whole. There is no specific EPA guidance for this procedure, but the guidance given in Chapter Nine of SW-846 for stratified random sampling is quite similar to the situation described.

Care should be taken in defining what constitutes the matrix. The matrix is generally the materials that are integral with or in close proximity to the hazardous component. The matrix cannot be arbitrarily defined so large that enough non-hazardous material is present to effectively dilute the hazardous component. Segregation of the hazardous components from the rest of the matrix should be done if feasible, particularly when the hazardous component is sufficiently large to render the entire matrix hazardous. A simple cost-benefit analysis may be appropriate for decision making.

The determination of whether hazardous debris can be segregated from the rest of the matrix is based on many factors including the relative volumes of hazardous and non-hazardous debris, the potential exposure of workers to increased radiation doses and/or industrial hazards and the incremental cost to the project. In general, the determination can be qualitative in nature. The decision is primarily a field-based decision and should be based on the relative ease with which the separation operation can be performed with regard to worker safety.

Once the matrix is defined, representative samples of the matrix components needs to be taken. The sampling process involves 6 steps as outlined below:

1. Categorize materials
2. Determine the relative quantities of materials
3. Perform preliminary sampling to determine whether or not the various categories are potentially hazardous
4. Determine representative numbers of samples for each category which will produce results with the required level of confidence.
5. Perform secondary sampling and analysis
6. Analyze the data and report the results.

These steps are explained in more detail in the following sections.

E.4.1. Categorize Materials

The categorization of hazardous/dangerous waste materials is generally based on process knowledge, as-built drawings, and field observations. This step is an attempt to determine the different types of materials present that should be sampled. Some materials may not need to be sampled if they are generally regarded as non-hazardous (e.g., steel-reinforcing bars).

E.4.2. Determine Relative Quantities of Materials Present

An estimate of the relative quantities of different materials present can be based on a number of different methods such as estimates from as-built drawing, process history, or field observations.

The goal here is to quantify the amount of each component that comprises the entire matrix. The quantity of materials is used in part to determine the number of samples of each material type and then in the final calculation of the matrixed result of the laboratory analyses.

E.4.3. Preliminary Sampling

Preliminary sampling is used to identify the hazardous/dangerous waste materials toxicity characteristic concentrations for each material. The analytical results along with the relative quantities of materials are then used to determine a representative number of samples required of each material that will achieve a variance on the mean that is within acceptable levels. When feasible, a minimum of 3 samples of each component should be taken so that a variance on the mean can be calculated.

E.4.4. Determine Representative Numbers of Samples

This step has several sub-steps, but in general follows the method of stratified random sampling in Chapter Nine of SW-846.

- A. Using the results obtained in Step 3, calculate preliminary estimates of the sample mean (\bar{x}_k), sample variance (s_k^2), and standard deviation (s_k) for each contaminant in each component. The sample mean is

$$\bar{x}_k = \frac{\sum_{i=1}^n x_i}{n} \quad (1)$$

Where x_i is the analytical result of the I-th sample and n is the total number of results.

The variance is

$$s_k^2 = \frac{\sum_{i=1}^n x_i^2 - n\bar{x}_k^2}{n-1} \quad (2)$$

and the standard deviation is

$$s_k = \sqrt{s_k^2} \quad (3)$$

- B. Estimate the appropriate number of samples (n_k) to be collected from the waste matrix using the following equation:

$$n_k = \frac{t_{.20}^2 s_k^2}{(RT - x_k)^2} \quad (4)$$

Where RT is the regulatory threshold defined by EPA and/or Ecology (e.g., 100 ppm for barium in the elutriate of the TCLP test), and $t_{.20}$ is the student's "t" value for the two-tailed confidence interval with a probability of 0.20 (equivalent to a one-tailed confidence interval and a probability of 0.10). Obtain $t_{.20}$ from a table of student's "t" values. Alternatively, $t_{.20}$ may be calculated using a spreadsheet and the function:

TINV(probability, degrees of freedom)

with the probability = 0.20 and degrees of freedom = n-1.

Derive individual values of n_k for each chemical contaminant of concern, for each component material. The appropriate number of samples to be taken from the waste, n_1 , is the greatest of the individual n_k values, minus the samples already collected.

Caution should be used when using this method because it can lead to very large numbers of samples if the initial estimate of the standard deviation is large. The main goal here is to have enough analytical data that the variance can be made smaller. The method outlined here assumes that the requisite number of samples is proportional to the square of the variance, and inversely proportional to the square of the difference between the mean and regulatory threshold. If for some reason, the initial data set contains a value that forces the variance high, the calculated n_i may be inordinately large. If this is the case, one strategy would be to arbitrarily reduce the magnitude of n_i and evaluate the need to take more samples when this set of data is analyzed.

E.4.5. Secondary Sampling and Analysis

Collect at least n_1 (or $n_2 - n_1, n_3 - n_2$, etc., as will be discussed later) samples from the waste (collection of a few extra samples will provide protection against poor preliminary estimates of \bar{x} and s^2) at random locations. Optimally allocate samples among components (i.e., allocate samples among components so that the number of samples collected from each component is directly proportional to s_k for that component). Other methods of allocating samples are available as discussed in SW-846.

E.4.6. Analyze the Data and Report the Results

- A. Analyze the n_1 (or $n_2 - n_1, n_3 - n_2$, etc.) samples for each chemical contaminant of concern for each component. Superficially (graphically) examine each set of analytical data from each stratum for obvious departures from normality. SW-846 offers some guidance for proceeding in situations in which the data are not normally distributed.
- B. Calculate new values of the sample mean (\bar{x}_k), sample variance (s_k^2) using equations 1 and 2. Include the preliminary data in this calculation.
- C. Calculate the sample mean (\bar{x}) and variance (s^2) for each contaminant in each component, k , by the following equations:

$$\bar{x} = \sum_{k=1}^r W_k \bar{x}_k \quad (5)$$

and

$$s^2 = \sum_{k=1}^r W_k s_k^2 \quad (6)$$

- D. If the mean (\bar{x}) for a chemical contaminant is equal or greater than the applicable RT, and is believed to be an accurate estimator of the population mean (μ), then the contaminant is considered to be present in the waste at a hazardous/dangerous concentration, and the study is completed.
- E. If the mean (\bar{x}) for a chemical contaminant is less than the applicable RT, determine the confidence interval (CI) for each contaminant of concern by the following equation:

$$CI = \bar{x} \pm t_{.20} s_{\bar{x}} \quad (7)$$

Where the standard error ($s_{\bar{x}}$) is given by

$$s_{\bar{x}} = \sqrt{\frac{s^2}{n}} \quad (8)$$

- F. If the upper limit of the CI is less than the applicable RT, the chemical contaminant is not considered to be present in the waste at a hazardous/dangerous concentration, and the study is complete. Otherwise, a tentative conclusion that the waste is hazardous/dangerous.
- G. If a tentative conclusion of hazard is reached, the factors used to calculate the confidence interval should be examined. If it is considered possible that more samples could drive the upper limit of the CI downward, more samples (n_2) may be collected. When deriving n_2 , use the most recently calculated (not preliminary) values of the sample mean (\bar{x}) and variance (s^2) and repeat the process, starting at Step 4B. above. Discretion should be used in deciding to resample. The decision to resample should be based more on the premise that the variance is too large to draw a conclusion and less on an expectation that the sample mean is somehow biased high.

E.5 Sampling Analysis and Disposal

Sampling and analysis will be based on the form of waste encountered, taking into account process knowledge with emphasis on compliance with the ERDF waste acceptance criteria. Analyses may include additional parameters (radiological and other) outside of the onsite contaminants of concern (COCs). Based on test results, the material will be sent to ERDF (meets waste acceptance criteria) or stored for treatment and disposal. All sampling and testing will follow best engineering judgement and be in compliance with appropriate procedures contained in BHI-EE-01, *Environmental Investigation Procedures*, and Part III of this document.

216-B-2-2 Ditch Borehole Geophysical Logging Data for Man-Made Gamma-Emitting Radionuclides

