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Please distribute to the following:

100/300 AREA UNIT MANAGER MEETING
ATTENDANCE AND DISTRIBUTION

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100/300 AREA UNIT MANAGERS MEETING
APPROVAL OF MEETING MINUTES

October 13, 2011

APPROVAL: M S French Date 11/10/11
Mark French, DOE/RL (A3-04)
River Corridor Project Manager

APPROVAL: Jana P. Hanson for Date 11/10/06
Briant Charboneau, DOE/RL (A6-33)
Groundwater Project Manager

APPROVAL: Nina M. Menard Date 11/10/11
Nina Menard. Ecology (H0-57)
Environmental Restoration Project
Manager

APPROVAL: Date 11/10/11
Laura Buelow, Rod Lobos, or Christopher
Guzzetti, EPA (B1-46)
100 Area Project Manager

APPROVAL: Date 11/10/11
Laura Buelow for
Larry Gadbois, EPA
(B1-46)
300 Area Project Manager

100 & 300 AREA UNIT MANAGER MEETING MINUTES

Groundwater and Source Operable Units; Facility Deactivation, Decontamination, Decommission, and Demolition (D4); Interim Safe Storage (ISS); Field Remediation (FR); and Mission Completion

October 13, 2011

ADMINISTRATIVE

- Next Unit Manager Meeting (UMM) – The next meeting will be held November 10, 2011, at the Washington Closure Hanford (WCH) Office Building, 2620 Fermi Avenue, Room C209.
- Attendees/Delegations – Attachment A is the list of attendees. Representatives from each agency were present to conduct the business of the UMM.
- Approval of Minutes – The September 8, 2011, meeting minutes were approved by the U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), and U.S. Department of Energy, Richland Operations Office (RL).
- Action Item Status – The status of action items was reviewed and updates were provided (see Attachment B).
- Agenda – Attachment C is the meeting agenda.

EXECUTIVE SESSION (Tri-Parties Only)

An Executive Session was held by RL, EPA, and Ecology prior to the October 13, 2011, UMM. Attachment D is the meeting agenda.

GENERAL

The groundwater, D4, FR, and Mission Completion presentations were provided in advance of the UMM. This allowed the presentation to be discussed "by exception." This practice will be continued for future UMMs.

100-F & 100-IU-2/100-IU-6 AREAS (GROUNDWATER, SOILS, D4/ISS)

Attachment 1 provides status and information for groundwater. Attachment 2 provides status and information for Field Remediation activities. No issues were identified and no action items were documented.

Agreement 1: Attachment 3 provides an agreement to expand the staging area for waste coming out of 100-F-57

Agreement 2: Attachment 4 provides an agreement to use water from fire water pipelines from waste site 100-F-41 (a rejected WIDS site) for dust suppression while expanding 100-F-57 to the West.

100-D & 100-H AREAS (GROUNDWATER, SOILS, D4/ISS)

Attachment 1 provides status and information for groundwater. Attachment 2 provides status and information for Field Remediation activities. No issues were identified.

Action Item 1: DOE will have CHPRC provide Ecology with a schedule for evaluating the decommissioning path-forward of the ISRM Pond and a schedule for when a meeting will be held to present recommendations.

Agreement 1: Attachment 5 provides Ecology's agreement to use the abandoned 100-H railroad berm soil for backfill.

Agreement 2: Attachment 6 provides Ecology's agreement to establish additional stockpile areas to support future remediation activities at 100-D.

Agreement 3: Attachment 7 provides Ecology's agreement that ecology's comments have been incorporated into the 132-H-3 Sampling and Analysis Instructions (SAI) and that the SAI may be implemented.

100-N AREA (GROUNDWATER, SOILS, D4/ISS)

Attachment 1 provides status and information for groundwater. Attachment 2 provides status and information for Field Remediation activities. Attachment 8 provides status and information for D4/ISS activities at 100-N. No issues were identified and no agreements or action items were documented.

100-K AREA (GROUNDWATER, SOILS, D4/ISS)

Attachment 1 provides status and information for groundwater. Attachment 2 provides status and information for Field Remediation activities. No issues were identified and no action items were documented.

Agreement 1: Attachment 9 provides *Sampling and Analysis Plan for Ex Situ Plant and Invertebrate Bioassays to Evaluate Terrestrial Environments Across the Hanford Site*, DOE/RL-2010-118, Rev. 0.

100-B/C AREA (GROUNDWATER, SOILS, D4/ISS)

Attachment 1 provides status and information for groundwater. Attachment 2 provides status and information for Field Remediation activities. No issues were identified and no action items were documented.

Agreement 1: Attachment 10 provides EPA's agreement with sampling designs for the 100-C-7 and 100-C-7:1 sidewalls.

300 AREA – 618-10/11 (GROUNDWATER, SOILS, D4/ISS)

Attachment 1 provides status and information for groundwater. No issues were identified and no action items were documented.

Agreement 1: Attachment 11 provides TPA Change Notice TPA-CN-481, revising DOE/RL-2001-48, *300 Area Remedial Action Sampling and Analysis Plan,* Rev. 3, to change the sampling frequency for designation of "process soil" from every 100 – 200 yd^3 to an observational approach.

300 AREA - GENERAL (GROUNDWATER, SOILS, D4/ISS)

Attachment 1 provides status and information for groundwater. Attachment 12 provides status of the 300 Area Closure Project activities. No issues were identified and no agreements or action items were documented.

600 AREA

Agreement 1: Attachment 13 provides TPA Change Notice TPA-CN-469, revising DOE/RL-2010-34, *Removal Action Work Plan for River Corridor General Decommissioning Activities,* Rev. 0, to add MO-480 and MO-481.

REGULATORY CLOSEOUT DOCUMENTS OVERALL SCHEDULE

No issues were identified and no agreements or action items were documented.

MISSION COMPLETION PROJECT

Attachment 14 provides status and information regarding the Orphan Sites Evaluations, Long-Term Stewardship, River Corridor Baseline Risk Assessment, the Remedial Investigation of Hanford Releases to the Columbia River, and a Document Review Look-Ahead. No issues were identified and no agreements or action items were documented.

5-YEAR RECORD OF DECISION ACTION ITEM UPDATE

No changes were reported to the status of the CERCLA Five-Year Review action Items. No issues were identified and no agreements or action items were documented.

Attachment A

100/300 AREA UNIT MANAGER MEETING
ATTENDANCE AND DISTRIBUTION
October 13, 2011

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Attachment B

100/300 Area UMM
Action List
October 13, 2011

Open (O)/ Closed (X)	Action No.	Co.	Actionee	Project	Action Description	Status
O	100-181	RL	J. Hanson	100-HR	DOE will provide Ecology with a briefing on the applicability and status of bioremediation of chromium and the associated feasibility studies.	Open: 4/14/11; Action:
O	100-189	RL	J. Hanson	100-HR	DOE will provide Ecology with the decommissioning schedule for the ISRM Pond by October 17, 2011.	Open: 9/8/11; Action:
X	100-190	RL	J. Hanson	100-D	DOE will provide Ecology with a information for filling the 182-D reservoir or an update at the October 2011 UMM.	Open: 9/8/11; Action: Closed 10/13/11
O	100-191	RL	J. Hanson	100-HR	DOE will have CHPRC provide Ecology with a schedule for evaluating the decommissioning path-forward of the ISRM Pond and a schedule for when a meeting will be held to present recommendations.	Open: 10/13/11; Action:

Attachment C

100/300 Area Unit Manager Meeting
October 13, 2011
Washington Closure Hanford Building
2620 Fermi Avenue, Richland, WA 99354
Room C209; 1:30p.m.

Administrative:

- Approval and signing of previous meeting minutes (September 2011)
- Update to Action Items List
- Next UMM (11/10/2011, Room C209)

Open Session: Project Area Updates - Groundwater, Field Remediation, D4/ISS:

- 100-F & 100-IU-2/6 Areas (Greg Sinton/Tom Post/Jamie Zeisloft)
- 100-D & 100-H Areas (Jim Hanson/Tom Post/Joanne Chance)
- 100-N Area (Joanne Chance, Rudy Guercia, Mike Thompson)
- 100-K Area (Jim Hanson, Jamie Zeisloft, Ellen Dagon, Steve Balone)
- 100-B/C Area (Greg Sinton, Tom Post)
- 300 Area - 618-10/11 exclusively (Jamie Zeisloft)
- 300 Area (Mike Thompson/Rudy Guercia)
- Regulatory Closeout Documents Overall Schedule (John Neath, Mike Thompson)
- Mission Completion Project (John Sands)

Special Topics/Other

- 5-Year Record of Decision Action Item Update (Jim Hanson)

Adjourn

Attachment D

100/300 Area Executive Session
Tri-Parties Only
October 13, 2011
Washington Closure Hanford Building
2620 Fermi Avenue, Richland, WA 99354
Room C209; 1:00-1:30 p.m.

1:00 - 1:30 p.m. **Executive Session (Tri-Parties Only):**

- K RI/FS review/response process (John Sands)
- Next Executive Session (11/10/2011, Room C209)

Attachment 1

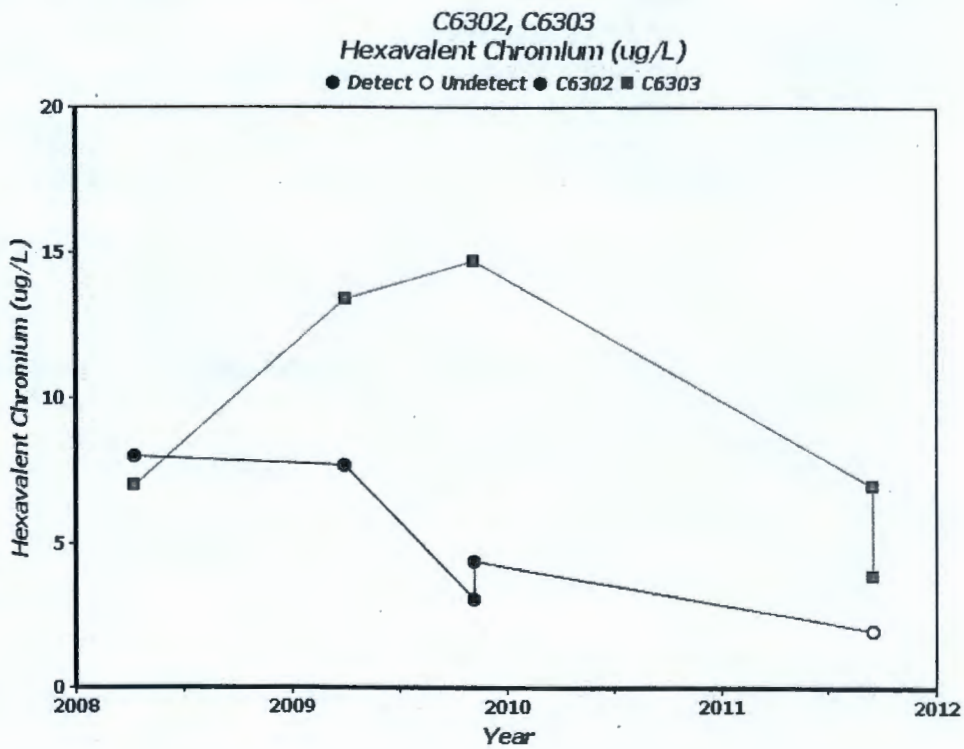
100/300 Areas Unit Managers Meeting
October 18, 2011

RL Concurrance on RI/FS Report and PP Submittal Dates
Letter 11-AMCP-0247 received from RL on October 3, 2011, concurs with the revised schedule set forth at the request of letter CHPRC-1104577, "Contract Number DE-AC06-08RL14788 – Request for Clarification Direction Regarding River Corridor Remedial Investigation/Feasibility Study and Proposed Plan Documentation Schedule," dated September 14, 2011 as identified below:

Operable Unit	TPA #	Current Tri-Party Agreement Target Date	Submittal Date to Regulators
D/H	M-015-70-T01	11/24/11	1/12/12
BC	M-015-68-T01	11/30/11	3/15/12
FIU	M-015-64-T01	12/17/11	5/14/12

100-FR-3 Groundwater Operable Unit – Nathan Bowles / Mary Hartman
(M-015-64-T01, 12/17/2011, Submit CERCLA RI/FS Report and Proposed Plan for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units for groundwater and soil.)
Schedule Status - The new planned delivery date for the 100-FIU Draft A RI/FS Report to the regulators is May 14, 2012. Field investigations are complete.
No new groundwater monitoring results to report. The full network of wells is scheduled for sampling this month.

As reported at an earlier meeting, the FY 2011 aquifer tube sampling in 100-F was incomplete because sampling was delayed from fall into CY 2011, and then the river rose in the spring and submerged the tubes. Remaining FY 2011 sampling was cancelled; however, two tubes were sampled in September. These were C6302 and C6303, located within the boundaries of the groundwater Cr(VI) plume. The September Cr(VI) concentrations in the aquifer tubes were below the aquatic standard of 10 µg/L. All of the 100-F aquifer tubes are scheduled for sampling in October.



100-HR-3 Groundwater Operable Unit – Fred Biebesheimer / John Smoot
(M-15-70-T01, 11/24/2011, Submit feasibility study report and proposed plan for the 100-HR-1, 100-HR-2, 100-HR-3, 100-DR-1 and 100-DR-2 operable units for groundwater and soil.)
Schedule Status - The new planned delivery date for the 100-D/H Draft A RI/FS Report to the regulators is January 12, 2012. Field investigations will be complete after the R5 replacement well is

installed, and slug testing is complete. A draft is being provided to DOE/RL for review by October 10th, 2011.

- HR-3 Treatment System
  - For the period September 1 through 30, 2011:
  - The HR-3 system has been placed in cold standby.
- DR-5 Treatment System
  - For the period September 1 through 30, 2011:
  - The DR-5 shut down is complete.
- DX Pump and Treat system
  - For the period September 1 through 30, 2011:
  - The DX pump and treat system is operating.
  - Total average flow through the system is 500 gpm.
  - The average influent hexavalent chromium concentration was 560 µg/L.
  - Design modifications are being prepared to protect the four wells on the flood plain from damage in future high water events. A down hole inspection of these wells was be completed in late September, and initial review suggests no damage was sustained by the well casing. Copies of the videos are being prepared for Ecology. Work packages are being prepared to repair the wells and return them to service.
  - Performance monitoring is ongoing.
- HX Pump and Treat System,
  - Construction of the facility been turned over to S&GRP operations to commence operations testing. During acceptance testing, approximately 2.6M Gal of contaminated water was treated by the facility, removing .34kg of hexavalent chromium. Influent concentrations remain approximately 35 ppb, and the system is running at approximately 550 gpm..
  - fOperational Testing is scheduled from October through December 2011.
  - Performance monitoring will be initiated concurrently with Operational Testing.
- ISRM Pond Sealing
  - The ISRM pond is largely dry.
  - CHPRC is evaluating decommissioning path forward. Upon completion of the evaluation a meeting will be held to present recommendations.
  - An ISRM pond decommissioning schedule will be added to the RD/RA WP revision. An IAMIT agreement calls for the pond decommissioning to be complete by 12/31/2011.
- RI/FS Activities
  - Fieldwork is complete, with the exception of the replacement well to be installed at the 100-D-12 waste site location (well R5). Drilling began the week of October 10th.

<u>100-NR-2 Groundwater Operable Unit – Nathan Bowles / Deb Alexander</u>

(M-015-62-T01, 9/17/2012, Submit a Feasibility Study [FS] Report and Proposed Plan [PP] for the 100-NR-1 and 100-NR-2 Operable Units including groundwater and soil. The FS Report and PP will evaluate the permeable reactive barrier technology and other alternatives and will identify a preferred alternative in accordance with CERCLA requirements.)

Schedule Status – On schedule. Field investigations are now complete with all well-drilling/sampling work completed in September (discussed further below).

- <u>RI/FS Activities</u>
  - Well drilling/sampling:
    - 199-N-182 (C8184/#R1), 199-N-183 (C8185/#2), 199-N-185 (C8187/#R2), 199-N-186 (C8188 #3), and 199-N-189 (C8191/#6) – Field activities were completed in previous months.

- 199-N-184 (C8186/#1), 199-N-187 (C8189/#4), and 199-N-188 (C8190/#5) –Well drilling and sampling were completed for all three wells as planned in the SAP, and the wells have been constructed and accepted for routine use
- 199-N-186 (C8188 #3), 199-N-187 (C8189/#4), and 199-N-188 (C8190/#5) – The three wells completed in the footprint of either the 1301-N or the 1325-N trenches will be sampled quarterly for one year using the RI/FS SAP groundwater analyte list as now required under approved TPA-CN-478.

- Apatite PRB Extension

Inititial implementation is complete for the *Design Optimization Study for Apatite Permeable Reactive Barrier Extension for the 100-NR-2 Operable Unit* (DOS; DOE/RL-2010-29, as modified by approved TPA-CN-474) for the expansion of the existing Apatite Barrier by an additional 600 feet. Well injections were completed for the upriver and downriver sections (300 feet each) of this expansion effort. The overall volume of injected solution for the upriver section was approximately 1,560,000 gallons, for an average treatment of approximately 65,000 gallons per well. The overall volume of the injected solution for the downriver section was approximately 1,428,000 gallons, for an average treatment of approximately 59,500 gallons per well. Post-injection performance monitoring and sampling will continue as planned in the DOS. These efforts are expected to result in ~~an additional~~ a total 900 foot barrier for Sr-90 removal from groundwater entering the Columbia River.

Samples were collected during the injections to track the make-up of the chemical injection fluid/Columbia River water mix prior to injection in wells for all four phases of the injections (upriver Ringold Fm. and Hanford fm. wells and downriver Ringold Fm. and Hanford fm. wells). Initial post-injection samples have been taken for both the upstream and downstream extensions. Two-week post-injection samples have also been collected from the upstream extension. Previous injections performed in 2006 to 2008 gave the following set of indicative field parameters following injections (for wells):

- Higher than normal conductivity (>1000 to >10,000 μS/cm)
- pH in the 6.6 to 8.0 range
- Low dissolved oxygen (3.0 mg/L or less)
- Low to negative Oxidation-reduction potential
- Some turbidity/color/odor

Field parameters from the current injections (monitoring wells) are all showing indications that fluid has mixed with groundwater, and the chemical reaction (ion-exchange) has started to occur.

- Higher than normal conductivity (>1000 to <7000 μS/cm)
- pH in the 6.6 to 7.7 range
- Low dissolved oxygen (2.0 mg/L or less)
- Low to negative Oxidation-reduction potential
- Some color/odor, no turbidity

Aquifer tubes nearer to the injection wells showed more indication of the injection than those further away. However, all sampled monitoring locations did show some effect in the intial post-injections samples. The biggest differences seen thus far between the last 2008 high-concentration injections and the high-concentration injections performed this September are as follows:

- no turbidity – water samples from wells and aquifer tubes are clear (no visible cloudiness)
- the color is a pale yellow, if there is any color at all

- the characteristic odor that comes from the degradation of the citrate (which allows the formation of calcium-phosphate to occur) is present in most initial samples and even more so in the two week samples.

The lack of turbidity in this set of injections is due to the high quality of the injection chemicals; they were mixed from food-grade liquids (with extremely low to no trace impurities) and ultra high-purity water (<0.5 µS/cm). The higher purity mix is causing much lower spikes in conductivity than seen in past injections, and may have decreased the "spike" seen in previous injections. As analytical data become available, we will update this discussion in upcoming UMMs.

- Apatite PRB Performance Monitoring
  The low river stage performance monitoring is tentatively scheduled for the end of October (or first week of November).

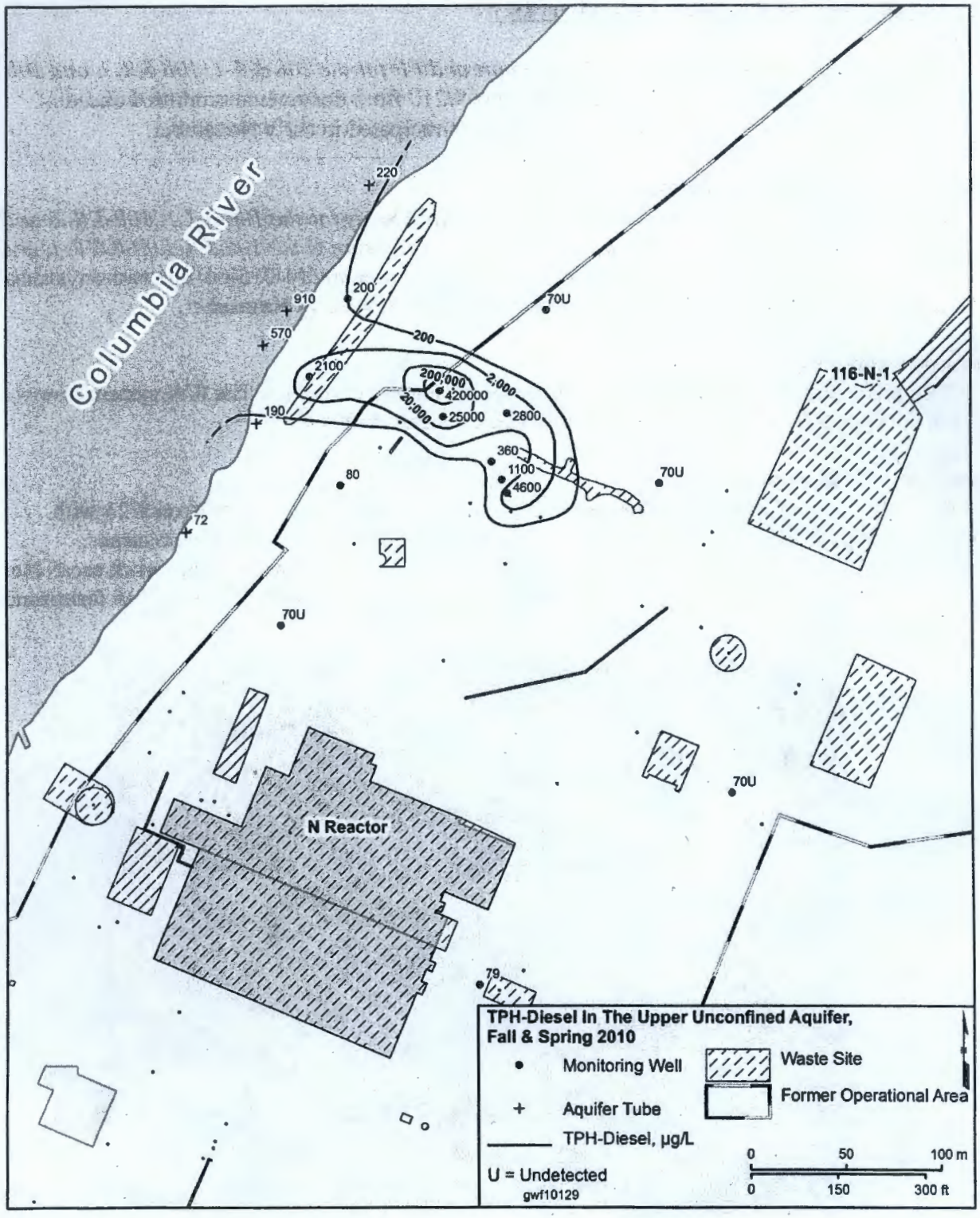
- Diesel Plume and Monitoring Data
  All five WCH wells were sampled in late May/early June (199-N-167, -169, -170, -171, and -172). The table below shows data from the main wells and aquifer tubes which have had TPH-D detections in the last three years.

Well Name	Date / TPH-D	Date / TPH-D	Date / TPH-D	Date / TPH-D
199-N-18	8-20-09 / 16,000 µg/L	7-09-10 / 420,000 µg/L	12-5-10 / 41,000 µg/L	2-27-11 / 48,000 µg/L
199-N-96A	9-15-09 / 260 µg/L	11-14-10 / 200 µg/L		1-18-11 / 70 µg/L (U)
199-N-167	8-20-09 / 3100 µg/L	4-23-10 / 4600 µg/L		5-25-11 / 70 µg/L (U)
199-N-169		4-23-10 / 1100 µg/L		5-20-11 / 760 µg/L
199-N-170		4-23-10 / 360 µg/L		5-20-11 / 70 µg/L (U)
199-N-171		4-23-10 / 2800 µg/L		6-08-11 / 70 µg/L (U)
199-N-172	8-20-09 / 2400 µg/L	4-23-10 / 25,000 µg/L		5-25-11 / 70 µg/L (U)
199-N-173	9-16-09 / 2100 µg/L	9-15-10 / 2100 µg/L		
C6132	12-19-09 / 70 µg/L (U)	9-16-10 / 190 µg/L		6-01-11 / 70 µg/L (U)
N116mArray-0A	9-17-09 / 810 µg/L	9-16-10 / 570 µg/L		6-01-11 / 70 µg/L (U)
C6135	12-17-09 / 770 µg/L	9-16-10 / 910 µg/L		6-01-11 / 80 µg/L (U)
N116mArray-1A	12-17-09 / 70 µg/L (U)	9-16-10 / 220 µg/L		6-01-11 / 70 µg/L (U)

U = non-detect

One thing to note is the drop in N-18 between July and December of 2010. During this time period, passive diesel removal (Smart sponges) was not occurring in the well due to sponge breakage and subsequent well cleaning. The only activity occurring in the vicinity of N-18 during that time was the high volume bioremediation test being performed by WCH. As reported in the 2010 Annual GW Report (DOE/RL-2011-01), we believe that this test is the reason for the substantial decrease in TPH-D concentration from July to December. The test is also believed to have contributed to the near lack of detections in most upland wells, in samples collected thus far in 2011. The only upland wells where we could still detect diesel were N-18 and N-169, One more point, the high river levels through most of June and into July of 2011 could also have affected the wells closer to the river, which is why we have non-detect results in N-96A and the aquifer tubes. 199-N-173 will not be sampled again until this month. Samples have been collected in September 2011 for N-96A, N-18, and several aquifer tubes and will be reported in a later UMM as data becomes available. The previous plume map (2010) is given below (DOE/RL-2011-01). We will not generate a new plume map for 2011 until all the well and aquifer tube data are in for the year.

Smart sponge removal data (for N-18) for this year will be reported at the next UMM, to allow for more data to be reported. So far this year, we have only one set of data, and a new set will be available later this month.


Columbia River
220
910
570
200
200
70U
2100
200,000
420000
2,000
20,000
25000
2800
190
360
1100
4600
80
70U
116-N-1
72
70U
70U
N Reactor
79
TPH-Diesel In The Upper Unconfined Aquifer,
Fall & Spring 2010
Monitoring Well
Aquifer Tube
TPH-Diesel, µg/L
U = Undetected
gwf10129
Waste Site
Former Operational Area
0
50
100 m
0
150
300 ft

100/300 Areas Unit Managers Meeting
October 18, 2011

100-KR-4 Groundwater Operable Unit – Bert Day

- **Milestones:**
  - M-015-66-T01: *Submit CERCLA RI/FS Report and PP for the 100-KR-1, 100-KR-2, and 100-KR-4 Operable Units for groundwater and soil*, due 9/21. Both documents submitted ahead of schedule on 9/19 for a 45 day review; comments anticipated in early November.

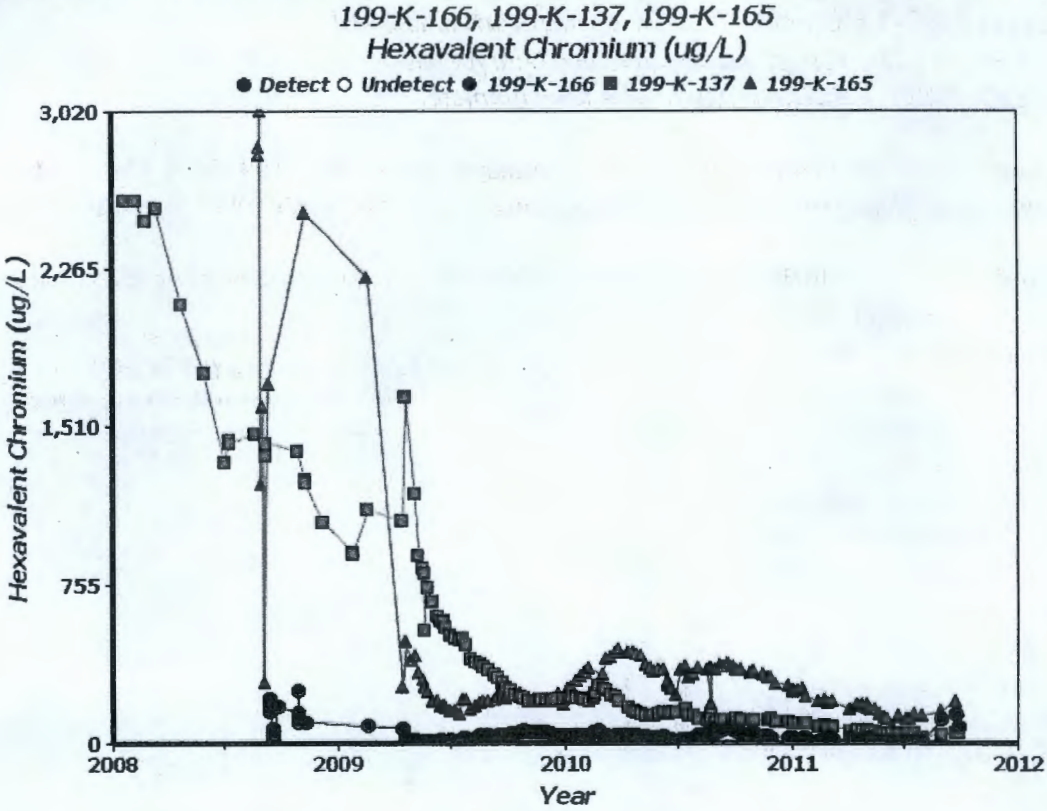
- **CERCLA Process Implementation:**
  - Draft A of both the *Remedial Investigation/Feasibility Study for the 100-KR-1, 100-KR-2, and 100-KR-4 Operable Units* and the *Proposed Plan for Remediation of the 100-KR-1, 100-KR-1, and 100-KR-4 Operable Units*, were submitted to EPA on 9/19 (meeting M-015-66-T01 two days ahead of schedule) for a 45 day review. Comments are anticipated in early November.

- **Remedial Actions:**
  - KR-4, KX, and KW pump and treat systems are operating normally. The KW system is now operating with SIR-700 resin modifications (see discussion below).

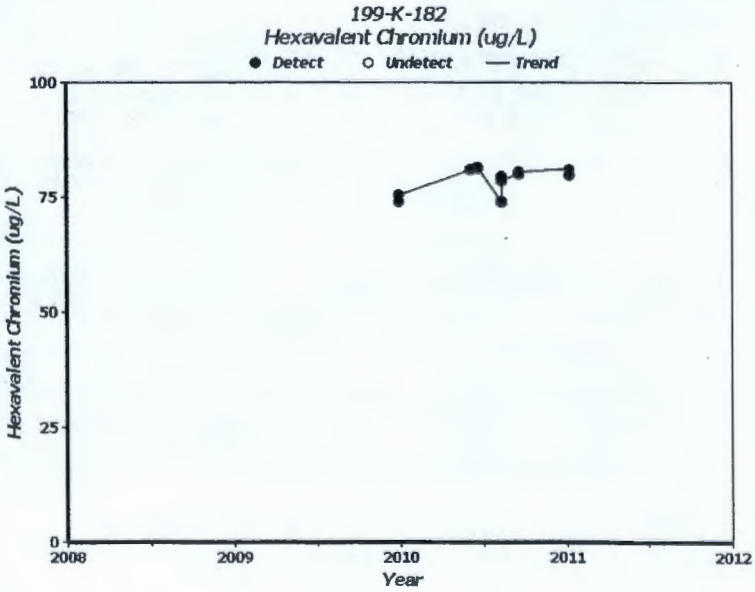
- **Monitoring & Reporting:**
  - KR4 P&T cultural resources monitoring: This month's monitoring occurred on 9/23 with participation of one individual representing the CTUIR. The results yielded no issues.
  - 199-K-36: Additional excavation occurred around 199-K-36 to make a stable work area. Next activities include performing a camera survey and visual examination of the area to determine if the well is permanently damages and requires decommissioning.

  - Well Monitoring:
    - The following wells were sampled in August or September 2011. In addition to these routine samples, operators collected samples from the extraction wells.
      - Compliance: 199-K-32A and 199-K-117A
      - Monitoring: 199-K-34, 106A, 108A, 111A, 125A, 149, 150, 173, and 183
      - Extraction: 199-K-137, 141, 152, and 165

- Recent hexavalent chromium results were on trend (declining or steady) with the exception of well 199-K-166, a KW extraction well. This well was sampled four times between August 1 and end of September and chromium concentration varied from <10 µg/L to a maximum of 138 µg/L. The increase in concentrations is within the range measured in nearby extraction wells 199-K-137 and 199-K-165. Nearby RI well 199-K-184 has no new data since July (12 µg/L).



- The following trend chart for hexavalent chromium in well 199-K-182 (southeast of the 116-K-2 trench near injection well 199-K-143) is provided in response to Ecology's interest. The well was last sampled in January 2011 and is scheduled for sampling this month (October 2011) and semiannually thereafter. This well is identified as a future extraction well. Efforts are underway to prioritize funds to support this effort.



- **Modifications & Expansions**
  - Phase 3 Realignment:
    - Completed well 199-K-196 (north of 105-KW) on September 29, 2011; laboratory data is in progress
  - ResinTech SIR-700:
    - Completed loading the SIR-700 resin in KW P&T Train B; the system is now running 100% with this new resin.

- Initiated development of the Test Report evaluating the use of SIR-700 at KW
- KX Trailers: Completed power installationg on September 29, 2011.

100-BC-5 Groundwater Operable Unit – Nathan Bowles / Mary Hartman

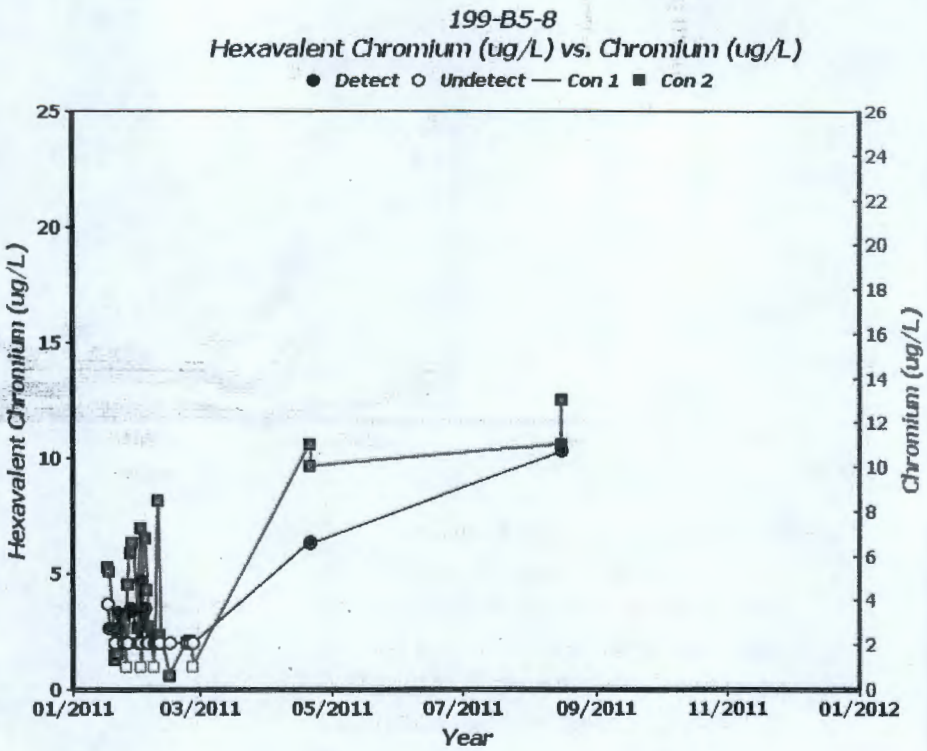
(M-015-68-T01, 11/30/2011, Submit CERCLA RI/FS Report and Proposed Plan for the 100-BC-1, 100-BC-2 and 100-BC-5 Operable Units for groundwater and soil.)

Schedule Status - The new planned delivery date for the 100-BC Draft A RI/FS Report to the regulators is March 15, 2012. Field investigations are complete.

FY 2011 groundwater sampling was completed except for one well, 199-B2-16. The delays were caused by electrical grounding concerns associated with pumps, or access issues related to high fire danger.

The new wells are next scheduled for sampling in October. They will complete the required one year of quarterly sampling in October or January, depending on the well.

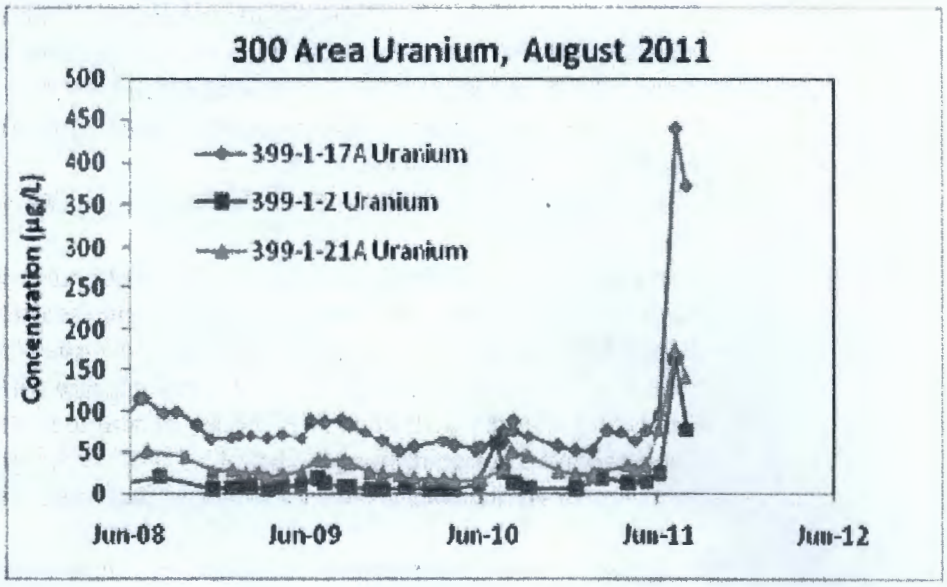
The only new data received during the past month were from well 199-B5-8, located southeast of 100-BC. Total and hexavalent chromium increased to a bit over 10 µg/L in August. Total chromium was 11 µg/L in the unfiltered sampled and 13 µg/L in the filtered sample. The Cr(VI) concentration was 10.3 µg/L. In the graph below, total chromium is plotted in green and Cr(VI) in black. TCE continued to be detected at a low level in the same well (2.2 µg/L, flagged "J" for estimated). Other constituents (Sr-90, tritium, nitrate) were on trend and far below DWS.



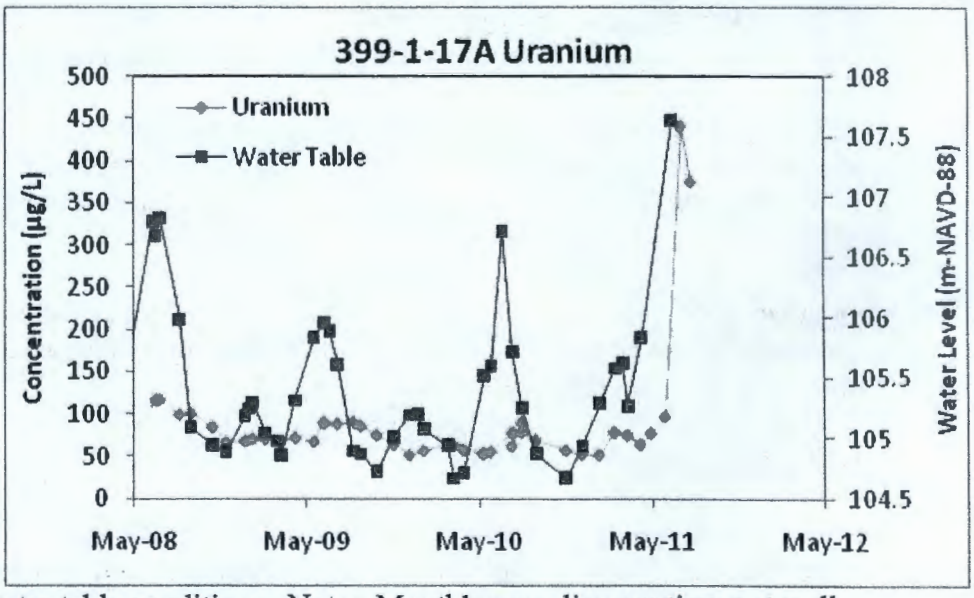
300-FF-5 Groundwater Operable Unit – Marty Doornbos

(M-015-72-T01, 12/31/2011, Submit CERCLA RI/FS Report and Proposed Plan for the FF-5 Operable Units for groundwater and soil.)

- Schedule Status - On Schedule to meet TPA milestone. All field investigations are complete.
- *300 Area RI/FS Report:* Decisional draft report sent to RL on October 11th for review.
- 300-FF-5 Operations and Maintenance Plan Activities (DOE/RL-95-73, Rev. 1, 2002)



Uranium Plume The most recent analytical results are for samples collected in September 2011. The significant increases in groundwater contamination by uranium because of the unusually high water table conditions in June have reversed their trend, with fall results showing generally lower concentrations. Uranium concentrations were most significantly elevated at several wells in the vicinity of the former 300 Area Process Trenches and Ponds (see trend chart). For wells near the river, where uranium concentrations were dramatically reduced by the intrusion of river water in June, concentrations have started to rise back to their previous levels, as expected.



Special sampling near the 618-1 Burial Special sampling Ground/Acid Neutralization Pit remediation site: No new information to report regarding potential impacts on groundwater because of residual uranium remaining throughout the vadose zone impacted by discharge to the neutralization pit. The increased uranium concentrations observed at 399-1-21A and 399-1-2 in June (see graph above) are attributed to the unusually high water table conditions. Note: Monthly sampling continues at wells 399-1-2A and 399-1-2, although remediation activities are essentially complete at these waste sites.

Groundwater contamination associated with 618-7 Burial Ground remediation activities Uranium concentrations at 399-8-5A, located adjacent to the former burial ground, increased to 195 ug/L during the June period of high water table conditions, suggesting that some mobile uranium remains in the lower portion of the vadose zone at that location. The source for that uranium is presumed to be downward migration during excavation activities that included extensive use of dust control water and soil fixatives.

326 Pipeline Leak: On 7/17/2011, a potable water pipeline failed and released an estimated 100,000 gallons of water near the southeast corner of the 326 building. The monitoring at wells nearby has been increased to the following (monitoring response plan submitted to RL and EPA approved on 7/20/2011):

- 399-3-2 and 399-3-3 will be monitored every 10 days for one month for gross alpha, gross beta, and field parameters and within one month for uranium, major cation, and major anion concentrations. Note: 399-3-2 was sampled on 8/4/2011.
- 399-3-6 will be sampled as soon as possible for the currently scheduled sample (uranium, major cations, anions, etc).
- 399-6-5 (new well as part of recent RI drilling) will be sampled as soon as possible as a baseline well.
- Based on the gross alpha, gross beta, and field parameters results, CHPRC will determine which wells are best fit for monthly sampling for the duration of four months.
- Initial Results: Results available as of early September indicate that gross alpha and gross beta concentrations are within their normal range for these wells, with the possible exception of gross alpha at 399-3-6 for a sample collected on 8/10/2011, which was twice the expected concentration at ~30 pCi/L (DWS for gross alpha is 15 pCi/L). Subsequent values for September are back to their typical range, and the August value is under review.

324 Building issue: The most recent groundwater results for wells in the vicinity of the building are for samples collected in late August/early September. The available radiological screening data do not reveal clear evidence for groundwater impacts from releases at the building.

618-11 Burial Ground Subregion: The most recent results for tritium concentrations are for samples collected in August, and are consistent with historical trends and expectations.

618-10 Burial Ground/316-4 Cribs Subregion: Awaiting results for sampling conducted post-startup of excavation activities at the burial ground. Excavations planned for the near future will include the need to remove 699-S6-E4A (monitors conditions beneath the former 316-4 Cribs) and 699-S6-E4C, which is not in the current monitoring network).

Annual Reports

Groundwater Annual Report - The 2010 site-wide annual groundwater report issued on August 26, and transmitted to RL on August 30, 2011.

General Discussion

The Stop work for the use of dedicated submersible pumps has been lifted. The well access list was revised to include the electrical bonding requirements for each well. Additionally, the groundwater sampling procedure was revised to require the use of a temporary grounding strap pending permanent electrical bonding of the wells.

Attachment 2

October 13, 2011 Unit Manager's Meeting
Field Remediation Status

100-B/C

- Continued remediation efforts at 100-C-7 & 100-C-7:1
  - 100-C-7, 244,000 bank cubic meters removed, excavation depth 71 feet
  - 100-C-7:1, 458,000 bank cubic meters removed, excavation depth 61 feet

- Continued load-out activities
  - Truck and pup, 113,000 tons
  - ERDF cans, 39,00tons
  - LDR material, 15,000 tons

100-D

- Continued demo, processing and load-out at 100-D-50:6
- Restarted excavation and sampling at 100-D-100
- Started load-out of 100-D-100.
- Continued preparation for anomaly processing final anomalies at 118-D-3
- Continued preparation for remediation of 100-D-8 below ordinary high water mark
- Began backfill of 130-D-1, 600-30, 628-3, 100-D-13 and 100-D-31:4, continued backfill of 100-D-31:3 and 128-D-2

100-F

- Completed excavation and stockpiling of western deeper portion of 100-F-57 plume to -35 ft
- Began overburden removal on the western portion of 100-F-57 to prepare for enlarging the excavation to the west

100-H

- Began overburden removal at 100-H-28:2 and :4
- Preparing for demolition and load-out of 100-H excess trailers
- Continued miscellaneous restoration activities

100-K

- Continued excavation and load-out at trench I
- Conducting final cleanup activities (downposting/surveying/sampling/spot removal) at trenches N and J/L
- Continued orphan site cleanup work at 600-29

100-N

- Continued excavation, processing and load-out of 100-N-61, 100-N-63 and 100-N-64
- Continued load-out of miscellaneous debris at UPR-100-N-19, 21, 22, 23, 42 and 36
- Initiated load-out of UPR-100-N-19 and UPR-100-N-36 stockpiles via truck and pup

618-10 Trench Remediation

- Continued Excavation of East Trench
- Set up Sampling Tents at Drum Punch #2 Area
- Performed Soil Sampling and Plating at East Trench
- Continued development of the "in trench" bottle processing.

100-IU-2/6

- 600-149:1 (Small Arms Range UXO) continued the closure process
- 600-186 (Hanford Construction Camp Septic and Pipelines) closure process complete
- 600-3 backfill complete, continued site grading, awaiting construction of a snake pit and revegetation
- 600-108, 600-109, 600-120, 600-124, 600-127, 600-176, 600-178, 600-182, 600-188, 600-202, 600-205, 600-280 backfill and/or recon touring complete, awaiting revegetation.
- 600-5, 600-100, 600-125, 600-146 backfilled and revegetated. All work completed.

Non-Milestone Sites

- Waiting for completion of cultural review prior to remediation at the IU farmstead sites
- Waiting for completion of cultural review prior to remediation at the IU White bluffs sites
- Waiting for completion of cultural review prior to remediation at the IU shoreline sites

Attachment 3

161557

^WCH Document Control

From: Saueressig, Daniel G
Sent: Wednesday, October 12, 2011 7:50 AM
To: ^WCH Document Control
Subject: FW: REQUEST FOR STAGING AREA EXPANSION

Attachments: MO980_20111005113417.PDF

MO980_201110051
13417.PDF (139 ...

Please provide a chron number (and include the attachment). This email documents a regulatory approval.

Thanks,

Dan Saueressig
FR Environmental Project Lead
Washington Closure Hanford
521-5326

-----Original Message-----
From: Guzzetti.Christopher@epamail.epa.gov [mailto:Guzzetti.Christopher@epamail.epa.gov]
Sent: Wednesday, October 05, 2011 3:09 PM
To: Post, Thomas C
Cc: Saueressig, Daniel G; Jakubek, Joshua E
Subject: RE: REQUEST FOR STAGING AREA EXPANSION

I concur as well.

Christopher J. Guzzetti
U.S. EPA Region 10
Hanford Project Office
Phone: (509) 376-9529
Fax: (509) 376-2396
Email: guzzetti.christopher@epa.gov

From: "Post, Thomas" <Thomas.Post@rl.doe.gov>
To: "Saueressig, Daniel G" <dgsauere@wch-rcc.com>, Christopher Guzzetti/R10/USEPA/US@EPA
Cc: "Jakubek, Joshua E" <jejakube@wch-rcc.com>
Date: 10/05/2011 02:00 PM
Subject: RE: REQUEST FOR STAGING AREA EXPANSION

I concur, Dan.

Tom

From: Saueressig, Daniel G
Sent: Wednesday, October 05, 2011 12:06 PM
To: Guzzetti.Christopher@epamail.epa.gov; Post, Thomas
Cc: Jakubek, Joshua E

Subject: REQUEST FOR STAGING AREA EXPANSION

Chris/Tom, I need to request you approval to expand the staging area for waste coming out of 100-F-57, see attached drawing. We're running out of room and probably will need this area by next week.

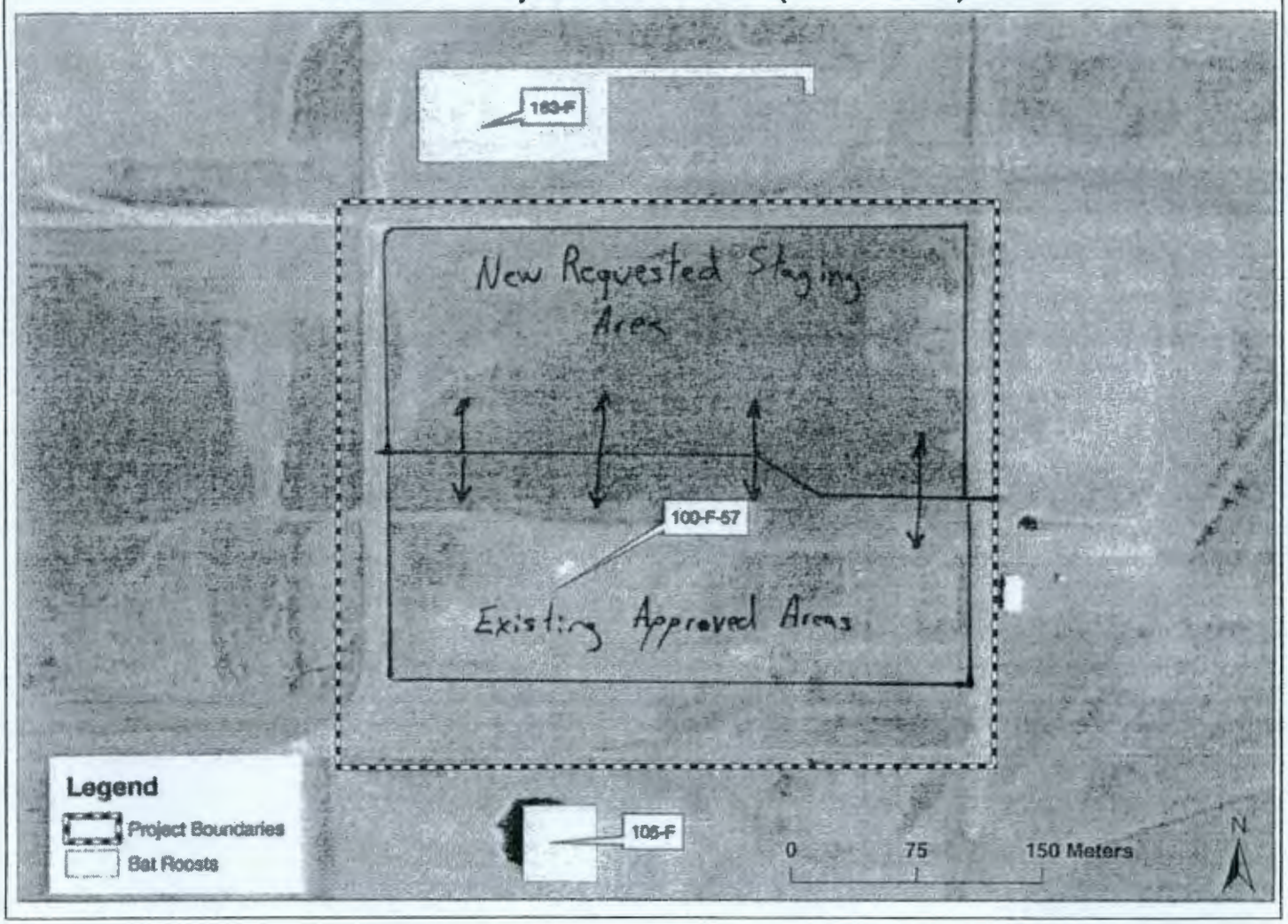
Let me know if you concur and we can document the agreement at the next UMM.

Thanks,

Dan Saueressig
FR Environmental Project Lead
Washington Closure Hanford
521-5326

<<MO980_20111005113417.PDF>>

100-F-57 Project Boundaries (11-ER-064)



Attachment 4

161519

^WCH Document Control

From: Saueressig, Daniel G
Sent: Wednesday, October 12, 2011 8:43 AM
To: ^WCH Document Control
Subject: FW: REQUEST TO USE WATER FOR DUST SUPPRESSION

Please provide a chron number, this email documents a regulatory approval.

Thanks,

Dan Saueressig
FR Environmental Project Lead
Washington Closure Hanford
521-5326

-----Original Message-----
From: Guzzetti.Christopher@epamail.epa.gov [mailto:Guzzetti.Christopher@epamail.epa.gov]
Sent: Thursday, October 06, 2011 3:52 PM
To: Post, Thomas C
Cc: Saueressig, Daniel G; Fancher, Jonathan D (Jon); Jakubek, Joshua E
Subject: RE: REQUEST TO USE WATER FOR DUST SUPPRESSION

I concur as well.

Christopher J. Guzzetti
U.S. EPA Region 10
Hanford Project Office
Phone: (509) 376-9529
Fax: (509) 376-2396
Email: guzzetti.christopher@epa.gov

From: "Post, Thomas" <Thomas.Post@rl.doe.gov>
To: "Saueressig, Daniel G" <dgsauere@wch-rcc.com>, Christopher Guzzetti/R10/USEPA/US@EPA
Cc: "Jakubek, Joshua E" <jejakube@wch-rcc.com>, "Fancher, Jonathan D (Jon)" <jdfanche@wch-rcc.com>
Date: 10/06/2011 03:14 PM
Subject: RE: REQUEST TO USE WATER FOR DUST SUPPRESSION

I concur.

Tom

From: Saueressig, Daniel G
Sent: Thursday, October 06, 2011 3:12 PM
To: Guzzetti.Christopher@epamail.epa.gov; Post, Thomas
Cc: Jakubek, Joshua E; Fancher, Jonathan D (Jon)
Subject: REQUEST TO USE WATER FOR DUST SUPPRESSION

Chris/Tom, we encountered some fire water lines (2 20" and 1 10" lines) while expanding the 100-F-57 excavation to the west. These pipelines are from waste site 100-F-41 (a rejected WIDS site) and still contain water. A pH was taken of the water and it was neutral (pH 7). With your concurrence, we'd like to use this water as dust suppression while expanding the 100-F-57 to the west. We estimate there may be a couple thousand

gallons of water in these lines.

Let me know if you concur and I'll document this at the next UMM.

Thanks,

Dan Saueressig
FR Environmental Project Lead
Washington Closure Hanford
521-5326

Attachment 5

161220

^WCH Document Control

From: Saueressig, Daniel G
Sent: Wednesday, September 14, 2011 12:25 PM
To: ^WCH Document Control
Subject: FW: APPROVAL TO USE 100-H RAILROAD BERM SOIL FOR BACKFILL

Please provide a chron number. This email documents a regulatory approval.

Thanks,

Dan Saueressig
521-5326

From: Seiple, Jacqueline (ECY) [mailto:jash461@ecy.wa.gov]
Sent: Wednesday, September 14, 2011 9:48 AM
To: Saueressig, Daniel G
Cc: Kapell, Arthur (ECY); Chance, Joanne C; Wilkinson, Stephen G; Landon, Roger J; Menard, Nina; Boyd, Alicia
Subject: RE: APPROVAL TO USE 100-H RAILROAD BERM SOIL FOR BACKFILL

Dan,

This looks fine. I concur that it is ready for agreement at the next UMM. I will let Nina know.

Thanks,
Jacqui

From: Saueressig, Daniel G [mailto:dgsauere@wch-rcc.com]
Sent: Wednesday, September 14, 2011 7:08 AM
To: Seiple, Jacqueline (ECY)
Cc: Kapell, Arthur (ECY); Chance, Joanne C; Wilkinson, Stephen G; Landon, Roger J
Subject: APPROVAL TO USE 100-H RAILROAD BERM SOIL FOR BACKFILL

Jacqui, the following summary was prepared to document the past agreements and sample results related using the old abandoned railroad berm at 100-H for backfill. If you concur with this summary, please reply with your concurrence and I'll document this agreement at the next UMM.

Agreement was reached with Ecology (documented in the October 2009 Unit Managers Meeting) to scrape 1 foot of material off the old railroad berm that was made to support construction of the 105-H Reactor (refer to attached drawings) in hopes of using the remaining soil for backfill of waste sites at 100-H. After the foot of soil was removed, radiological surveys were performed and soil samples were taken at locations agreed to by Ecology and analyzed for ICP metal, mercury, hexavalent chromium, PCBs and TPH. The sample results showed MTCA 2007 levels were exceeded for a number of organic contaminants. In December 2010, Ecology agreed (documented in the January 2011 Unit Mangers Meeting) to allow additional material be removed from the railroad berm and re-sampled. An additional foot of material was removed and the area was resampled. Only one sample showed elevated results (this sample, HEIS #J1H181, was inadvertently taken in the wrong location). An additional foot of material was removed from this area (1 foot of soil was removed halfway to the next closest sample points to the north and south (refer to attached drawings) and resampled. Sample data for the six samples (HEIS sample #'s J1H175, J1H176, J1H177, J1JM5, J1H179 and J1JVM6) showed there were no exceedances to MTCA 2007, therefore, use of the remaining railroad berm soil is authorized.

Thanks,

Dan Saueressig
ER Environmental Project Lead

Washington Closure Hanford
521-5326

161220

<< File: ENW01_13A.PDF >>

Attachment 6

^WCH Document Control 161355

From: Saueressig, Daniel G
Sent: Monday, September 26, 2011 10:15 AM
To: ^WCH Document Control
Subject: FW: 100-D Stockpile Area Requests
Attachments: SPA Request_9-13-11.PDF

Please provide a chron number (and include the attachment). This email documents a regulatory agreement.

Thanks,

Dan Saueressig
521-5326

From: Boyd, Alicia (ECY) [mailto:aboy461@ecy.wa.gov]
Sent: Monday, September 26, 2011 9:20 AM
To: Laurenz, Julian E; Kapell, Arthur (ECY); Post, Thomas C
Cc: Curcio, Joseph P; Saueressig, Daniel G
Subject: RE: 100-D Stockpile Area Requests

Tom/Dan/Julian
Ecology approves of the locations for the new stockpiles/Staging Areas in the attached file.

Alicia L. Boyd
Washington State Department of Ecology
3100 Port of Benton Boulevard
Richland, Washington 99354
Ph - 509-372-7934
Fx - 509-372-7971

From: Laurenz, Julian E [mailto:jelauren@wch-rcc.com]
Sent: Thursday, September 22, 2011 5:30 PM
To: Boyd, Alicia (ECY); Post, Thomas C
Cc: Curcio, Joseph P; Saueressig, Daniel G; Kapell, Arthur (ECY)
Subject: RE: 100-D Stockpile Area Requests

Alicia/Tom,

I just reviewed our reference maps and neither SPA #1 or SPA #2 fall within the former orchard lands areas.

Please let me know if you have any questions.

Thanks,
Julian

From: Laurenz, Julian E [mailto:jelauren@wch-rcc.com]
Sent: Tuesday, September 13, 2011 6:55 PM
To: Boyd, Alicia (ECY); Kapell, Arthur (ECY); Varljen, Robin (ECY)
Cc: Curcio, Joseph P; Saueressig, Daniel G

161355

Subject: 100-D Stockpile Area Requests

Alicia/Robin/Artie,

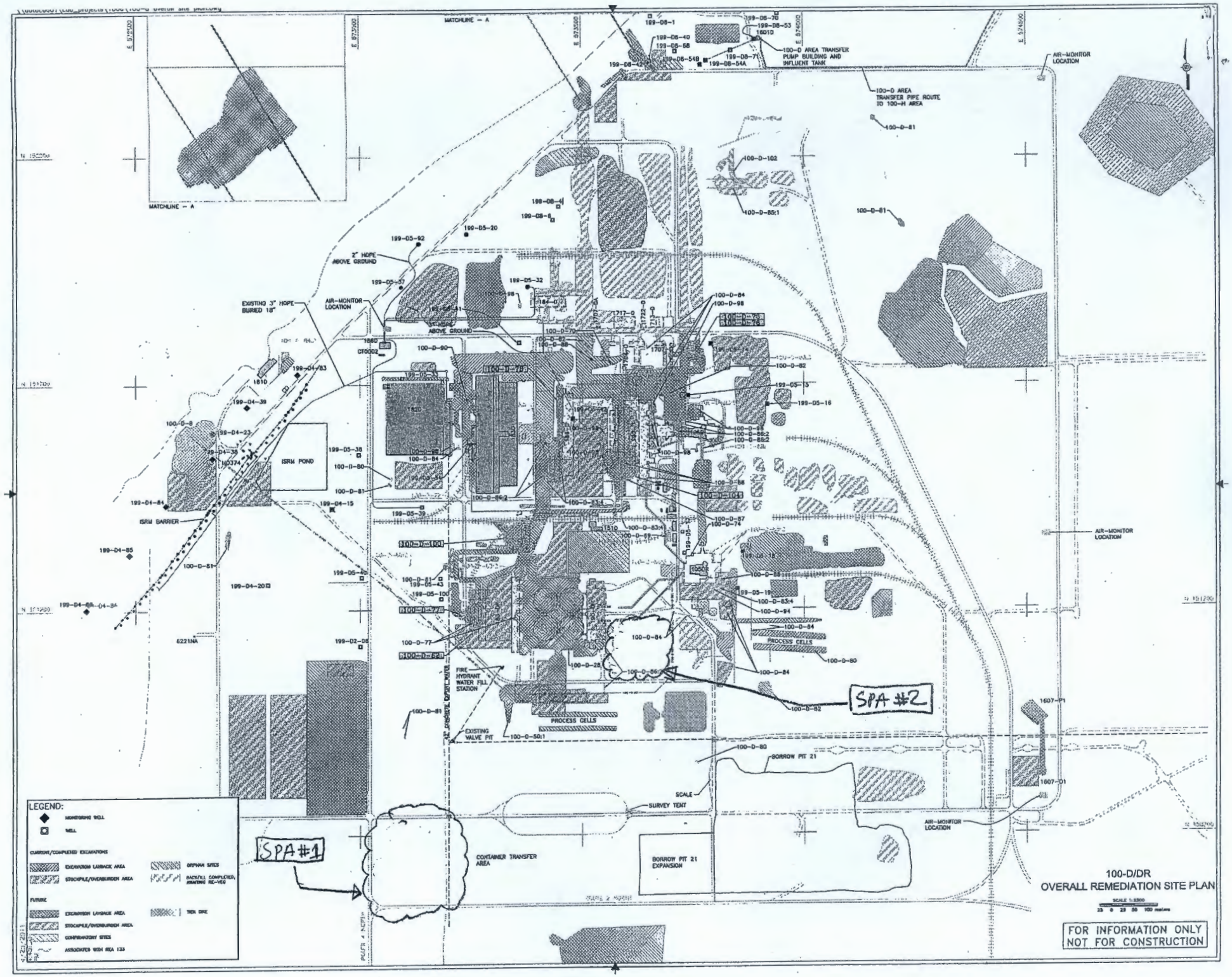
How is it going? The purpose of this e-mail is to request additional ACL stockpile areas (SPAs) to support future activities. Specifically, we'll need the SPAs to support high-priority chrome site remediations.

As you'll see on the attached sketch, I've highlighted two additional SPAs we need to support remediation activities (SPA #1, 2). All these areas have been approved through our cultural and ecological process, and do not interfere with future remediations.

If you feel the SPAs are acceptable, I'd like to get approval by COB Wednesday, September 21.

Thanks,
Julian

<< File: SPA Request_9-13-11.PDF >>


100-D/DR
OVERALL REMEDIATION SITE PLAN
SCALE 1:2500
FOR INFORMATION ONLY
NOT FOR CONSTRUCTION
LEGEND:
MONITORING WELL
WELL
CURRENT/COMPLETED EXCAVATIONS
EXCAVATION LAYBACK AREA
STOCKPILE/OVERBURDEN AREA
ORPHAN SITES
BACKFILL COMPLETED, AWAITING RE-VEG
FUTURE
EXCAVATION LAYBACK AREA
STOCKPILE/OVERBURDEN AREA
CONFIRMATORY SITES
ASSOCIATED WITH RIA 133
TEN DRE
SPA #1
SPA #2
MATCHLINE – A
AIR-MONITOR LOCATION
100-D AREA TRANSFER PUMP BUILDING AND INFLUENT TANK
100-D AREA TRANSFER PIPE ROUTE TO 100-H AREA
2" HDPE ABOVE GROUND
EXISTING 3" HDPE BURIED 18"
ISRM POND
ISRM BARRIER
FIRE HYDRANT WATER FILL STATION
EXISTING VALVE PIT
PROCESS CELLS
BORROW PIT 21
SCALE
SURVEY TENT
CONTAINER TRANSFER AREA
BORROW PIT 21 EXPANSION

Attachment 7

From: Menard, Nina (ECY) [nmen461@ECY.WA.GOV]

161476

Sent: Thursday, July 21, 2011 4:24 PM

To: Proctor, Megan L; Harrison, Robert P; Chance, Joanne C

Cc: Boyd, Alicia; Smith-Jackson, Noe'L; Kapell, Arthur; Thompson, Wendy S

Subject: RE: Comments on 132-H-3 Sampling and Analysis Instructions

Megan,

Ecology comments have been incorporated into the 132-H-3 Sampling and Analysis Instructions (SAI)and you may proceed with implementing the SAI. Please enter the SAI into the meeting minutes at the next 100/300 Area UMM.

Please let me know if you have any questions.

Nina Menard

-----Original Message-----
From: Proctor, Megan L [mailto:mlprocto@wch-rcc.com]
Sent: Thu 7/21/2011 9:27 AM
To: Menard, Nina (ECY); Harrison, Robert P; Chance, Joanne C
Cc: Boyd, Alicia (ECY); Smith-Jackson, Noe'l (ECY); Kapell, Arthur; Thompson, Wendy S
Subject: RE: Comments on 132-H-3 Sampling and Analysis Instructions

Sounds great.

Thanks, Nina.

From: Menard, Nina (ECY) [mailto:nmen461@ECY.WA.GOV]
Sent: Thursday, July 21, 2011 9:26 AM
To: Proctor, Megan L; Harrison, Robert P; Chance, Joanne C
Cc: Boyd, Alicia; Smith-Jackson, Noe'L; Kapell, Arthur; Thompson, Wendy S
Subject: RE: Comments on 132-H-3 Sampling and Analysis Instructions

An e-mail would be fine. Once I verify that the changes have been made per the comments, I will send the e-mail and then I understand that it is entered into the UMM meeting minutes.

From: Proctor, Megan L [mailto:mlprocto@wch-rcc.com]
Sent: Thursday, July 21, 2011 8:59 AM
To: Menard, Nina (ECY); Harrison, Robert P; Chance, Joanne C
Cc: Boyd, Alicia (ECY); Smith-Jackson, Noe'l (ECY); Kapell, Arthur; Thompson, Wendy S
Subject: RE: Comments on 132-H-3 Sampling and Analysis Instructions

Hi Nina. We don't have a signature sheet for this white paper sampling strategy. Can I use your email as concurrence or would you prefer we create a signature sheet?

Megan

From: Menard, Nina (ECY) [mailto:nmen461@ECY.WA.GOV]
Sent: Thursday, July 21, 2011 7:49 AM
To: Proctor, Megan L; Harrison, Robert P; Chance, Joanne C
Cc: Boyd, Alicia; Smith-Jackson, Noe'L; Kapell, Arthur; Thompson, Wendy S
Subject: RE: Comments on 132-H-3 Sampling and Analysis Instructions

I will be in the 200 UMM meeting this afternoon. The meeting starts at 2:30. So if the document gets here before 2:00, I will sign it. If not. I am here tomorrow morning and I will sign it then.

Thanks

From: Proctor, Megan L [mailto:mlprocto@wch-rcc.com]
Sent: Thursday, July 21, 2011 6:42 AM
To: Menard, Nina (ECY); Harrison, Robert P; Chance, Joanne C
Cc: Boyd, Alicia (ECY); Smith-Jackson, Noe'l (ECY); Kapell, Arthur; Thompson, Wendy S
Subject: RE: Comments on 132-H-3 Sampling and Analysis Instructions

Hi Nina.

Attached are response to Ecology's comments. We've accepted all the comments and an updated copy of the document will be delivered to you this afternoon. The project plans on sampling Monday.

Thank you for your help.

Megan

From: Menard, Nina (ECY) [mailto:nmen461@ECY.WA.GOV]
Sent: Wednesday, July 20, 2011 3:12 PM
To: Proctor, Megan L; Harrison, Robert P; Chance, Joanne C
Cc: Boyd, Alicia; Smith-Jackson, Noe'L; Kapell, Arthur
Subject: Comments on 132-H-3 Sampling and Analysis Instructions

Megan,

Attached are Ecology's comments on the 132-H-3 Sampling and Analysis Instructions. Please let me know if you have questions on Ecology's comments.

Nina M. Menard

Project Manager

Environmental Restoration

WA State Dept. of Ecology

(509) 372-7941

(509) 420-6839

SAMPLING AND ANALYSIS INSTRUCTION FOR EXPEDITING VERIFICATION SAMPLING OF 132-H-3 SOIL STOCKPILES

1.0 INTRODUCTION

This instruction provides the requirements for collection and analysis of verification soil samples for the 132-H-3, 1608-H Effluent Pumping Station overburden/layback soil stockpiles and for the footprint of the waste staging pile areas. The results of this sampling will be used to determine that the overburden/layback soil piles can be used for clean backfill material and that the footprints of the waste staging pile areas meets the remedial action goals specified in the *Remedial Design Report/Remedial Action Work Plan* (RDR/RAWP) *for the 100 Area* (DOE/RL 2009b). This verification sampling is being expedited to support remediation of the 100-H-28:4 pipeline waste site, because soil removal in the deep portion of the 132-H-3 excavation has not been completed and the northern overburden/layback soil stockpile and the northern waste staging pile area footprint are overlying portions of the 100-H-28:4 pipeline. Figure 1 shows the location of the soil stockpiles, including the overburden/layback soil stockpiles and the waste staging area soil stockpiles. Figure 2 shows the location of the 100-H-28:4 pipeline in the area coinciding with the 132-H-3 soil stockpiles and waste staging areas.

The waste staging area soil stockpiles, having residual contamination above cleanup levels (ACL), have been removed and disposed at the Environmental Restoration Disposal Facility (ERDF). The overburden/layback soil stockpiles, believed to have residual contaminant concentrations below cleanup levels (BCL), will be sampled to verify the soil is suitable for use as clean backfill material for the remediated and interim closed 118-H-6:4 waste site (WCH 2010) and the east ramp entering the 132-H-3 excavation. Figure 3 shows the location of the 132-H-3 ramp and the 118-H-6:4 waste site that are planned to receive the BCL soil for use as clean backfill.

This sampling instruction precedes the more comprehensive verification work instruction that will be prepared for the 132-H-3 excavation after soil removal is completed. Therefore, detailed information concerning the history, remediation, and contamination associated with the 132-H-3 waste site has not been incorporated into this instruction but is available in references (WCH 1987, WCH 1989, Proctor 2009) and will be incorporated into the future verification work instruction for the 132-H-3 waste site. Sampling and analysis requirements provided in this instruction for expedited verification sampling are consistent with the requirements of the *100 Area Remedial Action Sampling and Analysis Plan (SAP)* (DOE/RL 2009a).

The sampling information and decisions produced from this sampling effort will be considered independently from the future sampling to support closeout of the excavation portion of the 132-H-3 waste site. Accordingly, the waste site excavation footprint will be sampled and evaluated in accordance with the future verification work instruction. The decisions from both of these evaluations (this sampling instruction and the future verification work instruction) will be incorporated into the remaining sites verification package for the 132-H-3 waste site.

Figure 1. 132-H-3 Soil Stockpiles and Waste Staging Area Stockpiles. (March 2011)

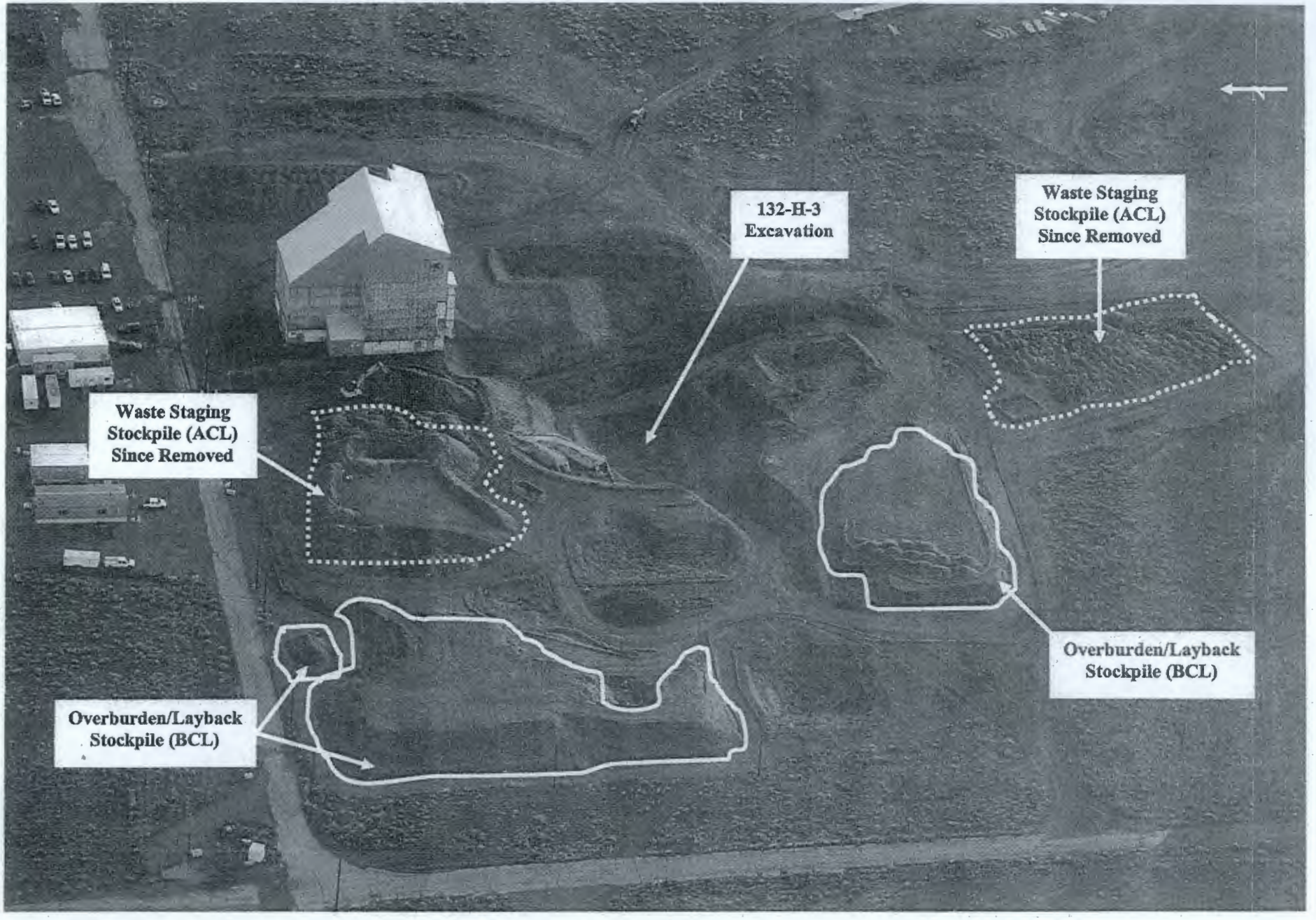
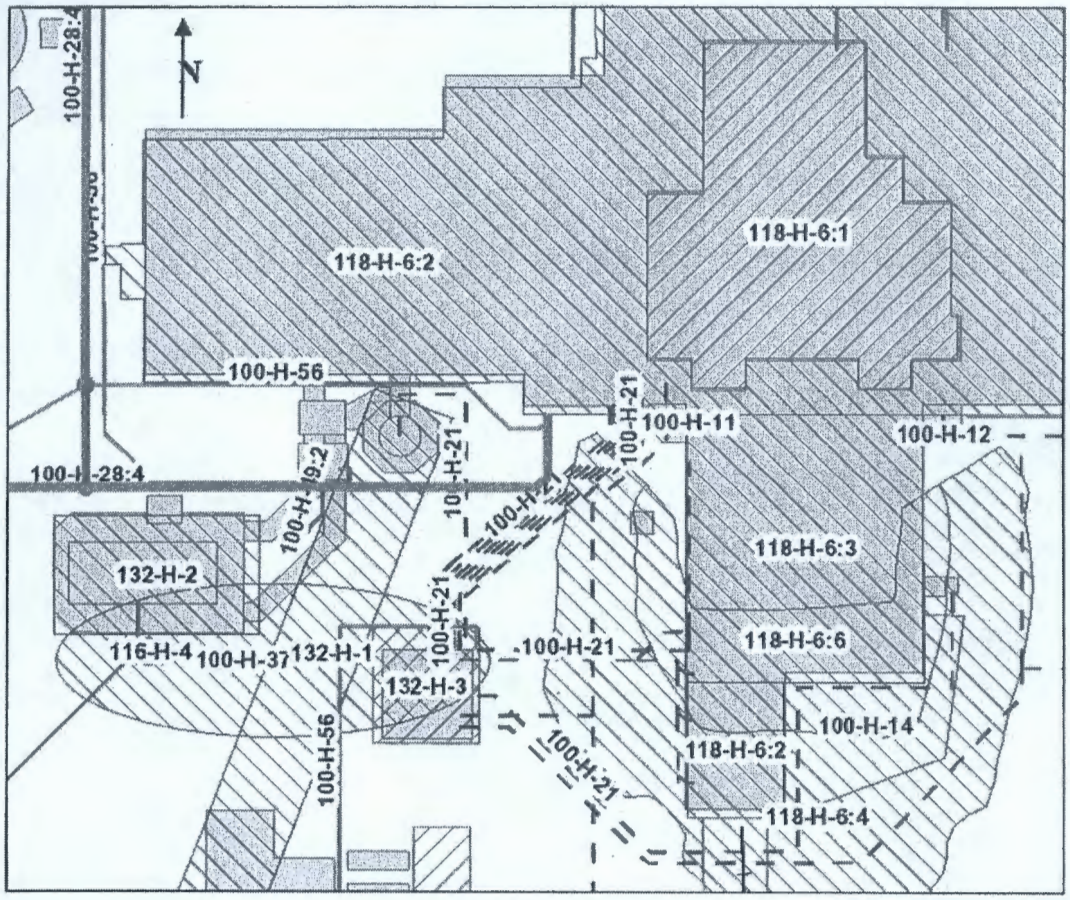


Figure 2. Map Showing Portion of 100-H-28:4 Pipeline North of 132-H-3 Waste Site.



WasteSitePoints

WasteSitesLine

WasteSitePoints

- Sitecode Missing in SIS
- Accepted,
- Accepted, Closed Out
- Accepted, Consolidated
- Accepted, Interim Closed Out
- Accepted, No Action
- Accepted, Rejected
- Not Accepted,

WasteSitesLine

- Sitecode Missing in SIS
- Accepted,
- Accepted, Closed Out

WasteSitesLine (continued)

- Accepted, Interim Closed Out
- Accepted, No Action
- Accepted, Rejected
- Discovery,
- Not Accepted,

WasteSitePolys

- Sitecode Missing in SIS
- Accepted,
- Accepted, Closed Out
- Accepted, Consolidated
- Accepted, Deleted From NPL
- Accepted, Interim Closed Out
- Accepted, No Action
- Accepted, Rejected

WasteSitePolys (continued)

- Discovery,
- Not Accepted (Proposed),
- Not Accepted,

Hanford Numbered Buildings

- Exclude Facilities in the RCC

RCC Facility Status

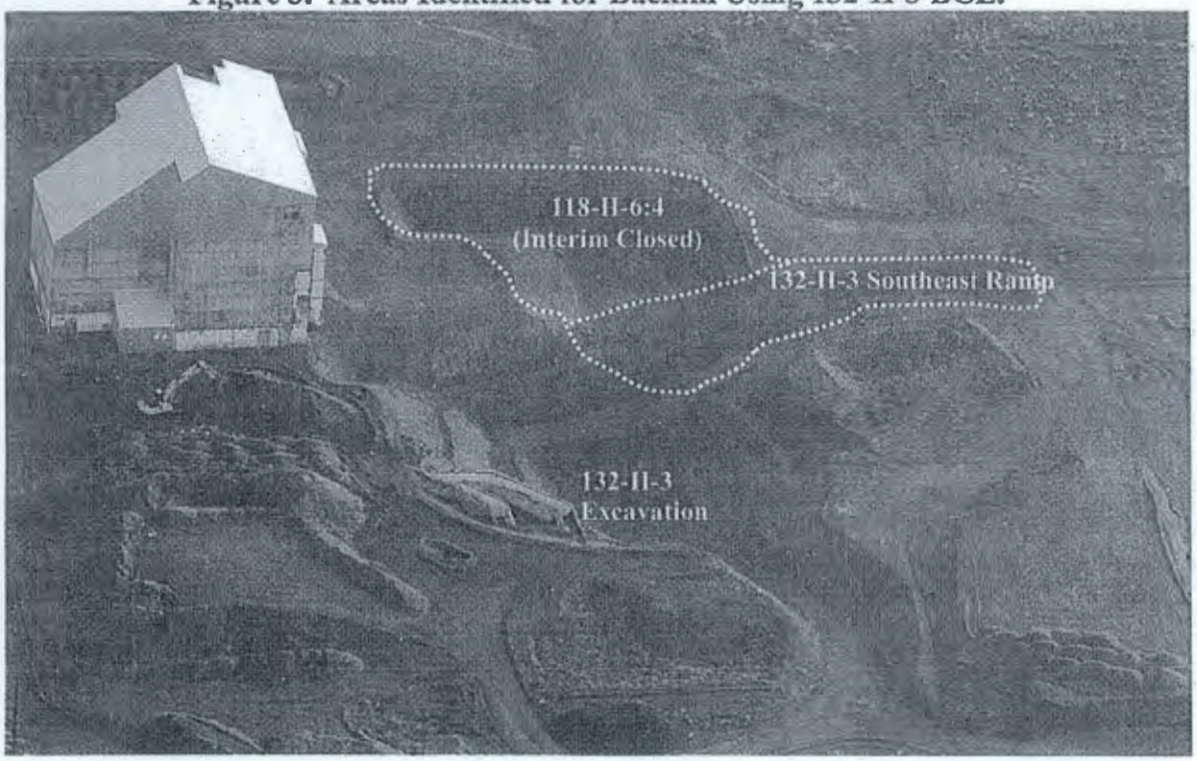
- Active
- Demolished
- Inactive
- Removed

Main Roads

Railroads

Roads

Figure 3. Areas Identified for Backfill Using 132-H-3 BCL.



2.0 SAMPLING DESIGN

Verification soil samples will be collected and analyzed to support a determination that the residual contaminant concentrations in the 132-H-3 overburden/layback soil stockpiles and the footprint of the waste staging pile areas meet the cleanup criteria specified in the RDR/RAWP (DOE/RL 2009b) and the Remaining Sites Record of Decision (EPA 1999). The results of the verification sampling will be used to calculate a 95% upper confidence limit (UCL) and data summary report for Ecology approval to support acceptance that the overburden/ layback material may be used as clean backfill and that the footprints of the waste staging pile areas meet the cleanup criteria. This information will subsequently be included in the remaining sites verification package (RSVP) for the 132-H-3 waste site.

2.1 Contaminants of Potential Concern

The 100 Area SAP (DOE-RL 2009a) identifies the following contaminants of potential concern (COPCs) for the 132-H-3 waste site: carbon-14, cobalt-60, cesium-137, europium-152, europium-154, europium-155, tritium, plutonium-238, plutonium-239/240, strontium-90, uranium-238, silver, cadmium, chromium (total and hexavalent), mercury, lead, selenium, and polychlorinated biphenyls (PCBs). A review of in-process sample results, collected March 2011, indicate that technetium-99 and nickel-63 are also COPCs. In addition, anions and polycyclic aromatic hydrocarbons (PAHs) have been included as COPCs.

2.2 Sample Design Basis

The boundaries of the overburden/layback (BCL) soil stockpiles and the footprint of the waste staging pile area (ACL) stockpiles were delineated in Visual Sample Plan (VSP) and used to locate a systematic grid to identify soil sample collection locations. A total of 48 soil samples will be collected using a random-start, triangular grid. A triangular grid was selected based on studies that indicate triangular grids are superior to square grids (Gilbert 1987). Additional details concerning the use of VSP to develop the statistical sampling design and derive the number of verification soil samples are discussed in Attachment 1 of this instruction.

Global positioning radiological surveys (GPERS) were performed over the surface of the BCL soil stockpiles after each 1 m (3 ft) lift. The footprints of the ACL waste staging piles were also surveyed after removal of the waste was performed. Copies of the GPERS maps are provided in Attachment 2.

2.3 Sample Collection

Figure 4 provides a map of the 48 statistical sample locations identified for verification sampling. Table 1 provides a summary of the sample locations and laboratory analyses that will be performed. The soil sample locations will be surveyed and staked prior to sample collection using the coordinate pairs provided in Table 1. One discrete soil sample will be collected from 0 to 0.15 m (0 to 6 in.) depth at each location. One field duplicate sample will be collected within each sample area at a location selected at the discretion of the project analytical lead and as discussed in Section 3.0 of this instruction. One or more Ecology split samples may be collected, if identified by Ecology.

All sampling will be performed in accordance with ENV-1, *Environmental Monitoring and Management* and consistent with the sampling and analytical requirements specified in the *100 Area Remedial Action Sampling and Analysis Plan* (DOE/RL 2009a).

Figure 4. 132-H-3 Soil Stockpile Sample Locations.

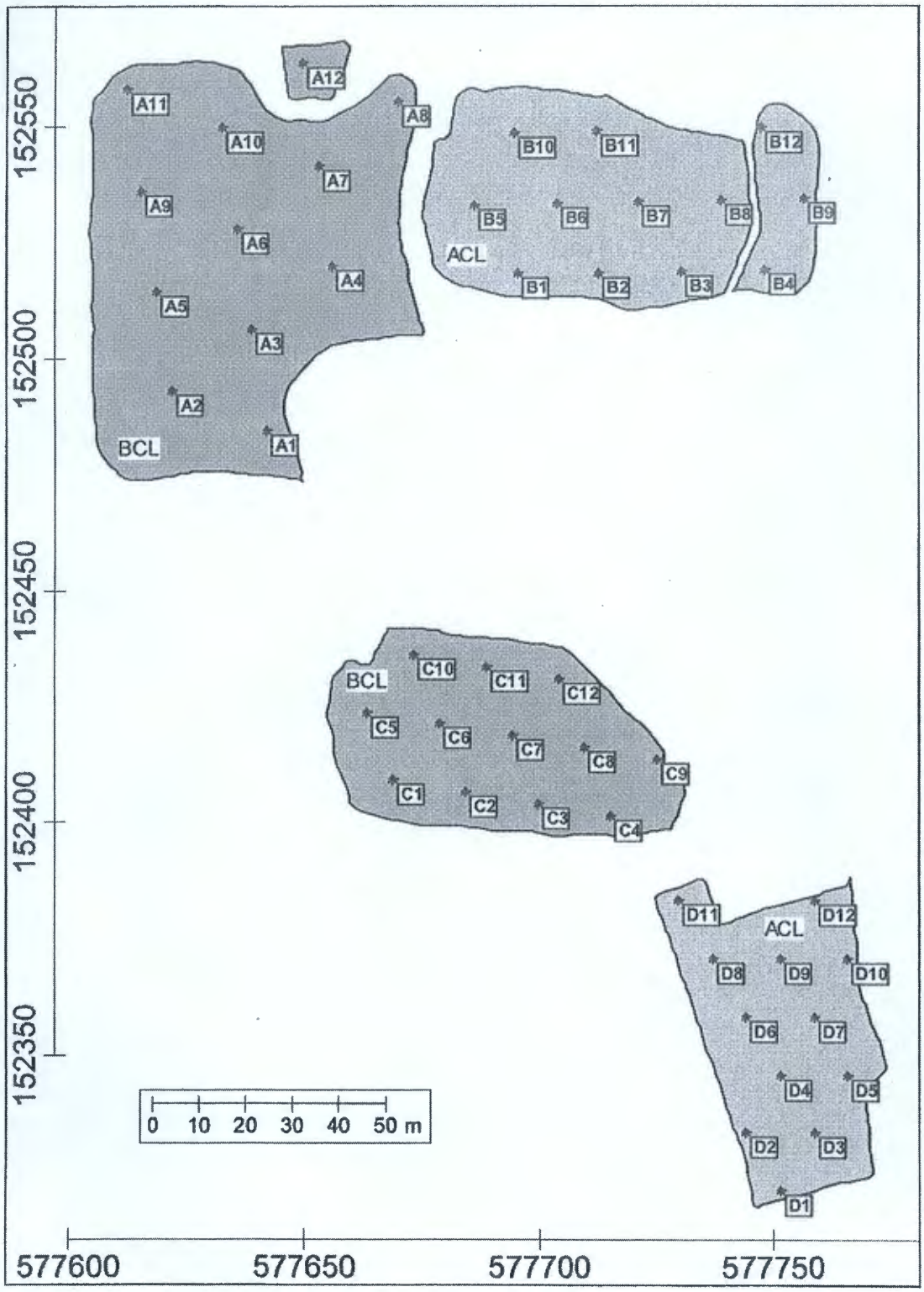


Table 1. 600-151 Verification Sample Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
Overburden/Layback Soil Stockpile (BCL)				
A-1	TBD	577641.9	152484.7	ICP metals [a], mercury, hexavalent chromium, IC anions, NO_2/NO_3, PAH, PCB, GEA, technicium-99, carbon-14, nickel-63, strontium-90, tritium, isotopic plutonium, isotopic uranium
A-2	TBD	577621.4	152492.9	
A-3	TBD	577638.7	152506.5	
A-4	TBD	577656.0	152520.2	
A-5	TBD	577618.2	152514.7	
A-6	TBD	577635.5	152528.3	
A-7	TBD	577652.8	152542.0	
A-8	TBD	577670.0	152555.7	
A-9	TBD	577615.0	152536.4	
A-10	TBD	577632.3	152550.1	
A-11	TBD	577649.6	152563.8	
A-12	TBD	577611.8	152558.2	
Duplicate	TBD	TBD	TBD	
Waste Staging Area Footprint (ACL)				
B-1	TBD	577695.2	152518.7	
B-2	TBD	577712.7	152519.0	ICP metals [a], mercury, hexavalent chromium, IC anions, NO_2/NO_3, PAH, PCB, GEA, technicium-99, carbon-14, nickel-63, strontium-90, tritium, isotopic plutonium, isotopic uranium
B-3	TBD	577730.3	152519.3	
B-4	TBD	577747.9	152519.7	
B-5	TBD	577686.1	152533.7	
B-6	TBD	577703.7	152534.1	
B-7	TBD	577721.2	152534.4	
B-8	TBD	577738.8	152534.7	
B-9	TBD	577756.4	152535.0	
B-10	TBD	577694.6	152549.1	
B-11	TBD	577712.2	152549.4	
B-12	TBD	577747.3	152550.1	
Duplicate [b]	TBD	TBD	TBD	
Overburden/Layback Soil Stockpile (BCL)				
C-1	TBD	577668.7	152409.2	ICP metals [a], mercury, hexavalent chromium, IC anions, NO_2/NO_3, PAH, PCB, GEA, technicium-99, carbon-14, nickel-63, strontium-90, tritium, isotopic plutonium, isotopic uranium
C-2	TBD	577684.2	152406.7	
C-3	TBD	577699.8	152404.1	
C-4	TBD	577715.3	152401.6	
C-5	TBD	577663.1	152423.9	
C-6	TBD	577678.7	152421.4	
C-7	TBD	577694.2	152418.8	
C-8	TBD	577709.7	152416.3	

Table 1. 600-151 Verification Sample Summary Table. (2 Pages)

Sample Location	HEIS Sample Number	Washington State Plane Coordinates		Sample Analysis
		Easting	Northing	
C-9	TBD	577725.3	152413.8	ICP metals [a], mercury, hexavalent chromium, IC anions, NO_2/NO_3, PAH, PCB, GEA, technicium-99, carbon-14, nickel-63, strontium-90, tritium, isotopic plutonium, isotopic uranium
C-10	TBD	577673.1	152436.1	
C-11	TBD	577688.6	152433.6	
C-12	TBD	577704.2	152431.0	
Duplicate [b]	TBD	TBD	TBD	
Waste Staging Area Footprint (ACL)				
D-1	TBD	577751.3	152321.2	ICP metals [a], mercury, hexavalent chromium, IC anions, NO_2/NO_3, PAH, PCB, GEA, technicium-99, carbon-14, nickel-63, strontium-90, tritium, isotopic plutonium, isotopic uranium
D-2	TBD	577744.1	152333.7	
D-3	TBD	577758.5	152333.7	
D-4	TBD	577751.3	152346.1	
D-5	TBD	577765.7	152346.1	
D-6	TBD	577744.1	152358.6	
D-7	TBD	577758.5	152358.6	
D-8	TBD	577736.9	152371.1	
D-9	TBD	577751.3	152371.1	
D-10	TBD	577765.7	152371.1	
D-11	TBD	577729.7	152383.6	
D-12	TBD	577758.5	152383.6	
Duplicate [b]	TBD	TBD	TBD	
Equipment blank	TBD	NA	NA	ICP metals [a], mecury, and PAH

[a] Analysis will be performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium(total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
[b] Duplicate soil samples will be collected from each sample area at a location selected at the project analytical lead's discretion.

ACL = above cleanup level
BCL = below cleanup level
HEIS = Hanford Environmental Information System
IC = ion chromatography
ICP = inductively coupled plasma
NA = not applicable
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
TBD = to be determined
TPH = total petroleum hydrocarbons
VOA = volatile organic analyte
VSP = visual sample plan

2.4 Laboratory Analytical Methods

Each soil sample will be analyzed using the analytical methods provided in Table 2.

Table 2. 132-H-3 Laboratory Analytical Methods. (2 Pages)

Analytical Method	Contaminant of Potential Concern
ICP metals [a] – EPA Method 6010	Cadmium, chromium, lead, selenium, and silver
Mercury – EPA Method 7471	Mercury
Hexavalent chromium – EPA Method 7196	Hexavalent chromium
IC anions [b] – EPA Method 300.0	Inorganic anions

Table 2. 132-H-3 Laboratory Analytical Methods. (2 Pages)

Analytical Method	Contaminant of Potential Concern
NO_2/NO_3 [c] – EPA Method 353.2	Nitrogen in nitrate and nitrite
PAH – EPA Method 8310	Polycyclic aromatic hydrocarbons
PCB – EPA Method 8082	Polychlorinated biphenyls
GEA – gamma spectroscopy	Americium-241, cesium-137, cobalt-60, europium-152, europium-154, europium-155
Technecium-99 – liquid scintillation	Technecium-99
Carbon-14 – liquid scintillation	Carbon-14
Nickel-63 – liquid scintillation	Nickel-63
Strontium-90 – liquid scintillation	Strontium-90
Tritium – liquid scintillation	Tritium
Isotopic plutonium	Plutonium-238, plutonium-239/240
Isotopic uranium	Uranium-238

[a] Analysis will be performed for the expanded list of ICP metals to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.
[b] Analysis will be performed for the expanded list of IC anions to include bromide, chloride, fluoride, nitrate, nitrite, phosphate, and sulfate.
[c] To preclude holding time issues associated with EPA Method 300.0 for nitrites and nitrates, EPA Method 353 will be performed.

EPA = U.S. Environmental Protection Agency
GEA = gamma energy analysis
IC = ion chromatography
ICP = inductively coupled plasma
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl

3.0 FIELD QUALITY CONTROL SAMPLES

The QC procedures must be followed in the field and laboratory to ensure that reliable data are obtained. When performing this field sampling effort, care shall be taken to prevent the cross-contamination of sampling equipment, sample bottles, and other equipment that could compromise sample integrity.

Field QC samples will consist of the following:

- One field duplicate soil sample for each sample area shall be collected and analyzed per Table 1 of this document. The duplicate sample should be collected at a sample location for which an Ecology split sample (if requested by Ecology) is collected.

- One equipment blank consisting of clean silica sand poured over sampling equipment will be collected and analyzed for ICP metals, mercury, and PAH.

- One or more split samples may be collected for Ecology. As previously noted, the duplicate soil sample should be collected at one of the Ecology split sample locations, if Ecology split samples are collected. The project will provide a minimum of two days notice to Ecology prior to sampling for coordination of collection of Ecology split samples.

4.0 DATA QUALITY ASSESSMENT

All samples will be requested for full protocol laboratory analysis. Post-data collection activities generally follow those outlined in *Statistical Guidance for Ecology Site Managers* (Ecology 1992) and the U.S. Environmental Protection Agency's *Guidance for Data Quality Assessment* (EPA 2000). The data analyst will be familiar with the context of the site remedial action goals for data collection and assessment. The data will be verified and validated in accordance with the SAP (DOE/RL 2009a) and WCH Procedure Number ENV-1-2.12, *Data Package Validation* before being subjected to statistical or other analyses. The data will be used to assess if they are adequate in both quality and quantity to support the primary objective of demonstrating that the overburden/layback soil stockpiles and the footprint of the waste staging pile areas meets the cleanup criteria and allow for use of the overburden/layback soil stockpiles as clean backfill material.

5.0 REFERENCES

DOE-RL, 2009a, *100 Area Remedial Action Sampling and Analysis Plan*, DOE/RL-96-22, Rev. 5, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2009b, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 1992, *Statistical Guidance for Ecology Site Managers*, Publication No. 92-54, Washington State Department of Ecology, Olympia, Washington.

ENV-1, *Environmental Monitoring and Management*, Washington Closure Hanford, Richland, Washington.

EPA, 1999, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2000, *Guidance for Data Quality Assessment*, EPA QA/G-9, EPA/600/R-96/084, U.S. Environmental Protection Agency, Washington, D.C.

Gilbert, R. O., 1987, *Statistical Methods for Environmental Pollution Monitoring*, Wiley & Sons, Inc., New York, New York.

Proctor, 2009, *132-H-3 Remaining Site for Remedial Action*, CCN 146431, dated September 8, 2009, Washington Closure Hanford, Richland, Washington.

WCH, 2010, *Transmittal of the Signed Waste Site Reclassification Form (WSRF) for the Cleanup Verification Package (CVP) for the 118-H-6:4, 105-H Fuel Storage Basin Shallow Zone Slope Soils and Document of the Department of Ecology's (Ecology) Comparison of the Site Data with Washington Administrative Code (WAC) 173-340 (2007) Requirements*, CCN 155406, dated November 18, 2010, Washington Closure Hanford, Richland, Washington.

WHC, 1987, *1608-H Effluent Water Pumping Station Facility Decommissioning Report*, WHC-SD-DD-TI-017, Westinghouse Hanford Company, Richland, Washington.

WHC, 1989, *Final Dose Assessment of In Situ Burial of the 1608-H Lift Station*, WHC-SD-DD-TI-011, Westinghouse Hanford Company, Richland, Washington.

ATTACHMENT 1

SUMMARY

This appendix summarizes the sampling design used and associated statistical assumptions for the 132-H-3 overburden/layback soil stockpiles and the footprints of the waste staging pile areas, as well as the general guidelines to be used for conducting post-sampling data analysis. Sampling plan components presented include how many sampling locations to choose and where within the sampling area to collect those samples. Requirements for how to collect and analyze the samples are provided in Section 2.0 of this work instruction.

PRIMARY SAMPLING OBJECTIVE

The primary purpose of sampling at this site is to compare a site mean value with a fixed threshold. The decision rule for demonstrating compliance with the cleanup criteria requires comparison of the true population mean, as estimated by the 95% upper confidence limit on the sample mean with the cleanup level (DOE-RL 2009). The working hypothesis (or "null" hypothesis) is that the mean value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the mean value is less than the threshold. Visual Sample Plan[1] (VSP) calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

SELECTED SAMPLING APPROACH

A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was selected because the conceptual model and past cleanup verification sampling indicates that typical parametric assumptions may not be true.

Both parametric and nonparametric equations rely on assumptions about the population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. Alternatively, if the parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation was used.

The Washington State Department of Ecology publication *Guidance on Sampling and Data Analysis Methods* (Ecology 1995) recommends that systematic sampling with sample locations distributed over the entire study area be used. Therefore, a systematic grid sampling design with a random start was selected for use in VSP. Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial

[1] Visual Sample Plan is a site map-based user-interface program that may be downloaded at http://vsp.pnl.gov.

variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

NUMBER OF TOTAL SAMPLES: CALCULATION EQUATION AND INPUTS

The equation used to calculate the number of samples is based on a Sign test (Gilbert et al. 2001). For this site, the null hypothesis is rejected in favor of the alternative one if the mean is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is as follows:

$$n = 1.20\left[\frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{4(SignP - 0.5)^2}\right]$$

where:

$$Sign\ P = \Phi\left(\frac{\Delta}{s_{Total}}\right)$$

$\Phi(z)$ = the cumulative standard normal distribution on $(-\infty, z)$ (see Gilbert et al. 2001 for details)

n = the number of samples

S_{total} = the estimated standard deviation of the measured values including analytical error

Δ = the width of the gray region

α = the acceptable probability of incorrectly concluding the site mean is less than the threshold

β = the acceptable probability of incorrectly concluding the site mean exceeds the threshold

$Z_{1-\alpha}$ = the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$

$Z_{1-\beta}$ = the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

NOTE: The *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (EPA 2009) suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of *n*. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2009, pp. 5-29).

The values of these inputs that result in the calculated number of sampling locations are summarized in Table A-1.

Table A-1. VSP User Inputs.

Parameter	Value	Basis
S	0.4	Assumed standard deviation value relative to a unit action level for the sampling area. (Conservative value based on consideration of past verification sampling and WAC 173-340-740(7)(e) [Ecology 1996] three-part test requirements.)
Δ	0.5	User-defined value relative to a unit action level. (MARSSIM-recommended default value.)
α	5%	False rejection rate specified in EPA guidance (EPA 2006b).
β	20%	False acceptance rate specified in EPA guidance (EPA 2006b).
$Z_{1-\alpha}$	1.64485	This value is automatically calculated by VSP based on the user-defined value of α.
$Z_{1-\beta}$	0.841621	This value is automatically calculated by VSP based on the user-defined value of β.
MARSSIM overage	20%	User-defined sample increase factor.

EPA = U.S. Environmental Protection Agency
MARSSIM = *Multi-Agency Radiation Survey and Site Investigation Manual* (EPA 2009)
VSP = Visual Sample Plan
WAC = *Washington Administrative Code*

In order to use VSP to calculate the number of samples, n, it is necessary to have some estimate of the sample standard deviation (S) for each contaminant. Since this is unknown without collection of samples, the standard deviation for each population was assumed to be less than 40% of the corresponding action level for that contaminant. Using this standard deviation value and an acceptable gray region width (50% of the action level) in VSP, the estimated number of verification samples to collect is 12.

Table A-2 summarizes the sampling design that was developed for the 132-H-3 overburden/layback soil stockpiles and footprint of waste staging pile areas. Table A-3 lists sampling location coordinates. Figure A-1 shows sampling locations in the field.

Table A-2. Summary of Sampling Design. (2 Pages)

Primary objective of design	Compare a site mean to a fixed threshold
Type of sampling design	Nonparametric
Sample placement (location) in the field	Systematic with a random start location
Working (null) hypothesis	The median (mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test – MARSSIM version
Calculated total number of samples	12 per decision unit

Table A-2. Summary of Sampling Design. (2 Pages)

Number of samples on map	48
Number of selected sample areas [a]	4
Specified sampling area [b]	12,842.9m^2 (138,240 ft^2)
Size of grid/area of grid cell [c]	14.3 m/180 m^2 (47 ft/1934 ft^2)
Grid pattern	Triangular

[a] The number of selected sample areas is the number of shaded areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected shaded sample areas on the map of the site.
[c] Size of grid/area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
MARSSIM = *Multi-Agency Radiation Survey and Site Investigation Manual* (EPA 2009)

Table A-3. Verification Sample Location Coordinates for 132-H-3 Overburden/Layback Stockpiles and Waste Staging Pile Footprints. (2 pages)

Sample Location	Washington State Plane Coordinates		Type
	X Coordinate	Y Coordinate	
Area A – Overburden/Layback Soil Stockpile (BCL)			
A-1	577641.9	152484.7	Systematic
A-2	577621.4	152492.9	Systematic
A-3	577638.7	152506.5	Systematic
A-4	577656.0	152520.2	Systematic
A-5	577618.2	152514.7	Systematic
A-6	577635.5	152528.3	Systematic
A-7	577652.8	152542.0	Systematic
A-8	577670.0	152555.7	Systematic
A-9	577615.0	152536.4	Systematic
A-10	577632.3	152550.1	Systematic
A-11	577649.6	152563.8	Systematic
A-12	577611.8	152558.2	Systematic
Duplicate	TBD	TBD	Systematic
Area B – Waste Staging Pile Footprint (ACL)			
B-1	577695.2	152518.7	Systematic
B-2	577712.7	152519.0	Systematic
B-3	577730.3	152519.3	Systematic
B-4	577747.9	152519.7	Systematic
B-5	577686.1	152533.7	Systematic
B-6	577703.7	152534.1	Systematic
B-7	577721.2	152534.4	Systematic
B-8	577738.8	152534.7	Systematic
B-9	577756.4	152535.0	Systematic
B-10	577694.6	152549.1	Systematic
B-11	577712.2	152549.4	Systematic
B-12	577747.3	152550.1	Systematic
Duplicate	TBD	TBD	Systematic

Table A-3. Verification Sample Location Coordinates for 132-H-3 Overburden/Layback Stockpiles and Waste Staging Pile Footprints. (2 pages)

Sample Location	Washington State Plane Coordinates		Type
	X Coordinate	Y Coordinate	
Area C – Overburden/Layback Soil Stockpile (BCL)			
C-1	577668.7	152409.2	Systematic
C-2	577684.2	152406.7	Systematic
C-3	577699.8	152404.1	Systematic
C-4	577715.3	152401.6	Systematic
C-5	577663.1	152423.9	Systematic
C-6	577678.7	152421.4	Systematic
C-7	577694.2	152418.8	Systematic
C-8	577709.7	152416.3	Systematic
C-9	577725.3	152413.8	Systematic
C-10	577673.1	152436.1	Systematic
C-11	577688.6	152433.6	Systematic
C-12	577704.2	152431.0	Systematic
Duplicate	TBD	TBD	Systematic
Area D – Waste Staging Pile Footprint (ACL)			
D-1	577751.3	152321.2	Systematic
D-2	577744.1	152333.7	Systematic
D-3	577758.5	152333.7	Systematic
D-4	577751.3	152346.1	Systematic
D-5	577765.7	152346.1	Systematic
D-6	577744.1	152358.6	Systematic
D-7	577758.5	152358.6	Systematic
D-8	577736.9	152371.1	Systematic
D-9	577751.3	152371.1	Systematic
D-10	577765.7	152371.1	Systematic
D-11	577729.7	152383.6	Systematic
D-12	577758.5	152383.6	Systematic
Duplicate	TBD	TBD	Systematic

Figure A-1. Map of Verification Sample Locations.

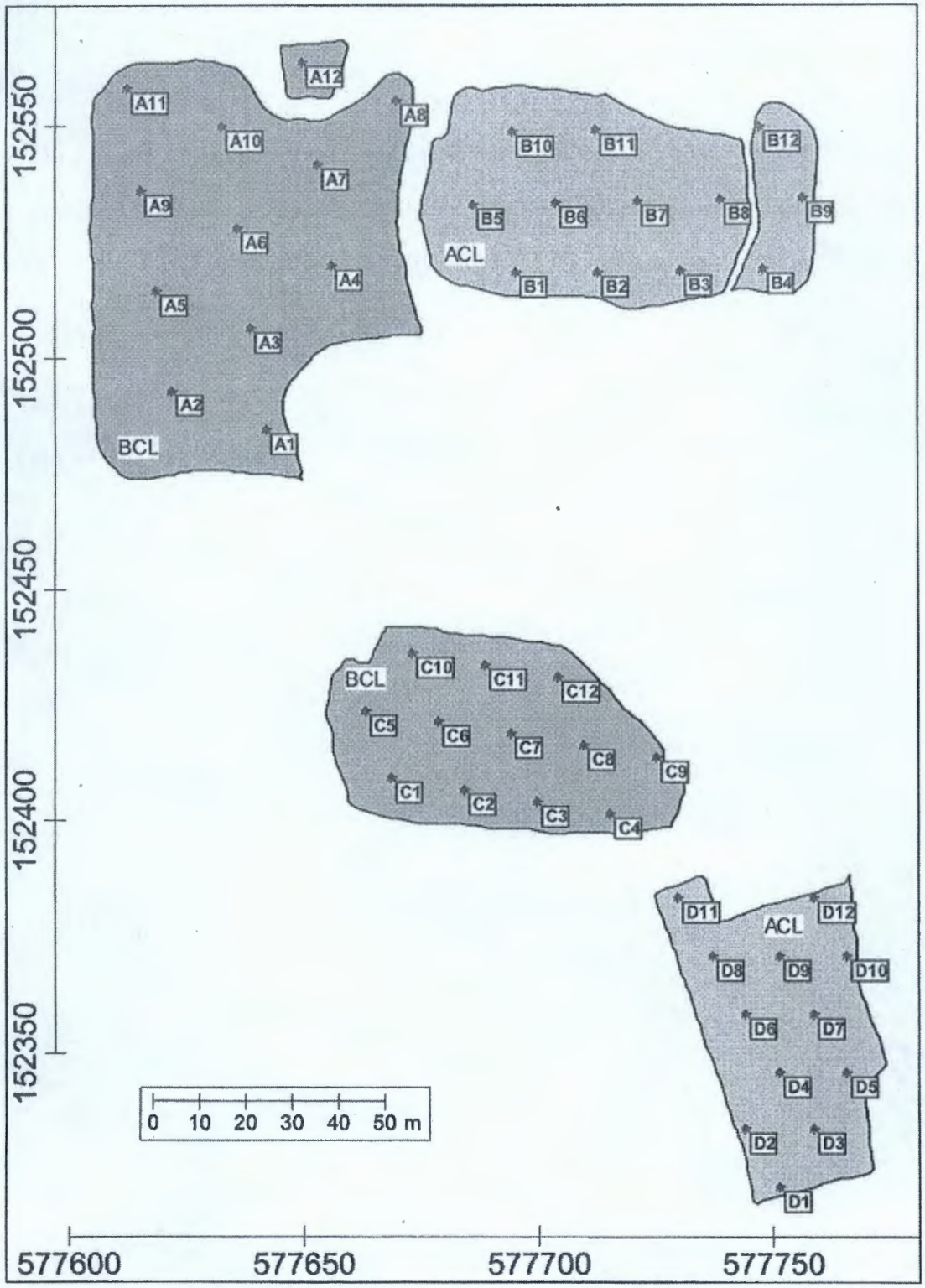
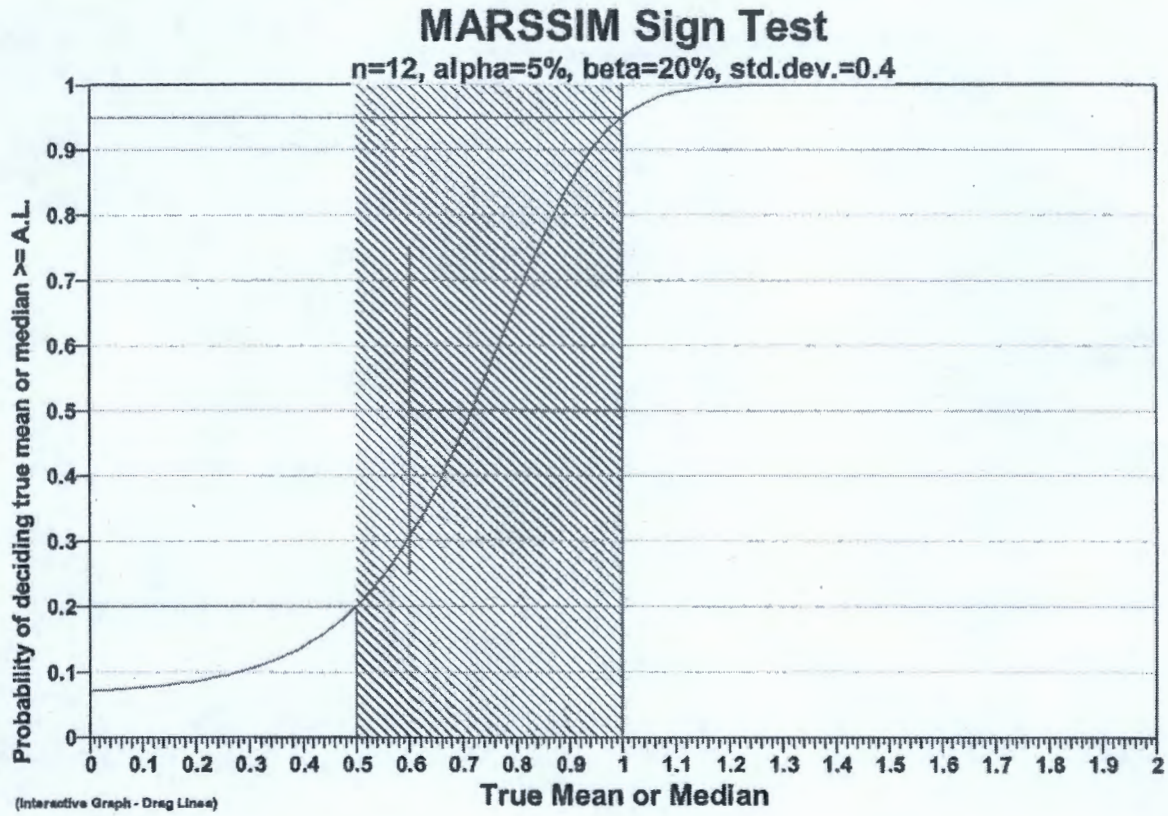


Figure A-2 is a performance goal diagram, described in the U.S. Environmental Protection Agency's *Guidance on Systematic Planning Using the Data Quality Objectives* (EPA 2006b). This shows the probability of concluding that the sample area is dirty on the vertical axis versus a range of possible true median (mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculations.

The solid vertical line to the right of the gray region is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed line is positioned at $1-\alpha$ on the vertical axis; and the lower horizontal dashed line is positioned at β on the vertical axis. The short vertical line in the gray region to the left of the action level is positioned at one standard deviation below the threshold. The shape of the curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at $1-\alpha$.

Figure A-2. Performance Goal Diagram.



STATISTICAL ASSUMPTIONS

The assumptions associated with the formulas for computing the number of samples are as follows:

- The computed Sign test statistic is normally distributed.
- The variance estimate, S^2, is reasonable and representative of the population being sampled.
- The population values are not spatially or temporally correlated.
- The sampling locations will be selected probabilistically.

The first three assumptions are reasonable and conservative based on consideration of past cleanup verification sampling. The last assumption is valid because the gridded sample locations were selected based on a random start.

SENSITIVITY ANALYSIS

The sensitivity of the calculation of number of samples was explored by varying S, lower bound of the gray region, β, α, and examining the resulting changes in the number of samples. Table A-4 shows the results of this analysis.

Table A-4. Results of the Sensitivity Analysis.

Number of Samples							
AL=1		α=5		α=10		α=15	
		s=0.8	s=0.4	s=0.8	s=0.4	s=0.8	s=0.4
LBGR=60	β=15	60	20	45	15	36	12
	β=20	52	17	38	12	30	10
	β=25	45	15	33	11	24	9
LBGR=50	β=15	40	15	30	11	24	9
	β=20	35	12	26	10	21	8
	β=25	30	11	22	9	17	6
LBGR=40	β=15	30	12	22	10	18	8
	β=20	26	11	20	9	15	6
	β=25	22	10	16	8	12	5

α = alpha (%), probability of mistakenly concluding that μ < action level
AL = action level (threshold)
β = beta (%), probability of mistakenly concluding that μ > action level
LBGR = lower bound of the gray region (% of action level)
s = standard deviation

RECOMMENDED DATA ANALYSIS ACTIVITIES

Post-data collection activities generally follow those outlined in the U.S. Environmental Protection Agency's *Data Quality Assessment: A Reviewer's Guide* (EPA 2006a). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. The data will be assessed to determine if they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site mean values with threshold values, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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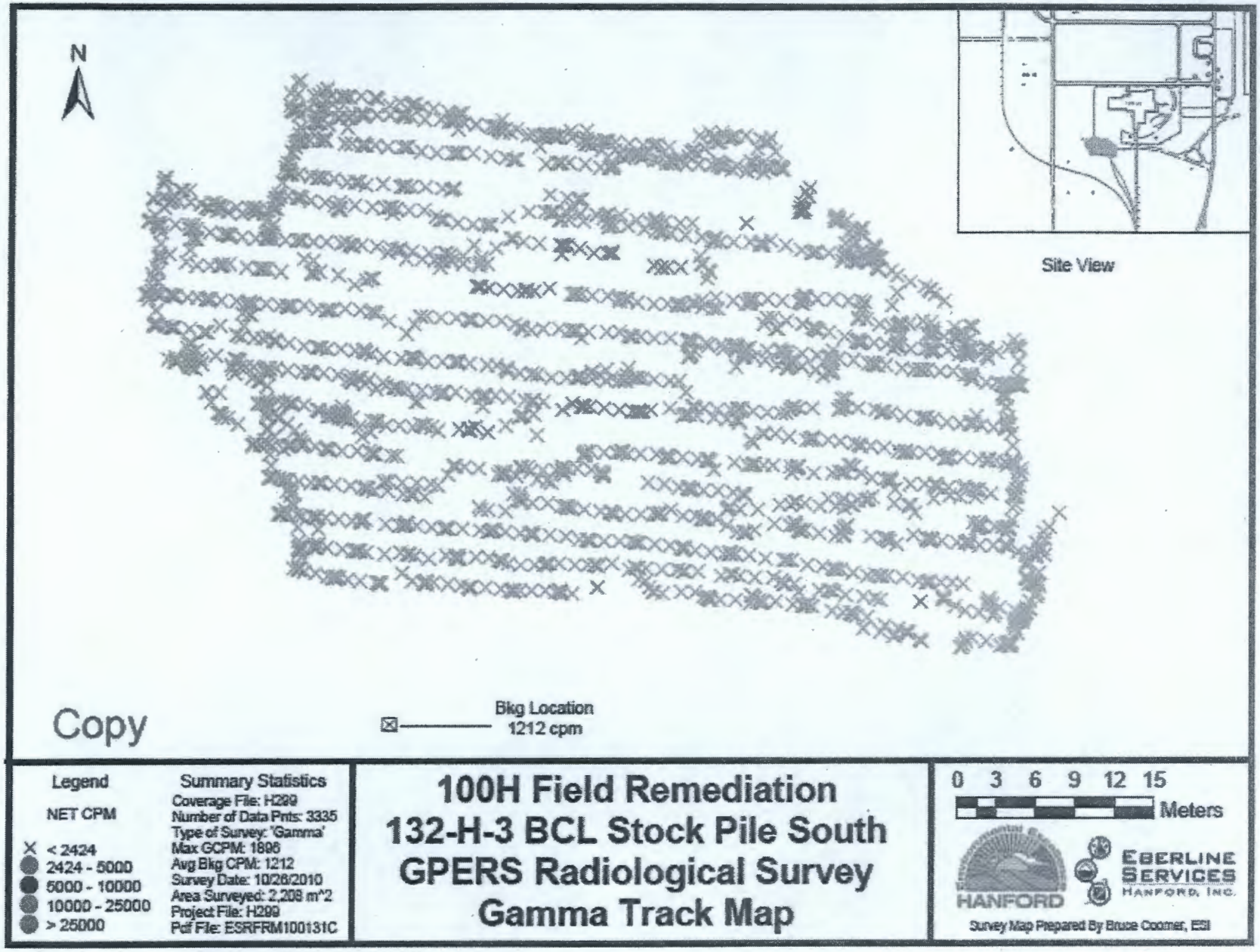
ATTACHMENT 2

GLOBAL POSITIONING ENVIRONMENTAL RADIOLOGICAL SURVEY MAPS


N
Site View
Copy
Bkg Location
1212 cpm
Legend
NET CPM
< 2424
2424 - 5000
5000 - 10000
10000 - 25000
> 25000
Summary Statistics
Coverage File: H299
Number of Data Pnts: 3335
Type of Survey: 'Gamma'
Max GCPM: 1896
Avg Bkg CPM: 1212
Survey Date: 10/26/2010
Area Surveyed: 2,208 m^2
Project File: H299
Pdf File: ESRFRM100131C
100H Field Remediation
132-H-3 BCL Stock Pile South
GPERS Radiological Survey
Gamma Track Map
0 3 6 9 12 15
Meters
HANFORD
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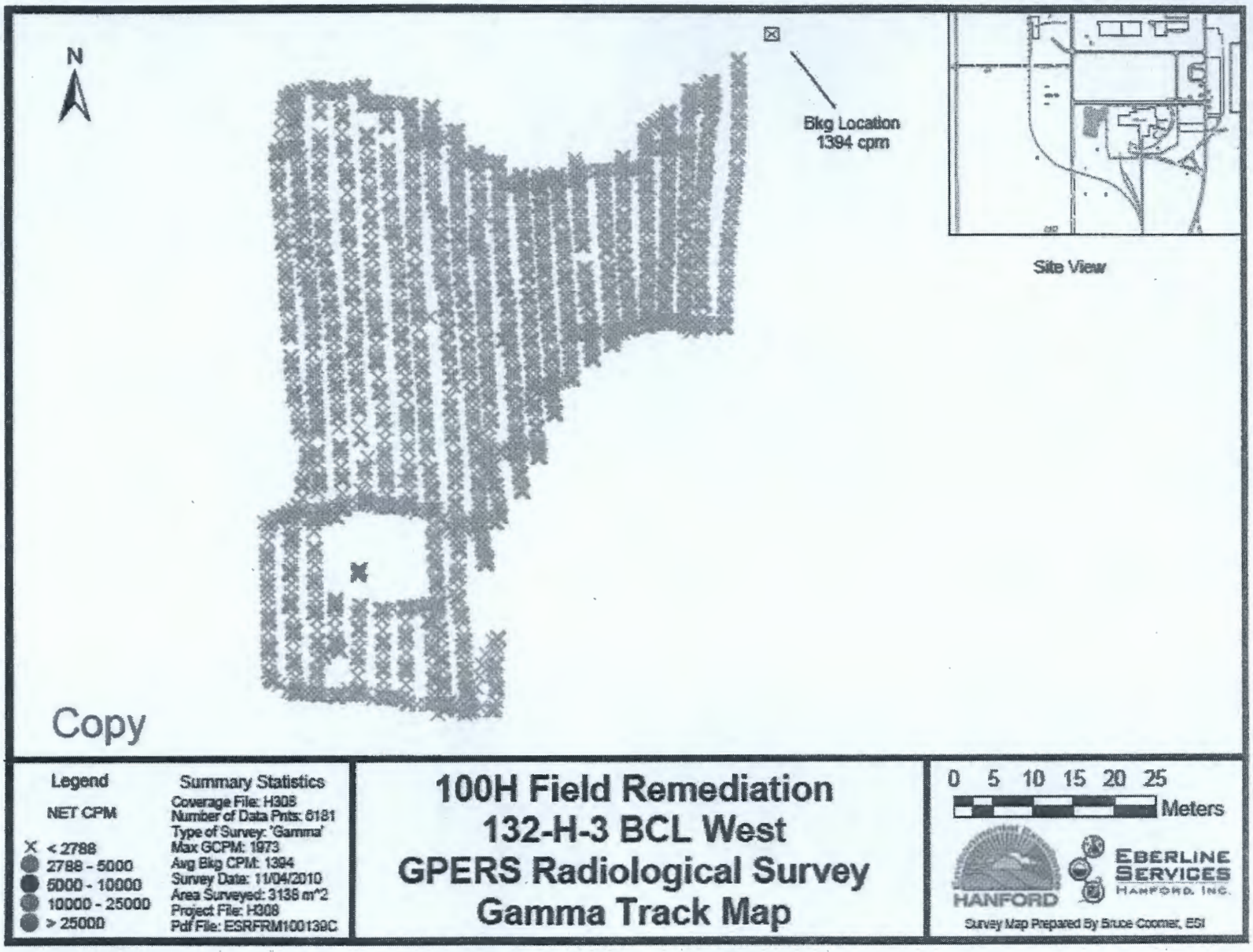
HANFORD, INC.
Survey Map Prepared By Bruce Coomer, ESI


N
Bkg Location
1394 cpm
Site View
Copy
Legend
NET CPM
< 2788
2788 - 5000
5000 - 10000
10000 - 25000
> 25000
Summary Statistics
Coverage File: H308
Number of Data Pnts: 6181
Type of Survey: 'Gamma'
Max GCPM: 1973
Avg Bkg CPM: 1394
Survey Date: 11/04/2010
Area Surveyed: 3138 m^2
Project File: H308
Pdf File: ESRFRM100139C
100H Field Remediation
132-H-3 BCL West
GPERS Radiological Survey
Gamma Track Map
0 5 10 15 20 25
Meters
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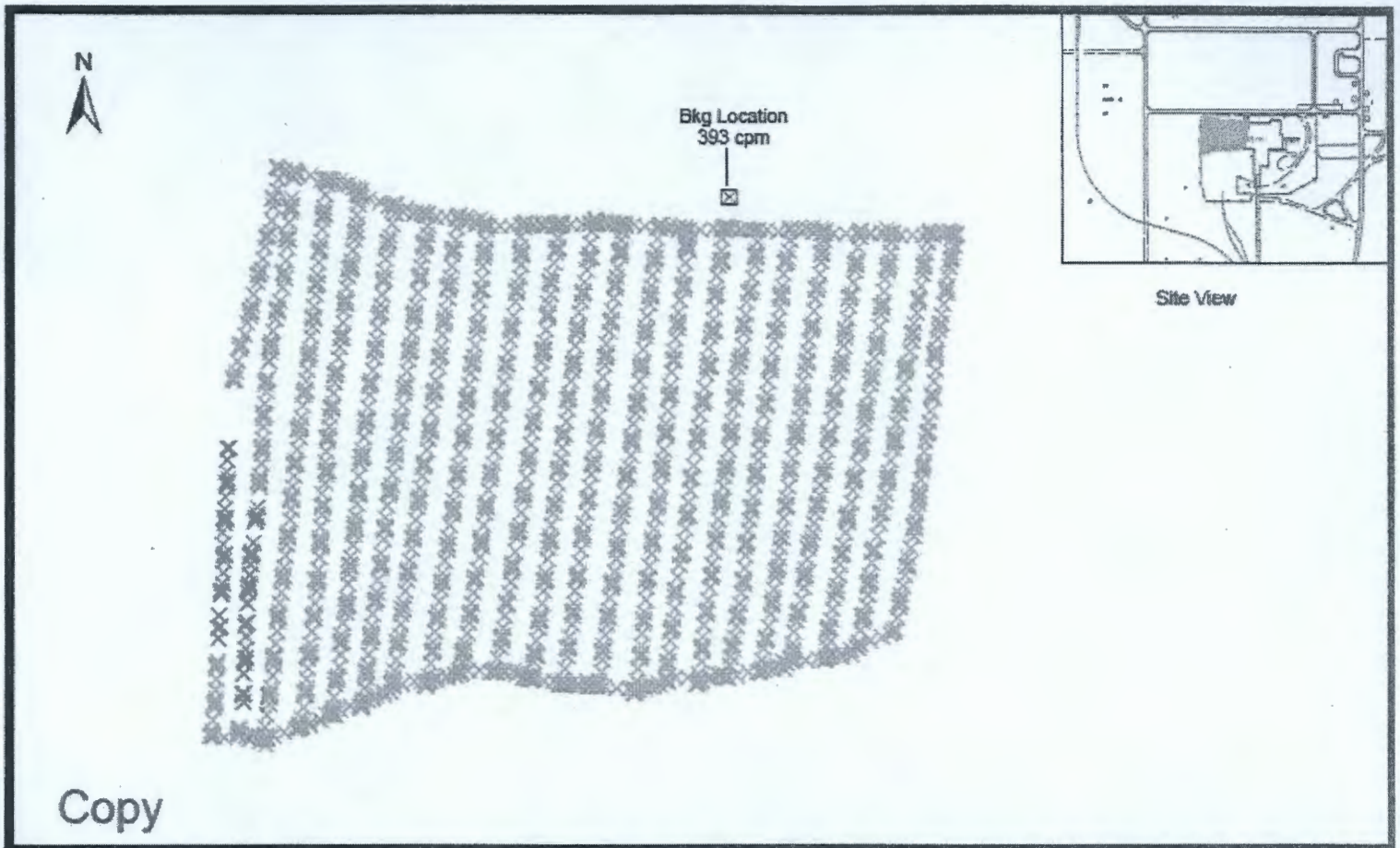

Legend

NET CPM

- <786
- 786 - 5000
- 5000 - 10000
- 10000 - 25000
- 25000

Summary Statistics

Coverage File: H063C,D
Number of Data Pnts: 3768
Type of Survey: beta
Max GCPM 705
Avg Bkg CPM: 393
Survey Date: 3/4/2011
Area Surveyed: 4155 m^2
Project File: ESRFRM110041
Pdf File: ESRFRM110041C

100H Field Remediation
132-H-3 ACL-BCL
GPERS Radiological Survey
Beta Track Map

0 5 10 15 20 25 Meters

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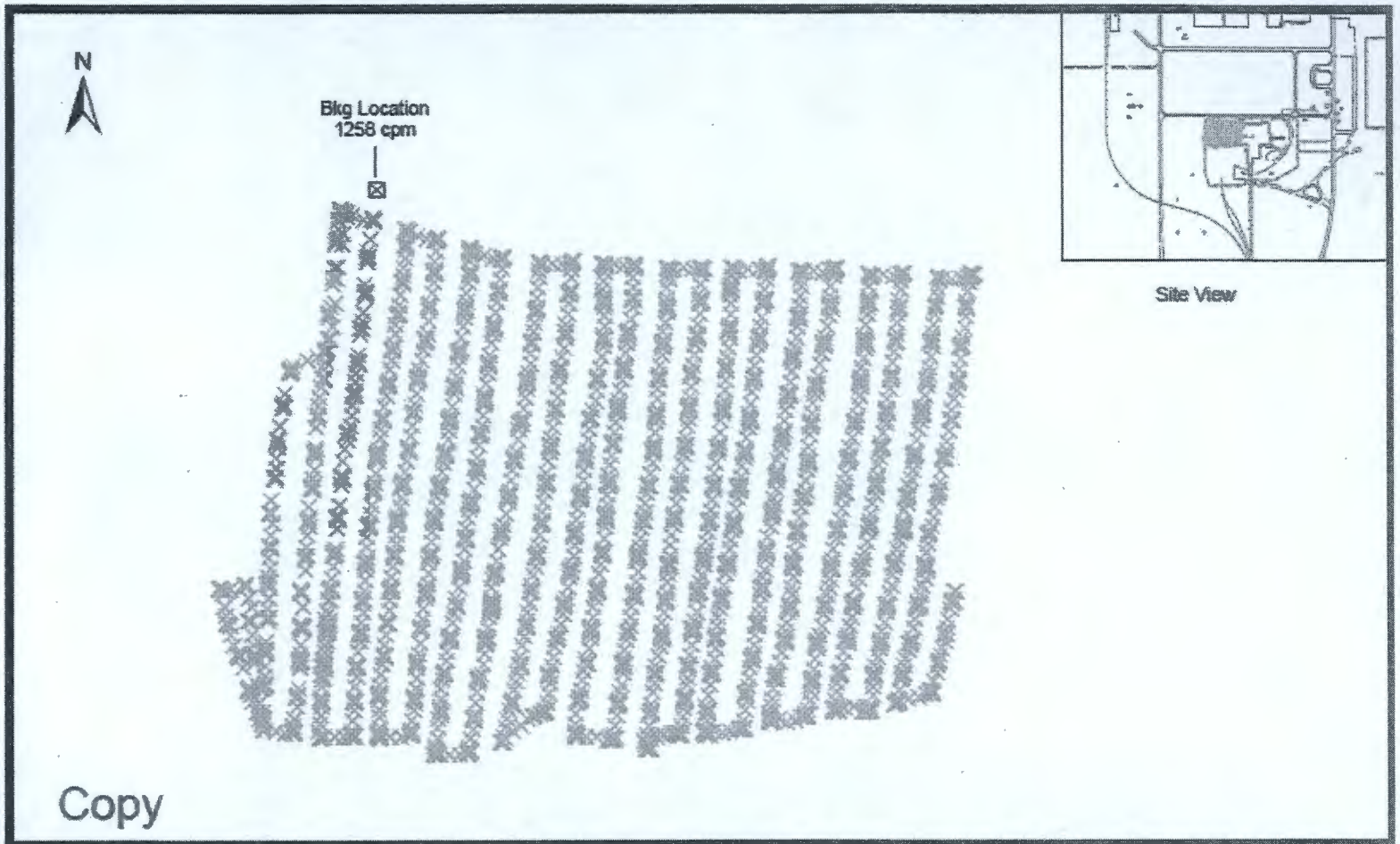

Copy

Legend	Summary Statistics
NET CPM	Coverage File: HH083,A
	Number of Data Pnts: 5285
	Type of Survey: gamma
× <2516	Max GCPM 2033
● 2516 - 5000	Avg Bkg CPM: 1258
● 5000 - 10000	Survey Date: 3/4/2011
● 10000 - 25000	Area Surveyed: 4155 m^2
● 25000	Project File: ESRFRM110037
	Pdf File: ESRFRM110037C

100H Field Remediation
132-H-3 ACL-BCL Area
GPERS Radiological Survey
Gamma Track Map

0 5 10 15 20 25 Meters

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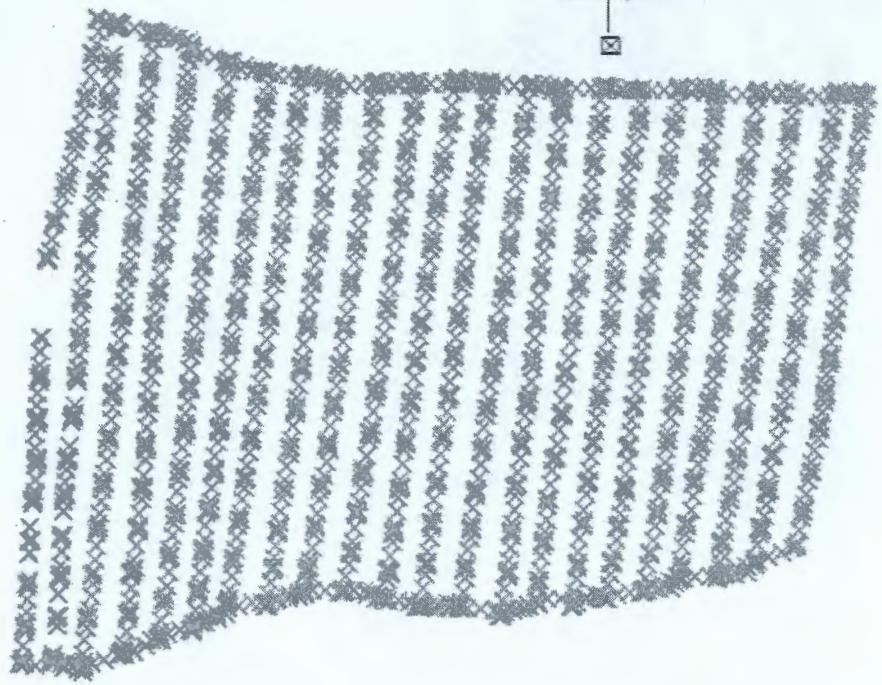

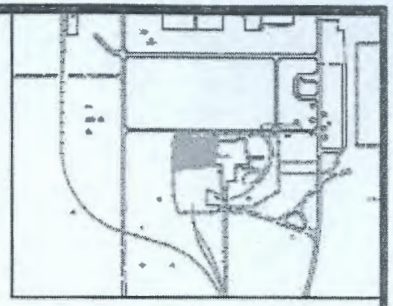

Site View

Copy

Legend	Summary Statistics
NET CPM	Coverage File: HH063,A
	Number of Data Pnts: 5285
	Type of Survey: gamma
× <2516	Max GCPM 2033
● 2516 - 5000	Avg Bkg CPM: 1258
● 5000 - 10000	Survey Date: 3/4/2011
● 10000 - 25000	Area Surveyed: 4155 m^2
● 25000	Project File: ESRFRM110037
	Pdf File: ESRFRM110037C

100H Field Remediation
132-H-3 ACL-BCL Area
GPERS Radiological Survey
Gamma Track Map

0 5 10 15 20 25 Meters

HANFORD

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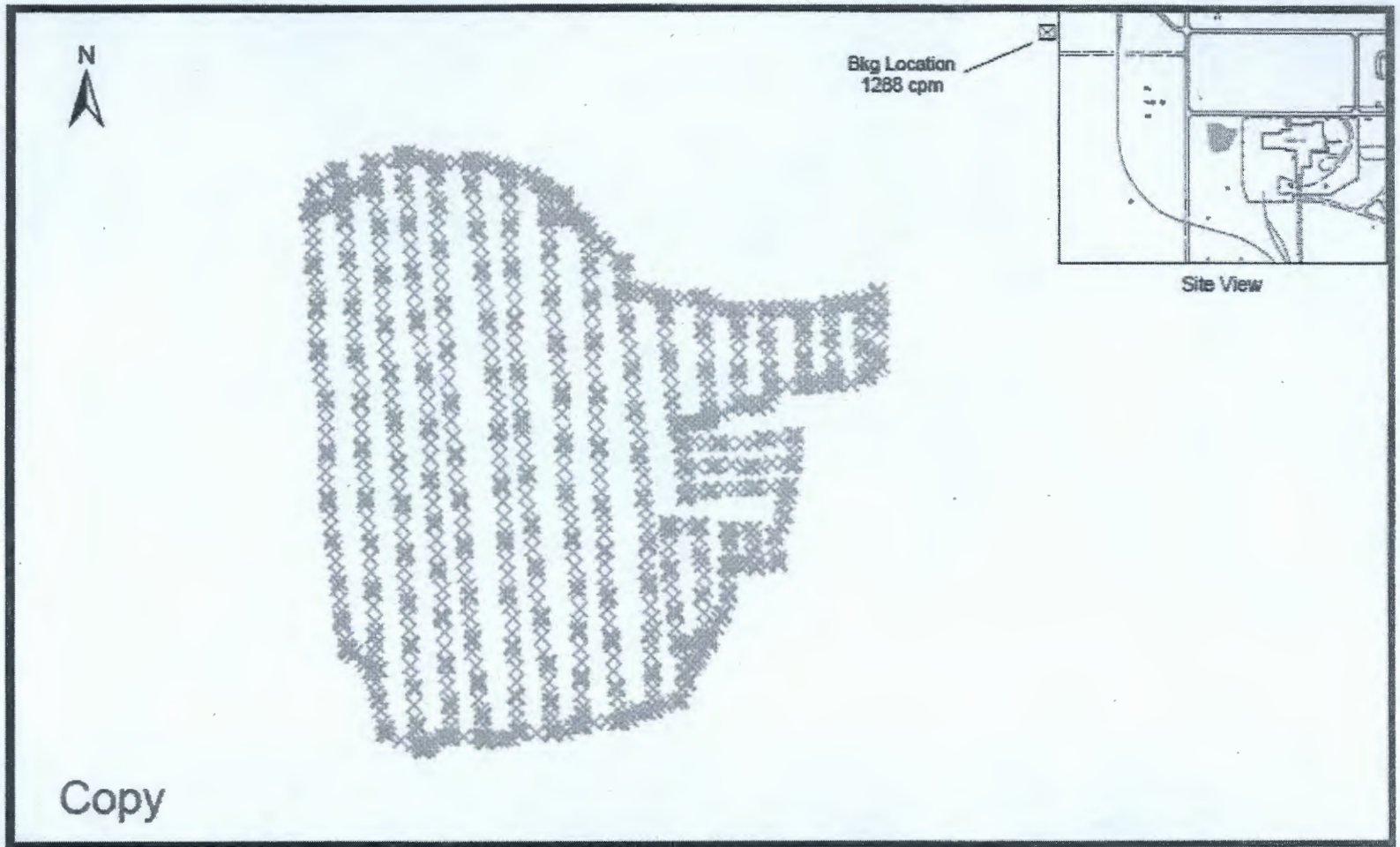
Survey Map Prepared By Bruce Coomer, GSI



Legend	Summary Statistics
NET CPM	Coverage File: H171A Number of Data Pnts: 2234 Type of Survey: gamma Max GCPM: 1934 Avg Bkg CPM: 1288 Survey Date: 6/20/2011 Area Surveyed: 1459 m^2 Project File: ESRFRM110144 Pdf File: ESRFRM110144C
× <1932	
● 1932 - 5000	
● 5000 - 10000	
● 10000 - 25000	
● 25000	

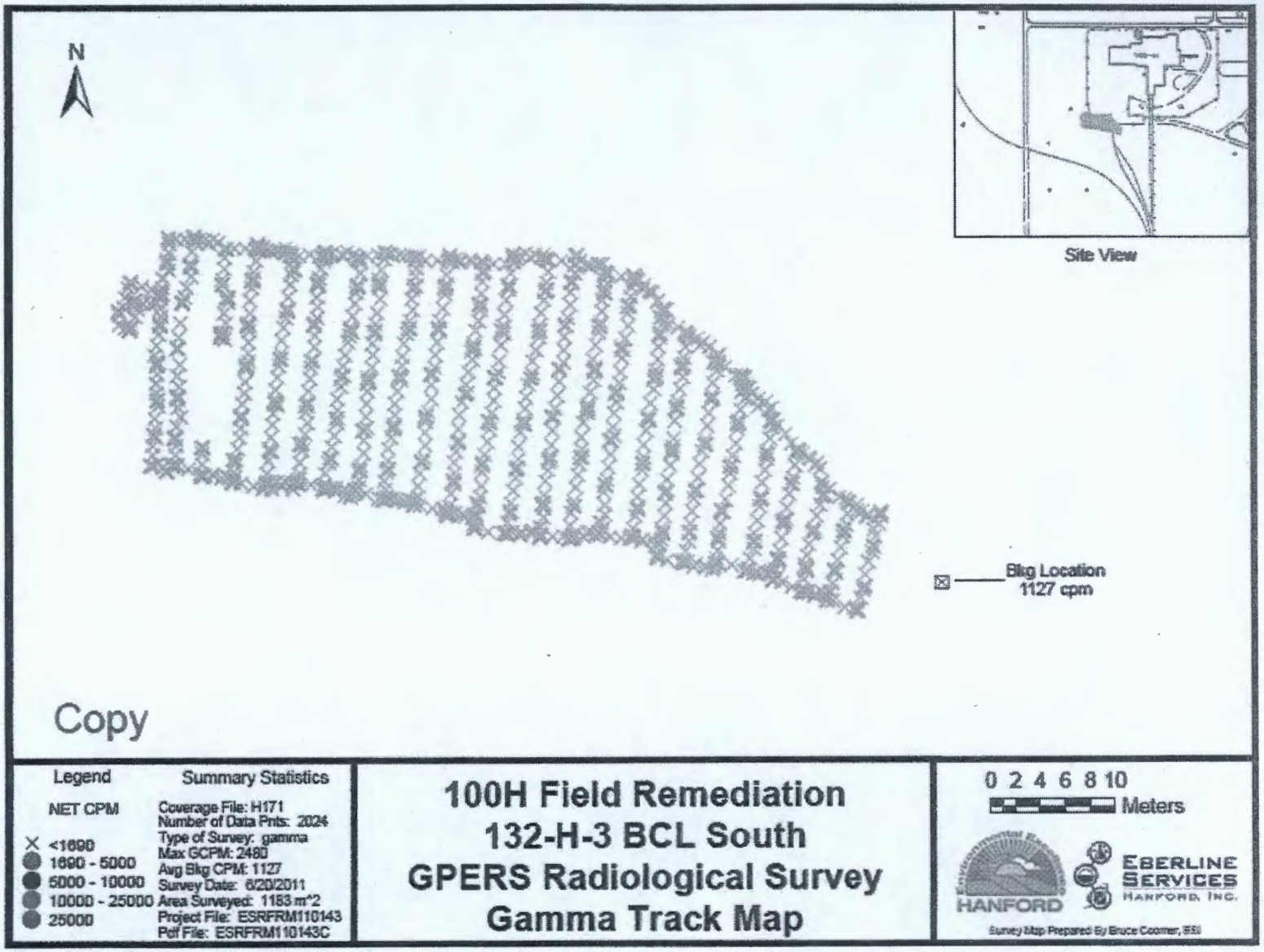
100H Field Remediation
132-H-3 BCL North
GPERS Radiological Survey
Gamma Track Map

0 2 4 6 8 10 Meters

HANFORD

EBERLINE SERVICES HANFORD, INC.

Survey Map Prepared By Bruce Coomer, ES3


N
Site View
Bkg Location
1127 cpm
Copy
Legend
NET CPM
<1690
1690 - 5000
5000 - 10000
10000 - 25000
25000
Summary Statistics
Coverage File: H171
Number of Data Pnts: 2024
Type of Survey: gamma
Max GCPM: 2480
Avg Bkg CPM: 1127
Survey Date: 6/20/2011
Area Surveyed: 1183 m^2
Project File: ESRFRM110143
Pdf File: ESRFRM110143C
100H Field Remediation
132-H-3 BCL South
GPERS Radiological Survey
Gamma Track Map
0 2 4 6 8 10
Meters
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Survey Map Prepared By Bruce Coomer, ESI

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Attachment 8

100 Area D4/ISS Status
October 13, 2011

D4 (WCH)

100-N River Structures (181-N, 181-NE, 1908-NE):

- Ecology issued to DOE a short-term modification (Order No. 8738) to the turbidity standard on September 7, 2011.
- Meeting held on September 8, 2011 at 100-N with NMFS and Ecology to view bench construction progress and review effectiveness of acoustic barrier system. NMFS approved reducing frequency of fish surveys from daily to once per week.
- Bench construction, facilitated by Order No. 8738, completed on September 21, 2011, three weeks ahead of schedule.
- River structures now being filled with sand from ERDF.
- Demolition scheduled to begin mid November.

182-N High Lift Pumphouse: Asbestos abatement complete. Plans for demolition are being finalized. Demolition of above-grade structure scheduled to begin by end of October.

105-N Fuel Storage Basin (FSB): Continuing with demolition of the 8-foot thick layer of grout at the bottom of FSB. Grout removal has not yet reached floor. WDOH is periodically being updated with the schedule to facilitate air sample collection once floor demolition activities commence. Radiological controls in place have kept dose levels ALARA.

117-N Exhaust Air Filter House: Demolition complete. Temporary road established over tunnels to 105-NE Fission Product Trap to facilitate FR removal of TSD piping northwest of the 116-N.

105-NE Fission Products Trap (FPT): Exclusion zone for Fuel Storage Basin currently being expanded to include Fission Products Trap. Demolition of FPT scheduled to begin by end of October.

105-N Reactor Building: ISS (Dickson/Intermech) nearing completion. Crane used for activities has been removed from site. Passive HEPA filter for Zone 1 has been installed. Water remaining in C elevator is scheduled to be pumped within two weeks and final grout is scheduled to be placed by end of October. All other activities (e.g., roofing, siding, electrical) scheduled to be complete by end of October.

Other Areas

400 Area: To date, twelve (12) buildings (i.e., 4791TC, 4843, and 4831, 4760, 4814, 4719, 4727, 4706, 4726, 4722B, 4734D and 4701B), including slabs, have been demolished and removed. Buildings 4790 and 4702 are the last two scheduled for demolition.

D Area: Construction of 114-D Bat Tower complete.

B Area: Fence restoration around Reactor Building complete.

Attachment 9

DOE/RL-2010-118
Revision 0

Sampling and Analysis Plan for Ex-Situ Plant and Invertebrate Bioassays to Evaluate Terrestrial Environments Across the Hanford Site

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office

P.O. Box 550
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DOE/RL-2010-118
Revision 0

Sampling and Analysis Plan for Ex-Situ Plant and Invertebrate Bioassays to Evaluate Terrestrial Environments Across the Hanford Site

Date Published
October 2011

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office

P.O. Box 550
Richland, Washington 99352

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Terms

aG	amber glass
ALARA	as low as reasonably achievable
ASTM	American Society for Testing and Materials
bgs	below ground surface
BHC	benzene hexachloride
CEC	Cation exchange capacity
CERCLA	*Comprehensive Environmental Response, Compensation and Liability Act of 1980*
DOE	U.S. Department of Energy
DOE-RL	DOE Richland Operations Office (also known as RL)
DQA	data quality assessment
DQO	data quality objectives
ECO	environmental compliance office
Ecology	Washington State Department of Ecology
Eco-SSL	ecological soil screening level
EPA	U.S. Environmental Protection Agency
ERAGS	ecological risk assessment guidance for superfund
ERDF	Environmental Restoration Disposal Facility
FTB	full trip blanks
G	glass
G/P	glass/plastic
HASQARD	*Hanford Analytical Services Quality Assurance Requirements Document*
HEIS	Hanford Environmental Information System
ICP	inductively coupled plasma
IDW	investigation-derived waste
LOEC	lowest observation effect concentration
MS	mass spectrometry
MTCA	Model Toxic Control Act
NOEC	no observed effect concentration

OA	Central Plateau Outer Area
OCSA	Old Central Shop Area
ORNL	Oak Ridge National Laboratory
OU	operational unit
P	plastic
PAH	polyaromatic hydrocarbons
PQL	practical quantitation limit
PRG	preliminary remediation goal
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
RC	river corridor
RCBRA	river corridor baseline risk assessment
SAP	sampling and analysis plan
SI	sampling instructions
SOP	standard operating procedures
SSL	soil screen level
TEE	terrestrial ecological evaluations
TOC	total organic carbon
Tri-Parties	Ecology, EPA, and DOE
Tri-Party Agreement (TPA)	*Hanford Federal Facility Agreement and Consent Order*
XRF	X-ray fluorescence

1 Introduction

The activities described in this sampling and analysis plan (SAP) are to support *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) baseline risk assessments and remedial investigations (RIs) in terrestrial habitats at the Hanford Site. Included, is a summary of the Data Quality Objectives (DQOs) identified specifically for the purposes of data collection to develop Hanford Site-specific soil preliminary remediation goals (PRGs) protective of plants and soil invertebrates. The data collected according to this SAP will have applicability to soils within terrestrial environments across the Hanford Site, which include both upland and riparian habitats. Subsequent chapters of this SAP present the quality assurance project plan (QAPjP), the field sampling plan, and the health and safety and waste management requirements.

1.1 Background

The Hanford Site encompasses approximately 1,517 km^2 (586 mi^2) in the Columbia River Basin of south-central Washington State. In 1989, the U.S. Environmental Protection Agency (EPA) placed the 100, 200, 300, and 1100 Areas of the Hanford Site on the 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priorities List," pursuant to CERCLA.[1] The Hanford Site is divided into multiple operable units (OU), each of which are included in various CERCLA decisions as outlined in the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement [TPA] [Ecology et al.,1989a]. The scope of the SAP encompasses waste sites needed to satisfy the DQOs for the Hanford Site terrestrial environments.

Current literature based PRGs may not be reflective of Hanford Site-specific conditions that affect analyte-specific exposure/response relationships for plants and invertebrates. This supports the need to create a field study to support PRG development for plants and invertebrates specific to the soils at the Hanford Site. This field study is part of a graded or iterative approach that is consistent with EPA 540-R-97-006 and the simplified and site-specific ecological evaluations described by the Washington State Department of Ecology (Ecology) (WAC 173-340-7492; WAC 173-340-7493). The field study presented in this SAP will report data that will represent Hanford Site-specific toxicity conditions that will be considered in remedy selection, as appropriate. Additional studies maybe warranted through the Remedial investigation/Feasibility Study (RI/FS) and Proposed Plan (PP) process for the OUs across the site, including the Inner Area of the Central Plateau.

Specifically, the field study should: (1) collect additional ecological data consisting of matching field soil chemistry and soil toxicity data from several defined concentration ranges, and (2) analyze those data to identify analyte-specific thresholds for effects or probabilities-of-effects at measured concentrations in terrestrial habitats. The results from these analyses will be used to develop concentration limits (PRGs), which can then be considered for use in remedial decision making.

This SAP was drafted to support soil sample collection, chemical analysis of the soils, and performance of bioassays for soil toxicity to plants and soil invertebrates. Washington State Department of Ecology (Ecology) has developed a sampling program to assess arsenic and lead toxicity that includes plant and invertebrate soil toxicity tests from the Hanford Site Old Orchards Areas. Ecology's sampling program at the Old Orchard Areas closely follows "Model Toxics Control Act—Cleanup Regulation" (MTCA) guidance for performing terrestrial ecological evaluations (TEE) per WAC 173-340-7490 through 7494. This SAP is consistent with Ecology's sampling and analysis program and with WAC 173-340-7490.

[1] The 1100 Area was removed from the National Priorities List in September 1996.

1.2 Purpose

The purpose of the activities described in this SAP is to provide data to support the development of Hanford Site-wide PRGs for plants and soil invertebrates. Preliminary screening of data from the terrestrial environments within the Hanford Site reveals concentrations of inorganic analytes (i.e., metals) were greater than the generic lookup values from Ecology (WAC 173-340, Table 749.3) and EPA OSWER Directives 9285.7-55 to 9285.7-78 for potential risks to plants and soil invertebrates. Thus, the purpose of this investigation is to collect data to assess whether potential toxicity to ecological receptors suggested by the desktop comparison of soil chemistry concentrations to generic lookup values is reflective of upland conditions at the Hanford Site. Concentrations in Hanford Site soils in excess of generic lookup values may not actually be toxic under conditions at the Hanford Site.

Activities described in this plan are based on the implementation of the DQO process as documented in this SAP.

1.3 Data Quality Objectives

The DQOs establish the type, quantity, and quality of data needed for ecological risk assessment purposes. The DQO process used in this SAP has been based on EPA/240/B-06/001, *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4 in accordance with the ecological risk assessment guidance for superfund (ERAGS) (EPA-540-R-97-006). These DQOs are based on the data used to develop Step 3 of ERAGS for the terrestrial environments of the Hanford Site as documented in the *Central Plateau Ecological Risk Assessment Data Package Report* (DOE/RL-2007-50). The DQOs themselves represent the Study Design, which is Step 4 of the ERAGS process. The following section summarizes the key outputs from ERAGS, which were used to implement the seven-step DQO process. The key DQO outputs that are summarized in this section include the statement of the problem, decision rules, tolerable limits on decision errors, and sampling design. The sampling design developed in this DQO is also summarized in this section.

The purpose of the DQO process was to define the scope and data needs to support ecological risk assessments of waste sites in the terrestrial soils at the Hanford Site, including both upland and riparian habitats. This SAP describes the samples and data collection processes that are needed to support refinement of terrestrial ecological PRGs.

1.3.1 DQO Step 1—Statement of Problem

Current literature-based PRGs may not be reflective of Hanford Site-specific conditions that affect analyte-specific exposure/response relationships for plants and invertebrates. The field study presented in this SAP will report data that will represent Hanford Site-specific toxicity conditions that will be considered in remedy selection, as appropriate..

1.3.2 DQO Step 2—Goals of the Study

The goals of the study are shown below:

- Identify bioassay sample locations in the Central Plateau that represent a range of soil analytical chemistry and geochemistry present throughout the Hanford Site.
- Capture the targeted analyte-specific low, medium, and high concentration ranges of as many high and medium priority analytes as possible (DQO Step 4 presents analyte priorities).
- Perform plant and invertebrate bioassays on selected samples and obtain sample-specific effects data.

- Integrate chemical characterization data with plant and invertebrate bioassay results; determine if significant relationships between soil chemistry and bioassay metrics are present.
- Present results that can support development and identification of Hanford Site-specific PRGs based on observed exposure/response relationships.

1.3.3 DQO Step 3—Identify Information Inputs

Information inputs for this SAP include:

- Conceptual site models and ecological exposure models
- Soil screening levels protective of plants and invertebrates obtained from literature-based generic look-up tables
- A list of additional soil chemical or geochemical properties that may influence bioassay results
- Chemical analysis of target analytes
- Background concentration ranges for analytes in Hanford Site soils
- Results of screening level ecological risk assessments that indicate specific analytes for which concentrations exceeded generic lookup values
- Field control samples with analyte concentration ranges at or below background and with similar soil types, geochemistry, and habitats to the waste sites being sampled in the Outer Area and River Corridor
- Plant reproduction and growth bioassay results (germination percentage, shoot mass, shoot height)
- Invertebrate reproduction and survival bioassay results (average number of progeny, percent survival)

1.3.4 DQO Step 4—Define the Boundaries of the Study

This section discusses the boundaries of the study. The study is designed to provide values that are applicable for surface soils across the Hanford Site, including soils in both upland and riparian habitats.

1.3.4.1 Concentration

Existing analytical chemistry data and process history information for waste sites were reviewed to identify potential analytes of interest. From the analytes of interest (Table 1-1), a subset of priority analytes was identified for guiding the overall study design and, in particular, selecting target sampling locations. Priority analytes (Table 1-2) were selected as those for which the literature-based soil screening levels are lower than other Hanford Site–specific PRGs. The priority analytes were also selected for those where the difference between the screening levels and the PRGs is large. In addition, the priority analytes were selected as those for which a significant number of historic samples

Table 1-1. Analytes of Interest for Sampling Design

Plants		Invertebrates	
Antimony	Manganese	Arsenic	Uranium
Arsenic	Mercury	Barium	Vanadium
Boron	Nickel	Boron	Zinc
Cadmium	Selenium	Chromium	
Chromium	Thallium	Lead	
Cobalt	Uranium	Manganese	
Copper	Vanadium	Mercury	
Lead	Zinc	Nickel	

exceed the screening levels, indicating a need to improve the PRGs. Data presented in the analysis are based on:

- Available site data at Outer Area and River Corridor.[2] Ranges of concentrations from available data were used to indicate the need for Hanford Site-specific cleanup goals (Table 1-3).
- Available Hanford Site-specific data including bioassay results from the upland and riparian soils in the River Corridor.
- Comparison of soil screening levels protective of plants and invertebrates relative to other Hanford Site-specific PRGs (wildlife, human health, and groundwater protection), plant and invertebrate no observed effect concentrations (NOECs) from the River Corridor (DOE/RL-2007-21, Draft B), and background.

Table 1-2. Priority Analytes

High Priority	Medium Priority
Antimony	Boron
Barium	Copper
Cadmium*	Lead
Chromium	Manganese
Mercury	
Thallium*	
Uranium*	
Zinc	

* Uranium is a high priority for the River Corridor, especially in the 300 Area. However, no sites have been identified in the Outer Area or River Corridor that have a suitable range of uranium (i.e., up to 250 mg/kg). In addition, lack of detection also helped guide the prioritization. For example, thallium was identified as an analyte of interest but few site measurements were available to guide site selection for this analyte. A similar situation exists for cadmium.

[2] The sampling and analytical data in soil for these selected analytes were obtained from a data pull from the Hanford Environmental Information System (HEIS). This data pull captured soil sampling and analytical data found in HEIS as of July 21, 2010 for Central Plateau Outer Area waste sites and post-remediation data from 100 and 300 Areas waste sites collected by the River Corridor Contractor. This data pull was performed on December 15, 2010 and exported to a Microsoft Excel™ workbook for further analysis.

Table 1-3. Comparison of Waste Site Contaminant Concentrations to Preliminary Screening Criteria for Prioritizing the Bioassay Study Design

	Criteria (mg/kg)											Statistics (mg/kg)											
Constituent	Background	Hanford Site-Specific Plant Bioassay from RCBRA[a] (confidence)	Hanford Site-Specific Invertebrate Bioassay from RCBRA[a] (confidence)	Tier 1 Wildlife	Tier II Wildlife	MTCA Method B Direct Contact for HH	Lowest Wildlife SSL	Lowest Plant SSL	Lowest Invert SSL	Priority	Area	Max	99th	98th	95th	90th	75th	50th	25th	10th	5th	Min	Sample Count
Antimony	5.2	0.695 Low	6.1 Moderate-high	6 Grasshopper mouse	146 Deer mouse	32	0.27	5	79	[illegible] Low	Outer Area	2,100	186.3	38.53	10.22	3.35	1.1875	0.505	0.2925	0.07735	0.047325	0.0368	166
											River Corridor	246	6.1	3.584	1.63	1.1	0.793	0.52	0.39	0.296	0.26	0.1	955
Arsenic	6.47	13.9 Moderate-high	12.2 Moderate-high	190 Deer mouse	127 Deer mouse	20[b]	43	10	60	Low Low	Outer Area	131	13.58	10.888	6.676	5.262	3.75	2.88	2.35	1.82	1.58	0.881	957
											River Corridor	100	24.834	15.6	8.61	6.3	3.8	2.3	2.2	1.7	1.4	0.43	5,174
Barium	132	314 Moderate	258 Moderate-high	1323 Killdeer	1697 Killdeer	16,000	102	500	330	[illegible] Low	Outer Area	4,750	185.2	150.4	120	105	89.6	76.5	62.5	49.8	43.7	0.77	961
											River Corridor	1,420	326.04	207.08	131	100	79.1	65	54.8	45.28	38.5	1.3	4,949
Boron	3.62	23.8 Moderate-high	29.4 Moderate-high	133 Pocket mouse	81 Killdeer and deer mouse	16,000	–	0.5	–	Mod Low	Outer Area	105	47.467	43.924	40.605	35.8	28.35	14.3	9.59	5.268	2.1	0.51	520
											River Corridor	49	26.569	15.2	7.225	3.9	2.3	1.5	1	0.7	0.5753	0.19	3,344
Cadmium	1	2.7 Moderate-high	2.54 Moderate-high	2 Killdeer	29 Killdeer	40	0.36	4	20	[illegible] Mod	Outer Area	28	7.39	4.09	2.685	1.19	0.3935	0.15	0.11	0.07	0.0535	0.0116	511
											River Corridor	55	2.4	1.84	1.1	0.56	0.2	0.118	0.075	0.053	0.047	0.01	2,776
Chromium	18.5	39.3 Low	149 Moderate-high	38 Killdeer	109 Killdeer	120,000	26	1	0.4	[illegible] [illegible]	Outer Area	615	93.96	46.34	21.86	14.66	10.4	8.07	6.055	4.028	3.026	1.43	1,003
											River Corridor	53,000	152	75.754	30.3	19.1	13	10	7.9	6.2	5.1	0.12	5,998
Cobalt	15.7	11.2 Low	12.2 Moderate	111 Killdeer	484 Killdeer	24	120	13	–	Low Low	Outer Area	18	13.217	12.6	11	9.884	8.6425	7.6	6.47	5.666	5.149	2.83	584
											River Corridor	34	12.8	11.4	10.2	9.4	8.2	7	5.81	5	4.5	0.28	4,458
Copper	22	51.6 Moderate-high	45.6 Moderate-high	107 Killdeer	213 Killdeer	3,200	28	70	50	Mod Low	Outer Area	4,080	170	77.82	38.9	22.5	16.5	13.7	11.5	9.7	8.83	0.729	841
											River Corridor	62,900	71.216	46.016	29.57	22.5	15.8	14.1	12.4	10.9	10	0.13	4,347
Lead	10.2	129 Moderate-high	116 Moderate-high	36 Killdeer	158 Killdeer	250	11	50	500	Mod Low	Outer Area	335,000	555.5	239.8	81.4	21.3	7.7	5.3	3.93	2.87	2.4	1.3	971
											River Corridor	52,800	104.44	93.244	46.71	24.7	8.67	4.9	3.5	2.618	2.3	0.25	6,079
Manganese	512	588 Moderate	570 Moderate	5,799 Deer mouse	3,322 Pocket mouse	11,200	1500	220	450	Mod Mod	Outer Area	8,410	913.28	741.64	431.4	396.6	365	326	286	261	247.8	134	213
											River Corridor	33,400	561.04	506.08	409	375	332	292	259	224	203	3.2	4,449
Mercury	0.33	0.126 Moderate	0.136 Moderate	2 Deer mouse	1.8 Deer mouse	24	5	0.3	0.1	Low [illegible]	Outer Area	86	30.564	10.798	4.3	0.964	0.245	0.07	0.0274	0.0107	0.008571	0.00514	175
											River Corridor	252	13.65	5.169	1.3	0.5	0.11	0.034	0.017	0.0092	0.0075	0.0044	2,011
Nickel	19.1	24.8 Moderate	24.8 Moderate	33 Grasshopper mouse	247 Deer mouse	1,600	130	30	200	Low Low	Outer Area	268	35.744	20.988	16.21	13.2	10.6	9.2	7.855	6.566	5.188	0.95	879
											River Corridor	142	42.18	22.628	15.6	13.1	11.2	9.93	8.8	7.9	7.202	1.6	1,485
Selenium	0.76	1.2 Low	0.973 Low	2 Deer mouse	1.4 Deer mouse	400	0.3	0.52	70	Low Low	Outer Area	5	2.4896	2.0024	1.716	1.516	1.2	0.92	0.64	0.45	0.38	0.197	635
											River Corridor	17	3.112	4.316	2.57	1.58	1.1	0.76	0.4955	0.3368	0.29	0.204	243
Thallium	[illegible]	Not detected Not applicable	Not detected Not applicable	9 Deer mouse	–	–	–	1	–	[illegible] [illegible]	Outer Area	5	3.0072	1.4	1.3	0.98	0.63	0.17	0.11	0.09436	0.06104	0.0192	285
											River Corridor	5	4.06	3.12	2.4	1.8	1.6	1.2	0.9	0.503	0.452	0.37	61
Uranium	[illegible]	8.1 Moderate	4.53 Moderate	706 Deer mouse	40 Badger	240	–		–	Low [illegible]	Outer Area	87	15.056	8.9	1.948	0.8704	0.54	0.43	0.35	0.2824	0.2594	0.14	637
											River Corridor	2,610	565.25	206.1	84.628	31.1	5.4175	3.1	2.2	1.5	1.4	1.1	106
Vanadium	95.1	84.7 Moderate	84.7 Moderate	31 Killdeer	43 Killdeer	400	7.8	2	–	Low Low	Outer Area	174	37.375	84.08	77.2	70.2	59.4	48.05	37.225	23.2	19.1	4.98	806
											River Corridor	129	87.142	81.9	74.1	68.2	57.7	47.1	39	31.3	27.3	0.09	4,430
Zinc	67.8	621 Moderate-high	393 Moderate-high	68 Killdeer	856 Killdeer	24,000	46	50	120	[illegible] Mod	Outer Area	9,420	760.1	311.96	144.3	93.72	53.375	43.95	36.3	29.2	25.1	10.2	958
											River Corridor	28,600	349	282.38	137	71.1	49.5	42.3	36.7	31.7	28.8	0.84	4,332

Notes:

[a] Values shown for the Hanford-specific plant and soil invertebrate bioassays are no observed effect concentrations (NOECs) based on studies conducted as part of the River Corridor Baseline Risk Assessment (RCBRA).

[b] Arsenic value is MTCA Method A which was used as the Interim Action Records of Decision for the River Corridor

red text = not a Hanford specific background value; source of value is PNNL-18577 (boron and thallium), Ecology Publication 94-115 (antimony, cadmium, and selenium) or DOE/RL-96-17 (uranium)

Gold highlight in criteria columns indicates major considerations in determining priority contaminants for bioassay

purple - cleanup values suggested in SSL that are higher than background or RCBRA bioassay results

Priority Column:

- red=high
- yellow=moderate
- blue=low

Statistics:

underline bold = below background

Yellow highlight = below RCBRA bioassay

Green highlight = above Direct Contact MTCA B

blue highlight - above wildlife value

Acronyms:

RCBRA = River Corridor Baseline Risk Assessment (DOE/RL-2007-21, 2008)

SSL = soil screening level (EPA's Ecological Soil Screening Levels and Ecology's Ecological Soil Indicator Concentrations (WAC 173-340-900, Table 749-3)

MTCA B = Model Toxics Control Act soil preliminary remediation goals established using Method B standards for direct contact (WAC 173-340-740, "Model Toxics Control Act—Cleanup, Unrestricted land use soil cleanup standards").

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In addition to the analytes of interest, this SAP will include the analysis of additional analytes to confirm the selection of soil samples for conducting bioassays (Table 1-4).

Table 1-4. Additional Analytes to Be Sampled

Inorganics		Insecticides	Herbicides
Total Organic Carbon	Calcium	DDT, DDE, and DDD	2-(2,4-Dichlorophenoxy)propionic Acid (Dichloroprop)
Cation Exchange Capacity	Magnesium	Dieldrin	Pentachlorophenol
Grain Size Distribution reported as percents material (e.g., percent soil, percent clay, percent rock, etc.)	Phosphorous	Endrin, Endrin Aldehyde, Endrin Ketone	4,6,-dinitro-2-methylphenol
pH	Potassium	Heptachlor Heptachlor epoxide	2-sec-butyl-4,6-dinitrophenol (Dinoseb)
Beryllium	Total Nitrogen compounds	BHC compounds (Lindane isomers)—alpha, beta, delta, and gamma	Pentachloronitrobenzene
Molybdenum	Sodium	Aldrin	Hexachlorobenzene
Nickel		Endosulfan I and II and Endosulfan Sulfate	
Silver		Alpha and gamma chlordane	
Tin		Methoxychlor	
		Toxaphene	

DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyl trichloroethane

These additional analytes will help select target locations for performing soil bioassays and will be used to perform correlative analysis of soil chemistry and observed response in the bioassays. The presence of analytes such as herbicides, insecticides, or particular soil geochemistry conditions may suggest that some locations are not good candidates for bioassays. The presence of herbicides or insecticides in soils could create a false-positive indication of soil toxicity. Geochemical conditions that are not conducive to plant or invertebrate growth could also be a confounding factor in observing metals toxicity in soil.

Following the selection of samples for bioassays, those samples will be analyzed for selected chemical parameters in addition to the analytes of interest (Table 1-1). Analyses of these chemical parameters will be used to facilitate interpretation of the bioassay results; specifically, these analyses will be used to identify confounding factors that might be responsible for observed adverse effects to plants or invertebrates in the bioassays.

The selection of target sites for PRG development was intended to obtain concentrations of priority analytes in soil that brackets ecologically relevant effects for plants and soil invertebrates. Data employed for the site selection step included available soil data from tens of waste sites across the Central Plateau

Outer Area and the River Corridor. The data sets included a mix of waste sites that have undergone remediation under interim action measures as well as waste sites that have not been remediated yet. Table 1-5 shows the established ranges for all analytes considered in this study.

1.3.4.2 Horizontal (Lateral Area) Study Boundary

The combination of the data review and field information resulted in identification of five waste sites in the Central Plateau Outer Area with the combination of the most suitable concentration ranges that were readily accessible. These five waste sites are:

- OCSA (Old Central Shop Area)
- 600-218
- 600-220
- 600-281
- 600-228

These five waste sites are shown in Figure 1-1. From within these five waste sites, 23 specific locations were identified with previously collected data that spans the target concentration ranges. Previously measured concentrations of priority analytes within the 23 specific target sampling locations and where the concentrations fall within the target ranges of priority analytes are presented in Table 1-6. Assuming that proposed samples will result in similar measurements of priority analytes, these historic data serve to validate the study design by indicating how many samples may hit the target concentration ranges. Data suggests that concentrations from these 23 target locations do not bound target ranges of some of the priority analytes: mercury, thallium, uranium, and cadmium. Additional samples will be collected from the 120-KW-1 waste site in the River Corridor (Figure 1-2) to capture the target range for mercury. A suitable site with uranium data was not identified as part of this SAP. Should a suitable site become available, the feasibility of soil sampling from that site and performing toxicity testing will be evaluated.

Field controls are a necessary component of the analysis of bioassay results for PRG development. Results from the waste sites will be compared to those from the field controls as part of data interpretation. Observed effects in the bioassays will be compared to controls to identify those that are significantly different from those that naturally occur.

Field controls were identified as locations with concentrations of target analytes that are at or below 90th percentile background upper tolerance levels. Concentrations of target analytes from previously collected samples from within the Outer Area were reviewed to select candidate sites. The list of prospective sites were then field verified to confirm 20 locations where vegetation was present. These 20 locations will have chemical analysis performed from which ten locations will be identified for performing bioassays. Ten locations will be selected with concentrations at or below Hanford Site background (DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, and Hart Crowser, 2007). The details of this two-phased approach to bioassay selection described in the DQOs in Chapter 1 also apply to selection of field control bioassays.

Selection of sampling locations followed a systematic approach:

- Identification of desired concentration ranges for individual analytes. The bioassays require a gradient of concentrations in soil—from low to high—in order to identify NOECs and lowest observation effect concentrations (LOECs). For each analyte, these concentration ranges were identified, taking into consideration the distribution of concentrations in soil, background concentrations, ecological screening levels, and LOECs presented in the literature.

Table 1-5. Concentration Ranges in Soil Used for Selection of Bioassay Sampling Locations

Contaminant	Background and Screening Level Concentrations in Soil (mg/kg)									Concentration Ranges (mg/kg)			Explanation for Determining Soil Concentration Ranges
	Background	Eco-SSL—Plant[a]	MTCA/ORNL—Plant[a]	Eco-SSL—Invert	MTCA/ORNL—Invert	Lowest Wildlife Eco-SSL	Hanford Site-Specific Plant Bioassay from RCBRA[b]	Hanford Site-Specific Invertebrate Bioassay from RCBRA[b]	Unrestricted Land Use MTCA Method B[c]	Low	Mid	High	
Antimony	5.2	Not available	5	78	Not available	0.27	0.685	6.1	32	5.2 to 38	38 to 186	186 to >2,100	**Low range:** from background 98th percentile of OA data **Mid range:** 98th percentile OA to 99th percentile OA **High range:** 99th percentile OA to OA max
Arsenic	6.47	18	10	Not available	60	43	19.3	12.2	0.7	6.5 to 18	18 to 100	100 to >131	**Low range:** from background to Eco-SSL plant **Mid range:** from Eco-SSL plant to RC max **High range:** from RC max to OA max
Barium	132	Not available	500	330	Not available	102	314	358	16,000	132 to 330	330 to 2,000	2,000 to >4,760	**Low range:** from background to the invert Eco-SSL **Mid range:** from invert Eco-SSL to highest of plant LOEC in Eco-SSL data set **High range:** highest of plant LOEC in Eco-SSL data set to max OA
Boron	3.62	Not available	0.5	Not available	Not available	Not available	29.6	28.6	16,000	3.62 to 7.2	7.2 to 30	30 to >105	**Low range:** from background to 95th percentile from the OA data. **Mid range:** from the 95th percentile to the max dose tested from RCBRA **High range:** from RCBRA bioassay to max OA
Cadmium	1	32	4	140	20	0.36	2.7	2.54	40	1 to 4	4 to 20	20 to >40	**Low range:** between background and the lowest plant benchmark **Mid range**: between ORNL plant and ORNL invert **High range:** ORNL invert and MTCA Method B
Chromium	18.5	Not available	1	Not available	0.4	26	39.3	149	120,000	18.5 to 30	30 to 150	150 to >815	**Low range:** background to RCBRA 95th percentile **Mid range:** RCBRA 95th percentile to 99th percentile **High range**: RCBRA 99th percentile to OA max

Table 1-5. Concentration Ranges in Soil Used for Selection of Bioassay Sampling Locations

Contaminant	Background and Screening Level Concentrations in Soil (mg/kg)									Concentration Ranges (mg/kg)			Explanation for Determining Soil Concentration Ranges
	Background	Eco-SSL—Plant	MTCA/ORNL—Plant[a]	Eco-SSL—Invert	MTCA/ORNL—Invert	Lowest Wildlife Eco-SSL	Hanford Site-Specific Plant Bioassay from RCBRA[b]	Hanford Site-Specific Invertebrate Bioassay from RCBRA[b]	Unrestricted Land Use MTCA Method B[c]	Low	Mid	High	
Cobalt	15.7	13	20	Not available	Not available	120	11.2	12.2	24	<15.7	Not applicable	Not applicable	Maximum concentrations (18 mg/kg in OA and 33.9 mg/kg in RC) are not substantially different from background, and would not provide a useful for defining concentration gradient. **Low range:** background to ORNL plant
Copper	22	70	100	80	50	28	53.6	45.6	3,200	22 to 50	50 to 170	170 to 4,080	**Low range:** background to RCBRA bioassay **Mid range:** RCBRA bioassay to OA 99th percentile **High range:** from OA 99th percentile to the OA max
Lead	10.2	120	50	1,700	500	11	125	116	250	10 to 120	120 to 500	>500	**Low range:** between background and the Eco-SSL plant/RCBRA max bioassay **Mid range:** from the Eco-SSL plant/RCBRA max bioassay to approximately the 95th percentile in the OA/ORNL invert/median of plant LOECs from ORNL/ES/ER-TM-85/R3 **High range:** above 95th percentile in the OA/ORNL invert/median of plant LOECs; protection of human health risk will be more of an issue above 2,000 mg/kg
Manganese	512	220	500	450	Not available	1,500	558	570	11,200	512 to 750	750 to 1,000	1,000 to >8,400	Ranges not particularly useful as concentration range above screening levels is tight. **Low range:** from background to 98th percentile of OA data **Mid range:** 98th percentile OA to just above 99th percentile for OA **High range:** 99th percentile OA to approximate OA max

Table 1-5. Concentration Ranges in Soil Used for Selection of Bioassay Sampling Locations

Contaminant	Background and Screening Level Concentrations in Soil (mg/kg)									Concentration Ranges (mg/kg)			Explanation for Determining Soil Concentration Ranges
	Background	Eco-SSL—Plant	MTCA/ORNL—Plant[a]	Eco-SSL—Invert	MTCA/ORNL—Invert	Lowest Wildlife Eco-SSL	Hanford Site-Specific Plant Bioassay from RCBRA[b]	Hanford Site-Specific Invertebrate Bioassay from RCBRA[b]	Unrestricted Land Use MTCA Method B[c]	Low	Mid	High	
Mercury	0.33	Not available	0.3	Not available	0.1	5	0.126	0.136	24.0	0.33 to 1.3	1.3 to 13.7	13.7 to 250	Mildly useful for OA, useful for RC. **Low range:** background to RC 95th percentile **Mid range:** 95th to 99th percentiles RC **High range:** 99th percentile RC to approximate RC max
Nickel	19.1	38	30	280	200	130	24.8	24.8	1600.0	19.1 to 30	30 to 280	Not applicable	**Low range:** from background to plant ORNL **Mid range:** from plant ORNL to invert Eco-SSL; also the max OA concentration **High range:** not applicable—concentration range bounded by low and mid ranges
Selenium	0.78	0.52	1	Not available	70	0.3	1.2	0.973	400.0	0.78 to 2.5	2.5 to 4.3	4.3 to 11	Range of data is tight. **Low range:** background to 99th percentile OA **Mid range:** 99th percentile OA to approximate 98th percentile RC **High range:** 98th percentile RC to approximate RC max
Thallium	0.209	Not available	1	Not available	Not available	Not available	Not detected	Not detected	Not available	1 to 2.4	2.4 to 4	4 to >5	All ranges based on data distribution. Data distribution is tight. **Low range:** ORNL plant value to 95th percentile in RC **Mid range:** 95th to 99th percentile in RC **High range:** 99th percentile in RC to approximate site max
Uranium	3.21	250	5	Not available	Not available	Not available	8.1	4.53	240.0	3.21 to 100	100 to 250	250 to 2,610	High uranium concentrations are limited in the OA and RC. **Low range:** background to Sheppard et al., 2005 lowest **Mid range:** Based on ranges of benchmarks in Sheppard et al., 2005 **High range:** Sheppard et al., 2005 high benchmark to RC max concentration

Table 1-5. Concentration Ranges in Soil Used for Selection of Bioassay Sampling Locations

	Background and Screening Level Concentrations in Soil (mg/kg)									Concentration Ranges (mg/kg)			
Contaminant	Background	Eco-SSL—Plant	MTCA/ORNL—Plant[a]	Eco-SSL—Invert	MTCA/ORNL—Invert	Lowest Wildlife Eco-SSL	Hanford Site-Specific Plant Bioassay from RCBRA[b]	Hanford Site-Specific Invertebrate Bioassay from RCBRA[b]	Unrestricted Land Use MTCA Method B[c]	Low	Mid	High	Explanation for Determining Soil Concentration Ranges
Vanadium	85.1	Not available	2	Not available	Not available	7.8	84.7	84.7	400.0	85 to 100	100 to 115	115 to 130	Most ecological levels are close to background concentrations in soil. **Low range:** background to arbitrary number below site max based on site data distribution **Mid range:** arbitrary numbers below site max based on site data distribution **High range:** arbitrary number based on site data distribution to site max
Zinc	67.8	160	50	120	200	46	621	393	24000.0	67 to 145	145 to 760	760 to 9,420	**Low range:** background to maximum tested RCRA biossay **Mid range:** maximum tested RCRA biossay to just below 99th percentile OA **High range:** 99th percentile OA to a high value that is obtainable in the field

Sources for background values:

DOE/RL-92-24: arsenic, barium, chromium, cobalt, copper, lead, manganese, mercury, nickel, vanadium, zinc, 90th percentile of the log-normal distribution.

PNNL-18577: boron, thallium, 90th percentile of the log-normal distribution.

Ecology Publication 94-115: antimony, cadmium, selenium, 90th percentile of log-normal distribution of state-wide soils.

DOE/RL-96-17: uranium.

Additional Notes:

a. MTCA/ORNL are soil screening levels published as Soil indicator Concentrations in WAC 173-340, the original sources are ORNL documents listed below.

b. Values shown for the Hanford-specific plant and soil invertebrate bioassays are no observed effect concentrations (NOECs) based on studies conducted as part of the River Corridor Baseline Risk Assessment (RCBRA).

c. MTCA B are direct contact soil preliminary remediation goals established using Method B standards (WAC 173-340-740).

Acronyms:

EcoSSL = EPA's Ecological Soil Screening Levels (http://www.epa.gov/ecotox/ecossl/)

LOEC = lowest observed adverse effect level

MTCA = Model Toxics Control Act published by the Washington State Department of Ecology (Ecology) as WAC 173-340.

OA = Central Plateau Outer Area

ORNL = Oak Ridge National Laboratory ecological benchmark for plants and soil invertebrates (ORNL/ES/ER/TM-85/R3 for plants and ORNL/ES/ER/TM-126/R2 for soil invertebrates)

RC = River Corridor

--- = means value is not available

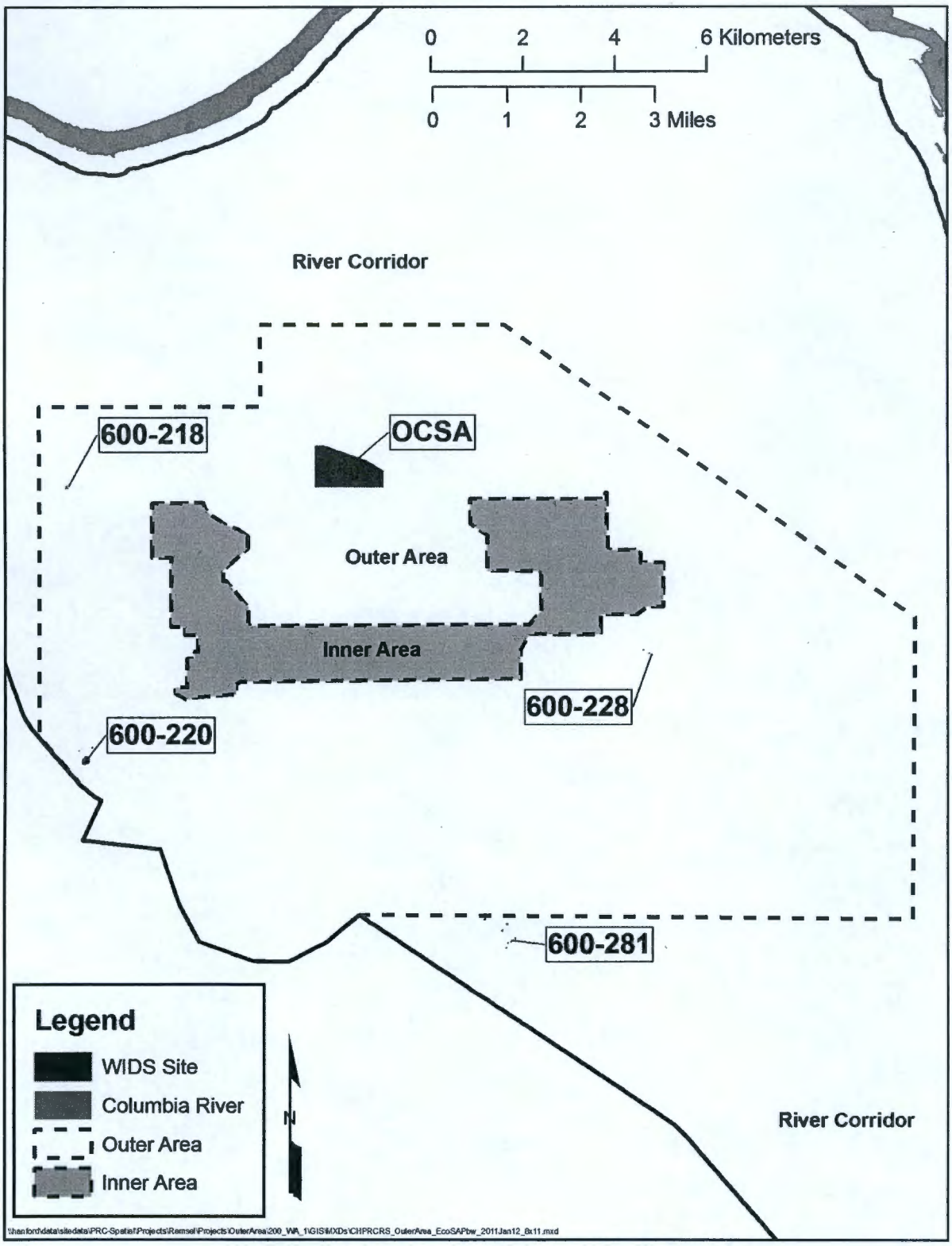

Figure 1-1. Central Plateau Outer Area Waste Sites Targeted for Sample Collection to Support PRG Development

- Site selection was intended to aim for the range of measurements at the selected locations and to cover the range of concentrations measured in the Central Plateau Outer Area and River Corridor.
- Sites were selected that are readily accessible, with permits that are up-to-date, and with historical measured concentrations within the established target ranges of the priority analytes (Step 1 above).
- Sites selected for conducting bioassays were based on high and medium priority analytes only. Low priority analytes are not expected to drive remedial decisions, and in many cases, the range of analytical chemistry that can be captured will not bring significant improvement to remedial decisions because the plant and invertebrate screening levels are relatively close to other remediation goals (e.g., human health or wildlife based). Table 1-6 shows available data for targeted sites and the predicted ability to hit targeted ranges.

1.3.4.3 Vertical (Depth in Soil) Study Boundary

Soil sampling needs to capture the range of target analytes with the appropriate concentration (see Table 1-5). Sites have been identified where the appropriate concentrations are accessible in readily obtainable surface soil 0 to 30 cm (0 to 12 in.) below ground surface (bgs). For PRG development, concentration range is more important the exposure location.

1.3.4.4 Temporal (Time Frame) Considerations

There are no temporal considerations in this study design. Target analyte (mostly metals) concentrations in soil are unlikely to vary seasonally.

1.3.5 DQO Step 5—Develop the Analytical Approach

The analytical approach will be broken into two separate phases. Phase 1 is designed to obtain laboratory data that can be used to identify prospective locations for performing bioassays for the purposes of meeting goals designed to address the problem statement. Phase 2 is designed to document how target analytes contributed to any observed toxicity in bioassay results.

1.3.5.1 Phase 1 Sample Collection and Analysis

Phase 1 consists of collecting and analyzing 100 to 120 surface soil (0 to 30 cm [0 to 12 in.] bgs) samples from the sites identified above. The field samples will be collected in one mobilization effort such that sample collection will proceed for as many days as necessary to complete the activities. As part of this continuous field effort, soil for chemical analysis and potential bioassays will be collected simultaneously and concurrently from the same soil that has been homogenized prior to filling sample bottles. Three to five total chemistry samples will be collected from within an approximately 3 m (10 ft) radius of each target sample location. Twenty field control samples will also be collected. The target waste site sample locations are summarized in Chapter 3. Sample volume for chemical analysis will be sent to analytical laboratories. Additional sample volume for performing bioassays in Phase 2 will be shipped and archived at the bioassay laboratory until completion of Phase 1 laboratory analysis and subsequent evaluation of the data.

Once the Phase 1 data are received, they will be reviewed for analytical chemistry results to select a subset of samples (60 to 80 total locations) from waste site samples for performing Phase 2 bioassays. A minimum of 60 total samples for plant bioassays and 60 total samples for invertebrate bioassays will be selected as a subset of the 100 to 120 samples analyzed for chemical and physical properties. The subset will include 10 field controls and 60 to 80 samples from waste sites where concentrations exceed generic lookup values, including locations representing maximum, midrange, and low concentrations of high and medium priority analytes with historic concentrations that exceeded generic lookup values.

Table 1-6. Concentrations of Priority Analytes within Historic Samples at Target Sampling Locations

Constituent	Concentration ranges (mg/kg) Low	Mid	High	HEIS* Sample Identifier B23C48	B23C49	B25CL2	B25CL3	B25CM2	B25CM4	B25FV6	B25FW2	B25KN8	B25KP0	B25KP1	B25VN2	B296P8/ B296P9	B26792	B26795	B26X42	B26X46	B26X51	B26XC7	B27HV8	B27JB0	B295D6	B295D7
High Priority																										
Antimony	5.2 to 38	38 to 186	186 to >2100	0.34	NA	0.81	41.2	3.69	NA	[illegible]	0.49	[illegible]	[illegible]	[illegible]	NA	0.6	0.169	NA	1.41	15.4	[illegible]	1.48	0.469	1.02	0.562	1.33
Barium	132 to 330	330 to 2,000	2,000 to > 4,760	73.2	71.2	[illegible]	105	[illegible]	74.9	81.6	[illegible]	[illegible]	[illegible]	[illegible]	69.1	52.6	72.1	85.2	97.8	94.5	61.6	61.8	[illegible]	406	97.5	[illegible]
Cadmium	1 to 4	4 to 20	20 to >40	0.26	0.12	0.7	0.12	0.62	[illegible]	0.21	0.16	0.67	[illegible]	[illegible]	0.16	0.5	[illegible]	[illegible]	5.65	[illegible]	[illegible]	0.19	0.291	0.622	[illegible]	0.164
Chromium	18.5 to 30	30 to 150	150 to >815	[illegible]	8.59	18.2	15	31.8	36.9	8.64	8.16	13.5	[illegible]	35.2	11.9	6.77	7.85	6.98	7.62	10.7	[illegible]	34	14.9	[illegible]	17.9	14.1
Mercury	0.33 to 1.3	1.3 to 13.7	13.7 to 250	NA	NA	NA	NA	0.08	NA	NA	NA	NA	0.06	0.05	NA	0.2	0.118	0.233	NA	NA	0.06	NA	NA	NA	NA	NA
Thallium	1 to 2.4	2.4 to 4	4 to >5	NA	NA	0.13	0.09	NA	NA	NA	NA	NA	0.1	0.2	NA	0.65	0.0794	NA	NA	NA	[illegible]	NA	NA	NA	NA	NA
Uranium	3.21 to 100	100 to 250	250 to 2610	0.34	0.56	0.46	0.42	0.45	0.4	0.75	0.34	0.44	0.53	0.45	0.47	0.523	0.31	0.398	0.43	1.94	0.14	0.24	0.335	0.793	0.432	0.611
Zinc	67 to 145	145 to 760	760 to 9420	39.3	52.7	694	65.9	329	148	[illegible]	201	175	548	468	44.4	66.7	[illegible]	[illegible]	51.9	[illegible]	[illegible]	30.7	[illegible]	250	[illegible]	[illegible]
Medium Priority																										
Boron	3.62 to 7.2	7.2 to 30	30 to > 105	9.38	9.03	18.4	11.6	10.6	9.39	28	[illegible]	28.1	[illegible]	29.6	28.2	2	[illegible]	[illegible]	[illegible]	[illegible]	15.7	[illegible]	22	[illegible]	NA	[illegible]
Copper	22-50	50-170	170-4080	21.5	11.8	[illegible]	[illegible]	52.7	9.31	17.3	20.9	[illegible]	160	[illegible]	16.2	[illegible]	10.7	[illegible]	[illegible]	62.8	[illegible]	84.7	12.7	[illegible]	66.2	[illegible]
Lead	10 to 120	120 to 500	> 500	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	453	[illegible]	[illegible]	[illegible]	[illegible]	442	5.08	[illegible]	[illegible]	139	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	130	176
Manganese	512 to 750	750 to 1000	1000 to >8400	388	304	1000	314	295	298	360	319	399	469	376	368	[illegible]	265	935	277	194	134	431	310	383	[illegible]	421
Low Priority																										
Arsenic	6.5 to 18	18 to 100	100 to > 131	2.89	2.68	4.26	3.49	3.27	3.01	4.15	2.68	4.67	5.71	[illegible]	3.08	1.87	2.02	2.65	2.42	2.5	28.5	[illegible]	3.51	6.37	[illegible]	4.55
Cobalt	<15.7	not applicable	not applicable	11	6.8	7.85	6.86	6.28	5.68	8.39	6.62	8.51	10.6	8.52	8.12	[illegible]	6.17	6.34	5.99	4.1	2.83	10.6	7.47	6.73	9.82	8.89
Nickel	19.1 to 30	30 to 280	not applicable	288	8.42	14.4	11.4	9.86	10.6	10.6	8.86	12.2	17.1	16.4	11.7	[illegible]	8.97	8.21	8.14	6.69	5.19	85.3	9.1	[illegible]	15.9	13.8
Selenium	0.78 to 2.5	2.5 to 4.3	4.3 to 11	0.84	0.73	[illegible]	[illegible]	[illegible]	[illegible]	0.85	0.85	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.59	NA	[illegible]	[illegible]	[illegible]	0.388
Vanadium	85 to 100	100 to 115	115 to 130	42.2	40.9	41	41.2	37.5	33.1	55.3	52.8	50.8	75.2	52.6	53.6	71.4	22.2	21.7	23	11.2	4.98	10.9	36.2	41.5	58.8	54.6

Notes:

high concentration range

medium concentration range

low concentration range

Concentration Value in Historical Database

Acronyms:

ND = non detect

NA = not available

* HEIS numbers associated with previously collected and analyzed samples from specific locations within the waste site and are not representative of samples collected per this SAP.

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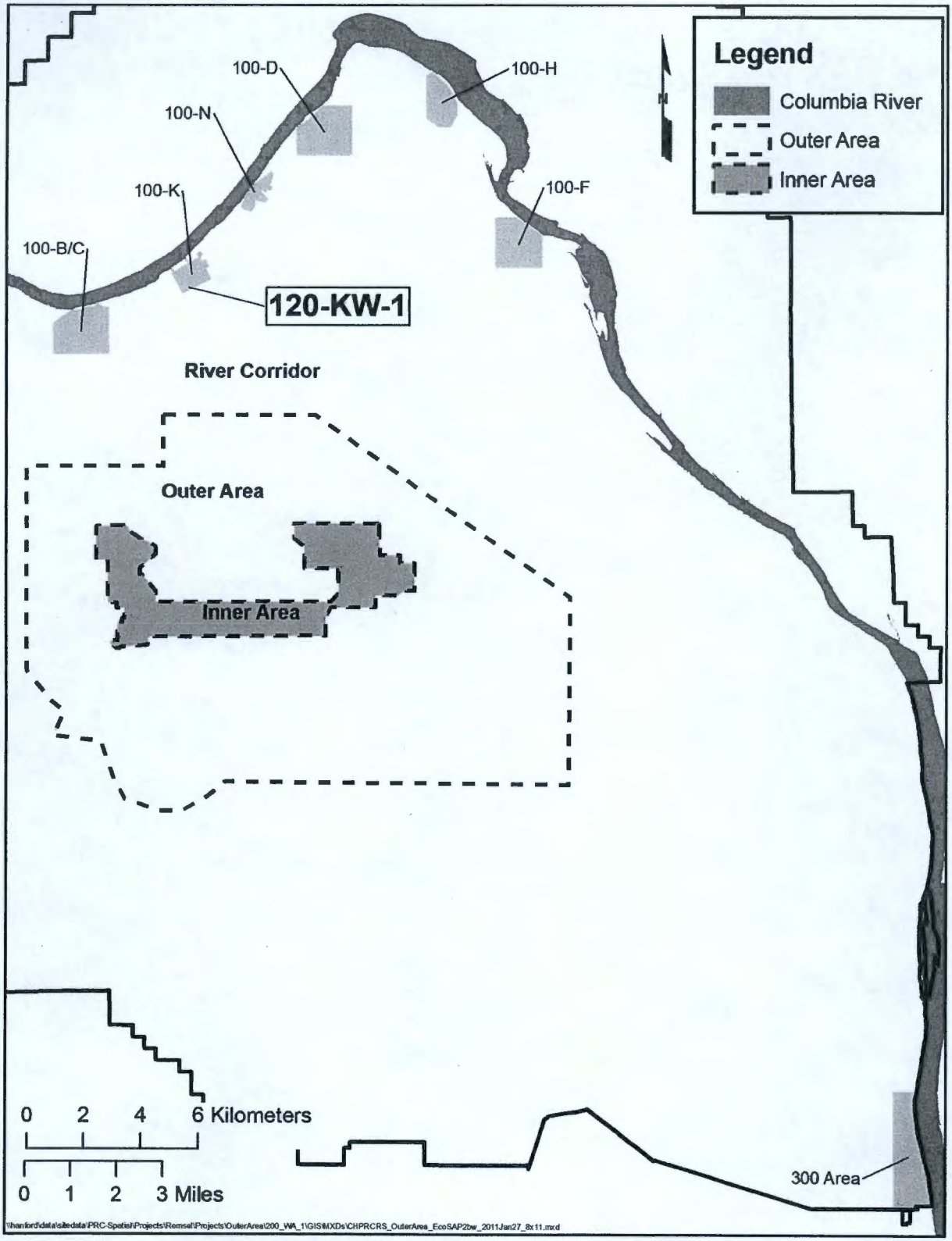

Figure 1-2. River Corridor Waste Site Targeted for Sample Collection to Support PRG Development

1.3.5.2 Phase 2 Bioassay and Data Analysis

Based on the results of Phase 1, this phase will target 60 to 80 samples for the bioassays based on these considerations:

- Samples must have minimal to no interfering factors that can impact plant and invertebrate survival, growth, or reproduction. These factors include the presence of herbicides and pesticides, polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), high alkalinity, or other geochemical conditions not reflective of Hanford Site terrestrial environments. Screening of existing data from target locations reveals that measured concentrations of PAHs and Aroclors are all below screening levels for plants and invertebrates; thus, these analytes will not be measured with the current sampling design. Other factors will be measured as part of this sampling design and will be evaluated after the initial chemical and physical tests are conducted (Table 1-4).

- Samples should ideally have only one analyte at a time in the high or medium range of its target concentration, with all other analytes being at their low end of their target concentration ranges. Because this requirement is quite restrictive, it might be problematic to achieve in natural or waste site soil samples. Judgment will have to be applied to this criterion and a case must be made to select an appropriate subset of samples that will be expected to provide reasonable results that are amenable to analysis. It is possible that fewer samples (less than the target number of samples of 60) will be deemed appropriate for the bioassays depending on the expected use of the bioassay results.

Bioassays will be conducted on two separate species, one for plants, and one for invertebrates. Including bioassays for these two measurement endpoints follows Ecology's TEE procedures per WAC 173-340-7490 through 7494. Bioassays to be performed are as follows:

- Sandberg bluegrass (*Poa secunda*) 14-day post germination and 28-day growth bioassays using Ecology, 1996 Publication No. 96-324, and "Standard Guide for Conducting Plant Toxicity Tests" (ASTM E 1963-02). Metrics recorded by the lab will include germination percentage, shoot length, and shoot weight (dry).

- Springtail (*F. candida*) 28-day reproduction and survival bioassays using a protocol from Environment Canada (EPS 1/RM/47). Metrics recorded by the lab will include percent survival, and average number of progeny in each test vessel.

PRGs that result from this work will be applicable to soils found throughout the Hanford Site including the Inner Area and Outer Area of the Central Plateau and the upland and riparian areas of the River Corridor. PRG development will consider the analyses described below to support the establishment of the PRGs. The test species used in this study design are intended to represent the plant and invertebrate communities found within the terrestrial habitats found at the Hanford Site. The plant bioassay being proposed will include the same test protocol and native species that were employed in bioassay studies conducted within the upland and riparian areas of the River Corridor as summarized in *Risk Assessment Report for the 100 Area and 300 Area Component of the River Corridor Baseline Risk Assessment* (DOE/RL-2007-21, Draft B). For the invertebrate bioassay, the proposed springtail test differs from the nematode test employed in DOE/RL-2007-21. However, the springtail test employs a species that can represent all terrestrial soils found at the Hanford Site, whereas the nematode is less applicable to the drier upland sites found in the Central Plateau. As with Ecology's program to use bioassays for evaluating arsenic and lead within the Old Orchard Areas at the Hanford Site (Ecology Publication No. 10-03-107), the proposed study design includes analysis of geochemical and physical data that characterizes the test soils. This information will be used to assess the applicability of the bioassay data

and resulting PRGs across a broad range of conditions. Thus, the applicability of the PRGs can be assessed accordingly for all soils at the Hanford Site whether found in upland or riparian areas.

Chemistry and bioassay results will be reviewed using multiple methods to tease out potential causative factors associated with observed responses in the performance metrics of the study including the presence of elevated levels of target analytes. The methods that may be employed include graphical observation; NOEC/LOEC assignment (if possible); and statistical methods such as bivariate correlation, simple linear or nonlinear regression, and multivariate analyses. As a first step, data will be plotted for each analyte/ bioassay response combination to determine if a continuous dose response relationship can be established. While continuous relationship may be associated with effects, results must be significantly different from laboratory and field control results. The results of these analyses will be used in the context of published methods such as those that have been employed to develop analyte-specific thresholds from field collected toxicity studies with mixtures of analytes (e.g., McDonald et al., 1996; Field et al., 2002). While most published methods were applied to develop sediment or surface water thresholds, the principles employed are applicable to soil and will be considered in developing soil PRGs using the results of the plant and invertebrate toxicity bioassays..

The analysis will also include the following steps:

- If the bioassay results meet protocol-specific test acceptability criteria, then proceed with the Phase 2 data evaluation.
- If the bioassays meet acceptability criteria, then perform hypothesis testing statistical analysis according to bioassay method protocols (e.g., Dunnett's multiple comparison t-test or the Kruskal-Wallis nonparametric test). Compare samples from on-site locations to laboratory controls (to determine if responses differ from laboratory standards) and field control samples (to determine whether responses differ from uncontaminated areas).
- If the bioassays meet acceptability criteria, then combine soil concentrations with bioassay results for all samples.
- If the bioassays meet acceptability criteria, then determine whether observed effects are associated with soil geochemistry (nutrients, grain size, etc.) and not target analytes.
- If adverse effects are observed within bioassay results, they must differ from and represent a greater than 20 percent difference from field control results to be considered statistically significant (Field et al., 2002; Suter et al., 2000; Thursby et al., 1997).[3]
- Plot out data for each analyte/bioassay response combination looking for continuous dose-response relationships; continuous relationship may be associated with effects (i.e., do samples with statistically significant differences between waste site results and controls—both laboratory and field—occur at high concentrations?)
- If the analyte concentrations exceed generic lookup values and no samples had statistically significant effects relative to field controls, then the maximum concentration measured represents the NOEC.
- If analyte concentrations exceed generic lookup values, and some samples had statistically significant effects relative to field controls, and concentrations in samples with statistically significant effects are

[3] According to Suter et al., 2000, a decrement in an ecological effects measure of 20 percent is a generally accepted EPA regulatory practice and differences below 20 percent are not reliably confirmed in the field without substantial field design.

all greater than those that did not have effects, then the maximum concentration that did not have an effect will be the NOEC and the minimum concentration that had an effect will be the LOEC.

- Compare the concentration range for each analyte to the mean concentration in the nontoxic samples, as described in Field et al., 2002. If the concentration range is less than the mean of the nontoxic samples, then the analyte may not contribute to effects; if the concentration range exceeds the mean of the nontoxic samples, then the analyte may contribute to effects.
- If correlations among analytes display a continuous dose-response relationship, then this may indicate an interactive effect.
- Perform regression analyses (linear/nonlinear as appropriate) on specific analytes to develop models describing the dose-response relationship. If the dose/response relationship for an analyte is statistically significant, then solve for 20 and 50 percent effects levels.
- Visually investigate if multiple distributions exist (principal components and other multivariate tools may also be employed). If multiple distributions are suggested, then segregate the data and determine whether the groupings are logical; if the groupings are logical, then develop condition-specific effects thresholds. Multivariate methods may also be employed to document potential causative associations.

1.3.6 DQO Step 6—Specific Performance Criteria

- Phase 1 sample analyses should meet practical quantitation limits (PQLs) for analytical methods identified in Chapter 2.
- Field control samples for bioassays will include samples from with concentrations that are representative of Hanford Site background.
- Bioassay results must meet the following minimum protocol-specific test acceptability criteria (50 percent germination and 80 percent survival for plants in control soil; 70 percent survival of springtails in control soil, 80 percent survival of springtails in artificial soil, and average reproduction of $\geq$ 100 juveniles for springtails in control soil).
- Hypothesis tests will be considered statistically significant if $p \geq 0.05$.
- Observed adverse effects within bioassays will be considered significant if they differ statistically from and represent a greater than 20 percent difference from field control results. Differences less than 20 percent are not considered reproducible in the field (Field et al., 2002; Suter et al., 2000; Thursbury et al., 1997).
- Regression analysis will be considered statistically significant if $p \geq 0.05$.
- NOECs for a specific measured effect are the highest concentrations below which no statistically significantly adverse measurements of the same effect were observed relative to field controls.
- LOECs for a specific measured effect are the lowest concentrations equal to or above which significantly adverse measurements of the same effect are always observed.

1.3.7 DQO Step 7—Study Design Summary

Data collection locations and sampling methods have been selected that resolve the problem statement and provide information regarding sample analytes. A biased (nonstatistical), two-phase investigation approach is proposed to identify locations with a range of concentrations that can be used to develop PRGs for use across terrestrial environments at the Hanford Site. This investigative approach relies on

observational techniques and judgmental data review to determine appropriate locations for focused soil sampling.

Final sample locations will be adjusted in the field based on conditions encountered.

1.3.7.1 Field and Laboratory Phase 1

- Collect soil samples from all targeted locations from 0 to 30 cm (0 to12 in.) bgs.
- Collect samples from targeted sample locations within waste sites across the Hanford Site, including field control locations and some additional higher concentration range areas in the River Corridor.
- Analyze samples for metals, other inorganics, herbicides, insecticides, pH, total organic carbon (TOC), cation exchange capacity, and grain size (see Tables 1-1 and 1-4).
- Collect sample volume at each location for analytical chemistry and bioassays.
- Based on results of analytical chemistry, select a subset of 60 to 80 locations for bioassays to be completed for Phase 2.

1.3,7.2 Laboratory Phase 2

- Perform plant and invertebrate bioassays.
- Analyze 10 bioassays from field control locations in addition to those from waste sites (60 to 80).

1.4 Study Design Change Management

Changes to the work scope detailed in this SAP may be required during implementation for the study design because of unexpected field conditions, new information, health and safety concerns, or other circumstances. Minor changes that have no adverse effect on the technical adequacy of the work or schedule can be made in the field with the approval of the Field Team Lead and will be documented in the daily field logbook and/or field summary reports. Changes that influence DQOs will be communicated via email and will require concurrence by the U.S. Department of Energy (DOE) Richland Operations Office (also known as RL) (DOE-RL). Alternately, if substantial changes are needed, the SAP can be revised and issued as a revision, requiring DOE-RL approval.

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2 Quality Assurance Project Plan

The QAPjP establishes the quality requirements for environmental data collection, including planning, implementation, and assessment of sampling, field measurements, and laboratory analysis. This QAPjP complies with the requirements of the following:

- DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document*
- DOE O 414.1C, *Quality Assurance*
- 10 CFR 830, Subpart A, "Quality Assurance Requirements"
- EPA/240/B-01/003, *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5

Sections 6.5 and 7.8 of the *Hanford Federal Facility Agreement and Consent Order Action Plan* (Ecology et al., 1989b, henceforth, the Tri-Party Agreement Action Plan) require that quality assurance (QA)/ quality control (QC) and sampling and analysis activities specify the QA requirements for treatment, storage, and disposal units, as well as past-practice processes. Therefore, this QAPjP follows the QA elements of EPA QA/R-5 (EPA/240/B-01/003). The QAPjP also demonstrates conformance to Part B requirements of ANSI/ASQ E4-2004.

The QAPjP is divided into the following four sections, which describe the quality requirements and controls applicable to this investigation.

Section 2.1, Project Management. This section addresses project management, including project history and objectives, and roles and responsibilities of the participants. These elements ensure the project has a defined goal, participants understand the goal and the approach to be used, and planning outputs are documented.

Section 2.2, Data Generation and Acquisition. This section addresses aspects of project design and implementation. Implementing these elements ensures appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and QC activities are employed and are properly documented.

Section 2.3, Assessment and Oversight. This section addresses the activities for assessing the effectiveness of implementing the project and associated QA/QC activities. The purpose of assessment is to ensure the QAPjP is implemented as prescribed.

Section 2.4, Data Validation and Usability. This section addresses the QA activities occurring after the data collection or generation phase of the project is completed. Implementing these elements ensures data conform to the specified criteria, thus achieving the project objectives.

2.1 Project Management

This section addresses the basic areas of project management and ensures that the project has a defined goal, that the participants understand the goal and the approach to be used, and that the planned outputs have been appropriately documented.

2.1.1 Project and Task Organization

The managing contractor is responsible for planning, coordinating, collecting, preparing, packaging, and shipping samples to the laboratory as defined in their respective contracts. The following sections describe the project organization concerning sampling and characterization, also shown in Figure 2-1. The Project Manager maintains a list of individuals or organizations as points of contact for each

functional element in the figure. For each functional primary contractor role, a corresponding oversight role exists within DOE.

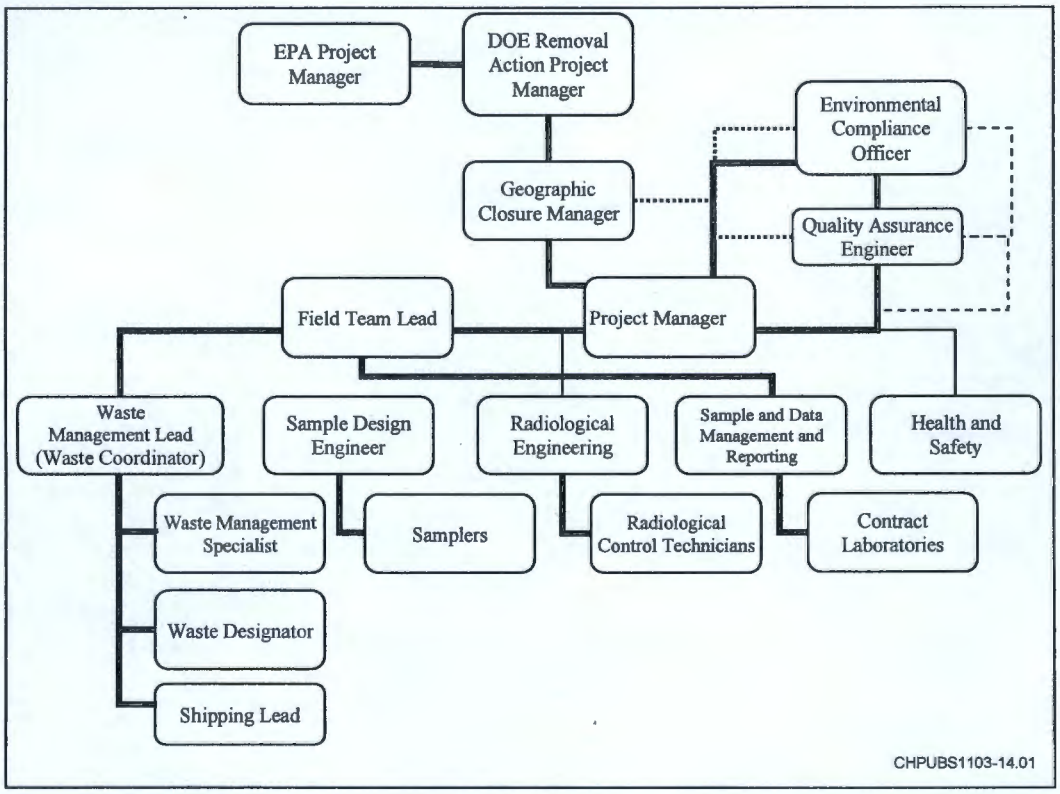

Figure 2-1. Project Organization

EPA Project Manager. EPA has assigned project managers responsible for overseeing the cleanup projects and activities. The DOE Removal Action Project Manager will provide the EPA Project Manager with a copy of this SAP.

DOE Removal Action Project Manager. The Removal Action Project Manager is responsible for approving this SAP, "*Sampling and Analysis Plan for Ex-Situ Plant and Invertebrate Bioassays to Evaluate Terrestrial Environments across the Hanford Site.*" The Removal Action Project Manager is also responsible for overseeing the contractor in performing the work scope and working with the contractor and the regulatory agencies to identify and work through issues, and providing technical input to the DOE-RL federal Project Director.

Environmental Compliance Officer. The Environmental Compliance Officer (ECO) has programmatic and project responsibilities. For programmatic responsibilities, the ECO provides technical guidance to the Geographic Closure Manager. The ECO provides technical guidance, direction, and acceptance of projects and project subcontracted environmental work, and develops appropriate project mitigation measures with a goal of minimizing adverse environmental impacts. The Environmental Compliance Officer also performs the following: (1) reviews project plans, procedures, and project technical documents to ensure that environmental requirements have been addressed; (2) identifies environmental issues affecting project operations and develops project cost-effective solutions; and (3) responds to environmental and regulatory issues or concerns raised by DOE-RL and/or the regulatory agencies. The

Environmental Compliance Officer also may oversee project implementation for compliance with applicable internal and external environmental requirements.

Geographic Closure Manager/Project Manager. The Geographic Closure Manager has the overall management responsibility for all work activities in the Central Plateau Outer Area. In order to accomplish this large work scope, responsibilities are delegated to the Field Team lead and the Project Manager through the Geographic Closure Manager. The Geographic Closure Manager is the primary point of contact for communication of all crosscutting Outer Area matters with DOE and the regulatory agencies.

The Project Manager provides oversight for project activities and coordinates these activities with DOE, regulators, and primary contractor management in support of sampling activities. The Project Manager has project responsibility for planning and coordinating sampling activities. The Project Manager is responsible for direct management of sampling documents and requirements, and subcontracted tasks, and for ensuring the project file is properly maintained. The Project Manager maintains a list of individuals or organizations filling each of the functional elements of the project organization (Figure 2-1). In addition, the Project Manager is responsible for version control of the SAP to ensure that personnel are working to the most current job requirements. The Project Manager also coordinates with DOE on all sampling activities. The Project Manager supports DOE in coordinating sampling activities with the regulators.

Field Team Lead. The Field Team Lead reports to the Geographic Closure Manager. The Field Team Lead ensures that the sampling design requirements are converted into field instructions (e.g., work packages) that provide specific direction for field activities. The Field Team Lead works closely with the QA, Health and Safety, and the Field Work Supervisor, to integrate these and the other lead disciplines in planning and implementing the work scope. The Field Team Lead is responsible for implementing field work activities and is responsible for the field work instruction and ensures all the applicable permits and work controls are achieved prior to and during the field work activities.

Quality Assurance Engineer. The QA Engineer is matrixed to the Project Manager and is responsible for QA issues on the project. Responsibilities include overseeing implementation of project QA requirements, closing corrective actions, reviewing project documents (including SAPs and the QAPjP), and participating in QA assessments. The QA point of contact must be independent of the unit generating the data.

Waste Management Lead (Waste Coordinator). The Waste Management Lead reports to the Field Team Lead and communicates policies and procedures for storage, transportation, disposal, and waste tracking in a safe and cost-effective manner to ensure project compliance to the Project Manager. Other responsibilities include receiving data from the Field Team Lead to initiate waste designations and to ensure project compliance with waste acceptance criteria and disposal practices.

Sample Design Engineer. The Sample Design Engineer communicates with the Field Team Lead to identify field constraints or emergent conditions affecting sampling design or execution, directs the procurement and installation of materials and equipment needed to support fieldwork, and prepares data packages based on instructions from the Field Team Lead and information contained in this SAP.

Radiological Engineering. The Radiological Engineering Lead is responsible for the radiological/health physics support within the project. Specific responsibilities include conducting as low as reasonably achievable (ALARA) reviews, exposure and release modeling, and radiological controls optimization for work planning. In addition, the Radiological Engineering Lead identifies radiological hazards and implements appropriate controls to maintain worker exposures ALARA (e.g., requiring personal

protective equipment). The Radiological Engineering Lead also interfaces with the project Health and Safety contact, and plans and directs Radiological Control Technician support for activities.

Sample and Data Management and Reporting. Sample and Data Management and Reporting coordinates laboratory analytical work, ensuring that the laboratories conform to Hanford Site internal laboratory QA requirements, or their equivalent, as approved by Ecology, EPA, and DOE (Tri-Parties). Sample Management and Reporting receives analytical data from the laboratories, performs data entry into Hanford Environmental Information System (HEIS), and arranges for data validation. Sample Management and Reporting is responsible for informing the Project Manager of any issues reported by the analytical laboratory. Sample Management and Reporting develops and oversees the implementation of the letter of instruction to the analytical laboratories, oversees data validation, and works with the Project Manager to prepare a characterization report on the sampling and analysis results.

Health and Safety. Health and Safety is responsible for coordinating industrial safety and health support for the project through health and safety plans, job hazard analyses, and other pertinent safety documents required by federal regulation or by internal primary contractor work requirements. In addition, Health and Safety assists project personnel in complying with applicable health and safety standards and requirements. Health and Safety coordinates with Radiological Engineering to determine personal protective clothing requirements.

2.1.2 Problem Definition and Background

This SAP describes the sampling and analysis from terrestrial environments at the Hanford Site to support Ecological Risk Assessment. The specific problems to be solved, background information, and general information are provided in Chapter 1. The specific media to be sampled will be surface soil (0 to 30 cm [0 to12 in.] bgs). Figures 1-2 and 1-3 show the soil wastes sites to be sampled within the scope of this SAP.

2.1.3 Project and Task Description

This project consists of data collection processes that are needed to support the terrestrial ecological risk assessment only and, if the data are supportive, to help establish new PRG levels for plants and invertebrates. The sampling and analysis activities are described in further detail in Chapter 3 of this SAP.

2.1.4 Quality Objectives and Criteria

The QA objective of this SAP is to develop guidance to provide data of known and appropriate quality. Data quality indicators describe data quality by evaluation against identified data needs and the activities identified in this SAP. The applicable QC guidelines, PQLs, and levels of effort for assessing data quality are dictated by the intended use of the data and the nature of the analytical method. The principal data quality indicators are precision, bias or accuracy, representativeness, comparability, completeness, and sensitivity. These data quality indicators are defined for the purpose of this document in Table 2-1. The data quality indicators will be evaluated during the data quality assessment (DQA) process.

Table 2-2 presents the analytical performance requirements for samples based on the analytes listed in Tables 1-1 and 1-2. Laboratory operations and analytical services shall be in compliance with Volume 4 of *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD, DOE/RL-96-68) and specific criteria identified in Table 2-2. Criteria in Table 2-2 take precedence over similar criteria in HASQARD. In consultation with the laboratory, the Project Manager, and/or others as appropriate, Sample Management and Reporting can approve changes to analytical methods as long as the new method is based upon a nationally recognized method (e.g., EPA, American Society for Testing and Materials [ASTM]). The new method achieves project DQOs as well or better than the replaced method, and the new method is required due to the nature of the sample (e.g., high radioactivity).

2.1.4.1 Bioassay Quality Objectives

Bioassay results must meet protocol-specific test acceptability criteria. The minimum acceptability for the wheat grass bioassay is 50 percent germination and 80 percent survival for plants in control soil. Further, plants for the laboratory controls, field controls, and waste sites should be from the same seed batch. The minimum acceptability for the springtail bioassay is 70 percent survival in control soil, 80 percent survival in artificial soil, and average reproduction of greater than one hundred (>100) juveniles for springtails in control soil.

Table 2-1. Data Quality Indicators

DQI	Definition	Example Determination Methodologies	Project-Specific Information*	Corrective-Action Examples
Precision	The measure of agreement among repeated measurements of the same property under identical or substantially similar conditions; calculated either as the range or as the standard deviation. May also be expressed as a percentage of the mean of the measurements, such as relative range, relative percent difference, or relative standard deviation (coefficient of variation).	Use the same analytical instrument to make repeated analyses on the same sample. Use the same method to make repeated measurements of the same sample within a single laboratory or have two or more laboratories analyze identical samples with the same method. Split a sample in the field and submit both for sample handling, preservation and storage, and analytical measurements. Collect, process, and analyze collocated samples for information on sample acquisition, handling, shipping, storage, preparation, and analytical processes and measurements.	Field precision: At randomly selected locations, duplicate samples will be collected 1 per 20 samples per media. Laboratory precision: Analysis of laboratory duplicate or matrix spike duplicate results.	If duplicate data do not meet objective: • Evaluate apparent cause (e.g., sample heterogeneity). • Request re-analysis or remeasurement. • Qualify the data before use.

Table 2-1. Data Quality Indicators

DQI	Definition	Example Determination Methodologies	Project-Specific Information*	Corrective-Action Examples
Accuracy	A measure of the overall agreement of a measurement to a known value; includes a combination of random error (precision) and systematic error (bias) components of sampling and analytical operations.	Analyze a field control material or re-analyze a sample to which a material of known concentration or amount of pollutant has been added (a spiked sample), usually expressed either as percent recovery or as a percent bias.	Laboratory accuracy determination based on matrix spikes and matrix spike duplicate results.	If recovery does not meet objective: • Qualify the data before use. • Request re-analysis or remeasurement.
Representativeness	A qualitative term to express "the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition" (ANSI/ASQC S2-1995).	Evaluate whether measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the environment or condition being measured or studied.	Samples will be collected as described in the sampling design. Judgment sampling ensures areas most likely to be contaminated, based on current information, will be evaluated.	If results are not representative of the system sampled: • Identify the reason result is not representative. • Reject the data or, if data are otherwise usable, qualify the data for limited use and define the portion of the system the data represent. • Redefine sampling and measurement requirements and protocols. • Resample and re-analyze.

Table 2-1. Data Quality Indicators

DQI	Definition	Example Determination Methodologies	Project-Specific Information*	Corrective-Action Examples
Comparability	A qualitative term expressing the measure of confidence with which one data set can be compared to another and can be combined for the decision(s) to be made.	Compare sample collection and handling methods, sample preparation and analytical procedures, holding times, stability issues, and QA protocols.	Sampling personnel will use the same sampling protocols. Samples will be submitted to the same laboratories when possible (based on laboratory contracts) for analysis by the same methods; thus, data results will be comparable.	If data are not comparable to other data sets: • Identify appropriate changes to data collection and/or analysis methods. • Identify quantifiable bias, if applicable. • Qualify the data as appropriate. • Resample and/or re-analyze, if needed. • Revise sampling/ analysis protocols to ensure future comparability.
Completeness	A measure of the amount of valid data needed to be obtained from a measurement system.	Compare the number of valid measurements completed (samples collected or samples analyzed) with those established by the project's data needs.	The percent complete will be determined during data validation.	If data set does not meet completeness objective: • Identify appropriate changes to data collection and/or analysis methods. • Identify quantifiable bias, if applicable. • Qualify the data as appropriate. • Resample and/or re-analyze, if needed. • Revise sampling/ analysis protocols to ensure future comparability.

Table 2-1. Data Quality Indicators

DQI	Definition	Example Determination Methodologies	Project-Specific Information*	Corrective-Action Examples
Sensitivity	A term expressing the capability of a method or instrument to discriminate among measurement responses representing different levels of the variable of interest.	Determine the minimum concentration or attribute to be measured by a method (method detection limit), by an instrument (instrument detection limit), or by a laboratory (quantitation limit). The practical quantitation limit is the lowest level that can be routinely quantified and reported by a laboratory.	Ensure that sensitivity, as measured by detection limits, is appropriate for the action levels.	If sensitivity does not meet objective: • Request re-analysis or remeasurement. • Qualify/reject the data before use.

Source: ANSI/ASQC S2-1995, *Introduction to Attribute Sampling*

* Field sampling requirements are noted. Laboratories will follow requirements for use and interpretation of laboratory control samples.

Table 2-2. Laboratory Management Analytical Performance Requirements for Analytes in Soil

Indicator Analyte	Chemical Abstracts Service Number	Analytical Instrument and/or Analytical Method[a,b]	Laboratory Reporting Limit [c,d h] mg/kg	Precision	Accuracy
		Nonradiological			
Antimony	7440-36-0	EPA SW Method 200.8 (ICP/MS metals)	3.0	≤30%[e]	70-130%[b]
Arsenic	7440-38-2	EPA SW Method 200.8 (ICP/MS metals)	4.0	≤30%[e]	70-130%[e]
Barium	7440-39-3	EPA SW Method 200.8 (ICP/MS metals)	2.0	≤30%[b]	70-130%[e]
Beryllium	7440-41-7	EPA SW Method 200.8 (ICP/MS metals)	0.5	≤30%[e]	70-130%[e]
Boron	7440-42-8	EPA SW Method 200.8 (ICP/MS metals)	4.1	≤30%[e]	70-130%[e]
Cadmium	7440-43-9	EPA SW Method 200.8 (ICP/MS metals)	1.0	≤30%[e]	70-130%[e]
Chromium	7440-47-3	EPA SW Method 200.8 (ICP/MS metals)	0.5	≤30%[e]	70-130%[e]
Cobalt	7440-48-4	EPA SW Method 200.8 (ICP/MS metals)	0.5	≤30%[e]	70-130%[e]
Copper	7440-50-8	EPA SW Method 200.8 (ICP/MS metals)	1.0	≤30%[b]	70-130%[e]
Lead	7439-92-1	EPA SW Method 200.8 (ICP/MS metals)	1.0	≤30%[e]	70-130%[e]
Manganese	7439-96-5	EPA SW Method 200.8 (ICP/MS metals)	1.0	≤30%[e]	70-130%[e]
Molybdenum	7439-98-7	EPA SW Method 200.8 (ICP/MS metals)	1.0	≤30%[e]	70-130%[e]
Nickel	7440-02-0	EPA SW Method 200.8 (ICP/MS metals)	2.0	≤30%[e]	70-130%[e]
Selenium	7782-49-2	EPA SW Method 200.8 (ICP/MS metals)	0.3	≤30%[e]	70-130%[e]
Silver	7440-22-4	EPA SW Method 200.8 (ICP/MS metals)	1.0	≤30%[e]	70-130%[e]
Thallium	7440-28-0	EPA SW Method 200.8 (ICP/MS metals)	0.5	≤30%[e]	70-130%[e]
Tin	7440-31-5	EPA SW Method 200.8 (ICP/MS metals)	0.5	≤30%[e]	70-130%[e]
Uranium	7440-61-1	EPA SW Method 200.8 (ICP/MS metals)	0.5	≤30%[e]	70-130%[e]

Table 2-2. Laboratory Management Analytical Performance Requirements for Analytes in Soil

Indicator Analyte	Chemical Abstracts Service Number	Analytical Instrument and/or Analytical Method[a,b]	Laboratory Reporting Limit [c,d h] mg/kg	Precision	Accuracy
Vanadium	7440-62-2	EPA SW Method 200.8 (ICP/MS metals)	2.0	≤30%[e]	70-130%[e]
Zinc	7440-66-6	EPA SW Method 200.8 (ICP/MS metals)	5.0	≤30%[e]	70-130%[e]
Calcium[f]	7440-70-2	EPA SW Method 6010/6020 (ICP/MS metals)	7[g]	≤30%[e]	70-130%[e]
Magnesium[f]	7439-95-4	EPA SW Method 6010/6020 (ICP/MS metals)	3[e]	≤30%[e]	70-130%[e]
Phosphorous[f]	7723-14-0	EPA SW Method 6010/6020 (ICP/MS metals)	36[e]	≤30%[e]	70-130%[e]
Potassium[d]	2023-69-5	EPA SW Method 6010/6020 (ICP/MS metals)	36.5[e]	≤30%[e]	70-130%[e]
Sodium[d]	7440-23-5	EPA SW Method 6010/6020 (ICP/MS metals)	3.5[e]	≤30%[e]	70-130%[e]
Mercury	7439-92-1	EPA SW Method 200.8 (ICP/MS metals)	0.05	≤30%[e]	70-130%[e]
TKN[d]	K-Kjeldahl	EPA Method 351.1	25	≤30%[e]	70-130%[e]
Total organic carbon[d]	TOC	EPA SW Method 9060	25	≤30%[e]	70-130%[e]
Cation exchange capacity[d]	CEC	EPA Method 9081	None	≤30%[e]	70-130%[e]
pH[d]	pH	EPA SW Method 9045	0.1 pH	≤30%[e]	70-130%[e]
4,4-DDD	72-54-8	Pesticides—EPA SW Method 8081A	0.0017	≤50%[h]	50-150%[e]
4,4-DDE	72-55-9	Pesticides—EPA SW Method 8081A	0.0017	≤50%[h]	50-150%[e]
4,4-DDT	50-29-3	Pesticides—EPA SW Method 8081A	0.0017	≤50%[h]	50-150%h[d]
Dieldrin	60-57-1	Pesticides—EPA SW Method 8081A	0.0017	≤50%[h]	50-150%[e]
Endrin	72-20-8	Pesticides—EPA SW Method 8081A	0.0017	≤50%[h]	50-150%[e]
Endrin aldehyde	7421-93-4	Pesticides—EPA SW Method 8081A	0.0017	≤50%[h]	50-150%[e]

Table 2-2. Laboratory Management Analytical Performance Requirements for Analytes in Soil

Indicator Analyte	Chemical Abstracts Service Number	Analytical Instrument and/or Analytical Method[a,b]	Laboratory Reporting Limit [c,d h] mg/kg	Precision	Accuracy
Endrin ketone	53494-70-5	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Endosulfan I	959-98-8	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Endosulfan II	33213-65-9	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Endosulfan sulfate	1031-07-8	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Alpha-BHC	319-84-6	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Beta-BHC	319-85-7	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Delta-BHC	319-86-8	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Gamma-BHC (Lindane)	58-89-9	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Heptachlor	76-44-8	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Heptachlor epoxide	1024-57-3	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Alpha chlordane	5103-71-9	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Gamma chlordane	5566-34-7	Pesticides—EPA SW Method 8081A	0.0017	≤50%[c]	50-150%[c]
Methoxychlor	72-43-5	Pesticides—EPA SW Method 8081A	0.0033	≤50%[c]	50-150%[c]
Toxaphene	8001-35-2	Pesticides—EPA SW Method 8081A	0.067	≤50%[c]	50-150%[c]
Semivolatile Organic Compounds Herbicides					
2-(2,4-dichlorophenoxy) propionic acid (dichloroprop)	120-36-5	Herbicides—EPA SW Method 8270C/8151a	0.08	≤50%[c]	50-150%[c]
Pentachlorophenol	87-86-5	Herbicides—EPA SW Method 8270C/8151a	0.66	≤50%[c]	50-150%[c]

Table 2-2. Laboratory Management Analytical Performance Requirements for Analytes in Soil

Indicator Analyte	Chemical Abstracts Service Number	Analytical Instrument and/or Analytical Method[a,b]	Laboratory Reporting Limit [c,d h] mg/kg	Precision	Accuracy
4,6,-dinitro-2-methylphenol	534-52-1	Herbicides—EPA SW Method 8270C/8151a	1.6	≤50%[c]	50-150%[c]
2-sec-butyl-4,6-dinitrophenol (Dinoseb)	88-85-7	Herbicides—EPA SW Method 8270C/8151a	0.66	≤50%[c]	50-150%[c]
Pentachloronitrobenzene	82-68-8	Herbicides—EPA SW Method 8270C/8151a	1.6	≤50%[c]	50-150%[c]
Hexachlorobenzene	118-74-1	Herbicides—EPA SW Method 8270C/8151a	0.33	≤50%[c]	50-150%[c]

Table 2-2. Laboratory Management Analytical Performance Requirements for Analytes in Soil

Indicator Analyte	Chemical Abstracts Service Number	Analytical Instrument and/or Analytical Method[a,b]	Laboratory Reporting Limit [c,d h] mg/kg	Precision	Accuracy

a. EPA methods from SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B* (EPA 2008). Access January 12, 2011 SW_846 online http://www.epa.gov/osw/hazard/testmethods/sw846/online/index.htm.

b. EPA 600/4-79-020, *Methods for Chemical Analysis of Water and Wastes*. Revised March 1983. (NTIS/PB84-128677 or CD ROM or NEPIS/ http://www.epa.gov/clariton/clhtml/pubtitleORD.html.)

c. TASL Reporting Limits current as of 01-20-2010 for organchlorine pesticides, and SVOA herbicides only.

d. WSCF CRDL requirements current as of 01-13-2011 for metals only.

e. Accuracy criteria for associated batch matrix spike percent recoveries. Evaluation criteria based on laboratory statistical limits or fixed limits as defined in the referenced methods. Precision criteria for batch laboratory replicate matrix spike analyses or replicate sample analysis.

f. Evaluated as a geochemical and or physical property of soil only.

g. Derived from current CRDL values from WSCF laboratories reported in HEIS.

h. Accuracy criteria are the minimum for associated batch laboratory control sample percent recoveries. Laboratories must meet statistically based control if more stringent. Additional analyte-specific evaluations also performed for matrix spikes and surrogates as appropriate to the method. Precision criteria for batch laboratory replicate matrix spike analyses.

ASTM = American Society for Testing and Materials

CRDL = contract requirement reporting limit

DDD = dichlorodiphenyldichloroethane

DDE = dichlorodiphenyldichloroethylene

DDT = dichlorodiphenyltrichloroethane

EPA = U.S. Environmental Protection Agency

HEIS = Hanford Environmental Information System

SVOA = semivolatile organics analysis

TASL = Test America St. Louis laboratory

TKN = total kjeldahl nitrogen

WSCF = Waste Sampling and Characterization Facility

2.1.4.2 Measurement Equipment

Each user of the measuring equipment is responsible for ensuring that the equipment is functioning as expected, properly handled, and is calibrated before expiration in accordance with procedures governing control of the measuring equipment. Field environmental instrument testing, inspection, calibration, and maintenance shall be recorded in a bound logbook (Section 3.4.1). Field-screening instruments will be used, maintained, and calibrated in accordance with the manufacturer's specifications and other approved procedures.

2.1.5 Special Training/Certification

A graded approach is used to ensure workers receive a level of training commensurate with responsibilities and comply with applicable DOE orders and government regulations. The Subcontractor Sampling Lead, in coordination with line management, will ensure field personnel meet special training requirements.

The primary contractor management team institutes typical training requirements or qualifications to meet training requirements imposed by the contract, regulations, DOE orders, DOE contractor requirements documents, American National Standards Institute/American Society of Mechanical Engineers standards, and the *Washington Administrative Code*. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Field personnel typically will have completed the following training before starting work:

- Occupational Safety and Health Administration 40-hour Hazardous Waste Worker Training and supervised 24-hour Hazardous Waste Site Experience
- 8-hour Hazardous Waste Worker Refresher Training (as required)
- Hanford General Employee Radiological Training
- Hanford General Employee Training
- Radiological Worker Training (as required)

Project-specific safety training, geared specifically to the project and the day's activity, includes the following:

- Training requirements or qualifications needed by sampling personnel will be in accordance with QA requirements.
- Samplers are required to have training and experience in the type of sampling being performed in the field.
- The Radiation Protection Program establishes qualification requirements for radiological control technicians. The radiological control technicians assigned to these activities will be qualified through the prescribed training program and will undergo ongoing training and qualification activities.

Training records are maintained for each individual in an electronic training record database. The contractor training organization maintains the training records system. Line management will be used to confirm an individual employee's training is appropriate and up-to-date before performing any fieldwork.

2.1.6 Documents and Records

The Project Manager is responsible for ensuring the current version of the SAP is being used and for providing updates to field personnel. The administrative document control process maintains version control. Before implementation, DOE will review and approve changes to the sampling plan that affect the data needs. Information pertinent to sampling and analysis will be recorded in field checklists and bound logbooks in accordance with existing sample collection protocols specified in HASQARD (DOE/RL-96-68).

The Project Manager or designee is responsible for ensuring the field instructions are maintained up-to-date and aligned with revisions or other approved changes to the SAP. The Subcontractor Sampling Lead will ensure that deviations from the SAP or problems encountered in the field are documented appropriately (e.g., in the field logbook or nonconformance report forms) in accordance with internal corrective action procedures.

The Project Manager or designee will be responsible for communicating field corrective action requirements and for ensuring immediate corrective actions are applied to field activities.

Logbooks are required for field activities and must be identified with a unique project name and number. Individuals responsible for logbooks will be listed and only authorized persons may make entries in logbooks. Those eligible to sign the logbooks include the Subcontractor Sampling Lead, trained scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason.

Logbook entries will be made in indelible ink and corrections will made by marking the erroneous data through with a single line, entering the correct data, and initialing and dating the changes.

The Project Manager is responsible for ensuring a project file is properly maintained. The project file will contain the records or references to their storage locations. The project file will include the following, as appropriate:

- Field logbooks or operational records
- Data forms
- Global Positioning System data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports
- Laboratory data packages
- Verification and validation report(s)

The laboratory is responsible for maintaining, and having available upon request, the following:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure accuracy and availability of stored records. Records required by the TPA (Ecology et al., 1989a) will be managed in accordance with the requirements of this Agreement.

2.2 Data Generation and Acquisition

The following sections address data generation and acquisition to ensure the project methods for sampling, measurement, and analysis, data collection or generation, data handling, and QC activities are appropriate and documented.

2.2.1 Sampling Process Design (Experimental Design)

The sampling design is judgmental and focused. In judgmental and focused sampling, sampling unit selection (e.g., the number and location and/or timing of collecting samples) is based on knowledge of the feature or condition under investigation and on professional judgment. Judgmental sampling is distinguished from probability-based sampling in that inferences are based on professional judgment, not statistical scientific theory.

This sample design reflects the project work scope developed using the EPA DQO process (EPA-240/B-6-001). The Field Sampling Plan in Chapter 3 presents additional sample design details, summary tables, and figures that address sampling procedures, sampling locations, sampling frequencies, and required field and laboratory analytical methods per each sampling media.

2.2.2 Sampling Methods

Chapter 3 describes the sampling methods. The specific information includes the following:

- Field sampling methods
- Corrective actions for sampling activities (the Geographic Closure Manager will be responsible for corrective action)
- Decontamination of sampling equipment
- Radiological field data

Sampling will be performed in accordance with this SAP and the sampling instructions (SIs), which will describe the individual sample collection details.

Specific sample collection requirements in terms of collection containers and target sample volumes for analytical methods are described in Table 2-3.

2.2.3 Sample Handling and Custody

A sampling and data-tracking database is used to track the samples from the point of collection through the laboratory analysis process. Samplers should note any anomalies (e.g., sample appears unusual, sample is sludge) with the samples to prevent batching across similar matrices. If anomalies are found, the samplers should write "DO NOT BATCH" on the chain-of-custody form and inform Sample Management and Reporting.

Laboratory analytical results are entered and maintained in HEIS. The HEIS sample numbers are issued to the sampling organization for the project. Each chemical and radiological sample is identified and labeled with a unique HEIS sample number.

Table 2-3. Sample Preservation, Container, and Holding Time Guidelines

Analytes	Matrix	Bottle Number	Bottle Type	Amount[a,b]	Preservation	Packing Requirements	Holding Time[c]
Metals—EPA Method 200.8	Soil	1	G/P	100 g	None	Cool 4 °C	6 months
Herbicides—EPA SW Method 8270C/8151a	Soil	1	aG	250 g	None	Cool 4 °C	14/40 days
Insecticides—EPA SW Method 8081A	Soil	1	aG	250 g	None	Cool 4 °C	14/40 days
Mercury—EPA Method 200.8	Soil	1	G	100 g	None	Cool 4 °C	28 days
TOC—EPA SW Method 9060	Soil	1	aG	50 g	None	Cool 4 °C	28 days
Particle Size—ASTM D422	Soil	1	G/P	1,000 g	None	Cool 4 °C	None
Cation Exchange Capacity—EPA Method 9081	Soil	1	G/P	1,000 g	None	Cool 4 °C	None
pH—EPA SW Method 9040/9045	Soil	1	G	5 to 125 g	None	Cool 4 °C	Immediate
Total Kjeldahl Nitrogen	Soil	1	G/P	300 g	None	Cool 4 °C	28 days
Plant Bioassay: Ecology, 1996 Publication No. 96-324	Soil	1	G/P	1 L	None	Cool 4 °C, minimal heeadspace	None
Invertebrate Bioassay: EPS 1/RM/47	Soil	1	G/P	1 L	None	Cool 4 °C, minimal heeadspace	None

Notes: For the four-digit EPA methods, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B.*

14/40 days = 14 days to extraction, then 40 days to analysis

48 hours/28 days = 48 hours for nitrate, nitrite, and phosphate; 28 days for others

a. Optimal volumes, which may be adjusted downward to accommodate the possibility of retrieval of small amount of sample. Minimum sample size will be defined in the Sampling Authorization Form.

b. Some analyses may be combined in one sample bottle to reduce soil requirement and bottle burden as long as the lab receives sufficient volume for all combined analyses, the preservation and bottle type are the same, and all combined analyses are being performed by the same laboratory.

c. Extraction holding times are from the date of sampling. Analysis holding times are from the date of extraction.

Section 3.6 provides the following specific sample handling information:

- Container packaging
- Container labeling
- Sample custody requirements
- Sample shipping

Sample custody during laboratory analysis is addressed in the applicable laboratory standard operating procedures. Laboratory custody procedures will ensure that sample integrity and identification are maintained throughout the analytical process. Storage of samples at the laboratory will be consistent with laboratory instructions prepared by Sample Management and Reporting.

2.2.4 Holding Times

Suggested sample container, preservation, and holding time requirements for soil samples are specified in Table 2-3. These requirements are in accordance with the requirements of the specified analytical method prepared for specific sample events. The final container type will be provided on the sampling authorization form and the chain of custody form. This SAP defines a "sample" as a filled sample bottle for the starting of the holding time restrictions.

2.2.5 Analytical Methods

Table 2-2 lists the analytical parameters and methods. An overview of the proposed analytical methods to be used for this investigation is presented in the following subsections. Changes to or addition of analytical methods identified in this SAP will be implemented in page changes, addenda, or revisions to this SAP, as appropriate.

These analytical methods are controlled in accordance with the laboratory's QA plan and the requirements of this QAPjP. The primary contractor participates in overseeing the offsite analytical laboratories to qualify the laboratories for performing Hanford Site analytical work.

2.2.5.1 Field Analytical Methods

Chemical field screening and radiological field survey data used for site characterization will be performed in accordance with contractor-approved procedures. Field analytical methods may also be performed in accordance with the manufacturers' manuals submitted to the Environmental Restoration Contractor/River Corridor Contractor Project Task Lead and QA Representative for review and acceptance for use. Chapter 3 provides the parameters identified for field analysis.

2.2.5.2 Laboratory Analytical Methods

All laboratory analyses will be performed in accordance with the referenced analytical methods identified in Table 2-2 and the associated laboratory quality management plan and applicable standard operating procedures (SOPs). The Project Task Lead and QA Representative, prior to sample analysis, will approve the laboratory quality management plan and SOPs.

If the laboratory uses a nonstandard or unapproved method, then the laboratory must provide method validation data to confirm the method is adequate for the intended use of the data. This includes information such as determination of detection limits, quantitation limits, typical recoveries, and analytical precision and bias. In consultation with the laboratory, the Project Manager, and/or others as appropriate, Sample Management and Reporting can approve changes to analytical methods as long as the new method is based upon a nationally recognized (e.g., EPA and ASTM) method. The new method must

achieve project DQOs as well or better than the replaced method, and the new method is required due to the nature of the sample (e.g., high radioactivity).

Laboratories providing analytical services supporting this SAP will have a corrective action program in place to address analytical system failures and documents on the effectiveness of corrective actions. Issues affecting analytical results are to be resolved by Sample Management and Reporting in coordination with the Project Manager.

2.2.5.3 Additional Analysis

In addition to analysis of target parameters in soil, data will be collected on common soil properties to provide for a more robust framework to interpret an assessment of the potential for contamination related effects. These data will be used to: (1) aid bioassay site selection and (2) evaluate the potential for these additional analytes to affect the toxicity and its interpretation.

2.2.6 Laboratory Toxicity Testing

Toxicity testing will be performed in a laboratory using abiotic media (soil) collected from the terrestrial environments of the Hanford Site. Procedures for toxicity testing, including the experimental design and test acceptability requirements, will be submitted for review and acceptance to the Sample and Data Management and Reporting Lead and Quality Assurance Engineer.

Toxicity tests can provide site-specific information on adverse effects of analyte mixtures and on analyte bioavailability for Hanford Site soil media. Test organisms with statistically significant responses to known concentrations of analytes can indicate the likelihood of biological impacts in a contaminated environment. Results from these tests can be used to make decisions about permissible analyte concentrations and exposure limits to sensitive organisms.

Plants. The plant bioassay is a standard phytotoxicity test for soils (Ecology, 1996, *Early Seedling Growth Protocol for Soil Toxicity Screening*). This test was selected because of the fact that it was developed by Ecology and because it has been used previously at the Hanford Site, specifically for investigations in the River Corridor. The protocol developed by Ecology (1996) will use representative Hanford Site flora for the test. For testing soils, Sandberg's bluegrass (*Poa secunda*) will be used. Sufficient soil will be collected for five laboratory replicates, and soil samples submitted for toxicity testing also will be analyzed for standard agricultural parameters (plant nutrients, soil texture, and geochemistry) to help interpret the results of the toxicity test. Differences between test soils, laboratory controls, and field controls will be evaluated using Dunnett's multiple comparison t-test or the Kruskal-Wallis nonparametric test.

The 28-day phytotoxicity test endpoints include:

- Emergence count
- Day 7 post-emergence count
- Day 7 post-emergence shoot appearance
- Day 14 post-emergence count
- Day 14 post-emergence shoot appearance, survival, stem height, and shoot mass (dry weight) per plant

Invertebrates. The springtail bioassay is also a standard test that was developed by Environment Canada (EPS 1/RM/47, *Biological Test Method: Test for Measuring Survival and Reproduction of Springtails*

Exposed to Contaminants in Soil). This test was selected because the organisms are found at the site and are more appropriate for the environmental conditions found at the Hanford Site then more traditional and common tests such as those using earthworms or nematodes. The test currently is established for only a single species, *F. candida*. Sufficient soil sample material is needed for five laboratory replicates. The soil samples will be checked for the presence/absence of organic material, and the samples must be sieved. Soil samples must be hydrated to a standard level and allowed to equilibrate for seven days. Soil samples submitted for toxicity testing also will be analyzed for geochemical parameters (e.g., pH, organic matter, cation exchange capacity, and particle size) to help interpret the results of the toxicity tests. Differences between test soils, laboratory controls, and field control materials will be evaluated using Dunnett's multiple comparison t-test or the Kruskal-Wallis nonparametric test. Toxicity endpoints include mean percent survival and mean number of live progeny at the end of 28 days.

2.2.7 Quality Control

To ensure reliable results are obtained, QC procedures must be followed in the field and laboratory. Field personnel will collect QC samples to evaluate the potential for cross-contamination and to provide information pertinent to field variability. Field QC for sampling will require collecting field duplicates, field transfer blanks, and equipment rinsate blanks. Laboratory QC samples estimate the precision and bias of the analytical data. Table 2-4 summarizes field and laboratory QC samples. Additional QC samples may be collected if conditions arise.

2.2.7.1 Field QC Samples

The field QC sample types are discussed within this section.

Equipment rinsate blanks are collected for reused sampling devices to assess the adequacy of the decontamination process. Equipment rinsate blanks will consist of reagent water poured over or pumped through the decontaminated sampling equipment and placed in containers. If disposable (e.g., single use) equipment is used, equipment rinsate blanks will not be required.

Full trip blanks (FTBs) are prepared prior to traveling to the sampling site. Bottles are filled with high purity water, sealed, and transported, unopened, to the field in the same storage containers used for samples collected that day. Collected FTBs are analyzed for the same analytes as the soil samples. FTBs are used to evaluate potential contamination of the samples due to the sample bottles, preservation, handling, storage, and transportation.

For the field blanks (e.g., equipment rinsate blank), results greater than two times the method detection limit are identified as suspected contamination. However, for common laboratory analytes such as acetone, methylene chloride, 2-butanone, toluene, and phthalate esters, the limit is five times the method detection limit. For radiological data, blank results are flagged as suspected contamination if the results are greater than two times the total minimum detectable activity.

Field duplicate samples are used to evaluate sample consistency and the laboratory precision. Field duplicates are collected and homogenized before dividing into two separate samples in the field. Field duplicates are stored and transported together and analyzed for the same analytes.

Comparison of field duplicate sample results can provide an indication of intra-laboratory variability. Section 2.2.7.3 describes the evaluation criteria for field duplicate sample results.

2.2.7.2 Laboratory QC Samples

The laboratory QC samples (e.g., method blanks, laboratory control sample/blank spike, and matrix spike) are defined for three-digit EPA methods (*Methods for the Determination of Metals in Environmental Samples*, EPA-600/R-94-111) and four-digit EPA methods (*Test Methods for Evaluating Solid Waste:*

Physical Chemical Methods, SW-846), and will be prepared and analyzed at the frequency specified in the respective reference. Laboratory QC results outside control limits will be reflected in the data validation process and during the DQA described in Section 2.4. No additional field QC samples are required for samples dedicated for bioassays. QC for these samples is inherent in the methods including testing replicates for each sample.

Table 2-4. Field and Laboratory QC Requirements

QC Sample Type	Purpose	Frequency
Field Quality Control		
Full trip blank	Assess contamination from containers or transportation	One per 20 soil samples collected.
Equipment rinsate blank	Verify adequacy of sampling equipment decontamination	As needed.[a] If only disposable equipment is used, then an equipment rinsate blank is not required. Otherwise, 1 per 20 soil samples collected.
Field duplicates	Estimate precision, including sampling and analytical variability	One field duplicate per 20 soil samples collected.
Laboratory Quality Control[b]		
Method blank	Assess response of an entire laboratory analytical system	One per batch,[b] 20 samples maximum, or as identified by the method guidance.
Matrix spike	Identify analytical (preparation and analysis) bias; possible matrix affect on the analytical method used	When required by the method guidance, one per batch,[b] 20 samples maximum, or as identified by the method guidance.
Matrix duplicate or matrix spike duplicate	Estimate analytical bias and precision	When required by the method guidance, one per batch,[b] 20 samples maximum, or as identified by the method guidance.
Laboratory control samples	Assess method accuracy	One per batch,[b] 20 samples maximum, or as identified by the method guidance.
Surrogates	Estimate recovery/yield	When required by the method guidance, as identified by the method guidance.

Notes: QC for plant and invertebrate bioassays are specific to the test and involve detailed design at various points within the test. The details are found within the protocols.

a. Whenever a new type of nondedicated equipment is used, an equipment rinsate blank will be collected every time sampling occurs until it can be shown that less frequent collection of equipment rinsate blanks is adequate to monitor the decontamination procedure for the nondedicated equipment.

b. Batching across projects is allowed for similar matrices (e.g., Hanford Site groundwater).

2.2.7.3 QC Requirements

If only disposable equipment is used, then an equipment rinsate blank is not required.

Only those field duplicate results with at least one result greater than five times the appropriate detection limit or minimum detectable activity are evaluated. Field duplicate results must agree within 20 percent, as measured by the relative percent difference, to be acceptable. Large relative percent differences can be an indication of field sampling or laboratory performance problems and should be investigated. Unacceptable field duplicate results are flagged and qualified in the HEIS database, as appropriate.

For chemical analyses, Table 2-4 states the control limits for laboratory duplicates, matrix spikes, matrix spike duplicates, and laboratory control samples.

Holding time is the elapsed time period between sample collection, extraction, and analysis. Exceeding required holding times could result in changes in analyte concentrations due to volatilization, decomposition, or other chemical alterations. Required holding times depend on the analytical method, as specified for three- and four-digit EPA methods (EPA-600/R-94-111; SW-846). Holding times are specified in laboratory contracts. Data associated with exceeded holding times are qualified and flagged in the HEIS database, as appropriate.

Additional QC measures include laboratory audits and participation in nationally based performance evaluation studies. The laboratories participate in national studies such as the EPA-sanctioned water pollution and water supply performance evaluation studies. The Soil and Groundwater Remediation Project periodically audits the analytical laboratories to identify and solve quality problems or to prevent such problems. Audit results are used to improve performance. Failure of QC will be determined and evaluated during data validation and the DQA process. Data will be qualified as either appropriate or inappropriate.

2.2.8 Instrument and Equipment Testing, Inspection, and Maintenance

Collection, measurement, and testing equipment should meet the applicable standards (e.g., ASTM) or have been evaluated as acceptable and valid in accordance with the procedures, requirements, and specifications. The subcontractor Sampling Lead or equivalent will ensure that the data generated from instructions using a software system are backed up and/or downloaded regularly. Software configuration will be acceptance tested before use in the field.

Measurement and testing equipment used in the field or in the laboratory that directly affects the quality of analytical data will be subject to preventive maintenance measures to ensure minimization of measurement system downtime. Laboratories and onsite measurement organizations must maintain and calibrate their equipment. Maintenance requirements (such as documentation of routine maintenance) will be included in the individual laboratory and the onsite organization QA plan or operating procedures, as appropriate. Maintenance of laboratory instruments will be performed in a manner consistent with three- and four-digit EPA methods (EPA-600/R-94-111; SW-846), or with auditable Hanford Site and contractual requirements. Consumables, supplies, and reagents will be reviewed in accordance with SW-846 requirements and will be appropriate for their use.

2.2.9 Instrument and Equipment Calibration and Frequency

Section 3.5 provides specific field equipment calibration information. Analytical laboratory instruments and measuring equipment are calibrated in accordance with the laboratory's QA plan.

2.2.10 Inspection and Acceptance of Supplies and Consumables

Supplies and consumables used in support of sampling and analysis activities will be procured in accordance with internal work requirements and processes described in the contractor acquisition system. Responsibilities and interfaces necessary to ensure items are procured/acquired for the contractor to meet the specific technical and quality requirements must be in place. The procurement system ensures purchased items comply with applicable procurement specifications and that users check and accept supplies and consumables before use. Supplies and consumables procured by the analytical laboratories are procured, checked, and used in accordance with the laboratories' QA plans.

2.2.11 Nondirect Measurements

Nondirect measurements include data obtained from sources such as computer databases, programs, literature files, and historical databases. Nondirect measurements will not be evaluated as part of this activity.

2.2.12 Data Management

Sample Management and Reporting, in coordination with the Project Lead, is responsible for ensuring analytical data are appropriately reviewed, managed, and stored following the applicable programmatic requirements governing data management procedures. Electronic data access, when appropriate, will be through a database (e.g., HEIS, a project-specific database). Where electronic data are not available, hard copies will be provided in accordance with Section 9.6 of the Tri-Party Agreement Action Plan (Ecology et al., 1989b).

Laboratory errors are reported to Sample Management and Reporting routinely. For reported laboratory errors, a sample issue resolution form will be initiated in accordance with contractor procedures. This process is used to document analytical errors and to establish resolution with the Project Lead. The sample issue resolution forms become a permanent part of the analytical data package for future reference and for records management.

Planning for sample collection and analysis will be in accordance with the programmatic requirements governing fixed-laboratory sample collection activities, as discussed in sampling procedures. If specific procedures do not exist for a particular work evolution, or it is determined additional guidance is needed to complete certain tasks, a work package will be developed to adequately control the activities, as appropriate. Examples of the sampling procedure requirements include activities associated with the following:

- Chain-of-custody/sample analysis requests
- Project and sample identification for sampling services
- Control of certificates of analysis
- Logbooks
- Checklists
- Sample packaging and shipping

When this SAP is implemented, approved work control packages and procedures will be used to document field activities, including radiological and nonradiological measurements. Field activities will be recorded in the field logbook.

2.3 Assessment and Oversight

The elements included in assessment and oversight address the activities for assessing the effectiveness of project implementation and associated QA and QC activities. The purpose of assessment is to ensure that the QAPjP is implemented as prescribed.

2.3.1 Assessments and Response Actions

Contractor management, regulatory compliance, quality, and/or Health and Safety organizations may conduct random surveillances and assessments to verify compliance with the requirements outlined in this SAP, project work packages, the QAPjP, procedures, and regulatory requirements. Section 2.4 discusses the only planned assessment, a DQA, for the activities identified in this SAP. The results of the DQA will be provided to the Project Manager.

If circumstances arise in the field dictating the need for additional assessment activities, then these additional activities will be performed. Deficiencies identified by these assessments will be reported in accordance with existing programmatic requirements. The project's line management chain coordinates the corrective actions in accordance with the contractor QA program, the corrective action management program, and associated procedures that implement these programs.

Oversight activities in the analytical laboratories, including corrective action management, are conducted in accordance with the laboratories' QA plans. The contractor oversees offsite analytical laboratories and qualifies the laboratories for performing Hanford Site analytical work.

2.3.2 Reports to Management

Reports to management on data quality issues will be made if these issues are identified. Issues reported by the laboratories are communicated to Sample Management and Reporting, which initiates a sample issue resolution form in accordance with contractor procedures. This process is used to document analytical or sample issues, and to establish resolution with the Project Manager. At the end of the project, a DQA report will be prepared to determine whether the type, quality, and quantity of collected data met the quality objectives described in this SAP.

2.4 Data Validation and Usability

The elements under data validation and usability address the QA activities occurring after the data collection phase of the project is completed. Implementation of these elements determines whether the data conform to the specified criteria, thus satisfying the project objectives.

2.4.1 Data Review, Verification, and Validation

The criteria for verification include, but are not limited to, review for completeness (samples were analyzed as requested), use of the correct analytical method or procedure, transcription errors, correct application of dilution factors, and correct application of conversion factors. Laboratory personnel may perform data verification.

Data validation will ensure the data quality goals established during the planning phase are achieved. Data validation will be in accordance with internal procedures. The criteria for data validation are based on a graded approach. The primary contractor has defined five levels of validation: Levels A through E. Level A is the lowest level and is the same as verification and Level E is a 100 percent review of data (e.g., calibration data and calculations checks). Validation will be performed to contractor Level C, which is a review of the QC data. Level C validation specifically requires: (1) verification of deliverables; (2) requested versus reported analyses; and (3) qualification of the results based on analytical holding times, method blank results, matrix spike/matrix spike duplicate results, duplicate sample results, and analytical method blank results. Level C validation will be performed on at least five percent of the data by matrix and analyte group. Analyte group refers to categories, such as radionuclides or metals. The goal is to cover the various analyte groups and matrices during the validation.

Relative to analytical data in sample media, physical data and/or field screening results are of lesser importance in making inferences of risk. Field QA/QC will be reviewed to ensure that physical property data and/or field screening results are usable.

2.4.2 Verification and Validation Methods

Validation activities will be based on EPA national functional guidelines guidance. Data validation may be performed by the analytical laboratory, by Sample Management and Reporting, and/or by a party

independent of both the data collector and the data user. Data validation qualifiers must be compatible with the HEIS database.

When outliers or questionable results are identified, additional data validation will be performed. The additional validation will be performed for up to five percent of the statistical outliers and/or questionable data. The additional validation will begin with Level C and may increase to Levels D and E as needed to ensure that data are usable. Level C validation is a review of the QC data, while Levels D and E include review of calibration data and calculations of representative samples from the dataset. Data validation will be documented in data validation reports. An example of questionable data is if the positive detections are greater than the practical quantitation limit or reporting limit in soil/aquifer sediment from a site that should not have exhibited contamination. Similarly, results less than background would not be expected and could trigger a validation inquiry. The determination of data usability will be conducted and documented in a DQA report. Data validation will be documented in data validation reports, which will be included in the project file.

2.4.3 Reconciliation with User Requirements

The DQA process compares completed field sampling activities to those proposed in corresponding sampling documents and provides an evaluation of the resulting data. The purpose of the data evaluation is to determine whether quantitative data are of the correct type and are of adequate quality and quantity to meet the project data needs. The results of the DQA will be used in interpreting the data and determining if the objectives of this activity have been met. The DQA will be in accordance with *Data Quality Assessment: A Reviewer's Guide* (EPA/240/B-06/002) and *Data Quality Assessment: Statistical Methods for Practitioners* (EPA/240/B-06/003).

2.4.4 Corrective Actions

The responses to data quality defects identified through the DQA process will vary and may be data- or measurement-specific. Table 2-1 identifies some pre-identified corrective actions.

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3 Field Sampling Plan

3.1 Sampling Objectives

The objective of the field sampling plan is to identify and describe the sampling and analysis activities to support collection of media for the purpose of assessing potential toxicity to ecological receptors for waste sites in the terrestrial environments of the Hanford Site. This SAP presents a general process that identifies activities for obtaining data necessary to meet site data needs. The process and associated activities are described in the following sections. This process is based on use of the observational approach that is appropriate for sites with limited process knowledge. This approach begins investigating the site with visual inspections and field screening to identify initial site conditions and then performs sampling and analysis (where applicable) to verify the locations are appropriate for evaluating toxicity to ecological receptors.

Following this general approach and based on initial visual inspection and field screening results, the Field Team Lead will develop site-specific sampling instructions that provide the site-specific sampling design. The overall sampling strategy is outlined in Table 3-1. Changes to the field sampling plan may be made in the field by the Sample Design Engineer only in consultation with the Field Team Lead.

Table 3-1. Key Features PRG Ecological Sampling Design

Analytical Methodology	Key Features of Design	Sampling Design Rationale
	Field Screening and Visual Inspections	
Visual inspections	**Specific location/area of concern:** Surface soils. **Investigation method:** Direct visual inspection using available site information and process knowledge (e.g., sample results or visual indicators). **Criteria:** Visually inspect for staining, discoloration, absence of vegetation, or any other anomalies.	Guide selection of locations for field screening and sampling
Radiological field screening	**Specific location/area of concern:** Surface soils. **Investigation method:** Radiological field screening methods are identified in Section 3.2.3. **Analytes:** Soils will be screened for cesium-137 as an indicator analyte for radionuclides.	Guide selection of sample locations
Chemical field screening	**Specific location/area of concern:** Surface soils. **Investigation method:** XRF. **Analytes:** Soils will be screened for metals to indicate if analysis will yield targeted concentration ranges.	Guide selection of sample locations
	Surface Grab Samples	
Grab sampling	**Specific location/area of concern:** Limited area sampling; surface soils (generally 0.3 m [1 ft] bgs) of targeted locations as described in Section 1.5. **Analytes:** Soil samples will undergo laboratory analysis for the analytes listed in Table 2-2.	As required, confirms viability of bioassay samples

XRF = X-ray fluorescence

3.2 Sampling Design

This study design is based on collecting matched sets of chemical analyses from samples of field-collected soils with bioassays on plant and soil invertebrate toxicity from those same samples. The bioassays will be characterizing toxic responses associated with mixtures of analytes in the soil samples. A key feature of the study design is to provide results that can be used to evaluate the toxicity associated with individual analytes measured in those soil samples. Because of the observational nature of the data to be collected in this study, the relationships between analyte concentrations and observed toxic responses will be characterized statistically, and the quantitative relationships between analyte concentrations in soil and observed toxicity will be developed by fitting appropriate models through the concentration-response data.

Collection and analysis of matching field soil chemistry and biological effects data is being performed in order to identify chemical-specific thresholds for toxic effects or to estimate the probability of observing specified effects at measured concentrations in soil. These thresholds then will be used to develop protective concentrations in soil that can be proposed as PRGs.

Developing quantitative relationships between concentrations and toxic responses through observational techniques requires matching chemistry and toxicity data that covers a broad range of concentrations in soil.

3.2.1 Observational Approach for Site Investigation

Under the observational approach, the site investigation is streamlined such that site identification and characteristics of each of the targeted sample locations will occur as described below.

- An initial visual field survey will be performed to formally document visual observations at specific targeted areas (Table 3-3 for the list of target locations). The visual survey will include documentation of Geographic Information System coordinates, descriptions of observed conditions and delineations of the condition that resulted in the original identification of the site (from Waste Information Data System), and any additional observed conditions and/or confirmation of historical conditions. The field survey also will include photo documentation of the site. Radiological surveys will be conducted to identify site health and safety needs. Debris and any stabilization cover, if existing, will be removed as necessary to gain access to soils. If radionuclides are detected above background, samples will not be collected.
- The Sample Design Engineer will develop a plan that addresses the observed conditions of the site to a nominal depth of up to 30 cm (12 in.) bgs.

Data will be collected as necessary for waste designation and disposal to ensure compliance with Environmental Restoration Disposal Facility (ERDF) waste acceptance criteria.

The key features of the soil ecological sampling design and the sampling rationale are summarized in Chapter 1.

3.2.2 Visual Inspections

Visual inspections will be performed to help guide the locating of site contamination areas for further evaluation. The site surfaces will be inspected for soil staining or discoloration, absence of vegetation, potentially contaminated debris, and any other indications of contamination or visual anomalies. The intent of the visual inspection is to identify the areas near target locations most likely to result in detected concentrations of the priority analytes for this SAP. The results of the visual inspection and survey will be documented in field notes. Observations will be clearly noted and described.

3.2.3 Radiological Field Screening Methods

The following sections describe the radiological field screen methods. Target soil samples will be screened for cesium-137 as an indicator analyte. Should cesium-137 be detected above background, the surface soil sample will not be collected from that area. The intent of the investigation is to collect samples for developing PRGs for metals. The presence of concentrations of radionuclides could confound interpretation of the bioassay results.

3.2.3.1 Radiological Survey

A surface radiation survey will be performed on the soil at a waste site to document existing surface contamination and to support preparation of supporting health and safety documentation. Gamma radiation instrument measurements (i.e., count rates) will be taken systematically at specified locations using portable radiological equipment. The minimum detectable activity capability of the radiological survey instrumentation will be established. Qualified radiological control technicians will conduct surface radiation surveys and a survey report will be prepared documenting the results of each survey.

Field screening for cesium-137 as a radiological indicator analyte will be used to identify the presence of radionuclides. Radiological survey information will be used to make decisions concerning targeted areas by identifying areas to be avoided.

Field screening will be used to identify detectable radiological contamination, adjust sampling points if needed, and support worker health and safety planning. Field screening instruments will be used, maintained, and calibrated in accordance with the instrument program, manufacturers' specifications, and other approved procedures. Field screening instruments may include the Geiger-Müller meter, portable alpha meter, and portable sodium iodide detector or other comparable equipment to screen for radionuclides.

3.2.4 Soil Sampling

This section describes the general approach for determining the number and type of samples required for this investigation. The technical basis for the number and location of samples is presented in Section 1.7. The final and site-specific sampling details for ecological sampling will be provided in a site-specific sampling instruction developed by the Field Team Lead. The site-specific SI will be revised in a timely fashion as necessary to accommodate changes in field conditions or sampling needs.

3.2.4.1 Number of Samples

All sampling will be focused judgmental sampling. Grid sampling or other statistically based sampling design will not be employed. The number of samples to be collected are as follows:

- Three to five samples to be collected from within the range of visual indicators (e.g., soil staining, lack of vegetation) at each of 23 target locations within the Outer Area of the Central Plateau identified previously.
- Three to five sample to be collected from within the range of visual indicators (e.g., soil staining, lack of vegetation) in the 120-KW-1 waste site.
- Twenty field control samples to be collected from within the Outer Area of the Central Plateau.

3.2.4.2 Sample Collection Methods

All samples will be collected from the top 30 cm (12 in.) of soil using a stainless steel spoon or hand trowel or a hand auger. If dedicated field equipment is not used, then it will be decontaminated between sample locations. Samples will be sieved and homogenized in the field prior to shipping to the laboratory.

3.2.5 Chemical Screening Measurements

Field screening methods will be used to provide a field indicator of targeted concentration ranges for samples. The target ranges for each analyte of interest are outlined in the DQO. Historic analytical chemistry data at target sample locations and where the concentrations fall within the target ranges are outlined in the DQO. Field screening will be used in combination with process knowledge to determine sample locations within the visual indicators.

Field screening instruments will be used, maintained, and calibrated in accordance with the manufacturer's specifications and other approved procedures. The Sample Design Engineer will record field screening results in the field log. The potential chemical field screening measurement methods are displayed in Table 3-2.

Table 3-2. Potential Chemical Field Screening Measurement Methods

Variable	Potentially Appropriate Measurement Method	Possible Limitations
Metals	XRF	Equipment will be used to indicate presence of analyte relative to the target levels

Note: Nondetect results may not be usable when the practical quantitation limit of the field-screening method is at or below background.

3.2.6 Waste Management Sampling

The following steps are involved in determining an adequate sample mass to collect in the field and the proper particle size for the analytical laboratory to measure for radiological and nonradiological analysis.

The DQO process for waste management included a review of the analytes of interest identified in Table 1-1 and an analysis of any additional analytes (Table 1-2) that should be evaluated to complete the waste designation and profile.

Modification of the waste sampling and analysis requirements determined during the DQO process may be required at some sites. Site-specific waste characterization sampling and analytical requirements will be developed as needed for waste acceptance at the ERDF. Additional analytical data may be needed at some sites if no existing waste profiles correspond to the suspected waste streams.

3.2.6.1 Waste Designation Sampling Design

A judgmental sampling approach is used for waste designation determinations. Wastes that require characterization include material/media that cannot be designated without characterization and may require special handling for human exposure protection or waste acceptance. The sampling protocols for waste material/media and unknown waste forms will be completed in accordance with site procedures.

3.2.6.2 Optimal Sample Size that Satisfies the DQOs

Sample size is determined by the total sample volume required to perform all proposed chemical analysis and laboratory bioassays as shown in Table 2-3.

3.3 Sampling Locations

The observational approach will be used to investigate these sites. The actual number and location of soil samples will be collected in accordance with site-specific sampling instructions. Deep excavations (> 4.67 m [15 ft]) are not within the scope of this SAP.

Table 3-3 summarizes the proposed sample locations.

Table 3-3. Target Sample Locations

Central Plateau Outer Area Targets	
Waste Site Identifier	HEIS Identifier for Specific Target Locations*
600-218	B23C48
600-218	B23C49
600-220	B26792
600-220	B26795
600-228	B25FV6
600-228	B25FW2
600-281	B25CL3
600-281	B25CM2
600-281	B25CL2
600-281	B25CM4
OCSA	B26X51
OCSA	B25KP1
OCSA	B26X46
OCSA	B25KN8
OCSA	B25KP0
OCSA	B26XC7
OCSA	B26X42
OCSA	B295D7
OCSA	B27JB0
OCSA	B296P8/B296P9
OCSA	B295D6
OCSA	B27HV8
OCSA	B25VN2

Table 3-3. Target Sample Locations

Central Plateau Outer Area Targets	
Waste Site Identifier	HEIS Identifier for Specific Target Locations*
100 Area River Corridor Targets	
120-KW-1	At visual indicators (yellow dirt/surface staining)

* HEIS numbers are associated with previously collected and analyzed samples from specific locations within the waste site and are not the assigned HEIS number for samples to be collected per this SAP.

3.4 Documentation of Field Activities

The following text provides various documentation of field activities performed.

3.4.1 Logbooks

Logbooks or data forms are required for field activities. Requirements for the logbook are provided in Section 2.1.6. Data forms may be used to collect field information; however, they must follow the same requirements for logbooks and must be referenced in the logbooks. Section 3.2 provides the information that is required to be in field logbooks.

3.4.2 Corrective Actions and Deviations for Sampling Activities

The Field Team Lead or Sample Design Engineer must document all deviations from procedures or other problems pertaining to sample collection, chain-of-custody, target analytes, sample transport, or noncompliant monitoring. Examples of deviations include samples that cannot be collected because of field conditions, changes in sample locations because of physical obstructions, or additions of sample depth(s).

As appropriate, such deviations or problems will be documented in the field logbook or on nonconformance report forms in accordance with internal corrective action procedures. The Field Team Lead will be responsible for communicating field corrective action requirements and for ensuring that immediate corrective actions are applied to field activities.

More significant changes in sample locations that do not impact the DQOs will require notification and approval of the Geographic Closure Manager. Changes to sample locations that could result in impacts to meeting the DQOs will require concurrence with DOE.

3.5 Calibration of Field Equipment

The Field Team Lead is responsible to ensure that all field equipment is calibrated appropriately. All onsite environmental instruments are calibrated in accordance with the manufacturer's operating instructions, internal work requirements and processes, and/or work packages that provide direction for equipment calibration or verification of accuracy by analytical methods. The results from all instrument calibration activities are recorded in logbooks and/or work packages; either hard copy or electronic are acceptable.

Calibrations must be performed as follows:

- Before initial use of a field analytical measurement system.
- At the frequency recommended by the manufacturer or procedure, or as required by regulations.
- Upon failure to meet specified QC criteria.

Field instrumentation, calibration, and QA checks will be performed in accordance with the following:

- Calibration of radiological field instruments on the Hanford Site is performed under contract by Pacific Northwest National Laboratory, as specified in its program documentation.
- Daily calibration checks will be performed and documented for each instrument used to characterize areas that are under investigation. These checks will be made on standard materials that are sufficiently like the matrix under consideration to allow for direct comparison of data. Analysis times will be sufficient to establish detection efficiency and resolution.
- Standards used for calibration will be traceable to a nationally or internationally recognized standard agency source or measurement system, if available.

3.6 Sample Handling, Packaging, and Container Labeling

Packaging. Level I EPA pre-cleaned sample containers will be used for soil samples collected for chemical analysis. Container sizes may vary depending on laboratory-specific volumes/requirements for meeting analytical detection limits. The radiological engineering organization will measure both the contamination levels and dose rates associated with the sample containers. This information, along with other data, will be used to select proper packaging, marking, labeling, and shipping paperwork and to verify that the sample can be received by the analytical laboratory in accordance with the laboratory's acceptance criteria. If the dose rate on the outside of a sample jar or the Curie content exceeds levels acceptable by an offsite laboratory, the field work supervisor, in consultation with the Sample and Data Management organization, can send smaller volumes to the laboratory. Preliminary container types and volumes are identified in Table 2-3.

Container Labeling. The sample location, depth, and corresponding HEIS numbers are documented in the Sampler's field logbook. Each sample container will be labeled with the following information on firmly affixed, water-resistant labels:

- Sampling authorization form
- Sampling authorization form number
- HEIS number
- Sample collection date/time
- Analysis required
- Preservation method (if applicable)

In addition to the above information, sample records must include:

- Analysis required
- Source of sample

- Matrix (water, soil, etc.)
- Field data (potential of hydrogen, radiological readings)

Field Sample Logbook. Information pertinent to sampling and analysis will be recorded in field checklists and logbooks in accordance with existing sample collection protocols. The sampling team will be responsible for recording relevant sampling information. Entries made in the logbook will be dated and signed by the individual making the entry. Program requirements for managing the generation, identification, transfer, protection, storage, retention, retrieval, and disposition of records will be followed.

Sample Custody. Sample custody will be maintained in accordance with existing Hanford Site protocols. The custody of samples will be maintained from the time that samples are collected until ultimate disposal of the samples, as appropriate. A chain-of-custody record will be initiated in the field at the time of sampling and will accompany each set of samples shipped to the laboratory. Sample shipping procedures will be followed throughout sample shipment. Each chain-of-custody form will include the sample identification number, associated site identification number, and remediation system designation. The analyses requested for each sample will be indicated on the accompanying chain-of-custody form.

Chain-of-custody procedures will be followed throughout sample collection, storage, transfer, analysis, and disposal to ensure that sample integrity is maintained. Each time the responsibility for the custody of the sample changes, the new and previous custodians will sign the record and note the date and time. A custody seal (i.e., evidence tape) will be affixed to the lid of each sample jar. The container seal will be inscribed with the sampler's initials and the date. Sample custody during laboratory analysis will be addressed in the applicable laboratory's standard operating procedures.

Sample Shipping. Samples will be transported after authorization from the project-authorized shipper. Sample transportation will be in compliance with the applicable regulations for packaging, marking, labeling, and shipping hazardous materials, hazardous substances, and hazardous waste that are mandated by the U.S. Department of Transportation (49 CFR 171-177, Chapter 1, "Research and Special Programs Administration, Department of Transportation," Part 171, "General Information, Regulations, and Definitions," through Part 177, "Carriage by Public Highway"). Sample transportation will also be in compliance with the International Air Transportation Authority, DOE requirements, and applicable program-specific implementing procedures.

As a general guideline, samples with no or very low radioactivity will be shipped for analysis to the Waste Sampling and Characterization Facility. Samples with activities <0.5 mrem/h can be shipped to an appropriate offsite laboratory (e.g., DOE contract laboratory, or a laboratory with a U.S. Nuclear Regulatory Commission or state license for specific radionuclides). Samples with activities between 0.5 and 10 mrem/h can be shipped to an offsite laboratory, although samples with dose rates within this range will be evaluated on a case-by-case basis by Sample and Data Management. Samples with activities >10 mrem/h will be sent to an onsite laboratory, as arranged by the Sample and Data Management organization.

Bioassay Samples. At each target location, samples labeled for bioassays are being collected concurrently with analytical chemistry samples One liter of soil will be collected for each of two bioassays. These samples will be labeled and shipped to the bioassay laboratory where they will be archived in a cooler that will maintain samples at 4°C. Upon review of analytical chemistry results, a subset of these samples (60 to 80 samples for the plant bioassay and 60 to 80 for the invertebrate bioassay plus 10 field controls) will be analyzed by the bioassay laboratory.

4 Health and Safety

Field operations will be performed in accordance with Health and Safety requirements and appropriate Soil and Groundwater Remediation Project requirements. Additionally, work control documents will be prepared to further control site operations. Safety documentation will include an activity hazard analysis and, as applicable, radiological work permits. The sampling procedures and associated activities will implement ALARA practices to minimize the radiation exposure to the sampling team, consistent with the requirements defined in 10 CFR 835.

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5 Management of Investigation-Derived Waste

The investigation-derived waste (IDW) generated by characterization activities will be managed in accordance with the most current Investigation Derived Waste strategy agreed to by DOE, EPA, and Ecology. The IDW will be managed in accordance with the applicable waste control plan, waste DQO document, and waste packing and labeling instruction sheet provided by the Waste Management Representative.

Unused samples and associated laboratory waste from offsite laboratory analysis will be dispositioned in accordance with the laboratory contract, which in most cases, will allow the laboratory to dispose of this material. Unused sample material from onsite laboratories will be returned to the project for disposal.

A waste designation DQO process will be completed before characterization activities are initiated, to ensure that information necessary to support designation of all project IDW is collected during the field activities. During the IDW DQO activities, any listed waste issues will be resolved. Additional sampling or analysis required to support designation activities will be identified in the waste designation DQO summary report.

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Attachment 10

161508

^WCH Document Control

From: Berezovskiy, Inna B
Sent: Thursday, October 06, 2011 7:19 AM
To: ^WCH Document Control
Cc: Saueressig, Daniel G
Subject: RE: 100-C-7 and 100-C-7:1 Sidewall Sampling designs

Attachments: 100-C-7 Sidewall sampling Design - Final.doc; 100-C-7_1 SidewallsamplingDesign_Final _Rev. 1.doc

100-C-7 Sidewall sampling Desi... 100-C-7_1 dewallsamplingDesi...

I'm sorry, they are attached now.

-----Original Message-----
From: ^WCH Document Control
Sent: Thursday, October 06, 2011 7:12 AM
To: Berezovskiy, Inna B
Cc: Saueressig, Daniel G
Subject: RE: 100-C-7 and 100-C-7:1 Sidewall Sampling designs

Hi,

I did not get the attachments... Please forward again.

Thank you,

Diana

-----Original Message-----
From: Berezovskiy, Inna B
Sent: Wednesday, October 05, 2011 4:38 PM
To: ^WCH Document Control
Cc: Martinez, Charlene R; Beach, Christopher L; Fahlberg, Robert T; Buckmaster, Mark A
Subject: FW: 100-C-7 and 100-C-7:1 Sidewall Sampling designs

Please chronicle,
Thank you,
Inna

-----Original Message-----
From: Post, Thomas [mailto:Thomas.Post@rl.doe.gov]
Sent: Wednesday, October 05, 2011 4:33 PM
To: Buelow.Laura@epamail.epa.gov; Berezovskiy, Inna B
Subject: RE: 100-C-7 and 100-C-7:1 Sidewall Sampling designs

I concur as well with the modification.

Thanks.

-----Original Message-----
From: Buelow.Laura@epamail.epa.gov [mailto:Buelow.Laura@epamail.epa.gov]
Sent: Wednesday, October 05, 2011 4:28 PM
To: Berezovskiy, Inna B
Cc: Post, Thomas
Subject: RE: 100-C-7 and 100-C-7:1 Sidewall Sampling designs

I concur. Thanks for pointing out the changes.

Laura Buelow, Environmental Scientist
U.S. Environmental Protection Agency
Hanford Project Office
309 Bradley Blvd, Suite 115
Richland, WA 99352
Phone: 509 376-5466
Fax: 509 376-2396
E-mail: buelow.laura@epa.gov

From: "Berezovskiy, Inna B" <ibberezo@wch-rcc.com>
To: Laura Buelow/R10/USEPA/US@EPA, "Post, Thomas C" <thomas.post@rl.doe.gov>
Date: 10/05/2011 04:09 PM
Subject: RE: 100-C-7 and 100-C-7:1 Sidewall Sampling designs

Tom, Laura,

The 100-C-7:1 excavation sidewall boundaries somehow shifted 30 meters south/east from where they're actually supposed to be; therefore, the sample design was thrown off by 30 meters also. The 100-C-7:1 sidewall sampling design was revised to solve this problem.

Please review the new sample design and let me know if you have any comments. The wording in the sampling design did not change; however, Figure 3 was replaced to include new VSP design and Table 2 was updated with new coordinates (and an additional sample #13).

If you have no comments, then we would appreciate your concurrences.

Thank you,
Inna

-----Original Message-----
From: Buelow.Laura@epamail.epa.gov [mailto:Buelow.Laura@epamail.epa.gov]

Sent: Wednesday, October 05, 2011 11:06 AM
To: Post, Thomas C
Cc: Berezovskiy, Inna B
Subject: RE: 100-C-7 and 100-C-7:1 Sidewall Sampling designs

I concur with the sampling designs also.

Laura Buelow, Environmental Scientist
U.S. Environmental Protection Agency
Hanford Project Office
309 Bradley Blvd, Suite 115
Richland, WA 99352
Phone: 509 376-5466
Fax: 509 376-2396
E-mail: buelow.laura@epa.gov

From: "Post, Thomas" <Thomas.Post@rl.doe.gov>
To: "Berezovskiy, Inna B" <ibberezo@wch-rcc.com>
Cc: Laura Buelow/R10/USEPA/US@EPA
Date: 10/05/2011 10:46 AM
Subject: RE: 100-C-7 and 100-C-7:1 Sidewall Sampling designs

Inna,

I've reviewed and concur with the sampling designs.

Thank you.

Tom Post

From: Berezovskiy, Inna B
Sent: Wednesday, October 05, 2011 6:34 AM
To: Post, Thomas
Subject: FW: 100-C-7 and 100-C-7:1 Sidewall Sampling designs

Hi Tom,

Please look over the sampling designs and let me know if you have any comments,

Thanks!
Inna

From: Berezovskiy, Inna B
Sent: Friday, September 30, 2011 7:48 AM
To: Post, Thomas C; 'Buelow.Laura@epamail.epa.gov'
Cc: Buckmaster, Mark A; Beach, Christopher L
Subject: 100-C-7 and 100-C-7:1 Sidewall Sampling designs

Hi Tom and Laura,

I've attached two sampling designs related to 100-C-7 and 100-C-7:1 waste site excavations. Both of the sampling designs intend to sample the upper sidewalls of each excavation, before the excavation is extended deeper.

If the attached summary is acceptable, please provide concurrence as soon as possible so that the field can proceed with sampling. If you have any comments, you can either forward them to me or discuss on Tuesday's meeting.

<< File: 100-C-7 Sidewall sampling Design - Final.doc >> << File: 100-C-7_1 SidewallsamplingDesign_Final.doc >> Thank you, Inna [attachment "100-C-7_1 SidewallsamplingDesign_Final _Rev. 1.doc" deleted by Laura Buelow/R10/USEPA/US]

VERIFICATION SAMPLING OF 100-C-7 SIDEWALLS

Verification sampling will be performed on the sidewalls of the 100-C-7 excavation prior to completion of remedial activities due to the expected depth of the final excavation (approximately 27 m [89 ft] below ground surface). Based on the current excavation design, remediation will be extended to groundwater to remove all contaminated soil. Performing verification sampling of the upper sidewalls before the excavation is complete will also reduce fall hazard and safety concerns for sampling personnel.

1.0 SITE DESCRIPTION

The 100-C-7, 183-C Filter Building/Pumproom Facility Foundation and Demolition Waste site is located in the southwestern portion of the 100-B/C Area, 340 m (1,115 ft) west of the 105-C Reactor Building, and is associated with the decommissioned 183-C water treatment facilities. The 183-C water treatment facilities were constructed to provide treated water to the 105-C and 105-B Reactor Buildings. Sodium dichromate was added to the filtered water to preclude corrosion of the process tubes in the reactors. The 100-C-7 waste site addresses the residual sodium dichromate contamination associated with concrete that was left in place after the 183-C Filter Building/Pumproom was decommissioned in 1997, and stained surface soil that was observed in 2002 just north of the 183-C Head House. The stained surface soil will be addressed in a 100-C-7:1 verification work instruction.

Remedial action at 100-C-7 was initiated in 2004 and excavation was completed to a depth of 4.6 m (15 ft). Remedial activities were discontinued when visible chromium contamination was observed beneath a north-south trending steam line. The visible chromium contamination area was surveyed using the global positioning system (GPS). In 2007, a borehole was drilled to help determine the extent of the contamination. Analytical results showed a maximum concentration of 310 mg/kg total chromium at a depth of 35 ft below ground surface (bgs). In 2009, it was determined that the hexavalent chromium in the vadose zone below 4.6 m (15 ft) would need to be remediated in order to protect groundwater in the 100-B/C Area.

2.0 REMEDIAL ACTION ACTIVITIES

Following completion of the remedial design in 2010, additional remedial activities began on January 27, 2011. The current excavation depth is approximately 17 m (55 ft) bgs; in-process sampling showed hexavalent chromium is present above cleanup levels at this depth. A pothole was excavated to a depth of 22 m (72 ft) bgs; visual observation of soil stained with chromium and in-process data results show hexavalent chromium concentration at levels exceeding cleanup criteria. The 100-C-7 excavation is shown in Figure 1. Remediation of the 100-C-7 waste site will continue until groundwater is encountered (approximately 27 m [89 ft] bgs). The current design drawing will be revised to expand the excavation to the north to take into consideration the visual observation of chromium contamination at a depth of 22 m (72 ft) bgs trending to the northeast.

Figure 1. 100-C-7 Aerial Photograph (August 2011).

3.0 VERIFICATION SAMPLING AND ANALYSIS

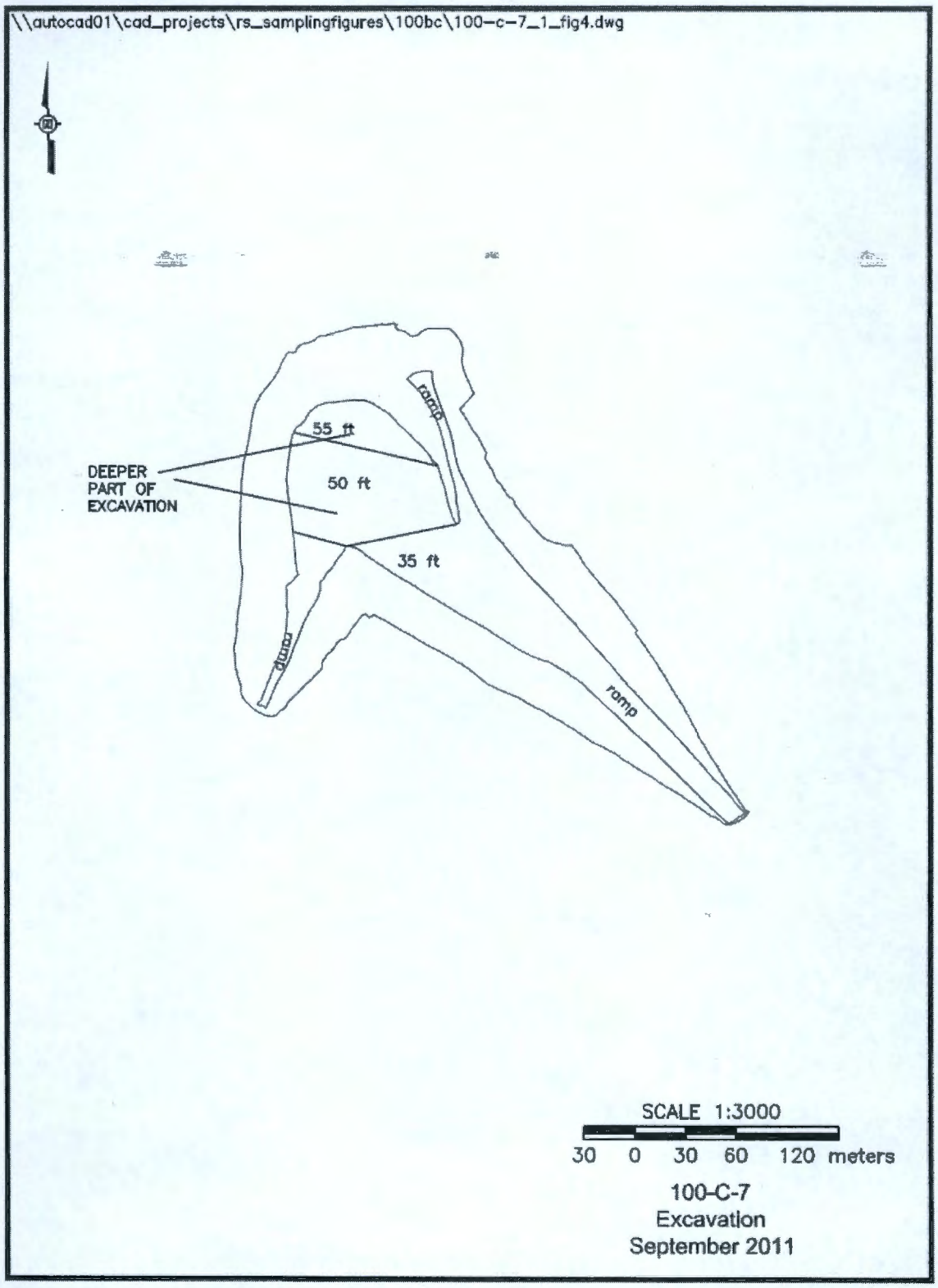
Verification sampling of the 100-C-7 upper sidewalls will be performed prior to completion of remedial activities due to the expected depth of the expected final excavation (approximately 27 m [89 ft] bgs). Figure 2 shows the current sidewall boundaries and depth of the excavation. The current remedial design will be revised to remove all contaminated soil and will expand the excavation to the north. The final depth of the excavation will remain unchanged from the original design. Due to fall hazard and safety concerns, verification sampling of the upper excavation sidewalls will be performed before the excavation is complete.

Verification sampling of the 100-C-7 upper sidewalls will be performed to support a determination that potential residual contaminant concentrations at this site meets the cleanup criteria specified in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999).

3.1 Contaminants of Concern

The results from previous investigations and process knowledge have identified total chromium, mercury, and hexavalent chromium as contaminants of concern (COCs). Radionuclides have not been previously detected above background at this location and are, therefore, not COCs.

Figure 2. 100-C-7 Excavation Boundary (September 2011).



3.2 Laboratory Analytical Methods

The laboratory analytical methods and associated COCs for this verification sampling design are listed in Table 1.

Table 1. Laboratory Analytical Methods.

Analytical Method	Contaminants of Concern (COCs)
ICP metals – EPA Method 6010	Metals [a]
Mercury – EPA Method 7471	Mercury
Cr VI – EPA Method 7196	Hexavalent chromium

[a] Analysis for the expanded list of ICP metals will be performed to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, silver, selenium, vanadium, and zinc in the analytical results package.

EPA = U.S. Environmental Protection Agency
ICP = inductively coupled plasma

3.3 Sample Design Selection and Basis

This section describes the basis for selection of an appropriate sample design and determination of the number of verification soil samples to collect. Verification samples will be applied only to the upper sidewalls of the 100-C-7 waste site excavation. Upon completion of remedial activities, verification sampling of the remaining portions of the waste site will be addressed under a separate verification work instruction.

The decision rule for demonstrating compliance with the cleanup criteria requires comparison of the true population mean with the cleanup level, as estimated by the 95% upper confidence limit on the sample mean. Therefore, a statistical sampling design is the preferred verification sampling approach for this site because the distribution of potential residual soil contamination over the study area (site) is uncertain. The Washington State Department of Ecology (Ecology) publication *Guidance on Sampling and Data Analysis Methods* (Ecology 1995) recommends that systematic sampling with sample locations distributed over the entire study area be used.

Visual Sample Plan[1] (VSP) was used as a tool to develop the statistical sampling design for the verification sampling. A global positioning survey was used to determine the boundaries of the excavation area. A total of 14 soil samples will be collected from the upper excavation sidewalls area on a random-start, triangular grid (Figure 4). A triangular grid was selected for this investigation based on studies that indicate triangular grids are superior to square grids (Gilbert 1987).

A sample design was prepared to conduct verification sampling at the 100-C-7 waste site upper excavation sidewalls. All samples will be analyzed for the contaminants of concern (COCs) identified in Tables 1. The soil sampling locations will be global positional surveyed and staked prior to sample collection using the coordinate pairs provided in Table 2. A discrete soil sample will be collected at each designated sample point from the surface of the excavation sidewall and

[1] Visual Sample Plan is a site map-based user-interface program that may be downloaded at http://dqo.pnl.gov.

analyzed using the methods identified in Table 1. Full protocol laboratory analysis will be requested for all samples.

Table 2. 100-C-7 Excavation Sidewall Verification Sampling Summary Table.

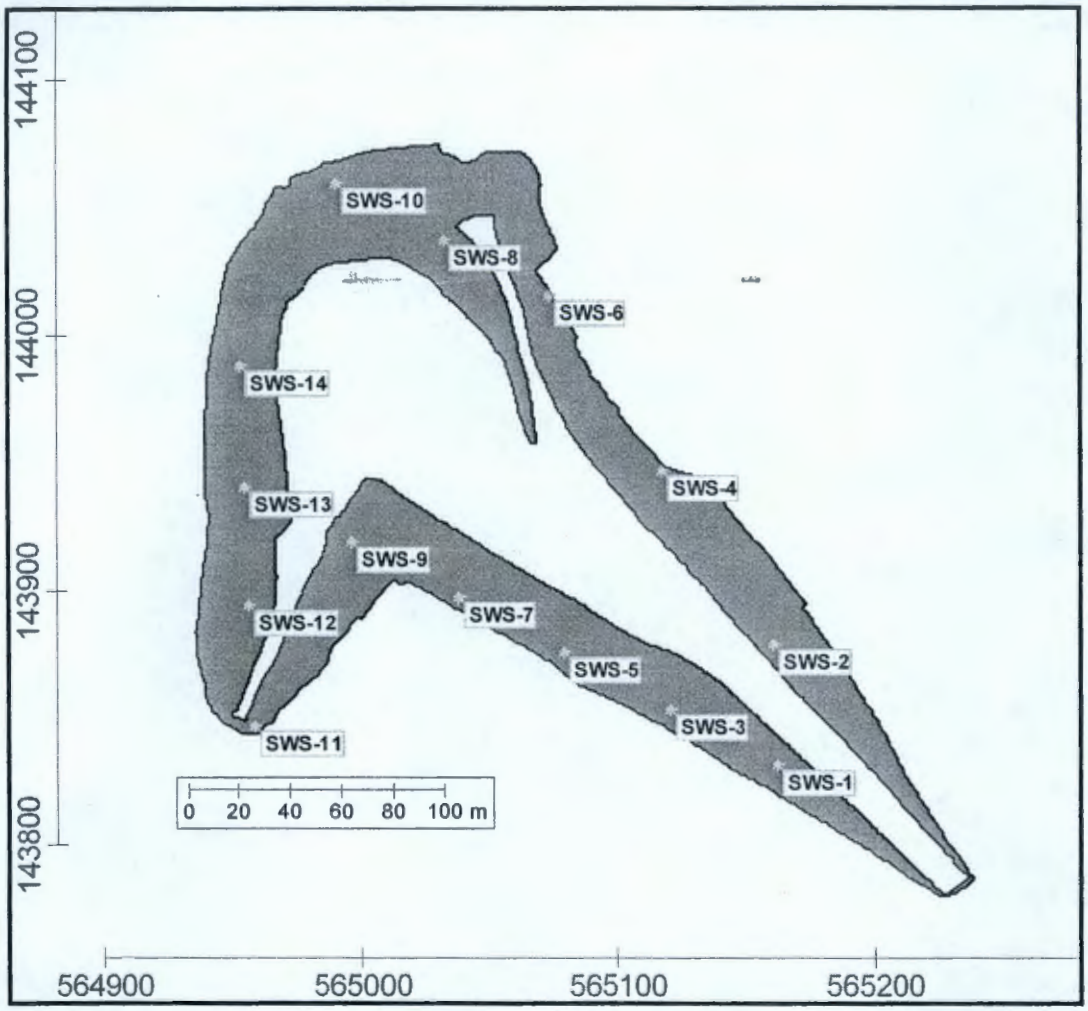
Sample Location	Sample Media	HEIS Sample Number	WSP Coordinate Locations		Sample Analysis
			Northing	Easting	
SWS-1	Soil	TBD	143831.7	565162.4	ICP metals,[a] mercury, hexavalent chromium
SWS-2	Soil	TBD	143878.5	565160.5	ICP metals,[a] mercury, hexavalent chromium
SWS-3	Soil	TBD	143853.5	565120.8	ICP metals,[a] mercury, hexavalent chromium
SWS-4	Soil	TBD	143947.3	565117.1	ICP metals,[a] mercury, hexavalent chromium
SWS-5	Soil	TBD	143875.3	565079.3	ICP metals,[a] mercury, hexavalent chromium
SWS-6	Soil	TBD	144016.0	565073.6	ICP metals,[a] mercury, hexavalent chromium
SWS-7	Soil	TBD	143897.1	565037.7	ICP metals,[a] mercury, hexavalent chromium
SWS-8	Soil	TBD	144037.8	565032.1	ICP metals,[a] mercury, hexavalent chromium
SWS-9	Soil	TBD	143918.9	564996.2	ICP metals,[a] mercury, hexavalent chromium
SWS-10	Soil	TBD	144059.6	564990.6	ICP metals,[a] mercury, hexavalent chromium
SWS-11	Soil	TBD	143847.0	564958.4	ICP metals,[a] mercury, hexavalent chromium
SWS-12	Soil	TBD	143893.9	564956.5	ICP metals,[a] mercury, hexavalent chromium
SWS-13	Soil	TBD	143940.8	564954.6	ICP metals,[a] mercury, hexavalent chromium
SWS-14	Soil	TBD	143987.7	564952.8	ICP metals,[a] mercury, hexavalent chromium
Duplicate	Soil	TBD	TBD	TBD	ICP metals,[a] mercury, hexavalent chromium
Equipment blank	Silica sand	TBD	NA	NA	ICP metals,[a] mercury

[a] The expanded list of ICP metals will be performed to include arsenic, antimony, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc in the analytical results package.

bgs = below ground surface
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
TBD = to be determined
WSP = Washington State Plane

Figure 3 shows verification sample locations for the 100-C-7 waste site.

Figure 3. 100-C-7 Excavation Sidewalls Verification Sample Locations.



3.4 Verification Sample Collection – Quality Control/Quality Assurance

One equipment blank sample consisting of clean silica sand poured over sampling equipment will be collected and analyzed for ICP metals and mercury. One field duplicate sample will be collected at a location selected at the project analytical lead's discretion. The duplicate sample will be analyzed for the full suite of analytes using the same methods specified for the corresponding primary sample.

4.0 REFERENCES

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Gilbert, R. O., 1987, *Statistical Methods for Environmental Pollution Monitoring,* Wiley & Sons, Inc., New York, New York.

VERIFICATION SAMPLING OF 100-C-7:1 SIDEWALLS

Verification sampling will be performed on the upper sidewalls of the 100-C-7:1 subsite excavation prior to completion of remedial activities due to the expected depth of the final excavation (approximately 25.6 m [84 ft] below ground surface). Based on the current excavation design, remediation will be extended to groundwater to remove all contaminated soil. Performing verification sampling of the upper sidewalls before the excavation is complete will reduce fall hazard and safety concerns for sampling personnel.

1.0 SITE DESCRIPTION

The 100-C-7:1, Yellow Stained Soil/183-C Water Treatment Facility Head House subsite is located in the southwestern portion of the 100-B/C Area, 557 m (1,828 ft) west of the 105-C Reactor Building, and is associated with the decommissioned 183-C water treatment facilities. The 183-C water treatment facilities were constructed to provide treated water to the 105-C and 105-B Reactor Buildings. Sodium dichromate was added to the filtered water to prevent corrosion of the process tubes in the reactors. The 100-C-7:1 waste site addresses the residual sodium dichromate contamination associated with the stained surface soil that was observed in 2002 just north of the 183-C Head House. A large area (approximately 6,600 m^2 [71,016 ft^2]) of soil, mostly free of vegetation and stained yellowish, appeared between the railroad tracks on the west side and the head house foundation. It is speculated that the stained area is a result from spillage when sodium dichromate, initially received by rail in solid form, was transferred from the head house to the pumproom facility.

The 100-C-7:1 subsite also included a section of 7.6-cm (3-in.) diameter steel soft-water pipeline that ran between the 184-B Power House and the 183-C Head House. This soft-water pipeline was later converted to a sodium dichromate line. The majority of this pipeline was remediated as part of the 100-B-28 waste site. However, the section assigned to the 100-C-7:1 subsite could not be removed due to the presence of an active export water pipeline.

Remedial action at the 100-C-7:1 subsite was initiated in 2004 and excavation continued to a depth of 4.6 m (15 ft). However, extensive chromium discolored soil was still evident. Characterization test pits were excavated in 2005 and boreholes were drilled in 2007 to help determine the extent of the chromium contamination. Analytical results indicated significant concentrations of chromium throughout the vadose zone beneath the site. In 2009, it was determined that the chromium in the vadose zone below 4.6 m (15 ft) would need to be remediated in order to protect groundwater in the 100-B/C Area. Between 2010 and 2011, the export water pipeline was relocated in order to remove the remaining section of the 7.6-cm (3-in.) diameter pipeline.

2.0 REMEDIAL ACTION ACTIVITIES

Following completion of the remedial design in 2010, additional remedial activities began on January 27, 2011. The current excavation depth of the 100-C-7:1 excavation is approximately 13.7 m (45 ft) below ground surface (bgs) as shown in the center of Figure 1. Chromium contamination is present in the bottom of the excavation; therefore, remediation will continue until the remaining contaminated soils have been removed (approximately 25.6 m [84 ft] bgs).

Figure 1. 100-C-7:1 Aerial Photograph (August, 2011).

In April 2011, an additional stained area was discovered in the northwest corner of the 100-C-7:1 excavation. In-process sampling of this stained area indicated significant concentrations of both total chromium and hexavalent chromium. Additional removal of material, to the extent of the design specifications, revealed extensive chromium contamination in the west sidewall that was outside the boundaries of the current design. In-process sampling results showed high levels of total chromium and hexavalent chromium. Currently, the excavation cannot be extended further to the west due to power lines located on the perimeter of the 100-C-7:1 excavation. The power lines will be re-routed around the southern side of the 100-C-7/100-C-7:1 waste sites prior to additional remediation on the western sidewall.

3.0 VERIFICATION SAMPLING AND ANALYIS

Verification sampling of the 100-C-7:1 upper sidewalls will be performed prior to completion of remedial activities due to the expected depth of the final excavation approximately 25.6 m [84 ft] bgs). Figure 2 shows the current sidewall boundaries of the excavation. The remedial design will be revised to remove all contaminated soil, and will extend the excavation boundary to the west. The final expected depth of the excavation will be unchanged. Due to fall hazard and safety concerns, verification sampling of the upper sidewalls will be performed before the excavation is complete.

Verification sampling of the upper sidewalls will be performed to support a determination that potential residual contaminant concentrations at this site meets the cleanup criteria specified in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2009) and the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Remaining Sites ROD) (EPA 1999).

3.1 Contaminants of Concern

The results from previous investigations and process knowledge have identified total chromium, mercury, and hexavalent chromium as contaminants of concern (COCs). Radionuclides have not been previously detected above background at this location and are, therefore, not COCs.

3.2 Laboratory Analytical Methods

The laboratory analytical methods and associated COCs for this verification sampling design are listed in Table 1.

Table 1. Laboratory Analytical Methods.

Analytical Method	Contaminants of Potential Concern
ICP metals – EPA Method 6010	Metals [a]
Mercury – EPA Method 7471	Mercury
Cr VI – EPA Method 7196	Hexavalent chromium

[a] Analysis for the expanded list of ICP metals will be performed to include antimony, arsenic, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, silver, selenium, vanadium, and zinc.

EPA = U.S. Environmental Protection Agency
ICP = inductively coupled plasma

3.3 Sample Design Selection and Basis

This section describes the basis for selection of an appropriate sample design and determination of the number of verification soil samples to collect. Verification samples will be applied only to the upper sidewalls of the 100-C-7:1 subsite excavation for this sample design. Upon completion of remedial activities, verification sampling of the remaining portions of the subsite will be addressed under a separate verification work instruction. The new chromium

contamination area in the western sidewall has been sampled thoroughly and will undergo further remediation; therefore, no samples will be collected from this area at the present time. Western sidewall will be sampled again, following additional remediation.

The decision rule for demonstrating compliance with the cleanup criteria requires comparison of the true population mean with the cleanup level, as estimated by the 95% upper confidence limit on the sample mean. Therefore, a statistical sampling design is the preferred verification sampling approach for this site because the distribution of potential residual soil contamination over the study area (site) is uncertain. The Washington State Department of Ecology (Ecology) publication *Guidance on Sampling and Data Analysis Methods* (Ecology 1995) recommends that systematic sampling with sample locations distributed over the entire study area be used.

Visual Sample Plan[1] (VSP) was used as a tool to develop the statistical sampling design for the verification sampling. A global positioning survey was used to determine the boundaries of the excavation area. A total of 13 soil samples will be collected from the upper excavation sidewall area on a random-start, triangular grid (Figure 3). A triangular grid was selected for this investigation based on studies that indicate triangular grids are superior to square grids (Gilbert 1987).

A sample design was prepared to conduct verification sampling at the 100-C-7:1 subsite upper excavation sidewalls. All samples will be analyzed for the contaminants of potential concern identified in Table 1. The soil sampling locations will be global positional surveyed and staked prior to sample collection using the coordinate pairs provided in Table 2. A discrete soil sample will be collected at each designated sample point (0 to 0.15 m [0 to 6 in.]) below the surface of the excavation sidewall and analyzed using the methods identified in Table 2. Full protocol laboratory analysis will be requested for all samples. Figure 3 shows verification sample locations for the 100-C-7:1 subsite.

[1] Visual Sample Plan is a site map-based user-interface program that may be downloaded at http://dqo.pnl.gov.

Figure 2. 100-C-7:1 Excavation Boundary (September, 2011).

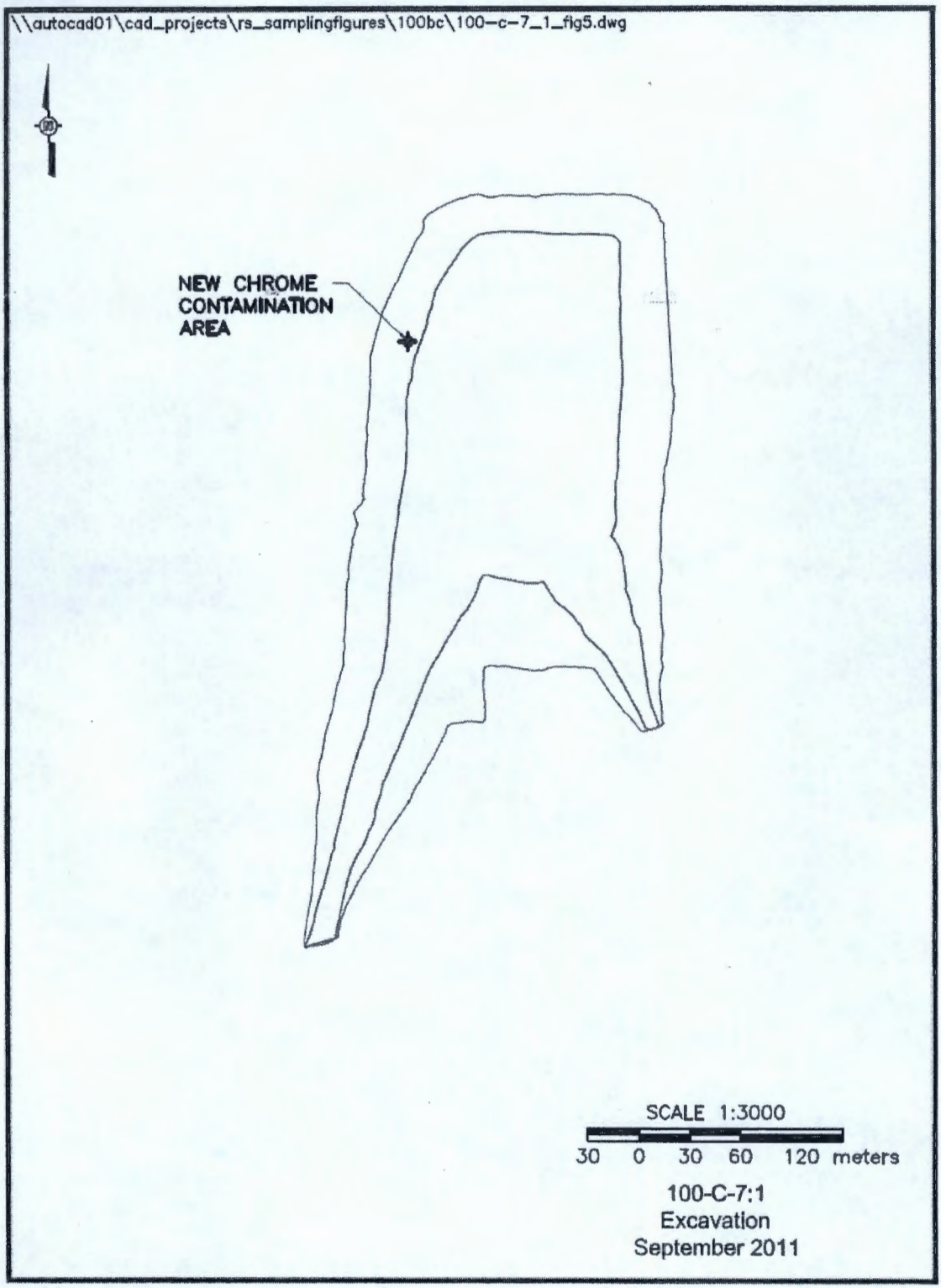

Figure 3. 100-C-7:1 Excavation Sidewalls, Verification Sample Locations.

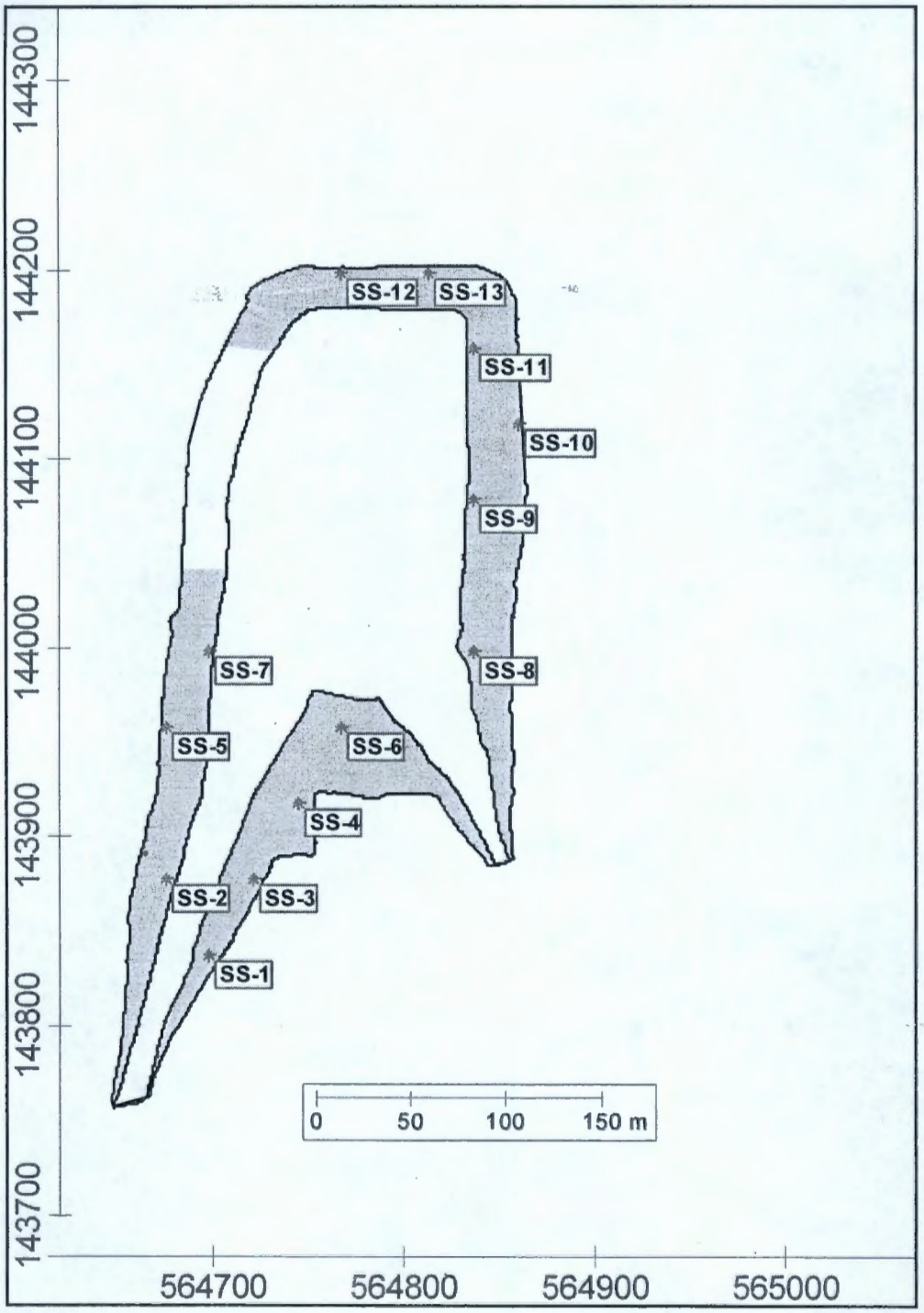

Table 2. 100-C-7:1 Excavation Sidewall - Verification Sampling Summary Table.

Sample Location	Sample Media	HEIS Sample Number	WSP Coordinate Locations		Sample Analysis
			Northing	Easting	
SS-1	Soil	TBD	143837.8	564697.5	ICP metals,[a] mercury, hexavalent chromium
SS-2	Soil	TBD	143877.8	564674.4	ICP metals,[a] mercury, hexavalent chromium
SS-3	Soil	TBD	143877.8	564720.7	ICP metals,[a] mercury, hexavalent chromium
SS-4	Soil	TBD	143917.9	564743.8	ICP metals,[a] mercury, hexavalent chromium
SS-5	Soil	TBD	143958.0	564674.4	ICP metals,[a] mercury, hexavalent chromium
SS-6	Soil	TBD	143958.0	564766.9	ICP metals,[a] mercury, hexavalent chromium
SS-7	Soil	TBD	143998.0	564697.5	ICP metals,[a] mercury, hexavalent chromium
SS-8	Soil	TBD	143998.0	564836.3	ICP metals,[a] mercury, hexavalent chromium
SS-9	Soil	TBD	144078.2	564836.3	ICP metals,[a] mercury, hexavalent chromium
SS-10	Soil	TBD	144118.2	564859.5	ICP metals,[a] mercury, hexavalent chromium
SS-11	Soil	TBD	144158.3	564836.3	ICP metals,[a] mercury, hexavalent chromium
SS-12	Soil	TBD	144198.4	564766.9	ICP metals,[a] mercury, hexavalent chromium
SS-13	Soil	TBD	144198.4	564813.2	ICP metals,[a] mercury, hexavalent chromium
Duplicate	Soil	TBD	TBD	TBD	ICP metals,[a] mercury, hexavalent chromium
Equipment blank	Silica sand	TBD	NA	NA	ICP metals,[a] mercury

[a] Analysis for the expanded list of ICP metals will be performed to include arsenic, antimony, barium, beryllium, boron, cadmium, chromium (total), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.

bgs = below ground surface
HEIS = Hanford Environmental Information System
ICP = inductively coupled plasma
NA = not applicable
TBD = to be determined
WSP = Washington State Plane

3.4 Verification Sample Collection – Quality Control/Quality Assurance

One equipment blank sample consisting of clean silica sand poured over sampling equipment will be collected and analyzed for ICP metals and mercury. One field duplicate sample will be collected at a location selected at the project analytical lead's discretion. The duplicate sample will be analyzed for the full suite of analytes using the same methods specified for the corresponding primary sample.

REFERENCES

DOE-RL, 2009, *Remedial Design Report/Remedial Action Work Plan for the 100 Area,* DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 1995, *Guidance on Sampling and Data Analysis Methods,* Publication No. 94-49, Washington State Department of Ecology, Olympia, Washington.

EPA, 1999, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington,* U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

Gilbert, R. O., 1987, *Statistical Methods for Environmental Pollution Monitoring,* Wiley & Sons, Inc., New York, New York.

Attachment 11

Tri-Party Agreement

Change Notice for Modifying Approved Documents/ Workplans
In Accordance with the Tri-Party Agreement Action Plan,
Section 9.0, *Documentation and Records*

Change Number		**Date:**
TPA-CN-481		10/12/2011
Document Number and Title: DOE/RL-2001-48, Rev.3, 300 Area Remedial Action Sampling and Analysis Plan		**Date Document Last Issued:** December 2010
Originator: M. French	**Phone:** 373-9863	

Description of Change: Pages 3-4 and 3-11 are being modified to change the sampling frequency for designation of "process soil" from every 100 – 200 yd^3 to an observational approach.

M. French (**DOE**) and L. Gadbois (**Lead Regulatory Agency**) agree that the proposed change modifies an approved workplan/document and will be processed in accordance with the Tri-Party Agreement Action Plan, Section 9.0, *Documentation and Records*, and not Chapter 12.0, *Changes to the Agreement.*

Note: Include affected page number

Justification and Impacts of Change:

Pages 3-4 and 3-11 are being modified to change the sampling frequency for designation of "process soil" from every 100 – 200 yd^3 to an observational approach. This change will greatly reduce sampling costs and yield more useful data. Waste designation sampling of process soil can be focused to areas suspected of needing additional characterization. See attached pages for specific changes. Shading indicates changes.

Approvals:

Mark S French DOE Project Manager	10/11/11 Date	X Approved	__ Disapproved	
Larry Gadbois Lead Regulatory Project Manager	Oct 12 '11 Date	X Approved	__ Disapproved	

Once all the above steps have been completed, the originator sends a copy of the signed change notice to the MSA TPAI organization (H7-28), the Administrative Record (H6-08) (refer to TPA Action Plan, Section 9.3), lead regulatory agency, affected Hanford contractor, DOE Project Manager, project/contractor Document Custodian, and others as appropriate. Maintain the original Change Notice per approved Records Management procedures.

Services representative. Because the locations are not specified, field decisions must be made based on available information. General locations of metallic debris, land disposal restricted waste (e.g., lead bricks), asbestos material, discolored soil, and/or anomalous waste that are characterized for waste designation will be noted so that biased sampling may be performed as a component of excavation guidance. Sampling frequencies are shown in Table 3-1 for the various WFMs that have been identified. Note that the WFMs 10 and 11 listed in Tables 1-4 and 3-1 apply only to the 618-10 Burial Ground remediation.

The specific analyses required for sampling an anomalous waste will be determined by the project on a case-by-case basis. The determination will be made using an anomaly characterization checklist.

Visual observations combined with historical data, process knowledge, and engineering calculations can result in a cost-effective and expeditious waste designation. The observational designation process is based on the assumption that the buried waste did not change after disposal. However, it is recognized that containers of liquids may have leaked, causing dangerous/hazardous materials to come into contact with buried solid wastes, or contaminated soils may have been disposed in the burial grounds. Consequently, field radiological surveys and chemical screening of the co-mingled soil is necessary during excavation as prescribed in Table 3-1.

After the waste sorting process is complete and anomalous waste forms are removed, the co-mingled soil will be referred to as "process soil." Process soil ~~will be~~ samples will be taken as determined by the Project Engineer or Waste Specialist to verify disposal profile parameters and to designate the waste.~~sampled for chemicals (metals) and radionuclides at a frequency of one composite laboratory sample per approximately 76 to 153 m^3 [100 to 200 yd^3].~~ Samples for metals screening will be delivered to a contract laboratory for metals analysis. Samples for radionuclide screening will be delivered to an onsite counting facility for analysis. An offsite, EPA-approved laboratory may be used for additional analysis if required. Soils outside of burial trenches proper are not considered to be "process soil".

Sampling with organic vapor analyzer (OVA) instrumentation will also be performed to detect organic vapors at sampling sites when soil samples are taken. Monitoring requirements for organic vapors using the OVA are specified by the health and safety plan in consideration of contaminants that are expected at the site. Samples for laboratory analysis are collected as needed to evaluate OVA measurements. If positive OVA results are obtained, a soil sample will be collected from the contaminated location for laboratory analysis or headspace analysis in a gas chromatograph.

In addition to the ~~frequency-based screening (in-~~process screening (as described above), visual observation of discoloration, leaking containers, hazardous solid materials (e.g., lead bricks), or other anomalous material in the dig face or process soil will be used to conduct field screening. The same techniques (OVA and metals screening) will be used for observational screening when determined necessary by the Project Engineer or Waste Specialist. In the absence of obvious

Table 3-1. Waste Characterization Sampling Design. (2 Pages)

WFM #	Media	Sample Collection Methodology	Key Features/ Sampling Frequency	Basis for Sampling Design
1	Demolition debris: concrete, structural steel, process equipment, piping, tools, miscellaneous hardware, nonasbestos-structural materials, Kraft paper, PPE, rags, and wood	Contingency lead paint sampling.	If sampling is required, collect one composite sample per paint color discovered.	Use historical data for previously characterized paint colors. If data do not exist, perform engineering matrix calculation or sample painted surfaces for heavy metals.
2	Visually recognized metallic wastes: uranium oxide metal, solid metallic oxides; machine shop metal cuttings, shavings, and filings	No sampling required unless external contamination observed.	Use historical data and process knowledge.	Well-known and previously designated waste forms.
3	Electrical components: control panels, wire, etc.	No sampling required unless external contamination observed.	Use historical data and process knowledge.	Well-known and previously designated waste forms.
4	Asbestos-containing materials: floor tiles, ceiling tiles, pipe lagging, cement asbestos board, and gaskets	No sampling is required.	Designate as asbestos without sampling.	Process knowledge/visual observation sufficient for waste designation.
5	Process soil[a]	Metals screen.	~~One sample per approx. 76 to 153 m^3 [100 to 200 yd^3]~~Determined by Project Engineer or Waste Specialist	~~Per regulatory (EPA) request.~~Observation based: to ensure conformance to waste disposal parameters (e.g., profile and waste designation)
6	Shielding, pipe caulking	No sampling required unless external contamination observed.	Use historical data and process knowledge.	Well-known and previously designated waste forms.
7	Waste lysimeters	No sampling required.	Use historical characterization data.	Waste lysimeters were characterized in (PNL-8955 1994).

Attachment 12

300 Area Closure Project Status
October 13, 2011
100/300 Area Combined Unit Manager Meeting

Ongoing Activities

- 324 – Finalizing short-list evaluation of 300-296 remediation options and technologies.
- 309 – Removed remainder of containment structure to grade, site to be turned over to Subcontractor for reactor removal preparations. Demolition initiated on south, west, and east wings.
- 308 – Completing final demolition preparations, completing above-grade demolition of 308-A.
- 340 – Completed demolition of 340-B Building. Completed majority of demolition of the 340 Building, with the exception of the control room.
- Completed above-grade demolition and initiated below-grade demolition of the 320 Building.
- Engineering evaluation of 300 Area "hot" piping in support of stabilization and remediation is ongoing.
- Initiated asbestos abatement of the 337-B CRCTA vessel, preparing for removal with crane.

Current Demolition Preparations & Activities

- Current "bump & roll" of HAMTC represented employees has resulted in suspension of most field work. Demolition will resume following new employee training.
- Finalize 308 demolition preparations.
- Continue preparations for 309 reactor core removal.
- Complete 320 building demolition.
- Continue above-grade demolition of all 340 Complex buildings.
- Continue with 337-B CRCTA vessel removal and asbestos abatement.
- Prepare and mobilize subcontractor for waste site remediation south of Apple St.

60-Day Project Look Ahead

- Continue evaluation/characterization of source-term beneath 324 Building, evaluation of remediation technique and technologies.
- Complete 308-A demolition, initiate demolition of 308. Finalize engineering for TRIGA reactor removal.
- Continue balance of 320 Building demolition, finalize preparations for 329 Building demolition.
- Resume 300 Area field remediation activities
- Resume and complete 327 below-grade demolition.
- Complete work at the 337 Complex, backfill and close area.

Attachment 13

Control Number:	TPA Agreement/Change Control Form	Date Submitted:
TPA-CN-469	___ Change _X_ Agreement ___ Information Operable Unit(s): 600 Area Removal Action	July 14, 2011 Date Approved:

Document Number/Title:	Date Document Last Issued:
Removal Action Work Plan for River Corridor General Decommissioning Activities, (DOE/RL-2010-34, Rev. 0)	May 2010
Originator: R. F. Guercia	**Phone:** (509) 376-5494

Summary Discussion:

Removal Action Work Plan for River Corridor General Decommissioning Activities (RAWP), DOE/RL-2010-34, Rev. 0, documents activities to be performed to achieve the non-time-critical removal action (NTCRA) for surplus facilities located in various areas within the scope of the River Corridor project on the Hanford Site. The removal process is achieved through the deactivation, decontamination, decommissioning, and demolition (D4) of surplus facilities. Both the RAWP and *Action Memorandum for General Hanford Site Decommissioning Activities*, DOE/RL-2010, Rev. 0, allow for inclusion of additional buildings provided they are sufficiently similar to buildings/structures already included in the NTCRA scope.

The MO-480 and MO-481 mobile office facilities added to the RAWP for *River Corridor General Decommissioning Activities*, based on potential for contamination. This facility was not included in Section 1.1, Table 1.1, of the RAWP. DOE finds that decommissioning and demolition of MO-480 and MO-481 is necessary. In accordance with section 1 of the *Action Memorandum for General Hanford Site Decommissioning Activities*, DOE/RL-2010-22, DOE has chosen, with regulator concurrence, to remove the MO-480 and MO-481 facilities. The MO-480 and MO-481facilities are sufficiently similar to other 100 and 300 Area buildings/structures already included in the River Corridor NTCRA scope and a reasonable basis exists to include it in the RAWP, Table 1-1, Building/Structure list.

Justification and Impact of Change:

Both the RAWP and *Action Memorandum for General Hanford Site Decommissioning Activities*, DOE/RL-2010, Rev. 0, allow for inclusion of additional buildings provided they are sufficiently similar to buildings/structures already included in the NTCRA scope. ~~The 183B~~ facility is sufficiently similar to buildings/structures already included in the River Corridor NTCRA scope and a reasonable basis exists to include it in the RAWP, Table 1-1, Building/Structure list.

RAWP, Section 1.1, Table 1-1., Building/Structure List and Location:

Add the following:

Building Number	Area	Approximate Waste Quantity (tons)
MO-480	600	15
MO-481	600	35

DOE Project Manager:	**Date:** 7/14/11
EPA Project Manager:	**Date:** 7/14/11
Ecology Project Manager:	**Date:** 7/14/11

Per Action Plan for Implementation of the Hanford Consent Order and Compliance Agreement Section 9.3

Attachment 14

Environmental Protection Mission Completion Project
October 13, 2011

Orphan Sites Evaluations

- The 100-F/IU-2/IU-6 Area – Segment 4 Orphan Sites Evaluation Report was transmitted to RL for review and subsequent submittal to EPA/Ecology for review on 7/20/11. Comments have been received from RL and EPA.
- The 100-F/IU-2/IU-6 Area – Segment 5 Orphan Sites Evaluation report will be transmitted to RL for review and subsequent transmittal to EPA in mid-October.

Long-Term Stewardship

- The consolidated Rev. 0, 100-F/IU-2/IU-6 - Segment 1 turnover and transition package was transmitted by MSA to RL on 9/29/11.
- The Rev. 0, 100-F/IU-2/IU-6 Segment 1 Interim Remedial Action Report was transmitted to RL on 5/24/11.

River Corridor Baseline Risk Assessment

- The Draft C Ecological Risk Assessment report (Volume I) has been issued for regulator and stakeholder review.

Remedial Investigation of Hanford Site Releases to the Columbia River

- The Draft A screening level ecological risk assessment is being processed by RL for distribution to the regulators for review.
- The Draft A human health risk assessment is being developed to reflect RL comments.

Document Review Look-Ahead

Document	Regulator Review Start	Duration
100-F/IU-2/IU-6 - Segment 5 Orphan Sites Evaluation Report	October 17, 2011	30 days
River Corridor Baseline Risk Assessment – Ecological Risk Assessment Report (DOE/RL-2007-21, Draft C, Volume I)	October 3, 2011	45 days
Columbia River Component Risk Assessment – Screening Level Ecological Risk Assessment Report (DOE/RL-2010-117, Draft A, Volume I)	October 17, 2011	45 days
Columbia River Component Risk Assessment – Baseline Human Health Risk Assessment Report (DOE/RL-2010-117, Volume II)	December 2011	45 days