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RPP-RPT-58339 DRAFT A

PHASE 2 RCRA FACILITY INVESTIGATION REPORT FOR WASTE MANAGEMENT C

SECTION 3 OF 5

No.	EPA Comment	Response	Status
		been potential sources, indicates these UPRs are not likely to be sources. Well 299-E27-4 is in the vicinity of UPR-200-E-82. To further assess potential vadose zone contribution to the Tc-99 present in groundwater at 299-E27-4, the site will be assessed using 3-D SGE, plus three long 2-D lines in 2011. Numerous direct push sampling holes around this UPR have been advanced; only one of those pushes resulted in a positive analysis for Tc-99, and that hole was an angle push directly beneath the UPR site (radiological concerns precluded a vertical push through the center of the UPR). The SGE survey is intended to assess the distribution of resistivity impacting features. (d) Investigation at sites H and I is intended to provide information in this vicinity. There is no indication of contamination at these locations with sampling completed thus far. Planning includes conducting SGE surveys in this area after retrievals are complete.	

MEETING NOTES
Waste Management Area C Work Plan Revisions

Meeting Date: March 24, 2011

Location: 1200 Jadwin, Richland

Purpose: Discuss the Status of the Waste Management Area (WMA C) RFI/CMS Investigation and Work Plan.

Attendees:

Heather Anastos (WRPS)	Rebecca Gerhart (EPA)
Mike Barnes (Ecology)	Bob Lober (ORP)
Marcel Bergeron (WRPS)	Dave Myers (WRPS)
Mike Connelly (WRPS)	Julie Robertson (WRPS)
Dwayne Crumpler (CEES)	Beth Rochette (Ecology)
Kathi Dunbar (WRPS)	Maria Skorska (WRPS)
Susan Eberlein (WRPS)	Harold Sydnor (WRPS)
Les Fort (WRPS)	

Background: These monthly meetings provide a forum for Ecology and ORP project managers and technical support personnel to review information generated by the WMA C RFI, and to determine whether changes to the characterization plans and/or the RFI/CMS work plan (RPP-PLAN-39114) are necessary. The meetings are also used as a forum to discuss comments and questions from EPA and Ecology about the WMA C RFI work scope. Meeting notes will be approved by the project managers and entered into the Administrative Record. If the parties agree that changes to the Work Plan are appropriate, the *Hanford Federal Facility Agreement and Consent Order* (TPA) change control process will be used to document Work Plan changes.

Discussion and New Topics:

- **Prior meeting notes**: The January 27, 2011 meeting notes were signed by the ORP Project manager and provided to the attending Ecology staff for Ecology Project Manager approval. The notes were signed by the Ecology Project Manager later on March 24, 2011.

- **Status of the Work Plan**:
  - WRPS noted that the following signed TPA Class 3 changes notices have been submitted to the Administrative Record:
    - TPA-CN-382, which revises Appendix B of RPP-PLAN-39114, *Sampling and Analysis Instructions for Small Mammal Sampling in WMA C* to provide corrections and clarifications
    - TPA-CN-422, revising RPP-PLAN-38777 to incorporate a cyanide detection limit.
  - Revisions of the WMA C RFI/CMS work plan and SAP to incorporate previously discussed changes are in progress.

- **Status of Ongoing Fieldwork**:
  - RPP-PLAN-39114, Rev 1A, Figure 6-1 identifies that in FY 11, four direct push locations will be completed. This commitment is expected to be completed by doing angle pushing at the following locations:
    - Location J (near Tank C-104)
    - Location A (near Tank C-101)
    - Location B (near Tank C-101)
    - Location C1 (near C-203).

The angle push at Site J (C-104) is in progress. WRPS hopes to complete drilling and decommission next week. The work package for the direct push at Site A (C-101) is ready to work. The work package for direct push at Site B (C-101) is in preparation. Work at Site C1 will occur later in the fiscal year.

- Analysis of the 3-D surface geophysical exploration (SGE) data set from Site Q (UPR-82/cesium pile) is in progress. Field work to conduct 2-D SGE at UPR-82 is on hold pending assignment of craft support.
- Additional spectral gamma logging of dry wells is on hold pending resolution of access issues.
- Live trapping of mice was initiated on March 8, 2011. Approximately 145 g of sample mass is needed from each of the three transects for the required analyses. Approximately 215 g additional sample mass is needed to complete the sampling effort (e.g., for duplicates). Due to the abundance of mice in Transect A, the additional mass will be taken from Transect A. As of March 24, 2011, a little under 2/3 the total required mass has been collected from Transect A, and approximately half the required mass has been collected from Transect B. No mice have been collected from the third transect, the C Farm perimeter. WRPS expressed a concern that there may be insufficient sample mass available from the C Farm perimeter to complete the required analytical work, but that efforts would continue for the time being.

- **Data Status:**
  - The laboratory has completed the initial release of all the 2010 data reports. The 2010 data is progressing through the data validation and verification process. Approximately 50% of the 2010 data has been loaded into HEIS.
  - A review of available Tc-99 data has indicated anomalous results; Tc-99 values from acid extract procedures are being reported at levels higher than Tc-99 values from water extract procedures. Reanalysis using ICP-MS and radiochemistry indicates the presence of interferences, resulting in the reporting of false positives for low levels of Tc-99 using ICP-MS. Zn, Co, and Ru are showing up as Tc-99. Laboratory modifications have been made, but there is still a potential for generation of false positives. Future positive results will be flagged for additional analysis. Data generated to date are being reviewed to evaluate possible impacts.
  - At the February 25, 2011 WMA C work plan status meeting, Ecology reported a delay in issuance of the 222-S Laboratory letter of accreditation. The letter of accreditation has now been issued.
  - The meeting attendees discussed concerns about possible future work load increases at the 222-S Laboratory and ramifications for the WMA C investigation. Ecology noted that the TPA requires Ecology review of the quality assurance plan of any new laboratory used for such purpose.

- **New Topics**: WRPS expressed a desire to present characterization data at the next WMA C Performance Assessment (PA) workshop. The presentation would include a description of the monthly internal data review process. Ecology concurred that provision of this information to the PA group would be beneficial.

Topic for Next Meeting: The attendees agreed to add to the April meeting agenda a discussion regarding the C-200s leak assessment as a lead in to discussion regarding whether to proceed with direct push holes at the C-200s.

Actions:

- **See attached table**. A date-based numbering system is being used as an aid in tracking the topics to completion. Topics/actions will be removed from the list after ORP and Ecology have agreed to their completion.

- **Discussion of Item No. 10-23-10-1**: The attendees discussed performance to date in meeting required analytical detection limits (DL). The DL issues for all analytes except selenium have been resolved. For Tc-99 and gamma energy analysis (GEA), required DLs are being met, but not target DLs.

The attendees agreed that failure to meet the T-99 and GEA target DLs reliably does not necessitate a work plan change. For selenium, the required DL is 0.03 mg/kg, and the target DL is 1.0 mg/kg. The laboratory is able to meet a DL of 0.1 to 0.2 mg/kg, which is well below the target DL but above the required DL. WRPS noted that the lowest concentration for protection of terrestrial life is 0.3 mg/kg, and the lab LD is below that level. The attendees agreed that it would be appropriate to modify the WMA C SAP and WP to show a required DL of 0.3 mg/kg. The attendees agreed that a DL of 0.3 mg/kg will provide data that is adequate for decision-making purposes.

Robert Lober		4/28/2011
DOE Project Manager (print)	DOE Project Manager (signature)	Date
Jeffery J. Lyon		4/28/2011
Ecology Project Manager (print)	Ecology Project Manager (signature)	Date

Discussion and Actions

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
08-11-10-3	Conceptual model for spare inlet overflow – important for C-105	Impact and locations of potential overfill spills should be evaluated near C-101, -105, and -110 and text included in WP.	L. Fort	Include info in next WP revision	In process.
08-11-10-5	Organic issue and status what has been agreed to on the 5 locations for organics… any TIC data?	(1) Provide Ecology with detailed status of organic results to support evaluation of need to continue sampling. Modify WP as appropriate. (2) Provide EPA with copy of Ecology authorization dated 02/11/2011.	A. Templeton, M. Connelly, H. Anastos; M. Barnes	Update WP and SAP to reflect revision of analyte list.	Work plan & SAP modification in process. VOC results were presented at 10/27/2010 meeting, along with recommendations. Additional results were provided in Feb 2011, and on 02/11/2011, Ecology provided authorization by email to optimize sampling by discontinuing sampling for VOCs, ethylene glycol, mono and di butyl phosphate, PCB congeners, and gas and diesel range organics. The reduction will result in additional sample material being available for improved analysis of the remaining analytes. ORP issued a letter documenting recommendations and requesting a response on 03/ 23/2011.
08-11-10-8	C-200s proposal for SGE and logging E27-7…	Proposal is to place several deep electrode strings/do SGE near C-200 tanks, in later FY11. Not currently in budget. Separate from this effort, updates are required to WP text regarding specific wells to be logged.	H. Sydnor/ D. Myers (define scope); B. Lober/ S. Eberlein (obtain budget); J Field (redlines on logging)	Include info in next WP revision regarding known in-scope changes to logging efforts.	(1) Redlines on known scope changes already added to the baseline will be incorporated into next revision. (2) Carry additional characterization proposal for consideration.
08-11-10-9	What is planned for E27-23	There is a well on SW side of C Farm near transfer line. Need to investigate a Tc-99 increase. Need follow-up discussion on scope of investigation.	D. Myers, G. Thomas, M. Barnes	Possible future WP change	Archive samples from drilling of E27-20 are available for investigation. Carry additional characterization proposal for consideration.
08-11-10-11	Status of availability of C-111 push (Site V)	Revise WP to change designation of Access Availability in tables from "good" to "constrained by retrieval operations." Similarly update other access information to reflect current state.	J. Robertson	Include info in next WP revision.	In process.
08-11-10-Q4	Do you want to update the analyte list based on changes to RPP-23403, Rev. 4 (sulfide)?	SST DQO has been modified to remove sulfide. Need to evaluate removal of sulfide from C Farm DQO and if appropriate revise analytes in WP.	M. Connelly, H. Anastos	Update WP and SAP to reflect revision of analyte list.	Work plan & SAP modification in process. On 02/11/2011, Ecology provided authorization by email to optimize sampling by discontinuing sampling for sulfide. The reduction

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Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
					will result in additional sample material being available for improved analysis of the remaining analytes. ORP issued a letter on 03/23/2011 documenting recommendations and requesting a response.
10-23-10-1	Detection limits	Evaluate whether detection limits identified in WP are appropriate.	D. Crumpler, H. Anastos	Revise Se RDL to 0.3 mg/kg in WP and SAP.	In process. (See discussion in Meeting Notes under "Actions.")
01-27-11-3	Cs at C-105	Evaluate installation of a temperature probe in dry wells near C-105 to gain information about the volume of releases from C-105 and the amount of Cs released.	S. Eberlein	None at this time.	Carry additional characterization proposal for consideration. Develop ROM cost estimate.
01-27-11-4	Resolution of EPA comments on RFI/CMS work plan	See Attachment A.	See Attachment A.	See Attachment A.	See Attachment A.
02-25-11-1	Groundwater sampling stop work order impact on required tank-related monitoring requirements.	Work with CHPRC to develop an understanding of the CHPRC priorities for recovery from the stop work related to Grundfos pump electrical issues, to determine impacts on tank-related groundwater monitoring requirements.	D. Myers	None.	CLOSED. CHPRC gave sampling C farm wells high priority. All but one well was sampled; the unsampled well had access blocked as the retrieval control trailer was being placed.
02-25-11-2	Possible WSCF lab accreditation letter delay	Notify appropriate personnel at RL and CHPRC about the potential that Ecology issuance of the WSCF lab accreditation letter may be delayed, to encourage advance planning to minimize delays to the degree possible.	V. Rohay	None.	CLOSED. The WSCF QA Officer was contacted about accreditation concerns. WSCF accreditation expires at the end of April 2011. WSCF is submitting their application early.
02-25-11-3	HAB summary of January 2011 PA Workshop	(1) Check with HAB Tank Waste Subcommittee Chair to obtain clarification regarding whether the distributed notes express an individual's opinion or are accurate and reflective of a HAB position, (2) Develop a plan for sharing characterization information directly with the HAB, (3) Develop a process for communicating directly with Tribes.	B. Lober	None.	CLOSED. (1) Clarifications were provided to HAB lead, and feedback was obtained regarding where the notes were distributed within the HAB (2) & (3) RFI process discussion provides for updates with stakeholders and Tribes. Multiple Tribes have also been contacted to arrange meetings for presentation of, and to obtain feedback on, WMA C leak loss report.
02-25-11-4	RFI report development	Develop clear process expectations for the RFI report to help the agencies plan support efforts. Establish opportunity for routine discussion of RFI development	M. Skorska	None.	CLOSED. ORP, Ecology, and EPA have initiated routine (monthly) meetings to discuss the RFI development effort to ensure

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Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
		effort.			the parties are working toward a common goal. Both RFI document development and technical information (e.g., information on HGA) will be presented as appropriate at these meetings.

ATTACHMENT A
EPA Comments on the Work Plan

Background:

- In December 2010, EPA provided comments on the WMA C RFI/CMS work plan. The table below details the comments and discussion relevant to the EPA concerns. Actions were identified as necessary to track closure of these comments.
- In addition to the comments below, the meeting participants discussed the path forward for pipeline remediation/corrective action. **ACTION**: Ecology took an action to provide EPA with a copy of the document RPP-PLAN-47559, which evaluates some of the possible measures that could be implemented for pipelines.

No.	EPA Comment	Response	Status
4	Section 3.4.1, page 3-30. Please remove the section on EPA anticipated Central Plateau exposure scenarios as we have had no discussion with DOE on exposure scenarios in regard to this document.	EPA will provide replacement text for discussion and incorporation.	**ACTION**: EPA will provide suggested replacement text. On 03/24/2011, WRPS proposed replacement text. On 03/28/2011, EPA accepted the proposed text. Text will be incorporated into next WP revision.
6	Figure 3-7, p 3-15 Needs compass.	Acknowledged.	**ACTION**: Compass will be added to figure, assuming the addition does not present a document clearance and public release issue.
7	To date, what percent of the work described in this workplan has been completed?	It was estimated that roughly 40% to 50% of the work has been completed.	No text change required. **ACTION**: A summary table will be developed as an aid to communicate the status of the investigation.
8	Is the Phase II RFI/CMS Report for WMA C still due to Ecology on 12/31/2010? Will this be available to EPA?	Under revised TPA milestone M-45-61, the Phase 2 RFI/CMS report for WMA C is now due to Ecology for review and approval as an Agreement primary document on 12/31/2014. However, baseline planning calls for earlier submittal. The document will be available to EPA.	**ACTION**: The next revision of the work plan will reflect the revised TPA milestone date for M-45-61.
11	Do holes from direct push investigations lead to preferential flow paths in the future? How many years ago were the first direct push investigations done in WMA C and have they led to channeled infiltration?	Boreholes from direct push investigations do not create preferential flow paths. Boreholes are decommissioned per requirements of Washington Administrative Code (WAC) 173-160. Any exceptions must be reviewed and approved by Ecology as a part of a variance filing process. Direct push investigations at WMA C were initiated in July 2005.	No text change required. **ACTION**: Ecology (Caggiano) will provide EPA with information on borehole decommissioning requirements. WRPS (Robertson) to verify information has been provided.
13	As sampling efforts may have evolved through the execution of this workplan, these are a few specific spots I had questions about: (a) Two valve boxes, located on the south side of	(a) The valve boxes were not identified as a location to investigate during the DQO process: therefore, no samples are planned at C-111 and C-112.	No text change required at this time. **GENERAL ACTION**: Carry additional characterization proposals for consideration.

	C-111 and C-112, are known to have drained directly to soil. Samples taken here? (b) Section 3.2.1, p. 3-6 (d) Anomalous resistivity zone centered around C-104 and a smaller zone around C-108 and C-109. Confirmation sampling done here? (c) Section 3.2.2, p. 3-11 and 3-12 describes Tc^{99} concentration that have "generally increased" since the late 1990s and are currently in excess of 2000pCi/L, which "suggests a tank waste source near monitoring well 299-E27-4". Adequate sampling in this area? (d) Section 4.3.2, p. 4-8 (c) Site 200-E-115 Are there plans to use SGE in this area?	(b) Reanalysis of well-to-well resistivity data, implementing recent advancements in analytical capabilities, indicates that the anomaly around C-108 and C-109 was an artifact of having to parse the data to perform the original analysis. The reanalysis also indicated that the anomaly in the vicinity of C-104 is more closely focused on the region near the spare inlet ports on C-101. Direct push investigation at Sites J and K is intended to provide additional information about the anomalies. (c) The planned investigative work is believed adequate to address the Tc-99 issue. Work at UPR 81 and 86, which were believed to have been potential sources, indicates these UPRs are not likely to be sources. Well 299-E27-4 is in the vicinity of UPR-200-E-82. To further assess potential vadose zone contribution to the Tc-99 present in groundwater at 299-E27-4, the site will be assessed using 3-D SGE, plus three long 2-D lines in 2011. Numerous direct push sampling holes around this UPR have been advanced; only one of those pushes resulted in a positive analysis for Tc-99, and that hole was an angle push directly beneath the UPR site (radiological concerns precluded a vertical push through the center of the UPR). The SGE survey is intended to assess the distribution of resistivity impacting features. (d) Yes. Investigation at sites H and I is intended to provide information in this vicinity. There is no indication of contamination at these locations with sampling completed thus far. Planning includes conducting SGE surveys in this area after retrievals are complete.	(b) Evaluate further when results of reanalysis of SGE data are available. (c) The draft 2010 groundwater monitoring report contains information that could be relevant to an evaluation of the need for further Tc-99 investigation. The final report should be released in summer 2011.

MEETING NOTES
Waste Management Area C Work Plan Revisions

Meeting Date: April 28, 2011

Location: 1200 Jadwin, Richland

Purpose: Discuss the Status of the Waste Management Area (WMA C) RFI/CMS Investigation and Work Plan.

Attendees:

Heather Anastos (WRPS)	Bob Lober (ORP)
Mike Barnes (Ecology)	Dave Myers (WRPS)
Marcel Bergeron (WRPS)	Julie Robertson (WRPS)
Mike Connelly (WRPS)	Harold Sydnor (WRPS)
Kathi Dunbar (WRPS)	Andrew Templeton (WRPS)

Background: These monthly meetings provide a forum for Ecology and ORP project managers and technical support personnel to review information generated by the WMA C RCRA facility investigation, and to determine whether changes to the characterization plans and/or the RFI/CMS work plan (RPP-PLAN-39114) are necessary. Comments and questions from EPA and Ecology about the WMA C RFI work scope are also discussed at the meetings. Meeting notes will be approved by the Ecology and ORP project managers and entered into the Administrative Record. If the parties agree that changes to the Work Plan are appropriate, the *Hanford Federal Facility Agreement and Consent Order* (TPA) change control process will be used to document Work Plan changes.

Discussion and New Topics:

- **Prior meeting notes**: The February 25 and March 24, 2011 meeting notes were signed by the ORP Project Manager and provided to the attending Ecology staff for Ecology Project Manager approval later. The minutes were subsequently signed by the Ecology Project Manager on April 28, 2011.

- **Status of the Work Plan**:
  - Revisions of the WMA C RFI/CMS work plan and SAP to incorporate previously discussed changes are in progress.
  - Appendix B of RPP-PLAN-39114, *Sampling and Analysis Instructions for Small Mammal Sampling in WMA C*, requires use of analytical Method 6010 (ICP-AES) for chromium analysis. The laboratory has identified that it cannot meet the target detection limit identified in RPP-PLAN-39114 using Method 6010 but can meet the limit using Method 200.8 (ICP-MS). H. Anastos took an action to email B. Rochette of Ecology to explain the issue and request approval to use Method 200.8 for chromium.

- **Status of Ongoing Fieldwork**:
  - RPP-PLAN-39114, Rev 1A, Figure 6-1 identifies that in FY 11, four direct push locations will be completed. This commitment is expected to be completed by doing angle pushing at the following locations:
    - Location J (near Tank C-104)
    - Location A (near Tank C-101)
    - Location B (near Tank C-101)
    - Location C1 (near C-203).

The angle push at Site J (C-104) is complete, and the borehole has been decommissioned. At Site A (C-101), approximately 32 feet of angled pipe have been pushed. Work at direct push Site B (C-101) will begin upon rig mobilization. Work at Site C1 will occur later in the fiscal year.

- Surface geophysical exploration (SGE) data collection at Site Q (UPR-82/cesium pile) is complete. The data set is being analyzed. A report summarizing the results of a reanalysis of 2006 C Farm data is nearing completion and release. The reanalysis appears to indicate an area of high conductivity vertically beneath Tank C-101.
- Live trapping of mice was concluded on April 14, 2011, after 6 weeks of trapping. Approximately 145 g of sample mass was needed from each of the three transects for the required analyses. Approximately 215 g additional grams of sample mass was needed to complete the sampling effort (e.g., for duplicates). As of April 14, 2011, all required sample mass, including the additional to support QC work, was collected from Transect A. At Transect B, approximately 65 grams was collected. At Transect C, approximately 12 grams was collected. On April 18, 2011, ORP, Ecology, and WRPS met to discuss the lack of suitable habitat and evidence of mouse activity in the transects. The parties concluded that continued trapping was unlikely to yield the required sample mass in a reasonable period of time, and they agreed that trapping should be discontinued. The parties also agreed on a prioritization of analyses to be conducted for sample mass in each transect. An email documenting these agreements is included as Attachment A.

  The collected sample mass is at the laboratory for digestion and preparation for analysis. Prepared samples are being held 7 days to address analytical laboratory concerns regarding hantavirus. Ecology asked if any radiological concerns had been noted about the samples, and WRPS responded that no elevated radiological readings had been identified in field surveys.

- **Data Status:**
  - **Summary of 2009/2010 data:** All 2009 and 2010 WMA C vadose zone data has been loaded into HEIS. WRPS provided a high-level summary, in tabular format, showing the numbers of locations that have been sampled and samples that have been analyzed for various categories of constituents. The summary highlighted the large amount of work that has been accomplished to date. The discussion focused on how this information might best be presented at the May 2011 WMA C Performance Assessment meeting. ORP expressed concern that the table listed numbers of analyses that detected various constituents without listing the numbers of analyses that exceeded regulated levels of constituents, thus providing no context for the significance of the data. WRPS will take the concern into account as presentations are prepared for the Performance Assessment session.
  - **Pesticide Data:** Previous discussions have indicated that pesticides were detected in WMA C vadose zone samples. Closer review of the data identified that while there were 16 positive detects for pesticides (14 for B-BHC; 1 for Gamma-BHC; 1 for Aldrin), 15 of those results (all except Aldrin) were associated with results from one laboratory. Those 15 results had significant data quality issues, including inadequate QC, failed QC, and analysis significantly outside of holding times. The data quality issues were significant enough that WRPS ceased using the laboratory to support WMA C closure immediately upon discovering the issues. There were data quality issues with the pesticide results that resulted in validation qualifiers for "estimated data"; however, based on the overall data quality issues and the fact that these compounds have not been identified in any subsequent sampling, these results are now considered highly suspect. One pesticide result (performed by a different lab) for Aldrin at C7672 at a depth of 10 ft to 12 ft is likely a true detect at 2 µg/kg. WRPS took an action to contact the Office of Sample Management (SMO) to advise them of the pesticide data quality issues, to flag the need for an evaluation of whether there are broader implications across the Site.
  - **C-104 Quick Turn Data:** Analysis of the quick turn analytical results from recent sampling at Location J (C-104) indicates there are low level positive detects for Tc-99 (on the order of 1 pCi/g) at depth. A report has been prepared to document the analytical results, but the report is being revised to address inaccuracies.

- **Tc-99 Interference update:** Testing by the laboratory indicates that their ICP/MS method adjustments have resolved the issues with false positives for Tc-99. However, WRPS is requesting confirmation testing by radiochemistry to verify positive results and supplement the laboratory testing.

- **Illustrating Progress**: On behalf of ORP, WRPS provided two tables detailing the field investigation actions described in the WMA C RFI/CMS work plan and a status of progress made toward completing the actions. It was evident that while considerable work has already been accomplished, a significant portion remains to be completed. The meeting attendees discussed the need to evaluate work that remains against the planned out-year budget and recent additional characterization proposals that have arisen as data was evaluated. WRPS will begin a more in depth evaluation of additional characterization activities that have been proposed. Ecology asked ORP/WRPS to add drilling a borehole near C-105 to address Cs concerns to the list of additional characterization proposals. (This action is captured under previously created action 01-27-11-3.)

- **New Topics**:

  - **Ecology Accreditation Audit at 222-S:** Ecology summarized the results of their recent accreditation audit at the 222-S laboratory. Ecology noted this was not a compliance audit, although matters related to waste management appeared to be well managed. Overall, the outcome was positive. Ecology related that some procedural issues were noted during the audit. Ecology also expressed a concern about potential near-term lay-offs at the lab and the continued ability of the lab to support tank farm vadose zone investigations with reduced staff.
  - **Ecology Response to Organics Optimization Letter:** On March 23, ORP sent Ecology a letter formally requesting authorization to discontinue analyses for certain constituents in WMA C soil samples. See Action 08-11-10-5. Ecology reported that their response is in review and that authorization will be granted. Ecology noted that the draft response includes a request that ORP continue to optimize WMA C analytical work and data reporting.

Actions:

- **Refer to the following table.** A date-based numbering system is being used to track the actions to completion. Actions will be removed from the list after ORP and Ecology have agreed to their completion.

Robert Lober		5/26/2011
DOE Project Manager (print)	DOE Project Manager (signature)	Date
Jeffery J Lyon		5/26/2011
Ecology Project Manager (print)	Ecology Project Manager (signature)	Date

Discussion and Actions

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
08-11-10-3	Conceptual model for spare inlet overflow – important for C-105	Impact and locations of potential overfill spills should be evaluated near C-101, -105, and -110 and text included in WP.	L. Fort	Include info in next WP revision	In process.
08-11-10-5	Organic issue and status what has been agreed to on the 5 locations for organics… any TIC data?	(1) Provide Ecology with detailed status of organic results to support evaluation of need to continue sampling. Modify WP as appropriate. (2) Provide EPA with copy of Ecology authorization dated 02/11/2011.	A. Templeton, M. Connelly, H. Anastos; M. Barnes	Update WP and SAP to reflect revision of analyte list.	Work plan & SAP modification in process. VOC results were presented at 10/27/2010 meeting, along with recommendations. Additional results were provided in Feb 2011, and on 02/11/2011, Ecology provided authorization by email to optimize sampling by discontinuing sampling for VOC, ethylene glycol, mono and di butyl phosphate, PCB congeners, and gas and diesel range organics. The reduction will result in additional sample material being available for improved analysis of the remaining analytes. ORP issued a letter documenting recommendations and requesting a response on 03/ 23/2011.
08-11-10-8	C-200s proposal for SGE and logging E27-7…	Proposal is to place several deep electrode strings/do SGE near C-200 tanks, in later FY11. Not currently in budget. Separate from this effort, updates are required to WP text regarding specific wells to be logged.	H. Sydnor/ D. Myers (define scope); B. Lober/ S. Eberlein (obtain budget); J Field (redlines on logging)	Include info in next WP revision regarding known in-scope changes to logging efforts.	(1) Redlines on known scope changes already added to the baseline will be incorporated into next revision. (2) Carry additional characterization proposal for consideration.
08-11-10-9	What is planned for E27-23	There is a well on SW side of C Farm near transfer line. Need to investigate a Tc-99 increase. Need follow-up discussion on scope of investigation.	D. Myers, G. Thomas, M. Barnes	Possible future WP change	Archive samples from drilling of E27-20 are available for investigation. Carry additional characterization proposal for consideration.
08-11-10-11	Status of availability of C-111 push (Site V)	Revise WP to change designation of Access Availability in tables from "good" to "constrained by retrieval operations." Similarly update other access information to reflect current state.	J. Robertson	Include info in next WP revision.	In process.

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Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
08-11-10-Q4	Do you want to update the analyte list based on changes to RPP-23403, Rev. 4 (sulfide)?	SST DQO has been modified to remove sulfide. Need to evaluate removal of sulfide from C Farm DQO and if appropriate revise analytes in WP.	M. Connelly, H. Anastos	Update WP and SAP to reflect revision of analyte list.	Work plan & SAP modification in process. On 02/11/2011, Ecology provided authorization by email to optimize sampling by discontinuing sampling for sulfide. The reduction will result in additional sample material being available for improved analysis of the remaining analytes. ORP issued a letter on 03/23/2011 documenting recommendations and requesting a response.
10-23-10-1	Detection limits	Evaluate whether detection limits identified in WP are appropriate.	D. Crumpler, H. Anastos	Revise Se RDL to 0.3 mg/kg in WP and SAP.	In process. (See discussion in Meeting Notes under "Actions.")
01-27-11-3	Cs at C-105	Evaluate options for additional investigation (e.g., installation of a temperature probes in dry wells or drilling new borehole near C-105) to gain information about the volume of releases from C-105 and the amount of Cs released.	S. Eberlein	None at this time.	Carry additional characterization proposal for consideration. Develop ROM cost estimate.
01-27-11-4	Resolution of EPA comments on RFI/CMS work plan	See Attachment B.	See Attachment B.	See Attachment B.	See Attachment B.
04-28-11-1	Method to be used for Cr analysis in bio samples	Email B. Rochette of Ecology to explain the issue and request use of Method 200.8 instead of 6010.	H. Anastos	If approved, update WP App B to reflect method change	<New action.>
04-28-11-2	Poor quality data from a lab that performed pesticide analyses	Contact Office of Sample Management (SMO) to advise them of WMA C pesticide data quality issues, to flag the need for evaluation of possible broader implications across the Site.	H. Anastos	No change required.	<New action.>

ATTACHMENT A

Meeting Notes from April 14, 2011

ORP-Ecology Meeting Regarding Discontinuing

WMA C Small Mammal Sampling

(3 pages, including cover sheet)

Robertson, Julie R

From: Rochette, Beth (ECY) [Broc461@ecy.wa.gov]
Sent: Tuesday, April 19, 2011 10:55 AM
To: Robertson, Julie R
Cc: Connelly, Michael; Delistraty, Damon; brett@easbio.com; Wilde, Justin W; Yokel, Jerel W; Eberlein, Susan J; Lober, Robert W
Subject: RE: Notes for 04/14/2011 Meeting on WMA Small Mammal Sampling

Julie,
I have made one minor edit below (see Meeting Summary) – I am correcting something that I said.
Otherwise, this looks good.
Thanks.

Beth

From: Robertson, Julie R [mailto:Julie_R_Robertson@RL.gov]
Sent: Monday, April 18, 2011 3:28 PM
To: Rochette, Beth (ECY)
Cc: Connelly, Michael; Delistraty, Damon A. (ECY); 'brett@easbio.com'; Wilde, Justin W; Yokel, Jerry (ECY); Eberlein, Susan J; Lober, Robert W
Subject: Notes for 04/14/2011 Meeting on WMA Small Mammal Sampling

Hi, Beth. This email documents the outcome of a meeting between Ecology and WRPS representatives last Thursday morning. If you agree with the write up provided below, please reply to that effect by email. We will then document this agreement in the notes for the upcoming monthly meeting on the WMA C work plan and investigation, which are placed in the Administrative Record after approval by the project managers.

Thank you.

Julie Robertson
Tank Closure and Corrective Measures
Washington River Protection Solutions
Contractor to the United States Department of Energy
(509)376-8162

Meeting Date/Location: April 14, 2011; Ecology Office Room 3A
Meeting Purpose: Discuss Status of Small Mammal Sampling Efforts in WMA C to Determine Whether Continued Sampling Is Necessary
Attendees: Mike Connelly (WRPS), Damon Delistraty (Ecology), Julie Robertson (WRPS), Beth Rochette (Ecology), Brett Tiller (EAS), Justin Wilde (MSA), Les Williams (Integral Consulting), Jerry Yokel (Ecology)

Background Information: Small mammal sampling at WMA C is being performed in accordance with Appendix B of RPP-PLAN-39114, "Phase 2 Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C." Field sampling activities began on March 7; thus, 6 weeks of field trapping have been conducted. Traps are laid out in three transects. Transects A and B are located a short distance from C Tank Farm and, generally speaking, are populated by sagebrush and rabbitbrush. Transect C comprises a line of traps at or very near the C Tank Farm fence line, where there is considerable human activity and no vegetation. At the end of 6 weeks of trapping, a sufficient mass of mice has been collected at Transect A to conduct all required analyses, including matrix spike/matrix spike duplicate (MS/MSD) samples. Traps have now been removed from Transect A. At Transect B, approximately 65 grams of mass have been collected of the approximately 146 grams required to run required analyses. No mice have been caught at Transect B in the past week. Unlike Transect A, there is a notable lack of burrowing activity in Transect B, which indicates a lack of

abundant mouse activity in the transect. At Transect C, only one mouse weighing approximately 12 grams has been collected of the approximately 146 grams required to run required analyses. The single specimen caught and retained at Transect C was actually captured and released twice before during trapping period, before a decision was made to retain that specimen. There have been no indications of other mice in Transect C. WRPS requested that a meeting be called to discuss the value of continued sampling in Transects B and C, and if a decision is made to cease sampling, to discuss analytical priorities for the sample mass retained to date.

Meeting Summary: WRPS kicked off the meeting by providing the background information stated above as well as photographs of the three transects to illustrate the quality of the habitat in each transect. After discussing the quality of the habitats and the likelihood of trapping additional mice in Transects B and C, the attendees concluded that due to the lack of habitat and exposure for small mammals (especially for Transect C), that further trapping activities would be unlikely to yield sufficient sample mass to conduct all required analyses within a reasonable period of time. Therefore, trapping in all transects should be discontinued. The attendees then began discussing prioritization of the analyses, focusing on the sample mass required to conduct the various analyses, soil sample analytical results obtained to date for WMA C, and the likelihood that various analytes would contribute to risk associated with WMA C. The attendees made note of past findings associated with Central Plateau ecological studies, such as the presence of PCBs in biota relatively near Transect A, and the relative lack of ~~risk~~ effects associated with the presence of radionuclides in biota near B/C Cribs. Based on this discussion, the attendees agreed that priority should be given to PCB and pesticide analyses, while analysis for radionuclides would be lower priority. WRPS representatives estimated that approximately 10 grams of sample mass would be required to conduct pesticide analyses, and that a similarly small mass would be required to conduct metals analyses.

Action: WRPS took an action to verify the quantity of sample mass the laboratory will require to conduct pesticide and metals analyses separate from other analyses and will reopen the discussion with Ecology if insufficient mass is available to support analytical work prioritized by the meeting attendees.

Agreements: Two agreements were reached during the meeting. First, the attendees agreed that trapping in all transects should be discontinued. Second, the attendees agreed that conducting the following analytical work would best meet the goals of the sampling and analysis plan described in RPP-PLAN-39114:

- Transect A: Conduct all required transect-specific analyses, including PCB congeners. Use additional mass available to conduct MS/MSD analyses.
- Transect B: Conduct all required transect-specific analyses, including PCB congeners, but excluding radionuclides (except for the rad screen required for shipping).
- Transect C: Based on results of WMA C soil analyses, conduct analysis for pesticides only, and perform rad screen required for shipping. If insufficient sample mass is available for pesticide analysis, instead conduct analysis for metals (whole carcass as well as liver/kidney composites).

Resolution of Action: After the meeting concluded, WRPS confirmed that the pesticide analysis can be performed separate from other organics analyses using 10 grams of sample mass. Therefore, the material from Transect C will be analyzed for pesticides only (with rad screen completed to support shipping). WRPS also confirmed that performance of the mammal carcass metals analysis can be completed with 10 grams of sample mass, which will allow for analysis of Transect B material as indicated above.

ATTACHMENT B

EPA Comments on the WMA C Work Plan

(3 pages, including cover sheet)

Background:

- In December 2010, EPA provided comments on the WMA C RFI/CMS work plan. The table below details the comments and discussion relevant to the EPA concerns. Actions were identified as necessary to track closure of these comments.
- In addition to the comments below, the meeting participants discussed the path forward for pipeline remediation/corrective action. **ACTION**: Ecology took an action to provide EPA with a copy of the document RPP-PLAN-47559, which evaluates some of the possible measures that could be implemented for pipelines. (**CLOSED**.)

No.	EPA Comment	Response	Status
4	Section 3.4.1, page 3-30. Please remove the section on EPA anticipated Central Plateau exposure scenarios as we have had no discussion with DOE on exposure scenarios in regard to this document.	EPA will provide replacement text for discussion and incorporation.	**ACTION**: EPA will provide suggested replacement text. On 03/24/2011, WRPS proposed replacement text. On 03/28/2011, EPA accepted the proposed text. Text will be incorporated into next WP revision.
6	Figure 3-7, p 3-15 Needs compass.	Acknowledged.	**ACTION**: Compass will be added to figure, assuming the addition does not present a document clearance and public release issue.
7	To date, what percent of the work described in this workplan has been completed?	It was estimated that roughly 40% to 50% of the work has been completed.	**CLOSE**: No text change required. A summary table, which was developed to communicate the status of the investigation, was presented at the 04/28/2011 meeting.
8	Is the Phase II RFI/CMS Report for WMA C still due to Ecology on 12/31/2010? Will this be available to EPA?	Under revised TPA milestone M-45-61, the Phase 2 RFI/CMS report for WMA C is now due to Ecology for review and approval as an Agreement primary document on 12/31/2014. However, baseline planning calls for earlier submittal. The document will be available to EPA.	**ACTION**: The next revision of the work plan will reflect the revised TPA milestone date for M-45-61.
11	Do holes from direct push investigations lead to preferential flow paths in the future? How many years ago were the first direct push investigations done in WMA C and have they led to channeled infiltration?	Boreholes from direct push investigations do not create preferential flow paths. Boreholes are decommissioned per requirements of Washington Administrative Code (WAC) 173-160. Any exceptions must be reviewed and approved by Ecology as a part of a variance filing process. Direct push investigations at WMA C were initiated in July 2005.	No text change required. **ACTION**: Ecology (Caggiano) will provide EPA with information on borehole decommissioning requirements. WRPS (Robertson) to verify information has been provided.
13	As sampling efforts may have evolved through the execution of this workplan, these are a few specific spots I had questions about: (a) Two valve boxes, located on the south side of C-111 and C-112, are known to have drained directly to soil. Samples taken here?	(a) The valve boxes were not identified as a location to investigate during the DQO process: therefore, no samples are planned at C-111 and C-112. (b) Reanalysis of well-to-well resistivity data, implementing recent advancements in analytical	No text change required at this time. **GENERAL ACTION**: Carry additional characterization proposals for consideration. (b) Evaluate further when results of

	(b) Section 3.2.1, p. 3-6 (d) Anomalous resistivity zone centered around C-104 and a smaller zone around C-108 and C-109. Confirmation sampling done here? (c) Section 3.2.2, p. 3-11 and 3-12 describes Tc^{99} concentration that have "generally increased" since the late 1990s and are currently in excess of 2000pCi/L, which "suggests a tank waste source near monitoring well 299-E27-4". Adequate sampling in this area? (d) Section 4.3.2, p. 4-8 (c) Site 200-E-115 Are there plans to use SGE in this area?	capabilities, indicates that the anomaly around C-108 and C-109 was an artifact of having to parse the data to perform the original analysis. The reanalysis also indicated that the anomaly in the vicinity of C-104 is more closely focused on the region near the spare inlet ports on C-101. Direct push investigation at Sites J and K is intended to provide additional information about the anomalies. (c) The planned investigative work is believed adequate to address the Tc-99 issue. Work at UPR 81 and 86, which were believed to have been potential sources, indicates these UPRs are not likely to be sources. Well 299-E27-4 is in the vicinity of UPR-200-E-82. To further assess potential vadose zone contribution to the Tc-99 present in groundwater at 299-E27-4, the site will be assessed using 3-D SGE, plus three long 2-D lines in 2011. Numerous direct push sampling holes around this UPR have been advanced; only one of those pushes resulted in a positive analysis for Tc-99, and that hole was an angle push directly beneath the UPR site (radiological concerns precluded a vertical push through the center of the UPR). The SGE survey is intended to assess the distribution of resistivity impacting features. (d) Yes. Investigation at sites H and I is intended to provide information in this vicinity. There is no indication of contamination at these locations with sampling completed thus far. Planning includes conducting SGE surveys in this area after retrievals are complete.	reanalysis of SGE data are available. (c) The draft 2010 groundwater monitoring report contains information that could be relevant to an evaluation of the need for further Tc-99 investigation. The final report should be released in summer 2011.

MEETING NOTES
Waste Management Area C Work Plan Revisions

Meeting Date: May 26, 2011

Location: 1200 Jadwin, Richland

Purpose: Discuss the Status of the Waste Management Area (WMA C) RFI/CMS Investigation and Work Plan.

Attendees:

Heather Anastos (WRPS)	Stuart Luttrell (CHPRC)
Mike Barnes (Ecology)	Jeff Lyon (Ecology)
Marcel Bergeron (WRPS)	Dave Myers (WRPS)
Susan Eberlein (WRPS)	Julie Robertson (WRPS)
Les Fort (WRPS)	Harold Sydnor (WRPS)
Dan Glaser (WRPS)	Greg Thomas (CHPRC)
Bob Lober (ORP)	

Background: These monthly meetings provide a forum for Ecology and ORP project managers and technical support personnel to review information generated by the WMA C RCRA facility investigation, and to determine whether changes to the characterization plans and/or the RFI/CMS work plan (RPP-PLAN-39114) are necessary. Comments and questions from EPA and Ecology about the WMA C RFI work scope are also discussed at the meetings. Meeting notes are approved by the Ecology and ORP project managers and entered into the Administrative Record. If the parties agree that changes to the Work Plan are appropriate, the *Hanford Federal Facility Agreement and Consent Order* (TPA) change control process will be used to document Work Plan changes.

Discussion and New Topics:

- **Prior meeting notes:** The April 28, 2011 meeting notes were signed by the ORP and Ecology Project Managers.

- **Status of the Work Plan:** Revisions of the WMA C RFI/CMS work plan and SAP to incorporate previously discussed changes are in progress. Current efforts are focused on completing revisions to the SAP. Those revisions will then be incorporated, with other necessary changes, into the work plan.

- **Status of Ongoing Fieldwork:**

  - RPP-PLAN-39114, Rev 1A, Figure 6-1 identifies that in FY 11, four direct push locations will be completed. This commitment is expected to be completed by doing angle pushing at the following locations:

    - Location J (near Tank C-104)
    - Location A (near Tank C-101)
    - Location B (near Tank C-101)
    - Location C1 (near C-203).

    Angle push work at Site J (C-104) is complete, and the borehole has been decommissioned. At Site A (C-101), logging is complete and the initial borehole has been decommissioned with probes in place. Direct push of the sampling borehole is underway. At Site B (C-101) approximately 44 feet of pipe run were pushed, then the rig met refusal. The location was decommissioned, the rig was relocated slightly, and borehole installation will begin again when weather conditions permit. Work at Site C1 (C-203) is in planning.

- Surface geophysical exploration (SGE) data from Site Q (UPR-82/cesium pile) are being analyzed.

- Prepared biological samples have been delivered to the appropriate laboratories for analysis. Isotopic thorium results were reported to be less than detection level.

- **Data Status:**

  - All 2009 and 2010 WMA C vadose zone data are loaded into HEIS. The 2010 data is approximately half way through the data validation and verification process.

  - Ecology requested additional information on a recent discussion between RL and Ecology regarding the use and applicability of the DOECAP Quality Systems for Analytical Services (QSAS) vs. the Hanford Analytical Services Quality Assurance Requirements Document (HASQARD). It was discussed that the on-site laboratories work to the HASQARD, while the commercial laboratories are audited to the DOECAP requirements. WRPS took an action to follow up with Ecology to better understand the questions and provide additional information.

- **New Topics**:

  - **Sites K and V:** WRPS has initiated FY2012 investigation work planning, including installation of direct push boreholes and Sites K and V. Reconnaissance indicates that it may be impossible to install vertical direct pushes at the desired locations due to field interferences (i.e., buried pipelines and other infrastructure). For Site K near C-108, WRPS will be evaluating the location of the postulated leak and available spectral gamma logging system and SGE information to determine if an angled borehole could be drilled to intercept the location. If it is determined that an angle push cannot be placed to intercept the postulated leak location, investigation using additional SGE will be evaluated.

    Installation of a direct push borehole at Site V was intended to provide information about a postulated release from tank C-111 (waste released through the tank spare inlet ports due to overfilling of the tank). However, recent detailed leak loss analysis concluded that although tank C-111 was overfilled, there was no evidence that a release of waste had occurred via the spare inlet ports. In the near future, the Tank Leak Loss Committee will ensure that the current tank C-111 leak assessment is still viable. The meeting attendees agreed that if the Tank Leak Loss Committee concludes there is no evidence of releases via C-111 spare inlet ports, a borehole a Site V would be unlikely to provide information valuable to the WMA C investigation.

  - **Ecology Questions on Quarterly Groundwater Report:** On May 25, 2011, Ecology emailed several questions to ORP regarding the Quarterly Groundwater Monitoring Report. The meeting attendees reviewed the questions, Ecology provided clarification as needed, and some preliminary responses were provided. The questions are entered as action items for this meeting, and provision of final responses will be tracked on the action list.

Actions:

- **Refer to the following table.** A date-based numbering system is being used to track the actions to completion. Actions will be removed from the list after ORP and Ecology have agreed to their completion.

Robert Lober		6/23/2011
DOE Project Manager (print)	DOE Project Manager (signature)	Date
Jeffery J Lyon		6/23/2011
Ecology Project Manager (print)	Ecology Project Manager (signature)	Date

Actions

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
08-11-10-3	Conceptual model for spare inlet overflow – important for C-105	Impact and locations of potential overfill spills should be evaluated near C-101, -105, and -110 and text included in WP.	J. Robertson	Include info in next WP revision	In process.
08-11-10-5	Organic issue and status what has been agreed to on the 5 locations for organics… any TIC data?	(1) Provide Ecology with detailed status of organic results to support evaluation of need to continue sampling. Modify WP as appropriate. (2) Provide EPA with copy of Ecology authorization dated 02/11/2011.	M. Barnes	Update WP and SAP to reflect revision of analyte list.	Work plan & SAP modification in process. VOC results were presented at 10/27/2010 meeting, along with recommendations. Additional results were provided in Feb 2011, and on 02/11/2011, Ecology provided authorization by email to optimize sampling by discontinuing sampling for VOC, ethylene glycol, mono and di butyl phosphate, PCB congeners, and gas and diesel range organics. The reduction will result in additional sample material being available for improved analysis of the remaining analytes. ORP issued a letter on 03/23/2011 documenting recommendations and requesting a response. Ecology response is in the approval process.
08-11-10-8	C-200s proposal for SGE and logging E27-7…	(1) Update WP text regarding specific wells to be logged. (2) Place several deep electrode strings/do SGE near C-200 tanks, in later FY11. Not currently in budget. (3) Locate/review existing paper on C-203 leak.	(1) J. Robertson (2) M. Barnes review initial SGE proposal discussed at 05/26/2011 meeting and provide comments (3) M. Barnes, B. Lober, L. Fort	Include info in next WP revision regarding known in-scope changes	(1) In process (2) Initial proposal provided for Ecology consideration on 5/26/2011 (3) <New action.>
08-11-10-9	What is planned for E27-23	There is a well on SW side of C Farm near transfer line. Need to investigate a Tc-99 increase. (1) Archive samples from drilling of E27-20 are available for analysis. (2) WRPS and CHPRC to review recent GW data to determine whether	D. Myers, G. Thomas, M. Barnes	Possible future WP change	(1) WRPS developing scope and cost to analyze E27-20 archive samples (2) WRPS and CHPRC are reviewing recent GW data in order to develop a recommendation.

RPP-RPT-58839, Rev. A DRAFT

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
		additional investigation is advisable.			
08-11-10-11	Status of availability of C-111 push (Site V)	Revise WP to change designation of Access Availability in tables from "good" to "constrained by retrieval operations." Similarly update other access information to reflect current state.	J. Robertson	Include info in next WP revision.	In process.
08-11-10-Q4	Do you want to update the analyte list based on changes to RPP-23403, Rev. 4 (sulfide)?	SST DQO has been modified to remove sulfide. Need to evaluate removal of sulfide from C Farm DQO and if appropriate revise analytes in WP.	M. Barnes	Update WP and SAP to reflect revision of analyte list.	Work plan & SAP modification in process. On 02/11/2011, Ecology provided authorization by email to optimize sampling by discontinuing sampling for sulfide. The reduction will result in additional sample material being available for improved analysis of the remaining analytes. ORP issued a letter on 03/23/2011 documenting recommendations and requesting a response. Ecology response is in the approval process.
10-23-10-1	Detection limits	Evaluate whether detection limits identified in WP are appropriate.	J. Robertson	Revise Se RDL to 0.3 mg/kg in WP and SAP.	In process.
01-27-11-3	Cs at C-105	Evaluate options for additional investigation to gain information about the volume of releases from C-105 and the amount of Cs released. (1) Install temperature probes in drywells (2) Install new direct push borehole near C-105 to intersect postulated plume	H. Sydnor, L. Fort	None at this time.	(1) WRPS evaluated installation of temp probes in dry wells. At C-105, the Cs would not be expected to travel very far from the tank. Any temp difference caused by a leak would be masked by the greater mass of and heat from Cs still in the tank. (2) WRPS is evaluating feasibility of installing a direct push borehole to intersect postulated plume.
01-27-11-4	Resolution of EPA comments on RFI/CMS work plan	See Attachment A.	See Attachment A.	See Attachment A.	See Attachment A.
04-28-11-1	Method to be used for Cr analysis in bio samples	Email B. Rochette of Ecology to explain the issue and request use of Method 200.8 instead of 6010.	J. Robertson	Update WP App B to reflect method change	Ecology authorized use of the alternative method, Method 200.8, for chromium in the bio samples. WP change is in process.

RPP-RPT-58339, Rev. A DRAFT

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
04-28-11-2	Poor quality data from a lab that performed pesticide analyses	Contact Office of Sample Management (SMO) to advise them of WMA C pesticide data quality issues, to flag the need for evaluation of possible broader implications across the Site.	H. Anastos	No change required.	<CLOSE> SMO was contacted and is aware of the data quality issues associated with the lab that performed the WMA C pesticide analyses. This lab has not provided this type of analytical support to other Hanford projects.
05-26-11-1	Replacing HASQARD with DOECAP Quality System for Analytical Services	WRPS to discuss further with Ecology (M. Barnes) to better understand the questions and provide additional information.	H. Anastos	None at this time.	<New action.>
05-26-11-2	FY12 borehole installation at Sites K and V	(1) Evaluate ability to install borehole to intercept postulated plume at Site K. (2) Re-evaluate need for Site V borehole, pending issuance of Tank Leak Loss Committee conclusions.	H. Sydnor, L. Fort	None at this time	<New action.>
05-26-11-3	Quarterly GW Monitoring Report, Iodine-129: Results are given for 5 wells in WMA C all hits including E27-25 which is spatially removed from WMA C. This well E 27-25 has a no detect for technetium-99. What are the varying interpretations of the significance of iodine and no technetium. The wells reported were 12, 155, 22, 23, and 25.	Provide information regarding possible sources of Tc-99 and iodine in the sampled wells.	G. Thomas/S. Luttrell	None at this time	<New action.>
05-26-11-4	Quarterly GW Monitoring Report, Temperature Results: Is it normal for the temperature in the groundwater at WMA C to vary from 15.6C to 19.1C? Is this variation noted in other tank farms?	Evaluate temperature variations in the GW at WMA C and other tank farms to determine if there is an anomaly at WMA C.	G. Thomas/S. Luttrell	None at this time	<New action.>
05-26-11-5	Quarterly GW Monitoring Report, Technetium: Why were samples from wells E27-13 and E27-4 not reported for technetium? I note samples were taken	Evaluate Tc-99 data set and provide information regarding • Sampling frequency and basis for sampling frequency. • Data trends • G review qualifier	G. Thomas/S. Luttrell	None at this time	<New action.>

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
	and reported for most other analytes. Are there any changes to trends of technetium-99 in any of the WMA C wells? What does the G review qualifier mean for E27-12 for technetium?				
05-26-11-6	Quarterly GW Monitoring Report, Sulfate: There are widely varying concentrations of sulfate in the groundwater (114,000 ug/L to 300,00 ug/L). Is this consistent with results from the vadose zone sampling? How could a wide variation of sulfate in the vadose zone impact the results and interpretation of SGE?	1. Are varying sulfate concentrations in GW consistent with VZ sample results? 2. Does VZ sulfate variation impact SGE results/interpretation?	G. Thomas/S. Luttrell; Dave Myers	None at this time	<New action.>
05-26-11-7	Quarterly GW Monitoring Report, Organics: If sample or analytical contamination was suspected; why weren't the wells immediately re-sampled? Is there a process that allows for immediate evaluation of suspect results and re-sampling?	Provide information about the process used when suspect GW results are reported.	G. Thomas/S. Luttrell	None at this time	<New action.>

ATTACHMENT A
Open EPA Comments on the WMA C Work Plan
(2 pages)

Background: In December 2010, EPA provided comments on the WMA C RFI/CMS work plan. The table below identifies comments that remain open. Closure of comments not shown below is documented in previous meeting notes.

No.	EPA Comment	Response	Actionee	Status
4.	Section 3.4.1, page 3-30. Please remove the section on EPA anticipated Central Plateau exposure scenarios as we have had no discussion with DOE on exposure scenarios in regard to this document.	EPA will provide replacement text for discussion and incorporation.	J. Robertson	EPA will provide suggested replacement text. On 03/24/2011, WRPS proposed replacement text. On 03/28/2011, EPA accepted the proposed text. Text will be incorporated into next WP revision.
6	Figure 3-7, p 3-15 Needs compass.	Acknowledged.	J. Robertson	Compass will be added to figure, assuming the addition does not present a document clearance and public release issue.
8	Is the Phase II RFI/CMS Report for WMA C still due to Ecology on 12/31/2010? Will this be available to EPA?	Under revised TPA milestone M-45-61, the Phase 2 RFI/CMS report for WMA C is now due to Ecology for review and approval as an Agreement primary document on 12/31/2014. However, baseline planning calls for earlier submittal. The document will be available to EPA.	J. Robertson	The next revision of the work plan will reflect the revised TPA milestone date for M-45-61.
11.	Do holes from direct push investigations lead to preferential flow paths in the future? How many years ago were the first direct push investigations done in WMA C and have they led to channeled infiltration?	Boreholes from direct push investigations do not create preferential flow paths. Boreholes are decommissioned per requirements of Washington Administrative Code (WAC) 173-160. Any exceptions must be reviewed and approved by Ecology as a part of a variance filing process. Direct push investigations at WMA C were initiated in July 2005.	B. Lober	No text change required. Ecology has provided EPA with information on borehole decommissioning requirements. ORP to follow up with EPA to seek closure.
13.	As sampling efforts may have evolved through the execution of this workplan, these are a few specific spots I had questions about: (a) Two valve boxes, located on the south side of C-111 and C-112, are known to have drained directly to soil. Samples taken here? (b) Section 3.2.1, p. 3-6 (d) Anomalous resistivity zone centered around C-104 and a smaller zone around C-108 and C-109. Confirmation sampling done here? (c) Section 3.2.2, p. 3-11 and 3-12 describes Tc^{99} concentration that have "generally	(a) The valve boxes were not identified as a location to investigate during the DQO process: therefore, no samples are planned at C-111 and C-112. (b) Reanalysis of well-to-well resistivity data, implementing recent advancements in analytical capabilities, indicates that the anomaly around C-108 and C-109 was an artifact of having to parse the data to perform the original analysis. The reanalysis also indicated that the anomaly in the vicinity of C-104 is more closely focused on the region near the spare inlet ports on C-101. Direct	WMA C Team	No text change required at this time. **GENERAL ACTION**: Carry additional characterization proposals for consideration. (b) Evaluate further when results of reanalysis of SGE data are available. (c) The draft 2010 groundwater monitoring report contains information that could be relevant to an evaluation of the need for further Tc-99 investigation. The final report should be released in summer 2011.

	increased" since the late 1990s and are currently in excess of 2000pCi/L, which "suggests a tank waste source near monitoring well 299-E27-4". Adequate sampling in this area? (d) Section 4.3.2, p. 4-8 (c) Site 200-E-115 Are there plans to use SGE in this area?	push investigation at Sites J and K is intended to provide additional information about the anomalies. (c) The planned investigative work is believed adequate to address the Tc-99 issue. Work at UPR 81 and 86, which were believed to have been potential sources, indicates these UPRs are not likely to be sources. Well 299-E27-4 is in the vicinity of UPR-200-E-82. To further assess potential vadose zone contribution to the Tc-99 present in groundwater at 299-E27-4, the site will be assessed using 3-D SGE, plus three long 2-D lines in 2011. Numerous direct push sampling holes around this UPR have been advanced; only one of those pushes resulted in a positive analysis for Tc-99, and that hole was an angle push directly beneath the UPR site (radiological concerns precluded a vertical push through the center of the UPR). The SGE survey is intended to assess the distribution of resistivity impacting features. (d) Yes. Investigation at sites H and I is intended to provide information in this vicinity. There is no indication of contamination at these locations with sampling completed thus far. Planning includes conducting SGE surveys in this area after retrievals are complete.		

MEETING NOTES
Waste Management Area C Work Plan Revisions

Meeting Date: June 23, 2011

Location: 1200 Jadwin, Richland

Purpose: Discuss the Status of the Waste Management Area (WMA C) RFI/CMS Investigation and Work Plan.

Attendees:

Mike Barnes (Ecology)	Dave Myers (WRPS)
Marcel Bergeron (WRPS)	Dan Parker (WRPS)
Mike Connelly (WRPS)	Julie Robertson (WRPS)
Kathi Dunbar (WRPS)	Beth Rochette (Ecology)
Susan Eberlein (WRPS)	Virginia Rohay (CHPRC)
Dan Glaser (WRPS)	Maria Skorska (WRPS)
Bob Lober (ORP)	Harold Sydnor (WRPS)
Stuart Luttrell (CHPRC)	Greg Thomas (CHPRC)
Jeff Lyon (Ecology)	

Background: These monthly meetings provide a forum for Ecology and ORP project managers and technical support personnel to review information generated by the WMA C RCRA facility investigation, and to determine whether changes to the characterization plans and/or the RFI/CMS work plan (RPP-PLAN-39114) are necessary. These meetings also provide an opportunity for discussion and integration of emerging information about ongoing vadose zone and ground water investigations at and near WMA C. Comments and questions from EPA and Ecology about the WMA C RFI work scope are also discussed at the meetings. Meeting notes are approved by the Ecology and ORP project managers and entered into the Administrative Record. If the parties agree that changes to the Work Plan are appropriate, the *Hanford Federal Facility Agreement and Consent Order* (TPA) change control process will be used to document Work Plan changes.

Discussion and New Topics:

- **Prior meeting notes**: The May 26, 2011 meeting notes were signed by the ORP and Ecology Project Managers.

- **Status of the Work Plan**: Revisions of the WMA C RFI/CMS work plan and SAP to incorporate previously discussed changes are in progress. Current efforts are focused on completing revisions to the SAP. Those revisions will then be incorporated, with other necessary changes, into the work plan.

  A meeting was held earlier in June to allow technical staff to review and discuss several of the proposed changes to the SAP. Ecology praised proposed changes reflecting the optimization of sampling and analysis activities and encouraged WRPS and ORP to identify additional optimization opportunities.

  WRPS noted that the next revision of the work plan will be a partial update and not a complete revision. The majority of the text in the work plan will reflect the state of knowledge about contamination at WMA C before Phase 2 RFI results became available. Upcoming changes to the work plan will reflect the current state of the investigation and Phase 2 RFI results only as necessary to explain necessary changes to the field investigation work scope.

- **Status of Ongoing Fieldwork**:
  - RPP-PLAN-39114, Rev 1A, Figure 6-1 identifies that in FY 11, four direct push locations will be completed. This commitment is expected to be completed by installing angle push boreholes at the following locations:
    - Location J (near Tank C-104) – Complete
    - Location A (near Tank C-101)
    - Location B (near Tank C-101)
    - Location C1 (near C-203).

    Angle push work at Site J (C-104) is complete, and the borehole has been decommissioned. At Site A (C-101), moisture logging and sampling are complete, and the sampling borehole will be decommissioned shortly. At Site B (C-101) logging of the initial borehole is complete, and the hole is being decommissioned with electrodes in place. The parties reached agreement on Site B sampling depths during the week of June 13, 2011. Work at Site C1 (C-203) is in final planning. WRPS took an action to provide information about bismuth-germanium oxide probe detection capabilities for uranium-235 and -238.
  - Surface geophysical exploration (SGE) results from Site Q (UPR-82/cesium pile) are being analyzed. WRPS expects to issue a report on the results in July 2011.
  - No additional biological sample results have been provided since the May 26, 2011 monthly meeting.
- **Data Status:** No new information was provided.
- **New Topics**:
  - **Analytical Prioritization at C8102 (Site A):** During installation of borehole C8102, insufficient sample material was recovered at the 16.1-feet to 18.1-feet pipe-run depth to support performing the full suite of necessary analyses. The full suite of analyses requires approximately 251 grams of sample; 150 grams were recovered. On June 7, 2011, Ecology provided concurrence on a prioritized list of analyses to be run on the available sample material, as detailed below. Ecology also agreed to use this priority list for future sampling events where sample recovery is an issue.

Prioritization	Constituent	Grams Needed
Analyze per normal process	Tc-99	35
	CN	0.6
	Water digest (IC)	5
	Acid digest (ICP & MS)	5
	Gamma scan	80
	pH	3
	ammonia	0.3
	Hg	0.3
Analyze using the gamma aliquot, which will not be refrigerated	Sr-90	10
	Pu-ISO, Am, Cm-ISO	1.5
	Tc-99 (acid)	5
	Ni-63/Se-79	4
	Water digest (H-3)	10
	I-129	10
	Sb, Sn-126 (acid)	1
Do not analyze	SVOA	20
	PCBs	20
	Pesticides	40

NOTE: Because there is limited sample, there may not be material available for reanalysis, so all of the requested analytes might not be reported if there are QC failures.

- **C-101 Retrieval Agreement**: On June 20, 2011, Ecology forwarded an email citing an agreement reached during an October 2010 meeting on C-101 retrieval. At that meeting, Ecology agreed to support modified sluicing of C-101 provided certain conditions were met in the retrieval process, including installation of direct push boreholes and logging to support retrieval operations. Related to that agreement, Ecology expects that the Tank Waste Retrieval Work Plan (TWRWP) will be modified to incorporate the minimum detectable leak calculation. Ecology pointed out that the TWRWP is being revised, and the boreholes and electrodes have now been installed, allowing for completion of the leak calculation and incorporation into the revised document. WRPS took an action to follow up.

- **Additional Ecology Questions on Quarterly Groundwater Report:** Ecology noted that cyanide levels in groundwater at well 299-E27-7 appear to be rather variable and include the highest Cn levels near WMA C as well as non-detects. Well 299-E27-155 has more stable but slowly increasing Cn results. WRPS took an action to review the Cn information and evaluate whether there are indications of a specific source in WMA C. Ecology also enquired about uranium at well 299-E27-7 and asked for an evaluation of whether levels there are comparable to levels at other wells near WMA C. CHPRC took an action to respond to that inquiry.

Actions:

- **Refer to the following table.** A date-based numbering system is being used to track the actions to completion. Actions will be removed from the list after ORP and Ecology have agreed to their completion.

Robert Lober		7/29/2011
DOE Project Manager (print)	DOE Project Manager (signature)	Date
Michael W Barnes		7-29-2011
Ecology Project Manager (print)	Ecology Project Manager (signature)	Date

Actions

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
08-11-10-3	Conceptual model for spare inlet overflow – important for C-105	Impact and locations of potential overfill spills should be evaluated near C-101, -105, and -110 and text included in WP.	J. Robertson	Include info in next WP revision	In process.
08-11-10-5	Organic issue and status what has been agreed to on the 5 locations for organics… any TIC data?	1. Provide Ecology with detailed status of organic results to support evaluation of need to continue sampling. Modify WP as appropriate. 2. Provide EPA with copy of Ecology authorization dated 02/11/2011.	J. Robertson	Update WP and SAP to reflect approved process optimization (revision of analyte list).	In process. Ecology authorization of DOE-proposed optimization was granted by Ecology letter 11-NWP-053 on June 1, 2011. Letter also encouraged further optimization of analyte list, increased use of electronic records, and review of data needs and requirements.
08-11-10-8	C-200s proposal for SGE and logging E27-7…	1. Update WP text regarding specific wells to be logged. 2. Evaluate current scope and funding against proposal to place several deep electrode strings/do SGE near C-200 tanks. 3. Locate/review existing paper on C-203 leak.	1. J. Robertson 2. D. Myers, D. Glaser, S. Eberlein, B. Lober 3. D. Glaser, L. Fort	Include info in next WP revision regarding known in-scope changes	1. In process 2. Initial proposal provided for Ecology consideration on 5/26/2011. Ecology provided informal concurrence with proposal. ROM estimate has been developed. 3. Document found in IDMS. Will be reviewed for information relevant to C-200s investigation.
08-11-10-9	What is planned for E27-23	There is a well on SW side of C Farm near transfer line. Need to investigate a Tc-99 increase. 1. Archive samples from drilling of E27-20 are available for analysis. 2. WRPS and CHPRC to review recent GW data to determine whether additional investigation is advisable.	D. Myers, G. Thomas, M. Barnes	Possible future WP change	1. ROM estimate has been developed for retrieval, transport, and analysis of E27-20 archive samples. 2. WRPS and CHPRC are jointly reviewing available information to develop a recommendation.
08-11-10-11	Status of availability of C-111 push (Site V)	1. Review and update designation of Access Availability in WP tables. 2. Installation of Site V borehole is unlikely to yield information valuable to the investigation, based on additional reviews of tank leak loss information. Discuss elimination of Site V borehole with Confederated Tribes of the Umatilla Indian Reservation, then	1. J. Robertson 2. M. Connelly & B. Lober	Include info in next WP revision.	1. In process. 2. **New action**: Need to arrange for discussion with CTUIR.

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Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
		eliminate Site V from WP as appropriate.			
08-11-10-Q4	Do you want to update the analyte list based on changes to RPP-23403, Rev. 4 (sulfide)?	SST DQO has been modified to remove sulfide. Need to evaluate removal of sulfide from C Farm DQO and if appropriate revise analytes in WP.	J. Robertson	Update WP and SAP to reflect approved process optimization (revision of analyte list).	In process. Ecology authorization of DOE-proposed optimization was granted by Ecology letter 11-NWP-053 on June 1, 2011. Letter also encouraged further optimization of analyte list, increased use of electronic records, and review of data needs and requirements.
10-23-10-1	Detection limits	Evaluate whether detection limits identified in WP are appropriate.	J. Robertson	Revise Se RDL to 0.3 mg/kg in WP and SAP.	In process.
01-27-11-3	Cs at C-105	Evaluate options for additional investigation to gain information about the volume of releases from C-105 and the amount of Cs released. (1) Install temperature probes in drywells (2) Install new angle push borehole near C-105 to intersect postulated plume	H. Sydnor, L. Fort	Possible future WP change.	(1) WRPS evaluated installation of temp probes in dry wells. At C-105, the Cs would not be expected to travel very far from the tank. Any temp difference caused by a leak would be masked by the greater mass of and heat from Cs still in the tank. (2) WRPS is evaluating feasibility of installing a push borehole to intersect postulated plume
01-27-11-4	Resolution of EPA comments on RFI/CMS work plan	See Attachment A.	See Attachment A.	See Attachment A.	See Attachment A.
04-28-11-1	Method to be used for Cr analysis in bio samples	Email B. Rochette of Ecology to explain the issue and request use of Method 200.8 instead of 6010.	J. Robertson	Update WP App B to reflect method change	Ecology authorized use of the alternative method, Method 200.8, for chromium in the bio samples. WP change is in process.
05-26-11-1	Replacing HASQARD with DOECAP Quality System for Analytical Services	WRPS to discuss further with Ecology (M. Barnes) to better understand the questions and provide additional information.	H. Anastos	None at this time.	<CLOSE> DOE may reword future contracts to encourage auditor participation in the DOE Consolidated Audit Program (DOECAP) and discourage separate HASQARD audits of the DOECAP-audited labs. This would encourage Hanford contractors to participate in DOECAP laboratory audits to ensure that the

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Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
					requirements of both DOECAP and HASQARD are implemented, as needed, without redundant audits being performed. The action, if implemented, will replace the HASQARD-specific audits being done by some Hanford contractors with the DOECAP audits.
05-26-11-2	FY12 borehole installation at Site K	Evaluate ability to install borehole to intercept postulated plume at Site K.	H. Sydnor, L. Fort	Possible future work plan change	Evaluation is ongoing. Need GPR.
05-26-11-3	Quarterly GW Monitoring Report, Iodine-129: Results are given for 5 wells in WMA C all hits including E27-25 which is spatially removed from WMA C. This well E 27-25 has a no detect for technetium-99. What are the varying interpretations of the significance of iodine and no technetium. The wells reported were 12, 155, 22, 23, and 25.	Provide information regarding possible sources of Tc-99 and iodine in the sampled wells.	G. Thomas/S. Luttrell	None at this time	<CLOSE> Iodine-129 is a regional plume and is discussed in DOE/RL-2011-01 for BP-5 OU as follows: A historical evaluation of iodine-129 in the 200 East Area was completed during preparation of the 200-BP-5 RI in 2010. Three sources (216-A-10 Crib and vicinity, 216-A-29 Ditch, and the 216-B-3 Pond) that received large volumes of liquid waste with I-129 operated years ago, and are largely responsible for the widespread distribution of I-129. I-129 ranged from 4.23 to 6.14 pCi/L in four wells at WMA C. Historically, activities have remained elevated over the past two decades. Technetium-99 is a local plume, and there appears to be a source of recent infiltration into the unconfined aquifer near well 299-E27-23. However, sources of technetium-99 are uncertain since recent vadose zone investigations have not provided definitive evidence from likely sources.
05-26-11-4	Quarterly GW Monitoring	Evaluate temperature variations in the GW	G. Thomas/S. Luttrell	None at this	<CLOSE> Yes. Temperature

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Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
	Report, Temperature Results: Is it normal for the temperature in the groundwater at WMA C to vary from 15.6C to 19.1C? Is this variation noted in other tank farms?	at WMA C and other tank farms to determine if there is an anomaly at WMA C.		time	variability is seen in all tank farms, as well as other site wells. The variability does not represent groundwater temperature variability, but is a result of changing ambient air temperature effects. The air temperature affects discharge pipes, hoses, lines, and instruments through which the samples pass.
05-26-11-5	Quarterly GW Monitoring Report, Technetium: Why were samples from wells E27-13 and E27-4 not reported for technetium? I note samples were taken and reported for most other analytes. Are there any changes to trends of technetium-99 in any of the WMA C wells? What does the G review qualifier mean for E27-12 for technetium?	Evaluate Tc-99 data set and provide information regarding 1. Sampling frequency and basis for sampling frequency. 2. Data trends 3. G review qualifier	G. Thomas/S. Luttrell	None at this time	<CLOSE> 1. Radionuclides were removed from the 200-BP-5 schedule for several wells as a result of a project-wide sample and analysis efficiency review conducted in 2009. The radionuclides continued to be analyzed under the RCRA monitoring plan. However, when the RCRA monitoring plan was revised in 2010, (DOE/RL-2009-77), radionuclides were removed at DOE's direction; the plan was implemented in the last quarter of 2010. Staff was unclear on the quarterly monitoring requirements for radionuclides associated with Letter 04-TPD-083, and was notified of this agreement on January 17, 2011. The required radionuclides were added back into the schedule in January 2011. One quarter of radionuclide analyses from most wells were missed. 2. Tc-99 in well 299-E27-23 began to decrease in early summer last year but has recently increased in two consecutive samples (Dec 2010-March 2011). Tc-99 has

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
					also been increasing in wells 299-E27-13 and 299-E27-21 located north and southeast of well 299-E27-23. Wells west and east of 299-E27-23 continue to show a fairly stable trend for Tc-99. The Tc-99 originally reported in well 299-E27-12 was recently determined to be associated with sample collection at the wrong well. The sample was actually collected at well 299-E27-13 using the paperwork generated for 299-E27-12. The results originally put in HEIS for December from well 299-E27-12 will be assigned to 299-E27-13. 3. A "G" qualifier indicates the result had been under review and was later determined to be correct. The "G" qualifier was misreported in the presentation table of the quarterly report; a "Y" qualifier was actually noted in HEIS indicating the results were suspect. After further review, the results were corrected and the qualifier removed from HEIS. (See previous paragraph for more information.)
05-26-11-6	Quarterly GW Monitoring Report, Sulfate: There are widely varying concentrations of sulfate in the groundwater (114,000 ug/L to 300,00 ug/L). Is	1. Are varying sulfate concentrations in GW consistent with VZ sample results? 2. Does VZ sulfate variation impact SGE results/interpretation?	G. Thomas/S. Luttrell; Dave Myers	None at this time	<CLOSE> 1. VZ sulfate concentrations vary considerably from well to well and with depth, ranging from 1,210ug/kg in the surface sample at C7466/Site L1 to

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Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
	this consistent with results from the vadose zone sampling? How could a wide variation of sulfate in the vadose zone impact the results and interpretation of SGE?				458,000 ug/kg at 10-12 ft in C7680/Site H. Sulfate was only 43,900 ug/kg at 14-16 ft in C7680. All other VZ sulfate results were less than 160,000 ug/kg. The VZ concentrations do not appear to correlate with GW variations. 2. The measured sulfate levels and variation should have no impact on SGE results or interpretations.
05-26-11-7	Quarterly GW Monitoring Report, Organics: If sample or analytical contamination was suspected; why weren't the wells immediately re-sampled? Is there a process that allows for immediate evaluation of suspect results and re-sampling?	Provide information about the process used when suspect GW results are reported.	G. Thomas/S. Luttrell	None at this time	<CLOSE> DOE/RL-2009-77 is the controlling document for the Assessment. The protocol for addressing laboratory issues is defined in Section 4.2. If a laboratory issue is suspected, we do not immediately consider the constituent to be associated with WMA C; rather, we may request a data review or re-analysis, and/or include the constituent analysis in the next quarterly sampling event (by the time the result has been reported and evaluated, the next quarterly sampling event is already pending, so a special re-sampling trip is not necessary).
06-23-11-1	BGO probe detection limits for uranium	Identify bismuth-germanium oxide probe detection limits for uranium-235 and -238.	H. Sydnor	None at this time.	<New action.>
06-23-11-2	C-101 retrieval agreement	Convey Ecology expectation that revised C-101 Tank Waste Retrieval Work Plan will incorporate the minimum detectable leak calculation.	J. Field & D. Glaser	None at this time.	<New action.>
06-23-11-3	Cn sources at C Farm	Review available information about Cn contamination in WMA C groundwater and Cn in WMA C tank waste, and evaluate whether there are indications of a specific source location.	J. Field & L. Fort	None at this time	<New action.>
06-23-11-4	Uranium in C Farm groundwater	Evaluate levels of uranium contamination in groundwater at WMA C, including E27-	G. Thomas/S. Luttrell	None at this time.	<New action.>

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Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
		7, to determine whether there are any anomalies.			

ATTACHMENT A
Open EPA Comments on the WMA C Work Plan
(2 pages)

Background: In December 2010, EPA provided comments on the WMA C RFI/CMS work plan. The table below identifies comments that remain open. Closure of comments not shown below is documented in previous meeting notes.

No.	EPA Comment	Response	Actionee	Status
4.	Section 3.4.1, page 3-30. Please remove the section on EPA anticipated Central Plateau exposure scenarios as we have had no discussion with DOE on exposure scenarios in regard to this document.	EPA will provide replacement text for discussion and incorporation.	J. Robertson	EPA will provide suggested replacement text. On 03/24/2011, WRPS proposed replacement text. On 03/28/2011, EPA accepted the proposed text. Text will be incorporated into next WP revision.
6	Figure 3-7, p 3-15 Needs compass.	Acknowledged.	J. Robertson	Compass will be added to figure, assuming the addition does not present a document clearance and public release issue.
8	Is the Phase II RFI/CMS Report for WMA C still due to Ecology on 12/31/2010? Will this be available to EPA?	Under revised TPA milestone M-45-61, the Phase 2 RFI/CMS report for WMA C is now due to Ecology for review and approval as an Agreement primary document on 12/31/2014. However, baseline planning calls for earlier submittal. The document will be available to EPA.	J. Robertson	The next revision of the work plan will reflect the revised TPA milestone date for M-45-61.
11.	Do holes from direct push investigations lead to preferential flow paths in the future? How many years ago were the first direct push investigations done in WMA C and have they led to channeled infiltration?	Boreholes from direct push investigations do not create preferential flow paths. Boreholes are decommissioned per requirements of Washington Administrative Code (WAC) 173-160. Any exceptions must be reviewed and approved by Ecology as a part of a variance filing process. Direct push investigations at WMA C were initiated in July 2005.	B. Lober	No text change required. Ecology has provided EPA with information on borehole decommissioning requirements. ORP to follow up with EPA to seek closure.
13.	As sampling efforts may have evolved through the execution of this workplan, these are a few specific spots I had questions about: (a) Two valve boxes, located on the south side of C-111 and C-112, are known to have drained directly to soil. Samples taken here? (b) Section 3.2.1, p. 3-6 (d) Anomalous resistivity zone centered around C-104 and a smaller zone around C-108 and C-109. Confirmation sampling done here? (c) Section 3.2.2, p. 3-11 and 3-12 describes Tc^{99} concentration that have "generally	(a) The valve boxes were not identified as a location to investigate during the DQO process: therefore, no samples are planned at C-111 and C-112. (b) Reanalysis of well-to-well resistivity data, implementing recent advancements in analytical capabilities, indicates that the anomaly around C-108 and C-109 was an artifact of having to parse the data to perform the original analysis. The reanalysis also indicated that the anomaly in the vicinity of C-104 is more closely focused on the region near the spare inlet ports on C-101. Direct	WMA C Team	No text change required at this time. **GENERAL ACTION**: Carry additional characterization proposals for consideration. (b) Evaluate further when results of reanalysis of SGE data are available. (c) The draft 2010 groundwater monitoring report contains information that could be relevant to an evaluation of the need for further Tc-99 investigation. The final report should be released in summer 2011.

	increased" since the late 1990s and are currently in excess of 2000pCi/L, which "suggests a tank waste source near monitoring well 299-E27-4". Adequate sampling in this area? (d) Section 4.3.2, p. 4-8 (c) Site 200-E-115 Are there plans to use SGE in this area?	push investigation at Sites J and K is intended to provide additional information about the anomalies. (c) The planned investigative work is believed adequate to address the Tc-99 issue. Work at UPR 81 and 86, which were believed to have been potential sources, indicates these UPRs are not likely to be sources. Well 299-E27-4 is in the vicinity of UPR-200-E-82. To further assess potential vadose zone contribution to the Tc-99 present in groundwater at 299-E27-4, the site will be assessed using 3-D SGE, plus three long 2-D lines in 2011. Numerous direct push sampling holes around this UPR have been advanced; only one of those pushes resulted in a positive analysis for Tc-99, and that hole was an angle push directly beneath the UPR site (radiological concerns precluded a vertical push through the center of the UPR). The SGE survey is intended to assess the distribution of resistivity impacting features. (d) Yes. Investigation at sites H and I is intended to provide information in this vicinity. There is no indication of contamination at these locations with sampling completed thus far. Planning includes conducting SGE surveys in this area after retrievals are complete.		

MEETING NOTES
Waste Management Area C Work Plan Revisions

Meeting Date: July 29, 2011

Location: 1200 Jadwin, Richland

Purpose: Discuss the Status of the Waste Management Area (WMA C) RFI/CMS Investigation and Work Plan.

Attendees:

Heather Anastos (WRPS)	Bob Lober (ORP)
Mike Barnes (Ecology)	Dave Myers (WRPS)
Mike Connelly (WRPS)	Julie Robertson (WRPS)
Susan Eberlein (WRPS)	Beth Rochette (Ecology)
Rebecca Gerhart (EPA)	Maria Skorska (WRPS)
Dan Glaser (WRPS)	Andrew Templeton (WRPS)

Background: These monthly meetings provide a forum for Ecology and ORP project managers and technical support personnel to review information generated by the WMA C RCRA facility investigation, and to determine whether changes to the characterization plans and/or the RFI/CMS work plan (RPP-PLAN-39114) are necessary. These meetings also provide an opportunity for discussion and integration of emerging information about ongoing vadose zone and ground water investigations at and near WMA C. Comments and questions from EPA and Ecology about the WMA C RFI work scope are also discussed at the meetings. Meeting notes are approved by the Ecology and ORP project managers and entered into the Administrative Record. If the parties agree that changes to the Work Plan are appropriate, the *Hanford Federal Facility Agreement and Consent Order* (TPA) change control process will be used to document Work Plan changes.

Discussion and New Topics:

- **Prior meeting notes**: The June 23, 2011 meeting notes were signed by the ORP Project Manager and Acting Ecology Project Manager.

- **Status of the Work Plan**: Revisions of the WMA C RFI/CMS work plan and SAP to incorporate previously discussed changes are in progress. Current efforts are focused on completing revisions to the SAP. Those revisions will then be incorporated, with other necessary changes, into the work plan.

  WRPS provided a brief description of key changes being made to the SAP:
  - Deletion of sulfide and certain organics from the analyte list, allowing for improved QC on remaining analytes, lowered detection limits for Tc-99, and deletion of trip blanks
  - Update to discussion of use of 2-step analytical approach
  - Revisions to analytical tables, primarily for clarity
  - Inclusion of discussion on analytical prioritization to be used if insufficient sample volume is collected to run full suite of required analytical methods

  The SAP and work plan will also be updated to reflect changes identified in the action list attached to these meeting notes, including deletion of the requirement to install a direct push borehole at Site V based on evidence that C-111 waste losses can be attributed to evaporation, and revision of the C-200s investigation (Site D) to allow for SGE investigation prior to borehole installation.

  The attendees discussed the review process for the proposed document revisions. All agreed that conducting an informal review of proposed changes prior to submittal of the final changes under the TPA change control process would be beneficial. Ecology technical staff have already reviewed an

initial draft of the SAP revisions. WRPS noted that SAP and work plan revisions incorporating proposed changes to field work need to occur fairly rapidly to support field implementation early in fiscal year 2012. WRPS took an action to provide the next draft of the SAP to EPA for informal review in approximately two weeks. Revisions to the work plan will be made in parallel, and a copy of the revised work plan will be provided to the agencies for informal review as soon as possible.

- **Status of Ongoing Fieldwork**:
  - RPP-PLAN-39114, Rev 1B, Figure 6-1 identifies that in FY 11, four direct push locations will be completed. This commitment is expected to be completed by installing angle push boreholes at the following locations:
    - Location J (near Tank C-104) – Complete
    - Location A (near Tank C-101) – Complete
    - Location B (near Tank C-101) – Complete
    - Location C1 (near C-203) – Mobilization delayed by field conditions.

    Angle push work at Locations A, B, and J is complete, and the boreholes have been decommissioned. At Location C1, mobilization was planned for early August. However, installation of a water line has impacted site access. As a result, equipment cannot be mobilized as planned. A work around is in planning.
  - The report on surface geophysical exploration (SGE) results from Site Q (UPR-82/cesium pile) has been released and is available on the web at www.wrpstoc.com/index.php/what_we_do/vadose_zone, under "Phase 2 activities documents." The document is RPP-RPT-50052, Rev. 0, *Surface Geophysical Exploration of UPR-200-E-82 Near the C Tank Farm*. The conclusion from the combined interpretation of porewater electrical conductivity and electrical resistivity geophysics is that there is no indication of a continuing source of groundwater contamination from this unplanned release.
- **Data Status:**
  - Preliminary results of small mammal sampling near WMA C are being returned. The results may indicate the presence of low levels of PCBs in some of the samples. Review of the sample results continues.
  - Quick turn data (Tc-99 and nitrate) for borehole C8102 at Location A is expected shortly. Insufficient sample material was collected from the 16.1-feet to 18.1-feet pipe-run depth at this location, resulting in the analytical prioritization agreement documented in the minutes of the June 23, 2011 meeting on WMA C work plan revisions. EPA asked if there had been other occasions when insufficient sample was recovered to perform the full suite of analyses. WRPS responded that the situation had arisen rarely in previous years, but that it had happened on only one sample location at one depth this year. WRPS briefly described that when there is inadequate recovery during a sampling event, another sample is taken immediately below the planned sample depth, and the material recovered from both sampling events is combined into one composite sample. Occasionally, there may also be inadequate material in the composite sample, and if that occurs, the analyses are prioritized.
- **New Topics**:
  - Electrical Issues at 222S Laboratory: 222-S experienced a complete loss of power on June 27, 2011. Partial power was restored to the building on June 28; however, power instability/failures continue to be experienced. All new samples are being diverted to the WSCF laboratory. 222-S personnel trained to work in the WSCF lab perform the sample breakdown and geological description, and then the WSCF laboratory is performing the short holding time and quick turnaround time analysis.

Due to the electrical outage, C8102 samples and organic extracts were outside the temperature storage requirements for 36 to 40 hrs, and 21 holding times associated with C8102 and C8104 have been missed thus far. Three samples for ammonium analyses were not analyzed within 2X holding time. All other samples were analyzed within 2X holding times. Additional holding time analyses are still in jeopardy due to the continued outage. All possible efforts are being made to transfer samples to alternative labs to meet holding times.

- Organics in WMA C Groundwater: The October-December 2010 RCRA Groundwater Monitoring Summary noted the presence of organics (at levels near detection limits) in groundwater near WMA C. As noted in previous discussions, the results are suspect and under investigation. WRPS noted that the detected analytes were at levels below the detection limit used by WSCF, that beginning in December 2010 a different lab with lower detection limits was used, and that if the samples had been analyzed at WSCF, the results would have come back non-detect. Ecology understands that the results are still being evaluated and asked that a follow-up be provided when concerns have been resolved. <ACTION assigned to CHPRC.>

Actions:

- **Refer to the following table.** A date-based numbering system is being used to track the actions to completion. Actions will be removed from the list after ORP and Ecology have agreed to their completion.

Robert W. Lober		8-29-2011
DOE Project Manager (print)	DOE Project Manager (signature)	Date
Jeffery J Lyon		8-25-11
Ecology Project Manager (print)	Ecology Project Manager (signature)	Date

Actions

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
08-11-10-3	Conceptual model for spare inlet overflow – important for C-105	Impact and locations of potential overfill spills should be evaluated near C-101, -105, and -110 and text included in WP.	J. Robertson	Include info in next WP revision	In process.
08-11-10-5	Organic issue and status what has been agreed to on the 5 locations for organics… any TIC data?	1. Provide Ecology with detailed status of organic results to support evaluation of need to continue sampling. Modify WP as appropriate. 2. Provide EPA with copy of Ecology authorization dated 02/11/2011.	J. Robertson	Update WP and SAP to reflect approved process optimization (revision of analyte list).	In process. Ecology authorization of DOE-proposed optimization was granted by Ecology letter 11-NWP-053 on June 1, 2011. Letter also encouraged further optimization of analyte list, increased use of electronic records, and review of data needs and requirements.
08-11-10-8	C-200s proposal for SGE and logging E27-7…	1. Update WP text regarding specific wells to be logged. 2. Evaluate current scope and funding against proposal to place several deep electrode strings/do SGE near C-200 tanks. 3. Locate/review existing paper on C-203 leak.	1. J. Robertson 2. D. Myers, D. Glaser, S. Eberlein, B. Lober 3. D. Glaser, L. Fort	Include info in next WP revision regarding known in-scope changes.	1. In process 2. BCR is being developed to include revised C-200s investigation scope in FY12 planning. 3. <CLOSE> Document was the 200 East Aggregate Area Management Study. It contained no information that would require modification of the newly proposed C-200s investigation.
08-11-10-9	What is planned for E27-23	There is a well on SW side of C Farm near transfer line. Need to investigate a Tc-99 increase. 1. Archive samples from drilling of E27-20 are available for analysis. 2. WRPS and CHPRC to review recent GW data to determine whether additional investigation is advisable.	D. Myers, G. Thomas, M. Barnes	Include info in next WP revision regarding known in-scope changes.	1. BCR is being developed to include retrieval, transport, and analysis of E27-20 archive samples in FY12 planning. 2. WRPS and CHPRC are jointly reviewing available information to develop a recommendation.
08-11-10-11	Status of availability of C-111 push (Site V)	Additional review of tank leak loss information indicates C-111 did not leak; evaporation accounts for losses. Therefore, installation of Site V borehole is unlikely to yield information valuable to the investigation. Site V is being deleted from FY12 planning. Elimination of Site V will be discussed with Tribes in the context of	J. Robertson	Delete Location V from next WP revision.	In process.

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Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
		the leak loss report.			
08-11-10-Q4	Do you want to update the analyte list based on changes to RPP-23403, Rev. 4 (sulfide)?	SST DQO has been modified to remove sulfide. Need to evaluate removal of sulfide from C Farm DQO and if appropriate revise analytes in WP.	J. Robertson	Update WP and SAP to reflect approved process optimization (revision of analyte list).	In process. Ecology authorization of DOE-proposed optimization was granted by Ecology letter 11-NWP-053 on June 1, 2011. Letter also encouraged further optimization of analyte list, increased use of electronic records, and review of data needs and requirements.
10-23-10-1	Detection limits	Evaluate whether detection limits identified in WP are appropriate.	J. Robertson	Revise Se RDL to 0.3 mg/kg in WP and SAP.	In process.
01-27-11-3	Cs at C-105	Evaluate options for additional investigation to gain information about the volume of releases from C-105 and the amount of Cs released. (1) Install temperature probes in drywells (2) Install new angle push borehole near C-105 to intersect postulated plume	H. Sydnor, L. Fort	Possible future WP change.	(1) <CLOSE> WRPS evaluated installation of temp probes in dry wells. At C-105, the Cs would not be expected to travel very far from the tank. Any temp difference caused by a leak would be masked by the greater mass of and heat from Cs still in the tank. (2) Access near C-105 is restricted by retrieval operations. It will not be possible to install a borehole in this vicinity in the next 2 years.
01-27-11-4	Resolution of EPA comments on RFI/CMS work plan	See Attachment A.	See Attachment A.	See Attachment A.	See Attachment A.
04-28-11-1	Method to be used for Cr analysis in bio samples	Email B. Rochette of Ecology to explain the issue and request use of Method 200.8 instead of 6010.	J. Robertson	Update WP Appendix B to reflect method change	Ecology authorized use of the alternative method, Method 200.8, for chromium in the bio samples. WP change is in process.
05-26-11-2	FY12 borehole installation at Site K	Evaluate ability to install borehole to intercept postulated plume at Site K.	H. Sydnor, L. Fort	Possible future work plan change	Evaluation is ongoing. Site is scheduled for GPR scan.
06-23-11-1	BGO probe detection limits for uranium	Identify bismuth-germanium oxide probe detection limits for uranium-235 and -238.	H. Sydnor	None at this time.	<CLOSE> Uranium is reported at 1.0 pCi/g on the KUT log. A direct U-235 gamma tool is approx. 1,000 pCi/g. U-235 has a very weak gamma signal.
06-23-11-2	C-101 retrieval agreement	Convey Ecology expectation that revised C-101 Tank Waste Retrieval Work Plan will	J. Field & D. Glaser	None at this time.	<CLOSE> The HRR leak detection (LD) monitoring method

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Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
		incorporate the minimum detectable leak calculation.			has been shown to be consistently sensitive to releases as low as 2,100 gal (RPP-30121) at a 95% confidence interval, with individual LDs occurring as low as 90 gal. The current well coverage is sufficient for LD requirements at C-101 and is as good or better than coverage provided in the S-102 leak injection test; no additional wells are needed. Therefore, there is no need to incorporate a revised leak calculation in the C-101 TWRWP. A separate white paper has been developed to document the evaluation and conclusions.
06-23-11-3	Cn sources at C Farm	Review available information about Cn contamination in WMA C groundwater and Cn in WMA C tank waste, and evaluate whether there are indications of a specific source location.	J. Field & L. Fort	None at this time	<CLOSE> Tanks C-101, C-108, C-109, and C-112 are all known to have received TFeCN waste and are known to have been overfilled.
06-23-11-4	Uranium in C Farm groundwater	Evaluate levels of uranium contamination in groundwater at WMA C, including E27-7, to determine whether there are any anomalies.	G. Thomas/S. Luttrell	None at this time.	<CLOSE> There does appear to be a slow, upward trend in U concentration in 299-E27-14. However, all values measured at this location are well below background.
07-23-11-1	EPA review of latest SAP revisions	Provide the next draft of the SAP to EPA for informal review as soon as possible. WRPS will continue with work plan redlines in parallel.	J. Robertson	None.	<NEW ACTION>
07-23-11-2	Organic detects in WMA C GW in December 2010	Review positive organic detects from December 2010 at wells 200-E27-4, -15, -21, -22, -23, and -24, and evaluate whether results indicate newly found contamination in GW. PRC will provide a follow up when evaluation of the results is more complete.	G. Thomas/S. Luttrell	None at this time.	<NEW ACTION>

RPP-RPT-53339, Rev A DRAFT

ATTACHMENT A
Open EPA Comments on the WMA C Work Plan
(2 pages)

Background: In December 2010, EPA provided comments on the WMA C RFI/CMS work plan. The table below identifies comments that remain open. Closure of comments not shown below is documented in previous meeting notes.

No.	EPA Comment	Response	Actionee	Status
4.	Section 3.4.1, page 3-30. Please remove the section on EPA anticipated Central Plateau exposure scenarios as we have had no discussion with DOE on exposure scenarios in regard to this document.	EPA will provide replacement text for discussion and incorporation.	J. Robertson	EPA will provide suggested replacement text. On 03/24/2011, WRPS proposed replacement text. On 03/28/2011, EPA accepted the proposed text. Text will be incorporated into next WP revision.
6	Figure 3-7, p 3-15 Needs compass.	Acknowledged.	J. Robertson	Compass will be added to figure, assuming the addition does not present a document clearance and public release issue.
8	Is the Phase II RFI/CMS Report for WMA C still due to Ecology on 12/31/2010? Will this be available to EPA?	Under revised TPA milestone M-45-61, the Phase 2 RFI/CMS report for WMA C is now due to Ecology for review and approval as an Agreement primary document on 12/31/2014. However, baseline planning calls for earlier submittal. The document will be available to EPA.	J. Robertson	The next revision of the work plan will reflect the revised TPA milestone date for M-45-61.
11.	Do holes from direct push investigations lead to preferential flow paths in the future? How many years ago were the first direct push investigations done in WMA C and have they led to channeled infiltration?	Boreholes from direct push investigations do not create preferential flow paths. Boreholes are decommissioned per requirements of Washington Administrative Code (WAC) 173-160. Any exceptions must be reviewed and approved by Ecology as a part of a variance filing process. Direct push investigations at WMA C were initiated in July 2005.	B. Lober	<CLOSE> No text change required. EPA was provided information on borehole decommissioning requirements.
13.	As sampling efforts may have evolved through the execution of this workplan, these are a few specific spots I had questions about: (a) Two valve boxes, located on the south side of C-111 and C-112, are known to have drained directly to soil. Samples taken here? (b) Section 3.2.1, p. 3-6 (d) Anomalous resistivity zone centered around C-104 and a smaller zone around C-108 and C-109. Confirmation sampling done here? (c) Section 3.2.2, p. 3-11 and 3-12 describes Tc^{99} concentration that have "generally	(a) The valve boxes were not identified as a location to investigate during the DQO process: therefore, no samples are planned at C-111 and C-112. (b) Reanalysis of well-to-well resistivity data, implementing recent advancements in analytical capabilities, indicates that the anomaly around C-108 and C-109 was an artifact of having to parse the data to perform the original analysis. The reanalysis also indicated that the anomaly in the vicinity of C-104 is more closely focused on the region near the spare inlet ports on C-101. Direct	WMA C Team	No text change required at this time. **GENERAL ACTION**: Carry additional characterization proposals for consideration. (a) The decision not to sample at the valve boxes is substantiated by the recent results of the reanalysis of SGE data, which found no resistivity anomalies in this area within the detection capability of the SGE system. (b) See initial response. A direct push was installed at Location J in FY2010,

No.	EPA Comment	Response	Actionee	Status
	increased" since the late 1990s and are currently in excess of 2000pCi/L, which "suggests a tank waste source near monitoring well 299-E27-4". Adequate sampling in this area? (d) Section 4.3.2, p. 4-8 (c) Site 200-E-115 Are there plans to use SGE in this area?	push investigation at Sites J and K is intended to provide additional information about the anomalies. (c) The planned investigative work is believed adequate to address the Tc-99 issue. Work at UPRs 81 and 86, which were believed to have been potential sources, indicates these UPRs are not likely to be sources. Well 299-E27-4 is in the vicinity of UPR-200-E-82. To further assess potential vadose zone contribution to the Tc-99 present in groundwater at 299-E27-4, the site will be assessed using 3-D SGE, plus three long 2-D lines in 2011. Numerous direct push sampling holes around this UPR have been advanced; only one of those pushes resulted in a positive analysis for Tc-99, and that hole was an angle push directly beneath the UPR site (radiological concerns precluded a vertical push through the center of the UPR). The SGE survey is intended to assess the distribution of resistivity impacting features. (d) Yes. Investigation at sites H and I is intended to provide information in this vicinity. There is no indication of contamination at these locations with sampling completed thus far. Planning includes conducting SGE surveys in this area after retrievals are complete.		and data will be evaluated as it becomes available. Due to access restrictions, direct push investigation at Location K must be deferred to support tank waste retrieval activities. (c) Continued investigation of possible local sources of Tc-99 contamination in the GW is addressed in Action 08-11-10-9, carried elsewhere in these meeting notes. Additional SGE investigation of UPR-82 found no resistivity anomalies in this area within the detection capability of the SGE system. (d) Direct push investigation at Locations H and I were conducted during FY2010. The data have been entered into the HEIS database and are undergoing final verification and validation.

MEETING NOTES
Waste Management Area C Work Plan Revisions

Meeting Date: August 25, 2011

Location: 2440 Stevens Center Place, Richland

Purpose: Discuss the Status of the Waste Management Area (WMA C) RFI/CMS Investigation and Work Plan.

Attendees:

Heather Anastos (WRPS)	Chris Kemp (ORP)
Mike Barnes (Ecology)	Jeff Lyon (Ecology)
Mike Connelly (WRPS)	Dave Myers (WRPS)
Kathi Dunbar (WRPS)	Julie Robertson (WRPS)
Susan Eberlein (WRPS)	Beth Rochette (Ecology)
Les Fort (WRPS)	Maria Skorska (WRPS)
Dan Glaser (WRPS)	Harold Sydnor (WRPS)

Background: These monthly meetings provide a forum for Ecology and ORP project managers and technical support personnel to review information generated by the WMA C RCRA facility investigation, and to determine whether changes to the characterization plans, the RFI/CMS work plan (RPP-PLAN-39114), and/or the SAP (RPP-RPT-38152) are necessary. These meetings also provide an opportunity for discussion and integration of emerging information about ongoing vadose zone and ground water investigations at and near WMA C. Comments and questions from EPA and Ecology about the WMA C RFI work scope are also discussed at the meetings. Meeting notes are approved by the Ecology and ORP project managers and entered into the Administrative Record. If the parties agree that changes to the Work Plan are appropriate, the *Hanford Federal Facility Agreement and Consent Order* (TPA) change control process will be used to document Work Plan changes.

Discussion and New Topics:

- **Prior meeting notes**: The July 29, 2011 meeting notes were signed by the Ecology Project Manager at the meeting. (The ORP Project Manager signed at a later date.)

- **Status of the Work Plan**: Revisions of the WMA C RFI/CMS work plan and SAP to incorporate previously discussed changes are in progress. A red-lined copy of the SAP was provided to EPA for informal review on August 15, 2011. The provided SAP was a work in progress that incorporates a number of critical changes (e.g., optimization of the analyte list, deletion of Site V), but not all planned sampling scope changes (changes at Site D/the C-200s). The analytical tables have also been completely revised for clarity and to eliminate redundancy.

  Revisions to the work plan are being made in parallel and are almost ready for internal review. Following internal review, a draft of the revised work plan will be provided to Ecology and EPA for informal review.

  The meeting attendees discussed the WMA C characterization schedule contained in Section 6 of the work plan. As a result of FY2012 funding uncertainties, it is difficult to complete redlines of the characterization schedule at this time. The attendees agreed that for the upcoming informal regulator review draft, Section 6 will be updated to include revised activities as discussed in these monthly meetings; however, schedule revisions will be incomplete until project scope and budget are clearly defined.

- **Status of Ongoing Fieldwork**:
  - RPP-PLAN-39114, Rev 1B, Figure 6-1 identifies that in FY 11, four direct push locations will be completed. This commitment is expected to be completed by installing angle push boreholes at the following locations:
    - Location J (near Tank C-104) – Complete
    - Location A (near Tank C-101) – Complete
    - Location B (near Tank C-101) – Complete
    - Location C1 (near Tank C-203) – Mobilization delayed by field conditions.

    Angle push work at Locations A, B, and J is complete, and the boreholes have been decommissioned. At Location C1, installation of a water line in the farm has impacted site access and delayed equipment mobilization. The project anticipates mobilizing the push mode rig by mid-September. Carry over funding is available to complete the work in early FY2012.
  - WRPS is preparing a brief presentation summarizing the SGE investigative work that has been completed at three unplanned release sites at WMA C, 200-E-UPR-81, -82, and -86, and the results of the SGE investigation. The goal of the presentation is to drive evaluation of the need for conducting further investigations in the area of these UPRs. The attendees agreed to find a time in mid-September to go over the presentation. A separate presentation on SGE technology application is being prepared to support an Ecology groundwater meeting to be held at the end of September.
- **Data Status:**
  - The rest of the preliminary results from small mammal sampling near WMA C have been returned and are under review.
  - Borehole quick turn and short hold time data for FY2011 field work continue to be returned from the lab.
- **New Topics**:
  - **Update on Electrical Issues at 222S Laboratory**: The outage at 222-S continued through the month of August, as efforts were underway to diagnose and correct electrical issues. The laboratory anticipates restart on September 6, 2011. Diversion of all new samples to the WSCF laboratory for sample break down and short hold time/quick turn analyses continues. .No additional hold time issues were identified beyond those discussed at the monthly meeting held July 29, 2011.
  - **Commingling of Tc-99 and Co-60 in Subsurface**: Prior to the meeting, Ecology relayed an observation made by a representative of the Nez Perce that there appears to be a correlation between Tc-99 and Co-90 distribution in the vadose zone at the BY cribs at well 299-E33-341. The commenter reasoned that perhaps this correlation might also be present at WMA C. If so, the presence of Co-60 (which is detectable with spectral gamma logging) could be used to inform decisions about where to place additional boreholes at WMA C.

    WRPS provided the results of a review of measured Tc-99 and Co-60 distributions at WMA C borehole C4297. At this location, there does not appear to be a correlation of the distributions of these contaminants. At 40 to 65 ft bgs at C4297, levels of Tc-99 and Co-60 are both elevated; however, at 130 to 160 ft bgs, Tc-99 levels are elevated while Co-60 was not detected.

    WRPS briefly described some of the process history that has impacted the vadose zone near the BY Cribs and pointed out that the BY Cribs are not a suitable analogous site for WMA C. In total, the BY Cribs near well 299-E33-341 received greater than 39 million gallons (~1M gal at B-48, ~1.8M gal at B-49, ~14.2M gal at B-50, and ~22M gal at B-57) of process effluent that contained

Co-60, which has significantly impacted the groundwater. WRPS pointed out that no equivalent releases occurred at WMA C, and that contaminant distributions at the two sites should be expected to be quite different.

WRPS noted that if the waste streams contained both Tc-99 and Co-60, and Co-60 were complexed with organics and/or in the anionic form, it would move with Tc-99 and could be used as a surrogate for Tc-99. However, it was also noted that Co-60 is an activation product. If Cobalt-59 (stable isotope of cobalt) were present, then Co-60 could be formed and found in the soil column regardless of the presence of Tc-99. However, if it is not present in the waste stream, we would not find Co-60. It is possible to have waste streams with Tc-99 and Co-60; it is also possible to have waste streams with Co-60 but little Tc-99, and waste streams with Tc-99 but little Co-60. Therefore, the distribution of Co-60 in the vadose zone is unlikely to be a valid indicator of the distribution of Tc-99 in the vadose zone at WMA C.

Actions:

- **Refer to the following table.** A date-based numbering system is being used to track the actions to completion. Actions will be removed from the list after ORP and Ecology have agreed to their completion.

Robert Lobe		9/22/2011
DOE Project Manager (print)	DOE Project Manager (signature)	Date
Jeffrey James Lyon		9-22-11
Ecology Project Manager (print)	Ecology Project Manager (signature)	Date

Actions

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
08-11-10-3	Conceptual model for spare inlet overflow – important for C-105	Impact and locations of potential overfill spills should be evaluated near C-101, -105, and -110 and text included in WP.	J. Robertson	Include info in next WP revision	In process.
08-11-10-5	Organic issue and status what has been agreed to on the 5 locations for organics… any TIC data?	1. Provide Ecology with detailed status of organic results to support evaluation of need to continue sampling. Modify WP as appropriate. 2. Provide EPA with copy of Ecology authorization dated 02/11/2011.	J. Robertson	Update WP and SAP to reflect approved process optimization (revision of analyte list).	In process. Ecology authorization of DOE-proposed optimization was granted by Ecology letter 11-NWP-053 on June 1, 2011. Letter also encouraged further optimization of analyte list, increased use of electronic records, and review of data needs and requirements.
08-11-10-8	C-200s proposal for SGE and logging E27-7…	1. Revise WP, including line items in Section 6 schedule, to incorporate use of 3D SGE at C-200s. 2. Process BCR to revise scope and funding to place several deep electrode strings and do 3D SGE near C-200 tanks.	1. J. Robertson 2. S. Eberlein, B. Lober	Include info in next WP revision	1. In process. 2. BCR for revised C-200s investigation scope is in review. Scope is included in FY13 planning, but will be pulled back to FY12 if possible.
08-11-10-9	What is planned for E27-23	There is a well on SW side of C Farm near transfer line. Need to investigate a Tc-99 increase. 1. Revise WP to incorporate analysis of archive samples from E27-20. 2. Process BCR to revise scope and funding to analyze samples from E27-20. 3. WRPS and CHPRC to review recent GW data to determine whether additional investigation is advisable.	1. J. Robertson 2. S. Eberlein, B. Lober 3. D. Myers, G. Thomas, M. Barnes	Include info in next WP revision	1. In process. 2. BCR including analysis of E27-20 archive samples is in review. Scope is included in FY13 planning, but will be pulled back to FY12 if possible. 3. WRPS and CHPRC are jointly reviewing available information to develop a recommendation.
08-11-10-11	Status of availability of C-111 push (Site V)	Additional review of tank leak loss information indicates C-111 did not leak; evaporation accounts for losses. Therefore, installation of Site V borehole is unlikely to yield information valuable to the investigation. Site V is being deleted from FY12 planning. Elimination of Site V will be discussed with Tribes in the context of the leak loss report.	J. Robertson	Delete Location V from next WP revision.	In process.
08-11-10-Q4	Do you want to update the analyte list based on changes to RPP-23403,	SST DQO has been modified to remove sulfide. Need to evaluate removal of sulfide from C Farm DQO and if	J. Robertson	Update WP and SAP to reflect approved	In process. Ecology authorization of DOE-proposed optimization was granted by Ecology letter 11-NWP-

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T-90

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
	Rev. 4 (sulfide)?	appropriate revise analytes in WP.		process optimization (revision of analyte list).	053 on June 1, 2011. Letter also encouraged further optimization of analyte list, increased use of electronic records, and review of data needs and requirements.
10-23-10-1	Detection limits	Evaluate whether detection limits identified in WP are appropriate.	J. Robertson	Revise Se RDL to 0.3 mg/kg in WP and SAP.	In process.
01-27-11-3	Cs at C-105	Revise WP to incorporate discussion of need for information about the volume of releases from C-105 and the amount of Cs released. May need to install new angle push borehole near C-105 to intersect postulated plume. However, access near C-105 is restricted by retrieval ops; thus, it will not be possible to install a borehole in this vicinity in the next 2 years	J. Robertson	Include info in next WP revision	In process.
01-27-11-4	Resolution of EPA comments on RFI/CMS work plan	See Attachment A.	See Attachment A.	See Attachment A.	See Attachment A.
04-28-11-1	Method to be used for Cr analysis in bio samples	Email B. Rochette of Ecology to explain the issue and request use of Method 200.8 instead of 6010.	J. Robertson	Update WP Appendix B to reflect method change	Ecology authorized use of the alternative method, Method 200.8, for chromium in the bio samples. WP change is in process.
05-26-11-2	FY12 borehole installation at Site K	Evaluate ability to install borehole to intercept postulated plume at Site K.	H. Sydnor, L. Fort	Possible future work plan change	Evaluation is ongoing. Site is scheduled for GPR scan in Sept 2011.
07-23-11-1	EPA review of latest SAP revisions	Provide the next draft of the SAP to EPA for informal review as soon as possible. WRPS will continue with work plan redlines in parallel.	J. Robertson	None.	**<CLOSE>** EPA was provided a redline of the SAP on 8/15/2011.
07-23-11-2	Organic detects in WMA C GW in December 2010	Review positive organic detects from December 2010 at wells 200-E27-4, -15, -21, -22, -23, and -24, and evaluate whether results indicate newly found contamination in GW. PRC will provide a follow up when evaluation of the results is more complete.	G. Thomas/S. Luttrell	None at this time.	Beginning in December 2010, organic analyses were performed by a lab with lower detection limits than the lab previously used (WSCF). Had WSCF performed the analyses, the results likely would have been non-detect. The reported values were at or near the new lab's detection limits. PRC is continuing to evaluate the results.

ATTACHMENT A
Open EPA Comments on the WMA C Work Plan
(2 pages)

Background: In December 2010, EPA provided comments on the WMA C RFI/CMS work plan. The table below identifies comments that remain open. Closure of comments not shown below is documented in previous meeting notes.

No.	EPA Comment	Response	Actionee	Status
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6	Figure 3-7, p 3-15 Needs compass.	Acknowledged.	J. Robertson	Compass will be added to figure, assuming the addition does not present a document clearance and public release issue.
8	Is the Phase II RFI/CMS Report for WMA C still due to Ecology on 12/31/2010? Will this be available to EPA?	Under revised TPA milestone M-45-61, the Phase 2 RFI/CMS report for WMA C is now due to Ecology for review and approval as an Agreement primary document on 12/31/2014. However, baseline planning calls for earlier submittal. The document will be available to EPA.	J. Robertson	The next revision of the work plan will reflect the revised TPA milestone date for M-45-61.
13.	As sampling efforts may have evolved through the execution of this workplan, these are a few specific spots I had questions about: (a) Two valve boxes, located on the south side of C-111 and C-112, are known to have drained directly to soil. Samples taken here? (b) Section 3.2.1, p. 3-6 (d) Anomalous resistivity zone centered around C-104 and a smaller zone around C-108 and C-109. Confirmation sampling done here? (c) Section 3.2.2, p. 3-11 and 3-12 describes Tc^{99} concentration that have "generally increased" since the late 1990s and are currently in excess of 2000pCi/L, which "suggests a tank waste source near monitoring well 299-E27-4". Adequate sampling in this area? (d) Section 4.3.2, p. 4-8 (c) Site 200-E-115 Are there plans to use SGE in this area?	(a) The valve boxes were not identified as a location to investigate during the DQO process: therefore, no samples are planned at C-111 and C-112. (b) Reanalysis of well-to-well resistivity data, implementing recent advancements in analytical capabilities, indicates that the anomaly around C-108 and C-109 was an artifact of having to parse the data to perform the original analysis. The reanalysis also indicated that the anomaly in the vicinity of C-104 is more closely focused on the region near the spare inlet ports on C-101. Direct push investigation at Sites J and K is intended to provide additional information about the anomalies. (c) The planned investigative work is believed adequate to address the Tc-99 issue. Work at UPRs 81 and 86, which were believed to have been potential sources, indicates these UPRs are not likely to be sources.	WMA C Team	No text change required at this time. **GENERAL ACTION**: Carry additional characterization proposals for consideration. (a) The decision not to sample at the valve boxes is substantiated by the recent results of the reanalysis of SGE data, which found no resistivity anomalies in this area within the detection capability of the SGE system. (b) See initial response. A direct push was installed at Location J in FY2010, and data will be evaluated as it becomes available. Due to access restrictions, direct push investigation at Location K must be deferred to support tank waste retrieval activities. (c) Continued investigation of possible local sources of Tc-99 contamination in the GW is addressed in Action 08-

No.	EPA Comment	Response	Actionee	Status
		Well 299-E27-4 is in the vicinity of UPR-200-E-82. To further assess potential vadose zone contribution to the Tc-99 present in groundwater at 299-E27-4, the site will be assessed using 3-D SGE, plus three long 2-D lines in 2011. Numerous direct push sampling holes around this UPR have been advanced; only one of those pushes resulted in a positive analysis for Tc-99, and that hole was an angle push directly beneath the UPR site (radiological concerns precluded a vertical push through the center of the UPR). The SGE survey is intended to assess the distribution of resistivity impacting features. (d) Yes. Investigation at sites H and I is intended to provide information in this vicinity. There is no indication of contamination at these locations with sampling completed thus far. Planning includes conducting SGE surveys in this area after retrievals are complete.		11-10-9, carried elsewhere in these meeting notes. Additional SGE investigation of UPR-82 found no resistivity anomalies in this area within the detection capability of the SGE system. (d) Direct push investigation at Locations H and I were conducted during FY2010. The data have been entered into the HEIS database and are undergoing final verification and validation.

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MEETING NOTES
Waste Management Area C Work Plan Revisions

Meeting Date: September 22, 2011

Location: 2440 Stevens Center Place, Richland

Purpose: Discuss the Status of the Waste Management Area (WMA C) RFI/CMS Investigation and Work Plan.

Attendees:

Heather Anastos (WRPS)	Dan Glaser (WRPS)
Mike Barnes (Ecology)	Bob Lober (ORP)
Marcel Bergeron (WRPS)	Dave Myers (WRPS)
Mike Connelly (WRPS)	Julie Robertson (WRPS)
Susan Eberlein (WRPS)	Maria Skorska (WRPS)
Jim Field (WRPS)	Harold Sydnor (WRPS)
Les Fort (WRPS)	Cynthia Tabor (WRPS)

Background: These monthly meetings provide a forum for Ecology and ORP project managers and technical support personnel to review information generated by the WMA C RCRA facility investigation, and to determine whether changes to the characterization plans, the RFI/CMS work plan (RPP-PLAN-39114), and/or the SAP (RPP-RPT-38152) are necessary. These meetings also provide an opportunity for discussion and integration of emerging information about ongoing vadose zone and ground water investigations at and near WMA C. Comments and questions from EPA and Ecology about the WMA C RFI work scope are also discussed at the meetings. Meeting notes are approved by the Ecology and ORP project managers and entered into the Administrative Record. If the parties agree that changes to the Work Plan are appropriate, the *Hanford Federal Facility Agreement and Consent Order* (TPA) change control process will be used to document Work Plan changes.

Discussion and New Topics:

- **Prior meeting notes**: The August 25, 2011 meeting notes were signed by the ORP Project Manager at the meeting. (The Ecology Project Manager signed later the same day.)

- **Status of the Work Plan**: Revisions of the WMA C RFI/CMS work plan and SAP to incorporate previously discussed changes are in progress. An interim draft of the red-lined SAP was provided to EPA for informal review on August 15, 2011. This version incorporated a number of critical changes (e.g., optimization of the analyte list, deletion of Site V), but not all planned sampling scope changes (changes at Site D/the C-200s). In addition, the analytical tables were revised for clarity and to eliminate redundancy.

  WRPS handed out a proposed revision to the WMA C sampling summary table that appears in both the SAP and work plan, and the attendees discussed the proposed changes. A version of the sampling summary table that incorporates changes made as a result of this meeting is provided as Attachment A to these meeting notes, along with information describing the bases for the proposed changes. This information was discussed at this meeting, and inclusion of the information in these meeting notes does not constitute formal approval of the proposed changes by the Project Managers.

- **Status of Ongoing Fieldwork**:

  - RPP-PLAN-39114, Rev 1B, Figure 6-1 identifies that in FY 11, four direct push locations will be completed. This commitment is expected to be completed by installing angle push boreholes at the following locations:

    - Location J (near Tank C-104) – Complete
    - Location A (near Tank C-101) – Complete
    - Location B (near Tank C-101) – Complete
    - Location C1 (near Tank C-203) – Mobilization delayed by field conditions.

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Angle push work at Locations A, B, and J is complete, and the boreholes have been decommissioned. At Location C1, the logging borehole has been pushed, and installation of a depth electrode, selection of sampling depths, and borehole decommissioning will follow. Carry over funding is available to complete the installation of the C1 sampling borehole in early FY2012 and to complete soil analyses.

- Several of the attendees participated in a September 12, 2011 briefing that summarized the SGE investigative work that has been completed at three unplanned release sites at WMA C, 200-E-UPR-81, -82, and -86. A key message relayed during the briefing was that the results of the SGE investigations at these sites correlate well with soil sample results for moisture content, nitrate, and Tc-99. Areas that lacked SGE anomalies generally also lacked analytical evidence of impacts from releases of tank waste. A separate presentation on SGE technology application was on the agenda for an Ecology groundwater meeting on September 21, 2011.

- **Data Status:** Nothing new to report.

- **New Topics**:

  - **Update on 222S Laboratory Availability**: The laboratory is operating normally, and samples are being returned from WSCF to 222-S for analysis. Analyses will be completed with carry over funding in fiscal year 2012.

  - **Clarification of Meeting Notes from July 29, 2011**: Ecology requested that clarification be entered into the administrative record regarding two items from the July 29, 2011 meeting notes: proposed modification of the investigation at the C-200 series tanks, and conclusions made from the results of the SGE investigation at Site Q (UPR-82/cesium pile). At the C-200's, the revised investigation scope will consist of completing work at Site C1, installing four additional direct push logging boreholes and equipping them with depth electrodes prior to decommissioning, conducting an SGE investigation, then following up with installation of direct push sampling boreholes as appropriate based on SGE results. Regarding the work at Site Q, the notes from the July 29, 2011 meeting indicated that a conclusion was drawn from the SGE investigation that there is no indication of a continuing source of groundwater contamination from UPR-82. It is more accurate to replace that statement with a conclusion that the SGE investigation showed no indication of a major source of vadose zone contamination from UPR 82.

  - **Cobalt Scavenging Information**: Ecology brought document WHC-SD-EN-TA-003, Rev. 0, *Potential for Groundwater Contamination from High Density Wastes Disposed to the BY Cribs, 200-BP-1 CERCLA Operable Unit*, to the group's attention. The document discusses the TBP scavenging process and associated discharges to the BY cribs in 1954 and 1955, as they relate to the detection of cobalt in groundwater.

  - **Future Meetings**: As a result of funding constraints in fiscal year 2012, future meetings of this group will be cancelled.

Actions:

- **Refer to the following table.** A date-based numbering system is being used to track the actions to completion. Actions will be removed from the list after ORP and Ecology have agreed to their completion.

Robert W. Lober		11-9-2011
DOE Project Manager (print)	DOE Project Manager (signature)	Date
Jeffery S. Lyon		11-9-11
Ecology Project Manager (print)	Ecology Project Manager (signature)	Date

Actions (2 sheets)

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
08-11-10-3	Conceptual model for spare inlet overflow – important for C-105	Impact and locations of potential overfill spills should be evaluated near C-101, -105, and -110 and text included in WP.	J. Robertson	Include info in next WP revision	In process. Discussion of overfill/cascade line spills associated with C-101, C-105, and C-110 have been added to conceptual model discussions in Sections 4.4.1 and 4.4.4 as appropriate.
08-11-10-5	Organic issue and status what has been agreed to on the 5 locations for organics... any TIC data?	1. Provide Ecology with detailed status of organic results to support evaluation of need to continue sampling. Modify WP as appropriate. 2. Provide EPA with copy of Ecology authorization dated 02/11/2011.	J. Robertson	Update WP and SAP to reflect approved process optimization (revision of analyte list).	In process. Ecology authorization of DOE-proposed optimization was granted by Ecology letter 11-NWP-053 on June 1, 2011. Letter also encouraged further optimization of analyte list, increased use of electronic records, and review of data needs and requirements.
08-11-10-8	C-200s proposal for SGE and logging E27-7...	1. Revise WP, including line items in Section 6 schedule, to incorporate use of 3D SGE at C-200s. 2. Process BCR to revise scope and funding to place several deep electrode strings and do 3D SGE near C-200 tanks.	1. J. Robertson 2. S. Eberlein, B. Lober	Include info in next WP revision	1. In process. 2. BCR for revised C-200s investigation scope has been submitted to ORP. Scope is included in FY13 planning, but will be pulled back to FY12 if possible.
08-11-10-9	What is planned for E27-23	There is a well on SW side of C Farm near transfer line. Need to investigate a Tc-99 increase. 1. Revise WP to incorporate analysis of archive samples from E27-20. 2. Process BCR to revise scope and funding to analyze samples from E27-20. 3. WRPS and CHPRC to review recent GW data to determine whether additional investigation is advisable.	1. J. Robertson 2. S. Eberlein, B. Lober 3. D. Myers, G. Thomas, M. Barnes	Include info in next WP revision	1. In process. 2. BCR including analysis of E27-20 archive samples has been submitted to ORP. Scope is included in FY13 planning, but will be pulled back to FY12 if possible. 3. WRPS and CHPRC are jointly reviewing available information to develop a recommendation.
08-11-10-11	Status of availability of C-111 push (Site V)	Additional review of tank leak loss information indicates C-111 did not leak; evaporation accounts for losses. Therefore, installation of Site V borehole is unlikely to yield information valuable to the investigation. Site V is being deleted from FY12 planning. Elimination of Site V will be discussed with Tribes in the context of the leak loss report.	J. Robertson	Delete Location V from next WP revision.	In process.

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Actions (2 sheets)

Item No.	Topic for Consideration	Action required	Actionee	Impact on WP	Status
08-11-10-Q4	Do you want to update the analyte list based on changes to RPP-23403, Rev. 4 (sulfide)?	SST DQO has been modified to remove sulfide. Need to evaluate removal of sulfide from C Farm DQO and if appropriate revise analytes in WP.	J. Robertson	Update WP and SAP to reflect approved process optimization (revision of analyte list).	In process. Ecology authorization of DOE-proposed optimization was granted by Ecology letter 11-NWP-053 on June 1, 2011. Letter also encouraged further optimization of analyte list, increased use of electronic records, and review of data needs and requirements.
10-23-10-1	Detection limits	Evaluate whether detection limits identified in WP are appropriate.	J. Robertson	Revise Se RDL to 0.3 mg/kg in WP and SAP.	In process.
01-27-11-3	Cs at C-105	Revise WP to incorporate need for information about the nature and extent of releases from C-105. Add installation of new push borehole near C-105 to intersect postulated plume. Acknowledge access restrictions resulting from retrieval operations.	J. Robertson	Include info in next WP revision	In process.
01-27-11-4	Resolution of EPA comments on RFI/CMS work plan	See Attachment B.	See Attachment B.	See Attachment B.	See Attachment B.
04-28-11-1	Method to be used for Cr analysis in bio samples	Email B. Rochette of Ecology to explain the issue and request use of Method 200.8 instead of 6010.	J. Robertson	Update WP Appendix B to reflect method change	Ecology authorized use of the alternative method, Method 200.8, for chromium in the bio samples. WP change is in process.
05-26-11-2	FY12 borehole installation at Site K	Re-evaluate need for installation of borehole to intercept postulated plume at Site K.	H. Sydnor, L. Fort	Include results of evaluation in next WP revision	Site scanned by GPR in Sept 2011, but results are not yet available. Site is highly congested with infrastructure and C-112 retrieval preparations. Leak loss studies indicate tank losses were likely due to cascade line leaks. Recommend deleting Site K direct push; site access is extremely poor, and the location is unlikely to yield information that will influence cleanup decisions.
07-23-11-2	Organic detects in WMA C GW in December 2010	Review positive organic detects from December 2010 at wells 200-E27-4, -15, -21, -22, -23, and -24, and evaluate whether results indicate newly found contamination in GW. PRC will provide a follow up when evaluation of the results is more complete.	G Thomas, S. Luttrell	None at this time.	Beginning in December 2010, organic analyses were performed by a lab with lower detection limits than the lab previously used (WSCF). Had WSCF performed the analyses, the results likely would have been non-detect. The reported values were at or near the new lab's detection limits. PRC is continuing to evaluate the results.

ATTACHMENT A
WMA C Sampling Summary Table and Description of Proposed Changes
(7 pages)

Draft Rev. 2 Changes to Table ES-1. Sample Plan WMA C Phase 2 Characterization for RFI/CMS (4 sheets)

Map Design. Site	Group[a]	Location	Deployment	Number of Sampling Direct Pushes	Average Number of Samples[c]	Known or Suspected Event	Objective	Access Availability	Ecology/ Stakeholder Interest	Status as of October 2011
A	G3	Spare inlet 241-C-101	Direct push, slant	1-2	8	Tank over fill. Loss through spare inlet	Characterize C-101 release and refine conceptual models 1, 2, and 4	Fair	High	Sampled in FY2011
B	G2	241-C-101, south side	Direct push, vertical or slant	1	8	Tank release	Characterize C-101 release and refine conceptual models 1 and 2	Good	High	Sampled in FY2011
C	G4	241-C-203 and 200-UPR-E-137	(1) Direct push, slant (2) 4 adjacent vertical direct pushes at Sites C and D combined to support placement of deep electrodes for 3D SGE; (3) Direct push slant, depending on SGE results[b]	1 or more, based on SGE results	8	Tank leak and/or tank over fill. Loss through spare inlet	Determine if C-200s actually leaked and refine conceptual models 1, 2, and 4	Fair	Moderate to high	One borehole in progress FY2011; SGE planned in 2013; additional sampling dependent on SGE results.
D	G4	241-C-201 241-C-202 241-C-204	(1) 4 adjacent vertical direct pushes at Sites C and D combined to support placement of deep electrodes for 3D SGE; (2) Direct push, slant, depending on SGE results[b]	TBD based on SGE results	8	200 series tank leaks	Determine if C-200s actually leaked and refine conceptual models 1, 2, and 4	Fair	Moderate, depending on C-203 results	SGE planned in 2013; sampling dependent on SGE results
E	G2	Between 241-C-106 and 200-C-109	Direct push, vertical	1	8	Suspected release	Assess ^{60}Co and refine conceptual models 1, 2, and 4	Fair	High	Sampled in FY2010
F	G2	Bldg C-801 chemical drain	Direct push, vertical	1	8	Suspected release site	Assess release of PUREX waste, ^{137}Cs and ^{99}Tc, and ^{60}Co and refine conceptual models 1, 2, and 4	Good	Moderate to high	Sampled in FY2010

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ATTACHMENT A
WMA C Sampling Summary Table and Description of Proposed Changes
(7 pages)

Draft Rev. 2 Changes to Table ES-1. Sample Plan WMA C Phase 2 Characterization for RFI/CMS (4 sheets)

G	G2	Between Bldg C-801 and 241-C-103	Direct push, vertical	1	8	Suspected transfer line release site	Assess release and ^{60}Co and refine conceptual models 1, 2, and 4	Good	High	Sampled in FY2009
H	G5	Northeast side of E-91	Direct push, vertical	1	8	Surface release	Surface exposures and assess ^{60}Co and surface release conceptual Model	Good	High	Sampled in FY2010
I	G5	Northeast side of E-115	Direct push, vertical or slant	1	8	Surface release	Surface exposures and assess ^{60}Co and surface release conceptual model, refine conceptual models 1, 2, and 4	Good	High	Sampled in FY2010
J	G3	241-C-104	Direct push, slant	1	8	Tank release	Assess suspected release and refine conceptual models 1, 2, and 4	Fair	High	Sampled in FY2011
K	G2	241-C-108	Direct push, vertical or slant	1	8	Transfer line leak, hot dry well (08-02)	Assess suspected release and refine conceptual models 1, 2, and 4	Poor due to retrieval operations	High	Deleted
L	G2	241-C-103 and 241-C-106	Drywell logging and direct push, vertical	2	8	Potential transfer line leak and tank over fill	Update logging data for ^{60}Co, ^{137}Cs, uranium, and moisture and assess potential release and refine conceptual models 1, 2, and 4	Fair	Moderate	All drywells logged with SGLS; 73% moisture logged in FY2009 through FY2011. Sampled in FY2009 and FY2010
M	G7	241-C-104, 108, 109, 110, 111, and 112	Drywell logging	N/A	N/A		Update logging data for ^{60}Co, ^{137}Cs, uranium, and moisture	Fair to good	Moderate	44% of drywells logged with SGLS; 67% moisture logged in FY2009 through FY2011. Discontinue further logging.
N	G8	UPR-86, UPR-82 and UPR-81	SGE	N/A	N/A		Test SGE, define plume at unplanned releases (UPR)-82 and -86; refine conceptual models 1, 2, and 4	Good	High	SGE work completed FY2009 through FY2011

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ATTACHMENT A
WMA C Sampling Summary Table and Description of Proposed Changes
(7 pages)

Draft Rev. 2 Changes to Table ES-1. Sample Plan WMA C Phase 2 Characterization for RFI/CMS (4 sheets)

O	G9	WMA C	SGE	N/A	N/A		3-D vision of suspected releases – may lead to supplemental sample locations	Good	High	Reanalysis of well-to-well data completed in FY2011. Additional SGE to be deployed selectively (e.g., at sites C/D).
P	G1	UPR-81	Balance of direct pushes to complete characterization	3	8	Known release site	Characterize release and refine conceptual models 1, 2, and 4	Good	High	Sampled in FY2009
Q	G6	UPR-82	(1) 4 adjacent direct pushes to support placement of strings of deep electrodes for 3D SGE per Map Design. Site N; (2) Direct push through center depending on SGE results[b]	1	8	Known release site	Test SGE: resolve depth with deep electrodes; define plume at UPR-82; refine conceptual models 1, 2, and 4	Poor due to shotcrete cover	High	SGE completed in FY 2011; direct push through center deleted.
R	G2	241-C-301 Catch Tank	Direct push vertical	1	8	Unlined concrete catch tank	Assess potential catch tank release and refine conceptual models 1, 2, and 4	Good	Moderate to high	Sampled in FY2010
S	G5	UPR-72 and C-8 Drain	Direct push vertical	1	8	Buried radioactive material and French drain from 241 CR Building are in this area	Assess presence of buried material and potential releases to C-8 drain. Assess possibility of lateral migration from source at C-101. Refine conceptual models 1, 2, and 4.	Good	Moderate to high	Deleted
T	TBD	TBD, based on SGE data for entire WMA	TBD, direct push vertical and/or slant	TBD	TBD	Previously unknown release sites	TBD	TBD	Moderate to high	Sampling dependent on SGE results
U	G3	C-110	Direct push, slant or vertical	1	8	Tank leak and/or tank over fill. Loss through spare inlet	Characterize C-110 release and conceptual models 1, 2, and 4	Fair	High	Sampled in FY2010

RPP-RPT-58339, Rev. A DRAFT

ATTACHMENT A
WMA C Sampling Summary Table and Description of Proposed Changes
(7 pages)

Draft Rev. 2 Changes to Table ES-1. Sample Plan WMA C Phase 2 Characterization for RFI/CMS (4 sheets)

V	G2	C-111	Direct push vertical	1	8	Tank leak and/or tank overfill. Loss through spare inlet	Characterize C-111 release and conceptual models 1, 2, and 4	Good	High	Deleted
W	G9	299-E27-4, 299-E27-12, 299-E27-13, 299-E27-14, 299-E27-15	Log groundwater monitoring wells outside of WMA C	N/A	N/A		Log wells to collect data on U, ^{60}Co, ^{137}Cs, and moisture	Poor	High	Logging data found for 299-E27-4 and -14. Logging of 299-E27-12, -13, and -15 deleted
299-E27-20	TBD	Well 299-E27-20, adjacent to 299-E27-23	Analysis of archived soil samples	N/A	4	Previously unknown release site	Assess presence of potential release (^{99}Tc) to soil column impacting groundwater and conceptual models 1, 2, and 4	N/A	Moderate to high	Planned for 2013
X	TBD	C-105	Direct push, slant	1	8	Cascade line leak. Possible tank leak and/or tank over fill.	Investigate extent of high activity (10^7 pCi/g) ^{137}Cs plume in drywell 30-05-07 near tank C-105 and refine conceptual models 1, 2, and 4	Fair	Moderate to high	Planned for 2013

[a] Group refers to the expected work package associated with the characterization effort broadly defined as follows:

G1 = Direct push at UPR-81 (covered by existing work package).
G2 = Vertical direct pushes at nine investigative sites around the 100-series SSTs.
G3 = Slant direct pushes at three investigative sites around the 100-series SSTs.
G4 = Slant direct push at the C-200 Series tanks.
G5 = Outside the WMA, vertical direct push at the investigative sites.
G6 = Vertical direct push through gunite at UPR-82.
G7 = Drywell logging at select dry wells.
G8 = Three separate SGE areas at the following locations: UPR-81, UPR-82, and UPR-86.
G9 = Deploy SGE at WMA C taking into account the results from testing at site N.

[b] Sampling design details for Map Design. Sites D and Q and for future work at site C are applicable only to probe holes installed for sampling. Additional probe holes will be placed to support logging/electrode placement.

[c] Value includes one surface sample.

FY = fiscal year N/A = Not Applicable SGE = surface geophysical exploration TBD = to be determined UPR = unplanned release site
WMA = Waste Management Area

I-101

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ATTACHMENT A
WMA C Sampling Summary Table and Description of Proposed Changes
(7 pages)

Summary of WMA C Sites Where Characterization Required by Work Plan Revision 1A Is Complete

Map Site	Location	Scope
A	C-101	Direct Push
B	C-101	Direct Push
E	between C-106 and C-109	Direct Push
F	Bldg C-801 chemical drain	Direct Push
G	Between Bldg C-801 and 241-C-103	Direct Push
H	NE side of E-91	Direct Push
I	NE side of E-115	Direct Push
J	C-104	Direct Push
N	UPRs 81, 82, 86	SGE
P	UPR-81	Direct Push
R	C-301 catch tank	Direct Push
U	C-110	Direct Push

Summary of Characterization Work Proposed for Modification by Work Plan Revision 2 (3 sheets)

Map Site	Location	Scope Change	Discussion
C	C-203	Rev. 1A: 3 slant direct push Rev 2: 1 slant sampling direct push; 4 vertical direct pushes for electrode installation; 3-D SGE using all 5 holes.	Evaluation of leak loss information and results from completed fieldwork indicates that installation of slant boreholes as initially planned may not provide information valuable to the RFI effort. Instead, depth electrodes will be installed in 5 new boreholes to support the conduct of a 3-D SGE study to identify anomalies in the vadose zone. Results of the SGE deployment will be evaluated with available soil analytical information to determine whether there is a need for subsequent borehole installation and soil investigation.
D	C-201, 202, 204	Rev. 1A: slant direct push Rev 2: C-200s SGE; additional direct push at later date based on SGE results	
K	C-108	Rev. 1A: Direct push Rev 2: Delete	Site was selected to assess a suspected transfer line release and elevated Co-60 in drywell 08-02. Evaluation of available information indicates there were multiple leaks from the cascade line between C-108 and C-109 during operations. The extent of the resulting plume has been previously defined by the presence of Co-60 in drywells. The Co-60 associated with this plume has now decayed to below SGLS detection limit. Given the timing, content, and likely quantity of the releases, as well as results available from sampling at nearby Site E, sampling at Site K would likely confirm that there was a release at this location and that mobile contaminants (e.g., Tc-99) have migrated deep into the vadose zone. Sampling at Site K is unlikely to yield additional results of value to the RFI investigation (that will influence cleanup decisions). Additionally, the location is highly congested with infrastructure and C-112 retrieval preparations. Access is extremely poor and will remain so until retrieval operations are complete.

ATTACHMENT A
WMA C Sampling Summary Table and Description of Proposed Changes
(7 pages)

Summary of Characterization Work Proposed for Modification by Work Plan Revision 2 (3 sheets)

Map Site	Location	Scope Change	Discussion
L	C-103 & C-106	Rev. 1A: Drywell logging and direct push Rev 2: Conduct no additional drywell logging driven solely by the RFI effort.	The majority of the dry wells associated with these tanks have been logged for the RFI using SGLS and/or neutron probe (moisture). Additional logging was completed to support retrievals, and logging to support retrievals/TWRWPs will continue into the future. Drywells logged to date show no significant change in gamma or spectral gamma from previous loggings. Co-60 has generally decayed to below SGLS detection limit. Continued logging is unlikely to yield information of value to the investigation and final cleanup decision. Logging performed to support retrievals will be considered in the RFI report.
M	C-104, 108, 109, 110, 111, 112	Rev. 1A: Drywell logging Rev 2: Conduct no additional drywell logging driven solely by the RFI effort.	
O	Whole of WMA C	Rev. 1A: SGE across entire farm Rev 2: Delete inclusion of whole farm SGE as a part of the RFI.	Reanalysis of farm-wide well-to-well data was completed in FY2011. Additional SGE will be deployed selectively during the RFI, as appropriate based on available analytical data and reassessment of historic information (e.g., at sites C/D). SGE may also be applied post-CMS to support final closure configuration and post-closure monitoring needs.
Q	UPR-82	Rev. 1A: direct push to support 3D SGE, then direct push through cap for sampling Rev 2: SGE complete; delete direct push through cap, which was to be pushed depending on SGE results	A wealth of SGE information and soil samples have been obtained to document the nature and extent of the release at this site. These results indicate no significant remaining moisture, Tc-99 or nitrate anomalies at UPR-82. However, notably elevated Cs-137 remains beneath the shotcrete cap, based on sampling of an angle push hole under the cap. As documented in RPP-14430, Rev. 0, Appendix F, high levels of Cs-137 were present in the soil at the site of the UPR-82 cap, based on historic sampling. Drilling through and sampling beneath the cap would result in personnel exposure to and dose from high levels of Cs-137 expected to be present. Additionally, sampling at this location is unlikely to yield information of value to the investigation and final cleanup decision.
S	UPR-72 and C-8 Drain	Rev. 1A: Direct push Rev 2: Delete	Sampling at Site S was proposed to assess contamination from releases to this location, and to evaluate the potential that contamination migrated toward this area as a result of releases from C-101 (conceptual model 2). Evaluation of waste discharge records indicate only low levels of Co-60 were discharged to the C-8 drain. Based on SGLS logging results, such low levels of Co-60 have already decayed to below detection levels. Sampling at Site S would almost certainly show that mobile contaminants at this site have migrated deep into the vadose zone. Recent evaluations indicate that losses from C-101 were likely from spare inlet or cascade line overflow, rather than from a tank leak. The Site B angle push hole was placed between C-101 and Site S. Low moisture, and little to no gamma activity, Tc-99, or nitrate were measured at Site B. Somewhat higher mobile contaminant concentrations were measured deep in the vadose zone. It is unlikely that direct push investigation at Site S would definitively show or indicate if waste did migrate from C-101, or would provide information valuable to final cleanup decisions.

RPP-RPT-58339, Rev. A DRAFT

ATTACHMENT A
WMA C Sampling Summary Table and Description of Proposed Changes
(7 pages)

Summary of Characterization Work Proposed for Modification by Work Plan Revision 2 (3 sheets)

Map Site	Location	Scope Change	Discussion
T	Whole of WMA C	Rev. 1A: TBD direct push based on whole farm SGE work Rev 2: Delete non-site-specific direct push holes from the scope of the RFI.	Site T was included in the scope of the RFI as an outcome of Site O, the conduct of whole-farm SGE, which is being deleted as part of the RFI scope. Based on Phase 2 characterization work completed to date, additional site-specific direct push work has been identified and added to the RFI scope. If additional direct push work is deemed necessary to support the RFI, such work will be incorporated into a future revision of the work plan. Direct push work may also be performed post-CMS to support final closure configuration and post-closure monitoring needs.
V	C-111	Rev. 1A: Direct push Rev 2: Delete	Leak assessment evaluation determined tank waste losses are explained by evaporation rather than by loss to soil column. Site unlikely to yield information valuable to the RFI and final cleanup decision.
W	GW monitoring wells	Rev. 1A: GW well logging Rev 2: Delete	All but 3 GW wells have been logged. Logging at final 3 wells is unlikely to yield information of value to the investigation and final cleanup decision. Additionally, unforeseen access issues have arisen, because existing downhole equipment (e.g., pumps required for routine groundwater monitoring) interfere with the installation of logging equipment.
299-E27-20	Adjacent to GW well E27-23, which contains Tc-99	Rev. 1A: N/A Rev 2: Analyze archive samples	Need to assess presence of potential release (Tc-99) to soil column impacting groundwater. A positive finding of Tc-99 in the archive samples may result in a need for additional follow-on investigation.
X	C-105	Rev. 1A: N/A Rev. 2: Slant direct push	A borehole would be pushed to intercept a postulated plume originating from C-105. A high activity Cs-137 plume has been identified in drywell 30-05-07. Plume is currently assumed to be small because it was detected in only one drywell and nearby in direct push hole C7469, and because geophysical theory suggests that Cs-137 would be expected to migrate about the same horizontal distance in all directions in the soil. The assumption that the plume is small seems to be supported by the observation that high activity Cs-137 has not been detected to date in any of the other drywells or in borehole C4297 that were installed to investigate the extent of the C-105 plume. However, another possibility is that a tank leak (either through a cascade/spare inlet line overfill release or tank liner breach) may have migrated from a point of release below the tank, may be much larger than assumed, and may be the source of Co-60 activity in drywells between tank C-105 and tank C-103 and northeast of tank C-103.

RPP-RPT-58339, Rev. 0, DRAFT

ATTACHMENT B
Open EPA Comments on the WMA C Work Plan
(2 pages)

Background: In December 2010, EPA provided comments on the WMA C RFI/CMS work plan. The table below identifies comments that remain open. Closure of comments not shown below is documented in previous meeting notes.

No.	EPA Comment	Response	Actionee	Status
4.	Section 3.4.1, page 3-30. Please remove the section on EPA anticipated Central Plateau exposure scenarios as we have had no discussion with DOE on exposure scenarios in regard to this document.	EPA will provide replacement text for discussion and incorporation.	J. Robertson	EPA will provide suggested replacement text. On 03/24/2011, WRPS proposed replacement text. On 03/28/2011, EPA accepted the proposed text. Text will be incorporated into next WP revision.
6	Figure 3-7, p 3-15 Needs compass.	Acknowledged.	J. Robertson	Compass will be added to figure, assuming the addition does not present a document clearance and public release issue.
8	Is the Phase II RFI/CMS Report for WMA C still due to Ecology on 12/31/2010? Will this be available to EPA?	Under revised TPA milestone M-45-61, the Phase 2 RFI/CMS report for WMA C is now due to Ecology for review and approval as an Agreement primary document on 12/31/2014. However, baseline planning calls for earlier submittal. The document will be available to EPA.	J. Robertson	The next revision of the work plan will reflect the revised TPA milestone date for M-45-61.
13.	As sampling efforts may have evolved through the execution of this workplan, these are a few specific spots I had questions about: (a) Two valve boxes, located on the south side of C-111 and C-112, are known to have drained directly to soil. Samples taken here? (b) Section 3.2.1, p. 3-6 (d) Anomalous resistivity zone centered around C-104 and a smaller zone around C-108 and C-109. Confirmation sampling done here? (c) Section 3.2.2, p. 3-11 and 3-12 describes Tc^{99} concentration that have "generally increased" since the late 1990s and are currently in excess of 2000pCi/L, which "suggests a tank waste source near monitoring well 299-E27-4". Adequate sampling in this area? (d) Section 4.3.2, p. 4-8 (c) Site 200-E-115 Are there plans to use SGE in this area?	(a) The valve boxes were not identified as a location to investigate during the DQO process: therefore, no samples are planned at C-111 and C-112. (b) Reanalysis of well-to-well resistivity data, implementing recent advancements in analytical capabilities, indicates that the anomaly around C-108 and C-109 was an artifact of having to parse the data to perform the original analysis. The reanalysis also indicated that the anomaly in the vicinity of C-104 is more closely focused on the region near the spare inlet ports on C-101. Direct push investigation at Sites J and K is intended to provide additional information about the anomalies. (c) The planned investigative work is believed adequate to address the Tc-99 issue. Work at UPRs 81 and 86, which were believed to have been potential sources, indicates these UPRs are not likely to be sources. Well 299-E27-4 is in the vicinity of UPR-200-E-82. To further assess potential vadose zone	WMA C Team	No text change required at this time. **GENERAL ACTION**: Carry additional characterization proposals for consideration. (a) The decision not to sample at the valve boxes is substantiated by the recent results of the reanalysis of SGE data, which found no resistivity anomalies in this area within the detection capability of the SGE system. (b) See initial response. A direct push was installed at Location J in FY2010, and data will be evaluated as it becomes available. Due to access restrictions, direct push investigation at Location K must be deferred to support tank waste retrieval activities. (c) Continued investigation of possible local sources of Tc-99 contamination in the GW is addressed in Action 08-11-10-9, carried elsewhere in these meeting notes. Additional SGE investigation of UPR-82 found no

ATTACHMENT B
Open EPA Comments on the WMA C Work Plan
(2 pages)

No.	EPA Comment	Response	Actionee	Status
		contribution to the Tc-99 present in groundwater at 299-E27-4, the site will be assessed using 3-D SGE, plus three long 2-D lines in 2011. Numerous direct push sampling holes around this UPR have been advanced; only one of those pushes resulted in a positive analysis for Tc-99, and that hole was an angle push directly beneath the UPR site (radiological concerns precluded a vertical push through the center of the UPR). The SGE survey is intended to assess the distribution of resistivity impacting features. (d) Yes. Investigation at sites H and I is intended to provide information in this vicinity. There is no indication of contamination at these locations with sampling completed thus far. Planning includes conducting SGE surveys in this area after retrievals are complete.		resistivity anomalies in this area within the detection capability of the SGE system. (d) Direct push investigation at Locations H and I were conducted during FY2010. The data have been entered into the HEIS database and are undergoing final verification and validation.

APPENDIX J

WMA C PHASE 2 RCRA FACILITY INVESTIGATION SAMPLE DEPTH MEETING NOTES

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APPENDIX J
WMA C PHASE 2 RCRA FACILITY INVESTIGATION
SAMPLE DEPTH MEETING NOTES

This appendix contains the meeting notes from ten meetings held in calendar years 2009, 2010, and 2011 to identify specific depths at which borehole vadose zone samples would be taken to support the investigation detailed in RPP-PLAN-39114, *Phase 2 RCRA Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C*. The attendees included representatives of DOE and Ecology. At each meeting, attendees were provided information about the vadose zone in the vicinity of the borehole as well as information about relevant contaminant releases to the soil to support decisions regarding depths at which vadose zone soil samples should be taken. The sample depth decisions are recorded in these meeting notes.

Meeting Minutes for 241-C Tank Farm Phase 2 Soil Sampling at CR-151 Diversion Box
January 15, 2009

Attendees: Harold Sydnor (WRPS), Marc Wood (CH-PRC), Mike Barnes (Ecology), Kathi Dunbar (WRPS), Martin Gardner (ES), Kent Reynolds (ES), Chris Brown (PNNL), David Myer (WRPS), Jeff Serne (PNNL), Greg Thomas (CH-PRC), Jim Field (WRPS), Fred Mann (WRPS) and Jeff Lyon (Ecology)

Meeting Objectives: Select three soil sampling locations and soil sampling depths at each location.

Background: Initial characterization field work commenced in April 2008 (RPP-Plan-35341) and stopped in July 2008. Five probe holes (C6391, C6393, C6395, C6397 and C6999) were driven to ~150 or 240 feet below ground surface for geophysical logging with gross gamma and neutron moisture sondes. Gamma emitting contamination was encounter at the three probe holes (C6391, C6393, and C6395) on the southwest side of the diversion box. No gamma emitting contamination was encounter in the two probe holes northeast of the diversion box.

Sampling hole C 6394 was driven adjacent to logging hole C6393 and eleven soil samples were collected from 9' to 172' below ground surface. The majority of soil samples were collected in zones with higher moisture content as indicated on geophysical logs.

Meeting Notes: The meeting opened with a synopsis of FY08 fieldwork completed and the leak event. Mike Connelly discussed the Phase 2 soil sampling program; various organic analyses are added to the suite laboratory test and the four sampling depth have been identified from ground surface to a depth of 15 feet for future risk assignments. The group task is to identify four additional sampling depths at each of the three selected locations.

Chris Brown presented the analytical results for the C6394 (sampling) probe hole. The summary is as follows:

- Gamma logging identified contamination through 44 ft bgs
  - 45,000 pCi/g at 3 ft bgs
- Elevated pH and electrical conductivity found in shallow samples collected through 43 ft bgs
- Profile of elevated alkalinity correlates with pH profile
- Peak water extractable nitrate and Tc-99 were found in the same sample set (42-43 ft bgs)
  - Tc-99: 1.2 pCi/g
  - Nitrate: 199 mg/g
- Peak water extractable U-238 was coincident with Tc-99 (42-43 ft bgs)
- Sodium was the dominant cation in all samples collected through 43 ft bgs
  - Leading edge of ion exchange is assumed to occur between 44-59 ft bgs (no samples collected in this interval).

- GEA analysis one quantitative result for Cs-137 (85 pCi/g at 8.7 ft bgs)
  - "Imperfect" agreement with logging data
- Gross beta (likely Sr-90) activity of 234 pCi/g detected at 8.7 ft bgs
- Np-237, Pu-239, and Am-241 were not detected in acid extracts

The initial soil dataC6393/C6394 indicated that the contaminate fluid front depth is about 60 feet below ground surface and future soil sampling depth will be selected above this depth.

After discussion, the group selected soil sampling locations adjacent to logging probe holes C6391, C6393 and C6397. Gamma radiation was measured at probe holes C6391 and C6393 indicating the locations are in the spill area. Soil sampling at these locations will determine if organic constituents were released in the leak. No gamma radiation was measured at probe hole C6397 and is assumed to be located outside the leak area; however, preliminary results for surface geophysical exploration (SGE) at UPR 81 indicate leaked fluids may have moved under the diversion box and migrated to the northeast. Soil samples collected adjacent to C6397 or an alternate probe hole (alternate location to be based on SGE results) are intended to confirm SGE results. Mike Barnes of Ecology will determine after consultation with other Ecology staff whether the samples from C6397 or an alternate are required to have Phase 2 laboratory analyses for organic contaminants. The sampling depths for three locations are given below

C6391/C6392	C6393/C6394	C6397/C6398
Surface	Surface	Surface
5'	6'	5'
10	10	10
14'	14'	14'
19.5'	19.5'	20'[1]
25'	31'	30'[1]
42'	42'	42'[1]
56'	57'	60'[1]

[1] The sampling depths in the table are approximate; sampling depths will be selected by a review of SGE and small probe hole diameter geophysical logging results.

Addendum:
On January 19, the preliminary 3D SGE of UPR 81, 241-C-151 diversion box, was presented and discussed. The 3D SGE results indicated a SGE signature north and east of 241-C-152 diversion box. Direct push location C6405 corresponds with the SGE signature. The group agreed to change the investigative site to C6405. Since probe hole C6405 was not driven in Phase 1; an initial probe hole was driven and logged before soil sampling starts. The new location will provide Phase 2 data and provide information for comparing with SGE results.

C6391/C6392	C6393/C6394	C6405/C4606
Surface	Surface	Surface
5’	6’	5’
10	10	10
14’	14’	14’
19.5’	19.5’	TBD
25’	31’	TBD
42’	42’	TBD
56’	57’	TBD

Addendum
On March 23, 2009, final soil sampling depth meeting was convened for selecting the lower four sampling intervals at C6405/C6406. The field draft log for gamma and neutron moisture was presented and reviewed. The group agreed to the sample four intervals between 14 and 61 feet. The sampling intervals are located at moisture peaks.

C6391/C6392	C6393/C6394	C6405/C6406
Surface	Surface	Surface
5’	6’	5’
10	10	10’
14’	14’	14’
19.5’	19.5’	18’
25’	31’	26’
42’	42’	54.5’
56’	57’	59’

241-C Tank Farm Phase 2 Soil Sampling Selection for Site "L" and "G"

July 28, 2009

Attendees: Greg S Thomas, Marcel Bergeron, Stuart Luttrell, Mike Barnes, Andrew Templeton, Fred Mann, Kent Reynolds, Jim Field and Harold Sydnor

Background: Phase 2 soil characterization is on-going in 241-C tank farm to support Corrective Measure Study. This field deployment is characterizing sites L (C7465) and G (7467). These sites are east of single shell tank C-103, see location map. These sites are investigating potential pipeline leaks or tank overfill.

Drywell 30-03-03 is located near the L sampling locations. The man-made radio nuclides detected the e borehole is Cs-137 and Co-60. The Cs-137 contamination was detected from the ground surface to 41 ft and at 98 ft and the maximum Cs-137 concentration was 218 pCi/g at a depth of 7 feet. Cobalt-60 contamination was detected almost continuously from 85 to 98 (total logging depth). The maximum Co-50 concentration was ~1.0 pCi/g.

Meeting Notes: Gamma and neutron moisture field draft logs were presented for site "L" (C7465) and "G" (C7467). The group agreed to at 5 intervals between 40 feet and 140 feet below ground surface. These sampling intervals are associated with moisture zones in the H2 fine grained sediments. The group discussed collecting a soil sample below 140 feet below surface. The group rejected deep soil sample since a well define moisture is not indicated in the logging results and the investigations at UPR-E81 and UPR-E-86, near surface leaks, found evidence of a spill (technetium 99 and nitrate) at a maximum depth of 60 feet below ground surface.

Four soil samples will be collected between surface and sixteen feet bgs. These sampling depth prescribe in the sampling plan.

Soil Sampling Table

Site" L" (C7465/C7466)	Site "G" (C7467/C7468)
Surface 0-1'	Surface 0-1
5-7'	5-7'
10-12'	10-12'
14-16'	14-16'
43.5-45.5'	43.5-45.5
84-86'	92-94
109.5-111.5	97-99
114-116	125-127
133-135	135-137

241-C Tank Farm Phase 2 Soil Sampling Depth for C7471 (F--east of 241-C-801 building)

Date 12/17/09

Attendees: Dave Myers, Cynthia Tabor, Marc Wood, Martin Gardner, Mike Barnes, Andrew Templeton, Mike Connelly, Marcel Bergeron, Susan Eberlein, Greg Thomas, and Bob Lober

Provided Materials:

(1) Draft Gross Gamma and Moisture Log for probe hole C7471 (F)

(2) C7471 and spectral gamma logs for probe holes C7465 (L) and C7467 (G)

(3) Location showing 241-C Tank Farm Phase 2 probe hole locations

Preliminary laboratory data for nitrate and technetium was discussed but not provided. Specifically, elevated nitrate concentrations were detected in the deepest samples soil sample collected at C7465 (L) and C7467 (G). The nitrate concentration ranged between 35 and 192 µg/g. The elevated concentration were found from 109' to 137' below ground surface (bgs)

Purpose: Select 4 soil sampling depths between 16' bgs and 220' bgs.

Notes: 6 soil sampling depths were selected:

- Four sampling intervals (108.5', 129', 142' and 216') were selected, based on gamma and moisture peaks, for full RCRA analytical analyses as identified in the WMA C Field Sampling Plan
- Two additional sampling intervals (158' and 195') were selected to investigate "drier" areas (i.e., no moisture peak). The sample interval of 158' was also selected base on the depth of nitrate concentrations in borehole C4297 (C-105), which is ~160'. Analysis on these intervals will only include the indicator parameters-- nitrate and technetium-99. Based on the indicator parameters results, additional laboratory test may be requested.

Meeting Notes 241-C Tank Farm Phase 2 Soil Sampling Depth for C7669/C7670 (L2) and C7667/C7668 (R)

January 20, 2010

Attendees:

Harold Sydner, Dave Myers, Cynthia Tabor, Andrew Templeton, Susan Eberlein, Penny Berlin, Maria Skorska, Stuart Luttrell, and Bob Lober

Provide Materials:

- Draft gamma and moisture plots for previously logged and sample 3 investigative sites, L1 (C7465), G (C7467), and F (7471)
- Gamma and moisture plots for the two new sites L2 (C7669) and R (C7667).
- Map showing 241-C Tank Farm Phase 2 locations
- Table with recommended sampling depths and a summary of available preliminary technetium-99, sulfate and nitrate data from sites L1 and G.

Notes: Prescribed near surface samples taken at surface, 5', 10' and 14' below ground surface were not discussed. The group selected four sampling depths between 19' and 222' below ground surface. The sampling depths and rationale are given below:

Site L2, northwest of C-103

- 39-41': To assess moisture peak at or near elevation of base on tank farm construction. Identify potential leak location or spreading zone.
- 139-141': To assess baseline increase in gamma count change and associated moisture peak. Also, elevated nitrate concentration and technetium-99 detected at a similar depth. This depth allows for comparing the lateral distribution of nitrate and technetium in this horizon.
- 163-165': To assess baseline change from fine grained to coarse grained and increase in moisture. Also, determine the depth of contamination.
- 220-222' (or as deep as possible): To assess moisture increase at total depth and to characterize total depth of contamination.

Site R, west of C-301 catch tank

- 27-29': To assess first major moisture peak in the subsurface could identify area of contamination source.
- 39-41': To assess a moisture peak at or near the tank farm excavation and potential contaminant spread zone or another potential interval for identifying contaminate source.
- 80-82': To assess moisture peak in fine grained fancies of H2.
- 132-134': To assess moisture peak and gamma change which indicates fining upward sediment. Also, the same horizon has been sampled at other sample locations; gathering information to determine possibility of lateral migration.

Meeting Notes 241-C Tank Farm Phase 2 Soil Sampling Depth for C7671/C7672 (E) C7675/C7676 (U) - July 7, 2010

Attendees: Harold Sydnor, Marcel Bergeron, Jim Field, Bob Lober, Joe Caggiano, Dave Myers, Penny Berlin, Dana Stewart, Cindy Tabor, Kent Reynolds, Maria Skorska, and Susan Eberlein

The following sample depths were agreed upon during the meeting:

Location (area) *Known or Suspected Event*	**Agreed Upon Sample Depth (Feet Below Ground Surface)**	**Reason**
C7671/C7672/**E** (Between C-106 and C-109) *Suspected Release*	Surface: 0-2, 5-7, 10-12, and 14-16	Required
	37-39	To determine the spread of high moisture zone at or near base of tank excavation – potential source location (facies change from Backfill to H1)
	73-75	To assess baseline increase in gamma count change (facies change from H1 to H2-fine grain)
	83-85	To assess moisture increase in fine grained H2 interval
	122-124	To assess moisture increase at total depth – To characterize total depth of potential contamination (54 pCi/g Tc-99 in similar G depth)
C7675/C7676/**U** (C-110) *Tank leak and/or tank over fill. Loss through spare inlet*	Surface: 0-2, 5-7, 10-12, and 14-16	Required
	38-40	To determine the spread of high moisture zone near base of tank excavation – potential source location (facies change from Backfill to H1)
	128-130	Based on moisture peak and gamma rate change indicating fining up sediments – coarse to fine
	157-159	Based on moisture peak and gamma rate change indicating fining up sediments – coarse to fine

Summary Information from meeting:

- C7671/C7672 (E): All recommended sample depths were agreed upon (required surface depths and the four deeper sample depths).
- C7675/C7676 (U): All recommended sample depths were agreed upon (required surface depths and the three deeper sample depths).
    - There were three rather than four deeper sample depths chosen at this location because there was no additional area of interest based on logs from this location and locations from the surrounding area (i.e., no grain size changes or high moisture zones). An additional sample depth might be chosen at another location, or at a later date another depth at C7676 might be chosen if more information becomes available that indicates another sample depth of interest.
    - Note: RPP-PLAN-39114 indicates an "average number of samples" should be collected from C Farm sample locations (Table ES-1. Sample Plan WMA C Phase 2 Characterization for RFI/CMS), so the above logic should be appropriate.

Relevant information associated with picking sampling depths:

- Draft Gamma and Moisture Plots for C7671(E) and C7675(U)
- Processed plots for C7671(E) and C7675(U) with KUT and moisture volume percent plots
- Cross Section of Gamma and Moisture Plot (SW to NE)
    - C5947, C6405, C7669(L2), C7465(L1), C7467(G), C7471(F), C7681(I) – reviewed for determining E and U sample depths
- Gamma and Moisture Plot for C7667(R) – additionally reviewed for determining U sample depths
- Gamma and Moisture Plot etc. for C4297 – additionally reviewed for determining E sample depths
- Information from 299-E27-12 (Northwest of U)
- Available preliminary analytical results from C7466(L1), C7468(G), C7472(F)
- Additionally gamma plots from dry wells in the area were reviewed

Preliminary analytical results:

- C7465/C7466 (**L1**) (Northeast of C-103) at depths: Surface depths, 43.5-45.5', 84-86', 109.5-111.5', 114-116', and 133-135'
    - Higher Nitrates at 109.5', 114', and 133' (88, 90, 35 µg/g)
    - Higher Sulfate at 109.5', 114', and 133' (53, 43, 57 µg/g)
    - Higher Tc-99 at 109.5', 114', and 133' (73, 76, 54 pCi/g) (Note: Tc-99 in lab blank at 38 pCi/g)

- C7467/C7468 (**G**) (West of C-108 loadout facility) at depths: Surface depths, 43.5-45.5', 92-94', 97-99', 125-127', and 135-137'
    - Higher Nitrates at 125' and 135' (192 and 173 µg/g)
    - Higher Sulfate at 125' and 135' (90 and 126 µg/g)
    - Nondetected Tc-99 results until depths of 125' and 135' (54 and 50 pCi/g)

- C7471/7472 (**F**) (West of C-108 loadout facility): Surface depths, 108.5-110.5', 129-131', 142-144', 158-160' (drier area), 195-197 (drier area), and 216-218. The sample interval of 158' was also selected base on the depth of nitrate concentrations in borehole C4297 (near C-105), which is ~160'.
    - Nitrate concentrations range from 2.5 – 9 ug/g
    - Tc-99 concentrations range from nondetect to 0.2 pCi/g

C Farm Sampling (Locations H and I)

August 4, 2010 Meeting

Background Information

Data Evaluated to Help Determine Possible Sample Depths:

- Draft and processed Gamma and Moisture Plots for C7679(H) and C7681(I)
- Cross Section of Gamma and Moisture Plot (SW to NE)
  C5947, C6405, C7669(L2), C7465(L1), C7467(G), C7471(F), and C7681(I)
- Information from 299-E27-7 (Southwest of H and I)
- Available preliminary analytical results from C7466(L1), C7468(G), C7472(F)

Objective of Sampling per RPP-Plan-39114, C-Farm Work Plan: Assessing surface exposures and Co-60 concentrations along with refining conceptual model

Additionally, Section 4.5.1.2 of the work plan identifies that:
"If contamination is not found at depth at Sites F and G, the depth of the direct push at Sites H and I will stop at 15 bgs. Sites H and I were located to address surficial contamination at UPR-200-E-91 and 200-E-115, but depths of the direct pushes can be extended if it appears contaminants are moving down dip northeasterly. If contamination is found at depth at Sites F and G, then the depth of the direct pushes at Sites H and I will be extended based on the information from Sites F and G. The purpose of extending the depth of these direct pushes is to provide information related to contaminant movement down dip (alternative conceptual model 2)."

Preliminary analytical results:

- C7467/C7468/**G** (West of C-108 loadout facility) at depths: Surface depths, 43.5-45.5', 92-94', 97-99', 125-127', and 135-137'
  - Higher Nitrates at 125' and 135' (192 and 173 µg/g)
  - Higher Sulfate at 125' and 135' (90 and 126 µg/g)
  - Nondetected Tc-99 results until depths of 125' and 135' (54 and 50 pCi/g)
- C7471/7472/**F** (East of C-108 loadout facility): Surface depths, 108.5-110.5', 129-131', 142-144', 158-160' (drier area), 195-197 (drier area), and 216-218. The sample interval of 158' was also selected base on the depth of nitrate concentrations in borehole C4297 (near C-105), which is ~160'.
  - Nitrate concentrations range from 2.5 – 9 ug/g
  - Tc-99 concentrations range from nondetect to 0.2 pCi/g
- C7465/C7466 (**L1)** (Northeast of C-103) at depths: Surface depths, 43.5-45.5', 84-86', 109.5-111.5', 114-116', and 133-135'
  - Higher Nitrates at 109.5', 114', and 133' (88, 90, 35 µg/g)
  - Higher Sulfate at 109.5', 114', and 133' (53, 43, 57 µg/g)
  - Higher Tc-99 at 109.5', 114', and 133' (73, 76, 54 pCi/g) (Note: Tc-99 in lab blank at 38 pCi/g)

Note: The preliminary results from C7466 and C7468 (Sites L1 and G) noted above support the conceptual model that H2 fines (extending from approximately 55+ ft to 180+ ft bgs) is a target area for sample collection and demonstrate apparent lateral movement on these east-southeast dipping beds).

Information from the Meeting Notes 241-C Tank Farm Phase 2 Soil Sampling Depth for C7671/C7672 (E) C7675/C7676 (U) - July 7, 2010:

- There were three rather than four deeper sample depths chosen at the U location because there was no additional area of interest based on logs from this location and locations from the surrounding area (i.e., no grain size changes or high moisture zones). An additional sample depth might be chosen at another location, or at a later date another depth at C7676 might be chosen if more information becomes available that indicates another sample depth of interest.
- Note: RPP-PLAN-39114 indicates an “average number of samples” should be collected from C Farm sample locations (Table ES-1. Sample Plan WMA C Phase 2 Characterization for RFI/CMS), so the above logic should be appropriate.

Sample Depth Recommendations for H and I

Location (area) Log Hole/Sample Hole *Known or Suspected Event*	**Recommended Sample Depth (Feet Below Ground Surface)**	**Reason**
H (Northeast side of E-91) C7679/C7680 *Surface Release*	Surface: 0-2, 5-7, 10-12, and 14-16	• Required
	17-19	• Natural material • High moisture and gamma at this depth interval - both H and I • (~15% moisture, ~3.2 pCi/g gamma)
	43-45	• Facies change from H1 coarse to H1 fine • High moisture and gamma • (~8% moisture, ~ 3.4 pCi/g gamma)
	87-89	• In H2 interval (facies change at 76') • Banding two moisture peeks • (~10% moisture, ~ 3.6 pCi/g gamma)
	92-94	• In H2 interval • Banding two moisture peeks • (~11% moisture, ~ 3.9 pCi/g gamma)
	116-118	• In H2 interval • High moisture and gamma • (~27% moisture, ~ 4.4 pCi/g gamma)
	142-144	• Transition zone for H2 to H2 coarse • High moisture and gamma • (~9% moisture, ~ 3.8 pCi/g gamma)
I (Northeast side of E-115) C7681/C7682 *Surface Release*	Surface: 0-2, 5-7, 10-12, and 14-16	• Required
	18-20	• Natural material • High moisture and gamma at this depth interval at both H and I • (~18% moisture, ~3.3 pCi/g gamma)
	45-47	• Facies change from H1 coarse to H1 fine • High moisture and gamma • (~18% moisture, ~ 3.3 pCi/g gamma)
	88-90	• In H2 interval (facies change at 81') • High moisture and gamma • (~9% moisture, ~ 3.8 pCi/g gamma)
	122-124	• In H2 interval • High moisture and gamma • (~7% moisture, ~ 3.9 pCi/g gamma)

Potential interval – could be either/or

MEETING NOTES
Waste Management Area C Sample Depth Selection for Location J (C8100) Angle Push Under C-104

Meeting Date: February 15, 2011

Location: 1200 Jadwin, Room 3-C3

Purpose: Determine Sample Depths for Location J

Attendees:

Harold Sydnor (WRPS)	Dave Myers (WRPS)
Joe Caggiano (Ecology)	Kent Reynolds (Energy Solutions)
Marcel Bergeron (WRPS)	Susan Eberlein (WRPS)
Mike Connelly (WRPS)	Cindy Tabor (WRPS)
Dwayne Crumpler (CEES)	Andrew Templeton (WRPS)
Les Fort (WRPS)	Bob Lober (DOE-ORP)
Beth Rochette (Ecology)	

Data Discussed to Help Determine Sample Depths:

- Draft Gamma and Moisture Plots for C8099 angle push
  Note: The plot shows both Vertical Depth and Pipe Run Depth since this is angle push
- Profile of sample depths (for depth perspective and relationship to Tank)
- Available information from C Farm Direct Push efforts
- Available dry well logging information
- General increase in moisture zones from 110 -175 ft bgs and 190 – 252 ft bgs (pipe run) while gamma results were fairly steady

Table 1: Agreed Upon Sample Depths for Location J (C8099/C8100)

Location Log Hole/Sample Hole	**Sample Depth Associated with Pipe Run Depth (ft bgs) [~Vertical Depth in ft bgs]**	**Reason**
J C8099/C8100 (Angle Push by Tank C-104)	Surface and Surface Duplicate	• Per plan requirements
	5.7 - 7.7 [~5 - 7]	• Equivalent to ~5-7 ft bgs (vertical depth), per plan requirements
	15 - 17 [~13 - 15]	• Native material • Noticeably higher gamma and low moisture (probably related to Cs-137) • Equivalent to ~13-15 ft bgs (vertical depth), being collected to meet plan requirements of collecting samples from 10-12 and 14-16 ft bgs (See plan requirements and deviation discussion below)
	54 - 56 [~46 - 48]	• Fine grained material (above Tank base) • Higher moisture and gamma increase
	76 - 78 [~66 - 68]	• H1/H2 transition (just below Tank base) • Higher moisture (impounding area)
	118 - 120 [~100 - 102]	• H2 (<1/4 way under Tank) • Higher moisture (impounding area)

Location Log Hole/Sample Hole	**Sample Depth Associated with Pipe Run Depth (ft bgs) [~Vertical Depth in ft bgs]**	**Reason**
	173 - 175 [~142 - 144]	• H2, Apparent slight decrease in grain size - based on gamma (~ 2/5 way under Tank) • Higher moisture (impounding area); Bottom of general increasing moisture area (110-180 ft bgs)
	207 - 209 [~183 - 185]	• H2, Past middle of Tank • General moisture increase
	252 - 254 [~218 - 220]	• H2, Near bottom of boring, far side of Tank • Bottom of general increasing moisture area (190 – 250 ft bgs)

Stratigraphic and/or relationship to Tank info
Moisture and/or gamma per Draft Log

Plan Requirements:
Per RPP-PLAN-38777, Sampling and Analysis Plan for Phase 2 Characterization of Vadose Zone Soil in Waste Management Area C:

"Four samples will be collected in the top 15 ft (one at the surface and one each at 5 ft, 10 ft and 14 ft bgs) at each location and up to four additional samples will be collected at depths >15 ft."

"An average of seven samples per location is planned: three in the top 15 ft (not including a surface sample) and four below 15 ft."

Deviation to Requirements:
It was decided that 3 samples (rather than 4) would be sufficient to represent the top 15 ft bgs. The surface and 5 ft bgs samples will be collected and a third sample from 13-15 ft bgs (vertical depth) will be collected from this location to represent the plan required 10-12 and 14-16 ft bgs samples.

The decision to collect one less sample in the top 15 ft bgs was agreed upon by all attendees as the deeper intervals appear to be of more interest (based on draft gamma and moisture plot). Since the deeper intervals were of more interest, six sample depths were chosen at depths > 15 ft bgs. Thus, a total of nine sample depth intervals will be collected and analyzed for this location.

Robert W. Lober		2-25-11
DOE Project Manager (print)	DOE Project Manager (signature)	Date
	Jeffery J Lyon	2-25-11
Ecology Project Manager (print)	Ecology Project Manager (signature)	Date

MEETING NOTES
Waste Management Area C Sample Depth Selection for Location A (C8102) Angle Push Under C-101

Meeting Date: May 16, 2011

Location: 1200 Jadwin, Room 3-C3

Purpose: Determine Sample Depths for Location A

Attendees*:

Harold Sydnor (WRPS)	Dave Myers (WRPS)
Dan Glaser (WRPS)	Kent Reynolds (Energy Solutions)
Marcel Bergeron (WRPS)	Jim Field (WRPS)
Mike Barnes (Ecology)	Cindy Tabor (WRPS)
Les Fort (WRPS)	Andrew Templeton (WRPS)
	Bob Lober (DOE-ORP)

*Joe Caggiano did not attend the meeting but sent an email (5/17/11) agreeing on sample depths.

Data Evaluated to Determine Sample Depths:

- Draft Gamma and Moisture Plots for C8101 angle push
  Note: The plot shows both Vertical Depth and Pipe Run Depth since this is angle push
- Profile of sample depths (for depth perspective and relationship to Tank)
- Available information from C Farm Direct Push efforts
- Available dry well logging information (E27-58/30-01-09)

General Notes:

- The basis for standard sampling is described in RPP-RPT-38152, DQO Report Phase 2 Characterization for WMA C RCRA Field Investigation/Corrective Measure Study. It was determined that samples would be collected from:
  - Standard 4 sample depths of - surface, 5-7, 10-12, and 14-16 ft bgs (vertical depths).
  - 5 deeper sample locations (Numbered: #5, #6, #7, #8, #9 in Table 1). A sample depth of 55-57 ft pipe run was unanimously replaced with the sample depth of 155-157 ft pipe run (#7 in Table 1)
- Based on Gyroscope Evaluation (x, y, z coordinates), the push was shallower than the planned push (was not at a continuous 60° angle from surface).

Table 1: Agreed Upon Sample Depths for Location A (C8100/C8101)

Location Log Hole/Sample Hole	**Recommended Sample Depth Associated with Pipe Run Depth (ft) [~Vertical depth in ft bgs]**	**Reason**
#5	65-67 [56]	• Native material (H1) or backfill /H2 transition zone • Pipe run is directly horizontal from the base of the tank
#6	96-98 [81]	• Below the H1/H2 transition zone • Pipe run is below the outlet and tank footer • Higher moisture zone, moisture appears to be impounded on grain size change at 100 ft

Location Log Hole/Sample Hole	**Recommended Sample Depth Associated with Pipe Run Depth (ft) [~Vertical depth in ft bgs]**	**Reason**
#7	155-157 [125]	• H2 material • Pipe run is <50% to other side of tank • Higher moisture area – corresponds to similar zone sampled in C Farm J location - area of interest with respect to SGE
#8	188-190 [148]	• H2 material • Pipe run is ~50% to other side of tank • Slightly coarser grained zone – highest moisture area in log
#9	221- 223 [169]	• H2 material • Pipe run is near the other side of the tank • Slightly finer grained material based on log (220-221 ft pipe run) and higher moisture zone

Stratigraphic and/or relationship to Tank info
Pipe run relationship to Tank C-101
Moisture and/or gamma per Draft Log/SGE results

MEETING NOTES
Waste Management Area C Sample Depth Selection for Location B (C8104) Angle Push by C-101

Meeting Date: June 17, 2011

Location: 1200 Jadwin, Room 3-C3

Purpose: Determine Sample Depths for Location B

Attendees*:

Cindy Tabor (WRPS)	Dave Myers (WRPS)
Dan Glaser (WRPS)	Kent Reynolds (Energy Solutions)
Marcel Bergeron (WRPS)	Susan Eberlein (WRPS)
Mike Barnes (Ecology)	Brian Cubbage (HGI)
Virginia Rohay (CHPRC)	Nigel Crook (HGI)

Data Evaluated to Determine Sample Depths:

- Draft Gamma and Moisture Plots for C8103 angle push
  Note: The plot shows both Vertical Depth and Pipe Run Depth since this is angle push
- Vertical profile and map view of sample depths (for depth perspective and relationship to Tank)
- Available information from C Farm Direct Push efforts
- Available dry well logging information (E27-60/30-01-01)

General Notes:

- The basis for standard sampling is described in RPP-RPT-38152, DQO Report Phase 2 Characterization for WMA C RCRA Field Investigation/Corrective Measure Study, which indicates that these samples are to be collected from:
  - Recommending 8 sample depths: standard 4 sample depths of – surface; 5-7 ft bgs; 10-12 ft bgs; and 14-16 ft bgs (vertical depths) and standard 4 deeper samples (agreed upon intervals are identified in Table 1). A sample of depth of 84-86 ft pipe run (72 ft bgs) was also discussed in the meeting; however, the group unanimously decided to sample the 4 deeper locations identified in Table 1 below.
- Based on Gyroscope Evaluation (x, y, z coordinates), the push was shallower than the planned push (~ 170 ft pipe run – planned depth was~ 200 ft pipe run).

Table 1: Sample Depths for Location B (C8103/C8104)

Location Log Hole/Sample Hole	**Recommended Sample Depth Associated with Pipe Run Depth (ft)** **[~Vertical depth in ft bgs, feet amsl]**	**Reason**
#5	41-43 [37, 613]	• Directly below the Backfill/H1 transition • Higher moisture content – moisture impounding area (grain size change)
#6	93-95 [82, 568]	• H2 material • Higher moisture content – moisture impounding area (grain size change)

Location Log Hole/Sample Hole	**Recommended Sample Depth Associated with Pipe Run Depth (ft)** **[~Vertical depth in ft bgs, feet amsl]**	**Reason**
#7	117-119 [104, 546]	• H2 material • Higher moisture content – moisture impounding area (grain size change) • Cesium concentration of 0.8 pCi/g around 100 ft bgs from well 30-01-01
# 8	157-159 [138, 512]	• H2 material • Higher moisture content – moisture impounding area (grain size change)

Stratigraphic and/or relationship to Tank info
Moisture and/or gamma per Draft Log
Dry Well information – need perspective to ft bgs

MEETING NOTES
Waste Management Area C Sample Depth Selection for Location C1 (C8106) Angle Push by C-203

Meeting Date: October 18, 2011

Location: 2440 Stevens

Purpose: Determine Sample Depths for Location C1

Attendees*:

Dan Glaser (WRPS)	Kent Reynolds (Energy Solutions)
Harold Sydnor (WRPS)	Susan Eberlein (WRPS)
Mike Barnes (Ecology)	

Data Evaluated to Determine Sample Depths:

- Draft gamma, moisture, and gyroscope data collected for push location east of tank C-203 (C8105/Location C1)

Note: The plot shows both Vertical Depth and Pipe Run Depth since this is angle push. Elevation of entry for C8105 193.65 meters (635.33 feet above mean sea level (msl) - Angle 28 degrees from horizontal and bearing 235 degrees from true north

- Vertical profile and map view of sample depths (for depth perspective and relationship to tank)
- Available information from C Farm Direct Push efforts: Locations C7471 and C7681 (Sites H & F, respectively); Location C7667 (Site R); Locations C7465 and C7467 (Sites L1 and L2, respectively); and locations around UPR 86 and UPR 81
- Available dry well logging information (E27-60/30-01-01)

General Notes:

- The basis for standard sampling is described in RPP-RPT-38152, DQO Report Phase 2 Characterization for WMA C RCRA Field Investigation/Corrective Measure Study, which indicates that these samples are to be collected from:
  - Recommending 8 sample depths: standard 4 sample depths of - surface, 5-7, 10-12, and 14-16 ft bgs (vertical depths) and standard 4 deeper samples (intervals recommended are identified in Table 1).
  - Specific information on shallower intervals:
    - 11-13 ft pipe run ≈ 5-6.77 vertical depth (ft bgs). Meets intent of 5-7 ft bgs regulatory required (at 630.33 ft msl)
    - 19-21 ft pipe run ≈ 9-10.77 vertical depth (ft bgs). Meets intent of 10-12 ft bgs regulatory required - adjusted up to center on moisture and gamma increases (at 626.33 ft msl)
    - 27-29 ft pipe run ≈ 12.5 – 14.27 vertical depth (ft bgs). Meets intent of 14-16 ft bgs regulatory required -adjusted up to center on gamma and moisture peak (at 622.83 msl)

Table 1: Sample Depths for Location C1 (C8105/C8106)

Location Log Hole/Sample Hole	Stratigraphic Info Pipe Run (ft) [Vertical depth in ft bgs, elevation ft msl]	Recommended Sample Depth Associated with Pipe Run Depth (ft) [~Vertical depth in ft bgs, elevation ft msl]	Reason
#5	H1/H2 91 [40.75, ~595] H2/H2 fines 153 [67.25, ~568]	64-66 [29, 606]	• H1 • Under pipe encasement on east side of tank C-203, just east of tank edge
#6		90-92 [40.5, 595]	• H1/H2 interface • Higher moisture content – moisture impounding area (grain size change) - moisture and gamma increase indicating formation/facies changes (interface correlates across the farm) • Just past center of tank C-203 approximately 17 feet below tank
#7		132-134 [58.5, 577]	• H2 material • Higher moisture content – moisture impounding area (grain size change) • Under infrastructure – pipe encasement west side of tank C-203
#8		161.5-163.5 [70.5, 565]	• H2 fines • Higher moisture content – moisture impounding area (grain size change) • Below east side of tank C-112

Stratigraphic and/or relationship to Tank info
Moisture and/or gamma per Draft Log
Location with respect to tank

APPENDIX K

FIELD SAMPLING AND ANALYSIS PLAN CHANGE NOTICES

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APPENDIX K
FIELD SAMPLING AND ANALYSIS PLAN CHANGE NOTICES

This appendix contains change notices to the field sampling and analysis plans used during the WMA C Phase 2 RCRA facility investigation. During the course of the Phase 2 investigation, the controlling work plan (RPP-PLAN-39114) and sampling analysis plan (RPP-RPT-38152) were revised a number of times in accordance with agreements reached between DOE, Ecology, and EPA. These higher tier document revisions, field conditions encountered during the investigation, and other factors resulted in a need to revise the field sampling and analysis plans that provided detailed direction regarding the collection, management, and analysis of vadose zone samples taken as a part of the WMA C Phase 2 investigation.

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-001 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 2-14-10

Original Requirement: Section 4 of the plan describes the sample analysis requirements. Table 4-8 shows Tc-99 is analyzed by ICP/MS and Table 4-1 shows nitrate is analyzed using method 9056 (ion chromatography). There is no discussion of water digest or quick-turn around times.

At a meeting on 12/17/09 (see attached notes), six depths, beyond the surface and three shallow samples, were selected. These depths were: 108.5-110.5 ft bgs, 129-131 ft bgs, 142-144ft bgs, 158-160ft bgs, 195-197ft bgs, and 216-218 ft bgs. During the December meeting, a decision was made to decrease the analyses at 2 intervals (158-160 ft bgs and 195-197 bgs) to only nitrate and Tc-99. The results of these tests would be used to determine if additional analysis should be performed.

Samples Impacted: Samples from the six deeper depths (i.e., 108.5-110.5 ft bgs, 129-131 ft bgs, 142-144ft bgs, 158-160ft bgs, 195-197ft bgs, and 216-218 ft bgs) that are collected in C Farm at borehole C7471 (C7472) site F in FY10.

Proposed Change:

1. Perform Tc-99 and Nitrate analyses on a 1:1 water digest on an expedited basis (~1 week).
2. Perform all analyses on all six sample depth intervals.

Reason for Change: Tc-99 and nitrate are the most mobile and prevalent constituents associated with tank farm contamination. These analyses were requested to be completed on an expedited manner in order to make decisions on additional analyses. The water digest method was requested to be consistent with previous analyses and in order to achieve lower detection limits. As indicated, it was anticipated that the "Quick Turn" analyses would provide insight regarding what additional analyses should be performed for the intervals; however in order to avoid missing any holding times, full analyses was requested for each sample interval.

Note: It was determined after this change was implemented that the water digest method is not a QA validated preparation method and therefore the data cannot be used for regulatory decisions.

Date Change Effective: 1-11-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 4-7-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 4-7-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 4-8-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 4-8-10

Other (Optional, Print/Sign): **Date:**

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Erik Wyse

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-002 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 4-12-10

Original Requirement: Collect a duplicate collocated surface soil sample at one of every five direct push sample locations.

Samples Impacted: Surface Soil Samples collected in C Farm in FY10.

Proposed Change: Collect a duplicate collocated soil surface sample at every direct push sample location in C-Farm

Reason for Change: RPP-PLAN-38777, Rev. 0, *Sampling and Analysis Plan for Phase 2 Characterization of Vadose Soil in Waste Management Area C*, Table 3-1, indicates that for each direct push sample location a collocated surface sample shall be collected.

Date Change Effective: 3-8-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 4-22-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 4-22-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 4-26-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 4-26-10

Other (Optional, Print/Sign): **Date:**

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse

RPP-RPT-50339, Rev A DRAFT
VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-003 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 4-12-10

Original Requirement: Listed in Table 5-1, titled *Equipment Blank Sample Preservation, Container and Holding Time Guidelines*.

Samples Impacted: Equipment Blanks collected in C Farm.

Proposed Change:
Add Ethylene Glycol and monobutylphosphate/dibutylphosphate analysis, change the Container/Volume requirements for TPH Gasoline, PCBs and Pesticides and change the Preservation requirements for TPH Gasoline by adding "Cool ≤6 °C" in Table 5-1, titled *Equipment Blank Sample Preservation, Container and Holding Time Guidelines* as shown below:

Parameter/ Analysis	Reference Method	Container/ Volume	Preservation	Holding Time
TPH Gasoline	WTPH- Gasoline	G 3X 40 ml VOA Vial	HCl to pH <2 Cool ≤6 °C	14 Days
PCBs	8082 PCB GC	aG 3X 1L	Cool ≤6 °C	None
Pesticides	8081 Pest. GC	aG 2X 1L	Cool ≤6 °C	14/40 Days
Ethylene Glycol	8015B	G 3X 40 ml VOA Vial	Cool ≤6 °C	14 Days
MBP/DBP	9056 (modified)	P/G 1X 125 ml	Cool ≤6 °C	14 Days

Reason for Change: Consistent with HASQARD requirement, Volume 2, section 5-1, indicates *equipment blanks should be analyzed for the same analytes as sample using that equipment* in order to ensure that the equipment has been properly cleaned.

It should be noted though that the samples collected are analyzed for percent water, bulk density, carbonate and bicarbonate and PCB congeners. These analyses are not being requested for the equipment blanks.

The additional sample volume was requested by the off-site laboratory to complete the required analyses.

Date Change Effective: 3-26-10

Schedule Impact: None

Authorization:
Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 5-20-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 5-20-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 5-24-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 5-24-10

Other (Optional, Print/Sign): **Date:**

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-004 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 4-22-10

Original Requirement: At each sample depth, three liner samples and one shoe sample are targeted to be taken. Good recovery is required to allow analysis of all requested analyses.

Samples Impacted: Samples collected in C Farm at site F, location C7472, 10-12 ft. bgs.

Proposed Change: Due to poor sample recovery from the 10-12 ft. bgs interval in C-Farm at the F location (C7472), an additional sample was collected from 12-14 ft. bgs. To ensure that there is enough material to do all the analysis, the material from these two intervals will be composited for analysis. The composite will consist of liner A from the 10-12 foot interval, and liners A, B, and C and the shoe from the 12-14 foot interval. The samples for volatile organic compound (VOC) analysis were collected from the shoe at the 10-12 ft. bgs interval.

Reason for Change: Poor sample recovery.

Date Change Effective: 12-29-09

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 5-11-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 5-11-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 5-13-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 5-13-10

Other (Optional, Print/Sign): **Date:**

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-005 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 4-22-10

Original Requirement: At each sample depth, three liner samples and one shoe sample are targeted to be taken. Good recovery is required to allow analysis of all requested analyses.

Samples Impacted: Samples collected in C Farm at site L2, location 7670, 10-12 ft bgs.

Proposed Change: Due to poor sample recovery from the 10-12 ft. bgs interval in C-Farm at the L2 location, an additional sample was collected from 12-14 ft. bgs. To ensure that we have enough material to do all the analysis, a composite will be prepared from Liner A from the 10-12 ft. bgs interval, the shoe from the 12-14 ft. bgs interval and Liner A from the 12-14 ft. bgs interval. The samples for volatile organic compound (VOC) analysis were collected from the shoe at the 10-12 ft. bgs interval.

Reason for Change: Poor sample recovery.

Date Change Effective: 4-22-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 5-11-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 5-11-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 5-13-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 5-13-10

Other (Optional, Print/Sign): **Date:**

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-006 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 5-11-10

Original Requirement: At each sample depth, three liner samples and one shoe sample are targeted to be taken. Good recovery is required to perform all of the requested analyses.

Samples Impacted: Samples collected in C Farm at site L2, location C7670, 220-222 ft bgs.

Proposed Change: Due to poor sample recovery from the 220-222 ft. bgs interval (0% in shoe, 0% in Liner A, 30% in Liner B and 30% in Liner C) , an additional sample was collected from 222-224 ft. bgs.

To ensure that we have enough material to do all the analyses, a composite will be prepared from Liner B at the 220-222 ft. bgs interval, Liner C at the 220-222 ft. bgs, Liner B at the 222-224 ft. bgs interval and Liner C at the 222-224 ft. bgs interval.

The samples for volatile organic compound (VOC) analysis were collected from Liner A at the 222-224 ft. bgs interval. No high level VOC samples (methanol) were collected but a methanol blank was collected by mistake at the 220-222 ft. bgs.

Reason for Change: Poor sample recovery.

Date Change Effective: 5-11-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 5-17-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 5-18-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 5-25-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 5-24-10

Other (Optional, Print/Sign): **Date:**

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-007 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 5-11-10

Original Requirement: Analyze for Tc-99 using an acid digestion.

Samples Impacted: Samples collected in C Farm in FY10.

Proposed Change: In addition to the acid digestion used for ICPMS Tc-99 analysis a vadose water digestion will be prepared and analyzed for ICPMS Tc-99 for all C Farm FY10 samples not previously designated for this water digestion analysis (C7472 I007-I010).

Reason for Change: Both preparation methods for technetium-99 are being requested in order to have consistent data analyses (i.e., previous technetium-99 analysis by PNNL was performed on both preparation methods). Both methods allow for calculating various factors such as the K_d coefficient, which can be used to help determine vertical migration.

Date Change Effective: 4-23-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 5-20-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 5-20-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 5-24-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 5-24-10

Other (Optional, Print/Sign): **Date:**

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor

RPP-RPT-50339, Rev A DRAFT
VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-003 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 4-12-10

Original Requirement: Listed in Table 5-1, titled *Equipment Blank Sample Preservation, Container and Holding Time Guidelines*.

Samples Impacted: Equipment Blanks collected in C Farm.

Proposed Change:
Add Ethylene Glycol and monobutylphosphate/dibutylphosphate analysis, change the Container/Volume requirements for TPH Gasoline, PCBs and Pesticides and change the Preservation requirements for TPH Gasoline by adding "Cool ≤6 °C" in Table 5-1, titled *Equipment Blank Sample Preservation, Container and Holding Time Guidelines* as shown below:

Parameter/ Analysis	Reference Method	Container/ Volume	Preservation	Holding Time
TPH Gasoline	WTPH- Gasoline	G 3X 40 ml VOA Vial	HCl to pH <2 Cool ≤6 °C	14 Days
PCBs	8082 PCB GC	aG 3X 1L	Cool ≤6 °C	None
Pesticides	8081 Pest. GC	aG 2X 1L	Cool ≤6 °C	14/40 Days
Ethylene Glycol	8015B	G 3X 40 ml VOA Vial	Cool ≤6 °C	14 Days
MBP/DBP	9056 (modified)	P/G 1X 125 ml	Cool ≤6 °C	14 Days

Reason for Change: Consistent with HASQARD requirement, Volume 2, section 5-1, indicates *equipment blanks should be analyzed for the same analytes as sample using that equipment* in order to ensure that the equipment has been properly cleaned.

It should be noted though that the samples collected are analyzed for percent water, bulk density, carbonate and bicarbonate and PCB congeners. These analyses are not being requested for the equipment blanks.

The additional sample volume was requested by the off-site laboratory to complete the required analyses.

Date Change Effective: 3-26-10

Schedule Impact: None

Authorization:
Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 5-20-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 5-20-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 5-24-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 5-24-10

Other (Optional, Print/Sign): **Date:**

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-008 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 05-27-10

Original Requirement: At each sample depth, three (3) liner samples and one (1) shoe sample are targeted to be taken. Good recovery is required to perform all of the requested analyses.

Samples Impacted: Samples collected in C Farm at Site R (C7668), this location is adjacent to the 241-C-301 Catch Tank.

Proposed Change: Due to poor sample recovery from 5-7 feet (ft.) bgs (50% in shoe, 25% in Liner A, 0% in Liner B and 15% in Liner C), an additional sample was ~~collected~~ attempted from 7-9 ft. bgs (0% in shoe, 0% in Liner A, 0% in Liner B and 0% in Liner C). AM 7-19-10

Due to poor sample recovery from 10-12 ft. bgs (100% in shoe, 75% in Liner A, 5% in Liner B and 0% in Liner C), an additional sample was collected from 12-14 ft. bgs (20% in shoe, 10% in Liner A, 0% in Liner B and 0% in Liner C).

To ensure there is enough material to do all the analyses, a composite will be prepared from Liner A and Liner B from the 10-12 ft. bgs sample and the shoe and Liner A at the 12-14 ft. bgs sample.

Due to poor sample recovery from 14-16 ft. bgs (40% in shoe, 0% in Liner A, 0% in Liner B and 0% in Liner C), an additional sample was collected from 16-18 ft. bgs (100% in shoe, 100% in Liner A, 50% in Liner B and 0% in Liner C).

To ensure there is enough material to do all the analyses, a composite will be prepared from the shoe (after VOA sample removed), Liner A and Liner B and the shoe from the 16-18 ft. bgs sample.

The samples for volatile organic compound (VOC) analysis were collected from the shoe at each initial sample (i.e. 5-7, 10-12 and 14-16 ft bgs).

As identified above, due to poor sample recovery, additional samples were collected at 7-9 ft. bgs. and from12-14 ft. bgs. There was zero (0) recovery from 7-9 ft. bgs interval. For the 5-7 ft. bgs sample a total of 46 grams (g) of soil was recovered. Between the 10-12 and 12-14 ft. bgs samples a total of 117g of soil was recovered. Based on the poor recovery, the laboratory was given a prioritized analysis list as shown below:

Analyses	Quantity of Soil needed for analysis in Grams
1. SVOA	20g
2. Tc-99/Sn	4g
3. I-129	10g
4. Acid digest (ICP, MS act)	5g
5. Sulfide	0.3g
6. CN	0.6g
7. Ammonia	0.3g
8. Hg	0.3g
5-7' Sample	**46 g.**
9. Gamma scan	Not Applicable
10. %moisture	20g

11. pH	3g
12. Pu-iso, Am, Cm-iso	1g
13. Sr-90	5g
14. Ni-63,Se-79	2g
15. Water dig. ((IC, C-14, H-3)	5g
10-14' Sample	**117.5 g**
16. Off-site	130g (low priority due to large sample amount required)

For the 5-7 ft. bgs sample a total of 46g of soil was recovered enabling analyses 1-8. For the 10-14 ft. bgs sample a total of 117.5g of soil was recovered enabling analyses 1-15. No material will be sent for off-site analysis from the 5-7 or the 10-14 ft. bgs samples due to the lack of material. For the 14-18 ft. bgs sample enough material was collected to perform all the analysis.

Reason for Change: Poor sample recovery.

Date Change Effective: 5-20-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton — **Date:** 6-30-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar — **Date:** 7-2-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney — **Date:** 7-19-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour — **Date:** 7-14-10

Other (Optional, Print/Sign): — **Date:**

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-009 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 07-16-10

Original Requirement: There is no original requirement in the project documents on what to analyze for if we encounter free liquids.

Samples Impacted: Samples collected in C Farm at Site R (C7668), depth 39-41 ft. bgs. This location is adjacent to the 241-C-301 Catch Tank.

Proposed Change: During sampling at the 39-41 ft. bgs depth, standing water/liquid was encountered on top of the sampler. Since this was unexpected and the work package does not cover sampling for water/liquid, work was suspended until modifications were made to the work package to sample the water/liquid. After changes were made to the work package a sample of the water/liquid in the sampler was collected in a 500 ml glass container. After filtration approximately 4 ml of liquid/water was recovered. The laboratory is directed to analyze water/liquid for Tc-99.

Reason for Change: Encountered water in sampler.

Date Change Effective: 6-1-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 10-11-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 10-11-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 10-14-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 10-14-10

Lab Interface Lead (, Print/Sign): **H.L. Anastos** **Date:** 10-11-2010

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-0011 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 7-27-10

Original Requirement: At each sample depth, three (3) liner samples and one (1) shoe sample are targeted to be taken. Good recovery is required to perform all of the requested analyses.

Samples Impacted: Samples collected in C Farm at site U, location 7676, 5-7 ft. bgs and 14-16 ft. bgs. All percent recoveries are approximate.

Proposed Change:

Due to poor sample recovery from 5-7 ft.bgs (95% in shoe, 100% in liner A, 30% in liner B and 0% in liner C), an additional sample was collected from 7-9 ft. bgs. (100% in shoe, 100% in liner A, 10% in liner B, and 0% in liner C).

To ensure that we have enough material to do all the analyses, a composite will be prepared from Liner A and Liner B at the 5-7 ft. interval and the shoe, Liner A and Liner B from the 7-9 ft. bgs interval.

The samples for volatile organic compound (VOC) analysis were collected from the shoe at the 5-7 ft.. bgs interval.

Due to poor sample recovery from 14-16 ft. bgs (100% in shoe, 100% in Liner A, 40% in Liner B and 0% in Liner C), an additional sample was collected from 16-18 ft. bgs. (100% in shoe, 100% in Liner A, 100% in Liner B and 20% in Liner C)

To ensure that we have enough material to do all the analyses, a composite will be prepared from Liner A and Liner B from the 14-16 ft. bgs interval, and the shoe, Liner A, Liner B and Liner C from the 16-18 ft. bgs interval.

The samples for volatile organic compound (VOC) analysis were collected from the shoe at the 14-16 ft.. bgs interval.

Reason for Change: Poor sample recovery.

Date Change Effective: 7-22-10

Schedule Impact: None

Authorization:

Characterization Task Lead (Print/Sign): A.M. Templeton **Date:** 10-11-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 10-11-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 10-14-10

VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-0010 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 07-24-10

Original Requirement: At each sample depth, samples are collected from the shoe and three liners. The liners are removed from the sampler, percent recovery estimated and then the samplers are capped, sealed and labeled for transport to the laboratory.

Samples Impacted: Samples collected in C Farm at Site E (C7672), depth 37-39 ft. bgs.

Proposed Change: Due to the compact nature of the soil, the liners could not be removed from the sampler. The VOC samples were collected from the shoe, then the soil was removed/extruded from the liners while still in the sampler and ~~containerized~~ placed ~~into~~ in a single 500 ml glass jar for delivery to the laboratory.

a.m.t. 7-29-10

Reason for Change: Compact soil

Date Change Effective: 7-13-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 7-29-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 7-29-10

222-S Project Coordinator (Print/Sign): S.G. McKinney **Date:** 7-29-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour for GPR **Date:** 7/28/2010

Other (Optional, Print/Sign): **Date:**

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-0011 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 7-27-10

Original Requirement: At each sample depth, three (3) liner samples and one (1) shoe sample are targeted to be taken. Good recovery is required to perform all of the requested analyses.

Samples Impacted: Samples collected in C Farm at site U, location 7676, 5-7 ft. bgs and 14-16 ft. bgs. All percent recoveries are approximate.

Proposed Change:

Due to poor sample recovery from 5-7 ft.bgs (95% in shoe, 100% in liner A, 30% in liner B and 0% in liner C), an additional sample was collected from 7-9 ft. bgs. (100% in shoe, 100% in liner A, 10% in liner B, and 0% in liner C).

To ensure that we have enough material to do all the analyses, a composite will be prepared from Liner A and Liner B at the 5-7 ft. interval and the shoe, Liner A and Liner B from the 7-9 ft. bgs interval.

The samples for volatile organic compound (VOC) analysis were collected from the shoe at the 5-7 ft.. bgs interval.

Due to poor sample recovery from 14-16 ft. bgs (100% in shoe, 100% in Liner A, 40% in Liner B and 0% in Liner C), an additional sample was collected from 16-18 ft. bgs. (100% in shoe, 100% in Liner A, 100% in Liner B and 20% in Liner C)

To ensure that we have enough material to do all the analyses, a composite will be prepared from Liner A and Liner B from the 14-16 ft. bgs interval, and the shoe, Liner A, Liner B and Liner C from the 16-18 ft. bgs interval.

The samples for volatile organic compound (VOC) analysis were collected from the shoe at the 14-16 ft.. bgs interval.

Reason for Change: Poor sample recovery.

Date Change Effective: 7-22-10

Schedule Impact: None

Authorization:

Characterization Task Lead (Print/Sign): A.M. Templeton **Date:** 10-11-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 10-11-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 10-14-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour _____ **Date:** 10-14-10

Vadose Lab Interface Lead (Print/Sign): H.L. Anastos _____ **Date:** 10-11-2010

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-0012 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 9-27-10

Original Requirement: At each sample depth, three (3) liner samples and one (1) shoe sample are targeted to be taken. Good recovery is required to perform all of the requested analyses.

Samples Impacted: Samples collected in C Farm at site I, location 7682, 10-12 ft. bgs.

Proposed Change:

Due to poor sample recovery from the 10-12 ft. bgs (100% in shoe, 0% in Liner A, 0% in Liner B and 0% in Liner C), an additional sample was collected from 12-14 ft. bgs. (100% in shoe, 100% in Liner A, 100% in Liner B and 100% in Liner C)

To ensure that we have enough material to do all the analyses, a composite will be prepared from and the shoe, Liner A, Liner B and Liner C from the 12-14 ft. bgs interval.

The samples for volatile organic compound (VOC) analysis were collected from the shoe at the 10-12 ft. bgs interval.

Reason for Change: Poor sample recovery.

Date Change Effective: 8-18-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 11-28-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 11-29-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 12-9-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 1-18-10

Vadose Lab Interface Lead (Print/Sign): HL Anastos **Date:** 12-3-10

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor

VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-0013 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 1-3-11

Original Requirement:

RPP-PLAN-40564, Rev. 2 *Field Sampling and Analysis Plan for Waste Management Area C*, Table 3-3, Sample Preservation, Container and Holding Time Guidelines, first row, column 7, states that the Holding Time for Radionuclides is "None".

Samples Impacted: All soil samples collected in C Farm.

Proposed Change:

Table 3-3, Sample Preservation, Container and Holding Time Guidelines, first row, column 7, the Holding Time for Radionuclides should be changed to 6 months to be consistent with the *Sampling and Analysis Plan for Phase 2 Characterization of Vadose Soil in Waste Management Area C*, RPP-PLAN-38777, Rev. 1

Reason for Change:

RPP-PLAN-38777, Rev. 1, *Sampling and Analysis Plan for Phase 2 Characterization of Vadose Soil in Waste Management Area C*, Table A-1, Sample Preservation, Container and Holding Time Guidelines, column 7, row 1, states 6 months.

Date Change Effective: 1-3-11

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 1-17-11

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 1-26-11

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 1-25-11

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 1-25-11

Vadose Lab Interface Lead (Print/Sign): H. L. Anastos **Date:** 1-18-11

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-0014 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 1-24-11

Original Requirement:

RPP-PLAN-40564, Rev. 2 Field Sampling and Analysis Plan for Waste Management Area C, does not request that the samples be analyzed for specific conductivity.

Samples Impacted: All soil samples collected in C Farm.

Proposed Change:

Add specific conductivity to the Field Sampling and Analysis Plan for Waste Management Area C, RPP-PLAN-40564, Rev. 2. Add the following row to the end of Table 4-1, Primary Inorganic Constituents and Analytical Methods. The measurement would be performed on the 1:1 water extract. The holding time will be 28 days.

Constituent	Analytical Method	Alternative Method
Specific Conductance (EC)	9050A	N/A

Reason for Change:

Specific conductivity measurements could be useful in the future to correlate electrical resistivity measurements (SGE) with vadose zone sediment and pore water composition.

Date Change Effective: 1-24-11

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 2-8-11

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 2-9-11

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 2-15-11

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 2-14-11

Vadose Lab Interface Lead (Print/Sign): H. L. Anastos **Date:** 2-8-11

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor

VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-015 **ECN to TSAP Required?** Y / N

Requestor: Andrew Templeton **Date:** 2/14/2011

Original Requirement: Section 4, Sample Analysis Requirements, Tables, 4-1, 4-3, 4-4, 4-6 and 4-7 require the following analyses: sulfide, volatile organic analysis, gasoline and diesel range organics, PCB congeners, ethylene glycol and monobutyl/dibutyl phosphate.

Samples Impacted: All FY2011 C Farm Sampling Events

Proposed Change: Analysis for sulfide, volatile organic analysis, gasoline and diesel range organics, PCB congeners, ethylene glycol and monobutyl/dibutyl phosphate will be discontinued for future C Farm sampling campaigns.

Delete sulfide from Table 4-1, delete Table 4-3, delete ethylene glycol and monobutyl/dibutyl phosphate from Table 4-4, delete the first column of Table 4-5 titled Method 8260 VOC, delete PCB congeners from Table 4-6 and delete GRO and DRO from Table 4-7.

Reason for Change: Data obtained in 2009 and 2010 meets or exceeds the data requirements specified in the work plan and SAP for these analyses. Review of 2009 and 2010 data to date, indicates that there is no justification to continue analysis of these constituents.

Elimination of these methods allows larger sample sizes to be used for remaining methods to decrease detection limits, ensure full QC, and allow re-analyses, if applicable.

Date Change Effective: 2/14/2011

Authorization:

Vadose Zone POC (Print/Sign): A.M. Templeton **Date:** 2-16-11

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 2-16-11

222-S Project Coordinator (Print/Sign): S.G. McKinney **Date:** 2-17-11

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 2-16-11

Lab Interface Lead (Print/Sign): H.L. Anastos **Date:** 2-16-11

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor, Bob Lober, M. Bergeron, M Skorska, J. Robertson

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-016 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 3-2-11

Original Requirement: At each sample depth, three (3) liner samples and one (1) shoe sample are targeted to be taken. Good recovery is required to perform all of the requested analyses.

Samples Impacted: Samples collected in C Farm at site J, direct push slant borehole, location C8100, 15-17 ft. bgs (pipe run).

Proposed Change:

Due to poor sample recovery from 15-17 ft. bgs (100% in Shoe, 75% in Liner A, 0% in Liner B and 0% in Liner C), an additional sample was collected from 17-19 ft. bgs. (100% in Shoe, 90% in Liner A, 0% in Liner B and 0% in Liner C)

To ensure that we have enough material to do all the analyses, a composite will be prepared from the Shoe and Liner A from the 15-17 ft. bgs interval, and the Shoe and Liner A from the 17-19 ft. bgs interval.

Reason for Change: Poor sample recovery.

Date Change Effective: 3-2-11

Schedule Impact: None

Authorization:

Characterization Task Lead (Print/Sign): A.M. Templeton **Date:** 3-3-11

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 3-3-11

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 3-8-11

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 3-7-11

Vadose Lab Interface Lead (Print/Sign): H.L. Anastos **Date:** 3-3-11

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor, Ann Shrum, Marcel Bergeron

VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-017 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 3-3-11

Original Requirement: Each sampling location consists of a surface sample, three shallow samples (5, 10 and 14 ft) and at least four additional samples down to a maximum depth of 200 ft. below ground surface (bgs) or refusal.

Samples Impacted: Samples collected in C Farm at site J, direct push slant borehole, location C8100

Proposed Change: It was decided that 3 samples (rather than 4) would be sufficient to represent the top 15 ft bgs. The surface and 5 ft bgs samples will be collected and a third sample from 13-15 ft bgs (vertical depth) will be collected from this location to represent the plan required 10-12 and 14-16 ft bgs samples.

Reason for Change: The decision to collect one less sample in the top 15 ft bgs was agreed upon by all attendees (at the February 15th 2011 WMAC Sample Depth Collection meeting for Location J (C8100)) as the deeper intervals appear to be of more interest (based on draft gamma and moisture plot). Since the deeper intervals were of more interest, six sample depths were chosen at depths > 15 ft bgs. Thus, a total of nine sample depth intervals will be collected and analyzed for this location.

Date Change Effective: 3-3-11

Schedule Impact: None

Authorization:

Characterization Task Lead (Print/Sign): A.M. Templeton **Date:** 3-3-11

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 3-3-11

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 3-8-11

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 3-7-11

Vadose Lab Interface Lead (Print/Sign): H.L. Anastos **Date:** 3-3-11

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor, Ann Shrum, Marcel Bergeron

VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-018 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 3-7-11

Original Requirement: At each sample depth, three (3) liner samples and one (1) shoe sample are targeted to be taken. Good recovery is required to perform all of the requested analyses.

Samples Impacted: Samples collected in C Farm at site J, direct push slant borehole, location C8100, 54-56 ft. bgs (pipe run).

Proposed Change:

Due to poor sample recovery from 54-56 ft. bgs (100% in Shoe, 80% in Liner A, 0% in Liner B and 0% in Liner C), an additional sample was collected from 56-58 ft. bgs. (100% in Shoe, 100% in Liner A, 70% in Liner B and 0% in Liner C)

To ensure that we have enough material to do all the analyses, a composite will be prepared from the Shoe and Liner A from the 54-56 ft. bgs interval, and the Shoe, Liner A and Liner B from the 56-58 ft. bgs interval.

Reason for Change: Poor sample recovery.

Date Change Effective: 3-7-11

Schedule Impact: None

Authorization:

Characterization Task Lead (Print/Sign): A.M. Templeton **Date:** 3-15-11

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 3-16-11

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 3-30-11

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 3-25-11

Vadose Lab Interface Lead (Print/Sign): H.L. Anastos **Date:** 3-16-11

cc: S. J. Eberlein, J.R. Prilucik, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor, Ann Shrum, Marcel Bergeron

VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-019 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 3-31-11

Original Requirement: The laboratory shall issue the Format VI laboratory data report within 120 calendar days following receipt of the last samples or as negotiated. Preliminary results shall be available within 60 calendar days following receipt of the last samples.

Samples Impacted: The following samples collected in C Farm at site J, direct push slant borehole, location C8100: 54 - 58 ft (pipe run), 76 - 78 ft (pipe run), 118-120 ft bgs (pipe run), 168.6-170.6 ft bgs (pipe run), 202-204 ft bgs (pipe run) and 222.8-224.8 ft bgs (pipe run).. These are sample intervals I004 through I010.

Proposed Change: In addition to the current data reporting, the laboratory shall provide a QA reviewed report with results for Tc-99 and nitrate within 2 to3 weeks after the last sample is received from location C8100.

Reason for Change: The data is needed to support waste retrieval activities.

Date Change Effective: 3-31-11

Schedule Impact: None

Authorization:

Characterization Task Lead (Print/Sign): A.M. Templeton **Date:** 4-12-11

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 4-13-11

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 4-22-11

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 4-13-11

Vadose Lab Interface Lead (Print/Sign): H.L. Anastos **Date:** 4-12-11

cc: S. J. Eberlein, J.R. Prilucik, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor, Ann Shrum, Marcel Bergeron

RPP-RPT-58339, Rev. A DRAFT

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-020 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 6-5-11

Original Requirement: At each sample depth, three (3) liner samples and one (1) shoe sample are targeted to be taken. Good recovery is required to perform all of the requested analyses.

Samples Impacted: Samples collected in C Farm at site A, direct push slant borehole, location C8102, 5.7-7.7 ft. bgs (pipe run) and 11.5-13.5 ft. bgs (pipe run).

Proposed Change:

Due to poor sample recovery from 5.7-7.7 ft. bgs (pipe run) an additional sample was collected from 7.7-9.7 ft. bgs (pipe run).

To ensure that we have enough material to do all the analyses, a composite will be prepared from the Shoe, Liner A, Liner B and Liner C from the 5.7-7.7 ft. bgs interval, and the Shoe, Liner A and Liner B from the 7.7-9.7 ft. bgs interval.

Due to poor sample recovery from 11.5-13.5 ft. bgs (pipe run) an additional sample was collected from 13.5-15.5 ft. bgs (pipe run).

To ensure that we have enough material to do all the analyses, a composite will be prepared from the Shoe and Liner A from the 11.5-13.5 ft. bgs interval, and the Shoe, Liner A and Liner B from the 13.5-15.5 ft. bgs interval.

Interval/ Depth (ft)	Composite HEIS Sample Number	Recovery Shoe	HEIS Sample Number	Recovery Liner A	HEIS Sample Number	Recovery Liner B	HEIS Sample Number	Recovery Liner C	HEIS Sample Number
I001/ 5.7-7.7	B2D1X2	100%	B2D1P8	100%	B2D1P9	50%	B2D1R0	15%	B2D1R1
I-002/ 7.7-9.7		100%	B2D1R2	100%	B2D1R3	90%	B2D1R4	0%	B2D1R5
I-003/ 11.5-13.5	B2D1X4	100%	B2D1R6	95%	B2D1R7	0%	B2D1R8	0%	B2D1R9
I-004/ 13.5-15.5		100%	B2D1T0	100%	B2D1T1	20%	B2D1T2	0%	B2D1T3

Reason for Change: Poor sample recovery.

Date Change Effective: 6-5-11

Schedule Impact: None

Authorization:

RPP-RPT-58339, Rev. A DRAFT

Characterization Task Lead (Print/Sign): A.M. Templeton	**Date:** 6-9-11
Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar	**Date:** 6-9-11
222-S Project Coordinator (Print/Sign): S.G. Mckinney	**Date:** 7-18-11
ATL Project Coordinator (Print/Sign): G.P. Ritenour	**Date:** 7-18-2011
Vadose Lab Interface Lead (Print/Sign): H.L. Anastos	**Date:** 6-9-11

cc: S. J. Eberlein, J.R. Prilucik, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor, Ann Shrum, Marcel Bergeron

VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-021 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 6-9-11

Original Requirement: At each sample depth, three (3) liner samples and one (1) shoe sample are targeted to be taken. Good recovery is required to perform all of the requested analyses.

Samples Impacted: Samples collected in C Farm at site A, direct push slant borehole, location C8102, 16.1-18.1 ft. (pipe run).

Proposed Change:
Due to poor sample recovery from 16.1-18.1 ft. pipe run (100% in the shoe, 50% in Liner A, 0% in Liner B and 0% in Liner C) an additional sample was attempted from 18.1 to 20.1 ft. (pipe run). There was zero recovery on the 18.1-20.1 ft pipe run sample. The shoe from 16.1-18.1 feet contained 68 grams of soil and Liner A contained 89 grams of soil. Approximately 7 grams was used for the % moisture. The analytical prioritization shown below shall be used, after homogenization, to prioritize the analysis using the remaining sample material of approximately 150 grams.

The gamma scan analysis is not destructive, so that material may be used to perform other radiochemical analyses; therefore, some lower priority radiochemical constituents may be able to be performed. The program understands that SVOA, PCBs and pesticides will likely not be performed due to lack of material and sample storage requirements (the gamma scan aliquot is not maintained refrigerated and cannot be used for SVOA organic analyses).

Analytical Prioritization

Constituents	Grams Needed	Total Grams Needed (Cumulative)
1.TC-99	35	35
2. CN	0.6	35.6
3. Water dig (IC)	5	40.6
4. Acid Dig (ICP & MS)	5	45.6
5. Gamma Scan	80	125.6
6. pH	3	128.6
7. Ammonia	0.3	128.9
8. Hg	0.3	129.2
9. Sr-90	10	139.2
10. Pu-ISO, Am, Cm-ISO	1.5	140.7
11. TC-99 (acid)	5	145.7
12. SVOA	20	165.7
13. Ni-63/Se-79	4	169.7
14. Water dig (H-3)	10	179.7
15. I-129	10	189.7
16. Sb, Sn-126 (acid)	1	190.7
17. PCBs	20	210.7
18. Pesticides	40	250.7
Total	250.7	

Reason for Change: Poor sample recovery.

Date Change Effective: 6-9-11

Schedule Impact: None

Authorization:

Characterization Task Lead (Print/Sign): A.M. Templeton	**Date:** 8-23-11
Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar	**Date:** 8-24-11
222-S Project Coordinator (Print/Sign): S.G. Mckinney	**Date:** 8-29-11
ATL Project Coordinator (Print/Sign): G.P. Ritenour	**Date:** 8-29-2011
Vadose Lab Interface Lead (Print/Sign): H.L. Anastos	**Date:** 8-25-11

cc: S. J. Eberlein, J.R. Prihucik, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor, Ann Shrum, Marcel Bergeron

VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-40564 Rev 2 **Change Number:** WMAC-023 **ECN to TSAP Required?** Y / N

Requestor: Andrew M. Templeton **Date:** 9-15-11

Original Requirement: The laboratory may group all samples from one location as a single preparation batch as needed to optimize the number of samples tested in each batch and that methods meet holding times [for quality control (QC) purposes for short hold time constituents].

This requires QC (duplicates, spikes, spike duplicates, etc.) be performed for each borehole location.

Samples Impacted: Samples collected in C Farm at site A, B and/or C1. (Direct push slant borehole locations C8102, C8104 and C8106).

Proposed Change: The laboratory may group all samples from these locations as a single preparation batch as needed to optimize the number of samples tested in each batch, so long as holding times and HASQARD minimum QC frequencies are met. Soil and QC samples shall be batched separately.

This change allows for maximum batch sizes and does not require QC for each borehole location; however, each preparation batch will have all required QC samples (duplicates, spikes, spike duplicates, etc.).

However, if sampling at C8106 is delayed past October 2012 or cancelled, the other two locations may be reported together and C8106 will be reported separately.

Reason for Change: This change will allow more efficient processing of the samples both in the laboratory and during the data review and reporting.

Date Change Effective: 9-15-11

Schedule Impact: None

Authorization:

Characterization Task Lead (Print/Sign): A.M. Templeton **Date:** 9-29-11

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 9-29-11

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 9-29-11

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:**

Vadose Lab Interface Lead (Print/Sign): H.L. Anastos **Date:** 9-29-11

cc: S. J. Eberlein, J.R. Prilucik, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor, Ann Shrum, Marcel Bergeron

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-44354 Rev 0 **Change Number:** WMAC-002 3 CLT 12/29/10 **CCN to TSAP Required?** Y / N

Requestor: Heather L. Anastos **Date:** 11-22-10

Original Requirement: Original document only required performing Tc-99 analysis on 1:1 water digest (e.g., Table 3-1). CCN WMAC-002 associated with this plan directed analysis of Tc-99 to be performed on both an acid digest and a 1:1 water leach.

Samples Impacted: Following samples collected in C Farm at C7570: B248B3, B248B4, B248B5, and B248B6.

Technetium-99 was detected in these samples (intervals at 246' – 262') in the acid digest samples; however, no Tc-99 was detected in the water leach samples. Additional analysis is requested to investigate this anomaly.

Proposed Change: For the samples listed above, reanalyze Tc-99 by both acid digest and water leach using radiochemistry separation followed by liquid scintillation counting and via ICP/MS.

Reason for Change: Encountered unexpected results

Date Change Effective: 11-22-10

Schedule Impact: The ICP/MS instrument is currently out-of-service due to maintenance activities. The instrument is expected to be returned to service on or around 12/15/2010. The laboratory has 30 days from when the instrument is returned to service to perform this requested analysis. Reporting requirements will be a letter report with data summary tables.

Authorization:

Vadose Zone ROC (Print/Sign): C.L. Tabor HLAnastos for CLT per telecon HL Anastos **Date:** 12-3-2010

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 11-29-10

222-S Project Coordinator (Print/Sign): S.G. Mckinney **Date:** 12-6-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 12-6-10

Lab Interface Lead (Print/Sign): H.L. Anastos HLAnastos **Date:** 11/22/2010

cc: S. J. Eberlein, K. M. Hall, Dana Stewart, Dave Myers, Penny Berlin, Eric Wyse, Mike Connelly, Harold Sydnor, Cindy Tabor

VADOSE ZONE
CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-44354 Rev 0 **Change Number:** WMAC-001 **ECN to TSAP Required?** Y / N

Requestor: Cynthia L. Tabor **Date:** 4-28-10

Original Requirement: The plan indicated that only percent moisture, technetium-99, and nitrate would be analyzed and that the preparation method for technetium-99 and nitrate would be 1:1 water digest (Section 3.0). Sections 3 and 4 of the plan do not identify that pH is to be measured.

Samples Impacted: All soil samples identified in the plan.

Proposed Change: Acid digest preparation method will be used for technetium-99 analysis (rather than water digest). Water digest (1:1) will still be used for the nitrate analysis. pH was also added to the soil sample analysis.

Reason for Change: RPP-PLAN-44354, Rev. 0, (Appendix A, page A-5, last sentence of paragraph under "**Continuation on page 4-21 of RPP-39114 Rev 1. pages 4-19 and 4-20 are figures**", which are meeting minutes with Ecology) indicates that pH should be measured. Note that the information from the Ecology meeting minutes has been incorporated into Section 4 of RPP-PLAN-39114, Rev. 1 (Phase 2 RCRA Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C).

In regards to the preparation method for technetium-99, the acid digest preparation method will be used for technetium-99 because the water digest preparation method (for technetium-99) is not a validated method.

Date Change Effective: 4-28-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): C.L. Tabor **Date:** 4-28-10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 4-28-10

222-S Project Coordinator (Print/Sign): S.G. McKinney **Date:** 4-28-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 4-28-10

Other (Optional, Print/Sign): **Date:**

VADOSE ZONE CHARACTERIZATION CHANGE NOTICE

Document: RPP-PLAN-44354 Rev 0 **Change Number:** WMAC-002 **ECN to TSAP Required?** Y / N

Requestor: Cynthia L. Tabor **Date:** 5-19-10

Original Requirement: The plan indicates that the preparation method for technetium-99 is the 1:1 water digest (Section 3.0). Change Notice WMAC-001 requested the laboratory to use acid digest preparation method.

Samples Impacted: All soil samples identified in the plan.

Proposed Change: The purpose of this change notice is to direct the laboratory to do the technetium-99 analyses on both water digest and the acid digest preparation method.

Reason for Change: Both preparation methods for technetium-99 are being requested in order to have consistent data analyses (i.e., previous technetium-99 analysis by PNNL was performed on both preparation methods). Both methods allow for calculating various factors such as the K_d coefficient, which can be used to help determine vertical migration.

Date Change Effective: 5-17-10

Schedule Impact: None

Authorization:

Vadose Zone POC (Print/Sign): C.L. Tabor **Date:** 5/24/10

Vadose Zone Quality Assurance (Print/Sign): K.J. Dunbar **Date:** 5-24-10

222-S Project Coordinator (Print/Sign): S.G. McKinney Steven McKinney **Date:** 5-24-10

ATL Project Coordinator (Print/Sign): G.P. Ritenour **Date:** 5-24-2010

Other (Optional, Print/Sign): **Date:**

APPENDIX L

MISCELLANEOUS FIELD DOCUMENTATION

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APPENDIX L
MISCELLANEOUS FIELD DOCUMENTATION

This appendix contains relevant documentation that doesn't fit into other appendices.

MEETING SUMMARY

washington river protection solutions

From: J. G. Field
Phone: 376-3753
Location: Ecology Office,
Date: August 11, 2010
Subject: Tank Farm Leak Evaluation

To: Distribution/Attendees

Attendees: Mike Barnes, ECOLOGY
Joe Caggiano, ECOLOGY
Les Fort, WRPS
Paul Henwood, S.M. Stoller
Bob Lober, ORP
Marc Wood, CHPRC

PURPOSE:
Review and assess the approach proposed by the SST Retrieval & Closure organization to compile evidence for a pending 241-C-101 leak evaluation based on spare inlet leak/release conceptual models in accordance with procedure TFC-ENG-CHEM-D-42.

Review of Previous Meeting Summary:
Previous meeting summaries were not available for review.

Tank 241-C-101 Leak Conceptual Model – spare inlets
Tank C-101 waste volume and other monitoring information was discussed. The information presented was part of various reports, including C-Farm Leak Assessment Report RPP-ENV-33418. The tank was classified as questionable integrity in 1969 based on a 4-inch liquid level decrease from 194.5 to 190.5 inches between approximately January 1968 and December 1969. Tank 101-C was reclassified as a Confirmed Leaker in 1980 after a leak assessment performed by four separate groups (RHO-CD-896). The review groups concluded that 17,000 to 24,000 gallons of waste had leaked from tank 241-C-101. The C-Farm Leak Assessment Report (RPP-ENV-33418) determined that there is insufficient data available to establish a minimum range or leak mass for tank C-101. The upper range appears to be 36,000 gallons based on liquid level decreases. The mass of the C-101 leak is in question because of inconsistencies in low radioactivity measurements in surrounding drywells and expected dry well radioactivity for a large leak of high activity waste. Based on the four organizations assessing the data in 1980, the 20,000 gallon leak volume estimate apparently represents a compromise estimate based on unspecified evidence or evaluation that is not documented in the record.

Review of the basis for the 1980 Tank C-101 leak evaluation showed that the 4 inch waste level decrease was above the spare-inlet elevation of 191.5 inches. Drywell 30-01-09 is close to the spare inlets and could be detecting an overflow of waste from the tank. An informal working group composed of Technical Integration and Closure & Corrective Measures technical staff has been reviewing the possible outcomes of the tank C-101 leak assessment. They stated they have not found historical information that, by itself, could be used as a basis to change tank C-101 designated status to a sound tank. They looked at the tank contents and fission product inventory to see whether or not evaporation could account for the

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36,000 gallon loss during the 1965 – 1969 time period, and determined that it can account for some, but not all of the loss. They identified locations for three direct pushes, and a possible soil sample push, that is hoped will provide the best chance for supporting a final decision on the tank's leak integrity status. They also suggested re-logging the existing drywells around the tank with the Spectral Gamma Logging System (SGLS) to update the soil contamination profile baseline. These drywells have not been logged since 1997.
These are described below.

1. Re-log drywells in the Vicinity of Tank C-101. Also through techniques such as ground penetrating radar – global positioning survey ground scans confirm location of at-grade and below-grade structures using global positioning and ground penetrating radar before commencing direct pushes.
2. Conduct a direct push near Drywell 30-01-09.
3. Conduct two additional Direct Pushes.
    a. near Drywell 30-01-06 between existing Drywell 30-01-06 and line 8107 from 241-CR-152-L8 connecting to V844 and 241-CR-151-L8 that lies south and east of the drywell, as close to the line as feasible. Complete radiation and moisture logs, and install an electrode string before resealing.
    b. between existing Drywell 30-01-06 and the East side of Tank C-101 where no drywells exist.

Response from the Closure and Corrective Measures organization to the three points stated above was as follows:

1. Logging drywells and the GPR/GPS scans are within the existing work scope of the organization. Stoller is currently logging in C farm.
2. The first direct push (near drywell 30-01-09) is in scope for FY11.
3. The other 2 direct push/log locations are not in the current baseline. These will require a Budget Change Request to add them, and perform them early next FY.

There was some discussion as to the charter of the group. This group is to assess the nature and extent of tank farm releases and to that end assess data gaps and/refine waste release data/information. The goal is to establish a waste contaminate release inventory. With that in mind the group recommended performing items 1, 2, and 3b. The group also recommended extending the re-logging scope of the drywells to incorporate moisture logging and that they be involved in the sampling and direct push planning efforts.

ACTIONS:

1. All: Review meeting summary.
2. J. Field: Prepare and distribute August 11, 2010 Meeting Summary.
3. J. Field/L. Fort: Prepare information for S Farm tanks
4. J. Field: Prepare information for near surface line leaks and other unplanned releases

NEXT MEETING:

Assess S Farm tanks and review near surface line leaks and other unplanned releases

Date: August 24, 2010
Time: 9:00-10:30
Location: ECOLOGY Office

From: Sydnor, Harold A
Sent: Tuesday, June 15, 2010 2:59 PM
To: Eberlein, Susan J
Cc: Connelly, Michael; Robertson, Julie R; Dunbar, Kathryn J
Subject: FW: C-110 push

For your information

From: Barnes, Michael (ECY) [mailto:miba461@ecy.wa.gov]
Sent: Tuesday, June 15, 2010 2:57 PM
To: Sydnor, Harold A
Cc: Lyon, Jeffery; Lober, Robert W
Subject: C-110 push

Harold:

Appreciate the discussion on the C-110 push. Ecology agrees with putting in a straight direct push. Ecology's concern with a direct push was the potential for getting a cesium kick from waste on the stiffener rings of the tank when using the gamma probe. With the probe only reading 18 inches this will NOT be an issue with the planned placement. A slanted push does not offer a better option and given the delays in retrieval waiting will not present a better option either.

Ecology agrees with the planned direct push.

Thanks,

Mike

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APPENDIX M

DATA QUALITY ASSESSMENT

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LIST OF TERMS

Abbreviations and Acronyms

%R	percent recovery
AEA	alpha energy analysis
AQA	Analytical Quality Associates, Inc.
bgs	below ground surface
BS	blank spike
CAS	Chemical Abstracts Service
CMS	Corrective Measures Study
CN	Change Notice
COPC	contaminant of potential concern
CVAA	cold vapor atomic absorption
DQA	data quality assessment
DQO	data quality objective
DRO	diesel range organics
EPA	U.S. Environmental Protection Agency
EQL	estimated quantitation limit
FB	field blank
FD	field duplicate
GC/ECD	gas chromatography/electron capture detector
GC/FID	gas chromatography/flame ionization detector
GC/MS	gas chromatography/mass spectroscopy
GEA	gamma energy analysis
GPC	gas proportional counting
GRO	gasoline range organics
HASQARD	Hanford Analytical Services Quality Assurance Requirements Documents
HEIS	Hanford Environmental Information System
IC	ion chromatography
ICP/AES	inductively coupled plasma/atomic emission spectrometry
ICP/MS	inductively coupled plasma/mass spectroscopy
IDL	instrument detection limit

LCL	lower control limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LSC	liquid scintillation counting
MB	method blank
MDA	minimum detectable activity
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
QA	quality assurance
QC	quality control
RB	rinsate blank
RCRA	*Resource Conservation and Recovery Act of 1976*
RFI	RCRA Facility Investigation
RJLG/CLS	R. J. Lee Group/Center for Laboratory Services
RPD	relative percent difference
SAP	sampling and analysis plan
SDG	sample data group
SVOC	semi-volatile organic compound
SwRI	Southwest Research Institute
TAKN	Test America Knoxville
TASL	Test America St. Louis
TB	trip blank
TIC	tentatively identified compound
UCL	upper control limit
UPR	unplanned release
VOC	volatile organic compound
WIDS	Waste Information Data System
WMA	Waste Management Area
WSCF	Waste Sampling and Characterization Facility
WTPH	Washington State Total Petroleum Hydrocarbons

M DATA QUALITY ASSESSMENT

M1 INTRODUCTION

This data quality assessment (DQA) evaluates laboratory data for vadose zone soil samples collected and analyzed as part of the Waste Management Area (WMA) C Phase 2 *Resource Conservation and Recovery Act of 1976* (RCRA) Facility Investigation (RFI). This DQA is intended to determine whether these data are of the right type, acceptable quality, and sufficient quantity for direct regulatory use. The information contained in this DQA follows guidelines for DQAs established for the project and are based upon the U.S. Environmental Protection Agency (EPA) guide, EPA/200/B-06/002, *Data Quality Assessment: A Reviewer's Guide EPA QA/G-9R*.

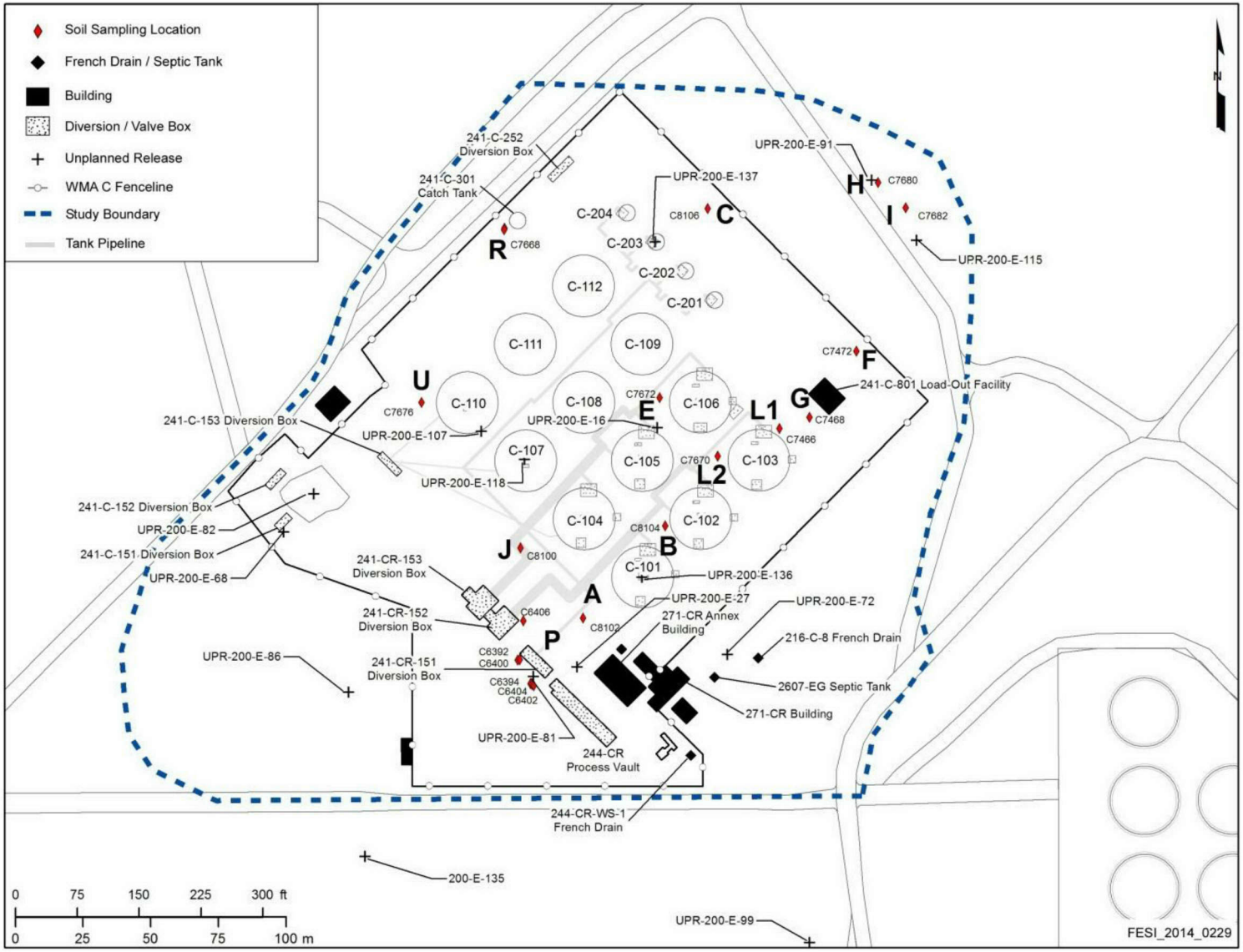
The WMA C Phase 2 RFI field sampling effort included installing push borings and the associated sampling and analysis. This DQA assesses chemical and radiochemical data obtained from vadose zone soil samples collected as part of this field sampling effort. Figure M-1 shows the vadose zone soil sample locations. In addition to these locations, archived soil samples from groundwater monitoring wells 299-E27-20 and 299-E27-24 were analyzed.

Sampling and analytical requirements are listed in RPP-PLAN-38777, *Sampling and Analysis Plan for Phase 2 Characterization of Vadose Zone Soil in Waste Management Area C*, as amended through Change Notices (CNs). Details regarding site and project background are presented in RPP-PLAN-39114, *Phase 2 RCRA Facility Investigation/Corrective Measures Study Work Plan for Waste Management Area C* and RPP-RPT-38152, *Data Quality Objectives Report Phase 2 Characterization for Waste Management Area C RCRA Field Investigation/ Corrective Measures Study*.

M1.1 PURPOSE

The primary purpose of the field sampling effort consisted of installing push borings for geophysical logging, surface geophysical exploration, and vadose zone soil sample collection in WMA C at locations where the Tri-Parties agreed to collect additional data in support of corrective measures evaluation and decision making or to augment the decision-making process. The samples and data collected in accordance with RPP-PLAN-38777 are intended to provide information regarding the nature and extent of contamination, support data needs outlined in RPP-PLAN-38152, refine alternatives analysis for the Corrective Measures Study (CMS), and enhance decision making. The purpose of this DQA was to determine whether the data generated from the WMA C Phase 2 field sampling effort meet the data quality requirements specified in RPP-PLAN-38777. Meeting the data quality requirements of that document provides assurance these data are appropriate for the intended use.

Figure M-1. Waste Management Area C Phase 2 Soil Sampling Locations



WMA = Waste Management Area

The DQA process assesses the quality of the data collected to determine whether the data is the right type, acceptable quality, and sufficient quantity for the intended use. This DQA completes the EPA data quality life cycle (planning, implementation, and assessment).

M1.2 SCOPE

The DQA process involves the scientific evaluation of data to determine whether the data are of the right type, quality, and quantity to support the intended use. The DQA procedure is not intended to be a definitive analysis of a project or problem; but rather, it provides an initial assessment of the reasonableness of the data generated, based solely on the quality control (QC) information associated with the data, not the technical implications of the data values.

This DQA focuses on the chemical and radiochemical characterization data collected by sampling and analyzing vadose zone soil and small mammal tissue as stated in RPP-PLAN-38777. The data were examined to determine whether they met the analytical criteria outlined in RPP-PLAN-38777 and are adequate to support decision making. The evaluation steps, criteria, and outcome are presented in the following subsections. Evaluation of the surface geophysical exploration and geophysical logging data was not included in the scope of this DQA.

The DQA was performed in accordance with guidelines for DQAs established for the project. These guidelines are based upon EPA guide EPA/240/B-06/002. The DQA methodology roughly consisted of data verification, data validation, and data usability evaluations.

M1.2.1 Data Verification

Data verification is the process of evaluating the completeness, correctness and conformance or compliance of a specific data set against the method, procedural, and/or contractual requirements. It includes confirmation that the specified sampling and analytical requirements have been completed. This includes verification that the number, type, and location of all samples identified in RPP-PLAN-38777 were collected and that all required measurements and analyses were performed. This evaluation is documented in Section M5.8, which also includes an evaluation of the sampling design versus field implementation. In addition, verification was performed for field QC and laboratory QC samples and is documented in their appropriate sections.

M1.2.2 Data Validation

Data validation is an analyte- and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set. Data validation includes a determination, where possible, of the reasons for any failure to meet method, procedural, or contractual requirements, and an evaluation of the impact of such failure on the overall data set. It includes confirmation that the particular requirements for a specific intended use are fulfilled. Validation was performed on more than 5% of all project data per RPP-PLAN-38777 and is described in Section M5.2.

M1.2.3 Data Usability

The data usability assessment is a determination of the adequacy of the data to support a particular environmental decision and is based, in part, on the verification and validation results. The assessment relates to the adequacy of data to support a specific and defined data need. The usability step involves assessing whether the process execution and resulting data meet project data quality objectives (DQOs). This evaluation is summarized in Section M6.

M2 PROJECT OBJECTIVES

During the DQO process, the participants determined that the primary focus of the Phase 2 data collection effort at WMA C would be directed toward further characterizing the contamination sources in association with corrective measures alternatives for the soils. This effort was intended to improve the understanding of leak inventory and distribution to support testing and refining a site-specific conceptual model for past operational leaks and contaminant migration processes. The focus of the Phase 2 data collection effort at WMA C was on sampling the vadose zone soils in areas of known releases that include spills, tank leaks, and overfill events within the tank farms, and analyzing the samples for a range of contaminants of potential concern (COPCs) and in areas where release that had not been documented in the Waste Information Data System (WIDS) was suspected. These sites were identified through review of process records. These unplanned releases (UPRs) were addressed as potentially contributing contamination sources to the vadose zone in WMA C and the characterization efforts intended to support the risk assessment and subsequent alternatives evaluation to select a corrective action.

Vadose zone soil samples were collected and analyzed to provide data to fulfill the data need regarding near-surface (0 to 15 ft below ground surface) soil concentrations and inventories identified during the DQO process (RPP-RPT-38152). Details regarding this data need were more specifically presented in RPP-RPT-39114. The objectives for the WMA C Phase 2 RFI samples collected at WMA C and evaluated as part of this DQA are summarized in Table M-1.

M2.1 SAMPLING DESIGN

Vadose zone soil and small mammal tissue samples were collected in accordance with the sampling design described in RPP-PLAN-38777. Table M-2 presents the sampling design summary for each sample type.

M2.2 IMPLEMENTATION OF SAMPLING DESIGN

The scope of activities performed included collection of vadose zone soil samples which were to be collected for analysis as identified in Table M-3. Borehole completion reports were issued to document the field activities conducted as part of the characterization of vadose zone soil for direct push locations within WMA C.

Vadose zone soil samples were collected from 19 push borings in and near WMA C between 2008 and 2011. From these 19 push borings, 143 vadose zone soil samples and 122 associated QC water samples (equipment rinsate blank, field blank, and trip blank) were collected and sent to laboratories for chemical and radiochemical analyses. From these 143 vadose zone soil samples, 34,130 analytical results were reported. From the 122 QC samples, 4,850 results were reported. In addition, 5 soil samples collected from archived material for 2 groundwater wells were submitted for analysis. One QC sample was associated with these 8 soil samples. From these 5 soil samples, 32 results were reported. From the 1 QC sample, 3 results were reported.

Table M-1. Summary of Sampling Objectives

General Characterization Area/Location	Known or Suspected Event	Objective*
Area near Tank 241-C-101 (C8102, C8104)	Tank release and loss through spare inlet	Characterize releases and refine conceptual models 1, 2, and 4
Area near 200-series tanks (C8106)	Tank leak and/or tank over fill, loss through spare inlet	Determine whether 200-series tanks leaked, refine conceptual models 1, 2, and 4, and determine whether any 200-series tank leaked during retrieval
Area between Tanks 241-C-106 and 241-C-109 (C7672)	Suspected release	Characterize soil for presence of ^{60}Co and refine conceptual models 1, 2, and 4
Area near Tank 241-C-103 and Building C-801, and Building C-801 chemical drain (C472, C7468)	Suspected transfer line release and other suspected release	Characterize soil to assess release of Plutonium Uranium Extraction plant waste, ^{137}Cs and ^{99}Tc, and ^{60}Co and refine conceptual models 1, 2, and 4
Area northeast of UPR-91 and UPR-115 (C7680, C7682)	Surface releases	Assess surface exposures, and assess ^{60}Co and surface release conceptual models 1, 2, and 4
Area near Tank 241-C-104 (C8100)	Tank release	Assess suspected release and refine conceptual models 1, 2, and 4
Area between Tanks 241-C-103 and 241-C-106 (C7466, C7670)	Potential transfer line leak and tank overfill	Assess potential release and refine conceptual models 1, 2, and 4
Area near UPR-81 (C6392/C6400, C6394, C6402, C6404, C6406)	Known release site	Characterize release and refine conceptual models 1, 2, and 4
Area near C-301 Catch Tank (C7668)	Unlined concrete catch tank	Assess potential catch tank release and refine conceptual models 1, 2, and 4
Area near Tank 241-C-110 (C7676)	Tank leak and/or tank overfill; loss through spare inlet	Characterize Tank C-110 release and refine conceptual models 1, 2, and 4
Groundwater Monitoring Well 299-E27-20	Previously unknown release site	Assess potential release of Tc^{99} to soil column impacting groundwater and conceptual models 1, 2, and 4
Area due east of CR Vaults	Potential release	Investigate soil presence of Tc^{99} at groundwater monitoring well 299-E27-24

*Conceptual models presented by number in RPP-RPT-38152, *Data Quality Objectives Report Phase 2 Characterization for Waste Management Area C RCRA Field Investigation/Corrective Measures Study*.

Table M-3 presents a summary of the sampling performed for the WMA C Phase 2 RFI. Samples were analyzed for the constituents listed in RPP-PLAN-38777. Adjustments were made to fulfill the sampling design when sampling issues were encountered. Two borings were added due to poor recovery or other sampling issues at shallow intervals, and RPP-PLAN-38777 and RPP-PLAN-39114 were revised accordingly. Adjustments made that did not require a document revision included collecting samples from two consecutive intervals and compositing the material, except that for volatile organic compound (VOC) analysis, across both intervals in an

attempt to obtain sufficient sample volume to complete all analyses. With the exceptions noted above, the sampling design was implemented as described in RPP-PLAN-38777.

Table M-2. Waste Management Area C Phase 2 RCRA Facility Investigation Sampling Design Summary

Planned Survey or Sampling	Key Features of Design
Soil Sampling	Samples were collected at depths established during sample depth meetings held with participation of U.S. Department of Energy, Washington State Department of Ecology, Washington River Protection Solutions personnel, and other Site contractors. Samples were analyzed using established/approved methods for chemical and radiochemical constituents of potential concern in accordance with RPP-PLAN-38777, *Sampling and Analysis Plan for Phase 2 Characterization of Vadose Zone Soil in Waste Management Area C*.

RCRA = *Resource Conservation and Recovery Act of 1976*

M2.3 FIELD QUALITY CONTROL SAMPLES

The QC procedures described in the Hanford Site internal laboratory quality assurance (QA) requirements must be followed in the field and laboratory to ensure that reliable data are obtained. When performing this field sampling effort, care was taken to prevent the cross-contamination of sampling equipment, sample bottles, and other equipment that could compromise sample integrity.

M2.3.1 Types

Field QC samples are used to assess the precision, repeatability, and potential contamination related to sampling and laboratory activities. Field QC samples associated with the WMA C Phase 2 sampling events included three types of blank samples (equipment rinsate blanks, field blanks, and trip blanks) and field duplicate samples. These field QC samples and their intended purpose are defined as follows.

- Equipment rinsate blank (RB) samples are samples of reagent water that are passed through or over decontaminated, non-dedicated sampling equipment. The RB samples are analyzed for the same analytes as samples collected using that equipment. Results from RB samples are used to evaluate the effectiveness of equipment decontamination procedures. The collection frequency for RB samples in RPP-PLAN-38777 was 1 in 20 samples collected using non-dedicated sampling equipment.

- Field blank (FB) samples are samples that contain reagent water and any required preservatives. An FB sample is collected in the field. Results from FB samples are used to check for contamination associated with sampling conditions, sample bottles, and laboratory sample preparation. The FB sample is analyzed for all constituents of interest. Collection of FB samples was not required in RPP-PLAN-38777.

Table M-3. Sample Design Implementation and Completion Evaluation (5 sheets)

Location	Samples Required*	Sampling Completed	Percent Complete
Soil Borings			
C8102	Collect samples from: • 4 intervals ≤15 ft below ground surface (bgs) (top depths 0, 5, 10, and 14) • 5 intervals ≥15 ft bgs (top depths 56, 81, 125, 148, and 169) • Sample depths per Sample Depth Meeting (May 16, 2011, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 6.8, 11.4, and 14.1) • Field duplicate sample collected at surface interval (midpoint 0.5 ft bgs) • 5 intervals ≥15 ft bgs (midpoints 46.8, 69.7, 118.7, and 169.7)	100%
C8104	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 4 intervals ≥15 ft bgs (top depths 37, 82, 104, and 138) • Sample depths per Sample Depth Meeting (June 17, 2011, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 5.1, 11.9, and 14.2) • Field duplicate sample collected at surface interval (midpoint 0.5 ft bgs) • 4 intervals ≥15 ft bgs (midpoints 36, 81.4, 102.1, and 137)	100%
C8106	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0-1, 5-6.77, 9-10.77, and 12.5-14.27) • 4 intervals ≥15 ft bgs (top depths 29, 40.5, 58.5, and 70.5) • Sample depths per Sample Depth Meeting (October 18, 2011, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 6.5, 11.5, and 16.5) • Field duplicate sample collected at surface interval (midpoint 0.5 ft bgs) • 4 intervals ≥15 ft bgs (midpoints 45.6, 57.3, 75.5, and 87.8)	100%
C7672	Collect samples from: • 4 intervals ≤15 ft bgs (top depth 0, 5, 10, and 14) • 4 intervals ≥15 ft bgs (top depths 37, 73, 83, and 122) • Sample depths per Sample Depth Meeting (July 7, 2010, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 6, 11, and 15) • Field duplicate sample collected at surface interval (midpoint 0.5 ft bgs) • 4 intervals ≥15 ft bgs (midpoints 38, 74, 84, and 123)	100%

Table M-3. Sample Design Implementation and Completion Evaluation (5 sheets)

Location	Samples Required*	Sampling Completed	Percent Complete
C7472	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 6 intervals ≥15 ft bgs (top depths 108.5, 129, 142, 158, 195, and 216) • Sample depths per Sample Depth Meeting (December 17, 2009, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 6, 13, and 15) • Field duplicate sample collected at surface interval (midpoint 0.5 ft bgs) • 6 intervals ≥15 ft bgs (midpoints 109.5, 130, 143, 159, 196, and 217)	100%
C7468	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 5 intervals ≥15 ft bgs (top depths 43.5, 92, 97, 125, and 135) • Sample depths per Sample Depth Meeting (July 28, 2009, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 6, 11, and 15) • Field duplicate sample collected at surface interval (midpoint 0.5 ft bgs) • 5 intervals ≥15 ft bgs (midpoints 44.5, 93, 98, 126, and 136)	100%
C7680	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 5 intervals ≥15 ft bgs (top depths 17, 43, 116, 142, and either 87 or 92) • Sample depths per Sample Depth Meeting (August 4, 2010, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 6, 11, and 15) • 5 intervals ≥15 ft bgs (midpoints 18, 44, 93, 117, and 143)	100%
C7682	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 4 intervals ≥15 ft bgs (top depths 18, 45, 88, and 122) • Sample depths per Sample Depth Meeting (August 4, 2010, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 6, 13, and 15) • Field duplicate sample collected at surface interval (midpoint 0.5 ft bgs) • 4 intervals ≥15 ft bgs (midpoints 19, 46, 89, and 123)	100%
C8100	Collect samples from: • 3 intervals ≤15 ft bgs (top depth 0, 5.7, and 15) • 6 intervals ≥15 ft bgs (top depths 54, 76, 118, 173, 207, and 252) • Sample depths per Sample Depth Meeting (February 15, 2010, see Appendix J)	Samples collected from: • 3 intervals ≤15 ft bgs (midpoints 0.5, 4.9, and 13.5) • 6 intervals ≥15 ft bgs (midpoints 38.8, 54.3, 90.1, 131.8, 157.7, and 173.3)	100%

Table M-3. Sample Design Implementation and Completion Evaluation (5 sheets)

Location	Samples Required*	Sampling Completed	Percent Complete
C7466	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 5 intervals ≥15 ft bgs (top depths 43.5, 84, 109.5, 111.5, 114, and 133) • Sample depths per Sample Depth Meeting (July 28, 2009, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 6, 11, and 15) • Field duplicate sample collected at surface interval (midpoint 0.5 ft bgs) • 5 intervals ≥15 ft bgs (midpoints 44.5, 85, 110.5, 115, and 134)	100%
C7670	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 4 intervals ≥15 ft bgs (top depths 39, 139, 163, and 220) • Sample depths per Sample Depth Meeting (January 20, 2010, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 6, 12, and 15) • Field duplicate sample collected at surface interval (midpoint 0.5 ft bgs) • 4 intervals ≥15 ft bgs (midpoints 40, 140, 164, and 222)	100%
C6392 and C6400	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 4 intervals ≥15 ft bgs (top depths 19.5, 25, 42, and 56) • Sample depths per Sample Depth Meeting (January 15, 2009, see Appendix J)	Samples collected from: • 3 intervals ≤15 ft bgs (midpoints 5, 10, 15) • 5 intervals ≥15 ft bgs (midpoints 20.5, 26, 43, 57, and 132)	87.5% Surface soil sample was not collected. Seven of eight planned samples were collected. Due to high radioactivity at shallow 5-7 ft bgs, the sample from 10-12 ft bgs was not collected and C6400 was placed adjacent to C6392 to collect samples from shallow intervals missed for C6392. In addition, one deep sample interval (131-132 ft bgs) was planned for C6400.

Table M-3. Sample Design Implementation and Completion Evaluation (5 sheets)

Location	Samples Required*	Sampling Completed	Percent Complete
C6394	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 6, 10, ad 14) • 4 intervals ≥15 ft bgs (top depths 19.5, 31, 42, and 57) • Sample depths per Sample Depth Meeting (January 15, 2009, see Appendix J)	Samples collected from: • 0 intervals ≤15 ft bgs • 2 intervals ≥15 ft bgs (midpoints 37 and 169)	25% No samples ≤15 ft bgs were collected. Two of eight samples were collected; however, the samples collected were from intervals not reflected in sample depth meeting notes.
C6402 and C6404	Collect samples from: • 4 intervals ≤15 ft bgs (top depth 0, 5, 10, and 14) • 4 intervals ≥15 ft bgs	Samples collected from: • 3 intervals ≤15 ft bgs for each C6402 and C6404 (midpoints 7, 11, and 15) • 4 intervals ≥15 ft bgs for C6404 (midpoints 20.5, 32, 43, and 58)	87.5% Surface soil sample was not collected. Seven of eight planned samples were collected. Due to poor recovery at shallow depths, C6404 was placed adjacent to C6402 to collect additional sample material from shallow intervals and deep samples originally planned for C6402.
C6406	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 4 intervals ≥15 ft bgs (top depths 18, 26, 54.5, and 59) • Sample depths per Sample Depth Meeting (January 15, 2009, see Appendix J)	Samples collected from: • 3 intervals ≤15 ft bgs (midpoints 6, 11, and 15). • 4 intervals ≥15 ft bgs (midpoints 19, 27, 55.5, and 60)	87.5% Surface soil sample was not collected. Seven of eight planned samples were collected.
C7668	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 4 intervals ≥15 ft bgs (top depths 27, 39, 80, 132) • Sample depths per Sample Depth Meeting (January 20, 2010, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 6, 12, and 16). • 4 intervals ≥15 ft bgs (midpoints 28, 40, 81, and 133)	100%

Table M-3. Sample Design Implementation and Completion Evaluation (5 sheets)

Location	Samples Required*	Sampling Completed	Percent Complete
C7676	Collect samples from: • 4 intervals ≤15 ft bgs (top depths 0, 5, 10, and 14) • 3 intervals ≥15 ft bgs (top depths 38, 128, and 157) • Sample depths per Sample Depth Meeting (July 7, 2010, see Appendix J)	Samples collected from: • 4 intervals ≤15 ft bgs (midpoints 0.5, 7, 11, and 16). • Field duplicate sample collected at surface interval (midpoint 0.5 ft bgs) • 3 intervals ≥15 ft bgs (midpoints 39, 129, and 125)	100%
Archived Soil			
299-E27-20	Submit samples of archived material. Number of samples required not specified.	Archived sample material from 1 depth interval collected and submitted for analysis (midpoint 267.5 ft bgs)	100% Evaluation based on completion of action without regard for number of samples.
299-E27-24	Submit samples of archived material. Number of samples required not specified.	Archived sample material from 4 depths collected and submitted for analysis (midpoints 247, 250.4, 255, and 261 ft bgs)	100% Evaluation based on completion of action without regard for number of samples
Small Mammal Sampling			
Transect A	Sample mass of 142 g	216 g sample mass	100%
Transect B	Sample mass of 142 g	65 g sample mass	46%
Transect C	Sample mass of 142 g	12 g sample mass	8.5%

*Calculation for completeness of sample collection. For overall completeness of sample data set, see Section M6.

- Trip blank (TB) samples consist of a sample container filled in the laboratory with reagent water and transported to the sampling site. These samples are not opened in the field. The TB sample is analyzed for VOCs and results are used to check for potential VOC contamination associated with sample transport, storage, and handling activities. The TB sample collection frequency in RPP-PLAN-38777 was one per day when samples collected for VOC analysis.

- Field duplicate (FD) samples are two samples collected from material collected in the same location. Results from FD sample analysis provide information regarding the homogeneity of the sample matrix and are used to determine the precision of laboratory analytical measurements. The FD sample pairs are analyzed as separate samples by the same laboratory. It is not possible to obtain two direct pushes at exactly the same location; therefore, FD samples were not required for direct push samples. The FD collection frequency of one per Investigation Site as defined in RPP-PLAN-38777.

Table M-4 summarizes the required and actual collection frequencies for each of the field QC sample types.

Table M-4. Field Quality Control Sample Collection Frequencies

Field Quality Control Sample Type	Number Collected	Frequency	
		Required*	Actual
Equipment Rinsate Blank	9	5% (1 in 20 samples)	6%
Field Blank	54	0	Not calculated
Trip Blank	58	73 (1 per day when volatile organic compound analysis required)	79%
Field Duplicate	13 (from 12 Investigation Sites)	13, one per Investigation Area	92% While 13 samples were collected, two were collected from one Investigation Site L and none from Investigation Site P, as defined in RPP-PLAN-38777

*Required frequency from RPP-PLAN-38777, *Sampling and Analysis Plan for Phase 2 Characterization of Vadose Zone Soil in Waste Management Area C.*

Collection of FB samples was not required per RPP-PLAN-38777; but 54 FB samples were collected and were collected and analyzed solely for VOCs. The results obtained were used to evaluate the potential for contamination associated with sampling conditions, sample bottles, and laboratory sample preparation for VOC samples; however, no such evaluation can be made for other analytical methods or COPCs.

Trip blank sample collection was not completed at the frequency listed in RPP-PLAN-38777. On 58 of the 73 days samples were collected for VOC analysis, an TB sample was collected. Twenty-five samples collected on 15 different days do not have an associated TB sample. An FB sample was collected on two of these days; therefore, some evaluation of potential contamination associated with sample transport, storage, and handling activities as well as with sampling conditions, sample bottles, and laboratory sample preparation can be made for the three associated soil samples. Two samples (soil sample B211X9 and FB sample B23V99) were collected with an associated TB, but neither stored nor delivered to the laboratory with that associated TB sample. Table M-5 provides a summary of samples either not collected or held with an associated TB sample.

Collection of RB and FD samples was generally at the frequencies listed in RPP-PLAN-38777. While the total number of FD samples collected matches the total number required, a surface soil FD sample pair was not collected from any of the five borings in Investigation Site P, as required in RPP-PLAN-38777. It is important to note that no surface soil samples were collected from borings in Investigation Site P.

Table M-5. Summary of Samples Not Collected or Held with Associated Trip Blank (2 sheets)

Sample ID	Sample Date and Time	Received by Lab Date	Sample Type	Comment
B1YT72	4/21/09 10:41 AM	21-Apr-09	SOIL	Only sample collected and received by laboratory this day.
B1YT75	4/22/09 10:00 AM	22-Apr-09	SOIL	Only sample collected and received by laboratory this day.
B1YT78	4/30/09 10:15 AM	30-Apr-09	SOIL	
B1YT81	4/30/09 2:15 PM		SOIL	
B1YT90	5/4/09 10:20 AM	04-May-09	SOIL	
B1YT93	5/4/09 12:45 PM		SOIL	
B1YT96	5/6/09 10:40 AM	06-May-09	SOIL	Only sample collected and received by laboratory this day.
B1YT99	5/13/09 9:30 AM	13-May-09	SOIL	Only sample collected and received by laboratory this day.
B1YTB8	5/19/09 9:45 AM	19-May-09	SOIL	Only sample collected and received by laboratory this day.
B1YTH4	6/1/09 11:35 AM	01-Jun-09	SOIL	Only sample collected and received by laboratory this day.
B1YTD0	6/3/09 2:25 PM	03-Jun-09	SOIL	Only sample collected and received by laboratory this day.
B1YTD3	6/4/09 9:34 AM	04-Jun-09	SOIL	
B1YTD6	6/4/09 10:30 AM		SOIL	
B1YTD9	6/4/09 1:28 PM		SOIL	
B1YTF2	6/9/09 9:20 AM	09-Jun-09	SOIL	
B1YTF5	6/9/09 10:55 AM		SOIL	
B20XV7	6/15/09 9:35 AM	15-Jun-09	SOIL	
B20XW1	6/15/09 10:17 AM		SOIL	
B20XW5	6/15/09 10:53 AM		SOIL	
B236N7	4/15/10 12:35 PM	15-Apr-10	SOIL	Field blank sample analyzed for VOCs. The FB sample results were used to evaluate potential contamination associated with sample transport, storage, and handling activities as well as with sampling conditions, sample bottles, and laboratory sample preparation.
B236P0	4/15/10 12:35 PM		SOIL	
B238F4	4/15/10 12:35 PM		FB	
B26CD5	7/29/10 9:35 AM	29-Jul-10	SOIL	Only sample collected and received by laboratory this day.
B26CX0	9/1/10 8:00 PM	01-Sep-10	FB	Field blank sample analyzed for VOCs. The FB

Table M-5. Summary of Samples Not Collected or Held with Associated Trip Blank (2 sheets)

Sample ID	Sample Date and Time	Received by Lab Date	Sample Type	Comment
B26C41	9/1/10 9:00 PM		SOIL	sample results were used to evaluate potential contamination associated with sample transport, storage, and handling activities as well as with sampling conditions, sample bottles, and laboratory sample preparation.
B211X9	7/30/09 8:25 AM	05-Aug-09	SOIL	Sample collected with TB sample B26CX6, but not submitted to laboratory with that TB sample. Unknown whether sample was stored with a TB or series of TBs. Sample was submitted to laboratory at same time as TB sample B21736.
B23V99	5/20/10 10:45 AM	20-May-10	FB	Sample collected with TB sample B26CX6, but not submitted to laboratory with that TB sample. Unknown whether sample was stored with a TB or series of TBs. Sample was submitted to laboratory at same time as TB sample B21736.

FB = field blank TB = trip blank VOC = volatile organic compound

With two exceptions, field QC samples were collected according to the sample design. The sampling design was generally implemented as prescribed for RB and FD sample collection. All but one planned FD sample was collected; however, the number of FD samples collected was sufficient to provide an evaluation of sample homogeneity and analytical measurement precision. Although the lack of an associated TB sample limited the evaluation of potential contamination associated with sample transport, storage, and handling activities, it is not believed that it adversely impacted the quality of the data obtained from these samples. Collection of FB samples was not required as part of the sample design; however, FB samples were collected. These additional data were used to evaluate potential contamination.

Summaries of field QC sample results evaluations are presented in Sections M3 and M4.

M2.3.2 Evaluation Criteria

Results obtained from analysis of field QC samples were evaluated. The criteria used are presented by QC sample type below. Summaries of the evaluation are presented in Sections M3 and M4.

Trip Blank Samples

The TB sample results were evaluated by comparison within two times the method detection limit (MDL) of the laboratory performing the analysis. For common laboratory contaminants (acetone, 2-butanone, chloroform, etc.), an evaluation criterion of 5 times the MDL was used. Associated samples are those field samples collected, transported, and stored with the corresponding TB sample.

Field Blank Samples
The FB sample results were evaluated by comparison within two times the MDL or minimum detectable activity (MDA) of the laboratory performing the analysis. For common laboratory contaminants (acetone, 2-butanone, bis-2-ethylehexyl phthalate, chloroform, n-butyl phthalate, n-octyl phthalate, etc.), an evaluation criterion of 5 times the MDL was used. Associated samples are those field samples collected on the same day and analyzed by the same method as the corresponding FB sample.

Field Duplicate Samples
Field duplicate sample results are evaluated using the following, concentration-dependent criteria:

- If one or both results are <5 times the MDL or MDA, a control limit of the absolute difference between the results within 2 times the MDL or MDA is used.

- If both results are ≥5 times the MDL or MDA, a control limit of a relative percent difference (RPD) ≤30% between the results is used. The RPD is calculated as follows:

$$RPD = \left(\frac{|C_1 - C_2|}{(C_1 + C_2)/2} \right) \times 100$$

Where:
C_1 = parent sample analyte concentration or activity
C_2 = duplicate sample analyte concentration or activity

M2.4 LABORATORY QUALITY CONTROL

Laboratory QA/QC requirements govern nearly all aspects of analytical laboratory operation, including instrument procurement, maintenance, calibration, and operation. During analysis of samples, laboratory QC samples are used to assess potential sample contamination, precision, and accuracy related to laboratory activities.

M2.4.1 Analytical Quality Control Checks

Laboratory QC samples may include method blank (MB) samples, laboratory duplicate samples, laboratory control samples (LCS), blank spike (BS) samples, laboratory control sample duplicates (LCSD), matrix spike (MS) samples, matrix spike duplicate (MSD) samples, surrogate spikes, and tracer spikes. Results from these laboratory QC samples are used to evaluate potential laboratory contamination and the precision and accuracy of the analysis that may impact or influence results obtained for field samples.

Laboratory Contamination. Each analytical batch contains an MB sample that is carried through the complete analytical process. The MB sample is generally distilled or deionized water, which is subjected to the same processing as the samples, including all reagent additions.

The MB sample results are used to evaluate false positive results in samples attributable to contamination during handling and preparation at the laboratory. The presence of measureable concentrations of analytes in the MB sample may indicate contamination of field samples during the analytical process. The MB sample results are not subtracted from associated field sample results.

Analytical Accuracy. Accuracy of the analytical process is measured through recovery of known amounts of analytes (spikes) added to samples prior to preparation and analysis. Laboratory QC spikes include, but are not limited to, LCS, MS, surrogates, and tracers or carriers. These are defined and used as follows.

- Matrix Spike samples: For most analyses, a known quantity of representative analytes of interest (MS) is added to a separate aliquot of a field sample from the analytical batch. The known amount added is compared to the actual measured amount to calculate the percent recovery. The recovery percentage of the added MS is used to evaluate analytical accuracy with respect to the sample matrix.

- Laboratory Control Samples and Blank Spike Samples: An LCS is a sample prepared from an independent standard at a concentration other than that used for calibration but within the calibration range. For analyses not amenable to MS techniques (such as gamma energy analysis [GEA]) or where analytical recovery is evaluated from recovery of the tracers or carriers, the accuracy of the laboratory preparation and analysis is evaluated via QC reference samples, such as laboratory control spike. The LCS is taken through all the preparation and analysis steps used in the method. The LCS sample measures the accuracy of the analytical process on a "clean" matrix. Depending on how it is introduced into the analysis, the LCS may be referred to as a BS sample.

- Surrogates: Surrogate compounds are used to evaluate accuracy in the organic analyses. Surrogate compounds with instrumental responses that are typical of the other analytes are added into the blanks, field samples, LCS, and MS samples prior to sample preparation. Surrogates are expected to respond to the preparation and measurement systems in a manner that is similar to the analytes of interest. Recoveries for each surrogate are calculated and used to evaluate overall method performance on a given matrix.

- Tracers: A tracer is a radioactive isotope that chemically mimics and does not chemically interfere with the target radioisotope through radiochemical preparation and separation. Tracers are added to all samples in an analytical batch (including batch QC samples) such that each sample has a specific measurable activity of the tracer. From the time of spiking, tracers undergo the same chemical processing as the samples. Activity effects of a tracer on the final sample counting configuration must be taken into account. The tracer yield is used in the data calculations to correct for any and all sources of analytical losses.

- Carriers: For this discussion, a carrier is used to correct radiochemical yield in a specific sample. As with a tracer, carrier recovery is a measure of the amount of analyte lost in

performing the procedure. The influence of a carrier on counting of the target analyte (e.g., mass attenuation of beta counting) must be addressed during procedure qualification. This affect may be considered as negligible in cases such as in gamma counting.

Analytical Precision. Precision of analytical measurements is determined by running duplicate analyses and calculating the agreement between sample results obtained. The degree of agreement between duplicate results indicates reproducibility of the combined preparation/separation and measurement process. Samples analyzed in duplicate to evaluate analytical precision include, but are not limited to, LCSD, MSD, and laboratory duplicate. These are defined as follows.

- Laboratory control sample duplicate: An LCSD is an LCS sample prepared and analyzed in duplicate. The results, not recoveries, for the LCS/LCSD pair are used to calculate an RPD and to assess precision of the analytical method on a "clean" matrix.

- Matrix spike duplicate: For an MSD, a separate aliquot is removed from the same sample container and spiked in the same manner as the MS sample. The results, not recoveries, from the MS/MSD pair are used to calculate an RPD and to assess precision of the analytical method on the sample matrix.

- Laboratory duplicate: Laboratory duplicate samples are separate aliquots removed from the sample containers and analyzed for each analytical batch, as appropriate for the analytical method. The duplicate samples are compared to the original sample results which are evaluated as an RPD and are used to assess analytical precision of the analytical method on the sample matrix.

M2.4.2 Evaluation Criteria

Results obtained from analysis of laboratory QC samples were evaluated. The criteria used are presented below. Summaries of the evaluation are presented in Section M5.

Method Blank Samples

The MB sample results were evaluated by comparison within two times the MDL or MDA of the laboratory performing the analysis. For common laboratory contaminants (acetone, 2-butanone, bis-2-ethylehexyl phthalate, chloroform, n-butyl phthalate, n-octyl phthalate, etc.), an evaluation criterion of 5 times the MDL was used. Associated samples are those field samples prepared and analyzed in the same analytical batch as the corresponding MB sample.

Analytical Precision

Evaluation of laboratory duplicate, LCSD, and MSD sample pair results provides a measure for the reproducibility of the analytical process. Analytical precision for a sample matrix is estimated by using laboratory duplicate and/or MSD samples. In addition, agreement between duplicate standards results (e.g., LCS/LCSD) can be calculated and used to monitor precision of the analytical measurement system over time. Samples used to calculate precision should

contain concentrations of the analytes of interest greater than the quantitation limit. Precision is expressed as the RPD or absolute difference.

Duplicate sample results are evaluated using the following, concentration-dependent criteria.

- If one or both results are <5 times the MDL or MDA, a control limit of the absolute difference between the results within 2 times the MDL or MDA is used.

- If both results are ≥5 times the MDL or MDA, a control limit of an RPD ≤30% between the results is used. The RPD is calculated as follows:

$$RPD = \left(\frac{|C_1 - C_2|}{(C_1 + C_2)/2} \right) \times 100$$

Where:

C_1 = parent sample analyte concentration or activity
C_2 = duplicate sample analyte concentration or activity.

Analytical Accuracy

The %R is the metric used to determine analytical accuracy. A %R of 100% suggests no measurable bias in the analytical process.

Method accuracy based on a sample spike is expressed as the %R of an MS (or MSD) sample. The percent recovery is calculated using the following equation:

$$\%R = \frac{(SSR - SR)}{SA} \times 100$$

Where:

SSR = spiked sample result
SR = sample result
SA = spike added.

Method accuracy based on a standard is expressed as the %R of an LCS or surrogate. The %R is calculated as:

$$\%R = \frac{C_m}{C_s} \times 100$$

Where:

C_m = measured analyte concentration or activity
C_s = actual, known analyte concentration or activity.

M2.4.3 Laboratory Programmatic Quality Control Requirements

Hanford onsite laboratories performing analyses in support of the WMA C Phase 2 RFI had approved and implemented QA plans. As required by TFC-PLN-02, "Quality Assurance Program Description," these QA plans met the minimum requirements of DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD). Commercial laboratories off the Hanford Site, the subcontractor's implementing QA programs for commercial laboratories off the Hanford Site complied with DOECAP, *Consolidated Audit Program Quality Systems for Analytical Services*.

Laboratories are also subject to periodic and random audits of laboratory performance, systems, and overall program. Audits ensure that the laboratories are performing to laboratory contract and DOECAP requirements. No audits were performed with respect to the data analyses performed as part of this project.

M2.5 ANALYTICAL DATA QUALITY REQUIREMENTS

Table M-6 presents the data quality requirements from RPP-PLAN-38777. Field and laboratory QC sample results were evaluated against these requirements as part of this DQA. Summaries of these evaluations are presented in Sections M4 and M5. Sections M2.3 and M2.4 describe these two types of QC samples.

M2.6 QUALIFICATION FLAGS

During the generation and evaluation of environmental analytical data, any of several qualification flags may be assigned to an individual result. The Hanford Environmental Information System (HEIS) database includes qualification flags applied from three sources: laboratory, a data reviewer, and a third party data validator.

The subsections below present the definitions for qualification flags applied to WMA C Phase 2 RFI sample results.

M2.6.1 Laboratory Flags

Laboratory flags are applied by the laboratory to sample results with associated laboratory QC check(s) that did not meet laboratory acceptance criteria. The flag applied defines or describes the type of laboratory QC nonconformance. These flags are used during data review and assessment, among other information, to determine impact to which data quality and whether limitations regarding use of the data are warranted. Table M-7 presents the definitions for laboratory data qualifier flags applied to WMA C Phase 2 RFI data.

Table M-6. Data Quality Requirements (3 sheets)

Class	Quality Control Element	Acceptance Criterion

Table M-6. Data Quality Requirements (3 sheets)

Class	Quality Control Element	Acceptance Criterion
Metals (Al, Ag, Ba, Be, Cd, Co, Cr, Cu, Fe, Hg, Pb, Mn, Ni, Sb, Se, Sr, Tl, U, V, Zn)	Laboratory Control Sample %R	80-120
	Spike %R	75-125
	Solid Relative Percent Difference	≤30
Anions (F^-, NO_2^-, NO_3^-, Cl^-, SO_4^{2-}, S^{2-})	Laboratory Control Sample %R	80-120
	Spike %R	75-125
	Solid Relative Percent Difference	≤30
Acetate, Formate, Glycolate, Oxylate	Laboratory Control Sample %R	80-120
	Spike %R	75-125
	Solid Relative Percent Difference	≤30
Ammonium Ion (NH_4^+)	Laboratory Control Sample %R	80-120
Cyanide	Laboratory Control Sample %R	80-120
	Spike %R	75-125
	Solid Relative Percent Difference	≤30
Polychlorinated Biphenyl Aroclors	Laboratory Control Sample %R	70-130
	Spike %R	70-130
	Solid Relative Percent Difference	≤30
Polychlorinated Biphenyl Congeners	Laboratory Control Sample %R	Not Applicable
	Spike %R	Not Applicable
	Solid Relative Percent Difference	Not Applicable
Volatile Organic Compounds	Laboratory Control Sample %R	70-130
	Spike %R	70-130
	Solid Relative Percent Difference	≤30
Semivolatile Organic Compounds	Laboratory Control Sample %R	70-130
	Spike %R	70-130
	Solid Relative Percent Difference	≤30
Pesticides	Laboratory Control Sample %R	70-130
	Spike %R	70-130
	Solid Relative Percent Difference	≤30
Gasoline Range Organics	Laboratory Control Sample %R	70-130
	Spike %R	70-130
	Solid Relative Percent Difference	≤30

Table M-6. Data Quality Requirements (3 sheets)

Class	Quality Control Element	Acceptance Criterion
Diesel Range Organics	Laboratory Control Sample %R	70-130
	Spike %R	70-130
	Solid Relative Percent Difference	≤30
Percent Moisture	Laboratory Control Sample %R	80-120
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
Bulk Density	Laboratory Control Sample %R	Not Applicable
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
pH	Laboratory Control Sample %R	+ 0.1 pH Units
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
^{235}U, ^{238}U, ^{237}Np, ^{232}Th, ^{126}Sn	Laboratory Control Sample %R	80-120
	Spike %R	75-125
	Solid Relative Percent Difference	≤30
^{233}U, ^{234}U, ^{236}U, ^{230}Th, ^{234}Th	Laboratory Control Sample %R	Not Applicable
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
^{228}Th (Calculation)	Laboratory Control Sample %R	Not Applicable
	Spike %R	Not Applicable
	Solid Relative Percent Difference	Not Applicable
^{60}Co, ^{137}Cs, ^{125}Sb	Laboratory Control Sample %R	80-120
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
^{152}Eu, ^{154}Eu, ^{155}Eu	Laboratory Control Sample %R	Not Applicable
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
^{129}I	Laboratory Control Sample %R	80-120
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30

Table M-6. Data Quality Requirements (3 sheets)

Class	Quality Control Element	Acceptance Criterion
^{14}C, ^{3}H	Laboratory Control Sample %R	80-120
	Spike %R	75-125
	Solid Relative Percent Difference	≤30
^{63}Ni	Laboratory Control Sample %R	80-120
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
^{90}Sr	Laboratory Control Sample %R	80-120
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
^{99}Tc	Laboratory Control Sample %R	80-120
	Spike %R	75-125
	Solid Relative Percent Difference	≤30
^{79}Se	Laboratory Control Sample %R	Not Applicable
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
^{238}Pu	Laboratory Control Sample %R	Not Applicable
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
$^{239/240}Pu$	Laboratory Control Sample %R	80-120
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
^{241}Pu (Calculation)	Laboratory Control Sample %R	Not Applicable
	Spike %R	Not Applicable
	Solid Relative Percent Difference	Not Applicable
^{241}Am	Laboratory Control Sample %R	80-120
	Spike %R	Not Applicable
	Solid Relative Percent Difference	≤30
^{242}Cm, $^{243/244}Cm$	Laboratory Control Sample %R	Not Applicable
	Spike %R	NA
	Solid Relative Percent Difference	NA

%R = metric used to determine analytical accuracy

Table M-7. Laboratory Qualifier Data Quality Flags

Flag	Definition*
B	INORGANICS and WETCHEM – The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the instrument detection limit (IDL)/ method detection limit (MDL) (as appropriate). ORGANICS – The analyte was detected in both the associated quality control (QC) blank and in the sample. RADIONUCLIDES – The associated QC sample blank has a result ≥ 2× the minimum detectable activity (MDA) and, after corrections, result is ≥ MDA for this sample.
C	INORGANICS/WETCHEM – The analyte was detected in both the sample and the associated QC blank, and the sample concentration was ≤ 5× the blank concentration.
E	INORGANICS – Reported value is estimated because of interference. See comment on cover page, hardcopy case narrative, or specific inorganic hardcopy data sheet.
J	ORGANICS – Estimated value; (1) constituent detected at a level less than the RDL or practical quantitation limit (PQL) and greater than or equal to the MDL, (2) estimated concentration for tentatively identified compounds (TICs).
M	INORGANICS – Duplicate precision criteria not met.
N	ALL (except gas chromatography/mass spectroscopy [GC/MS] based analysis) – Spike and/or spike duplicate sample recovery is outside control limits. ORGANICS (GC/MS only) – Presumptive evidence of compound based on mass spectral library search.
T	Organics (GC/MS only) – Spike and/or spike duplicate sample recovery is outside control limits.
U	ALL – Analyzed for but not detected above limiting criteria. Limiting criteria may be any of the following: value reported < 0; value reported < counting error; value reported < total analytical error; value_rptd ≤ contract MDL/IDL/MDA/PQL. Note: When another qualifier accompanies a "U" qualifier the result is always considered non-detected. The qualifier combination "UJ" indicates that the result was non-detected, but the detection limit (i.e., value reported in the VALUE_RPTD or MIN_DETECTABLE_ACTIVITY [rad analysis only] fields) was estimated.
X	ALL – The result-specific translation of this qualifier code is provided in the hardcopy data report and/or case narrative. Additional result-specific translation information may also be found in the RESULT_COMMENT field for this record.

*Definition as listed in Hanford Environmental Information System, edited for how applied to Waste Management Area C Phase 2 data.

M2.6.2 Review Flags

Review flags are applied by the data reviewer(s) and/or data users for the project. For WMA C Phase 2 RFI soil sample results, review flags were assigned based on review of results against project-specific requirements, evaluation and review of the analytical data and supplemental information provided by the laboratory, review of field sampling information regarding potential impacts to analytical results obtained, and evaluation of field quality control sample results and their implication to quality of analytical results obtained for field samples. Table M-8 presents the definitions for review flags assigned to WMA C Phase 2 RFI soil results.

Table M-8. Review Qualifier Data Quality Flags

Flag	Definition*
R	Do not use. Further review indicates the result is not valid.
Y	Result suspect. Review - insufficient evidence to show result valid or invalid.
F	The result is undergoing further review.
H	Laboratory holding time exceeded before the sample was analyzed.
Q	Associated quality control sample is out of limits.
Z	Miscellaneous circumstances exist. Additional information may be found in the result_comment field for this record and/or in the samp_comment field of the parent sample record.

*Definition as listed in Hanford Environmental Information System, edited for how applied to Waste Management Area C Phase 2 data.

The Q flag review qualifier is applied to results of samples associated with field QC samples having analytical results that exceed the QC criteria given in RPP-PLAN-38777 and outlined in Section M2.4, above.

M2.6.3 Validation Qualifier Flags

Validation flags are applied by a third party data validator for the project following guidelines set forth in SGRP-GD-SMP-50116, *Data Validation for Radiochemical Analyses* and SGRP-GD-SMP-50117, *Data Validation for Chemical Analyses*. These procedures are based on guidelines set forth in EPA 402-B-04-001A, *Multi-Agency Radiological Laboratory Analytical Protocols Manual, Volume I: Chapters 1 – 9 and Appendices A – E* and EPA National Functional Guidelines (EPA-540-R-04-004, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review Final* and USEPA-540-R-08-01, *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review Final*), respectively. Table M-9 presents data validation qualifiers used and their definitions.

Table M-9. Validation Qualifier Data Quality Flags

Flag	Definition*
+	Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
-	Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
J	Estimated value: The associated result value may not reflect quantitation/detection levels (if assigned with an associated "U" qualifier) or actual concentrations with the precision/accuracy typically associated with results by this methodology. Result precision/accuracy may have been impacted due to minor quality control deficiency/s or sample matrix interferences identified during data validation.
R	Rejected value: The value may not reflect true concentrations. The ability to establish detection/ non-detection may be questionable. Validation activities identified major quality control deficiency/s or sample matrix interferences. The data should be considered unusable for most purposes. Any use of this data should be undertaken with great care. The data should not be used for certain regulatory decision-making purposes.
U	Functional non-detect: The constituent was analyzed for and reported as detected by the laboratory. The constituent has been assigned a non-detect qualifier due to associated low-level analytical batch contamination or other circumstances noted by the validator that indicates that use of the data as detected is inappropriate. Validation may result in a revised reported value. Revised results typically involve substituting the quantitation/reporting limit if greater than the initial laboratory reported value. Note-this qualifier may be assigned along with either, but never both, of the other validation qualifiers. In that case, both definitions apply to the associated result. The data should be considered usable as a non-detect for most decision-making purposes.

*Definition as listed in Hanford Environmental Information System, edited for how applied to Waste Management Area C Phase 2 data.

M3 LABORATORY INFORMATION AND ANALYTICAL METHODS

Samples collected for the WMA C Phase 2 characterization effort were sent to six laboratories for analysis. Each sample was tracked by a unique HEIS database number. Analytical request for chemical and radiochemical services to be completed by the laboratories were documented on the chain-of-custody forms. Analytical results provided by the laboratories were documented by sample data group (SDG) in data packages. The analytical results were also electronically uploaded and stored in the HEIS database.

M3.1 LABORATORY INFORMATION

Samples were analyzed by the following laboratories:

- 222-S Laboratory (222-S, Hanford Site, managed by Advanced Technologies and Laboratories International, Inc.) provided sample analysis for chemical and radiochemical parameters for soil and associated field QC (water) samples.

- Test America St. Louis (TASL, St. Louis, Missouri) provided sample analysis for chemical parameters. A subset of samples sent to TASL for analysis were subcontracted by TASL to other laboratories for analysis. These subcontracted laboratory analyses are tallied separately.

- Test America Knoxville (TAKN, Knoxville, Tennessee) received samples via TASL subcontract for polychlorinated biphenyl (PCB) congener analysis for soil and water samples.

- Southwest Research Institute (SwRI, San Antonio, Texas) received samples via TASL subcontract for monobutyl and dibutyl phosphate analysis.

- Waste Sampling and Characterization Facility (WSCF, Hanford Site, management by Mission Support Alliance, LLC) performed chemical and radiochemical analyses on soil and QC water samples diverted from 222-S.

- R. J. Lee Group/Center for Laboratory Services (RJLG/CLS, Pasco, Washington) performed chemical and radiochemical analyses on soil and QC water samples.

M3.2 ANALYTICAL METHODS

For the analysis of samples for chemical constituents, the laboratories used standard methods from EPA, ASTM International (formerly American Society for Testing and Materials), and Standard Methods. For radiological constituents, the analyzing laboratories employed methods that are recognized as acceptable within the radiochemical industry. Samples were analyzed using the methods listed in Table M-10.

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
Inorganic Constituents		
Metals		
Aluminum	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Antimony	6020 (ICP/MS), 200.8 (ICP/MS) or 6010 (ICP/AES)	6020 (ICP/MS), 6010 (ICP/AES)
Arsenic	6020 (ICP/MS), 200.8 (ICP/MS) or 6010 (ICP/AES)	6020 (ICP/MS), 6010 (ICP/AES)
Barium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Beryllium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Bismuth	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Boron	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Cadmium	6020 (ICP/MS), 200.8 (ICP/MS) or 6010 (ICP/AES)	6020 (ICP/MS), 6010 (ICP/AES)
Calcium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Cerium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Chromium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES), 6020 (ICP/MS)
Cobalt	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES), 6020 (ICP/MS)
Copper	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Europium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Iron	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Lanthanum	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Lead	6020 (ICP/MS), 200.8 (ICP/MS) or 6010 (ICP/AES)	6010 (ICP/AES)
Lithium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Magnesium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Manganese	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Mercury	7470 (CVAA), 7471 (CVAA), 6020 or 200.8 (ICP/MS)	7470 (CVAA), 7471 (CVAA)
Molybdenum	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Neodymium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Nickel	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES), 6020 (ICP/MS)
Niobium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)**

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
Palladium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Phosphorus	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Potassium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Praseodymium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Rhodium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)**
Rubidium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Ruthenium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Samarium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Selenium	6020 (ICP/MS), 200.8 (ICP/MS) or 6010 (ICP/AES)	6020 (ICP/MS), 6010 (ICP/AES)
Silicon	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Silver	6020 (ICP/MS), 200.8 (ICP/MS) or 6010 (ICP/AES)	6020 (ICP/MS), 6010 (ICP/AES)
Sodium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Strontium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Sulfur	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Tantalum	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Tellurium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Thallium	6020 (ICP/MS), 200.8 (ICP/MS) or 6010 (ICP/AES)	6020 (ICP/MS), 6010 (ICP/AES)
Thorium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)**
Tin	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Titanium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Tungsten	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES)
Uranium	6020 (ICP/MS), 200.8 (ICP/MS), 6010 (ICP/AES), Kinetic Phosphorescence Absorption, or Calculated from isotopic results	6010 (ICP/AES), or Calculated from isotopic results
Vanadium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)
Yttrium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)
Zinc	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
Zirconium	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)	6010 (ICP/AES), 6020 or 200.8 (ICP/MS)
Anions and Wet Chemistry		
Acetate	9056 (IC), 300.0 (IC)	9056 (IC)
Bromide	9056 (IC), 300.0 (IC)	9056 (IC), 300.0 (IC)
Chloride	9056 (IC), 300.0 (IC)	9056 (IC), 300.0 (IC)
Cyanide	9014 (Spec), 4500E or 335.2, 9010, 9012 (Spec) or ICP/MS	9014 (Spec), 4500E, 335.2, 9010
Ferrocyanide	Estimated from Total Cyanide, Estimated from Total Cyanide	Estimated from Total Cyanide, Estimated from Total Cyanide
Fluoride	9056 (IC), 300.0 (IC)	9056 (IC), 300.0 (IC)
Formate	9056 (IC), 300.0 (IC)	9056 (IC)
Glycolate	9056 (IC), 300.0 (IC)	9056 (IC)
Nitrate	9056 (IC), 300.0 (IC)	9056 (IC), 300.0 (IC)
Nitrite	9056 (IC), 300.0 (IC)	9056 (IC), 300.0 (IC)
Oxalate	9056 (IC), 300.0 (IC)	9056 (IC)
Phosphate	9056 (IC), 300.0 (IC)	9056 (IC)
Sulfate	9056 (IC), 300.0 (IC)	9056 (IC), 300.0 (IC)
Ammonium ion	300.7 (IC)	300.7 (IC)
Sulfide	9215 (ion selective electrode), 9034 (titration)	9030 (distillation)
Miscellaneous Constituents		
Bulk Density	D2937	D5057
Percent Solids	Gravimetric	D2216
pH	9045 (pH)	9045 (pH), 150.1 (pH)
Organic Constituents		
Semivolatile Organic Constituents		
1,1'-Biphenyl	8270 (GC/MS)	8270 (GC/MS)
1,1-Dimethylhydrazine	8270 (GC/MS)	8270 (GC/MS)
1,2,4-Trichlorobenzene	8270 (GC/MS)	8270 (GC/MS)
1,2-Dichlorobenzene	8270 (GC/MS)	8270 (GC/MS)
1,3-Dichlorobenzene	8270 (GC/MS)	8270 (GC/MS)

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
1,4-Dichlorobenzene	8270 (GC/MS)	8270 (GC/MS)
1,4-Dinitrobenzene	8270 (GC/MS)	8270 (GC/MS)
2,4,5-Trichlorophenol	8270 (GC/MS)	8270 (GC/MS)
2,4,6-Trichlorophenol	8270 (GC/MS), 8041 (GC)	8270 (GC/MS)
2,4-Dinitrotoluene	8270 (GC/MS)	8270 (GC/MS)
2,6-Bis (tert-butyl)-4-methylphenol	8270 (GC/MS)	8270 (GC/MS)
2-Chlorophenol	8270 (GC/MS)	8270 (GC/MS)
2-Ethoxyethanol (Cellosolve solvent)	8270 (GC/MS)	8270 (GC/MS)
2-Methylphenol (o-cresol)	8270 (GC/MS)	8270 (GC/MS)
2-Nitrophenol	8270 (GC/MS)	8270 (GC/MS)
2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	8270 (GC/MS)	8270 (GC/MS)
3+4 Methylphenol (cresol, m+p)	8270 (GC/MS)	8270 (GC/MS)
3-Methyl-2-butanone	8270 (GC/MS)	8270 (GC/MS)
Acenaphthene	8270 (GC/MS)	8270 (GC/MS)
Acetophenone	8270 (GC/MS)	8270 (GC/MS)
Benzo(a)anthracene	8270 (GC/MS)	8270 (GC/MS)
Benzo(a)pyrene	8270 (GC/MS)	8270 (GC/MS)
Benzo(b)fluoranthene	8270 (GC/MS)	8270 (GC/MS)
Benzo(k)fluoranthene	8270 (GC/MS)	8270 (GC/MS)
Bis(2-ethylhexyl)phthalate	8270 (GC/MS)	8270 (GC/MS)
Butylbenzylphthalate	8270 (GC/MS)	8270 (GC/MS)
Chrysene	8270 (GC/MS)	8270 (GC/MS)
Cresylic acid (cresol, mixed isomers) (Total Cresols)	8270 (GC/MS)	8270 (GC/MS)
Cyclohexanone	8270 (GC/MS)	8270 (GC/MS)
Dibenz(a,h)anthracene	8270 (GC/MS)	8270 (GC/MS)
Di-n-butylphthalate	8270 (GC/MS)	8270 (GC/MS)
Di-n-octylphthalate	8270 (GC/MS)	8270 (GC/MS)

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
Fluoranthene	8270 (GC/MS)	8270 (GC/MS)
Hexachlorobutadiene	8270 (GC/MS)	8270 (GC/MS)
Hexachloroethane	8270 (GC/MS)	8270 (GC/MS)
Hexachloronaphtahlene	8270 (GC/MS)	8270 (GC/MS)
Hexafluoroacetone	8270 (GC/MS)	8270 (GC/MS)
Indeno (1,2,3-cd) pyrene	8270 (GC/MS)	8270 (GC/MS)
Isodrin	8270 (GC/MS)	8270 (GC/MS)
m-Cresol (3-Methylphenol)	8270 (GC/MS)	8270 (GC/MS)
Methylhydrazine	8270 (GC/MS)	8270 (GC/MS)
N,N-Diphenylamine	8270 (GC/MS)	8270 (GC/MS)
Naphthalene	8270 (GC/MS)	8270 (GC/MS)
Nitric acid, propyl ester	8270 (GC/MS)	8270 (GC/MS)
Nitrobenzene	8270 (GC/MS)	8270 (GC/MS)
n-Nitrosodi-n-butylamine	8270 (GC/MS)	8270 (GC/MS)
N-Nitrosodi-n-propylamine	8270 (GC/MS)	8270 (GC/MS)
n-Nitrosomethylethylamine	8270 (GC/MS)	8270 (GC/MS)
n-Nitrosomorpholine	8270 (GC/MS)	8270 (GC/MS)
N-Nitroso-N,N-dimethylamine	8270 (GC/MS)	8270 (GC/MS)
Octachloronaphthalene	8270 (GC/MS)	8270 (GC/MS)
p-Chloro-m-cresol	8270 (GC/MS)	8270 (GC/MS)
(4-Chloro-3-methylphenol)	8270 (GC/MS)	8270 (GC/MS)
Pentachloronaphthalene	8270 (GC/MS)	8270 (GC/MS)
Pentachloronitrobenzene (PCNB)	8270 (GC/MS)	8270 (GC/MS)
Phenol	8270 (GC/MS)	8270 (GC/MS)
p-Nitrochlorobenzene	8270 (GC/MS)	8270 (GC/MS)
Pyrene	8270 (GC/MS)	8270 (GC/MS)
Pyridine	8270 (GC/MS)	8270 (GC/MS)
Tetrachloronaphthalene	8270 (GC/MS)	8270 (GC/MS)
Toxaphene	8270 (GC/MS)	8270 (GC/MS)

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
Tributyl phosphate	8270 (GC/MS)	8270 (GC/MS)
Polychlorinated Biphenyls (PCBs)		
Aroclor 1016	8082 (GC/ECD)	8082 (GC/ECD)
Aroclor 1221	8082 (GC/ECD)	8082 (GC/ECD)
Aroclor 1232	8082 (GC/ECD)	8082 (GC/ECD)
Aroclor 1242	8082 (GC/ECD)	8082 (GC/ECD)
Aroclor 1248	8082 (GC/ECD)	8082 (GC/ECD)
Aroclor 1254	8082 (GC/ECD)	8082 (GC/ECD)
Aroclor 1260	8082 (GC/ECD)	8082 (GC/ECD)
PCB Congeners	1668A	1668A
Pesticides		
4,4'-DDD	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
4,4'-DDE	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
4,4'-DDT	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
Aldrin	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
alpha-BHC	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
beta-1,2,3,4,5,6-Hexachlorocyclohexane (beta-BHC)	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
Gamma-BHC (Lindane)	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
Delta-BHC	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
Chlordane	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
Dieldrin	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
Endrin	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
Heptachlor	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
Heptachlor epoxide	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
Hexachlorobenzene	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD)
Pentachlorophenol	8081 (GC/ECD), 8270 (GC/MS)	8081 (GC/ECD), 8270 (GC/MS)
Volatile Organic Compounds		
1,1,1-Trichloroethane	8260 (GC/MS)	8260 (GC/MS)
1,1,2,2-Tetrachloroethene	8260 (GC/MS)	8260 (GC/MS)

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
1,1,2,2-Tetrachloroethane	8260 (GC/MS)	8260 (GC/MS)
1,1,2-Trichloro-1,2,2-trifluoroethane	8260 (GC/MS)	8260 (GC/MS)
1,1,2-Trichloroethane	8260 (GC/MS)	8260 (GC/MS)
1,1,2-Trichloroethylene	8260 (GC/MS)	8260 (GC/MS)
1,1-Dichloroethene	8260 (GC/MS)	8260 (GC/MS)
1,2-Dichloroethane	8260 (GC/MS)	8260 (GC/MS)
Chloroethene(vinyl chloride)	8260 (GC/MS)	8260 (GC/MS)
2-Butanone(MEK)	8260 (GC/MS)	8260 (GC/MS)
2-Nitropropane	8260 (GC/MS)	8260 (GC/MS)
2-Propanone (Acetone)	8260 (GC/MS)	8260 (GC/MS)
4-Methyl-2-pentanone (MIBK)	8260 (GC/MS)	8260 (GC/MS)
Benzene	8260 (GC/MS)	8260 (GC/MS)
Carbon disulfide	8260 (GC/MS)	8260 (GC/MS)
Carbon tetrachloride	8260 (GC/MS)	8260 (GC/MS)
Chlorobenzene	8260 (GC/MS)	8260 (GC/MS)
Chloroform	8260 (GC/MS)	8260 (GC/MS)
Dichloromethane (methylene chloride)	8260 (GC/MS)	8260 (GC/MS)
Ethyl Acetate	8260 (GC/MS)	8260 (GC/MS)
Ethylbenzene	8260 (GC/MS)	8260 (GC/MS)
Diethyl ether	8260 (GC/MS)	8260 (GC/MS)
Isobutanol	8260 (GC/MS)	8260 (GC/MS)
Methanol	8260 (GC/MS)	8260 (GC/MS)
n-Butyl alcohol (1-butanol)	8260 (GC/MS)	8260 (GC/MS)
Toluene	8260 (GC/MS)	8260 (GC/MS)
trans-1,3-dichloropropene	8260 (GC/MS)	8260 (GC/MS)
Trichlorofluoromethane	8260 (GC/MS)	8260 (GC/MS)
Xylenes	8260 (GC/MS)	8260 (GC/MS)
o-Xylene	8260 (GC/MS)	8260 (GC/MS)

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
m-Xylene	8260 (GC/MS)	8260 (GC/MS)
p-Xylene	8260 (GC/MS)	8260 (GC/MS)
Cis-1,2-dichloroethene	8260 (GC/MS)	8260 (GC/MS)
Trans-1,2-dichloroethene	8260 (GC/MS)	8260 (GC/MS)
cis-1,3-Dichloropropene	8260 (GC/MS)	8260 (GC/MS)
Ethylene dibromide (1,2, Dibromoethane)	8260 (GC/MS)	8260 (GC/MS)
Butane	8260 (GC/MS)	8260 (GC/MS)
1,3-Butadiene	8260 (GC/MS)	8260 (GC/MS)
Acrolein (propenal)	8260 (GC/MS)	8260 (GC/MS)
3-Chloropropene (Allyl chloride)	8260 (GC/MS)	8260 (GC/MS)
Propionitrile (Ethyl cyanide)	8260 (GC/MS)	8260 (GC/MS)
Acrylonitrile	8260 (GC/MS)	8260 (GC/MS)
2-Pentanone	8260 (GC/MS)	8260 (GC/MS)
Methylcyclohexane	8260 (GC/MS)	8260 (GC/MS)
n-Pentane	8260 (GC/MS)	8260 (GC/MS)
5-Methyl-2-hexanone	8260 (GC/MS)	8260 (GC/MS)
2-Heptanone	8260 (GC/MS)	8260 (GC/MS)
n-Hexane	8260 (GC/MS)	8260 (GC/MS)
Cyclohexane	8260 (GC/MS)	8260 (GC/MS)
n-Octane	8260 (GC/MS)	8260 (GC/MS)
4-Heptanone	8260 (GC/MS)	8260 (GC/MS)
Acetic acid, n-butylester	8260 (GC/MS)	8260 (GC/MS)
1,4-Dioxane	8260 (GC/MS)	8260 (GC/MS)
n-Heptane	8260 (GC/MS)	8260 (GC/MS)
Cyclopentane	8260 (GC/MS)	8260 (GC/MS)
Ethyl alcohol	8260 (GC/MS)	8260 (GC/MS)
2-Propyl alcohol	8260 (GC/MS)	8260 (GC/MS)
n-propyl alcohol (1-propanol)	8260 (GC/MS)	8260 (GC/MS)

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
Bromomethane	8260 (GC/MS)	8260 (GC/MS)
Chloroethane	8260 (GC/MS)	8260 (GC/MS)
Acetonitrile	8260 (GC/MS)	8260 (GC/MS)
1,1 Dichloroethane	8260 (GC/MS)	8260 (GC/MS)
Dichlorofluromethane	8260 (GC/MS)	8260 (GC/MS)
Chlorodifluoromethane	8260 (GC/MS)	8260 (GC/MS)
3-Methy-2-butanone**	8260 (GC/MS)	8260 (GC/MS)
Hexafluoroacetone**	8260 (GC/MS)	8260 (GC/MS)
2-Butenaldehyde (2-Butenal)	8260 (GC/MS)	8260 (GC/MS)
Methyl isocyanate	8260 (GC/MS)	8260 (GC/MS)
n-Propionaldehyde	8260 (GC/MS)	8260 (GC/MS)
3-Heptanone	8260 (GC/MS)	8260 (GC/MS)
Chloromethane	8260 (GC/MS)	8260 (GC/MS)
n-Nonane	8260 (GC/MS)	8260 (GC/MS)
Styrene	8260 (GC/MS)	8260 (GC/MS)
Tetrahydrofuran	8260 (GC/MS)	8260 (GC/MS)
Cyclohexene	8260 (GC/MS)	8260 (GC/MS)
2-Methyl-2-propenenitrile	8260 (GC/MS)	8260 (GC/MS)
2-Hexanone	8260 (GC/MS)	8260 (GC/MS)
Triethylamine	8260 (GC/MS)	8260 (GC/MS)
Oxirane	8260 (GC/MS)	8260 (GC/MS)
2-Methyl-2-propanol	8260 (GC/MS)	8260 (GC/MS)
Dichlorodifluoromethane	8260 (GC/MS)	8260 (GC/MS)
1,2-Dichloro-1,1,2,2-tetrafluoroethane	8260 (GC/MS)	8260 (GC/MS)
Heptachlor	8260 (GC/MS)	8260 (GC/MS)
1,2-Dichloropropane	8260 (GC/MS)	8260 (GC/MS)
1-Methylpropyl alcohol	8260 (GC/MS)	8260 (GC/MS)
3-Pentanone	8260 (GC/MS)	8260 (GC/MS)

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
Petroleum Hydrocarbons		
Gasoline-range organics	8260 (GC/MS), 8015 (GC/FID)	WTPH Gasoline
Diesel-range organics	8015 (GC/FID), 8270 (GC/MS)	WTPH Diesel
Radionuclides		
Americium-241	AEA	AEA, GEA, ICP/MS
Antimony-125	GEA	GEA
Carbon-14	Liquid Scintillation Counter	Liquid Scintillation Counter
Cesium-137	GEA	GEA
Cobalt-60	GEA	GEA
Curium-242	AEA	AEA
Curium-243/244	AEA	AEA
Europium-152	GEA	GEA
Europium-154	GEA	GEA
Europium-155	GEA	GEA
Iodine-129	GEA, ICP/MS	GEA, ICP/MS, GEA
Neptunium-237	ICP/MS, AEA	ICP/MS, GEA
Nickel-63	Liquid Scintillation Counter	Liquid Scintillation Counter
Plutonium-238	AEA, ICP/MS	AEA
Plutonium-239/240	AEA, ICP/MS	AEA
Plutonium-241	Estimated from Pu-238 and Pu-239/240, AEA or ICP/MS	Calculated from Pu-238 and Pu-239/240
Selenium-79	Liquid Scintillation Counter	Liquid Scintillation Counter
Strontium-90	Gas Proportional Counting	Gas Proportional Counting
Technetium-99	ICP/MS, Liquid Scintillation Counter	ICP/MS
Thorium-228	GEA	GEA
Thorium-230	ICP/MS, AEA	ICP/MS
Thorium-232	ICP/MS, AEA	ICP/MS
Thorium-234	GEA, ICP/MS	GEA
Tin-126	ICP/MS, AEA	ICP/MS, GEA
Tritium	Liquid Scintillation Counter	Liquid Scintillation Counter
Uranium-233	ICP/MS, AEA	ICP/MS

Table M-10. Analytical Methods (11 sheets)

Parameter	Analytical Method(s) Listed in Sampling and Analysis Plan*	Analytical Method(s) Used
Uranium-234	ICP/MS, AEA	ICP/MS
Uranium-235	ICP/MS, AEA	ICP/MS, GEA
Uranium-236	ICP/MS, AEA	ICP/MS
Uranium-238	ICP/MS, AEA	ICP/MS

*RPP-PLAN-38777, *Sampling and Analysis Plan for Phase 2 Characterization of Vadose Zone Soil in Waste Management Area C.*
**This secondary contaminant of potential concern was not detected in any sample; therefore, no results were reported.

AEA = alpha energy analysis
GC = gas chromatography
GC/FID = gas chromatography/flame ionization detector
GC/MS = gas chromatography/mass spectroscopy
GPC = gas proportional counting
ICP/AES = inductively coupled plasma/atomic emission spectrometry
ICP/MS = inductively coupled plasma/mass spectroscopy
WTPH = Washington State Total Petroleum Hydrocarbons
CVAA = cold vapor atomic absorption
GC/ECD = gas chromatography/electron capture detector
GEA = gamma energy analysis
IC = ion chromatography

M3.3 TARGET ANALYTES

M3.3.1 Primary and Secondary Analytes

Both single-component and multiple-component analytical methods were used. Single-component analytical methods, such as EPA Method 7471 for mercury, yield a single analytical result per analysis. Multi-component analytical methods, such as EPA Methods 6010 for inductively coupled plasma/atomic emission spectrometry (ICP/AES) and 8081 for gas chromatography, yield results for multiple analytes per analysis. Multi-component methods may generate results for both target and non-target analytes.

Both RPP-RPT-38152 and RPP-PLAN-38777 identified primary and secondary analytes for reporting. Table M-11 provides the list of primary and secondary analytes for Revisions 0 and 2A of RPP-PLAN-38777 (corresponding to work plan Revisions 0 and 1A/1B, respectively).

The primary analytes were to be analyzed with the level of quality control specified in RPP-PLAN-38777. Several of the analytical methods for primary analytes could also detect concentrations of other analytes. A subset of these other analytes was identified as secondary analytes. Secondary analytes were reported from methods used to determine metals, VOCs, semi-volatile organic compounds (SVOCs), and radionuclides by GEA.

If a primary or secondary analyte was detected in a sample, the laboratory was required to report the numeric value found. For primary analytes not detected in a sample, the laboratory was required to report the result as not detected at the MDL. For secondary analytes not detected in a sample, the laboratory was not required to report a result.

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
Inorganic						
Metals						
Aluminum	7429-90-5	P	P	P	P	P
Antimony	7440-36-0	P	P	P	P	P
Arsenic	7440-38-2	P	P	P	P	P
Barium	7440-39-3	P	P	P	P	P
Beryllium	7440-41-7	P	P	P	P	P
Bismuth	7440-69-9	S	S	S	S	S
Boron	7440-42-8	S	S	S	S	S
Cadmium	7440-43-9	P	P	P	P	P
Calcium	7440-70-2	S	S	P	P	P
Cerium	7440-45-1	S	S	S	S	S
Chromium	7440-47-3	P	P	P	P	P
Chromium, hexavalent[b]	18540-29-9	P	P	P	P	P
Cobalt	7440-48-4	P	P	P	P	P
Copper	7440-50-8	P	P	P	P	P
Europium	7440-53-1	S	S	S	S	S
Iron	7439-89-6	P	P	P	P	P
Lanthanum	7439-91-0	S	S	S	S	S
Lead	7439-92-1	P	P	P	P	P
Lithium	7439-93-2	S	S	P	P	P
Magnesium	7439-95-4	S	S	P	P	P
Manganese	7439-96-5	P	P	P	P	P
Mercury	7439-97-6	P	P	P	P	P
Molybdenum	7439-98-7	S	S	P	P	P
Neodymium	7440-00-8	S	S	S	S	S
Nickel	7440-02-0	P	P	P	P	P
Niobium	7440-03-1	S	S	S	S	S
Palladium	7440-05-3	S	S	S	S	S

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
Phosphorus	7723-14-0	S	S	P	P	P
Potassium	7440-09-7	S	S	P	P	P
Praseodymium	7440-10-0	S	S	S	S	S
Rhodium	7440-16-6	S	S	S	S	S
Rubidium	7440-17-7	S	S	S	S	S
Ruthenium	7440-18-8	S	S	S	S	S
Samarium	7440-19-9	S	S	S	S	S
Selenium	7782-49-2	P	P	P	P	P
Silicon	7440-21-3	S	S	S	S	S
Silver	7440-22-4	P	P	P	P	P
Sodium	7440-23-5	S	S	P	P	P
Strontium	7440-24-6	P	P	P	P	P
Sulfur	7704-34-9	S	S	S	S	S
Tantalum	7440-25-7	S	S	S	S	S
Tellurium	13494-80-9	S	S	S	S	S
Thallium	7440-28-0	P	P	P	P	P
Thorium	7440-29-1	S	S	S	S	S
Tin	7440-31-5	S	S	S	S	S
Titanium	7440-32-6	S	S	S	S	S
Tungsten	7440-33-7	S	S	S	S	S
Uranium[c]	7440-61-1	P	P	P	P	P
Vanadium	7440-62-2	P	P	P	P	P
Yttrium	7440-65-5	S	S	S	S	S
Zinc	7440-66-6	P	P	P	P	P
Zirconium	7440-67-7	S	S	S	S	S
Anions						
Bromide	24959-67-9	S	S	S	S	S
Chloride	16887-00-6	P	P	P	P	P
Fluoride	16984-48-8	P	P	P	P	P

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
Nitrate	14797-55-8	P	P	P	P	P
Nitrite	14797-65-0	P	P	P	P	P
Phosphate	14265-44-2	S	S	S	S	S
Sulfate	14808-79-8	P	P	P	P	P
Sulfide	18496-25-8	P	P	P	P[d]	--
Wetchemistry						
Acetate	71-50-1	P	P	P	P	P
Formate	FORMATE	P	P	P	P	P
Glycolate	666-14-8	P	P	P	P	P
Oxalate	338-70-5	P	P	P	P	P
Ammonium	14798-03-9	P	P	P	P	P
Cyanide	57-12-5	P	P	P	P	P
Ferrocyanide[b]	13601-19-9	P	P	P	P	P
pH[e]	PH	P	P	P	P	P
Bulk Density[f]	BULKDENSITY-WET	S	S	S	S	S
Percent Water[g]	%MOISTURE	P	P	P	P	P
Specific Conductance[h]	CONDUCT	--	--	--	--	S
Organics						
Petroleum Hydrocarbons						
Diesel-range organics	TPHDIESEL	P	P	P	P[d]	--
Gasoline-range organics	TPHGASOLINE	P	P	P	P[d]	--
Polychlorinated Biphenyls						
PCB Congeners[i]	(Various)	P	P	P	P[d]	--
Aroclor 1016	12674-11-2	P	P	P	P	P
Aroclor 1221	11104-28-2	P	P	P	P	P
Aroclor 1232	11141-16-5	P	P	P	P	P
Aroclor 1242	53469-21-9	P	P	P	P	P
Aroclor 1248	12672-29-6	P	P	P	P	P

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
Aroclor 1254	11097-69-1	P	P	P	P	P
Aroclor 1260	11096-82-5	P	P	P	P	P
Pesticides						
4,4'-DDD[j]	72-54-8	P	P	P	P	P
4,4'-DDE[j]	72-55-9	P	P	P	P	P
4,4'-DDT[j]	50-29-3	P	P	P	P	P
Aldrin	309-00-2	P	S	P	P	P
alpha-BHC[k]	319-84-6	P	P	P	P	P
beta-BHC[k]	319-85-7	P	P	P	P	P
Chlordane	57-74-9	P	P	P	P	P
Delta-BHC[k]	319-86-8	P	P	P	P	P
Dieldrin	60-57-1	P	P	P	P	P
Endrin	72-20-8	P	P	P	P	P
gamma-BHC (Lindane)[k]	58-89-9	P	P	P	P	P
Heptachlor	76-44-8	P	P	P	P	P
Heptachlor epoxide	1024-57-3	P	P	P	P	P
Hexachlorobenzene	118-74-1	P	P	P	P	P
Pentachlorophenol	87-86-5	P	P	P	P	P
Semivolatile Organic Compounds						
1,1'-Biphenyl	92-52-4	S	S	S	S	S
1,1-Dimethylhydrazine	57-14-7	S	S	S	S	S
1,2,4-Trichlorobenzene	120-82-1	P	P	P	P	P
1,3-Dichlorobenzene	541-73-1	S	S	S	S	S
1,4-Dichlorobenzene	106-46-7	S	S	S	S	S
1,4-Dinitrobenzene	100-25-4	S	S	S	S	S
2,4,5-Trichlorophenol	95-95-4	P	P	P	P	P
2,4,6-Trichlorophenol	88-06-2	P	P	P	P	P
2,4-Dinitrotoluene	121-14-2	P	P	P	P	P

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
2,6-Bis (tert-butyl)-4-methylphenol	128-37-0	P	P	P	P	P
2-Chlorophenol	95-57-8	P	P	P	P	P
2-Ethoxyethanol	110-80-5	P	P	P	P	P
2-Methylphenol (o-cresol)	95-48-7	P	P	P	P	P
2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	88-85-7	S	S	S	S	S
3+4 Methylphenol (cresol, m+p)	65794-96-9	P	P	P	P	P
Acenaphthene	83-32-9	P	P	P	P	P
Acetophenone	98-86-2	S	S	S	S	S
Benzo(a) anthracene	56-55-3	P	P	P	P	P
Benzo(a)pyrene	50-32-8	P	P	P	P	P
Benzo(b)fluoranthene	205-99-2	P	P	P	P	P
Benzo(k)fluoranthene	207-08-9	P	P	P	P	P
Bis(2-ethylhexyl)phthalate	117-81-7	P	P	P	P	P
Butylbenzylphthalate	85-68-7	P	P	P	P	P
Chrysene	218-01-9	P	P	P	P	P
Cresylic acid (cresol, mixed isomers)	1319-77-3	P	P	P	P	P
Cyclohexanone	108-94-1	P	P	P	P	P
Dibenz(a,h)anthracene	53-70-3	P	P	P	P	P
Di-n-butylphthalate	84-74-2	P	P	P	P	P
Di-n-octylphthalate	117-84-0	P	P	P	P	P
Fluoranthene	206-44-0	P	P	P	P	P
Hexachlorobutadiene	87-68-3	P	P	P	P	P
Hexachloroethane	67-72-1	P	P	P	P	P
Hexachloronaphtahlene	1335-87-1	S	S	S	S	S
Indeno (1,2,3-cd) pyrene	193-39-5	P	P	P	P	P
Isodrin	465-73-6	S	S	S	S	S
Methylhydrazine	60-34-4	S	S	S	S	S
N,N-Diphenylamine	122-39-4	S	S	S	S	S
Naphthalene	91-20-3	P	P	P	P	P

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
Nitric acid, propyl ester	627-13-4	S	S	S	S	S
Nitrobenzene	98-95-3	P	P	P	P	P
n-Nitrosodi-n-butylamine	924-16-3	S	S	S	S	S
N-nitroso-di-n-propylamine	621-64-7	P	P	P	P	P
n-Nitrosomethylethylamine	10595-95-6	S	S	S	S	S
n-Nitrosomorpholine	59-89-2	P	P	P	P	P
N-Nitroso-N,N-dimethylamine	62-75-9	S	S	S	S	S
Octachloronaphthalene	2234-13-1	S	S	S	S	S
o-Dichlorobenzene	95-50-1	P	P	P	P	P
o-Nitrophenol	88-75-5	P	P	P	P	P
p-Chloro-m-cresol (4-Chloro-3-methylphenol)	59-50-7	P	P	P	P	P
Pentachloronaphthalene	1321-64-8	S	S	S	S	S
Pentachloronitrobenzene (PCNB)	82-68-8	S	S	S	S	S
Phenol	108-95-2	S	S	S	S	S
p-Nitrochlorobenzene	100-00-5	S	S	S	S	S
Pyrene	129-00-0	P	P	P	P	P
Pyridine	110-86-1	P	P	P	P	P
Tetrachloronaphthalene	1335-88-2	S	S	S	S	S
Toxaphene	8001-35-2	S	S	S	S	S
Tributyl phosphate	126-73-8	P	P	P	P	P
Volatile Organic Compounds						
(m+p)Xylene	179601-23-1	P	P	P	P[d]	--
1,1 Dichloroethane	75-34-3	S	S	S	S[d]	--
1,1,1-Trichloroethane	71-55-6	P	P	P	P[d]	--
1,1,2,2-Tetrachloroethane	79-34-5	P	P	P	P[d]	--
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	P	P	P	P[d]	--
1,1,2-Trichloroethane	79-00-5	P	P	P	P[d]	--
1,1,2-Trichloroethylene	79-01-6	P	P	P	P[d]	--

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
1,1-Dichloroethene	75-35-4	P	P	P	P[d]	--
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	S	S	S	S[d]	--
1,2-Dichloroethane	107-06-2	P	P	P	P[d]	--
1,2-Dichloropropane	78-87-5	S	S	S	S[d]	--
1,3-Butadiene	106-99-0	S	S	S	S[d]	--
1,4-Dioxane	123-91-1	S	S	S	S[d]	--
1-Methylpropyl alcohol	78-92-2	S	S	S	S[d]	--
2-Butanone(MEK)	78-93-3	P	P	P	P[d]	--
2-Butenaldehyde (2-Butenal)	4170-30-3	S	S	S	S[d]	--
2-Heptanone	110-43-0	S	S	S	S[d]	--
2-Hexanone	591-78-6	S	S	S	S[d]	--
2-Methyl-2-propanol	75-65-0	S	S	S	S[d]	--
2-Methyl-2-propenenitrile	126-98-7	S	S	S	S[d]	--
2-Nitropropane	79-46-9	P	P	P	P[d]	--
2-Pentanone	107-87-9	S	S	S	S[d]	--
2-Propanone (Acetone)	67-64-1	P	P	P	P[d]	--
2-Propyl alcohol	67-63-0	S	S	S	S[d]	--
3-Chloropropene (Allyl chloride)	107-05-1	S	S	S	S[d]	--
3-Heptanone	106-35-4	S	S	S	S[d]	--
3-Pentanone	96-22-0	S	S	S	S[d]	--
4-Heptanone	123-19-3	S	S	S	S[d]	--
4-Methyl-2-pentanone (MIBK)	108-10-1	P	P	P	P[d]	--
5-Methyl-2-hexanone	110-12-3	S	S	S	S[d]	--
Acetic acid, n-butylester	123-86-4	S	S	S	S[d]	--
Acetonitrile	75-05-8	S	S	S	S[d]	--
Acrolein (propenal)	107-02-8	S	S	S	S[d]	--

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
Acrylonitrile	107-13-1	S	S	S	S[d]	--
Benzene	71-43-2	P	P	P	P[d]	--
Bromomethane	74-83-9	S	S	S	S[d]	--
Butane	106-97-8	S	S	S	S[d]	--
Carbon disulfide	75-15-0	P	P	P	P[d]	--
Carbon tetrachloride	56-23-5	P	P	P	P[d]	--
Chlorobenzene	108-90-7	P	P	P	P[d]	--
Chlorodifluoromethane	75-45-6	S	S	S	S[d]	--
Chloroethane	75-00-3	S	S	S	S[d]	--
Chloroethene(vinyl chloride)	75-01-4	P	P	P	P[d]	--
Chloroform	67-66-3	P	P	P	P[d]	--
Chloromethane	74-87-3	S	S	S	S[d]	--
Cis-1,2-dichloroethylene	156-59-2	P	P	P	P[d]	--
cis-1,3-Dichloropropene	10061-01-5	S	S	S	S[d]	--
Cyclohexane	110-82-7	S	S	S	S[d]	--
Cyclohexene	110-83-8	S	S	S	S[d]	--
Cyclopentane	287-92-3	S	S	S	S[d]	--
Dibutyl phosphate	107-66-4	P	P	P	P[d]	--
Dichlorodifluoromethane	75-71-8	S	S	S	S[d]	--
Dichlorofluromethane	75-43-4	S	S	S	S[d]	--
Dichloromethane (methylene chloride)	75-09-2	P	P	P	P[d]	--
Diethyl ether	60-29-7	P	P	P	P[d]	--
Ethyl Acetate	141-78-6	P	P	P	P[d]	--
Ethyl alcohol	64-17-5	S	S	S	S[d]	--
Ethylbenzene	100-41-4	P	P	P	P[d]	--
Ethylene dibromide (1,2, Dibromoethane)	106-93-4	S	S	S	S[d]	--

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
Ethylene glycol	107-21-1	P	P	P	P[d]	--
Isobutanol	78-83-1	P	P	P	P[d]	--
Methanol	67-56-1	P	P	P	P[d]	--
Methyl isocyanate	624-83-9	S	S	S	S[d]	--
Methylcyclohexane	108-87-2	S	S	S	S[d]	--
Monobutyl phosphate	1623-15-0	P	P	P	P[d]	--
n-Butyl alcohol (1-butanol)	71-36-3	P	P	P	P[d]	--
n-Heptane	142-82-5	S	S	S	S[d]	--
n-Hexane	110-54-3	S	S	S	S[d]	--
n-Nonane	111-84-2	S	S	S	S[d]	--
n-Octane	111-65-9	S	S	S	S[d]	--
n-Pentane	109-66-0	S	S	S	S[d]	--
n-Propionaldehyde	123-38-6	S	S	S	S[d]	--
n-propyl alcohol (1-propanol)	71-23-8	S	S	S	S[d]	--
Oxirane	75-21-8	S	S	S	S[d]	--
o-Xylene	95-47-6	P	P	P	P[d]	--
Propionitrile (Ethyl cyanide)	107-12-0	S	S	S	S[d]	--
Styrene	100-42-5	S	S	S	S[d]	--
Tetrachloroethene	127-18-4	P	P	P	P[d]	--
Tetrahydrofuran	109-99-9	S	S	S	S[d]	--
Toluene	108-88-3	P	P	P	P[d]	--
Trans-1,2-dichloroethylene	156-60-5	P	P	P	P[d]	--
trans-1,3-dichloropropene	10061-02-6	P	P	P	P[d]	--
Trichlorofluoromethane	75-69-4	P	P	P	P[d]	--
Triethylamine	121-44-8	S	S	S	S[d]	--
Xylenes	1330-20-7	P	P	P	P[d]	--

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
Radionuclides[1]						
^{228}Actinium	14331-83-0	S	S	S	S	S
^{241}Americium	14596-10-2	P	P	P	P	P
^{125}Antimony	14234-35-6	P	P	P	P	P
^{133}Barium	13981-41-4	S	S	S	S	S
^{7}Beryllium	13966-02-4	S	S	S	S	S
^{212}Bismuth	14913-49-6	S	S	S	S	S
^{214}Bismuth	14733-03-0	S	S	S	S	S
^{109}Cadmium	14109-32-1	S	S	S	S	S
^{14}Carbon	14762-75-5	P	P	P	P	P
^{144}Cerium	14762-78-8	S	S	S	S	S
^{144}Cerium/Praseodymium	CE/PR-144	S	S	S	S	S
^{134}Cesium	13967-70-9	S	S	S	S	S
^{137}Cesium	10045-97-3	P	P	P	P	P
^{51}Chromium	14392-02-0	S	S	S	S	S
^{57}Cobalt	13981-50-5	S	S	S	S	S
^{60}Cobalt	10198-40-0	P	P	P	P	P
^{242}Curium	15510-73-3	P	P	P	P	P
$^{243/244}$Curium	CM-243/244	P	P	P	P	P
^{152}Europium	14683-23-9	P	P	P	P	P
^{154}Europium	15585-10-1	P	P	P	P	P
^{155}Europium	14391-16-3	P	P	P	P	P
^{129}Iodine	15046-84-1	P	P	P	P	P
^{131}Iodine	10043-66-0	S	S	S	S	S
^{59}Iron	14596-12-4	S	S	S	S	S
^{212}Lead	15092-94-1	S	S	S	S	S
^{214}Lead	15067-28-4	S	S	S	S	S
^{54}Manganese	13966-31-9	S	S	S	S	S
^{237}Neptunium	13994-20-2	P	P	P	P	P

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
^{63}Nickel	13981-37-8	P	P	P	P	P
^{94}Niobium	14681-63-1	S	S	S	S	S
^{40}Potassium	13966-00-2	S	S	S	S	S
^{238}Plutonium	13981-16-3	P	P	P	P	P
$^{239/240}$Plutonium	PU-239/240	P	P	P	P	P
^{241}Plutonium^{m}	14119-32-5	P	P	P	P	P
^{224}Radium	13233-32-4	S	S	S	S	S
^{226}Radium	13982-63-3	S	S	S	S	S
^{228}Radium	15262-20-1	S	S	S	S	S
^{103}Ruthenium	13968-53-1	S	S	S	S	S
^{106}Ruthenium	13967-48-1	S	S	S	S	S
^{108m}Silver	14391-65-2	S	S	S	S	S
^{22}Sodium	13966-32-0	S	S	S	S	S
^{79}Selenium	15758-45-9	P	P	P	P	P
^{90}Strontium	SR-RAD	P	P	P	P	P
^{99}Technitium	14133-76-7	P	P	P	P	P
^{208}Thallium	14913-50-9	S	S	S	S	S
^{228}Thorium	14274-82-9	P	P	P	P	P
^{230}Thorium	14269-63-7	P	P	P	P	P
^{232}Thorium	TH-232	P	P	P	P	P
^{234}Thorium	15065-10-8	P	P	P	P	P
^{113}Tin	13966-06-8	S	S	S	S	S
^{126}Tin	15832-50-5	P	P	P	P	P
^{3}Tritium	10028-17-8	P	P	P	P	P
^{233}Uranium	13968-55-3	P	P	P	P	P
^{234}Uranium	13966-29-5	P	P	P	P	P
^{235}Uranium	15117-96-1	P	P	P	P	P
^{236}Uranium	13982-70-2	P	P	P	P	P
^{238}Uranium	U-238	P	P	P	P	P

Table M-11. Waste Management Area C Phase 2 RCRA Facility Investigation Primary and Secondary Analytes (12 sheets)

Constituent	CAS No[a]	RPP-PLAN-38777 Revision Number				
		0	1	2	2A	3
^{65}Zinc	13982-39-3	S	S	S	S	S
^{95}Zirconium/Niobium	ZR/NB-95	S	S	S	S	S

[a] Chemical Abstracts Service or unique identifier as listed in Hanford Environmental Information System.

[b] Neither hexavalent chromium nor ferrocyanide concentration was determined by analysis; but rather, chromium and cyanide concentrations were used as conservative estimates, respectively.

[c] Uranium concentration either reported from analysis or calculated from isotopic uranium activities per all revisions of RPP-PLAN-38777.

[d] Not reported. Confirmed as removed from target analyte list through Letter 11-NWP-053, "Re: Organic Analyses Optimization for Waste Management Area (WMA) C" for samples collected and analyzed under Revision 2A of RPP-PLAN-38777.

[e] pH listed in Revisions 0 through 2A of RPP-PLAN-38777 as a primary analyte; however, Revision 3 of RPP-PLAN-38777 lists no priority level (primary or secondary) associated with pH. Considered a primary analyte for all revisions of RPP-PLAN-38777.

[f] Bulk density listed in Table 5-1 of each revision of RPP-PLAN-38777 with no priority level (primary or secondary).

[g] Percent water listed in text of Revisions 0 through 2A as required for reporting of polychlorinated biphenyls (PCBs) (primary analytes) on dry weight basis.

[h] Specific Conductance not listed in Revisions 0 through 2A of RPP-PLAN-38777. Listed in Table A-2 of RPP-PLAN-38777 Revision 3 with no priority (primary or secondary) assigned.

[i] The 209 PCB congeners are combined and presented as one entry for purposes of this table.

[j] Total DDD/DDE/DDT defined and reported as 4,4'-DDD, 4,4'-DDE, 4,4'-DDT for Waste Management Area C Phase 2 RCRA Facility Investigation.

[k] Benzene hexachloride (including Lindane) included alpha-BHC, beta-BHC, gamma-BHC (Lindane), and delta-BHC, each of which was reported separately.

[l] Secondary radionuclides by gamma energy analysis (GEA) only. List of secondary radionuclides for GEA differed between laboratories.

[m] Pu^{241} activity was not measured; but rather, calculated from activities for Pu^{238} and $Pu^{239/240}$.

P = Primary
S = Secondary
RCRA = *Resource Conservation and Recovery Act of 1976*

M3.3.2 Organics Optimization

Five locations were originally identified in RPP-PLAN-38777 for organic analysis. Nine additional locations were sampled for the full suites of organic constituents. Analytical results obtained from these 14 soil investigation locations were evaluated to determine whether to optimize the investigation at the remaining sites. Tributyl phosphate, the selected indicator for the potential occurrence of organic contamination associated with tank waste, was not identified

in any of the samples. Letter 11-TPD-020, "Organic Analyses Optimization for Waste Management Area (WMA) C" from DOE was sent on March 29, 2011 to Ecology requesting the removal of the following from WMA C sample analysis:

- VOCs
- Ethylene glycol
- Monobutyl and dibutyl phosphate
- PCB congeners
- Gasoline range organics (GRO)
- Diesel range organics (DRO).

In addition, the SST closure DQO (RPP-23403, *Single-Shell Tank Component Closure Data Quality Objectives*) was modified to remove sulfide as a constituent associated with tank waste; therefore, discontinuing analysis for sulfide was also requested. Analysis of samples for PCB aroclors, pesticides, and SVOCs continued without change.

Approval letter 11-NWP-053, "Re: Organic Analyses Optimization for Waste Management Area (WMA) C" from Ecology was received on June 1, 2011, confirming the removal of VOCs, ethylene glycol, monobutyl and dibutyl phosphates, PCB congeners, GRO, DRO, and sulfide from the analyte list for WMA C Phase 2 samples. This letter acknowledged the changes were implemented for the boring C8100. Soil samples collected from borings C8100, C8102, C8104, and C8106 were analyzed for a reduced suite of organic analytes. In effect, samples collected under Revision 2A of RPP-PLAN-38777 were analyzed with the changes set forth in Letter 11-NWP-053 implemented.

M3.4 SAMPLE PRESERVATION AND HOLDING TIMES

Sample preservation and holding times are designed to assure the analytical results generated from a sample are representative of the sample source. Sample preservation is any method used to ensure the analyte of interest is not altered between the time a sample is acquired and the time it is analyzed. Sample preservation includes selecting the correct sample container material (e.g., plastic or glass), and may include cooling the sample to ≤6°C, adjusting the sample pH with acid or base, or adding other chemicals (such as sodium bisulfite) to prevent oxidation or reduction of the COPC. Typically, any preservation chemicals are added to the sample container during container preparation prior to taking the container to the sample site.

Analytical holding times are defined as the time from sample collection or extraction to sample analysis. An extraction holding time is the time from sample collection to sample extraction. Holding times are calculated from the date of sample collection as recorded on the chain-of-custody form. Analytes that may change quickly or diminish in concentration with time, such as nitrate or VOCs, have short holding times, while other analytes, such as metals, have much longer holding times.

Table M-12 lists the sample preservation and holding time requirements for the WMA C Phase 2 characterization samples.

Table M-12. Sample Holding Times and Preservation Requirements (2 sheets)

Analyte or Analyte Class	Matrix	Method	Container	Preservation	Holding Time
Radionuclides	Soil/Solid	Various	Glass (G)/Plastic (P) with Teflon®-lined cap	None	180 days
GEA, ^{241}Am, ^{242}Cm, $^{243/244}$Cm, ^{63}Ni, ^{79}Se, ^{90}Sr, $^{239/240}$Pu, and ^{238}Pu	Water	Various		HNO_3 to pH <2	
^{14}C, ^{3}H, ^{129}I	Water	Various		None	
Ion Chromatography anions, ammonium ion	Soil/Solid	300.0, 9056, 300.7	G/P with Teflon®-lined cap	Cool ≤6°C (≤43°F)	48 hours (nitrate, nitrite, phosphate) / 28 days (others)
	Water	9056, 300.7			
Sulfide	Soil/Solid	9030	G with Teflon®-lined cap	ZnAc+NaOH to pH > 9	7 days
	Water		G/P with Teflon®-lined cap		
Inductively Coupled Plasma metals	Soil/Solid	6010, 6020, 200.8	G/P with Teflon®-lined cap	None	6 months
	Water	6010		HNO_3 to pH <2	
Mercury	Soil/Solid	7471	G with Teflon®-lined cap	None	28 days
	Water	7470		HNO_3 to pH <2	
Total cyanide	Soil/Solid	335.2, 9010, 9014, 4500E	G with Teflon®-lined cap	Cool ≤6°C (≤43°F)	14 days
	Water	9010, 9014		NaOH to pH >12, Cool ≤6°C (≤43°F)	
pH (soil)	Soil/Solid	150.1, 9045	G/P with Teflon®-lined cap	None	As soon as possible after receipt by laboratory
	Water	9040			
Soil Density	Soil	D5057	Capped stainless steel liners	None	None
Percent Solids	Soil	D2216	G with Teflon®-lined cap	None	None
Semi-volatile Organic Compounds, pesticides	Soil/Solid	8270	Amber Glass (AG) with Teflon®-lined cap	Cool ≤6°C (≤43°F)	14 days collection to extraction/40 days extraction to analysis
	Water				

Table M-12. Sample Holding Times and Preservation Requirements (2 sheets)

Analyte or Analyte Class	Matrix	Method	Container	Preservation	Holding Time
Volatile Organic Compounds	Soil/Solid	8260	AG with Teflon®-septum cap	Cool ≤6°C (≤43°F)	14 days
	Water			HCl to pH <2, Cool ≤6°C (≤43°F)	
Gasoline range organics	Soil/Solid	WTPH-G	AG with Teflon®-septum cap	Cool ≤6°C (≤43°F)	14 days
	Water			Cool ≤6°C (≤43°F)	
Diesel range organics	Soil/Solid	WTPH-D	AG with Teflon®-septum cap	HCl to pH <2, Cool ≤6°C (≤43°F)	14 days collection to extraction/40 days extraction to analysis
	Water				
Polychlorinated Biphenyls	Soil/Solid	8082, 1668A	G with Teflon®-lined cap	Cool ≤6°C (≤43°F)	None
	Water	8082, 1668A		None	

GEA = gamma energy analysis
WTPH-D = Washington State Total Petroleum Hydrocarbons-Diesel
WTPH-G = Washington State Total Petroleum Hydrocarbons-Gasoline

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M4 SENSITIVITY

M4.1 REQUIRED AND TARGET DETECTION LIMITS

Required detection limits as specified in RPP-PLAN-38777 are shown in Tables M-13 and M-14. Where multiple required detection limits are specified for a single analyte, the laboratory was to meet the lower limit. If a required detection limit was not listed in RPP-PLAN-38777, the COPC will not be listed. Target detection limits are shown in Tables M-15 and M-16. The basis for the target detection limits is provided in RPP-RPT-38152. If a target detection limit was not listed in RPP-PLAN-38777, the COPC will not be listed. The laboratories were required to meet the required detection limits and strive to meet the target detection limits whenever possible.

Detection limits for non-detect results were compared against these required and target detection limits. The results of that comparison are presented in Section M5.1.

M4.2 HANFORD BACKGROUND VALUES

The required and target detection limits were, in most instances, risk-based and/or statistically derived. Consequently, some of these limits were not achievable using current methodology. As an additional evaluation of data usability, non-detect results were compared against Hanford background values, where available. The Hanford background values used are listed in Table M-17. The outcome of this comparison is presented in Section M5.1.

Table M-13. Required Detection Limits for Radionuclides

Analyte	Source 10 CFR 61.55 Class C Waste (pCi/g)	Biota Concentration Guide for Terrestrial Animal (pCi/g)	Required Detection Limits (pCi/g)
^{241}Am	9.00E+03	3.9E+03	3.9E+02
^{14}C	5.33E+06	4.8E+03	4.8E+02
^{242}Cm	9.00E+03	2.1E+03	2.1E+02
^{243}Cm	9.00E+03	Not available	9.00E+02
^{244}Cm	9.00E+03	4.1E+03	4.1E+02
^{60}Co	Not available	6.9E+02	6.9E+01
^{137}Cs	3.07E+09	2.1E+01	2.1
^{152}Eu	Not available	1.5E+03	1.5E+02
^{154}Eu	Not available	1.3E+03	1.3E+02
^{155}Eu	Not available	1.6E+04	1.6E+03
^{3}H	Not available	1.7E+05	1.7E+04
^{129}I	5.33E+04	5.7E+03	5.7E+02
^{63}Ni	4.67E+08	Not available	4.67E+07
^{237}Np	9.00E+03	3.9E+03	3.9E+02
^{238}Pu	9.00E+03	5.3E+03	5.3E+02
^{239}Pu	9.00E+03 (as $^{239/240}$Pu)	6.1E+03	6.1E+02 (as $^{239/240}$Pu)
^{240}Pu	9.00E+03 (as $^{239/240}$Pu)	Not available	9.00E+02 (as $^{239/240}$Pu)
^{241}Pu	3.50E+09	Not available	3.50E+08
^{125}Sb	Not available	3.5E+03	3.5E+02
^{79}Se	Not available	Not available	Not available
^{90}Sr	4.67E+09	2.3E+01	2.3
^{99}Tc	2.00E+06	4.5E+03	4.5E+02
^{126}Sn	Not available	Not available	Not available
^{228}Th	Not available	5.3E+02	5.3E+01
^{230}Th	Not available	1.0E+04	1.0E+03
^{232}Th	Not available	1.5E+03	1.5E+02
^{233}U	9.00E+03	4.8E+03	4.8E+02
^{234}U	9.00E+03	5.1E+03	5.1E+02
^{235}U	9.00E+03	2.8E+03	2.8E+02
^{236}U	Not available	Not available	Not available
^{238}U	9.00E+03	1.6E+03	1.6E+02

Reference: 10 CFR 61.55, "Waste Classification," *Code of Federal Regulations*, as amended.

Table M-14. Required Detection Limits for Non-Radionuclides (3 sheets)

Analyte	Soil Concentration for Protection of Terrestrial (mg/kg)			Required Detection Limit (mg/kg)
	Plants	Soil Biota	Wildlife	
METALS				
Aluminum	50			5
Antimony	5			0.5
Arsenic III[1]			7	0.7
Arsenic V[1]	10	60	132	1
Barium	500		102	10.2
Beryllium	10			1
Boron	0.5			6
Bromine[2]	10			1
Cadmium	4	20	14	0.4
Chromium (total)	42	42	67	0.15[8]
Cobalt	20			2
Copper	100	50	217	5
Fluorine[3]	200			20
Iodine[4]	4			
Lead	50	500	118	5
Lithium	35			3.5
Manganese	1,100		1,500	110
Mercury, inorganic	0.3	0.1	5.5	0.01
Molybdenum	2		7	4
Nickel	30	200	980	3
Selenium	1	70	0.3	0.03
Silver	2			0.2
Technetium[4]	0.2			
Thallium	1			0.1
Tin	50			6
Uranium	5			0.5
Vanadium	2			0.2
Zinc	86	200	360	8.6

Table M-14. Required Detection Limits for Non-Radionuclides (3 sheets)

Analyte	Soil Concentration for Protection of Terrestrial (mg/kg)			Required Detection Limit (mg/kg)
	Plants	Soil Biota	Wildlife	
OTHER INORGANICS				
Cyanide[9]				0.5
PESTICIDES[5]				
Aldrin			0.1	0.01
Benzene hexachloride (including lindane)			6	0.6
Chlordane		1	2.7	0.1
DDT/DDD/DDE (total)			0.75	0.075
Dieldrin			0.07	0.007
Endrin			0.2	0.02
Hexachlorobenzene			17	1.7
Heptachlor/heptachlor epoxide (total)			0.4	0.04
Pentachlorophenol	3	6	4.5	0.3
OTHER CHLORINATED ORGANICS				
1,2,4-Trichlorobenzene		20		2
1,2-Dichloropropane		700		
1,4-Dichlorobenzene		20		
2,4,5-Trichlorophenol	4	9		0.4
2,4,6-Trichlorophenol		10		1
Chlorobenzene		40		4
PCB mixtures (total)[6]	40		0.65	0.065
OTHER NONCHLORINATED ORGANICS				
Acenaphthene	20			2
Benzo(a)pyrene			12	1.2
Di-n-butyl phthalate	200			20
Nitrobenzene		40		4
Phenol	70	30		
Styrene	300			
Toluene	200			20

Table M-14. Required Detection Limits for Non-Radionuclides (3 sheets)

Analyte	Soil Concentration for Protection of Terrestrial (mg/kg)			Required Detection Limit (mg/kg)
	Plants	Soil Biota	Wildlife	
PETROLEUM[7]				
Gasoline Range Organics		100	5,000 except that the concentration shall not exceed residual saturation at the soil surface	10
Diesel Range Organics		200	6,000 except that the concentration shall not exceed residual saturation at the soil surface	20

Note: Blank cells indicate that no value is available.
[1] Total arsenic is reported (same as RPP-23403, *Single-Shell Tank Component Closure Data Quality Objectives*).
[2] Bromine is reported as bromide (same as RPP-23403, where it was classed as secondary).
[3] Fluorine is reported as fluoride (same as RPP-23403, where it was classed as primary).
[4] Included in the radionuclide analysis, radionuclide will be converted from radioactivity to mass using specific activity. Iodine-129 and technetium-99 were both classed as primary in RPP-23403.
[5] In addition to the semivolatile organic analysis, U.S. Environmental Protection Agency Method 8081 for pesticides will also be performed to meet the reporting requirements for ecological indicator soil concentrations.
[6] Polychlorinated biphenyls (PCBs) reported as individual Aroclors and total PCB.
[7] Petroleum contaminants are not included in RPP-23403 but will be measured in soil for ecological risk assessment.
[8] This required detection limit is based on a maximized sample size. If a maximized sample size cannot be collected, the detection limit will be higher than indicated.
[9] This required detection limit is needed to meet the WAC 173-340, "Model Toxics Control Act – Cleanup" 3-Phase model derived soil concentrations for the protection of groundwater.

Table M-15. Target Detection Limits for Radionuclides

Chemical Abstracts Service Number or Constituent Identifier	Analyte	Target Detection Limits (pCi/g)
14234-35-6	Antimony-125	0.3
14596-10-2	Americium-241	1
14762-75-5	Carbon-14	1
10045-97-3	Cesium-137	0.1
10198-40-0	Cobalt-60	0.05
15510-73-3	Curium-242	1.0
15757-87-6	Curium-243	1.0
13981-15-2	Curium-244	1.0
14683-23-9	Europium-152	0.1
15585-10-1	Europium-154	0.1
14391-16-3	Europium-155	0.1
15046-84-1	Iodine 129	2
13994-20-2	Neptunium-237	1
13981-37-8	Nickel-63	30
13981-16-3	Plutonium-238	1
Pu-239/240	Plutonium-239/240	1
13982-63-3	Radium-226	0.2
15758-85-9	Selenium-79	10
Rad-Sr	Strontium-90	1
14133-76-7	Technetium-99	1
14274-82-9	Thorium-228	1
14269-63-7	Thorium-230	1
Th-232	Thorium-232	1
10028-17-8	Tritium	30
13966-29-5	Uranium-233/234	1
15117-96-1	Uranium-235	1
U-238	Uranium-238	1

Table M-16. Target Detection Limits for Non-Radionuclides (4 sheets)

Chemical Abstracts Service Number or Constituent Identifier	Analyte	Target Detection Limits (mg/kg)
7429-90-5	Aluminum	5
7440-36-0	Antimony	0.6
7440-38-2	Arsenic	1
7440-39-3	Barium	20
7440-41-7	Beryllium	0.5
7440-43-9	Cadmium	0.5
7440-47-3	Chromium (III)/chromium (total)	1
7440-48-4	Cobalt	2
7440-50-8	Copper	1
7439-89-6	Iron	5
7439-92-1	Lead	5
7439-96-5	Manganese	1.9
7439-97-6	Mercury	0.2
7439-98-7	Molybdenum	19
7440-02-0	Nickel	4
7782-49-2	Selenium	1
7440-22-4	Silver	2
7440-24-6	Strontium	1
7440-28-0	Thallium	0.5
7440-61-1	Uranium	1
7440-62-2	Vanadium	2.5
7440-66-6	Zinc	1
57-12-5	Cyanide (includes ferrocyanide)	0.5
16984-48-8	Fluoride	5
14797-55-8	Nitrate	2.5
14797-65-0	Nitrite	2.5
16887-00-6	Chloride	0.3
14808-79-8	Sulfate	2.7
71-50-1	Acetate	4.5
64-18-6	Formate	10.0

Table M-16. Target Detection Limits for Non-Radionuclides (4 sheets)

Chemical Abstracts Service Number or Constituent Identifier	Analyte	Target Detection Limits (mg/kg)
79-14-1	Glycolate	3.8
144-62-7	Oxalate	2
18496-25-8	Sulfide	5
NA	Ammonium (NH_4)	0.5
67-64-1	Acetone	0.02
71-43-2	Benzene	0.0015
75-15-0	Carbon disulfide	0.005
56-23-5	Carbon tetrachloride	0.0015
108-90-7	Chlorobenzene	0.005
67-66-3	Chloroform (trichloromethane)	0.005
108-94-1	Cyclohexanone	0.5
107-06-2	1,2-Dichloroethane	0.0015
75-35-4	1,1-Dichloroethylene	0.01
75-09-2	Dichloromethane (methylene chloride)	0.002
10061-02-6	Dichloropropene; 1,3,- (trans-)	0.005
141-78-6	Ethyl acetate	5
60-29-7	Diethyl ether	5
100-41-4	Ethyl benzene	0.005
67-72-1	Hexachloroethane	0.33
108-10-1	Methyl isobutyl ketone (MIBK hexone)	0.01
78-93-3	Methyl ethyl ketone (MEK)	0.01
79-46-9	Nitropropane; 2-	0.002
79-34-5	Tetrachloroethane; 1,1,2,2-	0.005
127-18-4	Tetrachloroethene (PCE)	0.005
108-88-3	Toluene	0.005
76-13-1	trichloro-1,2,2-trifluoroethane; 1,1,2-	0.010
71-55-6	1,1,1-Trichloroethane (TCA)	0.005
79-00-5	1,1,2-Trichloroethane	0.002
107-21-1	Ethylene glycol	5
156-59-2	Cis-1,2,-dichlorobenzene	0.0003

Table M-16. Target Detection Limits for Non-Radionuclides (4 sheets)

Chemical Abstracts Service Number or Constituent Identifier	Analyte	Target Detection Limits (mg/kg)
156-60-5	Trans-1,2-dichlorobenzene	0.0004
83-32-9	Acenaphthene	0.33
117-81-7	Bis(2-ethylhexyl)phthalate	2.95
71-36-3	Butanol; n- (n-butyl alcohol)	5
85-68-7	Butylbenzylphthalate	0.33
95-57-8	Chlorophenol; 2-	0.33
M + P CRESOL	Cresol; m + p (3/4-Methylphenol)	0.33
95-48-7	Cresol; o- (2-Methylphenol)	0.33
1319-77-3	Cresylic acid (cresol, mixed isomers)	0.5
84-74-2	Dibutylphthalate (Di-n-butylphthalate)	0.33
117-84-0	Di-n-octylphthalate	0.33
95-50-1	Dichlorobenzene; 1,2- (ortho-)	0.33
121-14-2	Dinitrotoluene; 2,4-	0.33
110-80-5	Ethoxyethanol; 2-	To Be Determined
206-44-0	Fluoranthene	0.33
87-68-3	Hexachlorobutadiene	0.33
78-83-1	Isobutyl alcohol (Isobutanol)	5
128-37-0	methylphenol; 2,6-Bis(tert-butyl)-4-	1.2
59-50-7	methylphenol; 4-Chloro-3- (p-Chloro-m-cresol)	0.33
91-20-3	Naphthalene	0.33
98-95-3	Nitrobenzene	0.33
88-75-5	Nitrophenol; o-	0.66
621-64-7	Nitroso-di-n-propylamine	0.33
79-01-6	Trichloroethylene (TCE)	3.7E-4
75-69-4	Trichlorofluoromethane	0.01
75-01-4	Vinyl chloride	0.01
1330-20-7	Xylenes	0.01
108-38-3	Xylene; m-	5.1E-4
95-47-6	Xylene; o-	2.4E-4
106-42-3	Xylene; p-	5.1E-4

Table M-16. Target Detection Limits for Non-Radionuclides (4 sheets)

Chemical Abstracts Service Number or Constituent Identifier	Analyte	Target Detection Limits (mg/kg)
120-82-1	1,2,4 - Trichlorobenzene	0.33
59-89-2	Nitrosomorpholine; N-	0.33
129-00-0	Pyrene	0.33
110-86-1	Pyridine	0.66
95-95-4	Trichlorophenol; 2,4,5-	0.33
88-06-2	Trichlorophenol; 2,4,6-	0.33
		0.165
126-73-8	Tributyl phosphate	3.3
107-66-4	Dibutyl phosphate	To Be Determined
--	Monobutyl phosphate	To Be Determined
56-55-3	Benzo (a) anthracene	0.33
205-99-2	Benzo (b) fluorathene	0.33
207-08-9	Benzo (k) fluorathene	0.33
50-32-8	Benzo (a) pyrene	0.33
218-01-9	Chrysene	0.33
53-70-3	Dibenzo (ab) anthracene	0.33
193-39-5	Indeno (123-cd) pyrene	0.33
2674-11-2	Aroclor 1016	0.02
11104-26-2	Aroclor 1221	0.02
11141-16-5	Aroclor 1232	0.02
53969-21-9	Aroclor 1242	0.02
126572-29-6	Aroclor 1248	0.02
11097-6999-1	Aroclor 1254	0.02
11096-82-5	Aroclor 1260	0.02
Not available	Polychlorinated Biphenyl congeners	To Be Determined

Table M-17. Hanford Background Values (2 sheets)

Chemical Abstracts Service Number/ Unique Identifier	Analyte	Lognormal 90th Percentile Hanford Background Concentration[a]	Units
Anions			
16887-00-6	Chloride	100,000	µg/kg
16984-48-8	Fluoride	2,810	µg/kg
14797-55-8	Nitrate	52,000	µg/kg
14265-44-2	Phosphate	785	µg/kg
14808-79-8	Sulfate	237,000	µg/kg
Metals			
7429-90-5	Aluminum	11,800,000	µg/kg
7440-36-0	Antimony	130[b]	µg/kg
7440-38-2	Arsenic	6,470	µg/kg
7440-39-3	Barium	132,000	µg/kg
7440-41-7	Beryllium	1,510	µg/kg
7440-42-8	Boron	3,890[b]	µg/kg
7440-43-9	Cadmium	563	µg/kg
7440-70-2	Calcium	17,200,000	µg/kg
7440-47-3	Chromium	18,500	µg/kg
7440-48-4	Cobalt	15,700	µg/kg
7440-50-8	Copper	22,000	µg/kg
7439-89-6	Iron	32,600,000	µg/kg
7439-92-1	Lead	10,200	µg/kg
7439-93-2	Lithium	13,300[b]	µg/kg
7439-95-4	Magnesium	7,060,000	µg/kg
7439-96-5	Manganese	512,000	µg/kg
7439-97-6	Mercury	13[b]	µg/kg
7439-98-7	Molybdenum	470[b]	µg/kg
7440-02-0	Nickel	19,100[b]	µg/kg
7440-09-7	Potassium	2,150,000[b]	µg/kg
7782-49-2	Selenium	780[c]	µg/kg
7440-22-4	Silver	167[b]	µg/kg

Table M-17. Hanford Background Values (2 sheets)

Chemical Abstracts Service Number/ Unique Identifier	Analyte	Lognormal 90th Percentile Hanford Background Concentration[a]	Units
7440-23-5	Sodium	690,000	µg/kg
7440-28-0	Thallium	185[b]	µg/kg
7440-61-1	Uranium	3,210[d]	µg/kg
7440-62-2	Vanadium	85,100	µg/kg
7440-66-6	Zinc	67,800	µg/kg
Radiochemicals			
10045-97-3	Cesium-137	1.1	pCi/g
10198-40-0	Cobalt-60	0.01	pCi/g
15585-10-1	Europium-154	0.03	pCi/g
14391-16-3	Europium-155	0.05	pCi/g
PU-239/240	Plutonium-239/240	0.03	pCi/g
13966-00-2	Potassium-40	17	pCi/g
13982-63-3	Radium-226	0.82	pCi/g
10098-97-2	Strontium-90	0.18	pCi/g
TH-232	Thorium-232	1.3	pCi/g
13966-29-5	Uranium-234	1.1	pCi/g
15117-96-1	Uranium-235	0.11	pCi/g
U-238	Uranium-238	1.1	pCi/g

[a]Unless noted otherwise, Hanford background values are from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Volume 1, or DOE/RL-96-12, *Hanford Site Background: Part 2, Soil Background for Radionuclides*.

[b]ECF-HANFORD-11-0038, *Soil Background for Interim Use at the Hanford Site*.

[c]Ecology Publication No. 94-115, *Natural Background Soil Metals Concentrations in Washington State*.

[d]Isotopic activity conversion based on DOE/RL-96-12 values.

M5 RESULTS

This section of the DQA discusses the analytical results for the WMA C Phase 2 RFI samples collected. Samples were packaged and sent to six laboratories for analysis: 222-S, TASL, TAKN, SwRI, WSCF, and RJLG/CLS, as described in Section M3.1. A sample designated for a particular analysis by the selected laboratory is tracked by a unique HEIS database number. Analytical requests for chemical and radiochemical services to be completed by the laboratories are documented on the chain-of-custody forms. Analytical results provided by the laboratories are tracked and documented by SDGs in data packages. The analytical results were also electronically uploaded and stored in the HEIS database.

M5.1 QUANTITATION

Reporting and general quality control requirements for primary and secondary COPCs were presented in Section M3.3.1. Primary analytes were to be analyzed with the level of QC specified in RPP-PLAN-38777; however, secondary COPCs were not required to be analyzed at that same level of quality control. More specifically, RPP-PLAN-38777 states that secondary COPCs:

- Are not required to be included in calibration mixes
- Need not be analyzed with the level of QC established for primary analytes
- From VOC and SVOC analyses should be reported as tentatively identified compounds (TICs)
- Should only be reported if detected at a concentration greater than or equal to the MDL or MDA.

If an analyte is not included in the calibration mix, no calibration curve or limits of quantitation would have been established; therefore, the quantitated results for that analyte would be an estimated value. Consequently, there would be limitations on usability of that data. Based on laboratory data packages (and confirmed by 222-S for their analyses), secondary COPCs were included in the calibration mix; therefore, calibration curves and limits of quantitation were established and, provided QC criteria were met, results for secondary COPCs could be reliably and accurately quantitated.

If QC requirements standard to the method are not applied to analysis for an analyte, measures of accuracy or precision would not be available for that result. Consequently, there would be limitations on usability of that data. The same level of QC established for primary analytes was applied by the laboratories to secondary COPCs. The QC results (measures of accuracy and precision) were evaluated for primary and secondary COPCs and those evaluations summarized in Sections M4 and M5.

Secondary COPCs were analyzed and reported using the same rigor and requirements by the laboratory applied to primary COPCs. Provided there are no QA/QC deficiencies that would limit the use of these data, results reported for secondary COPCs are suitable for use in decision making. Limitations imposed on the use of specific data points would be included in the subsections below.

When an analyte is reported as a TIC, the result represents an estimated concentration for an analyte presumed to be present. Tentatively identified compounds are not included in the calibration mix; therefore, no calibration curve or limits of quantitation have been established for the TIC. In addition, there are no associated measures of accuracy or precision associated with the TIC result. As such, TIC results are neither suitable for decision-making purposes nor can it be stated with confidence that the TIC is present in the sample. For VOC and SVOC analyses, secondary COPCs were not reported as TICs; but rather, were included in the calibration mix and analyzed with the same level of QC established for primary analytes. In other words, secondary COPCs were analyzed and reported with the same analytical requirements as primary COPCs (included in calibration mix and same level of QC).

For VOC and SVOC analyses, TICs were reported when detected based on identification criteria in RPP-PLAN-38777. No TICs reported were secondary COPCs. Results for TICs and an evaluation of their usability are presented in Section M5.1.4.

Although results for secondary COPCs were only required to be reported when detected for a sample, some non-detect results for secondary COPCs were reported. Reporting of these non-detect results varied among laboratories and within a laboratory over time. These differences were associated with project setup at the laboratory and did not impact data quality.

M5.1.1 Analytical Methodology

For the analysis of chemical constituents, laboratories used standard methods from EPA and ASTM International. For radiological constituents, laboratories employed methods that are recognized as acceptable within the radiochemical industry.

With five exceptions, samples were analyzed using the methods listed in RPP-RPT-38777 (see Table M-10).

1. Bulk density was determined as outlined in Interoffice memorandum WRPS-0900155 Rev. 2, "Test Plan for Sample Breakdown and Analysis of Sediment Samples Obtained as Part of the Vadose Zone Project" rather than ASTM Method D2937. Method D2937 could not be performed based on the compaction that occurs using the direct push sampling technique. The reported results were not a true bulk density; but rather, a soil density measurement.

2. Gasoline range organic concentration in samples was determined by the NWTPH-Gx method. While not explicitly called out as a method or alternate method, NWTPH-Gx is a gas chromatography/flame ionization detector (GC/FID) method based on promulgated EPA preparation and analytical methodology. A GC/FID method, EPA SW-846

Method 8015, is listed in RPP-PLAN-38777 as the "alternate" method for determining gasoline range organics in samples. Method NWTPH-Gx is the method preferred by the Washington State Department of Ecology. Therefore, analysis of samples by NWTPH-Gx is considered an acceptable method substitution that does not impact data quality.

3. Diesel range organic concentration in samples was determined by the NWTPH-Dx method. While not explicitly called out as a method or alternate method, NWTPH-Dx is a GC/FID method based on promulgated EPA preparation and analytical methods. The GC/FID method, EPA SW-846 Method 8015, is listed in RPP-PLAN-38777 as the "preferred" method for determining diesel range organics in samples. Method NWTPH-Dx is the method preferred by the Washington State Department of Ecology. Therefore, analysis of samples by NWTPH-Dx is considered an acceptable method substitution that does not impact data quality.

4. Neptunium-237 was reported as not detected by GEA analysis for 6 samples. Samples B1VJ57A, B1VJ57, B1VJ57C, B1VJ63A, B1VJ63B, and B1VJ63C were analyzed for ^{237}Np by inductively coupled plasma/mass spectroscopy (ICP/MS), a method listed in RPP-PLAN-38777, and GEA. All 12 ^{237}Np results were reported as not detected. Because it is a weak gamma-emitter, higher reporting limits were achieved for ^{237}Np by GEA than for ICP/MS; however, all results were less than the reporting limits listed in RPP-PLAN-38777. Although both sets of results are considered usable without qualification, the ICP/MS results should be preferentially used based on the lower reporting limit and better suitability of the method in quantifying ^{237}Np.

5. Uranium-235 was reported as detected by GEA analysis for 13 samples. For samples B1VJ57A, B1VJ57, B1VJ57C, B1VJ63A, B1VJ63B, and B1VJ63C, ^{235}U results were reported as not detected using GEA. Uranium-235 results were not reported by any other method for these samples. For samples B2FB27, B2FB29, B2FB30, B2FB31, B2FB32, B2FB33, and B2FB34, ^{235}U was reported as detected using both ICP/MS, the method listed in RPP-PLAN-38777, and GEA. The results reported by ICP/MS are considerably lower than those reported by GEA. However, ^{235}U is not a gamma emitter; therefore, the ICP/MS results are considered to likely be more representative (more accurate and precise) of the WMA C vadose zone soil at those locations. The ^{235}U results obtained using GEA are considered estimated values with unknown directional bias. Addition of the review qualifier "Z" to all ^{235}U results reported by GEA was deemed appropriate based on analytical methodology used.

M5.1.2 Sensitivity

Analytical sensitivity is the limit to which the concentration of an analyte can be detected. The analytical sensitivity for WMA C Phase 2 results was evaluated by comparing results reported as not detected against required and target detection limits as presented in RPP-PLAN-38777 and listed in Tables M-13 through M-16, above. In addition, both detected and non-detected results were compared against Hanford background values, where available. These evaluations were used, in part, to assess whether data obtained met data quality objectives.

Results for WMA C Phase 2 RFI samples were reported to the laboratories' MDL. The MDL is the lowest concentration at which an analyte can be measured and reported with 99% confidence that the analyte concentration is greater than zero. "Detected" in this context means that a sample containing the analyte detected at the MDL can be distinguished from a blank with 99% certainty. The MDL is a laboratory-specific value, dependent on the instrumentation used, the skill of the operator, and other things. The MDL value for a given analyte may change over time (MDLs are periodically re-established).

If an analyte is not detected at a concentration greater than or equal to the MDL, it cannot be stated that the analyte is not present in the sample; but rather, with 99% certainty, the analyte is not present at a concentration greater than or equal to the MDL. While non-detect results reported at detection limits exceeding those listed in RPP-PLAN-38777 are usable for decision making, adequate sensitivity may not have been achieved to satisfy data quality objectives (i.e., their data may not suitable for all intended uses).

M5.1.2.1 Non-detect Results Exceeding Required Detection Limits. Results for 37 primary and secondary COPCs were reported as not detected at MDLs exceeding required detection limits listed in RPP-PLAN-38777 and presented in Tables M-13 and M-14, above. For the 37 COPCs, a total of 2,170 results were reported as not detected at MDLs exceeding the required detection limits. These exceedances are summarized by COPC in Table M-18.

Some exceedances were attributable to result calculation based on aliquot size used for preparation and analysis. Other exceedances were attributable to sample dilutions needed to alleviate interference from other analytes in the sample (high concentrations, overlapping peaks, etc.) or the sample matrix. A number of exceedances were attributable to the variability in MDLs across laboratories. If an analyte is not detected at a concentration greater than or equal to the MDL, it cannot be stated that the analyte is not present in the sample; but rather, with 99% certainty, the analyte is not present at a concentration greater than or equal to the MDL. While non-detect results reported at detection limits exceeding the required detection limits listed in RPP-PLAN-38777 are usable for decision making, adequate sensitivity may not have been achieved to satisfy data quality objectives (i.e., their data may not suitable for all intended uses).

M5.1.2.2 Non-detect Results Exceeding Target Detection Limits. Results for 15 primary and secondary COPCs were reported as not detected at MDLs exceeding target detection limits listed in RPP-PLAN-38777 and presented in Tables M-15 and M-16, above. For these 15 COPCs, a total of 353 results were reported as not detected at MDLs exceeding the target detection limits. These exceedances are summarized by COPC in Table M-19.

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
Anions and Wet Chemistry (µg/kg)						
B2FB32, B2FB29, B2FB33, B2FB27, B2FB30, B2FB34, B2FB31	Bromide	1,000	4,200 – 4,500	7	4.8	13
B2FPF2, B2FPF1, B2FB29, B2FB27	Chloride	300	540 – 3,200	4	100	2.6
B2FB29, B2FB27	Nitrate	2,500	4,340 – 4,380	2	100	1.2
B2FB29, B2FB27, B2FB33, B2FB30, B2FB32, B2FB31, B2FB34, B211W3, B1YT83	Nitrite	2,500	2,950 – 3,790	9	27	5.9
B2FB29, B2FB27	Sulfate	2,700	3,700 – 3,800	2	50	3.8
B2FYM5, B238J9, B26JK6, B1YT80, B26C70, B26C59, B238J3, B26C38, B26JK3, B23KN7, B23R25, B26CD0, B236N5, B236N8, B27131, B26C30	Ammonium Anion	500	532 – 19,900	16	34	1.1

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B23R25, B236N8, B26CD0, B26CD4, B26CD2, B236N5, B29613, B23KN7, B238J9, B26C82, B26JK7, B25WM2, B25WM5, B26C70, B29612, B23KP9, B26C59, B26JL1, B25WM8, B26C74, B26C78, B26C34, B26C28, B27131, B26C47, B26C57, B23KP6, B26C68, B26C36, B26C32, B26CC4, B23TK8, B26JK2, B26JK9, B26C30, B26C26, B26JK6, B26C80, B26C76, B26C61, B26C40, B26JK8, B23TM6, B26C51, B26JL0, B26C38, B23TK2, B27130, B26C53, B26JK3, B26C55, B25ND7, B23KR5, B23TK5, B25CN2, B238J3, B238J6, B23KR2, B236P2, B238J0, B238K3, B1YTF1, B23KT4, B238H1, B1YTD2, B1YTF4, B238H7, B1YTC9, B238H4, B20XW3, B20XV9, B20XV5, B1YTD8, B1YTF7, B1YTB4, B21214, B21202, B21208, B21205, B20XW6, B21211, B1YT80, B1YTH3, B1YTC0, B1YTH1, B20XX2, B1YT74, B20XW9, B1YT71, B1YTD5, B215K8, B211W6, B20XX5, B211W9, B1YT92, B1YT98, B1YT77, B215K9, B211X2, B1YT83, B211Y3, B1YTB1, B215L0, B215L1, B1YTB7, B211Y9, B211Y6, B1YTH6, B211W3, B2FYM7	Cyanide	500	529 – 5,640	110	75	75
Metals (µg/kg)						
B1VJ57B, B1VJ63C, B1VJ57C, B1VJ63B, B1VJ63A, B1VJ57A, B1VJ63A, B1VJ63C, B1VJ57C, B1VJ57B	Antimony	500	502 – 18,100	10	17	6.3
B1VJ57B, B1VJ63C, B1VJ63B, B1VJ57C, B1VJ63A	Arsenic	700	10,300 – 10,600	5	50	3.1
B238H7, B238H1, B23TK4, B1YT71	Beryllium	500	853 – 1,010	4	6.6	2.5
B2FPF1, B2FPF2, B2FB29, B2FB32, B2FB30, B2FB34, B2FB27, B2FB33	Boron	6,000	6,500 – 6,800	8	33	20

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B1VJ63C, B1VJ63B, B1VJ63A, B1VJ57A, B238H4, B238H1	Lead	5,000	5,150 – 9,040	6	22	3.8
B29613, B1YT92, B1YTB4, B1YTF7, B1YTD2, B1YTB7, B1YTD8, B1YTC9, B1YTH6, B1YTD5, B1YTC0, B1YTH3, B20XV9, B1YT83, B1YTF1, B20XV5, B20XW3, B1YTF4, B1YT71, B21205, B21214, B211Y9, B21208, B21211, B21202, B215L0, B1YT74, B211W6, B1YT77, B211W9, B211X2, B215L1, B211Y6, B211Y3, B20XX5, B215K8, B20XX2, B211W3, B215K9, B20XW9, B20XW6, B2FPF1, B2FB27, B2FPF2, B2FB29, B2FB30, B2FB34, B2FB33	Mercury	10	10.1 – 48.1	49	38	33
B1YT77, B1YT80, B1YT74, B2FPF1, B2D1Y0, B2D1X9, B2D1X7, B2D1X5, B2D1X8, B2D1X6, B2FPF2, B2FB29, B2FB32, B2D1X2, B2FB31, B2FB30, B2FB27, B2FB33, B2FB34, B2B1L9, B2D1X4, B2B1L8, B238H7, B238H1, B23KT4, B1YT71, B1VJ63C, B1VJ57B, B1VJ63B, B1VJ57C, B1VJ63A, B1VJ57A	Molybdenum	4,000	4,010 – 20,200	32	22	20

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B1VJ63C, B1VJ57B, B1VJ57C, B1VJ63B, B1VJ63A, B1VJ57A, B1VJ57A, B1VJ63B, B1VJ63C, B1VJ57C, B1VJ63A, B1VJ57B, B238J3, B238J6, B238H4, B238J0, B1YTF4, B20XV9, B1YTD8, B1YTD2, B20XX5, B1YTF1, B211W3, B211W6, B20XX2, B211W9, B1YTD5, B211X2, B215K9, B20XW3, B1YTH6, B1YTC0, B1YT83, B1YTH1, B1YTF7, B1YTB4, B20XV5, B1YTH3, B1YTC9, B1YTB7, B1YT98, B1YT92, B20XW6, B1YTB1, B20XW9, B215K8, B1YT77, B1YT74, B1YT80, B1YT71, B2D1X9, B2D1Y0, B2D1X7, B25ND7, B2D1X6, B23KP9, B2D1X8, B2D1X5, B23KR2, B23KR5, B2D1X2, B2B1L9, B2D1X4, B2B1L8, B238H7, B238H1, B23KT4, B2FPF1, B2FPF2, B2FB29, B2FYM6, B2FB32, B2FYM5, B2FB31, B2FYM4, B2FB30, B2FB34, B2FB27, B2FB33, B2FYM3, B2FYM9, B2FYM7, B2FYM8, B2FPR7, B2FPR8, B238K3, B238J9, B236N5, B23KN7, B236N8, B236P2, B23KP6, B23R25, B2B1L6, B2C1M5, B2C1M7, B2B1L7, B2C1M3, B2C1M2, B2C1N0, B2C1M8, B2C1N1, B2C1M9, B21211, B21214, B211Y6, B211Y3, B215L1, B21208, B211Y9, B21205, B215L0	Selenium	30	119 – 18,100	113	100	71
B1VJ57B, B1VJ63C, B1VJ63B, B1VJ57C, B1VJ63A	Silver	200	857 – 884	5	7.4	3.1
B1VJ63C, B1VJ57B, B1VJ63B, B1VJ57C, B1VJ63A, B1VJ57A, B1VJ63B, B1VJ57C, B1VJ63A, B1VJ63C, B1VJ57B, B23KT4	Thallium	100	104 – 17,700	12	32	7.5

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B1YTF4, B1YTD8, B1YTD2, B20XX5, B1YTF1, B211W3, B211W6, B20XX2, B211W9, B21211, B211X2, B1YTD5, B21214, B20XV5, B20XW3, B211Y6, B215K9, B1YTH6, B1YT83, B211Y3, B1YTC0, B215L1, B1YTH1, B1YTB4, B1YTF7, B1YTH3, B1YTC9, B21208, B21202, B1YTB7, B20XV9, B1YT92, B1YT98, B211Y9, B21205, B20XW6, B215L0, B1YTB1, B20XW9, B215K8, B1YT77, B1YT74, B1YT80, B1YT71	Uranium*	500	17,000 – 101,000	44	100	100
Organics (µg/kg)						
Diesel Range Organics						
B215K9, B215K8, B20XW6	Total petroleum hydrocarbons – diesel range	2,000	32,000 – 35,000	3	7.0	3.6
Polychlorinated Biphenyls as Aroclors						
B2FYM4, B1YTH3, B20XV5, B2B1L7, B1YTD5, B1YTH1, B2C1M2, B26C53, B2B1L6, B1YTD2, B2FYM3, B2D1X2, B2D1X4, B2FB29, B2FB30, B2FPF2, B2FB27, B2B1L9, B2FPF1, B2B1L8, B2FPR8, B2FYM,5, B2FPR7	Aroclor-1016	20	20.2 – 28.8	23	33	33
B1YTH3, B20XV5, B1YTD5, B1YTH1, B1YTD2, B26C53	Aroclor-1221	20	20.2 – 21	6	8.7	8.7
B1YTH3, B20XV5, B1YTD5, B1YTH1, B1YTD2, B26C53	Aroclor-1232	20	20.2 – 21	6	8.7	8.7
B1YTH3, B20XV5, B1YTD5, B1YTH1, B1YTD2, B26C53	Aroclor-1242	20	20.2 – 21	6	8.7	8.7
B1YTH3, B20XV5, B1YTD5, B1YTH1, B1YTD2, B26C53	Aroclor-1248	20	20.2 – 21	6	8.7	8.7
B1YTH3, B20XV5, B1YTD5, B1YTH1, B1YTD2, B26C53	Aroclor-1254	20	20.2 – 21	6	9.1	8.7

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B20XV5, B1YTD5, B1YTH1, B1YTD2, B26C53	Aroclor-1260	20	20.4 – 24	5	7.6	7.2
Semivolatile Organic Compounds						
B23KN7, B211W6, B21202, B215L1, B1YTD5, B2C1N1, B211W9, B1YT71, B23TK2, B1YTF1, B215K9, B20XX5, B26C78, B1YT92, B26JK8, B23TK5, B21208, B20XW6, B26JK7, B2D1Y0, B2FYM3, B1YTD8, B2D1X8, B2C1M7, B25ND7, B26JK9, B238H1, B23KT4, B2D1X4, B215L0, B2FYM6, B23KP9, B26C74, B1YT98, B2C1N0, B236P2, B238H7, B26CC4, B2B1L6, B23KR5, B236N8, B1YTB4, B236N5, B26JK6, B211Y3, B238J0, B25WM2, B23KP6, B21211, B238K3, B211Y6, B26C36, B26C80, B238J6, B215K8, B20XX2, B26C38, B1YTC9, B26C59, B26C70, B238J9, B211Y9, B23R25, B23TK8, B26C68, B2C1M3, B1YT80, B26C53, B25WM5, B26CD0, B1YTH6, B23TM6, B1YTF4, B26CD4, B211W3, B2C1M5, B21214, B2C1M2, B2D1X6, B238J3, B29613, B27130, B26C47, B2FYM8, B23KR2, B1YTD2, B27131, B26C57, B2D1X7, B26C55, B26JL1, B21205, B20XW9, B2B1L7, B26C61, B26C40, B26C32, B2FPR7, B2D1X9, B26JK3, B26JK2, B26C28, B2FYM7, B2C1M9, B25WM8, B26CD2, B25CN2, B29612, B26C76, B26C26, B2FYM4, B2C1M8, B26C51, B26C30, B26C34, B26JL0, B211X2, B238H4, B20XV9, B2FYM5, B2FPR8, B1YT74, B1YTB7, B2B1L9, B2B1L8, B2D1X2, B1YTH1, B1YTB1, B1YTH3, B1YT83, B1YT77	Cyclohexanone	500	502 – 705	132	92	92

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B26C82, B1YTF7, B1YTC0, B23KN7, B211W6, B215L1, B21202, B1YTD5, B2C1N1, B211W9, B1YT71, B23TK2, B1YTF1, B215K9, B26C78, B26JK8, B23TK5, B21208, B20XW6, B26JK7, B1YTD8, B2D1Y0, B2FYM3, B23KT4, B238H1, B2D1X8, B2C1M7, B25ND7, B215L0, B2D1X4, B2FYM6, B23KP9, B2C1N0, B26C74, B236P2, B238H7, B26CC4, B23KR5, B2B1L6, B238J0, B238K3, B21211, B26JK6, B236N5, B211Y3, B25WM2, B23KP6, B236N8, B238J6, B211Y6, B26C80, B215K8, B2C1M3, B1YTC9, B20XX2, B26C36, B26C38, B238J9, B26C70, B23R25, B1YT80, B211W3, B1YTH6, B211Y9, B1YTF4, B26C59, B26C68, B23TK8, B23TM6, B26CD4, B238J3, B21214, B25WM5, B26CD0, B2C1M2, B2D1X6, B27130, B2C1M5, B2FYM8, B29613, B26C53, B26C47, B27131, B1YTD2, B20XW9, B21205, B2D1X9, B23KR2, B2FPR7, B2D1X7, B2FYM7, B26JK2, B20XX5, B26JL1, B2B1L7, B2C1M9, B26C61, B26JK3, B26C55, B29612, B26CD2, B25CN2, B25WM8, B2FYM4, B211X2, B26C76, B26C57, B2C1M8, B26C32, B2FYM9, B26C40, B238H4, B2FYM5, B26C28, B20XV9, B26C30, B26C51, B26JL0, B26C26, B2FPR8, B26C34, B1YT74, B1YTB7, B1YTH1, B2D1X2, B2B1L8, B2B1L9, B1YTH3, B1YT83, B1YT77	di-n-Butylphthalate	330	462 – 709	130	94	90
Radiochemicals (pCi/g)						
B215L0, B20XV9, B1YTF4, B20XX5, B21202, B20XW9, B1YTC9, B211W9, B1YTH3, B21205, B211Y9, B1YT83, B1YTB1, B215L1, B1YT92, B20XX2, B21208, B20XW3, B20XV5, B1YTD2, B1YT93, B1VJ63C, B1VJ57B, B1VJ63B, B1VJ57C, B1VJ63A	^{241}Americium	1	1.01 – 197	26	17	16

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B2FYM8, B2FPF2, B2FYM9, B2B1L9, B2FB32, B2FYM7, B2D1X5, B2D1X8, B215K9, B215K8, B20XX2, B20XW6, B1YTH3, B21211, B1YTH1, B20XW9, B21214, B1YTH6, B23KR5, B211Y9, B238K3, B25CN2, B1YT77, B23KP6, B20XV9, B1YT74, B215L1, B26JK9, B23TM6, B236P2, B26C40, B236N5, B27131, B25WM5, B238J9, B236N8, B23KT4, B238J6, B25ND7, B211Y6, B1VJ57C, B26C76, B23TK5, B1VJ63A, B211Y3, B25WM2, B1YTB4, B26C36, B26JK8, B26C38, B238J3, B26C28, B23KR2, B26C82, B1VJ63C, B238H1, B23TK2, B26C74, B215L0, B1VJ63B, B1YTB1, B1VJ57A, B26JK3, B238H4, B21202, B238H7, B1YTC0, B25WM8, B1VJ57B, B26C78, B21205, B238J0, B26C80, B26C34, B26JK6, B1YTF1, B26C30, B21208, B26CD4, B26JK7, B29613, B26C70, B26CD0, B26C68, B26JK2, B23KP9, B26C57, B23KN7, B26C55, B26JL0, B1YTB7, B26C47, B23R25, B1YTD5, B26C61, B26C53, B29612, B26C32, B26C51, B26C59, B1YTF7, B211X2, B1YT80, B26CC4, B1YTD8, B211W6, B1YTF4, B1YT83, B26CD2, B211W5, B26JL1, B26C26, B20XX5, B211W9, B1YT98, B20XW3, B1YT92, B1YTC9, B1YTD2, B20XV5	^{125}Antimony	0.3	0.31 – 7.47	120	77	76

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B2FPF1, B2FYM7, B2FPF2, B26C68, B2FPR8, B2FYM9, B2D1X2, B2B1L8, B2D1Y0, B2D1X7, B26JK6, B26JK7, B26C30, B26C59, B26C34, B26C51, B26JL1, B26C57, B26CD2, B26C40, B26C36, B26C32, B26C38, B26C61, B26CD0, B26C55, B26JK9, B26JL0, B26C28, B26JK8, B26C26, B2D1X8, B2D1X6, B26CD4, B29612, B2D1X5 B25WM2, B23TK2, B23TM6, B26C53, B23KR2, B27131, B23KR5, B23R25, B2C1N1, B236N8, B2C1M8, B2C1M9, B238J9, B2C1M5, B236P2, B27130, B23KN7, B25ND7, B2C1N0, B23TK5, B238J0, B2C1M3, B25CN2, B2C1M2, B23KP9, B238H4, B25WM5, B2B1L6, B25WM8, B238K3, B238J3, B211W3, B211W9, B215K9, B20XW9, B20XX5, B211W6, B20XV5, B1YTD5, B211Y6, B1YTB4, B215L0, B211Y3, B20XV9, B1YTF1, B1YTF4, B1YT98, B21211, B1YTH3, B211Y9, B1YTH6, B1YT71, B1YT77, B1YTC9, B1YTD8, B20XX2, B20XW3, B1YTH1, B1YT74, B1YT92, B1YT80, B21202, B1YTB1, B1YTF7, B215L1, B1YTD2, B1YTC0, B211X2, B1YTB7	^{14}Carbon	1	1.01 – 89.2	105	85	72

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B2FB29, B2FYM4, B2FB33, B2FB27, B2FYM8, B2FB31, B2FYM5, B2D1X4, B2D1X2, B2FYM9, B2FB34, B2FYM3, B2FYM7, B2D1X8, B2FYM6, B215K8, B2D1X5, B2FB32, B20XX2, B21211, B20XW9, B21214, B1YTH6, B23KR5, B211Y9, B1VJ63C, B23KP6, B23TK5, B25CN2, B26JK9, B238J9, B238K3, B25ND7, B25WM5, B238J6, B23TM6, B26C40, B23KR2, B27131, B236P2, B26C38, B1VJ57C, B26C76, B26C28, B211Y6, B1VJ63A, B1VJ63B, B238J3, B23KT4, B211Y3, B26C82, B25WM2, B26JK8, B238H1, B25WM8, B26C78, B26C80, B26C34, B26C36, B1VJ57A, B26C74, B1YTB4, B238H4, B238J0, B1YTB1, B238H7, B1YTC0, B21205, B21208, B1VJ57B, B23TK2, B26C30, B26C70, B211X2, B1YTB7, B26C32, B20XX5, B26CD4, B26C68, B1YTF1, B26CD0, B23KP9, B211W6, B211W9, B26C55, B211W5, B1YTD5, B29613, B26C51, B26C53, B26C61, B26C47, B1YT83, B26C57, B29612, B26JL0, B26C26, B26CC4, B26C59, B1YTF4, B1YTD8, B1YTF7, B26CD2, B26JL1, B1YTC9, B1YTD2	^{137}Cesium	0.1	0.103 – 3.08	106	84	67

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B2FYM5, B2D1Y0, B2FB30, B2B1L8, B2C1M9, B2C1N0, B2D1X7, B2FPF1, B2FPR8, B2B1L6, B2C1N1, B2FB27, B2C1M5, B2D1X6, B2FB34, B2C1M3, B2C1M8, B2C1M7, B2C1M2, B2FYM3, B2FPF2, B2B1L7, B2D1X4, B2D1X9, B2FYM4, B2FB29, B2FB33, B2FPR7, B2FYM6, B2FYM8, B2D1X2, B2FYM9, B2FB31, B2FB32, B2FYM7, B2B1L9, B2D1X5, B2D1X8, B215K9, B215K8, B20XW6, B20XX2, B20XV9, B1YTH3, B21211, B1YTH1, B20XW9, B1YTH6, B25CN2, B21214, B236N5, B211Y9, B23KR5, B23KP6, B215L1, B1YT77, B238K3, B215L0, B25WM5, B27131, B25ND7, B26JK9, B211Y6, B236P2, B236N8, B23KT4, B23TM6, B1VJ63B, B25WM2, B238J6, B25WM8, B21202, B26C34, B211Y3, B238J3, B23KR2, B1VJ63C, B26C28, B238J9, B26C40, B26C76, B26C82, B26JK3, B1VJ63A, B26C38, B26JK8, B26C74, B26C80, B23TK5, B238H7, B238J0, B23R25, B238H4, B26C36, B23TK2, B26JK6, B26C70, B21205, B1YTB1, B26JK7, B26CD4, B1YTF1, B26C78, B26C30, B23KN7, B238H1, B29613, B1YTB4, B26CC4, B26C51, B26JK2, B26CD0, B23KP9, B26C68, B1YTC0, B20XX5, B26C55, B26C59, B1YT83, B1YTB7, B26C47, B26JL0, B21208, B26C53, B26C32, B26C57, B26C61, B1YTF7, B211X2, B29612, B1YTD5, B211W5, B1YT80, B26C26, B26JL1, B26CD2, B1YTD8, B1YTF4, B211W9, B211W6, B1YT92, B1YT98, B20XW3, B1YTC9, B1YTD2, B20XV5	^{60}Cobalt	0.5	0.0614 – 3.13	146	96	92
B2FYM8	^{242}Curium	1	1.24E+14	1	0.68	0.68

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B2D1X7, B2D1X9, B2D1X6, B2C1N0, B2D1X2, B2C1M3, B2C1N1, B2B1L8, B2C1M8, B2C1M7, B2C1M2, B2FPF1, B2C1M9, B2B1L6, B2D1X4, B2FPR7, B2B1L7, B2FB34, B2C1M5, B2FB29, B2FB30, B2FB33, B2FYM3, B2B1L9, B2D1X8, B2FYM7, B2D1X5, B2FPF2, B2FYM6, B2FB27, B2FPR8, B2FYM4, B2FB31, B2FYM5, B2FYM8, B2FB32, B2FYM9, B215K9, B215K8, B20XW6, B1YTH3, B20XX2, B20XV9, B1YTH1, B21211, B20XW9, B21214, B25CN2, B1YTH6, B23KR5, B1YT74, B238J9, B23KP6, B23TM6, B1YT77, B238K3, B238J6, B23KR2, B1YT71, B27131, B238H1, B26C40, B236N5, B215L1, B238J3, B25WM5, B215L0, B26C76, B236N8, B211Y9, B211Y3, B211Y6, B26C82, B25ND7, B26JK9, B1VJ63A, B23TK5, B23KT4, B26C28, B21205, B236P2, B1VJ57A, B26JK8, B23KN7, B23TK2, B1VJ63B, B25WM2, B238J0, B238H7, B26C38, B26JK3, B21202, B1VJ57C, B26C36, B26CD0, B1VJ63C, B26C74, B25WM8, B1VJ57B, B26C80, B1YTB4, B1YTB1, B23R25, B26C78, B238H4, B29613, B1YTF1, B26JK7, B26C34, B26JK2, B26JK6, B1YTC0, B26C55, B21208, B26C70, B26C61, B1YTF4, B26C53, B26C30, B26C32, B29612, B211X2, B1YTB7, B26C68, B26JL0, B1YTD5, B23KP9, B26C47, B26C59, B26CD4, B26C26, B26C57, B1YT83, B1YTD8, B26C51, B26JL1, B1YT80, B1YTF7, B211W6, B26CC4, B211W5, B20XX5, B26CD2, B211W9, B1YT92, B1YT98, B20XW3, B1YTC9, B20XV5, B1YTD2	^{152}Europium	0.1	0.145 – 13.4	150	95	95

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B2C1M9, B2D1X6, B2C1N0, B2D1X9, B2C1N1, B2C1M7, B2C1M8, B2B1L8, B2C1M2, B2C1M3, B2B1L6, B2D1X4, B2D1X2, B2B1L7, B2C1M5, B2D1X8, B2B1L9, B2D1X5, B2FPF1, B2FB34, B2FYM4, B2FB30, B2FYM3, B2FYM6, B2FB29, B2FB33, B2FB27, B2FPR8, B2FPF2, B2FPR7, B2FYM8, B2FB31, B2FYM5, B2FB32, B2FYM9, B2FYM7, B215K9, B215K8, B20XX2, B1YTH3, B20XW6, B21211, B20XW9, B20XV9, B1YTH1, B21214, B1YTH6, B238K3, B236N5, B211Y9, B25CN2, B236N8, B23KP6, B27131, B23KR5, B23TM6, B1YT77, B238J9, B236P2, B215L1, B211Y3, B26C40, B1YT71, B23TK5, B26JK9, B25ND7, B1YTB4, B1VJ57A, B1VJ57C, B25WM5, B238J6, B23KT4, B215L0, B25WM8, B26C82, B26C76, B23KR2, B1VJ63A, B1VJ57B, B211Y6, B26C38, B26C34, B26C80, B26JK3, B26C74, B238H7, B23TK2, B21205, B238J3, B21202, B26JK8, B23R25, B238H1, B1VJ63B, B25WM2, B1YTF1, B29613, B26C28, B1VJ63C, B26JK6, B238J0, B1YTB1, B238H4, B26C36, B26C70, B26JK7, B21208, B26JK2, B23KN7, B1YTC0, B26C78, B26CD0, B26CD4, B29612, B23KP9, B26CC4, B26C57, B26C55, B1YTB7, B1YTD5, B26JL0, B26C30, B26C68, B26C47, B211W6, B1YTF7, B26C32, B211X2, B26JL1, B26C51, B1YTF4, B20XX5, B26C53, B26C61, B1YTD8, B211W5, B26C59, B1YT80, B1YT83, B26C26, B211W9, B26CD2, B1YT92, B20XW3, B1YT98, B1YTC9, B20XV5, B1YTD2	^{154}Europium	0.1	0.122 – 9.45	148	94	94

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B2FB29, B2FB27, B2D1Y0, B2D1X7, B2FPR8, B2FB31, B2FYM8, B2FPF1, B2D1X9, B2D1X6, B2C1N0, B2FB33, B2FYM4, B2FB29, B2C1N1, B2FB27, B2FPF2, B2FYM5, B2B1L8, B2FPR7, B2FB30, B2C1M9, B2C1M3, B2C1M8, B2C1M2, B2C1M7, B2D1X4, B2B1L6, B2FYM9, B2D1X2, B2B1L7, B2C1M5, B2FB34, B2FYM3, B215K9, B2FYM7, B2B1L9, B2FYM6, B2D1X8, B215K8, B2D1X5, B20XX2, B20XW6, B21211, B20XW9, B1YTH3, B2FB32, B211Y9, B23KR5, B1YTH1, B23TM6, B238K3, B25CN2, B236N5, B21214, B27131, B23KP6, B238J9, B238J6, B236N8, B1VJ57C, B26JK9, B215L1, B236P2, B25ND7, B25WM5, B26C40, B215L0, B26C38, B23KT4, B211Y6, B26C76, B238J3, B1YTH6, B211Y3, B25WM2, B1VJ63A, B23TK5, B26C82, B26JK8, B26C28, B1YTB4, B23KR2, B26JK3, B20XV9, B1YT77, B1VJ63C, B238H1, B1VJ63B, B21205, B26C74, B238H7, B1VJ57A, B238J0, B1YTB1, B21202, B1YTC0, B238H4, B25WM8, B26C36, B26C34, B23TK2, B26C80, B1VJ57B, B26C78, B23R25, B26JK2, B21208, B23KN7, B26C30, B26C70, B23KP9, B1YTB7, B26C68, B26C32, B26C26, B211X2, B1YT71, B211W6, B20XX5, B211W5, B211W9, B26CD4, B1YTF1, B26JK7, B26JK6, B29613, B26CD0, B26C57, B26C51, B26C55, B26C53, B26C61, B26JL0, B26C59, B26C47, B29612, B1YT80, B1YTD5, B1YT83, B1YTD8, B26CC4, B1YTF4, B1YTF7, B26JL1, B1YT98, B20XW3, B26CD2, B1YT92, B1YTC9, B1YTD2, B20XV5	^{155}Europium	0.1	0.12 – 6.7	152	97	96
B2D1X6, B2FB30, B2FB33, B2C1M7, B2B1L6, B2C1M3, B2C1M2	^{129}Iodine	2	2.05 – 2.63	7	4.8	4.6

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B1VJ63A, B1VJ57A, B1VJ58B	^{237}Neptunium	1	1.01 – 1.07	3	1.9	1.9
B20XV9, B1YTF7, B20XW3, B1YTC0, B1YT92, B1YTB7, B1YTB4, B1YTF4, B21202, B1YT98, B211Y3, B21205, B215L1, B21208, B21214, B211Y9, B215K9, B211W9, B20XX5, B215L0, B211Y6, B211W6, B21211, B215K8, B20XW9, B20XX2, B211X2, B1YT77, B1YTC9, B1YT80, B211W3, B1YTD8, B1YTB1, B1YT71, B1YT74, B20XW6, B1YTH6, B20XV5, B1YTH1, B1YT83, B1YT93, B1YTD5, B1YTD2	^{63}Nickel	30	40.8 – 112	43	31	29
B1YT71, B20XV5, B1YT93, B1YTD2	^{238}Plutonium	1	1.1 – 1.48	4	2.8	2.7
B20XV5, B1YT93, B1YTD2	$^{239/240}$Plutonium	1	1.11 – 1.48	3	2.1	2.1

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B26C70, B26C76, B26JK3, B26JK6, B26CC4, B29613, B29612, B26C78, B26C68, B26C82, B26JK7, B26JK2, B26C74, B26C80, B26JL1, B26C30, B26C40, B26C28, B26C59, B26C26, B26C34, B26C32, B26C55, B25WM5, B26C53, B25WM8, B26C36, B26C38, B26JK8, B26CD4, B26C61, B26C51, B26C47, B26JL0, B26C57, B26JK9, B25CN2, B236N5, B236P2, B238K3, B23KP6, B238J9, B23KN7, B236N8, B23R25, B2FYM9, B2D1Y0, B2FYM7, B2D1X8, B2FPF2, B2D1X4, B2FB30, B2D1X2, B2D1X9, B2FB29, B2D1X6, B2D1X7, B2FPF1, B2C1M7, B2FB33, B2FYM5, B2FYM8, B2FB34, B2B1L9, B2B1L8, B2FB27, B2C1M3, B2FB32, B2FYM6, B2C1M5, B2C1M2, B2B1L6, B2FPR8, B2B1L7, B2FPR7, B2FYM3, B2FYM4, B2C1N1, B2C1M9, B2C1N0, B2C1M8, B248B3, B248B4, B2D1X5, B248B5, B248B6, B1YTC9, B238H1, B20XW3, B238H4, B1YTH6, B1YT92, B1YTD5, B1YT83, B238J3, B1YTB4, B238J6, B20XV9, B1YTF7, B1YTH3, B20XV5, B1YTD2, B1YTF4, B211Y3, B215L1, B215L0, B23KT4, B1YTD8, B1YTH1, B1YTF1, B21202, B21208, B238J0, B21205, B238H7, B211Y9, B1YTB1, B1YTB7, B1YTC0, B211Y6, B1YT98, B1YT80, B1YT77, B215K8, B20XW9, B215K9, B20XX2, B20XW6, , B20XX5, B27131, B23TK5, B23TM6, B23TK8, B23KP9, B23TK2, B27130, B211W3, B211X2, B211W6, B211W9	^{99}Technetium	1	2.51 – 76	140	70	51

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B211Y9, B23KR5, B25CN2, B23KP6, B236N5, B236N8, B238J9, B238K3, B23TM6, B215L1, B215K9, B238J6, B25ND7, B211Y6, B236P2, B27131, B215L0, B25WM5, B26C40, B23KT4, B26C76, B211Y3, B26JK9, B23KR2, B26C82, B1VJ63A, B1YTB4, B26C38, B23TK5, B26C28, B215K8, B25WM2, B238J3, B1VJ63B, B26JK8, B26JK3, B26C74, B1VJ57C, B1VJ63C, B1VJ57A, B238J0, B20XW6, B20XX2, B1YTB1, B238H1, B21205, B21202, B25WM8, B238H4, B26C34, B26C36, B238H7, B1VJ57B, B1YTC0, B21211, B26C80, B1YTH3, B21208, B26C78, B23R25, B26C30, B20XW9, B1YTH1, B23KN7, B26C70, B23TK2, B26JK2, B21214, B23KP9, B26C32, B1YTB7, B26C68, B1YTH6, B20XV9, B1YT77, B1YT74, B26C26, B211X2, B211W5, B20XX5, B211W6, B211W9, B1YT71, B1YT98, B1YTF1, B26JK6, B26CD0, B26JK7, B20XW3, B1YT92, B26CD4, B26C55, B29613, B26C57, B1YTD5, B26C59, B26C53, B26JL0, B26C61, B26C47, B29612, B26C51, B26CC4, B1YT80, B1YTF7, B1YT83, B26JL1, B2C1N0, B26CD2, B1YTF4, B1YTD8, B2D1Y0, B2D1X7, B2D1X6, B2FB29, B2FPR7, B2FPF1, B2C1N1, B2FYM8, B2B1L8, B2FB31, B2C1M8, B2C1M7, B2B1L6, B2C1M9, B2FPR8, B2D1X9, B2FYM3, B2C1M3, B2FYM4, B2C1M2, B2D1X4, B2B1L7, B2FB27, B2FB33, B2D1X2, B2FB30, B2FPF2, B2FYM5, B2FYM6, B2FB32, B2FB34, B2FYM7, B2D1X8, B2C1M5, B2FYM9, B2B1L9, B2D1X5, B1YTC9, B1YTD2, B20XV5	^{228}Thorium	1	7.87 – 137	151	100	100
B238J9, B2B1L6, B2C1M5, B2C1M7, B2B1L7, B2C1M3, B2C1M2, B2C1M8, B2C1N0, B2C1N1, B2C1M9, B1YT77, B1YT80, B1YT74, B1YT71, B26C59	^{230}Thorium	1	1.01 – 1.8	16	14	11

Table M-18. Non-detect Results with Method Detection Limit Exceeding Required Detection Limit (18 sheets)

Sample Numbers	Analyte	Required Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
B26C30, B26C34, B26C40, B26C26, B26C28, B26JK9, B26C32, B26C36, B211W9, B211W6, B20XV5, B215K8, B215K9, B20XW9, B20XV9, B1YTD8, B215L1, B1YTD2, B211X2, B20XX2, B1YTB1, B1YTF1, B1YTB7, B1YTF4, B1YTH1, B1YT92, B1YTC0, B1YT98, B1YTB4, B1YTC9, B1YT83, B20XW6, B1YT77, B1YTD5, B20XX5, B211W3, B1YTF7, B1YTH6, B21205, B21208, B215L0, B1YT80, B1YT71, B21214, B21202, B1YT74, B20XW3, B211Y3, B211Y9, B211Y6	Tritium	30	51 – 550	50	40	34
B2FPF1, B2D1Y0, B2D1X9, B2D1X7, B2D1X8, B2D1X6, B2D1X5, B2FPF2, B2FYM6, B2FB29, B2FB32, B2FYM5, B2D1X2, B2FB31, B2FB30, B2FYM4, B2FB27, B2FB33, B2FB34, B2B1L9, B2FYM3, B2FYM9, B2FYM7, B2FYM8, B2FPR7, B2FPR8, B2D1X4, B2B1L8, B2B1L6, B2C1M5, B2B1L7, B2C1M7, B2C1M3, B2C1M2, B2C1M8, B2C1M9, B2C1N0, B2C1N1	^{233}Uranium	1	8.32 – 19.2	38	95	26

*Uranium reported from Method 6010 metals analysis. Factoring in the 159 uranium results calculated from isotopic uranium activity (all detected), the 22% of all uranium results were reported as not detected at method detection limits exceeding the required reporting limit.

Table M-19. Non-detect Results with Method Detection Limit Exceeding Target Detection Limit (3 sheets)

Sample Numbers	Analyte	Target Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
Anions and Wet Chemistry (µg/kg)						
B1YT77, B1YTC0, B238H7, B26C34, B238J3, B26C36, B211W9, B23KR5, B25WM8, B21205, B25ND7, B211W6, B25WM5, B238H1	Sulfide	5	5,250 – 29,200	14	100	13
B1VJ63C, B1VJ57B, B1VJ63B, B1VJ57C, B1VJ63A, B1VJ57A	Antimony	600	17,100 – 18,100	6	10	3.8
B1VJ57B, B1VJ63C, B1VJ63B, B1VJ57C, B1VJ63A	Arsenic	1,000	10,300 – 10,600	5	50	3.1
B1YT71	Molybdenum	19,000	20,200	1	0.68	0.63
B1VJ63C, B1VJ57B, B1VJ63B, B1VJ57C, B1VJ63A, B1VJ57A, B2B1L6, B2C1M5, B2B1L7, B2C1M7, B2C1M3, B2C1M2, B2C1N0, B2C1M8, B2C1M9, B2C1N1, B21211, B21214, B211Y6, B211Y3, B215L1, B21202, B21208, B211Y9, B21205, B215L0	Selenium	1,000	17,100	26	23	16
B1VJ63C, B1VJ57B, B1VJ57C, B1VJ63B, B1VJ63A, B1VJ63A, B1VJ57C, B1VJ63C, B1VJ57B	Thallium	500	502 – 17,100	9	24	5.7
B1YTF4, B1YTD8, B1YTD2, B20XX5, B1YTF1, B211W3, B211W6, B20XX2, B21211, B211W9, B211X2, B21214, B1YTD5, B20XV5, B20XW3, B215K9, B211Y6, B1YTH6, B211Y3, B1YT83, B1YTC0, B215L1, B1YTF7, B1YTB4, B1YTH1, B1YTH3, B1YTC9, B21208, B21202, B1YTB7, B20XV9, B1YT98, B1YT92, B211Y9, B21205, B215L0, B20XW6, B1YTB1, B215K8, B20XW9, B1YT77, B1YT80, B1YT74, B1YT71	Uranium*	1,000	17,000 – 101,000	44	100	100

Table M-19. Non-detect Results with Method Detection Limit Exceeding Target Detection Limit (3 sheets)

Sample Numbers	Analyte	Target Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
Semivolatile Organic Compounds (µg/kg)						
B26C38, B26C30, B26JL1, B26C28, B26C61, B26C40, B26JL0, B26C59, B26C53, B26C51, B26CC6, B23TK5, B236N5, B25WM8, B236N8, B26CC4, B26CD4, B238J9, B26JK7, B25WM5, B26CC0, B26CD2, B23TK2, B26JK8, B26C70, B23KR2, B26JK2, B26C76, B26C78, B23KR5, B25ND7, B26C74, B27131, B26JK3, B26C82, B26C68, B26JK6, B26JK9, B26C47, B26C55, B26C34, B26C26, B26C57, B26CD0, B23R25, B23KN7, B25WM2, B23KP6, B23KP9, B26C80, B26C36, B26C32, B25CN2, B23TM6	Ethylene glycol	5,000	13,000 – 15,000	54	53	52
Semivolatile Organic Compounds (µg/kg)						
B23TM2, B25WM4, B211Y5, B1YTD0, B1YTC7	(m+p)-Xylene	0.51	0.6 – 0.7	5	4.6	4.5
B211Y5, B1YTD0, B1YTC7, B23TM2, B25WM4	2-Nitropropane	2	2.32 – 3	5	4.5	4.5
B1YT69, B211Y5, B1YTD0, B1YTC7, B25WN0, B25WM7, B25WM4, B23TM2	cis-1,2-Dichloroethylene	0.3	0.31 – 0.6	8	7.3	7.3
B211Y5, B23TM2, B25WM4, B1YTD0, B1YTC7	o-Xylene	0.24	0.294 – 0.333	5	4.6	4.5
B1YTF8, B211W5, B1YT81, B26C60, B1YT69, B26CD5, B25WN0, B25WM7, B211Y5, B1YTD0, B1YTC7, B25WM4, B23TM2	trans-1,2-Dichloroethylene	0.4	0.409 – 0.6	13	2.7	2.7
B23TM2, B25WM4, B211Y5, B1YTD0, B1YTC7	Trichloroethene	0.37	0.4 – 0.5	5	4.5	4.5

Table M-19. Non-detect Results with Method Detection Limit Exceeding Target Detection Limit (3 sheets)

Sample Numbers	Analyte	Target Detection Limit	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Required Detection Limit	% of Total Non-detect Results	% of Total Number of Results
Radiochemicals (pCi/g)						
B2FB30, B2D1X6, B2D1X4, B2FYM8, B2D1X5, B2FYM9, B2D1X2, B23KR5, B25CN2, B2FYM4, B23KP6, B2B1L8, B211Y9, B238K3, B2FPR8, B2FYM5, B2FPR7, B236N5, B238J9, B25ND7, B23TM6, B2FYM7, B215L1, B236N8, B26C76, B211Y6, B238J6, B215L0, B23KT4, B27131, B26JK9, B25WM5, B236P2, B26C40, B1VJ57C, B26C28, B1VJ63A, B26C38, B238J3, B23KR2, B211Y3, B26JK3, B26JK8, B26C82, B1YTB4, B23TK5, B1VJ57A, B1YTB1, B25WM2, B1VJ63B, B238H1, B238J0, B26C74, B1VJ63C, B21205, B238H7, B26C36, B238H4, B25WM8, B23TK2, B1VJ57B, B21202, B26C78, B26C30, B26C34, B26C80, B1YTC0, B23R25, B23KN7, B26JK2, B26C70, B21208, B2B1L9, B23KP9, B26C68, B26C32, B2C1N1, B1YTB7, B26C26, B2C1M8, B2C1N0, B2C1M9, B211X2, B211W5, B20XX5, B211W6, B1YT98, B215K9, B211W9, B20XW3, B215K8, B1YT92, B20XW6, B2C1M7, B20XX2, B21211, B20XW9, B1YTH1, B21214, B2C1M3, B2FYM6, B2C1M2, B20XV9, B2B1L6, B1YTH6, B1YT74, B2D1Y0, B1YT77, B2C1M5, B1YTH3, B2FYM3, B2B1L7, B2D1X7, B2D1X9, B1YT71, B1YTF1, B26JK6, B26JK7, B1YTD5, B26CD0, B29613, B26CD4, B26C55, B26C57, B26C61, B26C51, B26C53, B26JL0, B29612, B26C59, B1YTF7, B26C47, B1YT83, B26CC4, B1YT80, B1YTF4, B26JL1, B1YTD8, B26CD2, B2FPF2, B2FPF1, B2D1X8, B2FB33, B2FB27, B2FB30, B2FB31, B2FB29, B1YTC9, B1YTD2, B20XV5, B2FB34, B2FB32	^{234}Thorium	1	1.4 – 166	152	99	96

*Uranium reported from Method 6010 metals analysis. Taking into consideration the 159 uranium results calculated from isotopic uranium activity (all detected), the 22% of all uranium results were reported as not detected at method detection limits exceeding the required reporting limit.

Some exceedances were attributable to result calculation based on aliquot size used for preparation and analysis. Other exceedances were attributable to sample dilutions needed to alleviate interference from other analytes in the sample (high concentrations, overlapping peaks, etc.) or the sample matrix. A number of exceedances were attributable to the variability in MDLs across laboratories. If an analyte is not detected at a concentration greater than or equal to the MDL, it cannot be stated that the analyte is not present in the sample; but rather, with 99% certainty, the analyte is not present at a concentration greater than or equal to the MDL. While non-detect results reported at detection limits exceeding the target detection limits listed in RPP-PLAN-38777 are usable for decision making, adequate sensitivity may not have been achieved to satisfy data quality objectives (i.e., their data may not suitable for all intended uses).

M5.1.2.3 Results Exceeding Hanford Background Values. Although not required per RPP-PLAN-38777 or RPP-RPT-38152, both detected and not detected results were compared against Hanford background values, where available. Results of these comparisons are discussed in the subsections below. These comparisons were added at the direction of the Project as a useful evaluation of the results after planning documents were developed and data were collected. Therefore, Hanford background values are less than several required and target reporting limits listed in RPP-PLAN-38777. The Hanford background values used are listed in Table M-17. Table M-20 lists the required and target reporting limits that are greater than Hanford background values.

M5.1.2.3.1 Non-detect Results. Results for 17 primary and secondary COPCs were reported as not detected at MDLs exceeding Hanford background values. A total of 1,042 results were reported as not detected at MDLs exceeding the target detection limits. These exceedances are summarized by COPC in Table M-21.

For non-detect results reported at MDLs exceeding Hanford background, it cannot be stated with any certainty whether the analyte was present at a concentration exceeding that Hanford background value.

M5.1.2.3.2 Detected Results. Results for 35 primary and secondary COPCs were reported as not detected at MDLs exceeding Hanford background values. A total of 450 results were reported as not detected at MDLs exceeding the target detection limits. These exceedances are summarized by COPC in Table M-22.

M5.1.3 Results Between Method Detection Limit and Estimated Quantitation Limit

The laboratories' MDLs were used as the detection/reporting limits for WMA C Phase 2 RFI samples. If a COPC was measured at a concentration greater than or equal to the MDL, it was reported as detected at the measured concentration; otherwise, the result was reported as not detected at a detection limit equal to the MDL. The MDL is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte.

Table M-20. Required and Target Reporting Limits that Exceed Hanford Background Values

Analyte	Hanford Background Value	Required Detection Limit	Target Detection Limit	Units
Required and Target Detection Limits > Hanford Background				
Antimony	130	500	600	µg/kg
Boron	3,890	6,000	None Listed	µg/kg
Molybdenum	470	4,000	19,000	µg/kg
Silver	167	200	2,000	µg/kg
Fluoride	2,810	5,000	20,000	µg/kg
Cobalt-60	0.01	0.05	None Listed	pCi/g
Europium-154	0.03	0.1	None Listed	pCi/g
Europium-155	0.05	0.1	None Listed	pCi/g
Plutonium-239/240	0.03	1	None Listed	pCi/g
Strontium-90	0.18	1	None Listed	pCi/g
Uranium-235	0.11	1	None Listed	pCi/g
Required Detection Limit < Hanford Background; but Target Detection Limit > Hanford Background				
Mercury	13	10	200	µg/kg
Selenium	780	30	1,000	µg/kg
Thallium	185	100	500	µg/kg

The estimated quantitation limit (EQL) is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The EQL is generally 5 to 10 times the MDL. However, it may be nominally chosen to simplify data reporting. Sample EQLs are highly matrix-dependent.

In the range between the MDL and the EQL, quantitation can still be achieved, but not necessarily with the same precision and accuracy possible at the EQL. As measurements approach the MDL, there is much less confidence in quantitation; therefore, EQLs set a target performance level for laboratories using a specified set of precision and accuracy limitations. In this manner, EQLs provide consistency in implementing a regulatory program where both QC and QA are critical.

Based on the increased uncertainty associated with quantitation between the MDL and the EQL, results reported as detected within this range are qualified by the laboratories. These qualifier flags are “B” for metals and other inorganic compounds and “J” for organic and radiochemicals. Analytes with results detected at concentrations between the MDL and EQL, signified by a “B” or “J” laboratory qualifier, are considered detected at the estimated value reported.

Table M-21. Non-detect Results Exceeding Hanford Background Values (8 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Hanford Background Value	% of Total Non-detect Results	% of Total Number of Results
Metals (µg/kg)						
B20XV9, B1YTD8, B1YTF4, B20XX5, B1YTF1, B211W6, B20XX2, B21211, B211W9, B21214, B211X2, B1YTD5, B211Y6, B1YTH6, B20XW3, B215L1, B211Y3, B1YT83, B1YTC0, B1YTB4, B1YTF7, B1YTH1, B1YTH3, B1YTC9, B21202, B21208, B1YTB7, B1YT98, B211Y9, B1YT92, B21205, B20XW6, B1YTB1, B20XW9, B215K8, B1YT74, B1YT77, B1YT80, B23KT4, B238J3, B238J6, B238K3, B238J0, B236N8, B26CD2, B26CD4, B1VJ57A, B1VJ63B, B1VJ57C, B1VJ63A, B1VJ63C, B1VJ57B, B1VJ57B, B1VJ63C, B1VJ57C, B1VJ63B, B1VJ63A, B1VJ57A	Antimony	130	149 – 18,100	58	98	37
B1VJ57B, B1VJ63C, B1VJ63B, B1VJ57C, B1VJ63A	Arsenic	6,470	10,300 – 10,600	5	50	3.1
B1VJ57B, B1VJ63C, B1VJ63B, B1VJ57C, B1VJ63A, B1VJ57A, B2FPF1, B2FPF2, B2FB29, B2FB32, B2FB30, B2FB34, B2FB27, B2FB33	Boron	3,890	5,140 – 6,800	14	58	35
B1YTF4, B1YT71, B21205, B21214, B211Y9, B21208, B21211, B21202, B215L0, B1YT74, B211W6, B1YT77, B211W9, B211X2, B215L1, B211Y6, B211Y3, B20XX5, B215K8, B20XX2, B211W3, B215K9, B20XW9, B20XW6	Mercury	13	13.6 – 48.1	24	22	19

Table M-21. Non-detect Results Exceeding Hanford Background Values (8 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Hanford Background Value	% of Total Non-detect Results	% of Total Number of Results
B2C1M8, B2C1N0, B2C1M9, B26JL0, B26JL1, B26C57, B26C59, B26C61, B26CD2, B26C47, B26CD0, B26C55, B2B1L6, B2C1M5, B2B1L7, B2C1M7, B2C1M3, B2C1M2, B26JK2, B26JK7, B26JK8, B26JK9, B26C30, B26C38, B26C40, B29613, B26JK3, B26C78, B26C80, B26C34, B26C36, B25WM2, B25WM8, B26CC4, B26C68, B26C70, B26C74, B26C28, B26C32, B23KP9, B23KR5, B25WM5, B26C76, B26C26, B23KR2, B27131, B238J9, B23TK8, B236N5, B23KN7, B23TK5, B236N8, B236P2, B23TK2, B27130, B23R25, B23TM6, B2FYM6, B2FYM5, B2FYM4, B2FYM3, B2FYM7, B2FYM9, B2FPR7, B2FYM8, B2FPR8, B1YTF4, B1YTD8, B1YTD2, B20XX5, B1YTF1, B211W6, B211W3, B20XX2, B21211, B211W9, B1YTD5, B21214, B211X2, B20XW3, B20XV5, B211Y6, B215K9, B1YTH6, B211Y3, B215L1, B1YT83, B1YTC0, B1YTB4, B1YTF7, B1YTH1, B1YTH3, B1YTC9, B21202, B21208, B1YTB7, B20XV9, B1YT98, B1YT92, B211Y9, B238J3, B21205, B215L0, B20XW6, B1YTB1, B20XW9, B238J6, B238H4, B215K8, B238J0, B1YT77, B1YT74, B1YT80, B2FPF1, B2D1X7, B2D1X9, B2D1Y0, B2D1X5, B2D1X6, B2D1X8, B2FPF2, B2FB29, B2D1X2, B2FB32, B2FB30, B2FB31, B2FB27, B2FB33, B2FB34, B2B1L9, B2D1X4, B2B1L8, B1VJ57B, B1VJ63C, B1VJ63B, B1VJ57C, B1VJ63A, B1VJ57A, B238H1, B238H7, B23KT4, B1YT71	Molybdenum	470	989 – 20,200	142	96	89
B2B1L6, B2C1M5, B2B1L7, B2C1M7, B2C1M3, B2C1M2, B2C1M8, B2C1N0, B2C1M9, B2C1N1, B21211, B21214, B211Y6, B211Y3, B215L1, B21202, B21208, B211Y9, B21205, B215L0, B1VJ57B, B1VJ63C, B1VJ57C, B1VJ63B, B1VJ63A, B1VJ57A	Selenium	780	1,230 – 18,100	26	23	16

Table M-21. Non-detect Results Exceeding Hanford Background Values (8 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Hanford Background Value	% of Total Non-detect Results	% of Total Number of Results
B1VJ57B, B1VJ63C, B1VJ63B, B1VJ57C, B1VJ63A	Silver	167	857 – 884	5	7.4	3.1
B1VJ57A, B1VJ63B, B1VJ57C, B1VJ63A, B1VJ63C, B1VJ57B, B1VJ57B, B1VJ63C, B1VJ57C, B1VJ63B, B1VJ63A	Thallium	185	500 – 17,700	11	29	6.9
B1YTF4, B1YTD2, B1YTD8, B20XX5, B1YTF1, B211W3, B211W6, B20XX2, B21211, B211W9, B21214, B211X2, B1YTD5, B20XV5, B20XW3, B211Y6, B215K9, B1YTH6, B211Y3, B1YT83, B215L1, B1YTC0, B1YTH1, B1YTB4, B1YTF7, B1YTH3, B1YTC9, B21202, B21208, B20XV9, B1YTB7, B1YT92, B1YT98, B211Y9, B21205, B215L0, B20XW6, B1YTB1, B215K8, B20XW9, B1YT74, B1YT77, B1YT80, B1YT71	Uranium*	3,210	17,000 – 101,000	44	100	100
Radiochemicals (pCi/g)						
B1YTC9, B1YTD2	^{137}Cesium	1.1	3.01 – 3.08	2	1.6	1.3

Table M-21. Non-detect Results Exceeding Hanford Background Values (8 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Hanford Background Value	% of Total Non-detect Results	% of Total Number of Results
B2FB31, B2FB30, B2FYM5, B2D1Y0, B2FB30, B2B1L8, B2C1M9, B2C1N0, B2D1X7, B2FPF1, B2FPR8, B2B1L6, B2C1N1, B2FB27, B2C1M5, B2D1X6, B2FB34, B2C1M3, B2C1M8, B2C1M7, B2C1M2, B2FYM3, B2FPF2, B2B1L7, B2D1X4, B2D1X9, B2FYM4, B2FB29, B2FB33, B2FPR7, B2FYM6, B2FYM8, B2D1X2, B2FB31, B2FYM9, B2FB32, B2FYM7, B2B1L9, B2D1X5, B2D1X8, B215K9, B215K8, B20XW6, B20XX2, B20XV9, B1YTH3, B21211, B1YTH1, B20XW9, B1YTH6, B25CN2, B21214, B236N5, B211Y9, B23KR5, B23KP6, B215L1, B1YT77, B238K3, B215L0, B25WM5, B27131, B25ND7, B26JK9, B211Y6, B236P2, B236N8, B23KT4, B23TM6, B1VJ63B, B25WM2, B238J6, B21202, B25WM8, B238J3, B211Y3, B26C34, B23KR2, B26C28, B1VJ63C, B238J9, B26C76, B26C40, B26C82, B26JK3, B1VJ63A, B26C38, B26JK8, B26C74, B26C80, B23TK5, B238H7, B238J0, B238H4, B23R25, B26C36, B23TK2, B26JK6, B26C70, B21205, B1YTB1, B26JK7, B26CD4, B26C78, B1YTF1, B26C30, B23KN7, B238H1, B29613, B1YTB4, B26CC4, B26JK2, B26C51, B26CD0, B23KP9, B26C68, B1YTC0, B20XX5, B26C55, B26C59, B1YT83, B1YTB7, B26C47, B21208, B26JL0, B26C32, B26C53, B26C57, B26C61, B1YTF7, B211X2, B29612, B1YTD5, B211W5, B1YT80, B26C26, B26JL1, B26CD2, B1YTD8, B1YTF4, B211W9, B211W6, B1YT92, B1YT98, B20XW3, B1YTC9, B1YTD2, B20XV5	^{60}Cobalt	0.01	0.02 – 3.13	148	97	94

Table M-21. Non-detect Results Exceeding Hanford Background Values (8 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Hanford Background Value	% of Total Non-detect Results	% of Total Number of Results
B2FB29, B2FB27, B2D1Y0, B2D1X7, B2C1M9, B2D1X6, B2C1N0, B2D1X9, B2C1N1, B2C1M7, B2C1M8, B2B1L8, B2C1M2, B2C1M3, B2B1L6, B2D1X4, B2D1X2, B2B1L7, B2C1M5, B2D1X8, B2B1L9, B2D1X5, B2FPF1, B2FB34, B2FYM4, B2FB30, B2FYM3, B2FYM6, B2FB29, B2FB33, B2FB27, B2FPR8, B2FPF2, B2FPR7, B2FYM8, B2FB31, B2FYM5, B2FB32, B2FYM9, B2FYM7, B215K9, B215K8, B20XX2, B20XW6, B1YTH3, B21211, B20XW9, B20XV9, B1YTH1, B21214, B1YTH6, B238K3, B236N5, B211Y9, B25CN2, B236N8, B23KP6, B27131, B23KR5, B23TM6, B1YT77, B238J9, B236P2, B215L1, B211Y3, B26C40, B1YT71, B23TK5, B26JK9, B25ND7, B1YTB4, B1VJ57A, B1VJ57C, B25WM5, B23KT4, B238J6, B215L0, B25WM8, B26C82, B26C76, B23KR2, B1VJ63A, B1VJ57B, B211Y6, B26C38, B26C34, B26JK3, B26C80, B26C74, B238H7, B23TK2, B21205, B238J3, B21202, B238H1, B26JK8, B23R25, B1VJ63B, B1YTF1, B25WM2, B26C28, B29613, B1VJ63C, B26JK6, B238J0, B1YTB1, B238H4, B26C36, B26C70, B21208, B26JK7, B26JK2, B23KN7, B1YTC0, B26C78, B26CD0, B26CD4, B29612, B23KP9, B26C57, B26CC4, B26C55, B1YTB7, B1YTD5, B26C30, B26JL0, B26C68, B26C47, B211W6, B1YTF7, B26C32, B211X2, B26JL1, B26C51, B20XX5, B1YTF4, B26C53, B26C61, B1YTD8, B211W5, B26C59, B1YT80, B1YT83, B26C26, B211W9, B26CD2, B1YT92, B20XW3, B1YT98, B1YTC9, B20XV5, B1YTD2	^{154}Europium	0.03	0.035 – 9.45	152	97	96

Table M-21. Non-detect Results Exceeding Hanford Background Values (8 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Hanford Background Value	% of Total Non-detect Results	% of Total Number of Results
B2FB33, B2FB31, B2FB34, B2FB32, B2FB29, B2FB27, B2D1Y0, B2D1X7, B2FPR8, B2FB31, B2FYM8, B2FPF1, B2D1X9, B2D1X6, B2C1N0, B2FB33, B2FYM4, B2FB29, B2C1N1, B2FB27, B2FPF2, B2B1L8, B2FYM5, B2FPR7, B2FB30, B2C1M3, B2C1M9, B2C1M8, B2C1M2, B2C1M7, B2D1X4, B2B1L6, B2FYM9, B2D1X2, B2B1L7, B2C1M5, B2FB34, B2FYM3, B215K9, B2FYM7, B2B1L9, B2FYM6, B2D1X8, B215K8, B2D1X5, B20XX2, B20XW6, B21211, B20XW9, B1YTH3, B2FB32, B211Y9, B23KR5, B1YTH1, B23TM6, B238K3, B25CN2, B236N5, B21214, B27131, B23KP6, B238J9, B238J6, B236N8, B1VJ57C, B26JK9, B215L1, B236P2, B25ND7, B25WM5, B26C40, B215L0, B26C38, B23KT4, B211Y6, B26C76, B238J3, B1YTH6, B211Y3, B25WM2, B1VJ63A, B23TK5, B26C82, B26JK8, B26C28, B23KR2, B1YTB4, B26JK3, B20XV9, B1YT77, B1VJ63C, B238H1, B1VJ63B, B26C74, B21205, B238H7, B1VJ57A, B238J0, B21202, B1YTB1, B1YTC0, B238H4, B25WM8, B26C34, B26C36, B26C80, B23TK2, B1VJ57B, B26C78, B23R25, B26JK2, B21208, B23KN7, B26C30, B26C70, B23KP9, B1YTB7, B26C68, B26C32, B26C26, B211X2, B1YT71, B211W6, B20XX5, B211W5, B211W9, B26CD4, B1YTF1, B26JK7, B26JK6, B29613, B26CD0, B26C57, B26C51, B26C55, B26C53, B26C61, B26JL0, B26C47, B26C59, B29612, B1YT80, B1YT83, B1YTD5, B1YTD8, B26CC4, B1YTF4, B1YTF7, B26JL1, B1YT98, B20XW3, B26CD2, B1YT92, B1YTC9, B1YTD2, B20XV5	^{155}Europium	0.05	0.062 – 6.7	156	99	99

Table M-21. Non-detect Results Exceeding Hanford Background Values (8 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Hanford Background Value	% of Total Non-detect Results	% of Total Number of Results
B2FYM3, B2C1M2, B2C1M9, B2FB33, B2B1L9, B2D1X9, B2FB27, B2C1M8, B2FYM7, B2FYM6, B2FB32, B2D1X8, B2C1M3, B2FB34, B2FYM4, B2C1M5, B2FB31, B2FB29, B2FB30, B2B1L7, B2D1X5, B2D1Y0, B2D1X7, B2FPR8, B2D1X4, B2FYM5, B2D1X6, B2FPR7, B2FYM9, B2D1X2, B2FYM8, B23KR5, B238H7, B23KR2, B23TM6, B238J9, B238J3, B25ND7, B25CN2, B236P2, B238H4, B23KN7, B23KP9, B26JL1, B23KP6, B238J6, B25WM8, B238J0, B26C70, B23R25, B26CC4, B26JK6, B23TK5, B26C26, B238K3, B26C34, B26C38, B26C47, B29612, B26JL0, B238H1, B26C80, B26C32, B26JK8, B26JK9, B27131, B25WM5, B26C82, B26C55, B23KT4, B25WM2, B26JK3, B26C28, B26C78, B26CD0, B29613, B26C53, B26C40, B26C76, B236N8, B26C36, B26C30, B26JK2, B26C51, B26CD2, B236N5, B26CD4, B26C74, B23TK2, B26C68, B26C57, B26C61, B26JK7, B26C59, B1YTD8, B211Y6, B21202, B211Y3, B21205, B1YTH3, B1YTH1, B211W3, B21214, B1YT80, B215K8, B1YTF1, B215L0, B20XW3, B1YTF4, B21208, B20XW6, B20XW9, B211W6, B1YT98, B1YT77, B20XX5, B215L1, B20XV9, B1YTC9, B215K9, B211W9, B1YTB1, B1YTB4, B1YTC0, B1YTB7, B1YTH6, B211Y9, B21211, B20XX2, B211X2, B1YT74, B1YTD5, B1YT83, B1YTF7, B1YT92, B20XV5, B1YT93, B1YTD2	$^{239/240}$Plutonium	0.03	0.0309 – 1.48	138	98	95
B2C1N1, B1VJ57C, B1VJ63A, B1VJ63C, B1VJ63B, B1VJ57A, B1VJ57B	^{226}Radium	0.82	1.39 – 5.6	7	100	28

Table M-21. Non-detect Results Exceeding Hanford Background Values (8 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Reported Detection Limits	Number of Non-detect Results Exceeding Hanford Background Value	% of Total Non-detect Results	% of Total Number of Results
B26C47, B238H7, B26C76, B2D1X6, B26C53, B2FYM4, B238J0, B26JK8, B26C30, B26C51, B26C57, B238J6, B238K3, B26C55, B238J3, B26C36, B26CD0, B2FYM7, B26JL1, B26C40, B29613, B2FYM8, B29612, B26CC4, B26JK9, B26C70, B26C78, B23KT4, B26C28, B26C74, B2C1N0, B26CD2, B2C1M9, B25WM8, B27131, B2D1X5, B26CD4, B26C38, B25CN2, B2D1X7, B23KP9, B23KP6, B2FB27, B23KR2, B2FB34, B23KR5, B2FB29, B2FB31, B2C1M5, B2D1Y0, B2FB33, B26C34, B2FYM3, B26C26, B26C32, B2FB30, B2FYM6, B26JL0, B238H4, B23TM6, B25ND7, B26C82, B2D1X2, B26C61, B26C68, B2C1M3, B26C59, B2C1M7, B2C1N1, B236N8, B236P2, B2C1M2, B26C80, B25WM5, B2C1M8, B25WM2, B23TK2, B1YTB1, B20XW9, B20XX2, B215K8, B211W9, B21205, B21214, B20XX5, B21202, B215L0, B21211, B1YTF7, B1YTB7, B215L1, B1YTF4, B211W6, B20XW6, B211X2, B211W3, B1YTD5, B1YTH3, B1YTH6, B1YTD8, B211Y6, B211Y9, B211Y3, B1YTD2	^{90}Strontium	0.18	0.182 – 8.79	104	95	71
B1VJ57C, B1VJ63A, B1VJ63B, B1VJ63C, B1VJ57A, B1VJ57B	^{235}Uranium	0.11	0.297 – 0.339	6	100	38

*Uranium reported from Method 6010 metals analysis. Taking into consideration the 159 uranium results calculated from isotopic uranium activity (all detected), the 22% of all uranium results were reported as not detected at method detection limits exceeding Hanford background value.

Table M-22. Detected Results Exceeding Hanford Background Values (5 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Detected Results Reported	Number of Detected Results Exceeding Hanford Background Value	% of Total Number of Results
Anions (µg/kg)					
B26C76, B236P2, B27130, B1YTB7, B1YT71, B1VJ57B, B1VJ57C, B1VJ57A	Fluoride	2,810	2,870 – 7,410	8	5.3
B26JL0, B26JL1, B26CD2, B211W6, B211W9, B1YTB7, B21214, B21211	Nitrate	5,200	53,3000 – 792,000	8	4.9
B2FYM3, B26C57, B26C74, B2D1X5, B26JK8, B20XW9, B1YTF1, B21208, B29613, B238J9, B26C70, B23KP6, B26C53, B26C68, B2FYM4, B26JK9, B26C51, B25CN2, B21202, B20XX5, B26C30, B1YT77, B25ND7, B1YTD8, B26CC4, B26C47, B2C1M2, B2D1X2, B1YTD5, B26C32, B20XW6, B238H1, B211Y3, B211Y9, B23KP9, B26JK2, B26JK7, B2B1L7, B215K8, B215K9, B26JK6, B26JK3, B25WM2, B2B1L6, B236N5, B215L0, B27131, B23KT4, B2B1L8, B23TM6, B1YTB4, B236N8, B23TK2, B2B1L9, B1YTC9, B26C26, B215L1, B27130, B23TK5, B1YT92, B20XV9, B2C1M5, B1YT98, B20XW3, B2FPR8, B2FPR7, B1YTH3, B1VJ57B, B26JL0, B26JL1, B2D1X4, B1YT74, B1YTB7, B1YTB1, B1VJ57A, B1YTH1, B1VJ57C, B1YT71	Phosphate	785	813 – 1,160	75	49
B2FB31, B26C28, B2FB30	Sulfate	237,000	366,000 – 592,000	3	2.0

Table M-22. Detected Results Exceeding Hanford Background Values (5 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Detected Results Reported	Number of Detected Results Exceeding Hanford Background Value	% of Total Number of Results
Metals (µg/kg)					
B2D1X6, B2FYM7, B29613, B25WM5, B25WM8, B26CC4, B2C1M7, B2D1X9, B26C68, B26C38, B23KR5, B2C1M5, B27130, B2C1M8, B2FB32, B26C74, B26JK3, B2FB30, B2FYM9, B23KR2, B26C59, B20XV5, B2FYM4, B26JK2, B2B1L7, B26C61, B215L0, B1YT71, B238H7, B23TK2, B26C36, B26JK9, B2FB33, B211W3, B26C26, B26JL0, B2FB34, B2B1L8, B2B1L9, B2FB31, B2D1X7, B26JK8, B26JK7, B26JL1, B2B1L6, B2FYM5, B26JK6, B2D1X2, B2C1M2, B238H4, B2C1M9, B236N5, B23TK5, B25ND7, B2D1X4, B236P2, B2FPR7, B26C80, B2D1X8, B23KN7, B2D1X5, B2FPR8, B23R25, B29612, B23TM6, B2FPF2, B2FPF1, B1YTD2, B26C47, B215K9, B2FYM3, B2C1M3	Antimony	130	132 – 2,160	72	46
B2FPR8, B26JL1, B29612, B2FYM9, B2C1M3, B1VJ57A, B29613, B2FYM3	Arsenic	6,470	6,700 – 21,200	8	5.0
B2B1L7, B2B1L6	Barium	132,000	239,000 – 244,000	2	1.3
B2C1M5, B2C1M2, B26JK6, B2FB31, B2C1M3, B2B1L7, B2B1L6	Boron	3,890	4,580 – 43,900	7	18
B1VJ63C, B1VJ57B, B1VJ63A, B25WM5, B1VJ63B, B1VJ57C, B25WM2, B1VJ57A, B26C80, B26C78, B26C76, B25WM8, B26C82, B23TK2, B26C68, B26JK2, B26C70, B27131, B27130, B23TK5, B23TM6, B26C74, B26JK3, B23TK8	Cadmium	563	861 – 3,470	24	15
B2FYM3, B236P2, B2FB31	Calcium	17,200,000	17,500,000 – 32,200,000	3	1.9

Table M-22. Detected Results Exceeding Hanford Background Values (5 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Detected Results Reported	Number of Detected Results Exceeding Hanford Background Value	% of Total Number of Results
B238J0, B238J3, B2FB31, B1VJ57B, B2D1X7, B26C82, B2FYM9, B26C34, B1YTD5, B2FYM7, B23KR2, B238K3, B2FYM5, B26C32, B23KR5, B26C59, B2D1X6, B2FB34, B26C30, B2C1N1, B26C78, B2FB32, B26C36, B26C76, B1VJ63C, B25ND7, B1VJ63B, B1VJ63A, B26CD4	Chromium	18,500	18,600 – 44,500	29	18
B25ND7	Copper	22,000	27,100	1	0.6
B26C55, B1VJ57B, B2FYM3, B26CD0, B26C47, B2FB31, B23KR2, B1VJ57C	Lead	10,200	10,300 – 14,100	8	5.0
B2FYM3	Magnesium	7,060,000	8,620,000	1	0.7
B1YT98, B23TK5, B2B1L7, B23KP6, B26JK2, B1YTH1, B26JK7, B2FB31, B26JK3, B236N5, B25ND7	Mercury	13	13.2 – 68.1	11	6.9
B26CD4, B26C51, B26C53, B238K3, B23KP6, B26JK6, B25CN2, B29612, B26C82, B2C1N1, B25ND7	Molybdenum	470	1,880 – 5,120	11	6.9
B26C76, B1YTF7, B1VJ63C, B23KP9, B1YTC0, B1VJ63B, B26C78, B26CD4, B1YT77	Nickel	19,100	19,300 – 30,600	9	5.7
B29613, B26CD2, B26CD4, B26C28, B26JL0, B26JL1, B26C47, B26C51, B26C53, B26C55, B26C57, B26C59, B26C61, B26JK6, B26JK7, B26CC4, B26CD0, B25CN2, B29612	Selenium	780	800 – 2,000	19	12
B1YTB7, B20XV5, B20XV9, B20XW3, B1VJ57A	Silver	167	180 – 933	5	3.1
B1YTB4, B1YTB1, B1YTB7, B26C76, B1YT74, B1VJ57C, B1VJ57B, B1VJ57A, B1YT71	Sodium	690,000	732,000 – 101,000	9	5.7
B2FYM6, B26C55, B26C51, B2FYM7, B2FYM5, B2FYM4, B2FPR8, B2FYM3, B2FPR7, B27131, B23TM6, B27130, B23TK8, B23TK5,	Thallium	185	186 – 20,800	16	10

Table M-22. Detected Results Exceeding Hanford Background Values (5 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Detected Results Reported	Number of Detected Results Exceeding Hanford Background Value	% of Total Number of Results
B23TK2, B1VJ57A					
B1YTB7	Uranium*	3,210	6,440	1	0.5
B1YTD8, B1YTD5	Vanadium	85,100	95,100 – 110,000	2	1.3
B1VJ63C, B1YTH3	Zinc	67,800	72,300 – 305,000	2	1.3
Radiochemicals (pCi/g)					
B215L1, B1YT77, B1YT80, B236N5, B26JK7, B26JK6, B236N8, B215K9, B26JK3, B2B1L9, B2B1L8, B2FPR7, B215L0, B2B1L6, B26JK2, B23KN7, B2B1L7, B1YT98, B1YT74, B2FPR8, B23R25, B20XW3, B20XV9, B2FPF2, B2FPF1, B20XV5, B1YT92, B1YT71	^{137}Cesium	1.1	1.31 – 73.1	28	18
B2FB33, B1VJ57C, B1VJ57A, B1VJ57B, B1YT74, B1YT71	^{60}Cobalt	0.01	0.03 – 0.833	6	3.8
B1YT74	^{154}Europium	0.03	2.28	1	0.6
B1YT74	^{155}Europium	0.05	0.81	1	0.6
B2B1L6, B2C1N1, B2FPF2, B2FPF1, B1YT71	$^{239/240}$Plutonium	0.03	0.0378 – 10.7	5	3.4
B2C1M8, B26C80, B1YTH6, B25WM5, B26C59, B21211, B1YT83, B2FB33, B26JL0, B2FB29, B26CD4, B2FB34, B2FB27, B2FB30, B2FB32	^{40}Potassium	17	17.4 – 31	15	11
B2FB30, B2FB32, B2FB33, B2FB31, B2B1L6, B2B1L7, B2D1X6, B2B1L9, B2D1X4, B2D1X2, B2D1X5, B2D1X8, B2D1Y0, B2D1X9, B2D1X7	^{226}Radium	0.82	0.96 – 6.98	15	60

Table M-22. Detected Results Exceeding Hanford Background Values (5 sheets)

Sample Numbers	Analyte	Hanford Background Value	Range of Detected Results Reported	Number of Detected Results Exceeding Hanford Background Value	% of Total Number of Results
B2FYM5, B238H1, B236N5, B23TK5, B23R25, B23KN7, B1YTB4, B2FPR7, B1YTH1, B21208, B26JK3, B26JK2, B1YTC0, B2FPR8, B1YTF1, B26JK6, B1YT77, B2B1L6, B2B1L7, B215K9, B26JK7, B1YT83, B1YT80, B2FPF1, B2FPF2, B1YTC9, B2B1L8, B1YT74, B2B1L9, B1YT92, B1YT98, B20XV9, B20XW3, B20XV5, B1YT71, B1YT93	^{90}Strontium	0.18	0.186 – 141	36	25
B29613	^{232}Thorium	1.3	1.8	1	0.7
B1YTH3, B1YTB7	^{234}Uranium	1.1	1.39 – 2.76	2	1.4
B2FB27, B2FB30, B2FB34	^{235}Uranium	0.11	0.12	3	1.9
B1YTB7	^{238}Uranium	1.1	2.12	1	0.6

M5.1.4 Tentatively Identified Compounds

Tentatively identified compounds were reported for VOC and SVOC analyses on solid samples when identification criteria in RPP-RPT-38777 were met. Tentatively identified compounds are reported as presumptively present at an estimated concentration; therefore, TIC results are considered estimated concentrations not suitable for use in decision-making.

Tentatively identified compounds results are flagged by the laboratories with an "N" qualifier at a minimum. Results for TICs are also identified in the HEIS database with a "Y" in the TIC_FLAG field. Ten TICs reported for WMA C Phase 2 RFI samples were not marked this way in HEIS. These results are listed in Table M-23. A "Y" in the TIC_FLAG field in HEIS for these 10 results was added after the data were loaded into HEIS. Data users should verify that the data set they are using contains a "Y" in the TIC_FLAG field for these records.

Table M-23. Tentatively Identified Compounds Not Marked in Hanford Environmental Information System

Sample Number	CAS Number	Analyte	Result	Lab Qualifier	Units	Method
B26C62	106-35-4	3-Heptanone	2.5	JN	µg/kg	8260_VOA_GCMS
B26C62	111-13-7	Hexyl methyl ketone	4.6	JN	µg/kg	8260_VOA_GCMS
B2B1L7	544-76-3	Hexadecane	170	JN	µg/kg	8270_SVOA_GCMS
B2C1M7	108-88-3	Toluene	220	BJN	µg/kg	8270_SVOA_GCMS
B23TM8	106-35-4	3-Heptanone	3.3	JN	µg/kg	8260_VOA_GCMS
B26CC7	629-62-9	Pentadecane	3.2	JN	µg/kg	8260_VOA_GCMS
B26CD5	106-35-4	3-Heptanone	11	JN	µg/kg	8260_VOA_GCMS
B26CD5	123-72-8	Butyraldehyde	2.3	JN	µg/kg	8260_VOA_GCMS
B26CD5	66-25-1	Hexanal	10	JN	µg/kg	8260_VOA_GCMS
B26CD5	111-71-7	n-Heptyl Aldehyde	10	JN	µg/kg	8260_VOA_GCMS

CAS = Chemical Abstracts Service

The method blank and calibration blank data available were examined for presence of TICs also reported for WMA C Phase 2 RFI soil samples (e.g., diisobutyl phthalate). In most instances, TICs were identified and present in these laboratory blank samples. Therefore, the TICs reported for WMA C Phase 2 RFI soil samples are most likely attributable to laboratory contamination and not likely present in WMA C soil.

M5.1.5 Technetium-99 Extraction and Quantitation

M5.1.5.1 Water Extraction and Acid Extraction Results. Two ^{99}Tc results were reported for the majority of the WMA C Phase 2 soil samples collected. A standard acid digestion based SW-846 Method 3050B was used for all samples. For most samples, a 1:1 water digest method was developed and implemented for this project to provide quick-turn results for use in making decisions in the field.

Usability of ^{99}Tc results differs based on the preparation methodology. For example, the water-extraction results were considered not usable for ecological risk assessment purposes and excluded from the data set used. The data user must be aware of the differences in preparation methods and make the determination whether the water-digest results are usable for their specific need. Results from water-digests are differentiated from results from acid-digests by the HEIS METHOD_NAME assigned. The METHOD_NAME of RADISO_ICPMS_WE indicates analysis of a water-digest for ^{99}Tc. The METHOD_NAMES of RADISO_ICPMS_AE and RADISOTOPES_ICPMS indicate the ^{99}Tc results were obtained by analysis of acid digests.

M5.1.5.2 Quantitation Issue. Low-levels of ^{99}Tc were detected in samples B248B3, B248B4, B248B5, and B248B6 in acid digest samples; however, ^{99}Tc was not detected in the water leach samples from the same boring and intervals. The laboratory (222-S) was directed to re-extract and reanalyze the samples to verify these unexpected results. Samples were to be reanalyzed using both ICP/MS and chemical separation followed by liquid scintillation counting (LSC).

During ICP/MS analysis, poly-atomic, isobaric interference with mass 99 from $ZnCl^+$ and $CoAr^+$ ion pairs may result in low-level false positive ^{99}Tc results. In addition, isobaric interference from ^{99}Ru, which occurs both naturally and as a fission product, may lead to ^{99}Tc false positive results. Sample dilution and monitoring mass 102 can be used to minimize these interferences; however, contribution of ^{99}Ru as an interferent cannot be reliably predicted or inferred from other Ru isotopes.

Through re-extraction and reanalysis of these samples on the original instrument (PQ EXCELL) and a newer instrument (Agilent 7500ce) that is equipped with collision cell technology designed to mitigate isobaric interferences from poly-atomic species, it was determined that the low levels of ^{99}Tc detected in acid-digest samples B248B3, B248B4, and B248B6 were false positives cause by these interferences. For sample B248B5, ^{99}Tc was detected at a low level by LSC. The reanalysis results reported from analyses using the Agilent 7500ce were reported in HEIS. Results for the original analyses were replaced by the Agilent 7500ce reanalysis results.

Based on the identification of this issue, results for ^{99}Tc were reviewed to determine which instrument was used for analysis (PQ EXCELL or Agilent 7500ce) and whether review qualifiers should be assigned. Detected results for ^{99}Tc for samples analyzed using the PQ EXCELL instrument (no collision cell) were considered suspect (potential high bias, possible false positive) and assigned the review qualifier "Y" in HEIS. Detected results for ^{99}Tc samples analyzed using the Agilent 7500ce with collision cell were considered usable and not qualified based on instrumentation used. Non-detect results for ^{99}Tc were not qualified based on instrumentation used. Table M-24 lists the ^{99}Tc results, instrument used, and review qualifiers assigned.

Table M-24. Detected Results for Technetium-99 Reviewed for Instrument Quantitation Issue (2 sheets)

Sample Number	Method Name	Laboratory Sample ID	Instrument	^{99}Tc Result (pCi/g)	Lab Qualifier	Review Qualifier
B23KR2	RADISOTOPES_ICPMS	S10V000677	PQEXCELL	33.5		Y
B23KR2	RADISO_ICPMS_WE	S10V001735	Agilent	2.69		
B23KR5	RADISOTOPES_ICPMS	S10V000686	PQEXCELL	30.1		Y
B25ND7	RADISOTOPES_ICPMS	S10V000695	PQEXCELL	28.4		Y
B25WM2	RADISOTOPES_ICPMS	S10V001012	PQEXCELL	6.45	B	Y
B25WM2	RADISO_ICPMS_WE	S10V002149	PQEXCELL	0.0789	B	Y
B25WM5	RADISO_ICPMS_WE	S10V002147	Agilent	0.328		
B26CD0	RADISOTOPES_ICPMS	S10V001774	PQEXCELL	5.32		Y
B26CD0	RADISO_ICPMS_WE	S10V001767	PQEXCELL	0.122	B	Y
B26CD2	RADISOTOPES_ICPMS	S10V001794	PQEXCELL	53.5		Y
B26CD2	RADISO_ICPMS_WE	S10V001787	PQEXCELL	22.1		Y
B26C40	RADISO_ICPMS_WE	S10V002803	Agilent	0.122		
B2C1N0	RADISO_ICPMS_WE	S11V004316	PQEXCELL	0.924		Y
B2FB31	RADISOTOPES_ICPMS	S11V005140	Agilent	16.2		
B1VJ57A	RADISO_ICPMS_AE	S08V000028	PQEXCELL	2.26		Y
B1VJ57B	RADISO_ICPMS_AE	S08V000029	PQEXCELL	4.52		Y
B1VJ57C	RADISO_ICPMS_AE	S08V000030	PQEXCELL	2.17		Y
B1VJ63A	RADISO_ICPMS_AE	S08V000031	PQEXCELL	2.14		Y
B1VJ63B	RADISO_ICPMS_AE	S08V000032	PQEXCELL	2.55		Y
B1VJ63C	RADISO_ICPMS_AE	S08V000033	PQEXCELL	6.07		Y
B238H4	RADISO_ICPMS_WE	S10V000016	Agilent	0.226		
B238H7	RADISO_ICPMS_WE	S10V000019	Agilent	0.125		
B238K3	RADISO_ICPMS_WE	S10V000085	PQEXCELL	0.0775		Y
B21214	RADISOTOPES_ICPMS	S09V001232	PQEXCELL	50.1		Y
B21211	RADISOTOPES_ICPMS	S09V001174	PQEXCELL	54.6		Y
B215K8	RADISOTOPES_ICPMS	S09V000863	PQEXCELL	21.6	B	Y
B215K9	RADISOTOPES_ICPMS	S09V000876	PQEXCELL	22.4	B	Y
B20XW6	RADISOTOPES_ICPMS	S09V000921	PQEXCELL	25.1	B	Y
B20XW9	RADISOTOPES_ICPMS	S09V000922	PQEXCELL	21.7	B	Y

Table M-24. Detected Results for Technetium-99 Reviewed for Instrument Quantitation Issue (2 sheets)

Sample Number	Method Name	Laboratory Sample ID	Instrument	^{99}Tc Result (pCi/g)	Lab Qualifier	Review Qualifier
B20XX2	RADISOTOPES_ICPMS	S09V000923	PQEXCELL	24.8	B	Y
B20XX5	RADISOTOPES_ICPMS	S09V001027	PQEXCELL	26.9	B	Y
B211W3	RADISOTOPES_ICPMS	S09V001028	PQEXCELL	39.7	B	Y
B211W6	RADISOTOPES_ICPMS	S09V001029	PQEXCELL	72.9	B	Y
B211W9	RADISOTOPES_ICPMS	S09V001030	PQEXCELL	76	B	Y
B211X2	RADISOTOPES_ICPMS	S09V001031	PQEXCELL	53.9	B	Y
B1YT71	RADISOTOPES_ICPMS	S09V000211	PQEXCELL	24	E	Y
B1YT74	RADISOTOPES_ICPMS	S09V000212	PQEXCELL	45.5	E	Y

M5.1.6 Calculation of Uranium Results

Per RPP-PLAN-38777, calculation of uranium concentrations using isotopic uranium results could be substituted for determination of uranium concentrations through metals analysis provided the required detection limit was met. Uranium concentrations were determined through analysis by Methods 6010 and 6020 for 44 samples. Uranium was reported as not detected in each of these samples; however, the detection limits achieved by analysis using these methods were 1 to nearly 3 orders of magnitude greater than the required (500 µg/kg) and target (1,000 µg/kg) detection limits listed in RPP-PLAN-38777.

Isotopic uranium analysis by ICP/MS was done for 159 samples. The laboratory measured and reported concentrations for the uranium isotopes (^{233}U, ^{234}U, ^{235}U, ^{236}U, ^{238}U). The HEIS database is built to display both the laboratory reported and standardized results for each record (result). These measured concentrations for each sample were loaded by the laboratory into the VALUE_RPTD field.

Prior to calculation of uranium concentrations from isotopic uranium results, the isotopic uranium results were evaluated to determine what calculation method was appropriate. Uranium-238 results were reported as detected in all 159 samples. There were six non-detects for ^{235}U. Results for ^{233}U, ^{234}U, and ^{236}U were all non-detect. Based on natural abundances of each isotope, this is what would be expected for naturally-occurring uranium.

Additional evaluations using ^{235}U and ^{238}U results were done to verify whether the reported results were representative of naturally-occurring uranium. Using the sum of ^{235}U and ^{238}U concentrations to approximate uranium concentration would theoretically yield ^{238}U abundance calculations biased slightly high. When calculating ^{238}U using this uranium estimate, the calculated (99.19 to 99.38%) abundances approximated the naturally-occurring abundance of 99.27% for ^{238}U.

Based on this evaluation, the measured uranium isotope concentrations are indicative of naturally-occurring uranium. The ^{238}U concentrations reported by ICP/MS were used to calculate uranium concentrations using the naturally-occurring abundance of 99.27% for ^{238}U. The calculated values are considered representative estimates of uranium concentration in the samples.

Table M-25 contains the measured uranium and calculated uranium results for WMA C Phase 2 RFI soil samples.

M5.1.7 Calculation of ^{241}Pu Results

The laboratory did not analyze for ^{241}Pu in the WMA C Phase 2 RFI soils samples; but rather, ^{241}Pu activities were estimated from $^{239/240}Pu$ results in accordance with RPP-PLAN-38777. A scaling factor of 3.73 was determined appropriate for use and applied $^{239/240}Pu$ results to conservatively estimate ^{241}Pu activities (SVF-3009, *Pu241_Soil_Estimate.xlsx*). Table M-26 shows the ^{241}Pu results estimated from detected $^{239/240}Pu$ results. These ^{241}Pu results are considered estimated values and usable for decision-making purposes.

M5.2 DATA VALIDATION AND DATA REVIEW

Data validation was performed by Analytical Quality Associates, Inc., (AQA) of Albuquerque, New Mexico, as documented in the following data validation reports:

- VSR10-013, *Revised Data Validation Report for CH2M Hill Plateau Remediation Company, Project WMA C, Chemical & Radiochemical Validation – Level C* (AQA, July 20, 2010)
- VSR10-021, *Data Validation Report for CH2M Hill Plateau Remediation Company, Project WMA C, Chemical & Radiochemical Validation – Level C* (AQA, July 29, 2010)
- VSR10-024, *Data Validation Report for CH2M Hill Plateau Remediation Company, Project WMA C, Chemical Validation – Level C* (AQA, September 13, 2010)
- VSR11-015, *Data Validation Report for CH2M Hill Plateau Remediation Company, Project WMA C (C7472), Chemical & Radiochemical Validation – Level C* (AQA, March 30, 2011)
- VSR11-035, *Data Validation Report for CH2M Hill Plateau Remediation Company, Project WMA C (C7670), Chemical & Radiochemical Validation – Level C* (AQA, May 12, 2011)
- VSR11-044, *Data Validation Report for CH2M Hill Plateau Remediation Company, Project WMA C, Chemical & Radiochemical Validation – Level C* (AQA, April 27, 2011)

Table M-25. Uranium Results Calculated from Isotopic Uranium Results (10 sheets)

Location	Sample Number	Sample Interval Top (ft)	Sample Interval Bottom (ft)	Analyte	Result	Units	Qualifier	Calculated Uranium (using measured U-238 mass and 99.27% natural abundance)
C8102	B2B1L8	0	1	Uranium-238	0.397	µg/g	N	0.400
C8102	B2B1L9	0	1	Uranium-238	0.441	µg/g	J	0.444
C8102	B2D1X2	5.7	9.7	Uranium-238	0.566	µg/g	N	0.570
C8102	B2D1X4	11.5	15.5	Uranium-238	0.444	µg/g	N	0.447
C8102	B2D1X5	16.1	18.1	Uranium-238	0.469	µg/g	N	0.472
C8102	B2D1X6	65	67	Uranium-238	0.445	µg/g	N	0.448
C8102	B2D1X7	96	98	Uranium-238	0.518	µg/g	N	0.522
C8102	B2D1X8	155	157	Uranium-238	0.492	µg/g	N	0.496
C8102	B2D1X9	188	190	Uranium-238	0.479	µg/g	N	0.483
C8102	B2D1Y0	221	223	Uranium-238	0.508	µg/g	N	0.512
C8104	B2FB27	5.7	7.7	Uranium-238	0.405	µg/g		0.408
C8104	B2FPF1	0.5	1	Uranium-238	0.416	µg/g		0.419
C8104	B2FPF2	0.5	1	Uranium-238	0.727	µg/g		0.732
C8104	B2FB29	11.5	15.5	Uranium-238	0.414	µg/g		0.417
C8104	B2FB30	16.1	18.1	Uranium-238	0.541	µg/g	J-	0.545
C8104	B2FB31	41	43	Uranium-238	0.959	µg/g		0.966
C8104	B2FB32	93	95	Uranium-238	0.588	µg/g		0.592
C8104	B2FB33	117	119	Uranium-238	1.89	µg/g		1.90
C8104	B2FB34	157	159	Uranium-238	0.425	µg/g		0.428
C8106	B2FPR7	1	1.5	Uranium-238	0.534	µg/g		0.538

Table M-25. Uranium Results Calculated from Isotopic Uranium Results (10 sheets)

Location	Sample Number	Sample Interval Top (ft)	Sample Interval Bottom (ft)	Analyte	Result	Units	Qualifier	Calculated Uranium (using measured U-238 mass and 99.27% natural abundance)
C8106	B2FPR8	1	1.5	Uranium-238	0.532	µg/g		0.536
C8106	B2FYM3	11	13	Uranium-238	0.84	µg/g		0.846
C8106	B2FYM4	19	21	Uranium-238	0.561	µg/g		0.565
C8106	B2FYM5	27	29	Uranium-238	0.425	µg/g		0.428
C8106	B2FYM6	64	66	Uranium-238	0.393	µg/g		0.396
C8106	B2FYM7	90	92	Uranium-238	0.457	µg/g		0.460
C8106	B2FYM8	90	92	Uranium-238	0.667	µg/g		0.672
C8106	B2FYM9	161.5	163.5	Uranium-238	0.514	µg/g		0.518
C7672	B26JK2	0	1	Uranium-238	0.533	µg/g		0.537
C7672	B26JK3	0	1	Uranium-238	0.709	µg/g		0.714
C7672	B26C68	5	7	Uranium-238	0.58	µg/g		0.584
C7672	B26C70	10	12	Uranium-238	0.565	µg/g		0.569
C7672	B26C74	14	16	Uranium-238	0.821	µg/g		0.827
C7672	B26C78	73	75	Uranium-238	0.541	µg/g		0.545
C7672	B26C80	83	85	Uranium-238	0.622	µg/g		0.627
C7672	B26C82	122	124	Uranium-238	0.534	µg/g		0.538
C7472	B236N5	0	1	Uranium-238	0.493	µg/g		0.497
C7472	B236N8	0	1	Uranium-238	0.406	µg/g		0.409
C7472	B236P2	5	7	Uranium-238	1.01	µg/g		1.02
C7472	B23KT4	10	14	Uranium-238	0.449	µg/g		0.452

Table M-25. Uranium Results Calculated from Isotopic Uranium Results (10 sheets)

Location	Sample Number	Sample Interval Top (ft)	Sample Interval Bottom (ft)	Analyte	Result	Units	Qualifier	Calculated Uranium (using measured U-238 mass and 99.27% natural abundance)
C7472	B238H1	14	16	Uranium-238	0.487	µg/g		0.491
C7472	B238H4	108.5	110.5	Uranium-238	0.506	µg/g		0.510
C7472	B238H7	129	131	Uranium-238	0.359	µg/g		0.362
C7472	B238J0	142	144	Uranium-238	0.411	µg/g		0.414
C7472	B238J3	158	160	Uranium-238	0.553	µg/g		0.557
C7472	B238J6	195	197	Uranium-238	0.396	µg/g		0.399
C7472	B238K3	216	218	Uranium-238	0.437	µg/g		0.440
C7468	B215L0	0	1	Uranium	19.7	µg/g	U	
C7468	B215L0	0	1	Uranium-238	0.761	µg/g		0.767
C7468	B215L1	0	1	Uranium	18.8	µg/g	U	
C7468	B215L1	0	1	Uranium-238	0.452	µug/g		0.455
C7468	B211Y3	5	7	Uranium	18.7	µg/g	U	
C7468	B211Y3	5	7	Uranium-238	0.438	µg/g		0.441
C7468	B211Y6	10	12	Uranium	18.5	µg/g	U	
C7468	B211Y6	10	12	Uranium-238	0.393	µg/g		0.396
C7468	B211Y9	14	16	Uranium	19.5	µg/g	U	
C7468	B211Y9	14	16	Uranium-238	0.422	µg/g		0.425
C7468	B21202	43.5	45.5	Uranium	19.2	µg/g	U	
C7468	B21202	43.5	45.5	Uranium-238	0.523	µg/g		0.527
C7468	B21205	92	94	Uranium	19.6	µg/g	U	

Table M-25. Uranium Results Calculated from Isotopic Uranium Results (10 sheets)

Location	Sample Number	Sample Interval Top (ft)	Sample Interval Bottom (ft)	Analyte	Result	Units	Qualifier	Calculated Uranium (using measured U-238 mass and 99.27% natural abundance)
C7468	B21205	92	94	Uranium-238	0.426	µg/g		0.429
C7468	B21208	97	99	Uranium	19.2	µg/g	U	
C7468	B21208	97	99	Uranium-238	0.479	µg/g		0.483
C7468	B21211	125	127	Uranium	18.1	µg/g	U	
C7468	B21211	125	127	Uranium-238	0.425	µg/g		0.428
C7468	B21214	135	137	Uranium	18.3	µg/g	U	
C7468	B21214	135	137	Uranium-238	0.49	µg/g		0.494
C7680	B26JK8	0	1	Uranium-238	0.467	µg/g		0.470
C7680	B26JK9	0	1	Uranium-238	0.37	µg/g		0.373
C7680	B26C26	5	7	Uranium-238	0.528	µg/g		0.532
C7680	B26C28	10	12	Uranium-238	0.474	µg/g		0.477
C7680	B26C30	14	16	Uranium-238	0.504	µg/g		0.508
C7680	B26C32	17	19	Uranium-238	0.981	µg/g		0.988
C7680	B26C34	43	45	Uranium-238	0.502	µg/g		0.506
C7680	B26C36	92	94	Uranium-238	0.508	µg/g		0.512
C7680	B26C38	116	118	Uranium-238	0.414	µg/g		0.417
C7680	B26C40	142	144	Uranium-238	0.446	µg/g		0.449
C7682	B26JL0	0	1	Uranium-238	0.446	µg/g		0.449
C7682	B26JL1	0	1	Uranium-238	0.573	µg/g		0.577
C7682	B26C47	5	7	Uranium-238	0.475	µg/g		0.478

Table M-25. Uranium Results Calculated from Isotopic Uranium Results (10 sheets)

Location	Sample Number	Sample Interval Top (ft)	Sample Interval Bottom (ft)	Analyte	Result	Units	Qualifier	Calculated Uranium (using measured U-238 mass and 99.27% natural abundance)
C7682	B26C51	12	14	Uranium-238	0.504	µg/g		0.508
C7682	B26C53	14	16	Uranium-238	0.574	µg/g		0.578
C7682	B26C55	18	20	Uranium-238	0.659	µg/g		0.664
C7682	B26C57	45	47	Uranium-238	0.456	µg/g		0.459
C7682	B26C59	88	90	Uranium-238	0.513	µg/g		0.517
C7682	B26C61	122	124	Uranium-238	0.487	µg/g		0.491
C8100	B2B1L6	0	1	Uranium-238	0.646	µg/g		0.651
C8100	B2B1L7	0	1	Uranium-238	0.627	µg/g		0.632
C8100	B2C1M2	5.7	7.7	Uranium-238	0.568	µg/g		0.572
C8100	B2C1M3	15	19	Uranium-238	0.578	µg/g		0.582
C8100	B2C1M5	54	58	Uranium-238	0.623	µg/g		0.628
C8100	B2C1M7	76	78	Uranium-238	0.434	µg/g		0.437
C8100	B2C1M8	118	120	Uranium-238	0.507	µg/g		0.511
C8100	B2C1M9	168.6	170.6	Uranium-238	0.568	µg/g		0.572
C8100	B2C1N0	202	204	Uranium-238	0.436	µg/g		0.439
C8100	B2C1N1	222.8	224.8	Uranium-238	0.48	µg/g		0.484
C7466	B215K8	0	1	Uranium	19.8	µg/g	U	
C7466	B215K8	0	1	Uranium-238	0.4	µg/g	X	0.403
C7466	B215K9	0	1	Uranium	18.5	µg/g	U	
C7466	B215K9	0	1	Uranium-238	0.554	µg/g	X	0.558

Table M-25. Uranium Results Calculated from Isotopic Uranium Results (10 sheets)

Location	Sample Number	Sample Interval Top (ft)	Sample Interval Bottom (ft)	Analyte	Result	Units	Qualifier	Calculated Uranium (using measured U-238 mass and 99.27% natural abundance)
C7466	B20XW6	5	7	Uranium	19.7	µg/g	U	
C7466	B20XW6	5	7	Uranium-238	0.755	µg/g	X	0.761
C7466	B20XW9	10	12	Uranium	19.8	µg/g	U	
C7466	B20XW9	10	12	Uranium-238	0.314	µg/g	X	0.316
C7466	B20XX2	14	16	Uranium	17.7	µg/g	U	
C7466	B20XX2	14	16	Uranium-238	0.417	µg/g	X	0.420
C7466	B20XX5	43.5	45.5	Uranium	17.2	µg/g	U	
C7466	B20XX5	43.5	45.5	Uranium-238	0.466	µg/g		0.469
C7466	B211W3	84	86	Uranium	17.5	µg/g	U	
C7466	B211W3	84	86	Uranium-238	0.321	µg/g		0.323
C7466	B211W6	109.5	111.5	Uranium	17.5	µg/g	U	
C7466	B211W6	109.5	111.5	Uranium-238	0.385	µg/g		0.388
C7466	B211W9	114	116	Uranium	18.1	µg/g	U	
C7466	B211W9	114	116	Uranium-238	0.368	µg/g		0.371
C7466	B211X2	133	135	Uranium	18.3	µg/g	U	
C7466	B211X2	133	135	Uranium-238	0.465	µg/g		0.468
C7670	B23KN7	0	1	Uranium-233	0.000216	µg/g		
C7670	B23KN7	0	1	Uranium-238	0.974	µg/g		0.981
C7670	B23R25	0	1	Uranium-238	0.558	µg/g		0.562
C7670	B238J9	5	7	Uranium-238	0.444	µg/g		0.447

Table M-25. Uranium Results Calculated from Isotopic Uranium Results (10 sheets)

Location	Sample Number	Sample Interval Top (ft)	Sample Interval Bottom (ft)	Analyte	Result	Units	Qualifier	Calculated Uranium (using measured U-238 mass and 99.27% natural abundance)
C7670	B25CN2	10	14	Uranium-238	0.399	µg/g		0.402
C7670	B23KP6	14	16	Uranium-238	0.416	µg/g		0.419
C7670	B23KP9	39	41	Uranium-238	0.544	µg/g		0.548
C7670	B23KR2	139	141	Uranium-238	0.565	µg/g		0.569
C7670	B23KR5	163	165	Uranium-238	0.555	µg/g		0.559
C7670	B25ND7	220	224	Uranium-238	0.446	µg/g		0.449
C6392	B1YT71	14	16	Uranium	101	µg/g	U	
C6392	B1YT71	14	16	Uranium-238	1.46	µg/g		1.47
C6392	B1YT74	19.5	21.5	Uranium	20.1	µg/g	U	
C6392	B1YT74	19.5	21.5	Uranium-238	1.38	µg/g		1.39
C6392	B1YT77	25	27	Uranium	20.1	µg/g	U	
C6392	B1YT77	25	27	Uranium-238	0.495	µg/g		0.499
C6392	B1YT80	42	44	Uranium	20.1	µg/g	U	
C6392	B1YT80	42	44	Uranium-238	0.446	µg/g		0.449
C6392	B1YT83	56	58	Uranium	18.7	µg/g	U	
C6392	B1YT83	56	58	Uranium-238	0.433	µg/g	B	0.436
C6400	B1YTH1	5	7	Uranium	18.9	µg/g	U	
C6400	B1YTH1	5	7	Uranium-238	1.31	µg/g		1.32
C6400	B1YTH3	10	12	Uranium	19	µg/g	U	
C6400	B1YTH3	10	12	Uranium-238	2.61	µg/g		2.63

Table M-25. Uranium Results Calculated from Isotopic Uranium Results (10 sheets)

Location	Sample Number	Sample Interval Top (ft)	Sample Interval Bottom (ft)	Analyte	Result	Units	Qualifier	Calculated Uranium (using measured U-238 mass and 99.27% natural abundance)
C6400	B1YTH6	132	134.5	Uranium	18.6	µg/g	U	
C6400	B1YTH6	132	134.5	Uranium-238	0.5	µg/g		0.504
C6402	B20XV5	6	8	Uranium	18.4	µg/g	U	
C6402	B20XV5	6	8	Uranium-238	0.89	µg/g	B	0.897
C6402	B20XV9	10	12	Uranium	19.3	µg/g	U	
C6402	B20XV9	10	12	Uranium-238	1.75	µg/g	B	1.76
C6402	B20XW3	14	16	Uranium	18.4	µg/g	U	
C6402	B20XW3	14	16	Uranium-238	0.702	µg/g	B	0.707
C6404	B1YT92	6	8	Uranium	19.4	µg/g	U	
C6404	B1YT92	6	8	Uranium-238	0.578	µg/g		0.582
C6404	B1YT98	14	17	Uranium	19.4	µg/g	U	
C6404	B1YT98	14	17	Uranium-238	0.497	µg/g	B	0.501
C6404	B1YTB1	19.5	21.5	Uranium	19.7	µg/g	U	
C6404	B1YTB1	19.5	21.5	Uranium-238	0.511	µg/g	B	0.515
C6404	B1YTB4	31	33	Uranium	18.9	µg/g	U	
C6404	B1YTB4	31	33	Uranium-238	1.28	µg/g		1.29
C6404	B1YTB7	42	44	Uranium	19.3	µg/g	U	
C6404	B1YTB7	42	44	Uranium-238	6.39	µg/g		6.44
C6404	B1YTC0	57	59	Uranium	18.8	µg/g	U	
C6404	B1YTC0	57	59	Uranium-238	0.398	µg/g	B	0.401

Table M-25. Uranium Results Calculated from Isotopic Uranium Results (10 sheets)

Location	Sample Number	Sample Interval Top (ft)	Sample Interval Bottom (ft)	Analyte	Result	Units	Qualifier	Calculated Uranium (using measured U-238 mass and 99.27% natural abundance)
C6406	B1YTC9	5	7	Uranium	19.1	µg/g	U	
C6406	B1YTC9	5	7	Uranium-238	1.05	µg/g		1.06
C6406	B1YTD2	10	12	Uranium	17.1	µg/g	U	
C6406	B1YTD2	10	12	Uranium-238	0.907	µg/g		0.914
C6406	B1YTD5	14	16	Uranium	18.3	µg/g	U	
C6406	B1YTD5	14	16	Uranium-238	0.693	µg/g		0.698
C6406	B1YTD8	18	20	Uranium	17.1	µg/g	U	
C6406	B1YTD8	18	20	Uranium-238	1.04	µg/g		1.05
C6406	B1YTF1	26	28	Uranium	17.4	µg/g	U	
C6406	B1YTF1	26	28	Uranium-238	0.489	µg/g		0.493
C6406	B1YTF4	54.5	56.5	Uranium	17	µg/g	U	
C6406	B1YTF4	54.5	56.5	Uranium-238	0.395	µg/g		0.398
C6406	B1YTF7	59	61	Uranium	18.9	µg/g	U	
C6406	B1YTF7	59	61	Uranium-238	0.432	µg/g		0.435
C7668	B23TK2	0	1	Uranium-238	0.57	µg/g		0.574
C7668	B23TK5	0	1	Uranium-238	0.541	µg/g		0.545
C7668	B23TK8	5	7	Uranium-238	0.654	µg/g		0.659
C7668	B27130	10	14	Uranium-238	0.468	µg/g		0.471
C7668	B27131	14	18	Uranium-238	0.477	µg/g		0.481
C7668	B23TM6	27	29	Uranium-238	0.518	µg/g		0.522

Table M-25. Uranium Results Calculated from Isotopic Uranium Results (10 sheets)

Location	Sample Number	Sample Interval Top (ft)	Sample Interval Bottom (ft)	Analyte	Result	Units	Qualifier	Calculated Uranium (using measured U-238 mass and 99.27% natural abundance)
C7668	B25WM2	39	41	Uranium-238	0.375	µg/g		0.378
C7668	B25WM5	80	82	Uranium-238	0.503	µg/g		0.507
C7668	B25WM8	132	134	Uranium-238	0.382	µg/g		0.385
C7676	B26JK6	0	1	Uranium-238	0.487	µg/g		0.491
C7676	B26JK7	0	1	Uranium-238	0.537	µg/g		0.541
C7676	B29612	5	9	Uranium-238	0.613	µg/g		0.618
C7676	B26CC4	10	12	Uranium-238	0.35	µg/g		0.353
C7676	B29613	14	18	Uranium-238	1.38	µg/g		1.39
C7676	B26CD0	38	40	Uranium-238	0.819	µg/g		0.825
C7676	B26CD2	128	130	Uranium-238	0.501	µg/g		0.505
C7676	B26CD4	157	159	Uranium-238	0.548	µg/g		0.552

- VSR11-045, *Data Validation Report for CH2M Hill Plateau Remediation Company, Project WMA C, Chemical & Radiochemical Validation – Level C* (AQA, May 23, 2011)

- VSR11-046, *Data Validation Report for CH2M Hill Plateau Remediation Company, Project WMA C, Chemical & Radiochemical Validation – Level C* (AQA, May 30, 2011)

- VSR11-047, *Data Validation Report for CH2M Hill Plateau Remediation Company, Project WMA C, Chemical & Radiochemical Validation – Level C* (AQA, June 21, 2011)

- VSR11-048, *Data Validation Report for CH2M Hill Plateau Remediation Company, Project WMA C, Chemical & Radiochemical Validation – Level C* (AQA, June 23, 2011)

- VSR12-023, *Data Validation Report for CH2M Hill Plateau Remediation Company, C Farm WMC 2011-C8100, Project C Farm C8100, Chemical & Radiochemical Validation – Level C* (AQA, September 5, 2012)

- VSR12-026, *Data Validation Report for CH2M Hill Plateau Remediation Company, Project C FARM C8102 C8104 C8106, Chemical & Radiochemical Validation – Level C* (AQA, September 19, 2012).

All data flags assigned resulting from data validation were entered into HEIS.

Table M-26. Plutonium-241 Results Calculated from Plutonium-239/240 Results

Sample ID	Analyte	Result	Units	Qualifier
B2FPF1	Plutonium-239/240	0.313	pCi/g	
B2FPF1	Plutonium-241	1.17	pCi/g	J
B2FPF2	Plutonium-239/240	0.198	pCi/g	
B2FPF2	Plutonium-241	0.739	pCi/g	J
B2B1L6	Plutonium-239/240	0.0378	pCi/g	
B2B1L6	Plutonium-241	0.141	pCi/g	J
B2C1N1	Plutonium-239/240	0.0439	pCi/g	
B2C1N1	Plutonium-241	0.164	pCi/g	J
B1YT71	Plutonium-239/240	10.7	pCi/g	J
B1YT71	Plutonium-241	39.9	pCi/g	J

*Plutonium-241 results conservatively estimated using Plutonium-239/341 results and a scaling factor of 3.73.

M5.2.1 Validation Summary

RPP-PLAN-38777 specifies that at least 5% of all chemical and radiochemical data will undergo Level C data validation. Validation of selected laboratory data was performed by AQA of Albuquerque, New Mexico. The 5% requirement was satisfied.

M5.2.2 Qualification Flags Applied to the Data Set

Table M-27 lists the qualification flags applied to the data set as a result of the data validation process. Of the 34,162 soil sample results reported, a total of 2,595 results (7.6%) were qualified during data validation. A total of 397 results (1.2%) were considered unusable (qualified R) based on gross exceedance of holding time criteria. Table M-27 lists the validation qualifiers assigned per analyte along with the reason for qualification. The subsections below describe the validation and review findings.

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
Anions and Wet Chemistry			
Bicarbonate	J	Sample analyzed outside holding time, but within 2X holding time, and poor laboratory duplicate sample precision	4
		Poor laboratory duplicate sample precision	6
Ammonium Ion	U	Laboratory blank contamination	12
	UJ	Laboratory blank contamination and lack of MS and laboratory duplicate data	2
	R	Sample analyzed outside 2X holding time	1
Cyanide	J	Sample analyzed outside holding time, but within 2X holding time	2
		Low MS recovery	1
		Sample analyzed outside holding time, but within 2X holding time, and lack of matrix-matched LCS data	1
	UJ	Low MS recovery	10
Glycolate	J	Sample analyzed outside holding time, but within 2X holding time	1
Acetate	J	Sample analyzed outside holding time, but within 2X holding time	1
Formate	UJ	Sample analyzed outside holding time, but within 2X holding time and laboratory blank contamination	1
		Laboratory blank contamination	5

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
Oxalate	J	Sample analyzed outside holding time, but within 2X holding time	1
Bromide	J	Sample analyzed outside holding time, but within 2X holding time	1
Chloride	J	Sample analyzed outside holding time, but within 2X holding time	1
Fluoride	J	Poor laboratory duplicate precision	1
		Sample analyzed outside holding time, but within 2X holding time	1
Nitrate	J	Sample analyzed outside holding time, but within 2X holding time	1
Nitrite	J	Sample analyzed outside holding time, but within 2X holding time	1
		Poor laboratory duplicate precision	2
	UJ	Laboratory blank contamination	7
	U	Laboratory blank contamination	6
Phosphate	J	Low MS recovery	5
		Sample analyzed outside holding time, but within 2X holding time	1
	J-	Low MS recovery	1
Sulfate	J	Poor laboratory duplicate sample precision	1
		Sample analyzed outside holding time, but within 2X holding time	1
Metals			
Antimony	J	Sample analyzed outside holding time, but within 2X holding time	5
	J-	Sample analyzed outside holding time, but within 2X holding time	1
	R	Spike sample recovery <10%	4
Arsenic	J	Sample analyzed outside holding time, but within 2X holding time	5
	J-	Sample analyzed outside holding time, but within 2X holding time	1
		Low MS and LCS recoveries	1

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
Barium	J	Poor laboratory sample duplicate precision	5
		High MS recovery	3
	J+	High MS recovery	2
Bismuth	J	Low MS recovery	2
Boron	J	High MS recovery	1
Cadmium	J	Sample analyzed outside holding time, but within 2X holding time	2
	J+	High LCS recovery	1
	UJ	Sample analyzed outside holding time, but within 2X holding time, and laboratory blank contamination	3
Calcium	J-	Low LCS recovery	3
Cerium	J	High MS recovery	2
	U	Laboratory blank contamination	3
Chromium	J	Poor laboratory duplicate sample precision	14
		Sample analyzed outside holding time, but within 2X holding time	4
Cobalt	J	Poor laboratory duplicate sample precision	2
		Sample analyzed outside holding time, but within 2X holding time	4
Lanthanum	J	Poor laboratory duplicate precision	5
Lead	J	Sample analyzed outside holding time, but within 2X holding time	5
	U	Laboratory blank contamination	7
Magnesium	J	High MS recovery	5
	J-	Low LCS recovery	1
Manganese	J	Poor laboratory duplicate precision	5
	J-	Low LCS recovery	1
Mercury	J	Sample analyzed outside holding time, but within 2X holding time	2
Molybdenum	J	Low LCS recovery	1
Neodymium	J	Poor laboratory duplicate precision	5
	U	Laboratory blank contamination	1

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
Nickel	J	Poor laboratory duplicate sample precision	11
		Sample analyzed outside holding time, but within 2X holding time	4
Phosphorus	J-	Low LCS recovery	1
Potassium	J	Low LCS recovery	1
		High MS recovery	8
		High MS recovery and poor laboratory duplicate sample precision	5
Selenium	J	Sample analyzed outside holding time, but within 2X holding time	5
	J+	High MS recovery	1
Silicon	J	Poor laboratory duplicate sample precision	1
		MS and/or LCS recoveries outside limits	44
	J-	Low LCS recovery	8
Silver	J	Sample analyzed outside holding time, but within 2X holding time	1
	J+	High MS recovery	2
	UJ	Laboratory blank contamination	10
		Sample analyzed outside holding time, but within 2X holding time, and laboratory blank contamination	4
Sodium	J	High MS recovery	27
		High MS recovery and poor laboratory duplicate sample precision	7
Strontium	J	High MS recovery	4
		Poor laboratory duplicate sample precision	2
Sulfur	J	High MS recovery	5
		Poor laboratory duplicate sample precision	5
Tantalum	J	Low MS recovery	1
		Low MS recovery	1

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
Thallium	J	Sample analyzed outside holding time, but within 2X holding time	3
	UJ	Laboratory blank contamination	4
		Sample analyzed outside holding time, but within 2X holding time, and laboratory blank contamination	2
	U	Laboratory blank contamination	13
Tin	J-	Low LCS recovery	1
Titanium	J	High MS and poor laboratory duplicate sample precision	5
	J-	Low LCS recovery	1
Tungsten	J	Low MS recovery	2
Vanadium	J	Sample analyzed outside holding time, but within 2X holding time	5
Yttrium	J	Poor laboratory duplicate sample precision	5
Zinc	J	Low MS recovery	5
Zirconium	J	Low MS recovery	24
		Poor laboratory duplicate sample precision	5
Pesticides			
4,4′-DDD	R	Sample analyzed outside 2X holding time	21
4,4′-DDE	R	Sample analyzed outside 2X holding time	20
4,4′-DDT	R	Sample analyzed outside 2X holding time	21
Aldrin	R	Sample analyzed outside 2X holding time	21
Alpha-BHC	R	Sample analyzed outside 2X holding time	20
Beta-BHC	R	Sample analyzed outside 2X holding time	7
	J	Sample analyzed outside 2X holding time and high LCS/LCSD recoveries	14
Chlordane	R	Sample analyzed outside 2X holding time	21
Delta-BHC	R	Sample analyzed outside 2X holding time	20
Dieldrin	R	Sample analyzed outside 2X holding time	20
Endrin	R	Sample analyzed outside 2X holding time	21
Lindane (gamma-BHC)	R	Sample analyzed outside 2X holding time	20
	J	Sample analyzed outside 2X holding time	1
Heptachlor	R	Sample analyzed outside 2X holding time	20

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
Heptachlor epoxide	R	Sample analyzed outside 2X holding time	20
Hexachlorobenzene	R	Sample analyzed outside 2X holding time	20
Pentachlorophenol	R	Sample analyzed outside 2X holding time	21
Volatile Organic Compounds			
(m+p)Xylene	J	Improper preservation	3
1,1,1-Trichloroethane	J	Improper preservation	3
1,1,2,2-Tetrachloroethane	J	Improper preservation	3
1,1,2-Trichloro-1,2,2-trifluoroethane	J	Improper preservation	3
1,1,2-Trichlororethane	J	Improper preservation	3
1,1-Dichloroethene	J	Improper preservation	3
1,2-Dichloroethane	J	Improper preservation	3
		Low MS recovery	1
1-Butannol	J	Improper preservation	1
		Improper preservation and poor MS/MSD precision	2
2-Butanone	J	Improper preservation	3
2-Hexanone	U	Laboratory blank contamination	1
2-Nitropropane	J	Improper preservation	3
4-Methyl-2-pentanone	J	Improper preservation	3
Acetone	J	Improper preservation	2
		Improper preservation and poor MS/MSD precision	1
		MS/MSD recoveries outside limits and/or poor MS/MSD precision	3
Benzene	J	Improper preservation	3
Carbon disulfide	J	Improper preservation and no MS/MSD or LCS information	3
		No MS/MSD or LCS information	49
Carbon tetrachloride	J	Improper preservation	3
Chlorobenzene	J	Improper preservation	3
Chloroform	J	Improper preservation	3
		Low MSD recovery	1

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
Cis-1,2-Dichloroethylene	J	Improper preservation	3
		Low MSD recovery	1
Diethyl ether	J	Improper preservation	3
Ethyl acetate	J	Improper preservation	3
Ethylbenzene	J	Improper preservation	3
Hexane	J	Improper preservation and no MS/MSD or LCS information	3
		No MS/MSD or LCS information	16
Methylene chloride	J	Improper preservation	3
		Low MSD recovery	1
o-Xylene	J	Improper preservation	3
Styrene	U	Laboratory blank contamination	2
Tetrachloroethene	J	Improper preservation	3
Toluene	U	Improper preservation and laboratory blank contamination	3
		Laboratory blank contamination	7
Trans-1,2-Dichloroethene	J	Improper preservation	3
		Low MSD recovery	1
Trans-1,3-Dichloropropene	J	Improper preservation and no MS/MSD or LCS information	3
		No MS/MSD or LCS information	49
Trichloroethene	J	Improper preservation	3
Trichloromonofluoromethane	J	Improper preservation	3
		Low MSD recovery	1
Vinyl chloride	J	Improper preservation	3
		Low MSD recovery	1
Xylenes (total)	J	Improper preservation	3
Semi-volatile Organic Compounds			
1,2,4-Trichlorobenzene	J	MS/MSD and/or LCS recoveries absent or outside limits	45
1,2-Dichlorobenzene	J	MS/MSD and/or LCS recoveries absent or outside limits	53
1,4-Dichlorobenzene	J	MS/MSD and/or LCS recoveries outside limits	24

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
2,4,5-Trichlorophenol	J	MS/MSD and/or LCS recoveries absent or outside limits	53
2,4,6-Trichlorophenol	J	MS/MSD and/or LCS recoveries absent or outside limits	53
2,6-Dinitrotoluene	J	Low LCs and/or MS/MSD recoveries	5
2,6-bis(1,1-dimethylethyl)-4-methylphenol	J	MS/MSD and/or LCS recoveries outside limits	16
2-Chlorophenol	J	MS/MSD and/or LCS recoveries absent or outside limits	37
2-Methylphneol	J	MS/MSD and/or LCS recoveries absent or outside limits	37
2-Nitrophenol	J	MS/MSD and/or LCS recoveries absent or outside limits	37
3,+4-Methylphenol	J	MS/MSD and/or LCS recoveries absent or outside limits	34
4-Chloro-3-methylphenol	J	MS/MSD and/or LCS recoveries outside limits	22
4-Nitrophenol	J	MS/MSD and/or LCS recoveries outside limits	5
Acenaphthene	J	MS/MSD and/or LCS recoveries outside limits	19
Benzo(a)anthracene	J	Low surrogate recovery	1
Benzo(a)pyrene	J	Low surrogate recovery	1
Benzo(b)fluoranthene	J	Low surrogate recovery	1
Benzo(f)fluoranthene	J	Low surrogate recovery	1
Bis(2-Ethylhexyl)phthalate	J	MS/MSD and/or LCS recoveries absent or outside limits	32
Butylbenzylphthalate	J	MS/MSD and/or LCS recoveries absent or outside limits	36
Cellosolve Solvent	J	MS/MSD and/or LCS recoveries absent or outside limits	58
Chrysene	J	Low surrogate recovery	1
Cyclohexanone	J	MS/MSD and/or LCS recoveries outside limits	58
Dibenz(a,h)anthracene	J	Low surrogate recovery	1
		MS/MSD and/or LCS recoveries outside limits	5
Dibutylphosphate	R	Analysis outside 2X holding time	45
di-n-Butylphthalate	J	MS/MSD and/or LCS recoveries absent or outside limits	36

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
di-n-Octylphthalate	J	MS/MSD and/or LCS recoveries absent or outside limits	35
Ethylene glycol	J	Sample extracted outside holding time but within 2X holding time	3
	R	Sample extracted outside 2X holding time	8
Fluoranthene	J	Low MS/MSD and/or LCS recoveries	18
		Low surrogate recovery	1
Hexachlorobutadiene	J	MS/MSD and/or LCS recoveries absent or outside limits	53
Hexachloroethane	J	MS/MSD and/or LCS recoveries absent or outside limits	54
Indeno(1,2,3-cd)pyrene	1	Low surrogate recovery	1
Isobutyl alcohol	J	MS/MSD and/or LCS recoveries absent or outside limits	55
Monobutylphosphate	R	Sample extracted outside 2X holding time	45
Naphthalene	J	MS/MSD and/or LCS recoveries outside limits	20
Nitrobenzene	J	MS/MSD and/or LCS recoveries outside limits	6
n-Nitrosodi-n-propylamine	J	MS/MSD and/or LCS recoveries absent or outside limits	55
n-Nitrosomorpholine	J	MS/MSD and/or LCS recoveries absent or outside limits	57
Pentachlorophenol	J	MS/MSD and/or LCS recoveries outside limits	7
Phenol	J	MS/MSD and/or LCS recoveries outside limits	13
Pyrene	J	Low surrogate recovery	1
Pyridine	J	MS/MSD and/or LCS recoveries absent or outside limits	58
Total cresols	J	MS/MSD and/or LCS recoveries absent or outside limits	27
Tributyl phosphate	J	MS/MSD and/or LCS recoveries absent or outside limits	59
Total Petroleum Hydrocarbons			
TPH-diesel	J	Sample extracted outside holding time but within 2X holding time	9

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
TPH-gasoline	J	Sample analyzed outside holding time but within 2X holding time	14
	R	Sample analyzed outside 2X holding time	5
	U	Sample extracted outside holding time but within 2X holding time and MS recovery low	1
Physical Properties			
pH	J	Sample analyzed outside holding time	54
Radiochemicals			
Americium-241	J	Carrier and tracer added to samples after acid digestion	25
		Lack of laboratory duplicate data	1
Curium-242	J	Carrier and tracer added to samples after acid digestion	25
		Lack of laboratory duplicate data	1
Curium-243/244	J	Carrier and tracer added to samples after acid digestion	25
		Lack of laboratory duplicate data	1
Carbon-14	J	Laboratory blank contamination	1
		Lack of MS and laboratory duplicate data	1
Bismuth-14	J	Poor laboratory duplicate precision	1
Lead-212	J	Poor laboratory duplicate precision	1
Potassium-40	J	Poor laboratory duplicate precision	1
Thallium-208	J	Poor laboratory duplicate precision	1
Iodine-129	J	Lack of laboratory duplicate data	1
Nickel-63	J	Carrier and tracer added to samples after acid digestion	25
		Analysis outside holding time but within 2X holding time	1
Plutonium-238	J	Carrier and tracer added to samples after acid digestion	25
Plutonium-239/240	J	Carrier and tracer added to samples after acid digestion	25
Neptunium-237	J	Analysis outside holding time but within 2X holding time	1
Technetium-99	UJ	Laboratory blank contamination	10

Table M-27. Waste Management Area C Phase 2 RCRA Facility Investigation Data Validation Qualifiers Assigned (11 sheets)

Analyte	Validation Qualifier	Reason	Number Results Qualified
Thorium-230	J	Analysis outside holding time but within 2X holding time	1
		Low MS recovery	8
	U	Laboratory blank contamination	4
Thorium-232	J	Low MS recovery	8
	J-	Analysis outside holding time but within 2X holding time	1
Tin-117	J	Analysis outside holding time but within 2X holding time	1
		Low MS recovery	19
Tin-126	J	Analysis outside holding time but within 2X holding time	1
		Low MS recovery	19
Uranium-233	J	Analysis outside holding time but within 2X holding time	1
Uranium-231	J-	Analysis outside holding time but within 2X holding time	1
	U	Laboratory blank contamination	1
Uranium-235	J-	Analysis outside holding time but within 2X holding time	1
Uranium-236	J	Analysis outside holding time but within 2X holding time	1
Uranium-238	J	High MS recovery	1
	J-	Analysis outside holding time but within 2X holding time	1
Selenium-79	J	Carrier added to samples after acid digestion and/or lack of LCS data	56
Strontium-90	J	Carrier added to samples after acid digestion	25
		Poor duplicate precision	1

LCS = laboratory control sample
MS = matrix spike
RCRA = *Resource Conservation and Recovery Act of 1976*
LCSD = laboratory control sample duplicate
MSD = matrix spike duplicate

M5.2.3 Data Review Summary

In addition to data validation, 100% review of the data was performed for laboratory reports provided. This review consisted of evaluating the summary information (case narratives and laboratory QC results) included in the laboratory reports. Laboratory report case narratives were reviewed to identify potential QC issues that would impact the usability of the data. Some minor data quality issues were identified in the case narratives. Summaries of the laboratory QC result information is included in the discussions regarding precision (Section M5.4) and accuracy (Section M5.5).

Table M-28 lists the qualification flags assigned to the data set as a result of the data review process, including qualification flag status (applied or pending application).

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
Anions and Wet Chemistry			
Alkalinity (carbonate, bicarbonate)	H	Analysis outside holding time but within 2X holding time	2
Cyanide	H	Analysis outside holding time but within 2X holding time	6
	R	Analysis outside 2X holding time	1
Sulfide	H	Analysis outside holding time but within 2X holding time	3
Nitrate, Nitrite, Phosphate	H	Analysis outside holding time but within 2X holding time	1
	R	Analysis outside 2X holding time	151
Bromide, Chloride, Fluoride, Sulfate	H	Analysis outside holding time but within 2X holding time	25
	R	Analysis outside 2X holding time	67
Acetate, Formate, Glycolate, Oxylate	H	Analysis outside holding time but within 2X holding time	25
	R	Analysis outside 2X holding time	73
Acetate	Q	Method blank contamination exceeded evaluation criteria	2
Ammonium ion	Q		21
Chloride	Q		2
Formate	Q		2
Nitrate	Q	Method blank contamination exceeded evaluation criteria	5
Nitrite	Q		9

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
Acetate	Q	Laboratory duplicate precision criteria not met	5
Ammonium ion	Q		2
Chloride	Q		1
Fluoride	Q		7
Formate	Q		5
Nitrate	Q		3
Nitrite	Q		6
Oxalate	Q		5
Phosphate	Q		1
Sulfate	Q		7
2-Hydroxyacetate	Q	LCS and/or LCSD accuracy criteria not met	1
Acetate	Q		1
Bromide	Q		1
Chloride	Q		1
Cyanide	Q		1
Fluoride	Q		1
Formate	Q		1
Nitrate	Q		1
Nitrite	Q		1
Oxalate	Q		1
Phosphate	Q		1
Sulfate	Q		1
Ammonium ion	Q	MS and/or MSD accuracy criteria not met	1
Bromide	Q		3
Cyanide	Q		5
Fluoride	Q		2
Nitrite	Q		1
Oxalate	Q		2
Phosphate	Q		11
Sulfide	Q		1

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
Physical Properties			
pH	H	Analysis outside holding time	142
Specific conductance	H	Analysis outside holding time but within 2X holding time	13
Specific conductance	R	Analysis outside 2X holding time	3
Metals			
Ammonium	R	Sample analyzed outside 2X holding time	1
Aluminum	R	Extremely low spike sample recovery	1
Antimony	R		1
All (except mercury)	H	Analysis outside holding time but within 2X holding time	24
Mercury	H		14
Arsenic	Q	Method blank contamination exceeded evaluation criteria	1
Calcium	Q		9
Iron	Q		8
Selenium	Q		3
Sulfur	Q		1
Thallium	Q		9
Aluminum	Q	Laboratory duplicate precision criteria not met	1
Antimony	Q		2
Barium	Q		1
Cadmium	Q		2
Calcium	Q		1
Chromium	Q		4
Cobalt	Q		2
Copper	Q		2
Iron	Q		1
Lanthanum	Q		1
Lead	Q		2
Lithium	Q		1
Magnesium	Q		2

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
Manganese	Q	Laboratory duplicate precision criteria not met	2
Neodymium	Q		1
Nickel	Q		5
Phosphorus	Q		1
Potassium	Q		1
Silicon	Q		3
Sodium	Q		3
Strontium	Q		4
Thallium	Q		3
Titanium	Q		2
Vanadium	Q		1
Yttrium	Q		2
Zinc	Q		1
Zirconium	Q		2
Aluminum	Q	LCS and/or LCSD accuracy criteria not met	1
Antimony	Q		1
Arsenic	Q		1
Beryllium	Q		1
Cadmium	Q		1
Calcium	Q		1
Cobalt	Q		1
Lead	Q		1
Nickel	Q		1
Potassium	Q		3
Rubidium	Q		1
Silicon	Q		9
Tantalum	Q		2
Thallium	Q		1
Tungsten	Q		1
Aluminum	Q	MS and/or MSD accuracy criteria not met	24
Antimony	Q		2

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
Arsenic	Q	MS and/or MSD accuracy criteria not met	4
Barium	Q		5
Bismuth	Q		2
Boron	Q		1
Calcium	Q		26
Copper	Q		1
Iron	Q		21
Lead	Q		2
Lithium	Q		2
Magnesium	Q		21
Manganese	Q		9
Molybdenum	Q		2
Neodynium	Q		1
Nickel	Q		1
Palladium	Q		1
Phosphorus	Q		11
Potassium	Q		20
Rhenium	Q		1
Rubidium	Q		1
Selenium	Q		1
Silicon	Q		18
Silver	Q		1
Sodium	Q		24
Strontium	Q		5
Sulfur	Q		32
Tantalum	Q		19
Tungsten	Q		3
Vanadium	Q		3
Ytrium	Q		1
Zinc	Q		2
Zirconium	Q		10

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
Pesticides			
All	H	Extraction outside holding time but within 2X holding time	5
All	R	Extraction outside 2X holding time	21
All	H	Analysis outside holding time but within 2X holding time	4
All	R	Analysis outside 2X holding time	18
4,4'-DDD (Dichlorodiphenyldichloroethane)	Q	LCS and/or LCSD accuracy criteria not met	1
4,4'-DDE (Dichlorodiphenyldichloroethylene)	Q		1
4,4'-DDT (Dichlorodiphenyltrichloroethane)	Q		1
Alpha-BHC	Q		1
beta-1,2,3,4,5,6-Hexachlorocyclohexane	Q		1
(beta-BHC)	Q		1
Delta-BHC	Q		1
Dieldrin	Q		1
Endosulfan I	Q		1
Endosulfan sulfate	Q		1
Endrin	Q		1
Gamma-BHC (Lindane)	Q		1
Heptachlor	Q		1
Heptachlor epoxide	Q		1
Methoxychlor	Q		2
trans-Chlordane	Q		1
4,4'-DDD (Dichlorodiphenyldichloroethane)	Q	MS and/or MSD accuracy criteria not met	1
4,4'-DDT (Dichlorodiphenyltrichloroethane)	Q		1
Delta-BHC	Q		1
Endrin	Q		1
Endrin aldehyde	Q		2
Heptachlor	Q		2
Heptachlor epoxide	Q		2
Methoxychlor	Q		2

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
PCB Congeners			
Co-elution of PCB congeners BZ 156 and 157	Y	Result is suspect	1
Semi-volatile Organic Compounds			
All (except dibutyl phospoate, monobutyl phosphate, and ethylene glycol)	H	Extraction outside holding time but within 2X holding time	4
Dibutyl phosphate	H		23
Monobutyl phosphate	H		23
Ethylene glycol	H		34
All (except dibutyl phospoate, monobutyl phosphate, and ethylene glycol)	R		2
Dibutyl phosphate	R	Extraction outside holding time but within 2X holding time	4
Monobutyl phosphate	R		4
Ethylene glycol	R		14
All (except dibutyl phospoate, monobutyl phosphate, and ethylene glycol)	H	Analysis outside holding time but within 2X holding time	8
Dibutyl phosphate	H		6
Monobutyl phosphate	H		6
Ethylene glycol	H		2
All (except dibutyl phospoate, monobutyl phosphate, and ethylene glycol)	R	Analysis outside 2X holding time	1
Dibutyl phosphate	R		44
Monobutyl phosphate	R		44
Ethylene glycol	R		10
Bis(2-Ethylhexyl)phthalate	Q	Method blank contamination exceeded evaluation criteria	1
1,2,4-Trichlorobenzene	Q	LCS and/or LCSD accuracy criteria not met	22
1,2-Dichlorobenzene	Q		2
1,4-Dichlorobenzene	Q		7
2,4-Dinitrotoluene	Q		1
2,4-Dinitrotoluene	Q		1
2,6-bis(1,1-dimethylethyl)-4-methyl phenol	Q		3
2-Chlorophenol	Q		22

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
2-Methylphenol (cresol, o-)	Q	LCS and/or LCSD accuracy criteria not met	2
2-Nitrophenol	Q		2
3,3'-Dichlorobenzidine	Q		1
3+4 Methylphenol (cresol, m+p)	Q		2
4-Chloro-3-methylphenol	Q		15
4-Chloro-3-methylphenol	Q		1
4-Chloroaniline	Q		1
Acenaphthene	Q		14
Cellosolve Solvent	Q		1
Cyclohexanone	Q		2
Hexachlorobutadiene	Q		2
Hexachloroethane	Q		4
Naphthalene	Q		1
Nitrobenzene	Q		1
n-Nitrosodi-n-dipropylamine	Q		22
Pentachlorophenol	Q		5
Phenol	Q		5
Pyrene	Q		2
Pyridine	Q		3
Total cresols	Q		1
Tributyl phosphate	Q		2
1,2,4-Trichlorobenzene	Q	MS and/or MSD accuracy criteria not met	53
1,2-Dichlorobenzene	Q		4
1,4-Dichlorobenzene	Q		23
2,4-Dinitrotoluene	Q		2
2,6-bis(1,1-dimethylethyl)-4-methyl phenol	Q		9
2-Chlorophenol	Q		39
2-Methylphenol (cresol, o-)	Q		4
2-Nitrophenol	Q		4
3,3'-Dichlorobenzidine	Q		1
3+4 Methylphenol (cresol, m+p)	Q		

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
4-Chloro-3-methylphenol	Q	MS and/or MSD accuracy criteria not met	22
4-Chloroaniline	Q		5
4-Nitrophenol	Q		4
Acenaphthene	Q		24
Carbazole	Q		1
Cellosolve Solvent	Q		2
Cyclohexanone	Q		6
Hexachlorobutadiene	Q		3
Hexachloroethane	Q		9
Naphthalene	Q		2
Nitrobenzene	Q		1
n-Nitrosodi-n-dipropylamine	Q		49
Pentachlorophenol	Q		4
Phenol	Q		11
Pyridine	Q		8
Volatile Organic Compounds			
CyanideCarbon disulfide	Q	Method blank contamination exceeded evaluation criteria	1
Methylene chloride	Q		2
Styrene	Q		6
Toluene	Q		11
1-Butanol	Q	LCS/LCSD precision criteria not met	1
Acetaone	Q		1
1,1-Dichloroethene	Q	LCS and/or LCSD accuracy criteria not met	1
1,1-Dichloroethene	Q		1
1-Butanol	Q		2
1-Butanol	Q		1
2-Butanone	Q		2
2-Butanone	Q		1
4-Methyl-2-pentanone	Q		4
4-Methyl-2-pentanone	Q		2
Acetone	Q		4

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
1,1-Dichloroethene	Q	MS and/or MSD accuracy criteria not met	1
1-Butanol	Q		5
2-Butanone	Q		11
4-Methyl-2-pentanone	Q		23
Acetone	Q		14
Total Petroleum Hydrocarbons			
TPH-Gasoline	H	Analysis outside holding time but within 2X holding time	20
TPH-Gasoline	R	Analysis outside 2X holding time	8
TPH-Diesel	R		3
Radiochemicals			
Technetium-99	Y	Result suspect based on instrument used for analysis	31
Americium-241, Curium-242, Curium-243/244	H	Analysis outside holding time but within 2X holding time	1
Nickel-63	H		5
Plutonium-238, Plutonium-239/240	H		1
All by ICP/MS analysis	H		14
Technetium-99	H		20
Selenium-79	H		1
Strontium-90	H		1
Tritium	H		3
Actinium-228	Q	Method blank contamination exceeded evaluation criteria	1
Americium-241	Q		1
Iodine-129	Q		2
Radium-226	Q		1
Selenium-79	Q		5
Strontium-90	Q		1
Technetium-99	Q		1
Thorium-232	Q		4
Tin-117	Q		1
Tin-126	Q		1

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
Uranium-233	Q	Method blank contamination exceeded evaluation criteria	1
Uranium-235	Q		1
Uranium-238	Q		3
Beryllium-7	Q	Laboratory duplicate precision criteria not met	1
Bismuth-214	Q		2
Cerium/Praseodymium-144	Q		1
Cerium-144	Q		1
Cobalt-57	Q		1
Cobalt-60	Q		1
Europium-152	Q		1
Europium-154	Q		1
Europium-155	Q		1
Lead-212	Q		1
Lead-214	Q		1
Niobium-94	Q		1
Potassium-40	Q		1
Radium-226	Q		1
Ruthenium-103	Q		1
Strontium-90	Q		1
Technetium-99	Q		1
Thorium-232	Q		2
Thorium-234	Q		1
Tin-113	Q		2
Uranium-233	Q		2
Uranium-235	Q		2
Uranium-238	Q		1
Zinc-65	Q		1
Iodine-129	Q	LCS and/or LCSD accuracy criteria not met	1
Tin-117	Q		1
Uranium-238	Q		1

Table M-28. Waste Management Area C Phase 2 RCRA Facility Investigation Data Review Qualifiers Assigned (12 sheets)

Analyte	Review Qualifier	Reason	Number Samples with Results Qualified
Thorium-232	Q	MS and/or MSD accuracy criteria not met	2
Thorium-232	Q		1
Tin-117	Q		9
Uranium-235	Q		1
Uranium-238	Q		1

ICP/MS = inductively coupled plasma/mass spectroscopy
LCS = laboratory control sample
LCSD = laboratory control sample duplicate
MSD = matrix spike duplicate
MS = matrix spike
PCB = polychlorinated biphenyl
RCRA = *Resource Conservation and Recovery Act of 1976*

In addition, all TICs were considered unusable for meeting project objectives and assigned review qualifier of R.

M5.2.4 Holding Times and Preservation

The following subsections summarize the sample preservation and holding time evaluation, including review qualifiers assigned.

M5.2.4.1 Sample Preservation. Temperature upon receipt of five soil samples and two field QC samples (one RB, one TB) was not measured at the laboratory (222-S). Although it cannot be stated conclusively that the WMA C Phase 2 RFI samples were received within recommended temperature ranges, samples were either delivered to the laboratory on the day collected in coolers containing ice or stored, per protocol, refrigerated until delivered to the laboratory. Therefore, the samples were likely cooling toward the recommended holding temperature. Data were not qualified based on the uncertainty regarding temperature of these samples.

In addition, five soil samples were received at temperatures exceeding the recommended holding temperature range of ≤6°C (43°F). The samples were received in coolers with ice on the same day as collected and, therefore, were likely still cooling down toward recommended holding temperatures. It is not believed the temperature excursions for these samples adversely impacted quality of the data obtained from the samples. Data were not qualified based on temperature of the sample upon receipt exceeding criterion.

The affected samples are listed in Table M-29.

Table M-29. Samples for which Temperature Upon Laboratory Receipt Was Not Recorded

Sample ID	Matrix	Sample Type	Laboratory Report	Comment
B1YT92	Soil	Primary	RPP-RPT-44557	Temperature not recorded by laboratory
B1YT93	Soil	FD	RPP-RPT-44557	Temperature not recorded by laboratory
B1YTF4	Soil	Primary	RPP-RPT-44557	Temperature not recorded by laboratory
B1YTF7	Soil	Primary	RPP-RPT-44557	Temperature not recorded by laboratory
B20XX5	Soil	Primary	RPP-RPT-46241	Temperature not recorded by laboratory
B21733	Water	TB	RPP-RPT-46241	Temperature not recorded by laboratory
B1YY17	Water	RB	RPP-RPT-46241	Temperature not recorded by laboratory
B248B4	Soil	Primary	RPP-RPT-50450	Received at 12°C (54°F) by laboratory on day collected
B248B5	Soil	Primary	RPP-RPT-50450	Received at 12°C (54°F) by laboratory on day collected
B248B6	Soil	Primary	RPP-RPT-50450	Received at 12°C (54°F) by laboratory on day collected
B236N5	Soil	Primary	RPP-RPT-49050	Received at 11°C (52°F) by laboratory on day collected
B236N8	Soil	FD	RPP-RPT-49050	Received at 17°C (63°F) by laboratory on day collected

FD = Field duplicate RB = Rinsate blank TB = Trip blank

References:
RPP-RPT-44557, *Final Analytical Report for Samples from Waste Management Area C for Core Holes: C6392, C6400, C6402, C6404 and C6406 in Support of RCRA Soil Characterization.*
RPP-RPT-46241, *Final Analytical Report for Samples from Waste Management Area C for Core Holes: C7466 and C7468 in Support of RCRA Soil Characterization.*
RPP-RPT-49050, *Final Analytical Report for Samples from Waste Management Area C for Core Hole C7472, in Support of RCRA Soil Characterization.*
RPP-RPT-50450, *Final Analytical Report for Samples from Waste Management Area C for Well C7570.*

M5.2.4.2 Holding Times. A two-step process for sample analysis optimization is presented in RPP-RPT-38152, whereby Step 1, a method-based screening process to determine if the soil has been contaminated with tank waste, would be followed by analysis for the full suite of analytes in Step 2 if a tank waste indicator analyte threshold was met. As identified in Revision 3 of RPP-PLAN-38777, this two-step process was not implemented; but rather, full characterization was performed on the samples. Completing the limited suite of analyses for Step 1 first would likely result in missed holding times for the other required constituents or required resampling. Therefore, the full suite of analyses was performed for samples to alleviate the risks to data quality (holding times) and cost (resampling).

Analytical and, where applicable, extraction holding times achieved were evaluated against the holding time requirements presented in Section M3.4. Table M-30 summarizes the number of sample results for each analytical method with missed holding times.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
Extraction Holding Times Exceeded								
8081 Pesticides	14 days (collection to extraction)	4 to 12	5	7.2	75	6.8	B2FPF1, B2FPF2, B2FB27, B2FB29, B2FB31	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
		23 to 232	21	30	315	29	B236P2, B238H1, B23KT4, B211Y3, B211Y6, B211Y9, B215L0, B215L1, B20XW6, B20XW9, B20XX2, B215K8, B215K9, B1YT71, B1YTH1, B1YTH3, B20XV5, B20XV9, B20XW3, B1YTD2, B1YTD5	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.
8270 SVOCs	14 days (collection to extraction)	1 to 14	4	2.8	262	4.3	B2FB29, B2FB30, B2FB31, B2FYM3	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
8270 Dibutyl phosphate and monobutyl phosphate			23	22	46	22	B26C82, B236N5, B236N8, B26C47, B26C51, B26C53, B26C55, B26JL0, B26JL1, B23KN7, B23KR2, B23KR5, B23R25, B25ND7, B23TK2, B23TK5, B26CC0, B26CC4, B26CC6, B26CD2, B26CD4, B26JK6, B26JK7	

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
8270 Ethylene glycol	14 days (collection to extraction)	1 to 14	33	32	33	32	B26C68, B26C70, B26C74, B26C76, B26C78, B26C80, B26C82, B26JK2, B26JK3, B236P2, B238H1, B23KT4, B26C26, B26C28, B26C30, B26C32, B26JK8, B26JK9, B26C53, B26C55, B26C57, B26C59, B26C61, B238J9, B23KN7, B25ND7, B1YTH6, B1YTD8, B23TK2, B23TK5, B26CC0, B26JK6, B26JK7	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
8270 SVOCs	14 days (collection to extraction)	15 to 31	2	1.4	74	1.2	B2FB27, B20XV9	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.
8270 Dibutyl phosphate and monobutyl phosphate		25 to 40	4	3.8	8	3.8	B238H1, B238J3, B23TM6, B27131	
8270 Ethylene Glycol		15 to 205	14	13	14	13	B1YT71, B1YT74, B1YT77, B1YT80, B1YT83, B1YTH1, B1YTH3, B20XV5, B20XV9, B20XW3, B1YTB1, B1YTB4, B1YTB7, B1YTC0	

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
Analytical Holding Times Exceeded								
2320 Alkalinity*	14 days	1	2	12	4	14	B236P2, B23KT4	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
4500E, 9010, and 9014 Cyanide	14 days	1 to 6 days	6	4.1	6	4.1	B2FB27, B2FB29, B2FB30, B1YT71, B2B1L6, B2B1L7	
9014 Cyanide	14 days	26 days	1	0.68	1	0.68	B2FYM7	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.
6020 Metals	180 days	2 to 63	24	16	212	19	B23KP9, B1YT71, B1YT74, B1YT77, B1YT80, B1YT83, B1YTH1, B1YTH3, B20XV5, B20XV9, B20XW3, B1YT92, B1YT98, B1YTB1, B1YTB4, B1YTB7, B1YTC0, B1YTC9, B1YTD2, B1YTD5, B1YTD8, B1YTF1, B26JK6, B26JK7	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
7471 Mercury	28 days	1 to 21	14	9.5	14	9.5	B2D1X8, B2D1X9, B1YT80, B1YT83, B1YT98, B2FB27, B2FB29, B2FB30, B2FB31, B2FB32, B2FB33, B2FB34, B2FPF1, B2FPF2	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
8081 Pesticides	40 days (extraction to analysis)	1 to 4	4	5.8	92	8.4	B2FB27, B2FB29, B2FB30, B2FPF2	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
		140 to 258	18	26	270	25	B211Y3, B211Y6, B211Y9, B215L0, B215L1, B20XW6, B20XW9, B20XX2, B215K8, B215K9, B1YT71, B1YTH1, B1YTH3, B20XV5, B20XV9, B20XW3, B1YTD2, B1YTD5	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.
8260 VOC	14 days	1 to 9	4	3.6	127	3.6	B21207, B21210, B1YTB2, B23TM2	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
8270 SVOCs	40 days extraction to analysis)	2 to 14	4	2.8	193	3.2	B21202, B21205, B21208, B25ND7	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
8270 Dibutyl phosphate and monobutyl phosphate		2 to 14	6	5.8	12	5.8	B238H1, B238H4, B238H7, B238J0, B23TM6, B25WM2	
8270 Ethylene Glycol		12 to 13	2	1.9	2	1.9	B1YT80, B1YT83	
8270 SVOCs	40 days extraction to analysis)	16 to 38	1	0.69	42	0.69	B20XV9	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.
8270 Dibutyl phosphate and monobutyl phosphate		15 to 274	44	42	88	42	B236P2, B23KT4, B211Y3, B211Y6, B211Y9, B21202, B21205, B21208, B21211, B21214, B215L0, B215L1, B20XW6, B20XW9, B20XX2, B20XX5, B211W3, B211W6, B211W9, B211X2, B215K8, B215K9, B1YT71, B1YT74, B1YT77, B1YT80, B1YT83, B1YTH1, B1YTH3, B1YTH6, B20XV5, B20XV9, B20XW3, B1YTB1, B1YTB4, B1YTB7, B1YTC0, B1YTD2, B1YTD5, B1YTD8, B1YTF1, B1YTF4, B1YTF7, B27131	

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
8270 Ethylene Glycol	40 days extraction to analysis)	21 to 179	10	9.6	10	9.6	B236P2, B238H1, B23KT4, B1YT71, B1YT74, B1YT77, B20XV5, B20XV9, B20XW3, B1YTB1	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.
9030 Sulfide	7 days	1 to 6	3	2.8	3	2.8	B1YTH1, B1YTH3, B1YT92	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
9045 pH	Within 24 hours of receipt by laboratory	1 to 97	142	92	142	92	B2B1L8, B2B1L9, B2D1X2, B2D1X5, B2D1X8, B2D1X9, B2FB27, B2FB29, B2FB30, B2FB31, B2FB32, B2FB33, B2FB34, B2FYM3, B2FYM4, B2FYM5, B2FYM6, B2FYM7, B2FYM8, B2FYM9, B26C68, B26C70, B26C74, B26C76, B26C78, B26C80, B26C82, B26JK2, B26JK3, B236N5, B236N8, B236P2, B238H1, B238H4, B238J0, B238J3, B238J6, B23KT4, B211Y3, B211Y6, B211Y9, B21202, B21205, B21208, B21214, B215L0, B215L1,	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
9045 pH (continued)	Within 24 hours of receipt by laboratory	1 to 97	142	92	142	92	B248B3, B248B4, B248B5, B248B6, B26C26, B26C28, B26C30, B26C32, B26C34, B26C36, B26C38, B26C40, B26JK8, B26JK9, B26C47, B26C51, B26C53, B26C55, B26C57, B26C61, B26JL0, B26JL1, B2B1L6, B2B1L7, B2C1M2, B2C1M3, B2C1M5, B2C1M7, B2C1M8, B2C1M9, B20XW6, B20XW9, B20XX2, B20XX5, B211W3, B211W6, B211W9, B211X2, B215K8, B215K9, B238J9, B23KN7, B23KP6, B23KP9, B23KR2, B23KR5, B23R25, B25CN2, B25ND7, B1YT71, B1YT74, B1YT77, B1YT80, B1YT83, B1VJ57A, B1VJ57B, B1VJ57C, B1VJ63A, B1VJ63B, B1VJ63C, B1YTH1, B1YTH3, B1YTH6, B20XV5, B20XV9, B20XW3, B1YT92, B1YT98, B1YTB1, B1YTB4, B1YTB7, B1YTC0, B1YTC9, B1YTD2, B1YTD5, B1YTD8, B1YTF1,	Addition of review qualifier “H” to results to reflect potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
9045 pH (continued)	Within 24 hours of receipt by laboratory	1 to 97	142	92	142	92	B1YTF4, B1YTF7, B23TK2, B23TK5, B23TM6, B25WM2, B25WM5, B25WM8, B27130, B27131, B26CC4, B26CD0, B26CD2, B26CD4, B26JK6, B26JK7, B29612, B29613	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
9050 Conductivity	28 days	1 to 27	13	37	13	37	B2B1L8, B2B1L9, B2D1X2, B2D1X4, B2D1X5, B2D1X6, B2D1X7, B2D1X8, B2D1X9, B2D1Y0, B1VJ63A, B1VJ63B, B1VJ63C	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
		39	3	8.6	3	8.6	B1VJ57A, B1VJ57B, B1VJ57C	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.
9056 Anions (Nitrate, Nitrite, Phosphate)	48 hours	1	1	0.65	3	0.68	B2C1N1	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
9056 Anions (Nitrate, Nitrite, Phosphate) (continued)	48 hours	3 to 258	151	97	433	98	B2B1L8, B2B1L9, B2D1X2, B2D1X4, B2D1X5, B2D1X6, B2D1X7, B2D1X8, B2D1X9, B2D1Y0, B2FPR7, B2FPR8, B2FYM3, B2FYM4, B2FYM5, B2FYM6, B2FYM7, B2FYM8, B2FYM9, B26C68, B26C70, B26C74, B26C76, B26C78, B26C80, B26C82, B26JK2, B26JK3, B236N5, B236N8, B236P2, B238H1, B238H4, B238H7, B238J0, B238J3, B238J6, B238K3, B23KT4, B211Y3, B211Y6, B211Y9, B21202, B21205, B21208, B21211, B21214, B215L0, B215L1, B26C26, B26C28, B26C30, B26C32, B26C34, B26C36, B26C38, B26C40, B26JK8, B26JK9, B26C47, B26C51, B26C53, B26C55, B26C57, B26C59, B26C61, B26JL0, B26JL1, B2B1L6, B2B1L7, B2C1M2, B2C1M3, B2C1M5, B2C1M7, B2C1M8, B2C1M9, B2C1N0, B20XW6, B20XW9, B20XX2, B20XX5,	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
9056 Anions (Nitrate, Nitrite, Phosphate) (continued)	48 hours	3 to 258	151	97	433	98	B211W3, B211W6, B211W9, B211X2, B215K8, B215K9, B23KN7, B23KP6, B23KP9, B23KR2, B23KR5, B23R25, B25CN2, B25ND7, B1YT71, B1YT74, B1YT77, B1YT80, B1YT83, B1VJ57A, B1VJ57B, B1VJ57C, B1VJ63A, B1VJ63B, B1VJ63C, B1YTH1, B1YTH3, B1YTH6, B20XV9, B20XW3, B1YT92, B1YT98, B1YTB1, B1YTB4, B1YTB7, B1YTC0, B1YTC9, B1YTD2, B1YTD5, B1YTD8, B1YTF1, B1YTF4, B1YTF7, B23TK2, B23TK5, B23TK8, B23TM6, B25WM2, B25WM5, B25WM8, B27130, B27131, B26CC4, B26CD0, B26CD2, B26CD4, B26JK6, B26JK7, B29612, B29613, B238H7, B238J6, B248B3, B248B4, B248B5, B248B6	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
9056 Anions (Bromide, Chloride, Fluoride, Sulfate)	28 days	1 to 14	25	17	100	17	B2D1X6, B2D1X7, B2D1X8, B2D1X9, B2D1Y0, B2FPR7, B2FPR8, B2FYM3, B2FYM4, B2FYM5, B238J3, B238J6, B26C61, B26JL0, B26JL1, B2B1L6, B2B1L7, B2C1M2, B25WM5, B25WM8, B26CC4, B26JK6, B26JK7, B29612, B29613	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
		15 to 232	67	47	271	47	B2B1L8, B2B1L9, B2D1X2, B2D1X4, B2D1X5, B236N5, B236N8, B236P2, B238H1, B238H4, B238H7, B238J0, B238K3, B23KT4, B211Y3, B211Y6, B211Y9, B21202, B21205, B21208, B21211, B21214, B215L0, B215L1, B20XW6, B20XW9, B20XX2, B20XX5, B211W3, B211W6, B211W9, B211X2, B215K8, B215K9, B23KN7, B23R25, B1YT71, B1YT74, B1YT77, B1YT80, B1YT83, B1VJ57A, B1VJ57B, B1VJ57C, B1YTH1, B1YTH3, B1YTH6, B20XV9, B20XW3,	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
9056 Anions (Bromide, Chloride, Fluoride, Sulfate) (continued)	28 days	15 to 232	67	47	271	47	B1YT92, B1YT98, B1YTB1, B1YTB4, B1YTB7, B1YTC0, B1YTC9, B1YTD2, B1YTD5, B1YTD8, B1YTF1, B1YTF4, B1YTF7, B23TM6, B25WM2, B26CD0, B26CD2, B26CD4	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.
9056 Acetate, Formate, Glycolate, Oxylate	28 days	1 to 14	25	17	100	17	B2D1X6, B2D1X7, B2D1X8, B2D1X9, B2D1Y0, B2FPR7, B2FPR8, B2FYM3, B2FYM4, B2FYM5, B238J3, B238J6, B26C61, B26JL0, B26JL1, B2B1L6, B2B1L7, B2C1M2, B25WM5, B25WM8, B26CC4, B26JK6, B26JK7, B29612, B29613	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
		15 to 232	73	51	290	51	B2B1L8, B2B1L9, B2D1X2, B2D1X4, B2D1X5, B2FB27, B2FB29, B2FB30, B2FB31, B2FB32, B2FB33, B2FB34, B2FPF1, B2FPF2, B236N5, B236N8, B236P2, B238H1, B238H4, B238H7, B238J0, B238K3, B23KT4, B211Y3, B211Y6, B211Y9, B21202,	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
9056 Acetate, Formate, Glycolate, Oxylate (continued)	28 days	15 to 232	73	51	290	51	B21205, B21208, B21211, B21214, B215L0, B215L1, B20XW6, B20XW9, B20XX2, B20XX5, B211W3, B211W6, B211W9, B211X2, B215K8, B215K9, B23KN7, B23R25, B1YT71, B1YT74, B1YT77, B1YT80, B1YT83, B1YTH1, B1YTH3, B1YTH6, B20XV9, B20XW3, B1YT92, B1YT98, B1YTB1, B1YTB4, B1YTB7, B1YTC0, B1YTC9, B1YTD2, B1YTD5, B1YTD8, B1YTF1, B1YTF4, B1YTF7, B23TM6, B25WM2, B26CD0, B26CD2, B26CD4	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
WTPH-Gasoline	14 days	1 to 14	20	39	20	39	B26JK2, B26JK3, B236N5, B236N8, B211Y3, B211Y6, B211Y9, B215L0, B215L1, B26JK9, B26C53, B238J9, B23KN7, B23R25, B1YTH1, B1YTH3, B20XV5, B20XV9, B20XW3, B27131	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
WTPH-Gasoline (continued)		19 to 116	8	16	8	16	B236P2, B238H1, B23KT4, B20XW6, B20XW9, B20XX2, B215K8, B215K9	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.
WTPH-Diesel	40 (extraction to analysis)	85 to 86	3	5.9	3	5.9	B236P2, B238H1, B23KT4	Review qualifier of "R" assigned to result based on gross exceedance of holding time criterion and associate potential low bias in results considered appropriate.
AEA ^{241}Am, ^{242}Cm, $^{243/244}$Cm	180 days	14	1	0.68	3	0.68	B2B1L8	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
LSC ^{63}Ni	180 days	1 to 10	5	3.4	5	3.4	B2B1L8, B2B1L9, B2D1X2, B2D1X4, B2D1X5	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
AEA ^{238}Pu, $^{239/240}$Pu	180 days	14	1	0.68	2	0.68	B2B1L8	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
Radiochemicals by ICP/MS	180 days	1 to 37	14	9.5	164	10	B2B1L8, B2B1L9, B2FB27, B2FB29, B2FB30, B1YT83, B1YTH1, B1YTH3, B1YT92, B1YT98, B1YTB1, B1YTB4, B1YTB7, B1YTC0	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
ICP/MS Tc-99	180 days	2 to 86	20	7.5	20	7.5	B236P2, B238H1, B23KT4, B248B3, B248B4, B248B5, B248B6, B248B3, B248B4, B248B5, B248B6, B1YT83, B1YTH1, B1YTH3, B1YT92, B1YT98, B1YTB1, B1YTB4, B1YTB7, B1YTC0	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
LSC ^{79}Se	180 days	12	1	0.68	1	0.68	B23TK2	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.
GPC ^{90}Sr	180 days	3	1	0.68	1	0.68	B1YT71	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.

Table M-30. Missed Holding Times (16 sheets)

Analysis	Holding Time	Days Past Holding Time	Holding Time Missed				Impacted Samples	Disposition
			Number Samples	Percentage of Total Samples	Number of Results	Percentage of Total Number Results		
LSC Tritium	180 days	2 to 3	3	2.1	3	2.1	B236P2, B238H1, B23KT4	Addition of review qualifier "H" to results to reflect potential low bias in results considered appropriate.

*Analysis not required per RPP-PLAN-38777, *Sampling and Analysis Plan for Phase 2 Characterization of Vadose Zone Soil in Waste Management Area C*.

Aliquots or archived soil samples from locations 299-E27-20 and 299-E27-24 were collected and submitted for pH, nitrate, and percent solids determinations. The aliquots (subsamples) for pH and nitrate analysis from 299-E27-20 (B2NRC4, and B2NRC5) and 299-E27-24 (B248B3, B248B4, B248B5, and B248B6) were collected more than two times outside the holding time for these analyses. The resultant data are considered estimated values usable as screening-level data only and are not appropriate for decision-making purposes.

Of the 34,162 WMA C Phase 2 RFI sample results, 1,506 (4.4%) were flagged "H" due to holding time exceedances where extraction or analysis was completed within twice the holding time. These results are considered estimated values with a potential low bias based on holding time exceedance. In addition, 1,786 of the 34,162 results (5.2%) were flagged "R" due to gross holding time exceedances (extraction or analysis after twice holding). Data flagged "R" are considered unusable (rejected).

Holding time exceedances can be attributed to the following:

- Samples delivered to the laboratory after holding time expired
- Laboratory equipment failure, or laboratory failure to observe the holding time limits for samples
- Dilution, re-extraction, and/or reanalysis not completed within holding time
- Samples diverted to secondary laboratory (due to outages at primary laboratory).

M5.3 BLANKS EVALUATION

Laboratory and field QC blank sample results were evaluated against the criteria presented in Sections M2.4 and M2.3, respectively. These evaluations are summarized in the following subsections.

M5.3.1 Method Blanks

Hanford Site laboratory contracts require that a laboratory MB sample be analyzed with each batch of up to 20 samples. Laboratory MBs are used to assess potential contamination associated with laboratory sample preparation and analysis. Evaluation of MB sample results was based on the criteria listed in Section M2.4.2. Laboratories flag results associated with out-of-limit results in the laboratory qualifier field in the HEIS database as described in Table M-7. For inorganic analytes and radiochemicals, results associated with an out-of-limit MB are flagged with a C. For organic analytes, results associated with an out-of-limit MB are flagged with a B. Table M-31 summarizes the out-of-limit MB results.

Table M-31. Method Blank Results Exceeding Criteria

Constituent	Number of Results	Number Out of Limits	Percent Out of Limits	Range of Quality Control Limits*	Range of Out-of-Limit Results
Total Method Blank Results Out (86)					
Volatile Organic Compound s, µg/kg (20 Method Blank results out of limits)					
Carbon disulfide	44	1	2.3	4.98	0.801
Methylene chloride**	44	2	4.5	9.43 – 9.50	0.604 – 3.23
Styrene	9	6	67	2.71 – 4.10	0.344 – 0.521
Toluene**	44	11	25	2.12 – 3.79	0.17 – 0.304
Semi-volatile Organic Compound s µg/kg (1 Method Blank result out of limits)					
bis(2-Ethylhexyl)phthalate	48	1	2.1	10.9	590
Metals, µg/L (31 Method Blank results out of limits)					
Arsenic	28	1	3.6	3.1	98.1
Calcium	28	9	32	2.1 – 15.96	101 – 798
Iron	28	8	29	2.04 – 7.84	10.2 – 39.2
Selenium	26	3	12	2.07 – 3.15	2.52 – 3.84
Sulfur	26	1	3.8	2.39	239
Thallium	26	9	35	2.75 – 14.05	0.412 – 28.1
Anions and Wet Chemistry, µg/L (41 M ethod B lank results out of limits)					
Acetate	40	2	5.0	2.05 – 3.03	12.4 – 18.3
Ammonium ion	66	21	32	2.03 – 35.3	244 - 1430
Chloride	40	2	5.0	2.07 – 12.8	20.7 – 39.7
Formate	40	2	5.0	2.66 – 4.41	12.4 – 20.6
Nitrate	48	5	10	2.01 – 14.3	41.8 - 231
Nitrite	43	9	21	2.02 – 8.33	42.1 – 160
Radiochemicals, pCi/g (24 Method Blank results out of limits)					
Actinium-228	7	1	14	3.13	1.01
Americium-241	28	1	3.6	25.4	0.779
Iodine-129	24	2	8.3	9.03 – 32.2	1.59 – 7.99
Radium-226	5	1	20	2.84	5.2
Selenium-79	23	5	22	2.46 – 3.56	3.93 – 4380
Strontium-90	22	1	4.5	2.03	0.294
Technetium-99	48	1	2.1	3.75	385.29
Thorium-232	25	4	16	3.69 – 105	0.0000392 – 0.0142
Tin-117	26	1	3.8	4.12	0.904
Tin-126	29	1	3.4	2.58	127.0608
Uranium-233	25	1	4.0	3.86	0.007490358
Uranium-235	28	1	3.6	2.43 – 17.9	0.00000851 – 0.001155975
Uranium-238	27	3	11	3.47 – 52.4	0.00000370 – 0.0036982

*For chemical parameters, the quality control limit is twice the method detection limit, unless otherwise specified. For radiochemistry parameters, the quality control limit is twice the minimum detectable activity.
**The quality control limit for this analyte is five times the method detection limit.

A total of 6,032 laboratory blank results were reported from MBs. Approximately 96% of these results satisfied evaluation criteria. Nonconformances were limited to 86 results at low concentrations, indicating little problem with laboratory contamination.

M5.3.2 Field Quality Control Blank Samples

Three types of field QC blank samples were collected and submitted to the laboratory for analysis. Field blank samples, equipment rinsate blank samples, and trip blank samples were collected at the frequencies presented in Section M2.3.1 and Table M-3. Field QC blank sample results that did not meet these evaluation criteria are summarized in Table M-32.

Field Blank Samples

Field blank samples are used to assess potential contamination associated with sampling and laboratory activities. Analytical results for the FB samples were assessed against the acceptance limits listed in Section M2.3.2. A total of 1,727 FB results were reported, 94 of which were positive results. Of these 94 detected results, 61 exceeded evaluation criteria; however, results for the associated field samples were reported as not detected. No field sample results were qualified based on FB results exceeding criteria. Overall, the percentage of acceptable FB sample results evaluated for WMA C Phase 2 sampling event was 96.5%, indicating little problem with contamination during sampling and analysis.

Equipment Rinsate Blank Samples

Equipment RB samples results are used to evaluate the effectiveness of equipment decontamination procedures. Analytical results for the RB samples were assessed against the acceptance limits listed in Section M2.3.2. A total of 1,304 RB results were reported, 87 of which were positive results. Of these 87 detected results, 49 exceeded evaluation criteria. Results for samples associated with RB samples with results exceeding these criteria are given a review qualifier of Q in the HEIS database to indicate potential contamination issues. A total of 23 results for associated field samples were assigned a Q qualifier based on RB sample results. Overall, the percentage of acceptable RB sample results evaluated for WMA C Phase 2 sampling events was 96.2%, indicating little problem with contamination during sampling and analysis.

Trip Blank Samples

Trip blank samples results are used to check for potential VOC contamination associated with sample transport, storage, and handling activities. Analytical results for the TB samples were assessed against the acceptance limits listed in Section M2.3.2. A total of 1,821 TB results were reported, 94 of which were positive results. Of these 94 detected results, 61 exceeded evaluation criteria. Results for samples associated with TB samples with results exceeding these criteria are given a review qualifier of Q in the HEIS database to indicate potential contamination issues. A total of 7 results for associated field samples were assigned a Q qualifier based on TB sample results. Overall, the percentage of acceptable TB sample results evaluated for WMA C Phase 2 sampling event was 96.7%, indicating little problem with contamination during sampling and analysis.

Table M-32. Field Quality Control Blank Results Exceeding Criteria (4 sheets)

Constituent	Blank Type	Number of Results	Number Out of Limits	Percent Out of Limits	Range of QC Limits*	Range of Out-of-Limit Results	Blank Sample ID	Associated Field Samples with Detected Result**
Volatile Organic Compounds (µg/L)								
2-Hexanone	FB		2		2.10 – 3.29	1.06 – 1.66	B26D12, B23V98	None
2-Hexanone	TB		1		2.02	1.02	B26D01	None
Acetone	TB		1		5.18	3.3	B23VB6	None
Benzene	FB		7		2.34 – 3.64	0.0424 – 0.0659	B26CY9, B23MR0, B23MR3, B26CY6, B23MR4, B23MR7, B26CW8	None
Benzene	TB		5		2.59 – 3.57	0.0469 – 0.0646	B26D01, B23MP3, B26D04, B238D3, B26CV4, B26CV6	None
Chloroform	RB		2		7.02 – 13.8	0.323 – 0.633	B23V95, B238D8	None
Chloroform	FB		44		8.85 – 24.1	0.407 – 1.11	B26CY9, B23MR0, B23MR3, B26CY6, B23MR4, B23MR7, B26CW8, B26CW9, B26D55, B26CX0, B23MR4, B26D56, B23MR5, B23MR2, B23MR3, B23MR1, B26D54, B26D53, B26CW8, B238F2, B238F4, B26D52, B26D12, B26D11, B26D51, B238D2, B23MR0, B238F3, B26CY5, B26CY6, B26D15, B26CY4, B26D16, B26CY1, B26CY3, B26CW7, B238D1, B23V97, B23VB0, B26CW3, B26CY2, B26D14, B26CY7, B23V98, B26D13, B238D0, B238C8, B238C9, B23MR7, B23V96, B23MR6	None

Table M-32. Field Quality Control Blank Results Exceeding Criteria (4 sheets)

Constituent	Blank Type	Number of Results	Number Out of Limits	Percent Out of Limits	Range of QC Limits*	Range of Out-of-Limit Results	Blank Sample ID	Associated Field Samples with Detected Result**
Chloroform	TB		38		10.93 – 24.1	0.503 – 1.11	B26CV6, B23MP4, B23MP2, B26D01, B238F6, B23MP3, B23MP5, B26D43, B26D42, B238F0, B26CV5, B238F5, B238D9, B26D02, B26D44, B26CX3, B26CV4, B26D05, B26D41, B238D5, B26CX2, B26D03, B238D7, B26D45, B238D6, B26CX5, B26D06, B23VB9, B26D04, B26CV2, B26CX1, B23VB8, B238D3, B238D4, B23VB7, B23MP7, B23VB6, B23MP6	None
Chloromethane	FB		5		7.22 – 28.0	0.221 – 0.858	B26CW2, B26CX0, B26CW8, B26CW9, B23MR1	None
Chloromethane	TB		4		7.22 – 15.2	0.221 – 0.465	B23MP2, B23MP3, B26CV3, B26CV5	None
Cyclohexane	FB		3		5.93 – 10.76	0.21 – 0.381	B26CW4, B26CW5, B26CW2	None
Hexane	TB		2		2.74 – 2.84	0.822 – 0.852	B21736, B21737	B211X1, B211X4, B21221, B21222
Methylene chloride	RB		1		13.8	2.61	B1YY17	None
Methylene chloride	TB		9		6.35 – 1020	1.2 – 172	B20VR1, B21734, B21735, B1YY23, B21736, B1YY24, B21733, B21737, B21739	B21221, B21222, B21204
Toluene	TB				5.07	0.674	B21736	None
Polychlorinated Biphenyl (PCB) Congeners (µg/L)								
2,3',4,5'-Tetrachlorobiphenyl	RB		1		4.02	0.00000527	B1YY17	None

Table M-32. Field Quality Control Blank Results Exceeding Criteria (4 sheets)

Constituent	Blank Type	Number of Results	Number Out of Limits	Percent Out of Limits	Range of QC Limits*	Range of Out-of-Limit Results	Blank Sample ID	Associated Field Samples with Detected Result**
3-Monochlorobiphenyl	RB		1		4.95	0.00000328	B1YY17	None
Co-elution of PCB congeners BZ 110 and 115	RB		1		4.00	0.000004	B1YY17	None
Co-elution of PCB congeners BZ 129, 138, 160, and 163	RB		1		4.00	0.000004	B1YY17	None
Co-elution of PCB congeners BZ 147 and 149	RB		1		4.00	0.000004	B1YY17	None
Co-elution of PCB congeners BZ 153 and 168	RB		1		5.00	0.000005	B1YY17	None
Co-elution of PCB congeners BZ 90, 101, and 113	RB		1		3.00	0.000003	B1YY17	None
Metals (µg/L)								
Aluminum	RB		1		2.31	69.4	B2B1N7	B21DX9
Calcium	RB		2		2.60 – 2.64	130 – 132	B23V95, B1YY17	B20XX5
Iron	RB		7		2.20 – 59.4	11 – 297	B238D8, B2B1N8, B1YY17, B2B1N6, B23V95, B26PF9, B2B1N7	B2FB33, B20XX5, B2C1N0, B26C57, B2D1X9
Silicon	RB		2		3.73 – 4.67	112 – 140	B1YY17, B2B1N7	B20XX5, B2D1X9
Sodium	RB		2		8.54 – 9.83	854 – 983	B1YY17, B23V95	B20XX5
Zinc	RB		1		9.64	48.2	B2B1N6	None

Table M-32. Field Quality Control Blank Results Exceeding Criteria (4 sheets)

Constituent	Blank Type	Number of Results	Number Out of Limits	Percent Out of Limits	Range of QC Limits*	Range of Out-of-Limit Results	Blank Sample ID	Associated Field Samples with Detected Result**
Anions and Wet Chemistry (µg/L)								
Ammonium ion	RB		1		2.07	248	B26PF9	B26C57
Chloride	RB		1		32.0	319	B1YY17	B20XX5
Fluoride	RB		6		30.5 – 87.0	49.1 – 140	B2B1N7, B238D8, B2B1N8, B2B1N6, B23V95, B26PF9	B2D1X9, B26C57
Formate	RB		4		4.11 – 12.6	19.2 – 58.8	B23V95, B1YY17, B2B1N7, B2B1N6	B20XX9
Nitrate	RB		4		2.10 – 9.33	43.6 – 194	B1YY17, B2B1N8, B248D4, B2B1N7	B20XX5, B2FB33, B248B3, B248B4, B2D1X9
Radiochemicals (pCi/L)								
Lead-214****	RB		1		4.36	0.000000951	B2B1N7	B2D1X9
Radium-226****	RB		1		2.55	0.00000383	B2B1N7	B2D1X9
Thorium-230	RB		2		23,600 – 32,400	0.33 – 0.454	B23V95, B238D8	None
Thorium-232	RB		1		2.05	0.00205	B2B1N7	B2D1X9
Uranium-236	RB		2		72.8 – 72.8	0.000582 – 0.000582	B2B1N7	None
Selenium-79****	RB		1		6.15	0.0000000966	B2B1N7, B23V95	None

*For chemical parameters, the quality control limit is twice the method detection limit, unless otherwise specified. For radiochemistry parameters, the quality control limit is twice the minimum detectable activity.
**Associated samples are samples collected on the same day and at the same location as the blank sample.
***The quality control limit for this analyte is five times the method detection limit.
****Results reported in µCi/mL.

FB = field blank QC = quality control RB = rinsate blank TB = trip blank

Although detected concentrations in blank samples (FB, RB, and/or TB) for 2-hexanone, acetone, benzene, chloromethane, cyclohexane, toluene, PCB congeners, ^{230}Th, ^{236}U, and ^{79}Se exceeded evaluation criteria, none were detected in the associated samples, suggesting the RB, FB, and/or TB results for these constituents were either present in the water used to collect these blank samples or were attributable to laboratory contamination. However, overall, the FB, RB, and TB results indicate no little problem with contamination.

M5.4 PRECISION

Laboratory duplicate samples, LCSD, and MSD sample results provide a measure of the reproducibility of the analytical process. The concentration-dependent criteria used to evaluate analytical precision are presented in Section M2.4.2. Field samples prepared analyzed in the same analytical batch as laboratory duplicate samples or LCSDs that do not meet precision criteria were assigned a review qualifier of Q. For MSD samples that do not meet precision criteria, review qualifiers (Q) were limited to only the field sample used for MSD analysis. Laboratory precision evaluations are summarized below.

M5.4.1 Laboratory Duplicate Results

A total of 2,324 laboratory duplicate sample results were reported, of which 809 were non-detect. Of the 1,515 detected laboratory duplicate results, 124 results (8.2%) did not satisfy evaluation criteria. Detect and non-detect results associated with laboratory duplicate samples for which evaluation criteria were not met were assigned the data review qualifier Q. Associated field samples are samples prepared and analyzed in the same analytical batch. Overall, acceptable analytical precision on the same matrix, as demonstrated by laboratory duplicate result evaluation, was achieved.

Table M-33 summarizes laboratory duplicate results that exceed evaluation criteria.

M5.4.2 Laboratory Control Sample/Laboratory Control Sample Duplicate and Matrix Spike/Matrix Spike Duplicate Results

A total of 120 LCSD results were reported, all of which satisfied evaluation criteria. No field sample results were assigned review qualifiers based on LCSD results. Overall, acceptable analytical precision on a clean sample matrix, as demonstrated by LCSD evaluation, was achieved.

A total of 969 MS/MSD result pairs were reported. Of those, 2 result pairs (0.21%) did not satisfy evaluation criteria. These results for the samples used for MS/MSD analysis were assigned the review qualifier Q based on minor exceedances of analytical precision criteria. Overall, acceptable analytical precision on the sample matrix, as demonstrated by MSD evaluation, was achieved. Table M-34 summarizes the MS/MSD pair results that did not meet evaluation criteria.

Table M-33. Laboratory Duplicate Results Exceeding Criteria (3 sheets)

Analytical Batch Number(s)	Analyte	Number Laboratory Duplicate Results	Number Laboratory Duplicate Results Out	Percentage Out	Range Out
Anions					
00016700, 00016744, 00016818, 00017027, 00019446	Acetate	37	5	14	42.6 – 87.22
00014710, 00021784	Ammonium ion	67	2	3.0	48.4 – 90.8
00016701	Chloride	40	1	2.5	74.7
00016700, 00016804, 00017017, 00019599, 00021046, 00026818, 00031881	Fluoride	40	7	18	31.8 – 79.7
00016700, 00016818, 00017027, 00026818, 00030862	Formate	37	5	14	44.6 – 79.9
00016700, 00016818, 00017027	Nitrate	44	3	6.8	32.37 – 50.3
00016701, 00016744, 00017027, 00019446, 00026531, 00031881	Nitrite	40	6	15	32.8 – 86.1
00016700, 00016701, 00019058, 00022897	Oxalate	37	5	14	54.6 – 98.2
00016700	Phosphate	40	1	2.5	39.5
00016700, 00016701, 00016818, 00017017, 00017027, 00022897, 00031881	Sulfate	40	7	18	30.8 – 71.4
Metals					
00016822	Aluminum	27	1	3.7	35.3
00020590	Antimony	18	2	11	37.2 – 37.2
00016820	Barium	27	1	3.7	90.6
00017062, 00024435	Cadmium	26	2	7.7	31.1 – 32.7
00016822	Calcium	27	1	3.7	40.4
00016820, 00020005, 00023817	Chromium	25	4	16	32.3 – 75.8
00023817, 00026878	Cobalt	27	2	7.4	33.2 –33.8
00016820, 00016822	Copper	27	2	7.4	41.1 – 44.0

Table M-33. Laboratory Duplicate Results Exceeding Criteria (3 sheets)

Analytical Batch Number(s)	Analyte	Number Laboratory Duplicate Results	Number Laboratory Duplicate Results Out	Percentage Out	Range Out
00016822	Iron	27	1	3.7	39.1
00016820	Lanthanum	24	1	4.2	40.3
00017062, 00017146	Lead	26	2	7.7	34.5 – 47.0
00016820	Lithium	27	1	3.7	63.9
00016820, 00016822	Magnesium	27	2	7.4	39.4 – 52.0
00016822, 00021230	Manganese	27	2	7.4	36.1 – 39.8
00016820	Neodymium	3	1	33	33.9
00017021, 00020005, 00020874, 00023817	Nickel	27	5	19	45.2 – 80.7
00016822	Phosphorus	27	1	3.7	52.6
00016820	Potassium	27	1	3.7	70.3
00016819, 00020821, 00023817	Silicon	17	3	18	30.3 – 50.3
00016820, 00016822, 00023817	Sodium	27	3	11	43.5 – 50.8
00016822, 00019868, 00023817	Strontium	27	4	15	31.2 – 39.2
00016972, 00017062, 00017063	Thallium	25	3	12	32.3 – 58.7
00016820, 00016822	Titanium	24	2	8.3	32.9 – 45.7
00017062	Vanadium	27	1	3.7	43.5
00016820, 00016822	Yttrium	19	2	11	33.3 – 48.1
00016822	Zinc	27	1	3.7	34.7
00016820, 00031996	Zirconium	22	2	9.1	32.8 – 47.0
Radiochemicals					
186876	Beryllium-7	2	1	50	42.9
186876, 186883	Bismuth-214	9	2	22	45.6 – 53.1
186883	Cerium/Praseodymium-144	2	1	50	59.6
186883	Cerium-144	2	1	50	59.6
186876	Cobalt-57	2	1	50	45.6
186876	Cobalt-60	22	1	4.5	46.4

Table M-33. Laboratory Duplicate Results Exceeding Criteria (3 sheets)

Analytical Batch Number(s)	Analyte	Number Laboratory Duplicate Results	Number Laboratory Duplicate Results Out	Percentage Out	Range Out
186883	Europium-152	22	1	4.5	62.3
186876	Europium-154	22	1	4.5	42.5
186883	Europium-155	22	1	4.5	39.7
00031523	Lead-212	14	1	7.1	64.5
186876	Lead-214	11	1	9.1	45.9
186883	Niobium-94	2	1	50	84.4
00028430	Potassium-40	21	1	4.8	37
186876	Radium-226	4	1	25	46.3
186883	Ruthenium-103	2	1	50	74.4
00030429	Strontium-90	19	1	5.3	34.8
187663	Technetium-99	48	1	2.1	35.2
00016595, 00016797	Thorium-232	24	2	8.3	30.1 – 42.6
186876	Thorium-234	22	1	4.5	36.5
186876, 186883	Tin-113	2	2	100	81.3 – 90
00021207, 00023864	Uranium-233	24	2	8.3	61.4 – 49.8
00016797, 186876	Uranium-235	26	2	7.7	37.6 – 89.9
00016797	Uranium-238	26	1	3.8	34
186883	Zinc-65	2	1	50	63.7

Table M-34. Laboratory Control Sample/Laboratory Control Sample Duplicate and Matrix Spike/Matrix Spike Duplicate Sample Pair Results Exceeding Precision Criteria

Sample IDs	Analyte	Number Laboratory Duplicate Results	Number Laboratory Duplicate Results Out	Percentage Out	Range Out
Volatile Organic Compounds					
B26JM0	1-Butanol	29	1	3.4	30.3
B23KR1	Acetone	29	1	3.4	35.9

M5.4.3 Field Duplicate Sample Results

For the data set, 13 field duplicate sample pairs were collected, all from surface intervals and collected as grab samples. These 13 field duplicate sample pairs yielded 7,784 analytical results. Precision between results reported as detected in one or both samples of a field duplicate pair were evaluated. Of the 7,718 usable results, 1,356 were evaluated. A total of 1,242 results (92%), met the applicable concentration-dependent evaluation criterion, indicating reasonable field sampling and laboratory precision was attained. Results for field duplicate pairs not meeting evaluation criteria were assigned review qualifier of Q. Table M-35 presents the field duplicate results that exceeded QC limits.

Table M-35. Field Duplicate Results Exceeding Quality Control Criteria (2 sheets)

Analyte	Number of Field Duplicate Pairs	Number of Field Duplicate Pairs Out of Limits	Percent Out of Limits	Range Out of Limit Relative Percent Differences
Anions and Wet Chemistry				
Ammonium	8	2	2.5	31.9 – 73.9
Chloride	12	1	8.3	47.0
Fluoride	12	2	17	31.3 – 46.0
Formate	11	2	18	53.8 – 57.8
Nitrate	13	3	23	51.3 – 83.7
Nitrite	7	1	14	100
Oxalate	6	1	17	39.7
Sulfate	12	4	33	31.1 – 50.3
Metals				
Barium	13	1	7.7	30.6
Cadmium	10	1	10	45.4
Calcium	13	1	7.7	35.3
Lead	12	2	17	34.7 – 44.6
Manganese	13	3	23	32.2 – 35.3
Nickel	13	2	15	36.5 – 64.6
Silicon	13	2	15	44.7 – 68.1
Sodium	13	1	7.7	53.7
Strontium	13	1	7.7	33.3
Thallium	9	2	22	31.1 – 45.3
Vanadium	13	1	7.7	32.1
Zirconium	13	6	46	38.9 – 71.8

Table M-35. Field Duplicate Results Exceeding Quality Control Criteria (2 sheets)

Analyte	Number of Field Duplicate Pairs	Number of Field Duplicate Pairs Out of Limits	Percent Out of Limits	Range Out of Limit Relative Percent Differences
Physical Properties				
Percent Moisture	12	1	8.3	37.1
Specific Conductance	8	1	13	44.2
Volatile Organic Compounds				
Hexane	2	2	100	82.3 – 83.2
Radiochemicals				
Cesium-137	9	2	22	32.8 – 42.2
Strontium-90	14	3	21	31.9 – 36.9
Tin-126	7	2	29	46.0 – 63.3
Uranium-233	9	4	44	30.4 – 84.1
Uranium-234	6	3	50	30.4 – 68.0

M5.5 ACCURACY

Three types of QC samples are used to assess accuracy. The LCS is used to assess the performance of the laboratory with respect to the method and the accuracy of the laboratory preparation and analysis processes. The MS samples are used to assess the accuracy of the published method on the sample matrix and evaluate matrix effects that may bias the data. Laboratory surrogate recoveries are used to assess overall method performance.

M5.5.1 Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries

There were a total of 5,237 LCS and BS recoveries reported. Of these 5,237 recoveries, 196 (3.7%) were outside control limits listed in RPP-PLAN-38777. Table M-36 summarizes the LCS and BS recoveries that did not meet evaluation criteria.

M5.5.2 Matrix Spike and Matrix Spike Duplicate Recoveries

Matrix spike recovery is also used as a measure of analytical accuracy. For the WMA C Phase 2 RFI data set, there were 3,868 MS and MSD results. Of those, 654 (17%) did not satisfy evaluation criteria. The overall accuracy with respect to the matrix was fair, as indicated by MS/MSD recoveries. Table M-37 summarizes MS/MSD recoveries that did not meet evaluation criteria.

Table M-36. Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries Exceeding Accuracy Criteria (10 sheets)

Analytical Batch Number(s)	Analyte	Spike Sample Type	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range of Out of Limits Recoveries	Comment	Review Qualifiers Assigned*
Anions and Wet Chemistry								
00019599	2-Hydroxyacetate	BS	97	1	1.0%	8.9	%R < both laboratory and SAP LCL	Associated detect and non-detect results assigned review qualifier Q
00019599	Acetate	BS	97	1	1.0%	8.83		
00019599	Bromide	BS	96	1	1.0%	9.17		
00019599	Chloride	BS	96	1	1.0%	9.05		
186444	Cyanide	LCS	72	1	1.4%	83.8	%R < lab LCL; but, within SAP limits	No qualifier assigned
00019599	Fluoride	BS	96	1	1.0%	9.29	%R < both laboratory and SAP LCL	Associated detect and non-detect results assigned review qualifier Q
00019599	Formate	BS	97	1	1.0%	9.1		
00019599	Nitrate	BS	104	1	1.0%	9.13		
00019599	Nitrite	BS	96	1	1.0%	8.8		
00019599	Oxalate	BS	97	1	1.0%	9.31		
00019599	Phosphate	BS	96	1	1.0%	9.11		
00019599	Sulfate	BS	96	1	1.0%	9.29		
Metals								
00011150	Aluminum	LCS	54	1	1.9%	75.6	%R < both laboratory and SAP LCL	Associated detect and non-detect results assigned review qualifier Q

Table M-36. Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries Exceeding Accuracy Criteria (10 sheets)

Analytical Batch Number(s)	Analyte	Spike Sample Type	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range of Out of Limits Recoveries	Comment	Review Qualifiers Assigned*
00028250	Antimony	LCS	47	1	2.1%	200	%R > both laboratory and SAP UCL	Associated detect results assigned review qualifier Q; non-detect results not qualified
00034232	Arsenic	LCS	53	1	1.9%	75.4	%R < both laboratory and SAP LCL	Associated detect and non-detect results assigned review qualifier Q
00011150	Beryllium	LCS	54	1	1.9%	79.8		
00011150	Cadmium	LCS	57	1	1.8%	79.4		
00020563	Calcium	LCS	54	1	1.9%	78.3		
00011150	Cobalt	LCS	58	1	1.7%	78.6		
00019915	Lead	BS	59	1	1.7%	112	%R > lab UCL; but, within SAP limits	No qualifier assigned
00011150	Nickel	LCS	58	1	1.7%	79.7	%R < both laboratory and SAP LCL	Associated detect and non-detect results assigned review qualifier Q
00011150	Potassium	LCS	54	3	5.6%	75.9 – 79.1		
00016778	Rubidium	BS	2	1	50%	112	%R > lab UCL; but, within SAP limits	No qualifier assigned

Table M-36. Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries Exceeding Accuracy Criteria (10 sheets)

Analytical Batch Number(s)	Analyte	Spike Sample Type	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range of Out of Limits Recoveries	Comment	Review Qualifiers Assigned*
00026878	Silicon	LCS	53	9	17%	16 – 78.3	%R < both laboratory and SAP LCL	Associated detect and non-detect results assigned review qualifier Q
00026878	Tantalum	LCS	12	2	17%	30.8 – 64.7		
00011150	Thallium	LCS	53	1	1.9%	76.2		
00016822	Tungsten	LCS	14	1	7.1%	54.4		
Volatile Organic Compounds								
00023313	1,1-Dichloroethene	LCS	44	1	2.3%	67.2	%R < SAP LCL; but, within lab limits	Associated detect and non-detect results assigned review qualifier Q
00015472	1,1-Dichloroethene	LCS	44	1	2.3%	133	%R > both laboratory and SAP UCL	Associated detect results assigned review qualifier Q; non-detect results not qualified
00020912	1-Butanol	LCS	43	2	4.7%	131 – 136	%R > SAP UCL; but, within lab limits	Associated detect results assigned review qualifier Q; non-detect results not qualified
00015785	1-Butanol	LCS	43	1	2.3%	134	%R > both laboratory and SAP UCL	Associated detect results assigned review qualifier Q; non-detect results not qualified
00015472	2-Butanone	LCS	43	2	4.7%	135 – 135		

Table M-36. Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries Exceeding Accuracy Criteria (10 sheets)

Analytical Batch Number(s)	Analyte	Spike Sample Type	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range of Out of Limits Recoveries	Comment	Review Qualifiers Assigned*
00023601	2-Butanone	LCS	43	1	2.3%	149	%R > SAP UCL; but, within lab limits	Associated detect results assigned review qualifier Q; non-detect results not qualified
00019123	4-Methyl-2-pentanone	LCS	43	4	9.3%	132 – 138		
00015785	4-Methyl-2-pentanone	LCS	43	2	4.7%	137 – 138	%R > both laboratory and SAP UCL	Associated detect results assigned review qualifier Q; non-detect results not qualified
00019566	Acetone	LCS	43	4	9.3%	140 – 146		
Pesticides								
1220046	4,4'-DDD (Dichlorodiphenyldichloroethane)	LCS	13	1	7.7%	152	%R > both laboratory and SAP UCL	Associated detect results assigned review qualifier Q; non-detect results not qualified
1220046	4,4'-DDE (Dichlorodiphenyldichloroethylene)	LCS	13	1	7.7%	129	%R > lab UCL; but, within SAP limits	No qualifier assigned
1220046	4,4'-DDT (Dichlorodiphenyltrichloroethane)	LCS	13	1	7.7%	155	%R > both laboratory and SAP UCL	Associated detect results assigned review qualifier Q; non-detect results not qualified

Table M-36. Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries Exceeding Accuracy Criteria (10 sheets)

Analytical Batch Number(s)	Analyte	Spike Sample Type	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range of Out of Limits Recoveries	Comment	Review Qualifiers Assigned*
1220046	Alpha-BHC	LCS	13	1	7.7%	128	%R > lab UCL; but, within SAP limits	No qualifier assigned
1220046	beta-1,2,3,4,5,6-Hexachlorocyclohexane (beta-BHC)	LCS	13	1	7.7%	125		
1220046	Delta-BHC	LCS	13	1	7.7%	139	%R > both laboratory and SAP UCL	Associated detect results assigned review qualifier Q; non-detect results not qualified
1220046	Dieldrin	LCS	13	1	7.7%	127	%R > lab UCL; but, within SAP limits	No qualifier assigned
1220046	Endosulfan I	LCS	13	1	7.7%	134	%R > both laboratory and SAP UCL	Associated detect results assigned review qualifier Q; non-detect results not qualified
1220046	Endosulfan sulfate	LCS	13	1	7.7%	126	%R > lab UCL; but, within SAP limits	No qualifier assigned

Table M-36. Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries Exceeding Accuracy Criteria (10 sheets)

Analytical Batch Number(s)	Analyte	Spike Sample Type	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range of Out of Limits Recoveries	Comment	Review Qualifiers Assigned*
1220046	Endrin	LCS	13	1	7.7%	148	%R > both laboratory and SAP UCL	Associated detect results assigned review qualifier Q; non-detect results not qualified
1220046	Gamma-BHC (Lindane)	LCS	13	1	7.7%	126	%R < lab LCL; but, within SAP limits	No qualifier assigned
1158099	Heptachlor	LCS	13	3	23%	133	%R > SAP UCL; but, within lab limits	Associated detect results assigned review qualifier Q; non-detect results not qualified
1220046	Heptachlor epoxide	LCS	13	1	7.7%	126	%R > lab UCL; but, within SAP limits	No qualifier assigned
1158099	Methoxychlor	LCS	13	2	15%	138	%R > SAP UCL; but, within lab limits	Associated detect results assigned review qualifier Q; non-detect results not qualified
1220046	trans-Chlordane	LCS	13	1	7.7%	126	%R > lab UCL; but, within SAP limits	No qualifier assigned

Table M-36. Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries Exceeding Accuracy Criteria (10 sheets)

Analytical Batch Number(s)	Analyte	Spike Sample Type	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range of Out of Limits Recoveries	Comment	Review Qualifiers Assigned*
Semi-volatile Organic Compounds								
00022043	1,2,4-Trichlorobenzene	LCS	48	22	46%	54.5 – 69.4	%R < SAP LCL; but, within lab limits	Associated detect and non-detect results assigned review qualifier Q
00028328	1,2-Dichlorobenzene	LCS	6	2	33%	64.5 – 66.9	%R < both laboratory and SAP LCL	
00014580	1,4-Dichlorobenzene	LCS	19	7	37%	54.8 – 68.5	%R < SAP LCL; but, within lab limits	
00014580	2,4-Dinitrotoluene	LCS	48	1	2.1%	66.9	%R < both laboratory and SAP LCL	
00026487	2,4-Dinitrotoluene	LCS	48	1	2.1%	101	%R > lab UCL; but, within SAP limits	No qualifier assigned
00028328	2,6-bis(1,1-dimethylethyl)-4-methyl phenol	LCS	6	3	50%	22.5 – 67.2	%R < both laboratory and SAP LCL	Associated detect and non-detect results assigned review qualifier Q

Table M-36. Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries Exceeding Accuracy Criteria (10 sheets)

Analytical Batch Number(s)	Analyte	Spike Sample Type	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range of Out of Limits Recoveries	Comment	Review Qualifiers Assigned*
00014580	2-Chlorophenol	LCS	48	22	46%	57.7 – 69.7	%R < SAP LCL; but, within lab limits	Associated detect and non-detect results assigned review qualifier Q
00028328	2-Methylphenol (cresol, o-)	LCS	9	2	22%	64 – 66.7	%R < both laboratory and SAP LCL	
00028328	2-Nitrophenol	LCS	9	2	22%	63.5 – 68.6		
187052	3,3'-Dichlorobenzidine	LCS	3	1	33%	69.4	%R < SAP LCL; but, within lab limits	
00028328	3+4 Methylphenol (cresol, m+p)	LCS	6	2	33%	67.2 – 68.4	%R < both laboratory and SAP LCL	
00014580	4-Chloro-3-methylphenol	LCS	48	15	31%	62.4 – 69.7	%R < SAP LCL; but, within lab limits	
00031350	4-Chloro-3-methylphenol	LCS	48	1	2.1%	97.6	%R > lab UCL; but, within SAP limits	No qualifier assigned

Table M-36. Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries Exceeding Accuracy Criteria (10 sheets)

Analytical Batch Number(s)	Analyte	Spike Sample Type	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range of Out of Limits Recoveries	Comment	Review Qualifiers Assigned*
187052	4-Chloroaniline	LCS	3	1	33%	63.1	%R < SAP LCL; but, within lab limits	Associated detect and non-detect results assigned review qualifier Q
00019999	Acenaphthene	LCS	48	14	29%	60.6 – 69.7		
00031701	Cellosolve Solvent	LCS	5	1	20%	69.8	%R < both laboratory and SAP LCL	
00028631	Cyclohexanone	LCS	5	2	40%	60.1 – 63.1		
00028328	Hexachlorobutadiene	LCS	6	2	33%	67 – 69.8		
00028328	Hexachloroethane	LCS	9	4	44%	50.4 – 69.4		
00028328	Naphthalene	LCS	9	1	11%	67.6		
00028328	Nitrobenzene	LCS	6	1	17%	68.4		
00019999	n-Nitrosodi-n-dipropylamine	LCS	39	22	56%	56.7 – 69.8	%R < SAP LCL; but, within lab limits	Associated detect and non-detect results assigned review qualifier Q
00028328	Pentachlorophenol	LCS	23	5	22%	0 – 68.8	%R < both laboratory and SAP LCL	
00014580	Phenol	LCS	19	5	26%	57.9 – 69.2	%R < SAP LCL; but, within lab limits	

Table M-36. Laboratory Control Sample and Laboratory Control Sample Duplicate Recoveries Exceeding Accuracy Criteria (10 sheets)

Analytical Batch Number(s)	Analyte	Spike Sample Type	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range of Out of Limits Recoveries	Comment	Review Qualifiers Assigned*
00031704	Pyrene	LCS	46	2	4.3%	107 – 117	%R > lab UCL; but, within SAP limits	No qualifier assigned
00028328	Pyridine	LCS	6	3	50%	61.8 – 68.2	%R < both laboratory and SAP LCL	Associated detect and non-detect results assigned review qualifier Q
00031704	Total cresols	LCS	1	1	100%	0		
00028328	Tributyl phosphate	LCS	5	2	40%	0		
Radiochemicals								
00011388	Iodine-129	BS	24	1	4.2%	114	%R > lab UCL; but, within SAP limits	No qualifier assigned
00016341	Tin-117	LCS	53	1	1.9%	142	%R > both laboratory and SAP UCL	Associated detect results assigned review qualifier Q; non-detect results not qualified
00026833	Uranium-238	BS	53	1	1.9%	10.1	%R < both laboratory and SAP LCL	Associated detect and non-detect results assigned review qualifier Q

*Associated samples are samples prepared and analyzed in same analytical batch

%R = percent recovery
BS = blank spike
LCL = lower control limit
LCS = laboratory control sample
SAP = sampling and analysis plan
UCL = upper control limit

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
Anions						
B2D1X9	Ammonium ion	129	1	1%	77	Associated detect and non-detect results assigned review qualifier Q
B24YW0, B2FPR7	Bromide	53	3	6%	77.4 – 79.7	
B26C55, B215L0, B2FYM3, , B26JL0, B23KR5	Cyanide	51	5	10%	42.6 – 75.8	
B26C76, B2FPR7	Fluoride	53	2	4%	73.6 – 75.8	Associated detect results assigned review qualifier Q
B23TM6	Nitrite	53	1	2%	76.8	Associated detect and non-detect results assigned review qualifier Q
B2FYM6, B2FPR7	Oxalate	48	2	4%	74.7 – 78.9	
B2FPR7, B26C76, B2FYM6, B2FPR7, B29613, B23TK8, B2C1M8, B236N5, B26C61, B26JL1, B23TM6	Phosphate	53	11	21%	47.4 – 79.1	
B26C76	Sulfate	53	1	2%	79.2	
Metals						
B1YT71, B1YT92, B215L0, B1YTH1, B23KT4, B23KT4, B20XW3, B1YTC9, B20XX5, B215K8, B26JL0, B26JK6, B23KP9, B2FPR7, B23R25, B23R25, B23TK2, B26JK2, B2B1L6, B2FPF1, B26JK9, B2B1L8, B26CD2, B1VJ57A	Aluminum	28	24	86%	233 – 14,300	Associated detect results assigned review qualifier Q

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
B1VJ57A. B26C68	Antimony	19	2	11%	0 – 62.8	Associated detect and non-detect results assigned review qualifier Q
B1VJ57A, B2FPF1, B23TK2, B23KP9,	Arsenic	27	4	15%	45.8 – 75.6	
B2FPF1, B26JK6, B26JK9, B26CD2, B2B1L6	Barium	28	5	18%	127 – 179	Associated detect results assigned review qualifier Q
B23TK2	Bismuth	6	1	17%	55.7	Associated detect and non-detect results assigned review qualifier Q
B1VJ57A	Bismuth	6	1	17%	181	Associated detect results assigned review qualifier Q
B2B1L6	Boron	8	1	13%	134	
B26JK2, B1YT71, B1YT92, B215L0, B20XX5, B1YTH1, B23KT4, B23KT4, B215K8, B1YTC9, B2FPR7, B20XW3, B2C1M8, B23KP9, B23TK2, B23R25, B23R25, B26JL0, B2FPF1, B26JK6, B2B1L8, B25WM5, B26JK9, B2B1L6, B26CD2, B1VJ57A	Calcium	28	1	4%	69.3	Associated detect and non-detect results assigned review qualifier Q
B1YT71	Calcium	28	25	89%	128 – 9,600	Associated detect results assigned review qualifier Q

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
B1VJ57A	Copper	28	1	4%	76.4	Associated detect and non-detect results assigned review qualifier Q
B23TK2	Iron	28	1	4%	67	
B1YT92, B1YTC9, B1YTH1, B20XX5, B20XW3, B23KT4, B23KT4, B215K8, B23KP9, B23R25, B23R25, B26JL0, B2FPR7, B26JK2, B2FPF1, B2B1L6, B26JK9, B2B1L8, B26CD2, B1VJ57A	Iron	28	20	71%	365 – 8,690	Associated detect results assigned review qualifier Q
B23TK2	Lead	27	1	4%	78.4	Associated detect and non-detect results assigned review qualifier Q
B2FPR7	Lead	27	1	4%	121	Associated detect results assigned review qualifier Q
B23TK2	Lithium	28	1	4%	78.3	Associated detect and non-detect results assigned review qualifier Q

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
B26JK2	Lithium	28	1	4%	121	Associated detect results assigned review qualifier Q
B1YT92, B215L0, B23TK2, B1YTC9, B1YTH1, B20XW3, B23KT4, B23KT4, B215K8, B20XX5, B26JL0, B26JK6, B26JK2, B2B1L8, B23R25, B23R25, B2B1L6, B2FPF1, B26JK9, B26CD2, B1VJ57A	Magnesium	26	21	81%	140 – 4,470	
B23KP9, B2FPR7	Manganese	28	2	7%	58.4 – 75.8	Associated detect and non-detect results assigned review qualifier Q
B26JK6, B2FPF1, B2B1L6, B2B1L8, B26JK9, B26CD2, B1VJ57A	Manganese	28	7	25%	122 – 301	Associated detect results assigned review qualifier Q
B1VJ57A, B23TK2	Molybdenum	28	2	7%	77.3 – 78.7	Associated detect and non-detect results assigned review qualifier Q
B26CD2	Neodymium	4	1	25%	9.14	
B23TK2	Nickel	28	1	4%	78.5	
B1YT71	Palladium	3	1	33%	78.9	
B23TK2, B2B1L8, B25WM5, B1YTC9, B215L0	Phosphorus	28	5	18%	59.8 – 79.9	
B26JK2, B2FPF1, B2FPR7, B2B1L6, B26CD2, B26JK9	Phosphorus	28	6	21%	289 – 416	Associated detect results assigned review qualifier Q

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
B23KP9	Potassium	28	1	4%	47.6	Associated detect and non-detect results assigned review qualifier Q
B1YT92, B2B1L6, B1YTH1, B1YTC9, B23KT4, B23KT4, B20XW3, B20XX5, B215K8, B26JL0, B23R25, B23R25, B26JK6, B2FPF1, B26JK9, B2FPR7, B26JK2, B26CD2, B1VJ57A	Potassium	28	19	68%	122 – 2200	Associated detect results assigned review qualifier Q
B1VJ57A	Rhenium	3	1	33%	0	Associated results assigned review qualifier of R
B20XW3	Rubidium	1	1	100%	55.9	Associated detect and non-detect results assigned review qualifier Q
B20XX5	Selenium	27	1	4%	135	Associated detect results assigned review qualifier Q
B23TK2, B26JK6, B26JK2, B26CD2, B1YTC9	Silicon	28	5	18%	39.1 – 79.6	Associated detect and non-detect results assigned review qualifier Q

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
B20XW3, B2FPF1, B26JK9, B215K8, B25WM5, B23R25, B23R25, B215L0, B1YT92, B1YT71, B23KT4, B23KT4, B23KP9	Silicon	28	13	46%	137 – 424	Associated detect results assigned review qualifier Q
B20XV5	Silver	27	1	4%	122	
B2C1M8, B215L0, B1YTH1, B25WM5, B20XX5, B1YTC9, B20XW3, B215K8, B23KT4, B23KT4, B26JL0, B23R25, B23R25, B2FPF1, B23KP9, B2B1L8, B26JK6, B26JK9, B26CD2, B23TK2, B2B1L6, B26JK2, B2FPR7, B1VJ57A	Sodium	28	24	86%	121 – 1,330	Associated detect results assigned review qualifier Q
B26CD2, B1VJ57A, B2B1L6, B2FPF1, B26JK9	Strontium	28	5	18%	125 – 134	
B2C1M8, B2FPR7, B25WM5, B23TK2	Sulfur	26	4	15%	52.3 – 76.1	Associated detect and non-detect results assigned review qualifier Q
B26JK2, B26CD2, B2B1L6	Sulfur	26	3	12%	121 – 136	Associated detect results assigned review qualifier Q
B215L0, B1YT92, B1YT71	Tantalum	4	3	75%	22 – 41.6	Associated detect and non-detect results assigned review qualifier Q

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
B1YT92, B20XW3, B1YTH1, B23KT4, B23KT4, B215K8, B25WM5, B23R25, B23R25, B23TK2, B23KP9, B2FPR7, B2FPF1, B26JL0, B26JK2, B26CD2, B26JK9, B2B1L8, B1VJ57A	Titanium	27	19	70%	132 – 1,330	Associated detect results assigned review qualifier Q
B1YTC9, B215K8, B2FPR7	Tungsten	6	3	50%	52.5 – 78.6	Associated detect and non-detect results assigned review qualifier Q
B26CD2, B1VJ57A, B2B1L8	Vanadium	28	3	11%	121 – 137	Associated detect results assigned review qualifier Q
B1YTH1	Yttrium	25	1	4%	79.3	Associated detect and non-detect results assigned review qualifier Q
B26CD2, B2B1L8	Zinc	28	2	7%	121 – 122	Associated detect results assigned review qualifier Q
B2B1L8, B23TK2, B23KP9, B23R25, B23R25, B26JK9, B25WM5, B26JL0, B2C1M8, B26JK6	Zirconium	28	10	36%	2.53 – 73.6	Associated detect and non-detect results assigned review qualifier Q

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
Volatile Organic Compounds						
B26JL7	1,1-Dichloroethene	61	1	2%	69.2	Associated detect and non-detect results assigned review qualifier Q
B1YTB2, B23KP2, B26C75, B26JM0, B26C79	1-Butanol	59	5	8%	132 – 149	Associated detect results assigned review qualifier Q
B20XW1, B26JL8, B26C75, B21216, B23TL0, B23KP2, B26JL7, B236P4, B26C79, B23KT3, B23KT3	2-Butanone	59	11	19%	131 – 160	
B23KR7, B26C39, B26JL7, B26C39, B26JL3, B26C75, B23KR1, B26JL8, B23KR7, B26JL7, B23KN6, B21216, B21216, B23KR1, B236N7, B26JL8, B23KN6, B23KP2, B23TL0, B23KP2, B26C79, B23KT3, B23KT3	4-Methyl-2-pentanone	59	23	39%	131 – 215	Associated detect results assigned review qualifier Q
B23KR1	Acetone	59	1	2%	66.6	Associated detect and non-detect results assigned review qualifier Q
B23TL0, B23KN6, B26C39, B21216, B26C75, B26C79, B23KR7, B21216, B23KR7, B23KP2, B23KT3, B23KP2, B23KT3	Acetone	59	13	22%	131 – 187	Associated detect results assigned review qualifier Q

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
Semi-volatile Organic Compounds						
B26C32, B26JK8, B26C32, B29612, B26C57, B1YTH6, B26JK8, B26CD2, B29613, B29613, B1YTD5, B21202, B26C57, B1YTH6, B26JL1, B29612, B1YT77, B25WM8, B26C61, B1YT77, B1YTD5, B26CD2, B23TK2, B23KR2, B26C61, B20XX5, B23TK2, B238K3, B20XX5, B20XV9, B25WM8, B21202, B26JL1, B26C78, B238H4, B238K3, B25WM5, B25WM5, B1YT74, B27131, B23KP9, B215L0, B238H4, B23KP9, B23KR2, B27131, B1YT74, B238J3, B2D1X9, B238J3, B26C70, B20XV9, B2D1X2	1,2,4-Trichlorobenzene	98	53	54%	49.1 – 69	Associated detect and non-detect results assigned review qualifier Q
B2D1X2, B2D1X9, B2D1X2, B2D1X9	1,2-Dichlorobenzene	12	4	33%	60.3 – 68.1	Associated detect and non-detect results assigned review qualifier Q
B1YTH6, B1YTH6, B1YTD5, B1YTD5, B21202, B1YT77, B1YT77, B20XX5, B20XV9, B21202, B1YT74, B1YT74, B215L0, B20XX5, B20XV9, B1YTB1, B215K8, B1YTB1, B215L0, B215K8, B2C1M5, B2C1M5, B2C1N1	1,4-Dichlorobenzene	38	23	61%	50.1 – 69.4	
B21202	2,4-Dinitrotoluene	98	2	2%	66 – 69.5	
B2D1X2, B2D1X9, B2D1X6, B2FYM9, B2FPR7	2,6-bis(1,1-dimethylethyl)-4-methyl phenol	12	9	75%	19.5 – 69.5	

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
B21202, B26JK8, B1YT77, B1YTH6, B1YT77, B26C32, B1YTH6, B29612, B1YTD5, B29613, B26JK8, B29613, B20XX5, B26C32, B1YT74, B25WM8, B1YTD5, B1YT74, B21202, B29612, B26CD2, B26C78, B25WM8, B238K3, B238K3, B23KR2, B26JL1, B23TK2, B26CD2, B20XX5, B26C61, B23KR2, B2D1X2, B2D1X9, B215L0, B20XV9, B27131, B1YTB1, B26C70	2-Chlorophenol	98	39	40%	53.2 – 69.3	Associated detect and non-detect results assigned review qualifier Q
B2D1X2, B2D1X9, B2D1X6	2-Methylphenol (cresol, o-)	18	4	22%	66.1 – 69.4	Associated detect and non-detect results assigned review qualifier Q
B2D1X2, B2D1X9, B2D1X6	2-Nitrophenol	18	4	22%	66.1 – 69.3	
B2FB34	3,3'-Dichlorobenzidine	6	1	17%	62	
B2D1X2, B2D1X9, B2D1X6	3+4 Methylphenol (cresol, m+p)	12	3	25%	68.7 – 69.8	
B26C32, B26JK8, B21202, B26C32, B26JK8, B26JL1, B26JL1, B21202, B26C61, B1YT77, B1YTD5, B20XX5, B29612, B26C61, B1YT77, B1YTH6, B20XX5, B26C57, B26C57, B1YTD5, B29613, B1YTH6	4-Chloro-3-methylphenol	98	22	22%	56.6 – 69.9	Associated detect and non-detect results assigned review qualifier Q
B2FPL7, B2FPF1	4-Chloroaniline	6	5	83%	58 – 69.7	
B21202, B2FB34	4-Nitrophenol	38	4	11%	58.3 – 69.5	Associated non-detect results assigned review qualifier Q

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
B26C32, B29613, B21202, B1YT77, B29613, B1YT77, B26JK8, B26C32, B1YTD5, B23KR2, B23TK2, B26C61, B25WM8, B1YTD5, B25WM8, B23TK2, B1YTH6, B26JK8, B20XX5, B25WM5, B26JL1, B25WM5, B26C57, B20XX5	Acenaphthene	98	24	24%	58.5 – 69.4	Associated detect and non-detect results assigned review qualifier Q
B2FB34	Carbazole	6	1	17%	66.6	Associated detect and non-detect results assigned review qualifier Q
B2D1X9	Cellosolve Solvent	10	2	20%	68.6 – 69.5	
B2D1X9, B2D1X6, B2FYM9	Cyclohexanone	10	6	60%	57.8 – 69.8	
B2D1X9, B2D1X2	Hexachlorobutadiene	12	3	25%	67.9 – 69.7	
B2D1X9, B2D1X2, B2D1X6, B2FPR7, B2FYM9	Hexachloroethane	18	9	50%	46 – 69.5	
B2D1X9, B2D1X2	Naphthalene	18	2	11%	69.4 – 69.6	
B2D1X2	Nitrobenzene	12	1	8%	69.1	

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
B21202, B26C32, B26JK8, B1YT77, B1YT77, B29613, B29613, B29612, B26C32, B25WM8, B26CD2, B20XX5, B26JK8, B1YT74, B23KR2, B25WM8, B27131, B25WM5, B26C61, B1YT74, B26CD2, B21202, B26JL1, B29612, B25WM5, B215K8, B26C61, B26JL1, B20XX5, B215L0, B26C57, B26C78, B23TK2, B23KP9, B26C57, B2D1X9, B27131, B23KR2, B2D1X2, B215K8, B26C70, B2D1X2, B23KP9, B26C78, B26C70, B215L0, B1YT83, B1YT83, B2D1X6	n-Nitrosodi-n-dipropylamine	80	49	61%	53.4 – 69.4	Associated detect and non-detect results assigned review qualifier Q
B2FB34, B21202, B2FPF1, B1YT77	Pentachlorophenol	46	4	9%	65.4 – 69.7	Associated detect and non-detect results assigned review qualifier Q
B21202, B1YTH6, B1YTH6, B1YT77, B1YT77, B1YTD5, B21202, B1YTD5, B20XX5, B1YT74, B1YT74	Phenol	38	11	29%	53.6 – 66.5	
B2D1X2, B2D1X9, B2FYM9, B2D1X6	Pyridine	12	8	67%	54.2 – 69.3	
Pesticides						
B2FPF1	4,4'-DDD (Dichlorodiphenyldichloroethane)	2	1	50%	132	Associated detect results assigned review qualifier Q
B2FPF1	4,4'-DDT (Dichlorodiphenyltrichloroethane)	2	1	50%	133	
B2FPF1	Delta-BHC	2	1	50%	132	
B2FPF1	Endrin	2	1	50%	133	

Table M-37. Matrix Spike and Matrix Spike Duplicate Sample Recoveries Exceeding Accuracy Criteria (13 sheets)

Sample ID	Analyte	Total Number Spike Sample Results	Total Number Spike Recoveries Out	Percentage Spike Recoveries Out	Range Out of Limits Recoveries	Review Qualifiers Assigned*
B2FPF1	Endrin aldehyde	2	2	100%	519 – 565	Associated detect results assigned review qualifier Q
B2FPF1	Heptachlor	2	2	100%	147 – 151	
B2FPF1	Heptachlor epoxide	2	2	100%	137 – 140	
B2FPF1	Methoxychlor	2	2	100%	133 – 142	
Radiochemicals						
B23R25	Thorium-232	26	2	8%	62.2 – 62.2	Associated detect and non-detect results assigned review qualifier Q
B2FPF1	Thorium-232	26	1	4%	121	Associated detect results assigned review qualifier Q
B23KP9, B26C26, B23R25, B25WM5, B26JK3, B23TK2, B26JK7, B26CD4	Tin-117	26	9	35%	52.9 – 74.5	Associated detect and non-detect results assigned review qualifier Q
B2B1L8	Uranium-235	25	1	4%	125	Associated detect results assigned review qualifier Q
B2B1L8	Uranium-238	26	1	4%	127	

*Samples associated with matrix spike and/or matrix spike duplicate recoveries are limited to the field samples spiked for matrix spike/matrix spike duplicate analysis.

M5.6 REPRESENTATIVENESS

Samples were collected and analyzed in accordance with approved procedures. Sample collection and analysis according to standardized procedures is intended to increase consistency and representativeness of the data obtained.

Although low recovery at some locations and intervals was encountered, the sampling design was generally implemented as presented in RPP-PLAN-38777. With few exceptions, judgmental samples were collected at the locations and depths planned based on DQO and follow-up systematic planning meetings. These exceptions were primarily due to low recovery during sampling.

Based on the use of a judgmental sample design, representativeness is limited to the individual sample locations (borings) from which the samples were collected. Results obtained are not necessarily representative of all WMA C vadose zone soil. Overall, the data set is considered representative of the WMA C vadose zone soil at the specific locations sampled.

M5.7 COMPARABILITY

The majority of results were reported on an as-received basis (not corrected for moisture content); however, the data set contains a mixture of as-received and dry weight corrected results. Calculating results on a dry weight basis removes the influence of sample moisture on the reported result. Because moisture content varies among samples, factoring out the contribution of the weight of moisture effectively normalizes results and increases comparability among samples collected at a location (boring). Moisture content of vadose zone soil samples from a location (boring) generally did not vary significantly; therefore, results from different sample depths at a location for this data set are considered comparable. However, the data user should determine whether results need to be corrected for moisture content before comparing to screening criteria (standards, limits, etc.).

M5.8 COMPLETENESS

Despite low sample recovery at shallow depths at some locations, sufficient sample material was collected to allow analysis of the majority of planned analyses. Sample collection completeness is estimated at 93%.

Samples results were considered unusable based on gross exceedance of holding time criteria and extremely low spike sample recoveries (<10%). The percent of data considered usable for its intended purpose is approximately 74%.

M6 DATA USABILITY SUMMARY

The assessment noted some deficiencies in the data. These deficiencies are summarized in the following subsections.

M6.1 VALIDATION

A minimum of 5% of the data collected were subjected to a rigorous third-part validation. Observed QC deficiencies were largely minor; however, a large number of results were considered usable for decision making. Values for constituents listed as "J" or "UJ" flagged should be considered estimated but usable. Values for constituents listed as "R" flagged should be considered unusable for decision making.

M6.2 REVIEW

The entire data set was reviewed against the sensitivity, precision, and accuracy criteria presented in this report. Review qualifiers were determined necessary as presented in Section M5. Limitations on use of data based on review findings are summarized in Section M5. Values for constituents listed as "Q" or "H" flagged should be considered estimated but usable. Values for constituents listed as "R" flagged should be considered unusable.

M6.3 CONCLUSIONS

With the exceptions noted above, samples were collected and analyzed as specified in RPP-PLAN-38777. With the exception of data rejected for use (qualified or flagged "R"), sample results accurately indicate the presence or absence of target analyte contamination at sample locations. Laboratory and matrix accuracy and precision were in control overall and no systematic or general discrepancies were displayed. Sample results are believed to be representative of site conditions at the time of collection. Results obtained are comparable to industry standards in that collection and analytical techniques followed approved, documented procedures (except as noted in this report and reflected in qualified data points). All results are reported in industry standard units. Although some blank contamination occurred, the concentrations generally are low-level and were consistent with normal laboratory and field procedures.

The conclusions of this assessment are that the data that have been collected are of the right type, quality, and quantity for direct regulatory use. Detection limits, precision, accuracy, and data completeness were evaluated to determine whether any analytical data should be rejected as a result of QA/QC deficiencies.

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APPENDIX N

SUMMARY OF SOIL RESULTS BY SAMPLE AND DEPTH FOR INVESTIGATION GROUPS AT WMA C

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APPENDIX N
SUMMARY OF SOIL RESULTS BY SAMPLE AND DEPTH FOR INVESTIGATION GROUPS AT WMA C

Contents of this appendix include five tables summarizing the vertical extent of contamination for constituents reported above background or reported as detected when no background value is available for comparison. Results are grouped by Investigation Group/Site in order of descending depth by borehole. These summary tables report all useable results for primary and secondary constituents that were reported above background (or reported as detected without background) for all Phase 2 direct push and angle push sampling locations.

Tables

Table N-1. Soil Inorganic and General Chemistry Results Above Hanford Site Background Reported by Location and Depth
Table N-2. Soil Radionuclide Results Above Hanford Site Radiological Background Reported by Location and Depth
Table N-3. Detected Organic Results Reported by Location and Depth
Table N-4. Detected General Chemistry and Inorganic Soil Results without Hanford Site Background Reported by Location and Depth
Table N-5. Detected Soil Radiological Results without Hanford Site Background Reported by Location and Depth
Table N-6. WMA C Phase 2 Soil pH Results Greater than 8.5 Reported Location and Depth

Table Heading Descriptions

Field Name	Description
Investigation Group	Identifies the Investigation Group for which the results are reported
WorkPlanName	Identifies the specific Investigation Site name, given by the Work Plan
WELL_NAME	Identifies the site by well name, as it appears in HEIS
SAMP_NUM	Identifies the specific sample ID, as it appears in HEIS
depth range	Presents the depth range of the sample result (as a measure of pipe run)
midpoint depth	Presents the midpoint depth of the depth range. Note that angle push results are reported using a midpoint depth that is a calculated depth from ground surface for the pipe run length reported in the "depth range" field
Strata	Notes the classification of the geologic strata associated with the result
Shallow/Deep	Denotes whether the sample result is located in shallow (≤15 ft bgs) or deep (> 15 ft bgs) soils

Result Qualifier Descriptions

Qualifier	Description
B	INORGANICS/WETCHEM: The analyte was detected at value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate) ORGANICS: The analyte was detected in both the associated QC blank and in the sample RADIONUCLIDES: The associated QC sample blank has a result greater than or equal to the MDA, and after corrections, the result is greater than or equal to the MDA for this sample.
C	INORGANICS/WETCHEM: The analyte was detected in both the sample and the associated QC blank and the sample concentration was less than or equal to 5X the blank concentration
E	(1) Concentration exceeds the calibration range of the instrument, or (2) Reported value is estimated due to interferences. See comment in narrative.
J	Estimated value; see case narrative for more detail
J-	(1) Estimated value due to low LCS Recovery, or (2) The sample was analyzed out of hold time but before 2X hold time
M	Duplicate precision criteria not met
N	Spike and/or duplicate sample recovery is outside control limits
T	Spike and/or spike duplicate sample recovery is outside of control limits
U	Analyzed for but not detected above limiting criteria
X	The result-specific translation of this qualifier code is provided in the hardcopy data report and/or case narrative.
Y	Same as X flag if more than one flag is required

Table N-1. Soil Inorganic Results Reported Above Hanford Site Background

								Primary Analytes																						Secondary Analytes	
								Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Lead	Magnesium	Molybdenum	Nickel	Selenium	Silver	Sodium	Thallium	Uranium	Vanadium	Zinc	Mercury	Fluoride	Nitrate	Sulfate	Phosphate	Boron
								Hanford Site Background Value (ug/kg)																							
Grouping	Work Plan N	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/Deep	130	6470	132000	563	17200000	18500	22000	10200	7060000	470	19100	780	167	690000	185	3210	85100	67800	13	2810	52000	237000	785	3890
	A	C8102	B2B1L8	0-1 ft	0.5 ft	BF	Shallow	211									4690 U													2410	
	A		B2B1L9	0-1 ft	0.5 ft	BF	Shallow	211									4560 UJ													2500	
	A		B2D1X2	5.7-9.7 ft	6.8 ft	BF	Shallow	231									4450 U													1290 B	
	A		B2D1X4	11.5-15.5 ft	11.3 ft	BF	Shallow	252									4670 U													5960	
	A		B2D1X5	16.1-18.1 ft	14.1 ft	BF	Shallow	269									4410 U													872 B	
	A		B2D1X6	65-67 ft	46.8 ft	H1	Deep	132					26100				4410 U														
	A		B2D1X7	96-98 ft	69.73 ft	H2	Deep	213					20200				4340 U														
	A		B2D1X8	155-157 ft	118.7 ft	H2	Deep	265									4410 U														
	A		B2D1X9	188-190 ft	144.9ft	H2	Deep	156									4340 U														
A+B	A		B2D1Y0	221-223 ft	169.7 ft	H2	Deep										4340 U														
	B	C8104	B2FPF1	0.5-1 ft	0.5 ft	BF	Shallow	342									4330 U													1320 U	6500 U
	B		B2FPF2	0.5-1 ft	0.5 ft	BF	Shallow	330									4410 U													1320 U	6620 U
	B		B2FB27	5.7-7.7 ft	5.1 ft	BF	Shallow										4530 U													7970 U	6800 U
	B		B2FB29	11.5-15.5 ft	11.1 ft	BF	Shallow										4430 U													7970 U	6650 U
	B		B2FB30	16.1-18.1 ft	14.2 ft	BF	Shallow	168 J-									4500 U												592000	7970 U	6760 U
	B		B2FB31	41-43 ft	36.0 ft	BF	Deep	211				32200000	19900		11900		4500 U									23 B		57500	366000	8280 U	6960 B
	B		B2FB32	93-95 ft	81.4 ft	H2	Deep	163					27700				4450 U													7670 U	6670 U
	B		B2FB33	117-119 ft	102.1 ft	H2	Deep	196									4530 U													7970 U	6800 U
	B		B2FB34	157-159 ft	137.0 ft	H2	Deep	208					26400				4530 U											121000		7970 U	6790 U
	C1	C8106	B2FPR7	1-1.5 ft	0.5 ft	H1	Shallow	263									2780 U					304 CB								4570 NJ	
	C1		B2FPR8	1-1.5 ft	0.5 ft	H1	Shallow	283	6700								2790 U					286 CB								4140 N	
	C1		B2FYM3	11-13 ft	6.5 ft	H1	Shallow	721	21200			17500000			10600	8620000	2750 U					287 CB								813 BN	
	C1		B2FYM4	19-21 ft	11.5 ft	H1	Shallow	175									2700 U					272 CB								1100 BN	
C	C1		B2FYM5	27-29 ft	16.5 ft	H1	Deep	224					22200				2670 U					248 CB									
	C1		B2FYM6	64-66 ft	45.6 ft	H1	Deep										2660 U					186 CB									
	C1		B2FYM7	90-92 ft	57.3 ft	H1	Deep	135					22000				2760 U					204 CB									
	C1		B2FYM8	132-134 ft	75.5 ft	H1	Deep										2780 U														
	C1		B2FYM9	161.5-163.5 ft	87.8 ft	H2	Deep	169	7770				21400				2760 U														
	E	C7672	B26JK2	0-1 ft	0.5 ft	BF	Shallow	178 N			2720 B						1960 U									18.5 B				1460 B	
	E		B26JK3	0-1 ft	0.5 ft	BF	Shallow	165 N			3260 B						1980 U									23.2 B				1650 B	
	E		B26C68	5-7 ft	6 ft	BF	Shallow	157 N			2700 B						1990 U													1020 B	
	E		B26C70	10-12 ft	11 ft	BF	Shallow				2870 B						1990 U													975 B	
E	E		B26C74	14-16 ft	15 ft	BF	Shallow	164 N			3180 B						1990 U													848 B	
	E		B26C76	37-39 ft	38 ft	BF	Deep				2110 B		29800				2000 U	19300 B			972000						2870 BM				
	E		B26C78	73-75 ft	74 ft	H2	Deep				1900 B		27600				1980 U	25300													
	E		B26C80	83-85 ft	84 ft	H2	Deep	263 N			1760 B						1980 U														
	E		B26C82	122-124 ft	123 ft	H2	Deep				2440 B		20300				2540 B														
	F	C7472	B236N5	0-1 ft	0.5 ft	H1	Shallow	245 B									2100 U									30.4 B				2010 B	
	F		B236N8	0-1 ft	0.5 ft	H1	Shallow	219 U									2120 U													2460 B	
	F		B236P2	5-7 ft	6 ft	H1	Shallow	262 B				19600000					2140 U										3290 J				
	F		B23KT4	10-14 ft	12 ft	H1	Shallow	200 U									17300 U													2400 B	
	F		B238H1	14-16 ft	15 ft	H1	Shallow										17100 U													1410 B	
	F		B238H4	108.5-110.5 ft	109.5 ft	H2	Deep	240 B									3970 U														
	F		B238H7	129-131 ft	130 ft	H2	Deep	186									17100 U														
	F		B238J0	142-144 ft	143 ft	H2	Deep	216 U					18600 J				4000 U														
	F		B238J3	158-160 ft	159 ft	H2	Deep	209 U					19200 J				3910 U														
	F		B238J6	195-197 ft	196 ft	H2	Deep	210 U									3960 U														
F+G	F		B238K3	216-218 ft	217 ft	H2	Deep	214 U					22100				2110 B														
	G	C7468	B215L0	0-1 ft	0.5 ft	BF	Shallow	182 B									3940 U		2410 U				19700 U			20.1 U				2070 B	
	G		B215L1	0-1 ft	0.5 ft	BF	Shallow	165 U									3750 U		2290 U				18800 U			26.7 U				2790 B	
	G		B211Y3	5-7 ft	6 ft	BF	Shallow	165 U									3740 U		2280 U				18700 U			28.9 U				1410 B	
	G		B211Y6	10-12 ft	11 ft	BF	Shallow	162 U									3690 U		2250 U				18500 U			27.6 U					
	G		B211Y9	14-16 ft	15 ft	BF	Shallow	171 U									3890 U		2380 U				19500 U			18.2 U				1430 B	
	G		B21202	43.5-45.5 ft	44.5 ft	H1	Deep	169 U									3840 U		2340 U				19200 U			20 U				1160 B	
	G		B21205	92-94 ft	93 ft	H2	Deep	173 U									3930 U		2400 U				19600 U			18.1 U					
	G		B21208	97-99 ft	98 ft	H2	Deep	169 U									3840 U		2340 U				19200 U			18.3 U				917 B	
	G		B21211	125-127 ft	126 ft	H2	Deep	159 U									3620 U		2210 U				18100 U			18.9 U		192000			
	G		B21214	135-137 ft	136 ft	H2	Deep	161 U									3660 U		2230 U				18300 U			18.1 U		173000			
	H	C7680	B26JK8	0-1 ft	0.5 ft	H1	Shallow	214 B									1970 U													875 B	
	H		B26JK9	0-1 ft	0.5 ft	H1	Shallow	192 B									1970 U													1110 B	
	H		B26C26	5-7 ft	6 ft	H1	Shallow	202 B									2000 U													2780	

Table N-1. Soil Inorganic Results Reported Above Hanford Site Background

								Primary Analytes																						Secondary Analytes	
								Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Lead	Magnesium	Molybdenum	Nickel	Selenium	Silver	Sodium	Thallium	Uranium	Vanadium	Zinc	Mercury	Fluoride	Nitrate	Sulfate	Phosphate	Boron
								Hanford Site Background Value (ug/kg)																							
Grouping	Work Plan N	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/Deep	130	6470	132000	563	17200000	18500	22000	10200	7060000	470	19100	780	167	690000	185	3210	85100	67800	13	2810	52000	237000	785	3890
	H		B26C28	10-12 ft	11 ft	H1	Shallow										1990 U		965 B										458000		
	H		B26C30	14-16 ft	15 ft	H1	Shallow						26800 MJ				1970 U													1180 B	
	H		B26C32	17-19 ft	18 ft	H1	Deep						22800 M				1990 U													1370 B	
	H		B26C34	43-45 ft	44 ft	H1	Deep						21500 M				1980 U														
	H		B26C36	92-94 ft	93 ft	H2	Deep	189 B					28700 M				1980 U														
	H		B26C38	116-118 ft	117 ft	H2	Deep	157 B									1970 U														
H+I	H		B26C40	142-144 ft	143 ft	H2	Deep										1970 U														
	I	C7682	B26JL0	0-1 ft	0.5 ft	H1	Shallow	207									1650 U		1000									53000		5600	
	I		B26JL1	0-1 ft	0.5 ft	H1	Shallow	218	7000								1650 U		1000									54600		5740	
	I		B26C47	5-7 ft	6 ft	H1	Shallow	420							11300		1660 U		1000											1270 B	
	I		B26C51	12-14 ft	13 ft	H1	Shallow										1980 B		1000			194								1120 B	
	I		B26C53	14-16 ft	15 ft	H1	Shallow										2000 B		1000											1010 B	
	I		B26C55	18-20 ft	19 ft	H1	Deep								10300		1670 U		1000			189									
	I		B26C57	45-47 ft	46 ft	H1	Deep										1650 U		1000											834 B	
	I		B26C59	88-90 ft	89 ft	H2	Deep	170					24600				1650 U		1000												
	I		B26C61	122-124 ft	123 ft	H2	Deep	181									1650 U		1000												
	J	C8100	B2B1L6	0-1 ft	0.5 ft	BF	Shallow	219		244000							1830 U		1230 U											1770 BJ-	43900 NJ
	J		B2B1L7	0-1 ft	0.5 ft	BF	Shallow	178		239000							1880 U		1270 U							16.2 B				1560 B	41700 N
	J		B2C1M2	5.7-7.7 ft	4.9 ft	BF	Shallow	233									1920 U		1300 U											1280 B	5610 BN
	J		B2C1M3	15-19 ft	13.4 ft	BF	Shallow	2160	7890								1910 U		1290 U												6970 BN
J	J		B2C1M5	54-58 ft	38.8 ft	BF	Deep	160									1870 U		1260 U											3290	4580 BN
	J		B2C1M7	76-78 ft	54.3 ft	H1	Deep	152									1890 U		1270 U												
	J		B2C1M8	118-120 ft	90.1 ft	H2	Deep	162									989 U		1340 U												
	J		B2C1M9	168.6-170.6 ft	131.8 ft	H2	Deep	241									997 U		1350 U												
	J		B2C1N0	202-204 ft	157.7 ft	H2	Deep										996 U		1340 U												
	J		B2C1N1	222.8-224.8 ft	173.3 ft	H2	Deep						27400				3580 B		1350 U												
	L1	C7466	B215K8	0-1 ft	0.5 ft	BF	Shallow	175 U									3970 U						19800 U			40.6 U				1590 B	
	L1		B215K9	0-1 ft	0.5 ft	BF	Shallow	500 B									3710 U						18500 U			41.6 U				1590 B	
	L1		B20XW6	5-7 ft	6 ft	BF	Shallow	173 U									3940 U						19700 U			48.1 U				1390 B	
	L1		B20XW9	10-12 ft	11 ft	BF	Shallow	174 U									3950 U						19800 U			45 U				879 B	
	L1		B20XX2	14-16 ft	15 ft	BF	Shallow	156 U									3540 U						17700 U			40.7 U					
	L1		B20XX5	43.5-45.5 ft	44.5 ft	H1	Deep	151 U									3440 U						17200 U			39.2 U				1170 B	
	L1		B211W3	84-86 ft	85 ft	H2	Deep	198 B									3510 U						17500 U			41.2 U					
	L1		B211W6	109.5-111.5 ft	110.5 ft	H2	Deep	154 U									3500 U						17500 U			21 U		87800			
	L1		B211W9	114-116 ft	115 ft	H2	Deep	159 U									3620 U						18100 U			23 U		90300			
L1+L2	L1		B211X2	133-135 ft	134 ft	H2	Deep	161 U									3660 U						18300 U			25.1 U					
	L2	C7670	B23R25	0-1 ft	0.5 ft	BF	Shallow	286									2190 U														
	L2		B23KN7	0-1 ft	0.5 ft	BF	Shallow	267									2110 U														
	L2		B238J9	5-7 ft	6 ft	BF	Shallow										2090 U													955 B	
	L2		B25CN2	10-14 ft	12 ft	BF	Shallow										2450 B		1350 B											1130 B	
	L2		B23KP6	14-16 ft	15 ft	BF	Shallow										2260 B									17.1 B				1000 B	
	L2		B23KP9	39-41 ft	40 ft	H1	Deep										1990 U	20200 MJ												1450 B	
	L2		B23KR2	139-141 ft	140 ft	H2	Deep	169 C					22000		13800		2000 U														
	L2		B23KR5	163-165 ft	164 ft	H2	Deep	159 C					23500				1990 U														
	L2		B25ND7	220-224 ft	222 ft	H2	Deep	247					32200	27100			5120 B									68.1 B				1210 B	
	P	C6392	B1YT71	14-16 ft	15 ft	BF	Shallow	184 BJ									20200 U				1930000		101000 U			17.5 U	4760 CM			11600 M	
	P		B1YT74	19.5-21.5 ft	20.5 ft	H1	Deep	177 UJ									4030 U				1120000		20100 U			20.5 U				6990 M	
	P		B1YT77	25-27 ft	26 ft	H1	Deep	177 UJ									4010 U	30600 J					20100 U			22.1 U				1190 BM	
	P		B1YT80	42-44 ft	43 ft	H1	Deep	177 UJ									4030 U						20100 U								
	P		B1YT83	56-58 ft	57 ft	H2	Deep	165 UJ									3750 U						18700 U								
	P	C6394	B1VJ57A	36-38 ft	37 ft	H1	Deep	18100 UN	11200 BN		1690 B						9040 U		18100 U	933 BN	1620000	20800 BN					7410			9700	5430 U
	P		B1VJ57B	36-38 ft	37 ft	H1	Deep	17100 UN	10300 UN		881 B		19900		10300 B		8570 U		17100 U	857 UN	1530000	17100 UN					5140			5200	5140 U
	P		B1VJ57C	36-38 ft	37 ft	H1	Deep	17400 UN	10500 UN		1370 B				14100 B		8720 U		17400 U	872 UN	1430000	17400 UN					5430			10300	5230 U
	P		B1VJ63A	168-170 ft	169 ft	H2	Deep	17700 UN	10600 UN		1100 B		32700				8840 U		17700 U	884 UN		17700 UN									5300 U
	P		B1VJ63B	168-170 ft	169 ft	H2	Deep	17400 UN	10400 UN		1200 B		32600				8680 U	22400 B	17400 U	868 UN		17400 UN									5210 U
	P		B1VJ63C	168-170 ft	169 ft	H2	Deep	17100 UN	10300 UN		861 B		30600				8570 U	19600 B	17100 U	857 UN		17100 UN			72300						5140 U
	P	C6400	B1YTH1	5-7 ft	6 ft	BF	Shallow	167 U									3790 U						18900 U			19.2 B				9710	
	P		B1YTH3	10-12 ft	11 ft	BF	Shallow	167 U									3800 U						19000 U		305000					4710	
	P		B1YTH6	132-134.5 ft	133.25 ft	H2	Deep	164 U									3730 U						18600 U								
P	P	C6402	B20XV5	6-8 ft	7 ft	BF	Shallow	174 B									3680 U			207 B			18400 U								
	P		B20XV9	10-12 ft	11 ft	BF	Shallow	149 U									3860 U			208 B			19300 U							3210	

Table N-1. Soil Inorganic Results Reported Above Hanford Site Background

								Primary Analytes																						Secondary Analytes	
								Antimony	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Lead	Magnesium	Molybdenum	Nickel	Selenium	Silver	Sodium	Thallium	Uranium	Vanadium	Zinc	Mercury	Fluoride	Nitrate	Sulfate	Phosphate	Boron
								Hanford Site Background Value (ug/kg)																							
Grouping	Work Plan N	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/Deep	130	6470	132000	563	17200000	18500	22000	10200	7060000	470	19100	780	167	690000	185	3210	85100	67800	13	2810	52000	237000	785	3890
	P		B20XW3	14-16 ft	15 ft	H1	Shallow	164 U									3670 U			223 B			18400 U							3730	
	P	C6404	B1YT92	6-8 ft	7 ft	BF	Shallow	171 U									3880 U						19400 U							3100	
	P		B1YT98	14-17 ft	15.5 ft	BF	Deep	170 U									3870 U						19400 U			13.2 B				3360	
	P		B1YTB1	19.5-21.5 ft	20.5 ft	H1	Deep	173 U									3940 U				734000		19700 U							8890	
	P		B1YTB4	31-33 ft	32 ft	H1	Deep	166 U									3780 U				732000		18900 U							2450 B	
	P		B1YTB7	42-44 ft	43 ft	H2	Deep	169 U									3850 U			180 B	888000		19300 U				3870	143000 M		8630	
	P		B1YTC0	57-59 ft	58 ft	H2	Deep	165 U									3750 U	20500					18800 U								
	P	C6406	B1YTC9	5-7 ft	6 ft	BF	Shallow	168 U									3820 U						19100 U							2570 B	
	P		B1YTD2	10-12 ft	11 ft	BF	Shallow	367 B									3420 U						17100 U								
	P		B1YTD5	14-16 ft	15 ft	BF	Shallow	161 U					21800				3650 U						18300 U	110000 M						1300 B	
	P		B1YTD8	18-20 ft	19 ft	H1	Deep	150 U									3410 U						17100 U	95100 M						1220 B	
	P		B1YTF1	26-28 ft	27 ft	H1	Deep	153 U									3470 U						17400 U							916 B	
	P		B1YTF4	54.5-56.5 ft	55.5 ft	H2	Deep	150 U									3400 U						17000 U			13.6 U					
	P		B1YTF7	59-61 ft	60 ft	H2	Deep	166 U									3780 U	19300					18900 U								
	R	C7668	B23TK2	0-1 ft	0.5 ft	BF	Shallow	186 M			2480 B						2140 U					1220 C								2470 B	
	R		B23TK5	0-1 ft	0.5 ft	BF	Shallow	245 M			3020 B						2110 U					769 C				13.5 B				2960 B	
	R		B23TK8	5-7 ft	6 ft	BF	Shallow				3470 B						2090 U					714 C									
	R		B27130	10-14 ft	12 ft	BF	Shallow	161 M			2990 B						2180 U					703 C					3530			2790 BNJ	
R	R		B27131	14-18 ft	16 ft	BF	Deep				2970 B						2040 U					661 C								2320 BNJ	
	R		B23TM6	27-29 ft	28 ft	H1	Deep	303 M			3080 B						2230 U					667 C								2430	
	R		B25WM2	39-41 ft	40 ft	H1	Deep				1510 B						1980 U													1650 B	
	R		B25WM5	80-82 ft	81 ft	H2	Deep	144			1160 B						1990 U														
	R		B25WM8	132-134 ft	133 ft	H2	Deep	149			2120 B						1980 U														
	U	C7676	B26JK6	0-1 ft	0.5 ft	BF	Shallow	229									2380 B		1000											1640 BNJ	6420 B
	U		B26JK7	0-1 ft	0.5 ft	BF	Shallow	215									1960 U		1000							20.6 B				1550 BN	
	U		B29612	5-9 ft	7 ft	BF	Shallow	291	7000								2530 B		2000												
U	U		B26CC4	10-12 ft	11 ft	BF	Shallow	151									1980 U		1000											1260 BN	
	U		B29613	14-18 ft	16 ft	BF	Deep	139	20000								1970 U		800											936 BN	
	U		B26CD0	38-40 ft	39 ft	BF	Deep										1660 U		1000												
	U		B26CD2	128-130 ft	129 ft	H2	Deep	300 U									1650 U		800									71600			
	U		B26CD4	157-159 ft	158 ft	H2	Deep	300 U					44500				1880 B	29400	800												

Gray shading denotes reported NONDETECT result

Table N-2. Soil Radionuclide Results Reported Above Hanford Site Radiological Background

								Primary Analytes											Secondary	
								Cesium-137*	Cobalt-60	Europium-154	Europium-155	Plutonium-238	Plutonium-239/240	Strontium-90*	Thorium-232	Uranium-234	Uranium-235	Uranium-238	Potassium-40	Radium-226
								Hanford Site Radiological Background Value (pCi/g)												
Grouping	Work Plan Name	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	allow/De	1.1	0.0084	0.033	0.054	0.0038	0.025	0.18	1.3	1.1	0.11	1.1	17	0.82
	A	C8102	B2B1L8	0-1 ft	0.5 ft	BF	Shallow	4.37	0.079 U	0.14 U	0.263 U	0.0261 U	0.0279 U	17.4 X						
	A		B2B1L9	0-1 ft	0.5 ft	BF	Shallow	4.17	0.139 U	0.194 U	0.348 U	0.0356 U	0.0357 U	24 J						3.74
	A		B2D1X2	5.7-9.7 ft	6.8 ft	BF	Shallow		0.129 U	0.156 U	0.305 U	0.038 U	0.0538 U	0.648 U						4.92
	A		B2D1X4	11.5-15.5 ft	11.3 ft	BF	Shallow		0.102 U	0.155 U	0.287 U	0.0292 U	0.0492 U							4.91
	A		B2D1X5	16.1-18.1 ft	14.1 ft	BF	Shallow		0.15 U	0.215 U	0.378 U	0.0447 U	0.0459 U	0.266 U						5.61
	A		B2D1X6	65-67 ft	46.8 ft	H1	Deep		0.0922 U	0.126 U	0.237 U	0.035 U	0.0498 U	0.183 U						3.58
	A		B2D1X7	96-98 ft	69.73 ft	H2	Deep		0.0825 U	0.0968 U	0.187 U	0.0341 U	0.0479 U	0.324 U						6.98 B
	A		B2D1X8	155-157 ft	118.7 ft	H2	Deep		0.157 U	0.173 U	0.366 U	0.0397 U	0.0399 U							5.74 B
	A		B2D1X9	188-190 ft	144.9ft	H2	Deep		0.103 U	0.131 U	0.235 U	0.0385 U	0.0368 U							6.01 B
A+B	A		B2D1Y0	221-223 ft	169.7 ft	H2	Deep		0.0712 U	0.0775 U	0.162 U	0.0376 U	0.0472 U	0.537 U						5.84 B
	B	C8104	B2FPF1	0.5-1 ft	0.5 ft	BF	Shallow	27.7	0.0832 U	0.226 U	0.213 U	0.022 U	0.313	8.12 B						
	B		B2FPF2	0.5-1 ft	0.5 ft	BF	Shallow	22.7	0.1 U	0.305 U		0.0434 U	0.198	11.8 B						
	B		B2FB27	5.7-7.7 ft	5.1 ft	BF	Shallow			0.039 U	0.14 U	0.0284 U	0.0371 U	0.415 U					23	
	B		B2FB29	11.5-15.5 ft	11.1 ft	BF	Shallow			0.035 U	0.12 U	0.0401 U	0.043 U	0.496 U					21	
	B		B2FB30	16.1-18.1 ft	14.2 ft	BF	Shallow		0.023 U		0.267 U	0.0371 U	0.0433 U	0.586 U					25	0.96
	B		B2FB31	41-43 ft	36.0 ft	BF	Deep		0.02 U		0.064 U	0.0363 U	0.0419 U	0.499 U						0.98
	B		B2FB32	93-95 ft	81.4 ft	H2	Deep		0.0097 U		0.093 U	0.0388 U	0.0387 U						31	0.96
	B		B2FB33	117-119 ft	102.11 ft	H2	Deep		0.03		0.062 U	0.0317 U	0.0329 U	0.555 U					20	0.97
	B		B2FB34	157-159 ft	137.0 ft	H2	Deep				0.071 U	0.0526 U	0.0409 U	0.478 U					22	
	C1	C8106	B2FPR7	1-1.5 ft	0.5 ft	H1	Shallow	4.62	0.114 U	0.306 U	0.265 U	0.0397 U	0.0506 U	2.11						
	C1		B2FPR8	1-1.5 ft	0.5 ft	H1	Shallow	7.09	0.0845 U	0.3 U	0.19 U	0.0421 U	0.0483 U	3						
	C1		B2FYM3	11-13 ft	6.5 ft	H1	Shallow		0.098 U	0.26 U	0.321 U	0.0368 U	0.0309 U	0.562 U						
	C1		B2FYM4	19-21 ft	11.5 ft	H1	Shallow		0.107 U	0.235 U	0.248 U	0.036 U	0.0416 U	0.184 U						
C	C1		B2FYM5	27-29 ft	16.5 ft	H1	Deep		0.0614 U	0.323 U	0.263 U	0.0356 U	0.0496 U	0.186						
	C1		B2FYM6	64-66 ft	45.6 ft	H1	Deep		0.116 U	0.263 U	0.356 U	0.0415 U	0.0386 U	0.597 U						
	C1		B2FYM7	90-92 ft	57.3 ft	H1	Deep		0.134 U	0.411 U	0.347 U	0.0262 U	0.0383 U	0.203 U						
	C1		B2FYM8	132-134 ft	75.5 ft	H1	Deep		0.119 U	0.314 U	0.211 U	0.0334 U	0.0674 U	0.208 U						
	C1		B2FYM9	161.5-163.5 ft	87.8 ft	H2	Deep		0.13 U	0.363 U	0.303 U	0.0235 U	0.0522 U							
	E	C7672	B26JK2	0-1 ft	0.5 ft	BF	Shallow	5.13	0.366 U	1.1 U	0.582 U	0.345 U	0.345 U	2.5						
	E		B26JK3	0-1 ft	0.5 ft	BF	Shallow	3.83	0.308 U	0.981 U	0.504 U	0.322 U	0.322 U	2.34						
	E		B26C68	5-7 ft	6 ft	BF	Shallow		0.384 U	1.24 U	0.638 U	0.397 U	0.397 U	0.669 U						
	E		B26C70	10-12 ft	11 ft	BF	Shallow		0.342 U	1.08 U	0.607 U	0.273 U	0.273 U	0.217 U						
E	E		B26C74	14-16 ft	15 ft	BF	Shallow		0.322 U	0.989 U	0.529 U	0.372 U	0.372 U	0.246 U						
	E		B26C76	37-39 ft	38 ft	BF	Deep		0.304 U	0.953 U	0.484 U	0.336 U	0.336 U	0.183 U						
	E		B26C78	73-75 ft	74 ft	H2	Deep		0.349 U	1.11 U	0.56 U	0.324 U	0.324 U	0.226 U						
	E		B26C80	83-85 ft	84 ft	H2	Deep		0.326 U	0.981 U	0.554 U	0.305 U	0.305 U	0.879 U					17.6	
	E		B26C82	122-124 ft	123 ft	H2	Deep		0.305 U	0.95 U	0.495 U	0.316 U	0.316 U	0.647 U						
	F	C7472	B236N5	0-1 ft	0.5 ft	H1	Shallow	1.74	0.242 U	0.811 U	0.435 U	0.361 U	0.361 U	0.3						
	F		B236N8	0-1 ft	0.5 ft	H1	Shallow	2.07	0.285 U	0.82 U	0.455 U	0.337 U	0.337 U	0.75 U						
	F		B236P2	5-7 ft	6 ft	H1	Shallow		0.284 U	0.876 U	0.468 U	0.243 U	0.243 U	0.753 U						
	F		B23KT4	10-14 ft	12 ft	H1	Shallow		0.29 U	0.934 U	0.482 U	0.319 U	0.319 U	0.226 U						
	F		B238H1	14-16 ft	15 ft	H1	Shallow		0.355 U	1.02 U	0.524 U	0.299 U	0.299 U	0.295						
	F		B238H4	108.5-110.5 ft	109.5 ft	H2	Deep		0.333 U	1.07 U	0.546 U	0.245 U	0.245 U	0.63 U						
	F		B238H7	129-131 ft	130 ft	H2	Deep		0.33 U	0.991 U	0.531 U	0.2 U	0.2 U	0.182 U						
	F		B238J0	142-144 ft	143 ft	H2	Deep		0.331 U	1.06 U	0.538 U	0.271 U	0.271 U	0.185 U						
	F		B238J3	158-160 ft	159 ft	H2	Deep		0.298 U	1 U	0.485 U	0.229 U	0.229 U	0.196 U						
	F		B238J6	195-197 ft	196 ft	H2	Deep		0.297 U	0.934 U	0.453 U	0.269 U	0.269 U	0.188 U						
F+G	F		B238K3	216-218 ft	217 ft	H2	Deep		0.261 U	0.806 U	0.431 U	0.288 U	0.288 U	0.19 U						

Table N-2. Soil Radionuclide Results Reported Above Hanford Site Radiological Background

								Primary Analytes											Secondary	
								Cesium-137*	Cobalt-60	Europium-154	Europium-155	Plutonium-238	Plutonium-239/240	Strontium-90*	Thorium-232	Uranium-234	Uranium-235	Uranium-238	Potassium-40	Radium-226
								Hanford Site Radiological Background Value (pCi/g)												
Grouping	Work Plan Name	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	allow/De	1.1	0.0084	0.033	0.054	0.0038	0.025	0.18	1.3	1.1	0.11	1.1	17	0.82
	G	C7468	B215L0	0-1 ft	0.5 ft	BF	Shallow	4.75	0.269 U	0.935 U	0.479 U	0.587 UJ	0.587 UJ	1.99 UJ						
	G		B215L1	0-1 ft	0.5 ft	BF	Shallow	1.31	0.258 U	0.877 U	0.467 U	0.625 UJ	0.625 UJ	2.47 UJ						
	G		B211Y3	5-7 ft	6 ft	BF	Shallow		0.298 U	0.88 U	0.487 U	0.562 UJ	0.562 UJ	4.06 UJ						
	G		B211Y6	10-12 ft	11 ft	BF	Shallow		0.283 U	0.969 U	0.483 U	0.544 UJ	0.544 UJ	3.64 UJ						
	G		B211Y9	14-16 ft	15 ft	BF	Shallow		0.243 U	0.817 U	0.424 U	0.673 UJ	0.673 UJ	3.71 UJ						
	G		B21202	43.5-45.5 ft	44.5 ft	H1	Deep	0.555	0.297 U	1.01 U	0.54 U	0.546 UJ	0.546 UJ	1.95 UJ						
	G		B21205	92-94 ft	93 ft	H2	Deep		0.342 U	0.996 U	0.529 U	0.564 UJ	0.564 UJ	1.84 UJ						
	G		B21208	97-99 ft	98 ft	H2	Deep		0.411 U	1.09 U	0.586 U	0.596 UJ	0.596 UJ	2.31 J						
	G		B21211	125-127 ft	126 ft	H2	Deep		0.206 U	0.641 U	0.395 U	0.673 UJ	0.673 UJ	2.02 UJ					19.1	
	G		B21214	135-137 ft	136 ft	H2	Deep		0.241 U	0.759 U	0.443 U	0.58 UJ	0.58 UJ	1.86 UJ						
	H	C7680	B26JK8	0-1 ft	0.5 ft	H1	Shallow		0.318 U	1.02 U	0.496 U	0.307 U	0.307 U	0.187 U						
	H		B26JK9	0-1 ft	0.5 ft	H1	Shallow		0.277 U	0.894 U	0.463 U	0.313 U	0.313 U	0.212 U						
	H		B26C26	5-7 ft	6 ft	H1	Shallow		0.439 U	1.46 U	0.724 U	0.287 U	0.287 U	0.567 U						
	H		B26C28	10-12 ft	11 ft	H1	Shallow		0.299 U	1.04 U	0.499 U	0.322 U	0.322 U	0.241 U						
	H		B26C30	14-16 ft	15 ft	H1	Shallow		0.354 U	1.22 U	0.593 U	0.34 U	0.34 U	0.188 U						
	H		B26C32	17-19 ft	18 ft	H1	Deep		0.413 U	1.28 U	0.665 U	0.305 U	0.305 U	0.569 U						
	H		B26C34	43-45 ft	44 ft	H1	Deep		0.298 U	0.974 U	0.552 U	0.289 U	0.289 U	0.558 U						
	H		B26C36	92-94 ft	93 ft	H2	Deep		0.336 U	1.07 U	0.552 U	0.337 U	0.337 U	0.199 U						
	H		B26C38	116-118 ft	117 ft	H2	Deep		0.313 U	0.972 U	0.48 U	0.292 U	0.292 U	0.273 U						
H+I	H		B26C40	142-144 ft	143 ft	H2	Deep		0.304 U	0.884 U	0.477 U	0.335 U	0.335 U	0.208 U						
	I	C7682	B26JL0	0-1 ft	0.5 ft	H1	Shallow		0.411 U	1.22 U	1.03 U	0.298 U	0.298 U	0.62 U					20	
	I		B26JL1	0-1 ft	0.5 ft	H1	Shallow		0.446 U	1.29 U	1.15 U	0.259 U	0.259 U	0.205 U						
	I		B26C47	5-7 ft	6 ft	H1	Shallow		0.403 U	1.24 U	1.03 U	0.292 U	0.292 U	0.182 U						
	I		B26C51	12-14 ft	13 ft	H1	Shallow		0.366 U	1.29 U	0.987 U	0.354 U	0.354 U	0.188 U						
	I		B26C53	14-16 ft	15 ft	H1	Shallow		0.413 U	1.34 U	1.01 U	0.331 U	0.331 U	0.184 U						
	I		B26C55	18-20 ft	19 ft	H1	Deep		0.395 U	1.21 U	1 U	0.318 U	0.318 U	0.192 U						
	I		B26C57	45-47 ft	46 ft	H1	Deep		0.413 U	1.2 U	0.981 U	0.399 U	0.399 U	0.188 U						
	I		B26C59	88-90 ft	89 ft	H2	Deep		0.395 U	1.38 U	1.03 U	0.467 U	0.467 U	0.713 U					18.8	
	I		B26C61	122-124 ft	123 ft	H2	Deep		0.413 U	1.35 U	1.01 U	0.409 U	0.409 U	0.651 U						
	J	C8100	B2B1L6	0-1 ft	0.5 ft	BF	Shallow	4.84	0.0847 U	0.15 U	0.29 U	0.0404 U	0.0378	3.95						1.88
	J		B2B1L7	0-1 ft	0.5 ft	BF	Shallow	5.71	0.101 U	0.159 U	0.306 U	0.0666	0.0454 U	4.01						1.91
	J		B2C1M2	5.7-7.7 ft	4.9 ft	BF	Shallow		0.0958 U	0.143 U	0.275 U	0.0298 U	0.0317 U	0.754 U						
	J		B2C1M3	15-19 ft	13.4 ft	BF	Shallow		0.0932 U	0.145 U	0.267 U	0.0384 U	0.0402 U	0.686 U						
J	J		B2C1M5	54-58 ft	38.8 ft	BF	Deep		0.0884 U	0.165 U	0.313 U	0.0357 U	0.0418 U	0.502 U						
	J		B2C1M7	76-78 ft	54.3 ft	H1	Deep		0.0952 U	0.137 U	0.279 U	0.0228 U	0.0289 U	0.719 U						
	J		B2C1M8	118-120 ft	90.1 ft	H2	Deep		0.0936 U	0.139 U	0.269 U	0.0323 U	0.0373 U	0.887 U					17.4	
	J		B2C1M9	168.6-170.6 ft	131.8 ft	H2	Deep		0.0795 U	0.122 U	0.267 U	0.0294 U	0.0327 U	0.258 U						
	J		B2C1N0	202-204 ft	157.7 ft	H2	Deep		0.0818 U	0.128 U	0.24 U	0.0216 U		0.247 U						
	J		B2C1N1	222.8-224.8 ft	173.3 ft	H2	Deep		0.0858 U	0.131 U	0.249 U	0.0288 U	0.0439	0.735 U						1.39 U
	L1	C7466	B215K8	0-1 ft	0.5 ft	BF	Shallow		0.175 U	0.562 U	0.371 U	0.583 UJ	0.583 UJ	1.83 UJ						
	L1		B215K9	0-1 ft	0.5 ft	BF	Shallow	2.46	0.162 U	0.539 U	0.339 U	0.651 UJ	0.651 UJ	4.01 J						
	L1		B20XW6	5-7 ft	6 ft	BF	Shallow	0.444	0.184 U	0.631 U	0.384 U	0.602 UJ	0.602 UJ	2.97 UJ						
	L1		B20XW9	10-12 ft	11 ft	BF	Shallow		0.21 U	0.679 U	0.418 U	0.611 UJ	0.611 UJ	1.78 UJ						
	L1		B20XX2	14-16 ft	15 ft	BF	Shallow		0.191 U	0.607 U	0.379 U	0.673 UJ	0.673 UJ	1.82 UJ						
	L1		B20XX5	43.5-45.5 ft	44.5 ft	H1	Deep		0.39 U	1.31 U	0.816 U	0.619 UJ	0.619 UJ	1.87 UJ						
	L1		B211W3	84-86 ft	85 ft	H2	Deep					0.572 UJ	0.572 UJ	3.18 UJ						
	L1		B211W5	84-86 ft	85 ft	H2	Deep		0.436 U	1.37 U	0.85 U									
	L1		B211W6	109.5-111.5 ft	110.5 ft	H2	Deep		0.497 U	1.25 U	0.811 U	0.613 UJ	0.613 UJ	2.88 UJ						

Table N-2. Soil Radionuclide Results Reported Above Hanford Site Radiological Background

								Primary Analytes											Secondary	
								Cesium-137*	Cobalt-60	Europium-154	Europium-155	Plutonium-238	Plutonium-239/240	Strontium-90*	Thorium-232	Uranium-234	Uranium-235	Uranium-238	Potassium-40	Radium-226
								Hanford Site Radiological Background Value (pCi/g)												
Grouping	**Work Plan Name**	**WELL_NAME**	**SAMP_NUM**	**depth range**	**midpoint depth**	**Strata**	**allow/De**	**1.1**	**0.0084**	**0.033**	**0.054**	**0.0038**	**0.025**	**0.18**	**1.3**	**1.1**	**0.11**	**1.1**	**17**	**0.82**
L1+L2	L1		B211W9	114-116 ft	115 ft	H2	Deep		0.49 U	1.48 U	0.861 U	0.659 UJ	0.659 UJ	1.83 UJ						
	L1		B211X2	133-135 ft	134 ft	H2	Deep		0.415 U	1.28 U	0.74 U	0.677 UJ	0.677 UJ	3.06 UJ						
	L2	C7670	B23KN7	0-1 ft	0.5 ft	BF	Shallow	5.4	0.354 U	1.1 U	0.591 U	0.247 U	0.247 U	1.45						
	L2		B23R25	0-1 ft	0.5 ft	BF	Shallow	7.52	0.333 U	1.02 U	0.572 U	0.278 U	0.278 U	1.34						
	L2		B238J9	5-7 ft	6 ft	BF	Shallow		0.303 U	0.871 U	0.451 U	0.227 U	0.227 U	0.117						
	L2		B25CN2	10-14 ft	12 ft	BF	Shallow		0.234 U	0.819 U	0.431 U	0.238 U	0.238 U	0.29 U						
	L2		B23KP6	14-16 ft	15 ft	BF	Shallow		0.257 U	0.836 U	0.446 U	0.259 U	0.259 U	0.342 U						
	L2		B23KP9	39-41 ft	40 ft	H1	Deep		0.376 U	1.19 U	0.628 U	0.252 U	0.252 U	0.338 U						
	L2		B23KR2	139-141 ft	140 ft	H2	Deep		0.298 U	0.956 U	0.503 U	0.214 U	0.214 U	0.468 U						
	L2		B23KR5	163-165 ft	164 ft	H2	Deep		0.243 U	0.851 U	0.427 U	0.199 U	0.199 U	0.492 U						
	L2		B25ND7	220-224 ft	222 ft	H2	Deep		0.274 U	0.896 U	0.47 U	0.229 U	0.229 U	0.64 U						
P	P	C6392	B1YT71	14-16 ft	15 ft	BF	Shallow	73.1	0.833	0.885 U	0.781 U	1.1 UJ	10.7 J	120 J						
	P		B1YT74	19.5-21.5 ft	20.5 ft	H1	Deep	6.31	0.626	2.28	0.81	0.677 UJ	0.677 UJ	23.7 J						
	P		B1YT77	25-27 ft	26 ft	H1	Deep	1.31	0.26 U	0.867 U	0.511 U	0.615 UJ	0.615 UJ	3.88 J						
	P		B1YT80	42-44 ft	43 ft	H1	Deep	1.64	0.438 U	1.38 U	1.04 U	0.582 UJ	0.582 UJ	6.68 J						
	P		B1YT83	56-58 ft	57 ft	H2	Deep		0.396 U	1.44 U	1.05 U	0.699 UJ	0.699 UJ	4.92 J					19.4	
	P	C6394	B1VJ57A	36-38 ft	37 ft	H1	Deep		0.519	0.908 U	0.534 U						0.324 U			5.28 U
	P		B1VJ57B	36-38 ft	37 ft	H1	Deep		0.536	0.968 U	0.559 U						0.339 U			5.6 U
	P		B1VJ57C	36-38 ft	37 ft	H1	Deep		0.383	0.925 U	0.462 U						0.297 U			4.9 U
	P		B1VJ63A	168-170 ft	169 ft	H2	Deep		0.309 U	0.961 U	0.491 U						0.308 U			5.08 U
	P		B1VJ63B	168-170 ft	169 ft	H2	Deep		0.294 U	1.02 U	0.527 U						0.318 U			5.24 U
	P		B1VJ63C	168-170 ft	169 ft	H2	Deep		0.299 U	1.05 U	0.52 U						0.32 U			5.23 U
	P	C6400	B1YTH1	5-7 ft	6 ft	BF	Shallow	0.983	0.207 U	0.694 U	0.428 U	0.57 U	0.57 U	2.2						
	P		B1YTH3	10-12 ft	11 ft	BF	Shallow	0.332	0.204 U	0.631 U	0.42 U	0.569 U	0.569 U			1.39				
	P		B1YTH6	132-134.5 ft	133.25 ft	H2	Deep		0.233 U	0.784 U	0.486 U	0.67 U	0.67 U						17.6	
	P	C6402	B20XV5	6-8 ft	7 ft	BF	Shallow	30.8	3.13 U	8.57 U	6.7 U	1.11 U	1.11 U	86.6 X						
	P		B20XV9	10-12 ft	11 ft	BF	Shallow	19.1	0.2 U	0.683 U	0.506 U	0.632 U	0.632 U	67.5 X						
	P		B20XW3	14-16 ft	15 ft	H1	Shallow	15.5	0.742 U	2.05 U	1.18 U	0.595 U	0.595 U	73.4 X						
	P	C6404	B1YT92	6-8 ft	7 ft	BF	Shallow	35	0.662 U	1.92 U	1.26 U	0.75 U	0.75 U	52.8						
	P		B1YT93	10-12 ft	11 ft	BF	Shallow					1.47 U	1.47 U	141						
	P		B1YT98	14-17 ft	15.5 ft	BF	Deep	6.07	0.714 U	2.1 U	1.16 U	0.614 U	0.614 U	53.7						
	P		B1YTB1	19.5-21.5 ft	20.5 ft	H1	Deep		0.343 U	1.06 U	0.54 U	0.663 U	0.663 U							
	P		B1YTB4	31-33 ft	32 ft	H1	Deep		0.364 U	0.906 U	0.503 U	0.664 U	0.664 U	1.89						
	P		B1YTB7	42-44 ft	43 ft	H2	Deep		0.402 U	1.21 U	0.63 U	0.669 U	0.669 U			2.76		2.15		
	P		B1YTC0	57-59 ft	58 ft	H2	Deep		0.388 U	1.1 U	0.543 U	0.667 U	0.667 U	2.73						
	P	C6406	B1YTC9	5-7 ft	6 ft	BF	Shallow	3.01 U	2.68 U	8.1 U	5.44 U	0.636 U	0.636 U	12.8						
	P		B1YTD2	10-12 ft	11 ft	BF	Shallow	3.08 U	3 U	9.45 U	6.05 U	1.48 U	1.48 U							
	P		B1YTD5	14-16 ft	15 ft	BF	Shallow		0.43 U	1.21 U	1.05 U	0.691 U	0.691 U							
	P		B1YTD8	18-20 ft	19 ft	H1	Deep		0.465 U	1.36 U	1.05 U	0.522 U	0.522 U							
	P		B1YTF1	26-28 ft	27 ft	H1	Deep		0.349 U	1.03 U	0.913 U	0.584 U	0.584 U	3.29 B						
	P		B1YTF4	54.5-56.5 ft	55.5 ft	H2	Deep		0.473 U	1.31 U	1.08 U	0.595 U	0.595 U							
	P		B1YTF7	59-61 ft	60 ft	H2	Deep		0.414 U	1.26 U	1.11 U	0.718 U	0.718 U							
R	R	C7668	B23TK2	0-1 ft	0.5 ft	BF	Shallow		0.337 U	0.992 U	0.554 U	0.372 U	0.372 U	1.19 U						
	R		B23TK5	0-1 ft	0.5 ft	BF	Shallow		0.329 U	0.893 U	0.494 U	0.286 U	0.286 U	0.371						
	R		B27131	14-18 ft	16 ft	BF	Deep		0.271 U	0.847 U	0.444 U	0.313 U	0.313 U							
	R		B23TM6	27-29 ft	28 ft	H1	Deep		0.293 U	0.865 U	0.43 U	0.214 U	0.214 U							
	R		B25WM2	39-41 ft	40 ft	H1	Deep		0.296 U	1.03 U	0.488 U	0.321 U	0.321 U							
	R		B25WM5	80-82 ft	81 ft	H2	Deep		0.27 U	0.929 U	0.474 U	0.313 U	0.313 U						18.1	

Table N-2. Soil Radionuclide Results Reported Above Hanford Site Radiological Background

								Primary Analytes											Secondary	
								Cesium-137*	Cobalt-60	Europium-154	Europium-155	Plutonium-238	Plutonium-239/240	Strontium-90*	Thorium-232	Uranium-234	Uranium-235	Uranium-238	Potassium-40	Radium-226
								Hanford Site Radiological Background Value (pCi/g)												
Grouping	**Work Plan Name**	**WELL_NAME**	**SAMP_NUM**	**depth range**	**midpoint depth**	**Strata**	**allow/De**	**1.1**	**0.0084**	**0.033**	**0.054**	**0.0038**	**0.025**	**0.18**	**1.3**	**1.1**	**0.11**	**1.1**	**17**	**0.82**
	R		B25WM8	132-134 ft	133 ft	H2	Deep		0.297 U	0.939 U	0.549 U	0.27 U	0.27 U							
U	U	C7676	B26JK6	0-1 ft	0.5 ft	BF	Shallow	2.06	0.338 U	1.05 U	0.92 U	0.281 U	0.281 U	3.38						
	U		B26JK7	0-1 ft	0.5 ft	BF	Shallow	1.8	0.344 U	1.09 U	0.917 U	0.433 U	0.433 U	4.2						
	U		B29612	5-9 ft	7 ft	BF	Shallow		0.42 U	1.18 U	1.03 U	0.296 U	0.296 U							
	U		B26CC4	10-12 ft	11 ft	BF	Shallow		0.365 U	1.2 U	1.07 U	0.278 U	0.278 U							
	U		B29613	14-18 ft	16 ft	BF	Deep		0.362 U	1.04 U	0.947 U	0.33 U	0.33 U		1.8					
	U		B26CD0	38-40 ft	39 ft	BF	Deep		0.371 U	1.15 U	0.976 U	0.329 U	0.329 U							
	U		B26CD2	128-130 ft	129 ft	H2	Deep		0.463 U	1.49 U	1.19 U	0.359 U	0.359 U							
	U		B26CD4	157-159 ft	158 ft	H2	Deep		0.346 U	1.17 U	0.898 U	0.365 U	0.365 U						21.7	

Gray shading denotes reported NONDETECT result

Table N-3. Detected Organic Results (ug/kg) by Location and Depth

								Primary Analytes (ug/kg)									Eliminated Analytes (ug/kg)																					
								PEST/PCB					SVOA				SVOA		VOA																		GENORG	
Grouping	Work Plan Name	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/D	Aldrin	Aroclor-1254	Aroclor-1260	beta-1,2,3,4,5,6-Hexachlorocyclohexane (beta-BHC)	Gamma-BHC (Lindane)	Bis(2-ethylhexyl) phthalate	Butylbenzylphthalate	Di-n-butylphthalate	Di-n-octylphthalate	Ethylene glycol	n-Heptane	(m+p)-Xylene	1,1-Dichloroethene	1-Butanol	2-Butanone	2-Hexanone	2-Pentanone	3-Heptanone	4-Methyl-2-pentanone	Acetone	Benzene	Carbon disulfide	Hexane	Methylene chloride	o-Xylene	Styrene	Tetrahydrofuran	Toluene	Trichloromonofluoromethane	Xylenes (total)	Total petroleum hydrocarbons - diesel range	Total petroleum hydrocarbons - gasoline range
	A		B2B1L9	0-1 ft	0.5 ft	BF	Shallow		6.46 J																													
	A		B2D1X4	11.5-15.5 ft	11.4 ft	BF	Shallow									109 J																						
	A	C8102	B2D1X8	155-157 ft	118.7 ft	H2	Deep											210 BJN																				
	A		B2D1X9	188-190 ft	144.9 ft	H2	Deep											250 BJN																				
	A		B2D1Y0	221-223 ft	169.7 ft	H2	Deep											340 BJN																				
	B		B2FPF1	0.5-1 ft	0.5 ft	BF	Shallow		8.59 J																													
	B	C8104	B2FPF2	0.5-1 ft	0.5 ft	BF	Shallow		8.33 J																													
A+B	B		B2FB29	11.5-15.5 ft	11.1 ft	BF	Shallow									300 J																						
C	C1	C8106	B2FPR8	1-1.5 ft	0.5 ft	H1	Shallow							80.7 J																								
	E		B26JK2	0-1 ft	0.5 ft	BF	Shallow							124 BJ																								
	E		B26JL2	0-1 ft	0.5 ft	BF	Shallow																											0.232 J				
	E		B26JL3	0-1 ft	0.5 ft	BF	Shallow																											0.211 J				
	E		B26C68	5-7 ft	6 ft	BF	Shallow							123 BJ																								
	E		B26C69	5-7 ft	6 ft	BF	Shallow																			4.14 J								0.236 J				
	E		B26C70	10-12 ft	11 ft	BF	Shallow	2																														
	E	C7672	B26C71	10-12 ft	11 ft	BF	Shallow																			6.63 J								0.337 J				
	E		B26C74	14-16 ft	15 ft	BF	Shallow							121 BJ																								
	E		B26C75	14-16 ft	15 ft	BF	Shallow																			4.83 J								0.284 J				
	E		B26C76	37-39 ft	38 ft	BF	Deep							125 BJ																								
	E		B26C78	73-75 ft	74 ft	H2	Deep							110 BJ																								
	E		B26C79	73-75 ft	74 ft	H2	Deep															6.58 BJT												0.734 BJ				
	E		B26C81	83-85 ft	84 ft	H2	Deep																										0.784 BJ	0.402 BJ				
E	E		B26C83	122-124 ft	123 ft	H2	Deep																			5.41 J								0.559 BJ				
	F		B236P2	5-7 ft	6 ft	H1	Shallow							48.8 J																								
	F		B236P4	5-7 ft	6 ft	H1	Deep												0.334 J												0.128 J			0.978		0.463 J		
	F		B236P7	10-12 ft	11 ft	H1	Shallow															2.5 J												0.246 J				
	F		B23KT4	10-14 ft	12 ft	H1	Shallow						667 J																									
	F		B238H1	14-16 ft	15 ft	H1	Shallow							72.6 J																								
	F		B238H3	14-16 ft	15 ft	H1	Shallow															2.47 J												0.238 J				
	F	C7472	B238H6	108.5-110.5 ft	109.5 ft	H2	Deep															2.22 J				2.04 J								0.223 J				
	F		B238H9	129-131 ft	130 ft	H2	Deep															2.55 J				2.03 J								0.233 J				
	F		B238J2	142-144 ft	143 ft	H2	Deep																											0.202 J				
	F		B238J5	158-160 ft	159 ft	H2	Deep																											0.161 J				
	F		B238J8	195-197 ft	196 ft	H2	Deep																											0.215 J				
	F		B23K86	216-218 ft	217 ft	H2	Deep															3.18 J	4.24 BJ											0.278 J				
	G		B21221	0-1 ft	0.5 ft	BF	Shallow																						5.53 J	2 BJ								
	G		B21222	0-1 ft	0.5 ft	BF	Shallow																						2.28 J	2 BJ		0.311 J						
	G		B215L0	0-1 ft	0.5 ft	BF	Shallow				25.2 XJ																											
	G		B215L1	0-1 ft	0.5 ft	BF	Shallow				22.4 XJ																											
	G		B211Y3	5-7 ft	6 ft	BF	Shallow				25.3 XJ		1790 J																									
	G		B211Y5	5-7 ft	6 ft	BF	Shallow																						2.46 JJ	2 BJ		0.654 J						
	G		B211Y6	10-12 ft	11 ft	BF	Shallow			20.6	21.3 XJ		2840 J																									
	G		B211Y8	10-12 ft	11 ft	BF	Shallow																						2.12 J	2 BJ		0.245 J						
	G		B211Y9	14-16 ft	15 ft	BF	Shallow				23.2 XJ	5.1 XJ	7420																									
	G	C7468	B21201	14-16 ft	15 ft	BF	Shallow																						35.9 J			0.251 J						
	G		B21202	43.5-45.5 ft	44.5 ft	H1	Deep						746 J																									
	G		B21204	43.5-45.5 ft	44.5 ft	H1	Deep																						15.6 J	2 BJ		0.32 J						
	G		B21205	92-94 ft	93 ft	H2	Deep						2930 J																									
	G		B21207	92-94 ft	93 ft	H2	Deep																						8.89 J	2 BJ								
	G		B21210	97-99 ft	98 ft	H2	Deep																						4.83 J	2 BJ								
	G		B21211	125-127 ft	126 ft	H2	Deep						714 J																									
	G		B21213	125-127 ft	126 ft	H2	Deep																						27.3 J									
	G		B21214	135-137 ft	136 ft	H2	Deep						1770 J																									
F+G	G		B21216	135-137 ft	136 ft	H2	Deep																						18.1 J	2.8 B		0.609 J						
	H		B26JK9	0-1 ft	0.5 ft	H1	Shallow								570 J																							
	H		B26JL8	0-1 ft	0.5 ft	H1	Shallow																									0.308 BJ		0.267 BJ				
	H		B26JL9	0-1 ft	0.5 ft	H1	Shallow																											0.258 BJ				
	H		B26C27	5-7 ft	6 ft	H1	Deep																									0.333 BJ		0.387 BJ				
	H		B26C31	14-16 ft	15 ft	H1	Shallow																									0.273 BJ		0.601 BJ				
	H	C7680	B26C33	17-19 ft	18 ft	H1	Deep																									0.354 BJ		0.421 BJ				
	H		B26C35	43-45 ft	44 ft	H1	Deep																									0.34 BJ		0.374 BJ				
	H		B26C36	92-94 ft	93 ft	H2	Deep						1010 J																									
	H		B26C38	116-118 ft	117 ft	H2	Deep						5620 J																									

								Primary Analytes (ug/kg)									Eliminated Analytes (ug/kg)																				
								PEST/PCB					SVOA				SVOA		VOA																	GENORG	
Grouping	Work Plan Name	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/D	Aldrin	Aroclor-1254	Aroclor-1260	beta-1,2,3,4,5,6-Hexachlorocyclohexane (beta-BHC)	Gamma-BHC (Lindane)	Bis(2-ethylhexyl) phthalate	Butylbenzylphthalate	Di-n-butylphthalate	Di-n-octylphthalate	Ethylene glycol	n-Heptane	(m+p)-Xylene	1,1-Dichloroethene	1-Butanol	2-Butanone	2-Hexanone	2-Pentanone	3-Heptanone	4-Methyl-2-pentanone	Acetone	Benzene	Carbon disulfide	Hexane	Methylene chloride	o-Xylene	Styrene	Tetrahydrofuran	Toluene	Trichloromonofluoromethane	Xylenes (total)	Total petroleum hydrocarbons - diesel range	Total petroleum hydrocarbons - gasoline range
	H		B26C39	116-118 ft	117 ft	H2	Deep																										0.302 BJ		0.268 J				
	H		B26C41	142-144 ft	143 ft	H2	Deep																												0.301 J				
	I		B26JL1	0-1 ft	0.5 ft	H1	Shallow																										0.359 BJ		0.347 BJ				
	I		B26JM0	0-1 ft	0.5 ft	H1	Shallow																															12000 BJ	
	I		B26C48	5-7 ft	6 ft	H1	Deep																										0.43 BJ		0.386 BJ				
	I		B26C50	10-12 ft	11 ft	BF	Shallow																										0.326 BJ		0.308 BJ				
	I	C7682	B26C53	14-16 ft	15 ft	H1	Shallow							200 J																									
	I		B26C54	14-16 ft	15 ft	H1	Shallow																										0.464 BJ		1.05 B				
	I		B26C56	18-20 ft	19 ft	H1	Deep																												0.394 BJ				
	I		B26C58	45-47 ft	46 ft	H1	Deep																										0.341 BJ	27.4	0.5 BJ				
	I		B26C60	88-90 ft	89 ft	H2	Deep																										0.417 BJ		0.438 BJ				
H+I	I		B26C62	122-124 ft	123 ft	H2	Deep																	2.5 JN															
	J		B2B1L6	0-1 ft	0.5 ft	BF	Shallow											420 BJN																					
	J		B2B1L7	0-1 ft	0.5 ft	BF	Shallow											460 JN																					
	J		B2C1M2	5.7-7.7 ft	4.9 ft	BF	Shallow									159 J		960 BJN																					
	J		B2C1M3	15-19 ft	13.4 ft	BF	Shallow						2070 J	77.8 J		89.5 J		960 BJN																					
	J	C8100	B2C1M5	54-58 ft	38.8 ft	BF	Deep											1300 BJN																					
	J		B2C1M7	76-78 ft	54.3 ft	H1	Deep											15000 BJN																1400 JN	220 BJN				
	J		B2C1M8	118-120 ft	90.1 ft	H2	Deep									86.3 J																							
	J		B2C1M9	168.6-170.6 ft	131.8 ft	H2	Deep							80.8 J		79 J																							
J	J		B2C1N0	202-204 ft	157.7 ft	H2	Deep							85.5 J		80 J																							
	L1		B211X9	0-1 ft	0.5 ft	BF	Shallow																						20.2 J										
	L1		B211Y0	0-1 ft	0.5 ft	BF	Shallow																						8.42 J										
	L1		B215K8	0-1 ft	0.5 ft	BF	Shallow				22.5 XJ																												
	L1		B215K9	0-1 ft	0.5 ft	BF	Shallow				23.4 XJ			59.2 J																								
	L1		B20XW6	5-7 ft	6 ft	BF	Shallow				19.4 XJ		1840 J																										
	L1		B20XW8	5-7 ft	6 ft	BF	Shallow																						32.6 J										
	L1		B20XW9	10-12 ft	11 ft	BF	Shallow				19.6 XJ																												
	L1		B20XX1	10-12 ft	11 ft	BF	Shallow																						45.2 J										
	L1	C7466	B20XX2	14-16 ft	15 ft	BF	Shallow				22.4 XJ			53.6 J																									
	L1		B20XX4	14-16 ft	15 ft	BF	Shallow																						60.5 J										
	L1		B20XX7	43.5-44.5 ft	44 ft	H1	Deep																				3.08 J		15.4 J										
	L1		B211W3	84-86 ft	85 ft	H2	Deep						1360 JJ																										
	L1		B211W5	84-86 ft	85 ft	H2	Deep																				9.43 J		8.25 J										
	L1		B211W8	109.5-111.5 ft	110.5 ft	H2	Deep																				11.9 J		6.71 J										
	L1		B211X1	114-116 ft	115 ft	H2	Deep																						4.99 J			0.506 J							
	L1		B211X2	133-135 ft	134 ft	H2	Deep						1260 JJ																										
	L1		B211X4	133-135 ft	134 ft	H2	Deep																						1.62 JJ			0.443 J							
	L2		B23KN9	0-1 ft	0.5 ft	BF	Shallow														22.2 J																		
	L2		B23KP2	10-12 ft	11 ft	BF	Shallow																				46.2 TJ												
	L2		B23KR1	39-41 ft	40 ft	H1	Deep																				72.5 J												
	L2	C7670	B23KR4	139-141 ft	140 ft	H2	Deep																												0.331 J				
	L2		B23KR7	163-165 ft	164 ft	H2	Deep																												0.314 J				
	L2		B25ND7	220-224 ft	222 ft	H2	Deep									1220 J																							
L1+L2	L2		B23KT3	222-224 ft	223 ft	H2	Deep																				21.5 JXT	0.395 J							0.325 J				
	P		B1YT69	14-16 ft	15 ft	BF	Shallow																				6.99 BJ												
	P	C6392	B1YT72	19.5-21.5 ft	20.5 ft	H1	Deep				25.8 XJ																											75700 XJ	
	P		B1YT80	42-44 ft	43 ft	H1	Deep																				12.3 BJ				1.14 J								
	P		B1YT83	56-58 ft	57 ft	H2	Deep				21.2 XJ																											64600 B	
	P		B1YTF9	5-7 ft	6 ft	BF	Shallow						2300 J		863 BJ																								
	P		B1YTH1	5-7 ft	6 ft	BF	Shallow																				12.6 BJ												
	P	C6400	B1YTF8	10-12 ft	11 ft	BF	Shallow			25.2 JN	22.5 XJ																											73200 XJ	
	P		B1YTH3	10-12 ft	11 ft	BF	Shallow			26.8			804 J																									91100 B	
	P		B1YTH4	132-134.5 ft	133.2 ft	H2	Deep																				4.2 J												
	P		B1YTH6	132-134.5 ft	133.2 ft	H2	Deep																				13.1 BJ				0.795 J								
	P		B20XV5	6-8 ft	7 ft	BF	Shallow																															89600 BXJ	100 XTJ
	P		B20XV9	10-12 ft	11 ft	BF	Shallow																				9.39 J								0.294 J				
	P	C6402	B20XW1	10-12 ft	11 ft	BF	Shallow																								2.61								
	P		B20XW3	14-16 ft	15 ft	H1	Shallow				22.5 XNJ																											72600 BX	
	P		B20XW5	14-16 ft	15 ft	H1	Shallow																				4.46 J												
	P		B1YT92	6-8 ft	7 ft	BF	Shallow						2040 J		645 BJ																								
	P		B1YT96	14-17 ft	15.5 ft	BF	Shallow																															135000 B	
	P		B1YT98	14-17 ft	15.5 ft	BF	Deep																				4.18 J												
	P		B1YT99	19.5-21.5 ft	20.5 ft	H1	Deep																				4.36 J			0.261 J	0.705 J								

								Primary Analytes (ug/kg)									Eliminated Analytes (ug/kg)																				
								PEST/PCB					SVOA				SVOA		VOA																	GENORG	
Grouping	Work Plan Name	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/D	Aldrin	Aroclor-1254	Aroclor-1260	beta-1,2,3,4,5,6-Hexachlorocyclohexane (beta-BHC)	Gamma-BHC (Lindane)	Bis(2-ethylhexyl) phthalate	Butylbenzylphthalate	Di-n-butylphthalate	Di-n-octylphthalate	Ethylene glycol	n-Heptane	(m+p)-Xylene	1,1-Dichloroethene	1-Butanol	2-Butanone	2-Hexanone	2-Pentanone	3-Heptanone	4-Methyl-2-pentanone	Acetone	Benzene	Carbon disulfide	Hexane	Methylene chloride	o-Xylene	Styrene	Tetrahydrofuran	Toluene	Trichloromonofluoromethane	Xylenes (total)	Total petroleum hydrocarbons - diesel range	Total petroleum hydrocarbons - gasoline range
	P	C6404	B1YTB1	19.5-21.5 ft	20.5 ft	H1	Deep																				4.57 J								1.36 J				
	P		B1YTB2	31-33 ft	32 ft	H1	Deep																				8.4 J												
	P		B1YTB4	31-33 ft	32 ft	H1	Deep								769 J																								
	P		B1YTB7	42-44 ft	43 ft	H2	Deep																			2.95 BJ				0.203 J								
	P		B1YTB8	57-59 ft	58 ft	H2	Deep																			6.14 BJ												
	P		B1YTC0	57-59 ft	58 ft	H2	Deep						2290 J		770 J																							
	P		B1YTC7	5-7 ft	6 ft	BF	Shallow						5050 J				1030 BJX																					
	P		B1YTD0	10-12 ft	11 ft	BF	Shallow						1120 J																									
	P		B1YTD2	10-12 ft	11 ft	BF	Shallow																			5.43 J												
	P		B1YTD3	14-16 ft	15 ft	BF	Shallow						1210 J																									
	P		B1YTD5	14-16 ft	15 ft	BF	Shallow										610 BJX																					
	P	C6406	B1YTD6	18-20 ft	19 ft	H1	Deep													0.323 JX																		
	P		B1YTD9	26-28 ft	27 ft	H1	Deep						2940 J																									
	P		B1YTF2	54.5-56.5 ft	55.5 ft	H2	Deep																			4.86 J												
	P		B1YTF4	54.5-56.5 ft	55.5 ft	H2	Deep						1080 J																									
	P		B1YTF5	59-61 ft	60 ft	H2	Deep																			6.69 BJ												
P	P		B1YTF7	59-61 ft	60 ft	H2	Deep						673 J																									
	R		B23TK2	0-1 ft	0.5 ft	BF	Shallow							68.6 BJ																								
	R		B23TK4	0-1 ft	0.5 ft	BF	Shallow															2.52 BJT												0.592 BJ				
	R		B23TK5	0-1 ft	0.5 ft	BF	Shallow							76.1 BJ																								
	R		B23TK7	0-1 ft	0.5 ft	BF	Shallow																											0.493 BJ				
	R		B23TK8	5-7 ft	6 ft	BF	Shallow							107 BJ		422 J																						
	R		B23TL0	5-7 ft	6 ft	BF	Shallow															2.77 BJ												0.344 J				
	R		B23TL6	10-12 ft	11 ft	BF	Shallow															2.08 BJ				2.53 J								0.316 J				
	R		B27130	10-14 ft	12 ft	BF	Shallow									572 J																						
	R	C7668	B23TM2	14-16 ft	15 ft	BF	Shallow																			6.4				1.4 J								
	R		B27131	14-18 ft	16 ft	BF	Deep									320 J																						
	R		B23TM6	27-29 ft	28 ft	H1	Deep							107 BJ		317 J																						
	R		B23TM8	27-29 ft	28 ft	H1	Deep																	3.3 JN		3.86 J								0.256 J				
	R		B25WM2	39-41 ft	40 ft	H1	Deep							114 BJ																								
	R		B25WM4	39-41 ft	40 ft	H1	Deep																			5 J				1.5 J					11			
	R		B25WM5	80-82 ft	81 ft	H2	Deep							108 BJ																								
	R		B25WM7	80-82 ft	81 ft	H2	Deep																			1.2 J				1.1 J					2.3 J			
	R		B25WM8	132-134 ft	133 ft	H2	Deep							105 J																								
R	R		B25WN0	132-134 ft	133 ft	H2	Deep																			10				6.9					11			
	U		B26JL6	0-1 ft	0.5 ft	BF	Shallow																											0.346 BJ				
	U		B26JL7	0-1 ft	0.5 ft	BF	Shallow																									0.377 BJ		0.738 B				
	U		B26CC1	5-7 ft	6 ft	BF	Shallow																											0.584 BJ				
	U	C7676	B26CC5	10-12 ft	11 ft	BF	Shallow																			6.18 J								0.555 BJ				
	U		B26CC7	14-16 ft	15 ft	BF	Shallow																			5.96 BJ	0.328 J							0.704 BJ				
	U		B26CD3	128-130 ft	129 ft	H2	Deep																											0.564 BJ				
U	U		B26CD5	157-159 ft	158 ft	H2	Deep														13.8 J		6.8 J	11 JN		25.7 J			4.16			0.346 BJ		0.561 BJ				

Table N-4. Detected General Chemistry and Inorganic Soil Results without Hanford Site Background.

								Primary									Secondary																			
Investigation Group	WorkPlanName	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/Deep	2-Hydroxyacetate	Acetate	Ammonium ion	Formate	Nitrite	Oxalate	Phosphorus	Strontium	Sulfide	Bismuth	Bromide	Cerium	Europium	Lanthanum	Neodymium	Palladium	Praseodymium	Rubidium	Ruthenium	Samarium	Silicon	Sulfur	Tantalum	Tellurium	Tin	Titanium	Tungsten	Yttrium	Zirconium
A+B	A	C8102	B2B1L8	0-1 ft	0.5 ft	BF	Shallow			3110 CB	112 B	358 CB		869000	38500				23600 B		10000			2480 CB				82100 XN	78100 B				1250000		9770	15500 N
	A	C8102	B2B1L9	0-1 ft	0.5 ft	BF	Shallow			3000 CB	188 B	1080 CBJ	237 B	907000 J-	45000				25700 B		11300			3190 CB				64100 BXN	76600 BJ			6900 BJ-	1680000 J-		10700	7310 BNJ
	A	C8102	B2D1X2	5.7-9.7 ft	6.8 ft	BF	Shallow			3810 B	266 B	848 CB	381 B	834000	34400				24200 B		10800			2980 CB				62500 BXN	66900 B				1400000		9830	12500 N
	A	C8102	B2D1X4	11.5-15.5 ft	11.3 ft	BF	Shallow		322 B	1060 B	320 B	342 CB	8200	834000	31400			972 B	23500 B		10800							67100 BXN	65700 B			11600 B	1600000		10100	6770 BN
	A	C8102	B2D1X5	16.1-18.1 ft	14.1 ft	BF	Shallow		304 B	1990 B	421 B	361 CB	898 B	1020000	30100			1760 B	25100 B		11500			4980 CB				66000 BXN	85700 B			9790 B	1980000		12500	6520 BN
	A	C8102	B2D1X6	65-67 ft	46.8 ft	H1	Deep			1190 B	362 B	303 CB		626000	30900				21700 B		9570			3220 CB				54200 BXN	62200 B				1210000		7350	10300 BN
	A	C8102	B2D1X7	96-98 ft	69.73 ft	H2	Deep			999 B	210 B	524 CB	229 B	521000	37500				24500 B		9470							51000 BXN	46900 B				862000		6050	7460 BN
	A	C8102	B2D1X8	155-157 ft	118.7 ft	H2	Deep		306 B	1260 B	958 B	389 CB		544000	34700				21000 B		9290			3190 CB				54000 BXN	51200 B				961000		7490	10000 BN
	A	C8102	B2D1X9	188-190 ft	144.9ft	H2	Deep							559000	28100				24000		8290			3920 CB				63700 BXN	72700 B				1030000		6490	8470 BN
	A	C8102	B2D1Y0	221-223 ft	169.7 ft	H2	Deep			1100 B	316 B	357 CB		691000	29700				22700 B		9890			4160 CB				65000 BXN	88200 B				1130000		8540	1950 BN
	B	C8104	B2FPF1	0.5-1 ft	0.5 ft	BF	Shallow				326 CB			856000	37200 N				24800 B		9840							78400 N	84700 B				1570000		10200	11700 N
	B	C8104	B2FPF2	0.5-1 ft	0.5 ft	BF	Shallow				220 CB			873000	35200 N				20900 B		10100							78700 N	87100 B				1560000		10200	7380 BN
	B	C8104	B2FB27	5.7-7.7 ft	5.1 ft	BF	Shallow				293 CB			876000	32200 N				25300 B		10300							86000 N	51400 B				1480000		10900	7950 BN
	B	C8104	B2FB29	11.5-15.5 ft	11.1 ft	BF	Shallow				327 CB			752000	30100 N				21500 B		9100							98200 N	53900 B				1460000		8750	9570 BN
	B	C8104	B2FB30	16.1-18.1 ft	14.2 ft	BF	Shallow				215 CB			791000	35000 NJ				23100 B		10800			3100 B				97100 NJ	56700 B				1630000		9580	10500 BNJ
	B	C8104	B2FB31	41-43 ft	36.0 ft	BF	Deep		1880	182 B	1290		2660	852000	67700 N				24500 B		10500							119000 N	595000				1630000		10200	5760 BN
	B	C8104	B2FB32	93-95 ft	81.4 ft	H2	Deep			156 BN	185 CB		278 B	518000	29400 N				20100 B		8110							58200 BN	54200 B				813000		5890	6190 BN
	B	C8104	B2FB33	117-119 ft	102.1 ft	H2	Deep			667 BN	246 CB			465000	30200 N				22500 B		10000							82500 N	52500 B				772000		5730	6970 BN
	B	C8104	B2FB34	157-159 ft	137.0 ft	H2	Deep			433 BN	189 CB		234 B	457000	35000 N				21000 B		8990							86400 N	59800 B				812000		5250	6190 BN
C	C1	C8106	B2FPR7	1-1.5 ft	0.5 ft	H1	Shallow			4290 B		2050 BJ		865000	31200		31700 B		22700 B		11700	11600 B					2950 B	106000 NJ	69100 BNJ				1370000	31800 B	9630	13700 NMJ
	C1	C8106	B2FPR8	1-1.5 ft	0.5 ft	H1	Shallow			3770 B	110 B	692 CB		788000	33100		25400 B		22700 B		11900	11600 B						79700 N	56400 BN				1400000		9070	6890 BNM
	C1	C8106	B2FYM3	11-13 ft	6.5 ft	H1	Shallow				125 B	2110		749000	44700		33300 B		25100 B		13100	13200 B						80000 N	59200 BN				1390000		9490	7920 NM
	C1	C8106	B2FYM4	19-21 ft	11.5 ft	H1	Shallow		1600		439	1180 CB	664 B	691000	36700		50500 B		20600 B		11600	10900 B						82000 N	53000 BN				2080000		10200	8040 NM
	C1	C8106	B2FYM5	27-29 ft	16.5 ft	H1	Deep				254 B	424 CB	247 B	551000	38200		43000 B		17400 B		9540	9510 B						77300 N	41900 BN				1250000		6960	9010 NM
	C1	C8106	B2FYM6	64-66 ft	45.6 ft	H1	Deep		180 B		216 B	1580 B	210 B	812000	36200		40200 B		18100 B		10000	10400 B						82900 N	55200 BN				1530000		9330	4870 BNM
	C1	C8106	B2FYM7	90-92 ft	57.3 ft	H1	Deep				135 B	1470 B		576000	33000		20800 B		16300 B		9750	10300 B						87200 N	62500 BN				1040000		6710	8250 NM
	C1	C8106	B2FYM8	132-134 ft	75.5 ft	H1	Deep				157 B	1860 B		510000	31700		34600 B		14300 B		8580	9200 B						69900 N	60800 BN				911000		6320	8200 NM
	C1	C8106	B2FYM9	161.5-163.5 ft	87.8 ft	H2	Deep				157 B	1930 B		477000	29200		16300 B		14400 B		8580	9330 B						79900 N	59900 BN				772000		5550	6350 BNM
E	E	C7672	B26JK2	0-1 ft	0.5 ft	BF	Shallow			3220 CB	70.8 B	997 B		819000	28400	32500 B			20500 B		9920							20000 BN	58200 B				1410000		9340	15600
	E	C7672	B26JK3	0-1 ft	0.5 ft	BF	Shallow				124 B	1060 B	1050 B	870000	28900	30100 B			22600 B		10600							25300 BNJ	70900 B				1530000		10400	15300
	E	C7672	B26C68	5-7 ft	6 ft	BF	Shallow			1770 CB	113 B	1030 B	1580 B	851000	31800	30600 B			24500 B		11900							20900 BN	66300 B				1470000		9770	16500
	E	C7672	B26C70	10-12 ft	11 ft	BF	Shallow				109 B	1400 B		786000	34700	20200 B			22200 B		10600							34200 NJ	55700 B				1440000		8880	15300
	E	C7672	B26C74	14-16 ft	15 ft	BF	Shallow			917 B	181 B	724 B	404 B	801000	30100	15000 B			21300 B		10900							24700 BN	49100 B				1390000		10600	16500
	E	C7672	B26C76	37-39 ft	38 ft	BF	Deep		452 B	1390 B	1270 B	1470 B	995 B	832000	56200	15400 B			24700 B		11100							25800 BN	163000				1610000		10300	18500
	E	C7672	B26C78	73-75 ft	74 ft	H2	Deep			864 B	359 B	1200 B		495000	29100	10900 B			21100 B		11600							33600 N	45500 B				849000		5730	7490
	E	C7672	B26C80	83-85 ft	84 ft	H2	Deep		128 B	986 B	270 B	721 B		467000	31900	7680 B			18000 B		9420							24200 BN	49600 B				710000		5400	6860
	E	C7672	B26C82	122-124 ft	123 ft	H2	Deep		179 B		540 B	764 B		596000	37200	17900 B			16900 B		8700							30900 N	165000				1000000		6630	11000
F+G	F	C7472	B236N5	0-1 ft	0.5 ft	H1	Shallow		108 B		474 B	2340 CB	391 B	1020000	28400	29300 B			23900 B		10700							144000 NJ	75400 B				1330000		12100	5720 CNJ
	F	C7472	B236N8	0-1 ft	0.5 ft	H1	Shallow				273 B		309 B	951000	25000	30400 B			23800 B		9680							145000 NJ	63500 B				1200000		11100	2810 CBNJ
	F	C7472	B236P2	5-7 ft	6 ft	H1	Shallow		319 BJ	4520 B		1580 BJ	659 BJ	786000	49700	42200			21400 B		8750							123000 NJ	96100 B				868000		7770	7000 CNJ
	F	C7472	B23KT4	10-14 ft	12 ft	H1	Shallow		943 B	942 B	399 B	3300 B	516 B	911000	26500 MJ	37200					9420 B	23200 CB						1170000					2640000		11100 B	22800 B
	F	C7472	B238H1	14-16 ft	15 ft	H1	Shallow		568 B	1190 B	423 B	1180 B	571 B	663000	34800 MJ						11700 B	23100 B						1190000					2260000		8820 B	20900 B
	F	C7472	B238H4	108.5-110.5 ft	109.5 ft	H2	Deep		272 B	1470 B	213 B	3210 B	387 B	471000	33300	7420 B			14100 B		7540							121000 NJ	45800 B				723000		5010	5310 BNJ
	F	C7472	B238H7	129-131 ft	130 ft	H2	Deep		158 B	2350 B	306 B	1890 B		426000 B	MJ						4770 B							1120000					942000		3750 B	6010 B
	F	C7472	B238J0	142-144 ft	143 ft	H2	Deep		307 B	1610 B	172 B	2140 B		488000	27700	10400 B			25000 B		15200							77500 NJ	60400 B				783000		5620	5870 BNJ
	F	C7472	B238J3	158-160 ft	159 ft	H2	Deep		4800		138 B	2120 B		517000	32800				18200 B		10300							94400 NJ	45300 B				874000		5690	6660 BNJ
	F	C7472	B238J6	195-197 ft	196 ft	H2	Deep		589 B	17300 CB	1020 B	3540	3130	659000	24100	8080 B	25300 B		18600 B		8350							79300 NJ	79800 B				1230000		8190	11500 NJ
	F	C7472	B238K3	216-218 ft	217 ft	H2	Deep		137 B	1470 B	419 B		1230 B	456000	29400	7560 B			14900 B		6570							111000 NJ	65500 B				865000		5460	6390 CNJ
	G	C7468	B215L0	0-1 ft	0.5 ft	BF	Shallow		274 B	2580 B	274 B	1350 B	336 B	1010000	28800	18200 B			26200 B		11900	23900	42300 B	4400 B				1030000 XNMJ	56800 B				1830000	55000 B	10500	21600
	G	C7468	B215L1	0-1 ft	0.5 ft	BF	Shallow			2700 B	364 B	4080	758 B	907000	30700	21700 B			22600 B	1340 B	11600	23300	73300 B	4500 B				959000 XNMJ	73100 B			6360 B	1890000	38400 B	9570	20800
	G	C7468	B211Y3	5-7 ft	6 ft	BF	Shallow			1290 B	272 B	3010		615000	24900	19900 B			24200 B	1720 B	9310	21300		2120 B				1050000 XNMJ	37500 B				1550000	37400 B	8120	15600
	G	C7468	B211Y6	10-12 ft	11 ft	BF	Shallow		176 B		236 B	2110 B		550000	25700	14600 B			16600 B	1170 B	6810	18200 B						883000 XNMJ	41700 B				1350000		6920	14000
	G	C7468	B211Y9	14-16 ft	15 ft	BF	Shallow		291 B		345 B	1470 B	465 B	947000	21700	39900			28500 B	1280 B	9140	27100	41500 B	2100 B				816000 XNMJ	66200 B	10000 BNJ	25800 B		2670000		11100	25300
	G	C7468	B21202	43.5-45.5 ft	44.5 ft	H1	Deep			1400 B		465 B	328 B	569000	30500	9440 B			18300 B	986 B	8440	17200 B						925000 XNMJ	80400 B				1030000	62100 B	6670	10900
	G	C7468	B21205	92-94 ft	93 ft	H2	Deep					302 B	776 B	421000	22400				14000 B		6900	13900 B						928000 XNMJ	67600 B				709000		4510	5610 B
	G	C7468	B21208	97-99 ft	98 ft	H2	Deep					457 B		432000	35800	12900 B			21200 B	1690 B	8920	16800 B						820000 XNMJ	33100 B				890000		5510	7490 B
	G	C7468	B21211	125-127 ft	126 ft	H2	Deep			1400 B		1230 B		443000	24900	30200 B			14300 B	1050 B	8600	14400 B					3730 B	775000 XNMJ	98200 B				732000		5320	5910
	G	C7468	B21214	135-137 ft	136 ft	H2	Deep		198 B	1890 B		1620 B		555000	30500	9140 B			15300 B	976 B	7810	14000 B						302000 NMJ	59100 B				727000		5720	8470 B
H+I	H	C7680	B26JK8	0-1 ft	0.5 ft	H1	Shallow			6220	126 B	232 B		801000	32600 NM	28900 B			22800 BN		10100							69500 NM	68300 B				1580000	39500 B	9050	12800 N
	H	C7680	B26JK9	0-1 ft	0.5 ft	H1	Shallow			5940	170 B	204 B		647000	23300 NM	24500 B			20600 BN		8830							44100 NM	57400 B				1300000		7420	11500 N
	H	C7680	B26C26	5-7 ft	6 ft	H1	Shallow				300 B	736 B	303 B	794000	23700 NM	14100 B			23800 BN		10800							59400 NM	45800 B				1430000		8570	14300 N
	H	C7680	B26C28	10-12 ft	11 ft	H1	Shallow		182 B	1350 CB	572 B	613 B		1350000	20200 NM	25200 B			31300 N		13000							69000 NM	145000				2440000		15900	19300 N
	H	C7680	B26C30	14-16 ft	15 ft	H1	Shallow		520 B		731 B	1120 B		748000	35100 NMJ	12700 B			22200 BN		9310							82600 NMJ	73100 B				1980000		9430	18700 NJ
	H	C7680	B26C32	17-19 ft	18 ft	H1	Deep		456 B	9450 C	1660 B	684 B	618 B	673000	35900 NM	11600 B			23300 BN		9390							94500 NM	62600 B				1850000		8550	15700 N
	H	C7680	B26C34	43-45 ft	44 ft	H1	Deep		181 B	7700 C	323 B	715 B		640000	33700 NM				21300 BN		9020							90200 NM	81500 B				1110000		7300	10900 N
	H	C7680	B26C36	92-94 ft	93 ft	H2	Deep		252 B	2670 CB	319 B	712 B		480000	37700 NM				22000 BN		10100							84800 NM	62100 B				907000		6400	7280 N
	H	C7680	B26C38	116-118 ft	117 ft	H2	Deep		196 B		144 B	437 B		483000	29400 NMJ	8750 B			19100 BN		8530							72800 NMJ	62800 B				795000		5530	6470 NJ
	H	C7680	B26C40	142-144 ft	143 ft	H2	Deep		13400	1180 CB	750 B	808 B		508000	24900 NM	8870 B			15900 BN		7390							46900 NM	105000				990000		6230	8670 N
	I	C7682	B26JL0	0-1 ft	0.5 ft	H1	Shallow		160 B	10500	168 B	963 B	2100 B	775000	25400	10200 B			18000 B		8160							77700	71500 B				635000		8090	9310 NJ
	I	C7682	B26JL1	0-1 ft	0.5 ft	H1	Shallow		258 B	22800	237 B	1210 B	3140	781000	30500	13300 B			19600 B		8320							73900	84400				685000		8340	7950 N
	I	C7682	B26C47	5-7 ft	6 ft	H1	Shallow			8850				706000	21500	7450 B			18200 B		7930							63600	48900 B				537000		7230	8820 N
	I	C7682	B26C51	12-14 ft	13 ft	H1	Shallow		340 B	1280 CB	1850 B	1850 B		762000	31100	8980 B			18600 B		9050							100000	79600 B				1250000		9890	5790 N
	I	C7682	B26C53	14-16 ft	15 ft	H1	Shallow		274 B	987 CB	313 B	1340 B		702000	37700	18700 B			19100 B		8020							118000	67900 B				1280000		9340	11900 N
	I	C7682	B26C55	18-20 ft	19 ft	H1	Deep			2290 CB	110 B			593000	31900	13300 B			17300 B		7660							101000	68400 B				753000		7340	10700 N
	I	C7682	B26C57	45-47 ft	46 ft	H1	Deep			1860 CB	163 B	842 B		578000	34500	10900 B			14900 B		6780					18200 B		144000	84000				653000		6260	9260 N
	I	C7682	B26C59	88-90 ft	89 ft	H2	Deep		202 B		204 B	1240 B		479000	34000	8040 B			13300 B		6390							58700	62500 B				561000		4910	5240 NJ
	I	C7682	B26C61	122-124 ft	123 ft	H2	Deep		159 B	2700 CB	361 B	276 CB	739 B	534000	29300	7080 B			12800 B		6530							86100	60200 B				621000		5470	6380 N
	J	C8100	B2B1L6	0-1 ft	0.5 ft	BF	Shallow		3220	3820 B				763000	125000 NJ				20300 B		9380			2260 B				68600 XNJ	129000 NJ		11300 B	3030 B	1180000		8990	15700 NJ

Table N-4. Detected General Chemistry and Inorganic Soil Results without Hanford Site Background.

								Primary									Secondary																			
Investigation Group	WorkPlanName	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/Deep	2-Hydroxyacetate	Acetate	Ammonium ion	Formate	Nitrite	Oxalate	Phosphorus	Strontium	Sulfide	Bismuth	Bromide	Cerium	Europium	Lanthanum	Neodymium	Palladium	Praseodymium	Rubidium	Ruthenium	Samarium	Silicon	Sulfur	Tantalum	Tellurium	Tin	Titanium	Tungsten	Yttrium	Zirconium
J	J	C8100	B2B1L7	0-1 ft	0.5 ft	BF	Shallow		174 B	2770 B	214 CB	1550 CB		705000	118000 N		13100 B		19000 B		8710			1520 B				71900 XN	126000 N				1060000		8470	9080 N
	J	C8100	B2C1M2	5.7-7.7 ft	4.9 ft	BF	Shallow		2710	2350 B	387 CB	2500 C		902000	33100 N				21400 B		9580			2560 B				61700 XN	79000 CBN			3600 B	1360000		10400	2930 BN
	J	C8100	B2C1M3	15-19 ft	13.4 ft	BF	Shallow		4140	1650 B	819 CB	1220 CB	1940	858000	33800 N				21100 B		9410			1840 B				72000 XN	149000 N				1600000		9940	4130 BN
	J	C8100	B2C1M5	54-58 ft	38.8 ft	BF	Deep		8380	3460 CB	430 CB	813 CB		758000	26500 N				19200 B		8830			1960 B				58600 XN	67600 CBN	6430 BX			1270000		8710	2940 BN
	J	C8100	B2C1M7	76-78 ft	54.3 ft	H1	Deep		404 B		1320 B	1880 CB		522000	31400 N				16500 B		8600			2240 B				71800 XN	59500 CBN				771000		5690	5980 N
	J	C8100	B2C1M8	118-120 ft	90.1 ft	H2	Deep			2330 CB	166 B	394 CB		531000 X	27500				21100		9400 X			1840 B				145000 X	84400 N		5980 B	3850 B	887000 X		5880	7370 N
	J	C8100	B2C1M9	168.6-170.6 ft	131.8 ft	H2	Deep		245 B	1220 CB	248 B	2650		457000 X	32700				17900		8470			1660 B				147000 X	69800 N			2020 B	788000 X		5240	6160 N
	J	C8100	B2C1N0	202-204 ft	157.7 ft	H2	Deep		296 B		355 B	1610 CB	279 B	609000 X	26100				17100		7970			1670 B				139000 X	71000 N	6750 BX		3810 B	1140000 X		6760	8520 N
	J	C8100	B2C1N1	222.8-224.8 ft	173.3 ft	H2	Deep		494 B	6690	270 B			563000 X	27700		7230 B		16800		7850			1740 B				147000 XJ-	84600 NJ	5410 BX		5490 B	1300000 X		6790	9180 NJ
L1+L2	L1	C7466	B215K8	0-1 ft	0.5 ft	BF	Shallow		192 B	1270 B	222 B	1930 B		835000	26200	19600 B			25000 B	1350 B	10300 MJ	24100 MJ					4960 B	465000 XNJ	63600 B				1710000 NMJ	42100 BNJ	9030 MJ	17900 MJ
	L1	C7466	B215K9	0-1 ft	0.5 ft	BF	Shallow			2420 B	124 B	675 B		923000	31100	27200 B			24600 B	1560 B	12400 MJ	24600 MJ		4940 B			5050 B	357000 XNJ	66100 B		19900 B		1810000 NMJ	38600 BNJ	9860 MJ	20300 MJ
	L1	C7466	B20XW6	5-7 ft	6 ft	BF	Shallow		237 B	1260 B	322 B	2540 B	604 B	1140000	32700	23100 B			31300 B	2440 B	13700 MJ	31400 MJ					4350 B	569000 XNJ	101000 B				2140000 NMJ		13400 MJ	21400 MJ
	L1	C7466	B20XW9	10-12 ft	11 ft	BF	Shallow		148 B		274 B	5180		522000	26300	14800 B			12900 B	1590 B	5200 BMJ	14300 BMJ						557000 XNJ	50800 B				963000 NMJ		5230 MJ	9360 BMJ
	L1	C7466	B20XX2	14-16 ft	15 ft	BF	Shallow		105 B	913 B	193 B			640000	19000	12400 B			15800 B	1340 B	7990 MJ	19600 MJ					3550 B	415000 XNJ	46500 B				1660000 NMJ		7100 MJ	13900 MJ
	L1	C7466	B20XX5	43.5-45.5 ft	44.5 ft	H1	Deep		611 B		382 B		699 B	497000	32500	11500 B			13800 B		6730	17400						544000 XJ	54500 BMJ				1060000	39300 B	5660	8710
	L1	C7466	B211W3	84-86 ft	85 ft	H2	Deep		384 B	978 B	342 B		1350 B	463000	28700	9170 B			21400 B	1520 B	8580	17700						578000 XJ	37700 BMJ				864000	36000 B	5320	7050 B
	L1	C7466	B211W6	109.5-111.5 ft	110.5 ft	H2	Deep		556 B	1270 B	221 B	3890 C	409 B	460000	21900				20700 B	1400 B	8370	18100						473000 XJ	84100 BMJ				875000	43300 B	5060	5790 B
	L1	C7466	B211W9	114-116 ft	115 ft	H2	Deep		287 B		193 B	3980 C		430000	23700				21500 B	1140 B	8890	18500						500000 XJ	83400 BMJ				831000		5360	6820 B
	L1	C7466	B211X2	133-135 ft	134 ft	H2	Deep		423 B	784 B	296 B	4710 C	695 B	479000	30700	9590 B			24100 B	1330 B	9970	19300						669000 XJ	61100 BMJ				1070000		6840	10000
	L2	C7670	B23R25	0-1 ft	0.5 ft	BF	Shallow		163 B		564 B		472 B	862000	31400	27300 B	12200 B		23600 B		10000							150000 NJ	60100 B				968000		9980	4270 BN
	L2	C7670	B23KN7	0-1 ft	0.5 ft	BF	Shallow				311 B		405 B	889000	33300	34800 B			20800 B		9220							172000 NJ	61900 B				1100000		9910	2880 CBN
	L2	C7670	B238J9	5-7 ft	6 ft	BF	Shallow		528 B		740 B	2420 B	3210 M	799000	28100	21300 B			19100 B		8280							105000 NJ	45200 B				883000		9210	1280 CBN
	L2	C7670	B25CN2	10-14 ft	12 ft	BF	Shallow		310 B	1070 B	293 B	1790 B	709 B	643000	25900	17900 B			18700 B		7490							95500 NJ	40700 B				890000		7380	3070 BN
	L2	C7670	B23KP6	14-16 ft	15 ft	BF	Shallow		467 B	1350 B	575 B	1250 B	880 B	630000	26900	17000 B			14000 B		6890							109000 NJ	38900 B				984000		7270	8330 N
	L2	C7670	B23KP9	39-41 ft	40 ft	H1	Deep		474 B	1530 B	803 B	1690 B	1410 B	601000	46100	14500 B			18300 B		8800							134000 XJ-	32800 B				1190000		7170	10800 NJ
	L2	C7670	B23KR2	139-141 ft	140 ft	H2	Deep		399 B	1050 B	241 B	1040 B		452000	36100	7210 B			20900 B		9020							93900 XJ-	53200 B				862000		5040	5850 NJ
	L2	C7670	B23KR5	163-165 ft	164 ft	H2	Deep		327 B	1130 B	288 B	982 B	812 B	596000	29400				20400 B		9340							83900 XJ-	72200 B				1290000		7010	9810 NJ
	L2	C7670	B25ND7	220-224 ft	222 ft	H2	Deep	663 B	4280	4240 B	7060	2470	14300	613000	30300				18400 B		9070							90600 XJ-	82900 B				1520000		7290	10200 NJ
P	P	C6392	B1YT71	14-16 ft	15 ft	BF	Shallow		3190 M	4030 B	1730 B		2580 B	984000	32300	32200 B					13800	21200 B	132000 B					1630000 NJ		58600 BJ			1960000		10900 B	17300 B
	P	C6392	B1YT74	19.5-21.5 ft	20.5 ft	H1	Deep		2190 BM		696 B		868 B	625000	25900	10300 B			19800 B	1430 B	8450	15200 B						1410000 NJ	48000 B			13000 B	1470000		7520	11900
	P	C6392	B1YT77	25-27 ft	26 ft	H1	Deep		383 BM		534 B		431 B	464000	33100				15300 B	1450 B	6270	11700 B						2330000 NJ	39600 B				918000		5050	7510 B
	P	C6392	B1YT80	42-44 ft	43 ft	H1	Deep		263 BM		380 B		570 B	510000	18700	14600 B			14200 B		6940	12000 B						1610000 NJ	53500 B				918000		5560	6570 B
	P	C6392	B1YT83	56-58 ft	57 ft	H2	Deep		246 BM	1450 B	482 B		1640 B	413000	23000	7480 B			18200 B	2580 B	7270	8910 B						1110000 N	44700 B				861000 N		4690	6470 B
	P	C6394	B1VJ57A	36-38 ft	37 ft	H1	Deep							720000	28800 N			61.8 B											53600 B				1250000			17600
	P	C6394	B1VJ57B	36-38 ft	37 ft	H1	Deep					1860		750000	30100 N			74 B											57800 B				1210000			17600
	P	C6394	B1VJ57C	36-38 ft	37 ft	H1	Deep							672000	26700 N			78.2 B											47800 B				1150000			16300
	P	C6394	B1VJ63A	168-170 ft	169 ft	H2	Deep					70.3 B		413000	27800 N														62700 B				664000			7590 B
	P	C6394	B1VJ63B	168-170 ft	169 ft	H2	Deep					347		426000	29300 N														68700 B				701000			7260 B
	P	C6394	B1VJ63C	168-170 ft	169 ft	H2	Deep					244 B		417000	29600 N			27.5 B											80300 B				708000			7410 B
	P	C6400	B1YTH1	5-7 ft	6 ft	BF	Shallow		24500 M	2490 B	977 B	5160 M	2220 B	879000	26600	29700 B			26300 B	4300 B	11000	11500 B				12100 B		470000	76800 B	14500 BN			1770000 N		9170	17400
	P	C6400	B1YTH3	10-12 ft	11 ft	BF	Shallow		791 BM	1790 B	407 B	4370 M	954 B	797000	27200	27800 B			26100 B	4520 B	11200	10500 B				15000 B		779000	166000 B	11600 BN			1920000 N		9560	17500
	P	C6400	B1YTH6	132-134.5 ft	133.25 ft	H2	Deep		135 BM	1440 B	216 B	3260 M		365000	35900	8180 B			33100 B	3760 B	17300	10900 B				8170 B		521000	52800 B	13100 BN			735000 N		4800	6100 B
	P	C6402	B20XV5	6-8 ft	7 ft	BF	Shallow			2290 B				979000	30300	22300 B			25700 B		13200	32000	43700 CB	4130 B	316000 CBN			1120000 XN	64600 B				2140000 N	85200 B	11500	20700
	P	C6402	B20XV9	10-12 ft	11 ft	BF	Shallow		828 BM	1740 B	416 B	3690 M	905 B	1010000	29500	20300 B			33200 B		14900	33400	69100 CB	2230 B	292000 CBN			950000 XN	62500 B				2030000 N	102000 B	10900	20200
	P	C6402	B20XW3	14-16 ft	15 ft	H1	Shallow		1230 BM	2350 B	569 B	5760 M	1560 B	955000	28000	24800 B			28100 B		12100	28600	66800 CB	2520 B	265000 CBN			925000 XN	83700 B				1990000 N	82200 B	10700	19000
	P	C6404	B1YT92	6-8 ft	7 ft	BF	Shallow		407 B		373 CB	1670 B	728 B	791000	26300	23800 B			24300 B	3270 B	10600	13300 B						1130000 N	60000 B	10800 B		9200 B	1750000 N		8580	16300
	P	C6404	B1YT98	14-17 ft	15.5 ft	BF	Deep		475 B		374 CB	1350 B	761 B	870000	27600	27000 B			25100 B	3890 B	10600	12700 B						1230000 N	65300 B				1800000 N		9010	16900
	P	C6404	B1YTB1	19.5-21.5 ft	20.5 ft	H1	Deep		1360 B	2820 CB	568 CB	1700 B	1250 B	640000	20800	15600 B			22800 B	2770 B	9560	11600 B		2100 B				1170000 N	45900 B			7090 B	1740000 N		8270	14300
	P	C6404	B1YTB4	31-33 ft	32 ft	H1	Deep		1590 B	1630 CB	655 CB	2690 B	1570 B	735000	24300	17200 B			23700 B	3810 B	9010	11600 B						1880000 N	70800 B				1690000 N		8080	14000
	P	C6404	B1YTB7	42-44 ft	43 ft	H2	Deep		712 B	5340 C	886 CB	4440	2790 B	1140000	25800	16800 B			30300 B	3990 B	13300	16900 B		2950 B				1070000 N	69600 B			6780 B	1480000 N		12100	17800
	P	C6404	B1YTC0	57-59 ft	58 ft	H2	Deep		245 B	946 CB	339 CB	838 B	1870 B	469000	17500				23300 B	2500 B	8970	10100 B						934000 N	60500 B				801000 N		4870	5660
	P	C6406	B1YTC9	5-7 ft	6 ft	BF	Shallow		1110 B	2770 CB	631 B	4800 M	916 B	908000 NM	39100 M	19000 B			27500 BN	1740 B	11500	25600 M		2090 CB				703000 X	76900 B			7750 B	1820000 M	43800 BXN	9440 M	20000
	P	C6406	B1YTD2	10-12 ft	11 ft	BF	Shallow		424 B	2870 CB	414 B	2600 M	382 B	879000 NM	37300 M	27200 B			31100 BN	2260 B	12400	25900 M		4180 CB				527000 X	92300 B			7970 B	1860000 M		10100 M	19100
	P	C6406	B1YTD5	14-16 ft	15 ft	BF	Shallow		445 B		425 B	3420 M	567 B	993000 NM	27400 M	28800 B			24300 BN	1830 B	11600	33000 M		2370 CB				682000 X	72200 B			14400 B	3410000 M	43100 BXN	12900 M	30700
	P	C6406	B1YTD8	18-20 ft	19 ft	H1	Deep		714 B		664 B	862 BM	492 B	770000 NM	26200 M	20700 B			20400 BN	1680 B	9880	27300 M		3630 CB				621000 X	50900 B			13900 B	2700000 M		10100 M	24800
	P	C6406	B1YTF1	26-28 ft	27 ft	H1	Deep		347 B		330 B	2140 BM	348 B	593000 NM	26900 M	12600 B			14500 BN	1270 B	7780	18300 M		2380 CB				593000 X	58100 B			8940 B	1530000 M		7190 M	12900
	P	C6406	B1YTF4	54.5-56.5 ft	55.5 ft	H2	Deep		317 B		357 B	2750 BM		368000 NM	26700 M	9060 B			19300 BN	1550 B	11000	14600 BM		2590 CB				682000 X	52100 B				844000 M	39700 BXN	4920 M	7240 B
	P	C6406	B1YTF7	59-61 ft	60 ft	H2	Deep		578 B		323 B	627 BM	300 B	457000 NM	28900 M	12000 B			19600 BN	1840 B	8920	15200 BM		3090 CB				820000 X	47200 B			6670 B	833000 M		5040 M	6640 B
R	R	C7668	B23TK2	0-1 ft	0.5 ft	BF	Shallow		138 B	3810 B	202 B		581 B	887000	29900	16200 B	39000 BN		20300 B		10300							101000 X	75000 B				1780000		10100	3620 BN
	R	C7668	B23TK5	0-1 ft	0.5 ft	BF	Shallow		128 B	3410 B	185 B	5310 C	584 B	953000	31000	21600 B	40500 BN		24400 B		11000							49700 X	83400 B				1960000		10900	1750 BN
	R	C7668	B23TK8	5-7 ft	6 ft	BF	Shallow		259 B	4130 B	253 B	387 CB	951 B	990000	37300	30800 B	36600 BN		27300 B		12000							70200 X	88000 B				1910000		10900	3680 BN
	R	C7668	B27130	10-14 ft	12 ft	BF	Shallow		854 B	1730 B	556 B		1200 B	772000	29900	24400 B	36700 BNJ		23700 B		9860							32900 XJ-	66000 B				1580000		8820	13900 NJ
	R	C7668	B27131	14-18 ft	16 ft	BF	Deep		478 B		318 B	4750	1250 B	839000	31500	24500 B	19400 BNJ		23700 B		9990							27500 BXJ-	70300 B				1630000		9150	7280 NJ
	R	C7668	B23TM6	27-29 ft	28 ft	H1	Deep		148 B	3720 CB	332 B	1400 B	324 B	812000	28400	20200 B	34100 BN		23300 B		10500							80000 X	71900 B				1550000		8820	5170 BN
	R	C7668	B25WM2	39-41 ft	40 ft	H1	Deep		289 B	3150 CB	717 B	2360 B	629 B	422000	33800	10800 B			14400 B		6050							55600 NM	33500 BN				556000		4440	4020 BN
	R	C7668	B25WM5	80-82 ft	81 ft	H2	Deep			1930 CB	127 B	846 CB		514000	30100				16400 B		6630							50600 NM	61800 BN				505000		5610	4650 BN
	R	C7668	B25WM8	132-134 ft	133 ft	H2	Deep		297 B	1050 CB	238 B	1150 CB		570000	33700				16000 B	575 B	6750							80800 NM	39800 BN				864000		6530	8490 N
U	U	C7676	B26JK6	0-1 ft	0.5 ft	BF	Shallow		142 B		139 B		628 B	917000	47100	27200 B			23400 BNJ		10100							16200 BMJ	73400 B				1480000		10600	6380 NJ
	U	C7676	B26JK7	0-1 ft	0.5 ft	BF	Shallow			877 CB	94.1 B	982 CB	365 B	821000	49600	17400 B			22500 BN		10400							16300 BM	54300 B				1320000		10700	7390 N
	U	C7676	B29612	5-9 ft	7 ft	BF	Shallow		316 B		133 B	2190 B	564 B	882000	36800	23500 B			26400 BN		11400							10800 BM	76800 B				1500000		10300	16200 N
	U	C7676	B26CC4	10-12 ft	11 ft	BF	Shallow		112 B	1560 CB	153 B	671 CB	819 B	562000	23000	21000 B			15500 BN		7510							18000 BM	43100 B				1100000		6780	11800 N
	U	C7676	B29613	14-18 ft	16 ft	BF	Deep		170 B	929 CB	147 B	2370 B	642 B	669000	28100	16200 B			20900 BN		8650							22300 BM					1250000		8330	13400 N
	U	C7676	B26CD0	38-40 ft	39 ft	BF	Deep							738000	36100	22100 B			20100 BNJ		9800	13200						63800	77000 BNJ				1190000		8110	12700
	U	C7676	B26CD2	128-130 ft	129 ft	H2	Deep		338 B	1940 CB	696 B	393 B		354000	28100	7170 B			17200 BN		7880	9660						49900	65700 BN				593000		4270	5450
	U	C7676	B26CD4	157-159 ft	158 ft	H2	Deep		114 B	2380 CB	200 B			571000	34300	8340 B			20900 BN		10800	12600						60300	76100 BN				907000		6800	6880

Table N-5. Detected Soil Radiological Results without Hanford Site Background.

								Primary															Secondary								
Investigation Group	WorkPlanName	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/Deep	Americium-241	Antimony-125	Carbon-14	Iodine-129	Neptunium-237	Nickel-63	Plutonium-241	Selenium-79	Technetium-99	Thorium-230	Thorium-234	Tin-126	Tritium	Uranium-233	Uranium-236	Actinium-228	Bismuth-212	Bismuth-214	Lead-212	Lead-214	Manganese-54	Radium-228	Thallium-208	Zinc-65
A+B	A	C8102	B2B1L8	0-1 ft	0.5 ft	BF	Shallow										1.17		26 E					1.53	0.626 X	0.525	0.595			0.193	
	A	C8102	B2B1L9	0-1 ft	0.5 ft	BF	Shallow			2.23													0.841		0.68	0.644	0.709			0.219	
	A	C8102	B2D1X2	5.7-9.7 ft	6.8 ft	BF	Shallow												23.6 E				0.878		0.67	0.594	0.73			0.259	
	A	C8102	B2D1X4	11.5-15.5 ft	11.3 ft	BF	Shallow	0.061		3.39									18.4 E				0.762		0.439	0.678	0.632			0.28	
	A	C8102	B2D1X5	16.1-18.1 ft	14.1 ft	BF	Shallow												47 E					2.08	0.574	0.462					
	A	C8102	B2D1X6	65-67 ft	46.8 ft	H1	Deep										1.07		186 E				0.634		0.402	0.544				0.229	
	A	C8102	B2D1X7	96-98 ft	69.73 ft	H2	Deep												212 E	2.01			0.733	1.54	0.562	0.737				0.216	
	A	C8102	B2D1X8	155-157 ft	118.7 ft	H2	Deep										0.72		281 E	1.67			0.89		0.749	0.514	1.84			0.315	
	A	C8102	B2D1X9	188-190 ft	144.9ft	H2	Deep			1.31									280 E				0.746		0.368	0.592	1.78			0.274	
	A	C8102	B2D1Y0	221-223 ft	169.7 ft	H2	Deep												35.5 E				0.56	1.3	0.343	0.488	1.65			0.212	
	B	C8104	B2FPF1	0.5-1 ft	0.5 ft	BF	Shallow	0.176						1.167	2.7 E				28.1 E				0.477 B		0.832	1.5	2.13			0.359	
	B	C8104	B2FPF2	0.5-1 ft	0.5 ft	BF	Shallow	0.0533						0.739					17.6 E				0.695 B		0.931	0.794	2.22			1.09	
	B	C8104	B2FB27	5.7-7.7 ft	5.1 ft	BF	Shallow												14.1 E				0.71	1.3	1	0.83	1.99		0.71	1.07	
	B	C8104	B2FB29	11.5-15.5 ft	11.1 ft	BF	Shallow			1.23								1.5	17.1 E				0.8	0.97	0.96	0.85	1.9		0.86	1.18	
	B	C8104	B2FB30	16.1-18.1 ft	14.2 ft	BF	Shallow	0.0381							2.19 E				25.2 EJ-				1.4	1.6	1.3	1.38	1.67		1.1	0.32	
	B	C8104	B2FB31	41-43 ft	36.0 ft	BF	Deep									16.2			15.4 E				1.48 B	1.1	1.1	1.02	0.91		0.76	0.21	
	B	C8104	B2FB32	93-95 ft	81.4 ft	H2	Deep								2.17 E			1.8	13.9 E				1.9 B	2.49	1.3	1.5	1.2		1.4	0.54	0.11
	B	C8104	B2FB33	117-119 ft	102.1 ft	H2	Deep			1.87								1.9	32.3 E			0.0287	0.91	0.77	1.2	0.825	2.36		0.77	1.22	
	B	C8104	B2FB34	157-159 ft	137.0 ft	H2	Deep						6.71		1.64 E			2.4	39.5 E	5.16			1.75 B	2.24	0.81	0.91	0.812	0.035	0.87	0.274	
C	C1	C8106	B2FPR7	1-1.5 ft	0.5 ft	H1	Shallow												22.8 E				0.825	1.5	0.867	0.843 XJ	2.6			1.17 XJ	
	C1	C8106	B2FPR8	1-1.5 ft	0.5 ft	H1	Shallow												25 E				0.885	1.59	0.919	0.855	2.59			1.06	
	C1	C8106	B2FYM3	11-13 ft	6.5 ft	H1	Shallow						4.5						53.1 E				1.74		1.12	0.804	1.28			0.337	
	C1	C8106	B2FYM4	19-21 ft	11.5 ft	H1	Shallow												20.7 E				0.799		0.871	0.758	2.5			1.13	
	C1	C8106	B2FYM5	27-29 ft	16.5 ft	H1	Deep												23.6 E				0.855		0.555	0.728	2.06			1.12	
	C1	C8106	B2FYM6	64-66 ft	45.6 ft	H1	Deep						3.82										1.62		0.732	0.358	0.518			0.2	
	C1	C8106	B2FYM7	90-92 ft	57.3 ft	H1	Deep												26.6 E				0.737		0.678	0.604	2.04			0.975	
	C1	C8106	B2FYM8	132-134 ft	75.5 ft	H1	Deep												14.3 E				0.567		0.727	0.634	2.11			0.912	
	C1	C8106	B2FYM9	161.5-163.5 ft	87.8 ft	H2	Deep												16 E				0.857		0.798	0.769	2.12			1.02	
E	E	C7672	B26JK2	0-1 ft	0.5 ft	BF	Shallow								2.15 B				18.5		1.58						1.14				
	E	C7672	B26JK3	0-1 ft	0.5 ft	BF	Shallow												4.42 J		1.95						1.17				
	E	C7672	B26C68	5-7 ft	6 ft	BF	Shallow								1.64 B				5.84		2				1.1	0.782					
	E	C7672	B26C70	10-12 ft	11 ft	BF	Shallow								3.77 BJ		0.767		3.75 J		1.72	0.00121			1.24		1.57				
	E	C7672	B26C74	14-16 ft	15 ft	BF	Shallow								1.58 B		0.635		3.76		1.59										
	E	C7672	B26C76	37-39 ft	38 ft	BF	Deep												3.38		1.24						0.979				
	E	C7672	B26C78	73-75 ft	74 ft	H2	Deep								7.1 B				3.96		2.14						0.994				
	E	C7672	B26C80	83-85 ft	84 ft	H2	Deep												4.74		2.49					0.716					
	E	C7672	B26C82	122-124 ft	123 ft	H2	Deep												3.41		1.4										
F+G	F	C7472	B236N5	0-1 ft	0.5 ft	H1	Shallow			3.51 BJ									2.55 NJ		1.2	0.0013				0.566					
	F	C7472	B236N8	0-1 ft	0.5 ft	H1	Shallow														0.983	0.0013				0.852					
	F	C7472	B236P2	5-7 ft	6 ft	H1	Shallow								2.42 BJ		1.32 J				1.35	0.00129				0.631					
	F	C7472	B23KT4	10-14 ft	12 ft	H1	Shallow			12.5											0.774					0.902					
	F	C7472	B238H1	14-16 ft	15 ft	H1	Shallow			6.07											0.942						0.862				
	F	C7472	B238H4	108.5-110.5 ft	109.5 ft	H2	Deep														1.47				0.711		1.47				
	F	C7472	B238H7	129-131 ft	130 ft	H2	Deep			37.7											0.913					0.682					
	F	C7472	B238J0	142-144 ft	143 ft	H2	Deep														1.25					0.892					
	F	C7472	B238J3	158-160 ft	159 ft	H2	Deep										0.495		28.4 B		0.741					0.518	0.643				
	F	C7472	B238J6	195-197 ft	196 ft	H2	Deep			33.7									32.7 B		1.15										
	F	C7472	B238K3	216-218 ft	217 ft	H2	Deep														0.864					0.503					
	G	C7468	B215L0	0-1 ft	0.5 ft	BF	Shallow														2.21										
	G	C7468	B215L1	0-1 ft	0.5 ft	BF	Shallow														0.902					0.753					
	G	C7468	B211Y3	5-7 ft	6 ft	BF	Shallow														1.06				0.907		0.923				
	G	C7468	B211Y6	10-12 ft	11 ft	BF	Shallow														0.619				0.663		0.876				
	G	C7468	B211Y9	14-16 ft	15 ft	BF	Shallow														0.747										
	G	C7468	B21202	43.5-45.5 ft	44.5 ft	H1	Deep														1.45					0.464					
	G	C7468	B21205	92-94 ft	93 ft	H2	Deep			129											0.729				0.778	0.664					
	G	C7468	B21208	97-99 ft	98 ft	H2	Deep			269											0.936										
	G	C7468	B21211	125-127 ft	126 ft	H2	Deep									54.6 Y				306	1.14				0.61	0.61	0.691				
	G	C7468	B21214	135-137 ft	136 ft	H2	Deep			50.3						50.1 Y					2.12	0.00117				0.575	0.71				
	H	C7680	B26JK8	0-1 ft	0.5 ft	H1	Shallow												6.03 BN	75.8	1.44				0.881	0.602					
	H	C7680	B26JK9	0-1 ft	0.5 ft	H1	Shallow										1.85 B		7.24 BN		1.06					0.446	0.651				
	H	C7680	B26C26	5-7 ft	6 ft	H1	Shallow								2.23 B				6.77 BN		1.38										

Table N-5. Detected Soil Radiological Results without Hanford Site Background.

								Primary															Secondary								
Investigation Group	WorkPlanName	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/Deep	Americium-241	Antimony-125	Carbon-14	Iodine-129	Neptunium-237	Nickel-63	Plutonium-241	Selenium-79	Technetium-99	Thorium-230	Thorium-234	Tin-126	Tritium	Uranium-233	Uranium-236	Actinium-228	Bismuth-212	Bismuth-214	Lead-212	Lead-214	Manganese-54	Radium-228	Thallium-208	Zinc-65
H+I	H	C7680	B26C28	10-12 ft	11 ft	H1	Shallow								2.65 B		0.716 B				0.575	0.00174 B			0.713		0.826				
	H	C7680	B26C30	14-16 ft	15 ft	H1	Shallow												3.89 BNJ		1.36										
	H	C7680	B26C32	17-19 ft	18 ft	H1	Deep								6.17 B				3.63 BN		1.8	0.0013 B					1.69				
	H	C7680	B26C34	43-45 ft	44 ft	H1	Deep												5.31 BN		1.46	0.00131 B			0.899	0.773					
	H	C7680	B26C36	92-94 ft	93 ft	H2	Deep												5.21 BN		1.02										
	H	C7680	B26C38	116-118 ft	117 ft	H2	Deep								2.22 BJ				4.17 BNJ	89.2	1.68					0.669					
	H	C7680	B26C40	142-144 ft	143 ft	H2	Deep												3.23 BN		0.872					0.649					
	I	C7682	B26JL0	0-1 ft	0.5 ft	H1	Shallow												5.07 B		1.81										
	I	C7682	B26JL1	0-1 ft	0.5 ft	H1	Shallow												9.76 B	2.91	1.58										
	I	C7682	B26C47	5-7 ft	6 ft	H1	Shallow			3.49									8.54 B		1.97										
	I	C7682	B26C51	12-14 ft	13 ft	H1	Shallow										0.747 B		3.42 B	2.93	1.04	0.00135									
	I	C7682	B26C53	14-16 ft	15 ft	H1	Shallow										1.16 B		5.42 B	5.06	1.29	0.0021									
	I	C7682	B26C55	18-20 ft	19 ft	H1	Deep										0.969 B		5.81 B		2.18										
	I	C7682	B26C57	45-47 ft	46 ft	H1	Deep										0.771 B		5.05 B		1.96										
	I	C7682	B26C59	88-90 ft	89 ft	H2	Deep												5.61 B	2.68	2.03	0.00142 B									
	I	C7682	B26C61	122-124 ft	123 ft	H2	Deep										0.984 B		8.32 B		1.98										
J	J	C8100	B2B1L6	0-1 ft	0.5 ft	BF	Shallow							0.141	9.19 BEJ										0.954	0.51	0.812			0.253	
	J	C8100	B2B1L7	0-1 ft	0.5 ft	BF	Shallow			13.7					11.3 BE								0.728		0.767	0.623	0.736			0.241	
	J	C8100	B2C1M2	5.7-7.7 ft	4.9 ft	BF	Shallow								3.76 BE								0.736		0.675	0.681				0.228	
	J	C8100	B2C1M3	15-19 ft	13.4 ft	BF	Shallow		2.1						5.19 BE								0.672		0.53	0.57	0.441			0.26	
	J	C8100	B2C1M5	54-58 ft	38.8 ft	BF	Deep								7.42 BE								0.639		0.709	0.745	0.557			0.294	
	J	C8100	B2C1M7	76-78 ft	54.3 ft	H1	Deep	0.049		2.73					13.6 BE								0.704		0.616	0.717	0.534			0.239	
	J	C8100	B2C1M8	118-120 ft	90.1 ft	H2	Deep								8.85 BE				4.55 E				0.638		0.668	0.507	0.515			0.237	
	J	C8100	B2C1M9	168.6-170.6 ft	131.8 ft	H2	Deep								6.11 BE				5.14 E				0.855		0.656	0.684	0.623			0.28	
	J	C8100	B2C1N0	202-204 ft	157.7 ft	H2	Deep								6.62 BE				8.71 E				0.671		0.629	0.483				0.248	
	J	C8100	B2C1N1	222.8-224.8 ft	173.3 ft	H2	Deep							0.164	14 BEJ				4.84 E				0.526		0.413	0.567	0.409			0.207	
L1+L2	L1	C7466	B215K8	0-1 ft	0.5 ft	BF	Shallow			43.7											0.7				0.671	0.476					
	L1	C7466	B215K9	0-1 ft	0.5 ft	BF	Shallow														1.25		0.842		0.436	0.412	0.592				
	L1	C7466	B20XW6	5-7 ft	6 ft	BF	Shallow			53.8							0.674				1.21				0.678	1.03	0.604				
	L1	C7466	B20XW9	10-12 ft	11 ft	BF	Shallow								1.6 J						0.443					0.787	0.618				
	L1	C7466	B20XX2	14-16 ft	15 ft	BF	Shallow														0.571				0.776						
	L1	C7466	B20XX5	43.5-45.5 ft	44.5 ft	H1	Deep								2.69 J						1.64										
	L1	C7466	B211W3	84-86 ft	85 ft	H2	Deep								1.9 J						0.495										
	L1	C7466	B211W5	84-86 ft	85 ft	H2	Deep																			0.763					
	L1	C7466	B211W6	109.5-111.5 ft	110.5 ft	H2	Deep								2.7 J		0.571				0.54										
	L1	C7466	B211W9	114-116 ft	115 ft	H2	Deep										0.858				0.589									0.71	
	L1	C7466	B211X2	133-135 ft	134 ft	H2	Deep								1.66 J		0.703				1.01										
	L2	C7670	B23R25	0-1 ft	0.5 ft	BF	Shallow						15.6				0.79 J		2.68 NJ		1.12	0.00134					1.06				
	L2	C7670	B23KN7	0-1 ft	0.5 ft	BF	Shallow						390						3.44 NJ		2.08	0.00128									
	L2	C7670	B238J9	5-7 ft	6 ft	BF	Shallow													4.65	1.11						0.664				
	L2	C7670	B25CN2	10-14 ft	12 ft	BF	Shallow														1.52					1.02 X	0.934				
	L2	C7670	B23KP6	14-16 ft	15 ft	BF	Shallow			4.69									8.94 NJ		0.935				0.844	0.746 X					
	L2	C7670	B23KP9	39-41 ft	40 ft	H1	Deep													3.15	0.946					0.765 X	0.876				
	L2	C7670	B23KR2	139-141 ft	140 ft	H2	Deep									33.5 Y				3.3	1.39					0.772 X					
	L2	C7670	B23KR5	163-165 ft	164 ft	H2	Deep									30.1 Y				4.37	0.738					0.631 X				0.438	
	L2	C7670	B25ND7	220-224 ft	222 ft	H2	Deep									28.4 Y					0.495					0.482 X					
P	P	C6392	B1YT71	14-16 ft	15 ft	BF	Shallow	2.2 J	1.12			1.46 B		39.9 J	2.5 J	24 Y					1.3	0.0392									
	P	C6392	B1YT74	19.5-21.5 ft	20.5 ft	H1	Deep	1.39 J				0.393 B				45.5 Y					1.01	0.0248									
	P	C6392	B1YT77	25-27 ft	26 ft	H1	Deep								1.97 J							0.00356									
	P	C6392	B1YT80	42-44 ft	43 ft	H1	Deep								4.14 J																
	P	C6392	B1YT83	56-58 ft	57 ft	H2	Deep			61.1		0.506			2.11 J						1.2										
	P	C6394	B1VJ57A	36-38 ft	37 ft	H1	Deep	235								2.26 Y									0.845 B	0.532	0.844			0.457	
	P	C6394	B1VJ57B	36-38 ft	37 ft	H1	Deep									4.52 Y										0.647	0.702				
	P	C6394	B1VJ57C	36-38 ft	37 ft	H1	Deep									2.17 Y									0.625 B	0.494	0.917				
	P	C6394	B1VJ63A	168-170 ft	169 ft	H2	Deep									2.14 Y											1.54				
	P	C6394	B1VJ63B	168-170 ft	169 ft	H2	Deep									2.55 Y										0.612	0.883				
	P	C6394	B1VJ63C	168-170 ft	169 ft	H2	Deep									6.07 Y											0.881				
	P	C6400	B1YTH1	5-7 ft	6 ft	BF	Shallow				0.808 B				2.84 B						0.751	0.0196			0.7	1.01	0.525				
	P	C6400	B1YTH3	10-12 ft	11 ft	BF	Shallow						85		4.69 B					308	1.69	0.0561			0.717	0.657	0.69				
	P	C6400	B1YTH6	132-134.5 ft	133.25 ft	H2	Deep														1.68				0.918	0.489					
	P	C6402	B20XV5	6-8 ft	7 ft	BF	Shallow								8.69 B						1.62 B	0.00919									

Table N-5. Detected Soil Radiological Results without Hanford Site Background.

								Primary															Secondary								
Investigation Group	WorkPlanName	WELL_NAME	SAMP_NUM	depth range	midpoint depth	Strata	Shallow/Deep	Americium-241	Antimony-125	Carbon-14	Iodine-129	Neptunium-237	Nickel-63	Plutonium-241	Selenium-79	Technetium-99	Thorium-230	Thorium-234	Tin-126	Tritium	Uranium-233	Uranium-236	Actinium-228	Bismuth-212	Bismuth-214	Lead-212	Lead-214	Manganese-54	Radium-228	Thallium-208	Zinc-65
	P	C6402	B20XV9	10-12 ft	11 ft	BF	Shallow								1.98 B						2.01 B	0.0364			0.768	0.511	0.786				
	P	C6402	B20XW3	14-16 ft	15 ft	H1	Shallow								5.17 B		0.652				2.57 B	0.00263									
	P	C6404	B1YT92	6-8 ft	7 ft	BF	Shallow														0.983										
	P	C6404	B1YT98	14-17 ft	15.5 ft	BF	Deep														0.779										
	P	C6404	B1YTB1	19.5-21.5 ft	20.5 ft	H1	Deep										1.18				1.08					0.638					
	P	C6404	B1YTB4	31-33 ft	32 ft	H1	Deep														1.23	0.0318					0.999				
	P	C6404	B1YTB7	42-44 ft	43 ft	H2	Deep														2.94	0.151				0.778					
	P	C6404	B1YTC0	57-59 ft	58 ft	H2	Deep								6.39						1.34										
	P	C6406	B1YTC9	5-7 ft	6 ft	BF	Shallow										0.551				1.2	0.00369									
	P	C6406	B1YTD2	10-12 ft	11 ft	BF	Shallow										0.887				2.27	0.00528									
	P	C6406	B1YTD5	14-16 ft	15 ft	BF	Shallow								2.05 B						1.32	0.00318									
	P	C6406	B1YTD8	18-20 ft	19 ft	H1	Deep								2.5 B						1.42	0.00339			1.2						
	P	C6406	B1YTF1	26-28 ft	27 ft	H1	Deep						87.1 B		2.55 B						1.11										
	P	C6406	B1YTF4	54.5-56.5 ft	55.5 ft	H2	Deep								2.33 B						1.18					1.17					
	P	C6406	B1YTF7	59-61 ft	60 ft	H2	Deep														1.37										
	R	C7668	B23TK2	0-1 ft	0.5 ft	BF	Shallow														1.83					0.482	0.801				
	R	C7668	B23TK5	0-1 ft	0.5 ft	BF	Shallow														2.14					0.72					
	R	C7668	B23TK8	5-7 ft	6 ft	BF	Shallow														2.36										
	R	C7668	B27130	10-14 ft	12 ft	BF	Shallow													2.5	1.84										
R	R	C7668	B27131	14-18 ft	16 ft	BF	Deep													4.21	1.66					0.816					
	R	C7668	B23TM6	27-29 ft	28 ft	H1	Deep														1.67				0.759	0.52	0.976				
	R	C7668	B25WM2	39-41 ft	40 ft	H1	Deep									6.45 BY			4.75 N	2.87	1.54					0.456					
	R	C7668	B25WM5	80-82 ft	81 ft	H2	Deep								3.97 B				6.16 N		1.38					0.501	0.582				
	R	C7668	B25WM8	132-134 ft	133 ft	H2	Deep												3.64 N	3.46	1					0.764					
	U	C7676	B26JK6	0-1 ft	0.5 ft	BF	Shallow					0.603 B							5.13 NJ		1.52										
	U	C7676	B26JK7	0-1 ft	0.5 ft	BF	Shallow					0.284 B					0.868		4.79 N		1.88										
	U	C7676	B29612	5-9 ft	7 ft	BF	Shallow								2.8		0.893		6.32 BN		2.07						1.45				
U	U	C7676	B29613	14-18 ft	16 ft	BF	Deep			4.88							1.05		3.75 BN		7.62										
	U	C7676	B26CC4	10-12 ft	11 ft	BF	Shallow			1.66							0.883		3.82 BN		0.77	0.00155 B					1.24				
	U	C7676	B26CD0	38-40 ft	39 ft	BF	Deep									5.32 Y			8.25 B		1.59	0.00175 B									
	U	C7676	B26CD2	128-130 ft	129 ft	H2	Deep									53.5 Y	0.959 B		7.25 B	3.77	2.33										
	U	C7676	B26CD4	157-159 ft	158 ft	H2	Deep										1.36 B		6.6 B		2.34						1.09				

Table N-6. WMA C Phase 2 Soil pH Results Greater than 8.5 Reported Location and Depth

Investigation Group/Site	Treatment Group	Well Name	Midpoint Depth	pH
299-E27-24	deep	299-E27-24	75.29 m (247 ft)	8.64
299-E27-24	deep	299-E27-24	76.32 m (250.4 ft)	8.7
299-E27-24	deep	299-E27-24	77.72 m (255 ft)	8.65
299-E27-24	deep	299-E27-24	79.55 m (261 ft)	8.53
A+B	shallow	C8104	0.15 m (0.5 ft)	9.1
A+B	shallow	C8104	1.55 m (5.1 ft)	9.2
A+B	shallow	C8102	2.07 m (6.8 ft)	8.57
A+B	shallow	C8104	3.38 m (11.1 ft)	9.3
A+B	shallow	C8102	3.47 m (11.4 ft)	8.55
A+B	shallow	C8104	4.33 m (14.2 ft)	9.32
A+B	deep	C8104	10.97 m (36 ft)	11.1
A+B	deep	C8104	24.81 m (81.4 ft)	9.38
A+B	deep	C8104	31.12 m (102.1 ft)	9.26
A+B	deep	C8102	36.18 m (118.7 ft)	8.5
A+B	deep	C8104	41.76 m (137 ft)	8.79
C	shallow	C8106	1.98 m (6.5 ft)	8.7
C	shallow	C8106	3.51 m (11.5 ft)	8.71
C	deep	C8106	5.03 m (16.5 ft)	8.59
C	deep	C8106	13.9 m (45.6 ft)	9.29
C	deep	C8106	17.47 m (57.3 ft)	9.26
C	deep	C8106	23.01 m (75.5 ft)	9.33
C	deep	C8106	26.76 m (87.8 ft)	9.17
E	shallow	C7672	0.15 m (0.5 ft)	8.92
E	shallow	C7672	1.83 m (6 ft)	8.67
E	shallow	C7672	3.35 m (11 ft)	8.97
E	shallow	C7672	4.57 m (15 ft)	9.24
E	deep	C7672	11.58 m (38 ft)	9.81
E	deep	C7672	22.56 m (74 ft)	8.74
E	deep	C7672	25.6 m (84 ft)	8.69
E	deep	C7672	37.49 m (123 ft)	8.92
F+G	shallow	C7468	0.15 m (0.5 ft)	8.62
F+G	shallow	C7472	0.15 m (0.5 ft)	8.95
F+G	shallow	C7468	1.83 m (6 ft)	8.81
F+G	shallow	C7472	1.83 m (6 ft)	8.5

Table N-6. WMA C Phase 2 Soil pH Results Greater than 8.5 Reported Location and Depth

Investigation Group/Site	Treatment Group	Well Name	Midpoint Depth	pH
F+G	shallow	C7468	3.35 m (11 ft)	8.84
F+G	shallow	C7472	3.66 m (12 ft)	9.1
F+G	shallow	C7468	4.57 m (15 ft)	8.94
F+G	shallow	C7472	4.57 m (15 ft)	8.9
F+G	deep	C7468	13.56 m (44.5 ft)	8.9
F+G	deep	C7468	28.35 m (93 ft)	9.24
F+G	deep	C7468	29.87 m (98 ft)	9.14
F+G	deep	C7472	33.38 m (109.5 ft)	9.57
F+G	deep	C7468	38.4 m (126 ft)	9.1
F+G	deep	C7468	41.45 m (136 ft)	8.96
F+G	deep	C7472	48.46 m (159 ft)	8.51
F+G	deep	C7472	66.14 m (217 ft)	8.58
H+I	shallow	C7680	0.15 m (0.5 ft)	8.91
H+I	shallow	C7682	0.15 m (0.5 ft)	9.64
H+I	shallow	C7680	1.83 m (6 ft)	8.62
H+I	shallow	C7682	1.83 m (6 ft)	9.1
H+I	shallow	C7680	3.35 m (11 ft)	9.76
H+I	shallow	C7682	3.96 m (13 ft)	9.26
H+I	shallow	C7680	4.57 m (15 ft)	9.71
H+I	shallow	C7682	4.57 m (15 ft)	9.14
H+I	deep	C7680	5.49 m (18 ft)	9.51
H+I	deep	C7682	5.79 m (19 ft)	8.94
H+I	deep	C7680	13.41 m (44 ft)	9.01
H+I	deep	C7682	27.13 m (89 ft)	8.59
H+I	deep	C7680	28.35 m (93 ft)	9.13
H+I	deep	C7680	35.66 m (117 ft)	9.29
H+I	deep	C7682	37.49 m (123 ft)	9.07
H+I	deep	C7680	43.59 m (143 ft)	9.38
J	shallow	C8100	0.15 m (0.5 ft)	8.69
J	shallow	C8100	1.49 m (4.9 ft)	8.85
J	shallow	C8100	4.11 m (13.5 ft)	8.82
J	deep	C8100	11.83 m (38.8 ft)	9.23
J	deep	C8100	16.55 m (54.3 ft)	9
J	deep	C8100	27.46 m (90.1 ft)	8.87

Table N-6. WMA C Phase 2 Soil pH Results Greater than 8.5 Reported Location and Depth

Investigation Group/Site	Treatment Group	Well Name	Midpoint Depth	pH
J	deep	C8100	40.17 m (131.8 ft)	8.94
J	deep	C8100	48.07 m (157.7 ft)	8.76
J	deep	C8100	52.82 m (173.3 ft)	8.75
L1+L2	shallow	C7466	0.15 m (0.5 ft)	8.88
L1+L2	shallow	C7670	0.15 m (0.5 ft)	8.84
L1+L2	shallow	C7466	1.83 m (6 ft)	9.17
L1+L2	shallow	C7466	3.35 m (11 ft)	9.31
L1+L2	shallow	C7670	3.66 m (12 ft)	9.33
L1+L2	shallow	C7466	4.57 m (15 ft)	9.09
L1+L2	shallow	C7670	4.57 m (15 ft)	9.03
L1+L2	deep	C7670	12.19 m (40 ft)	9.19
L1+L2	deep	C7466	13.56 m (44.5 ft)	9.08
L1+L2	deep	C7466	25.91 m (85 ft)	9.02
L1+L2	deep	C7466	33.68 m (110.5 ft)	8.72
L1+L2	deep	C7466	35.05 m (115 ft)	8.83
L1+L2	deep	C7466	40.84 m (134 ft)	8.79
L1+L2	deep	C7670	42.67 m (140 ft)	8.73
L1+L2	deep	C7670	49.99 m (164 ft)	8.65
L1+L2	deep	C7670	67.67 m (222 ft)	8.67
P	shallow	C6400	1.83 m (6 ft)	9.93
P	shallow	C6406	1.83 m (6 ft)	8.74
P	shallow	C6402	2.13 m (7 ft)	9.36
P	shallow	C6400	3.35 m (11 ft)	9.6
P	shallow	C6402	3.35 m (11 ft)	9.34
P	shallow	C6406	3.35 m (11 ft)	8.95
P	shallow	C6392	4.57 m (15 ft)	10.1
P	shallow	C6402	4.57 m (15 ft)	9.65
P	shallow	C6406	4.57 m (15 ft)	9.2
P	shallow	C6404	4.72 m (15.5 ft)	8.9
P	deep	C6406	5.79 m (19 ft)	9.04
P	deep	C6392	6.25 m (20.5 ft)	10.3
P	deep	C6404	6.25 m (20.5 ft)	9.81
P	deep	C6392	7.92 m (26 ft)	10.1
P	deep	C6406	8.23 m (27 ft)	9.18

Table N-6. WMA C Phase 2 Soil pH Results Greater than 8.5 Reported Location and Depth

Investigation Group/Site	Treatment Group	Well Name	Midpoint Depth	pH
P	deep	C6404	9.75 m (32 ft)	9.84
P	deep	C6394	11.28 m (37 ft)	9.79
P	deep	C6392	13.11 m (43 ft)	9.02
P	deep	C6404	13.11 m (43 ft)	9.69
P	deep	C6392	17.37 m (57 ft)	9.2
P	deep	C6404	17.68 m (58 ft)	9.38
P	deep	C6406	18.29 m (60 ft)	9.26
P	deep	C6400	40.63 m (133.3 ft)	8.88
R	shallow	C7668	0.15 m (0.5 ft)	8.53
R	deep	C7668	8.53 m (28 ft)	8.71
R	deep	C7668	12.19 m (40 ft)	9.34
R	deep	C7668	24.69 m (81 ft)	9.17
R	deep	C7668	40.54 m (133 ft)	9.32
U	shallow	C7676	0.15 m (0.5 ft)	8.74
U	shallow	C7676	2.13 m (7 ft)	9.13
U	shallow	C7676	3.35 m (11 ft)	9.1
U	deep	C7676	4.88 m (16 ft)	9.37
U	deep	C7676	11.89 m (39 ft)	9.14
U	deep	C7676	39.32 m (129 ft)	8.75
U	deep	C7676	48.16 m (158 ft)	8.66

APPENDIX O

VERTICAL PROFILES OF EXCEEDANCES BY INVESTIGATION SITE/GROUP AT WMA C

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APPENDIX O
VERTICAL PROFILES OF EXCEEDANCES BY INVESTIGATION SITE/GROUP AT WMA C

Contents of this appendix include 56 figures summarizing the vertical profile of contamination for constituents reported above background or reported as detected when no background value is available for comparison. Figures also present the relationship of the stratigraphy and volumetric moisture and gamma readings gathered during field investigations. Figures are ordered by Investigation Site/Group with constituents above background being displayed first, followed by constituents with detected concentrations that have no background (i.e., exceedance). These figures report all useable results for primary and secondary constituents that were reported above background (or reported as detected without background) for all Phase 2 direct push and angle push sampling locations.

Figure O-1. Summary of Constituents Above Background at Site A (C8102)

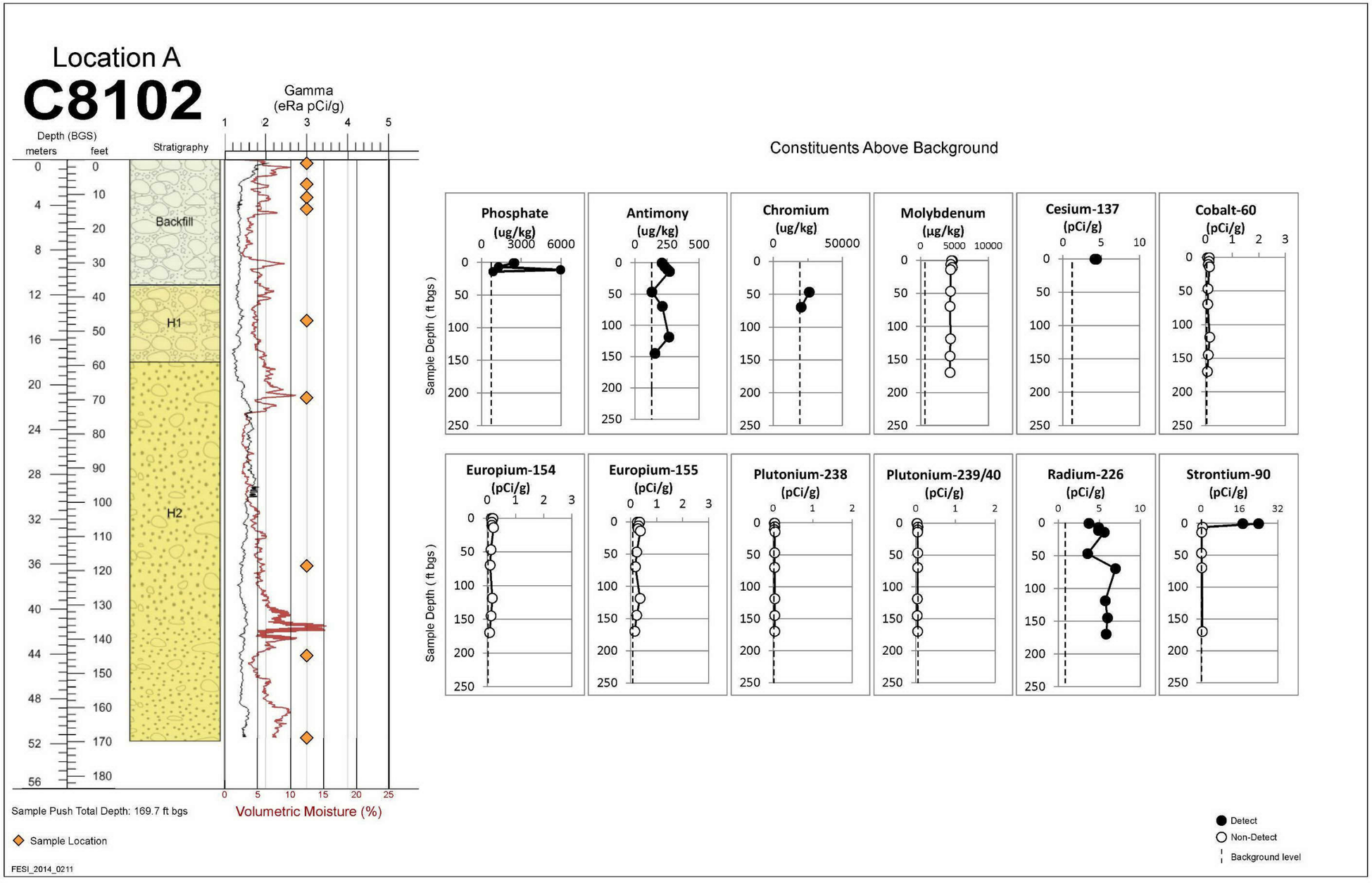


Figure O-2. Summary of Detected Constituents with No Background at Site A (C8102)

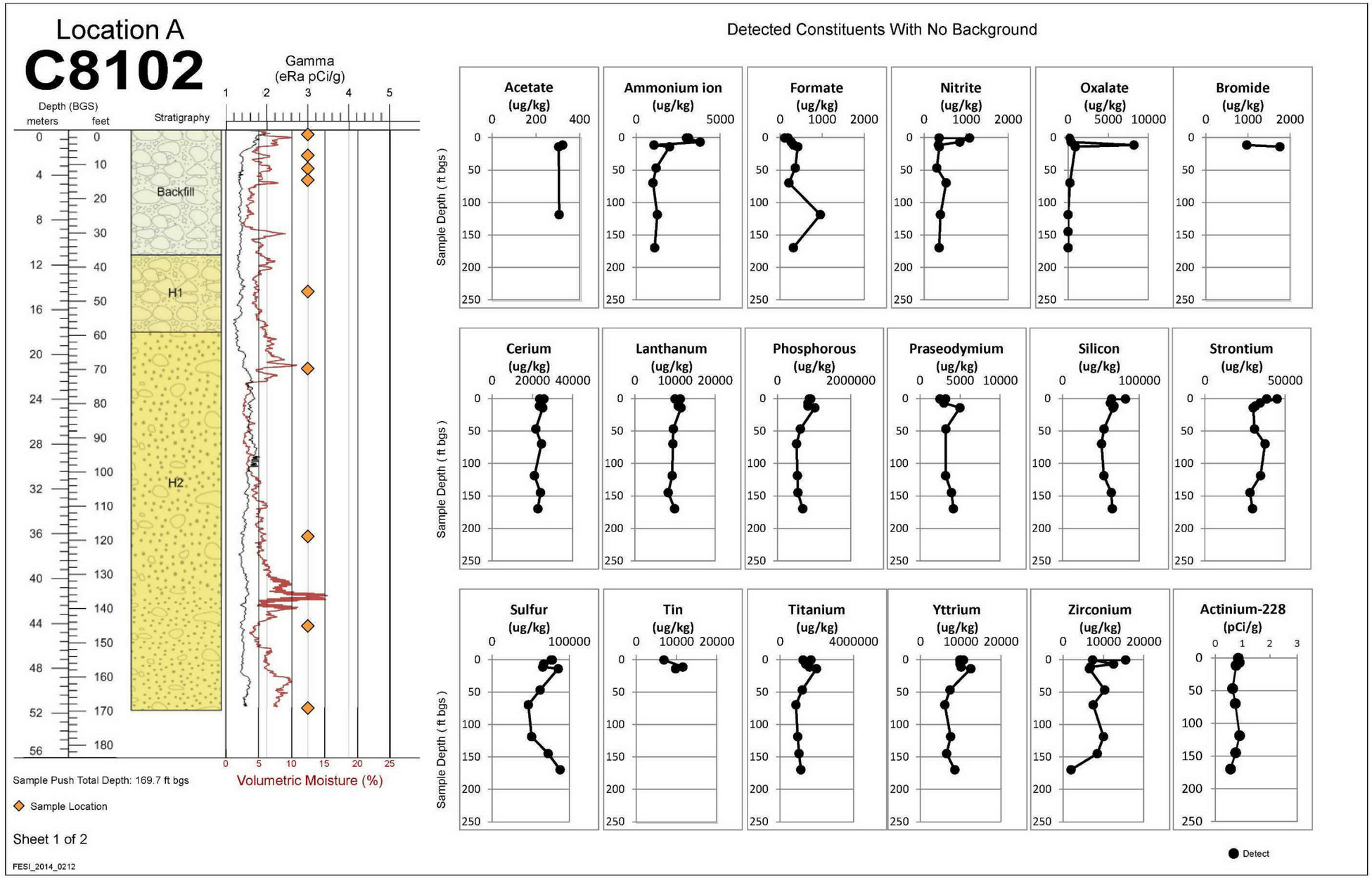


Figure O-3. Summary of Detected Constituents with No Background at Site A (C8102)

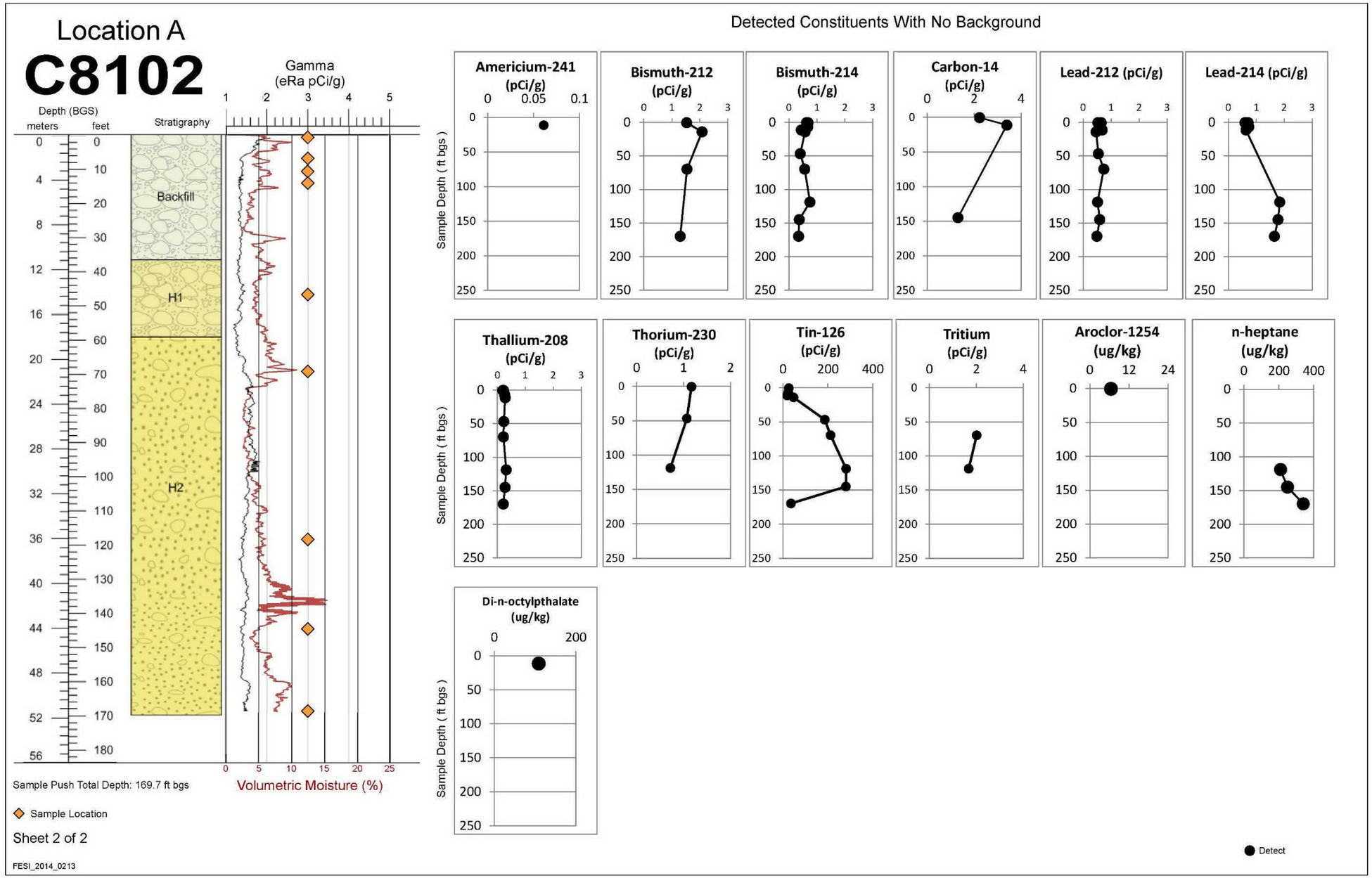


Figure O-4. Summary of Constituents Above Background at Site B (C8104)

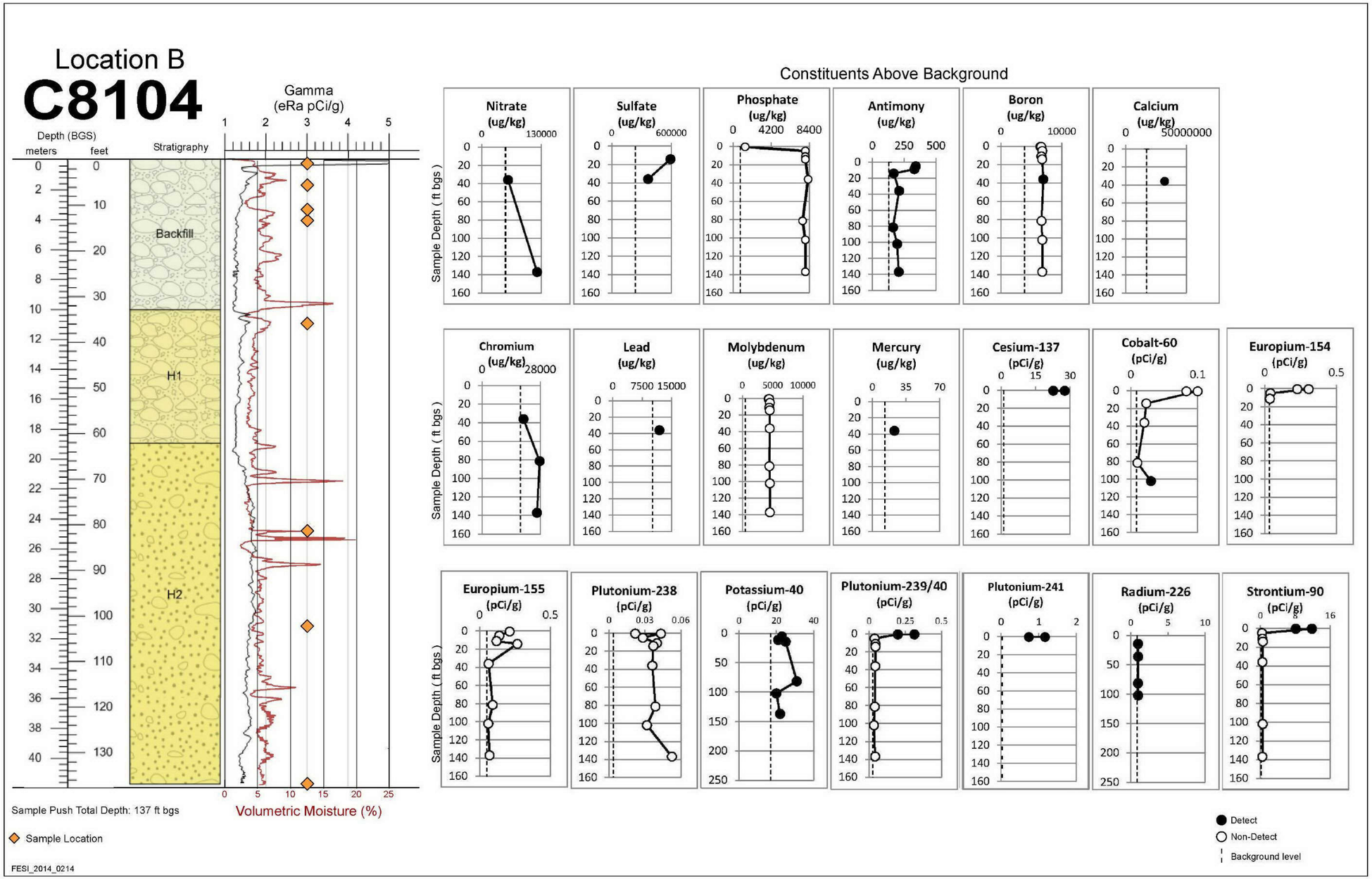


Figure O-5. Summary of Detected Constituents with No Background at Site B (C8104)

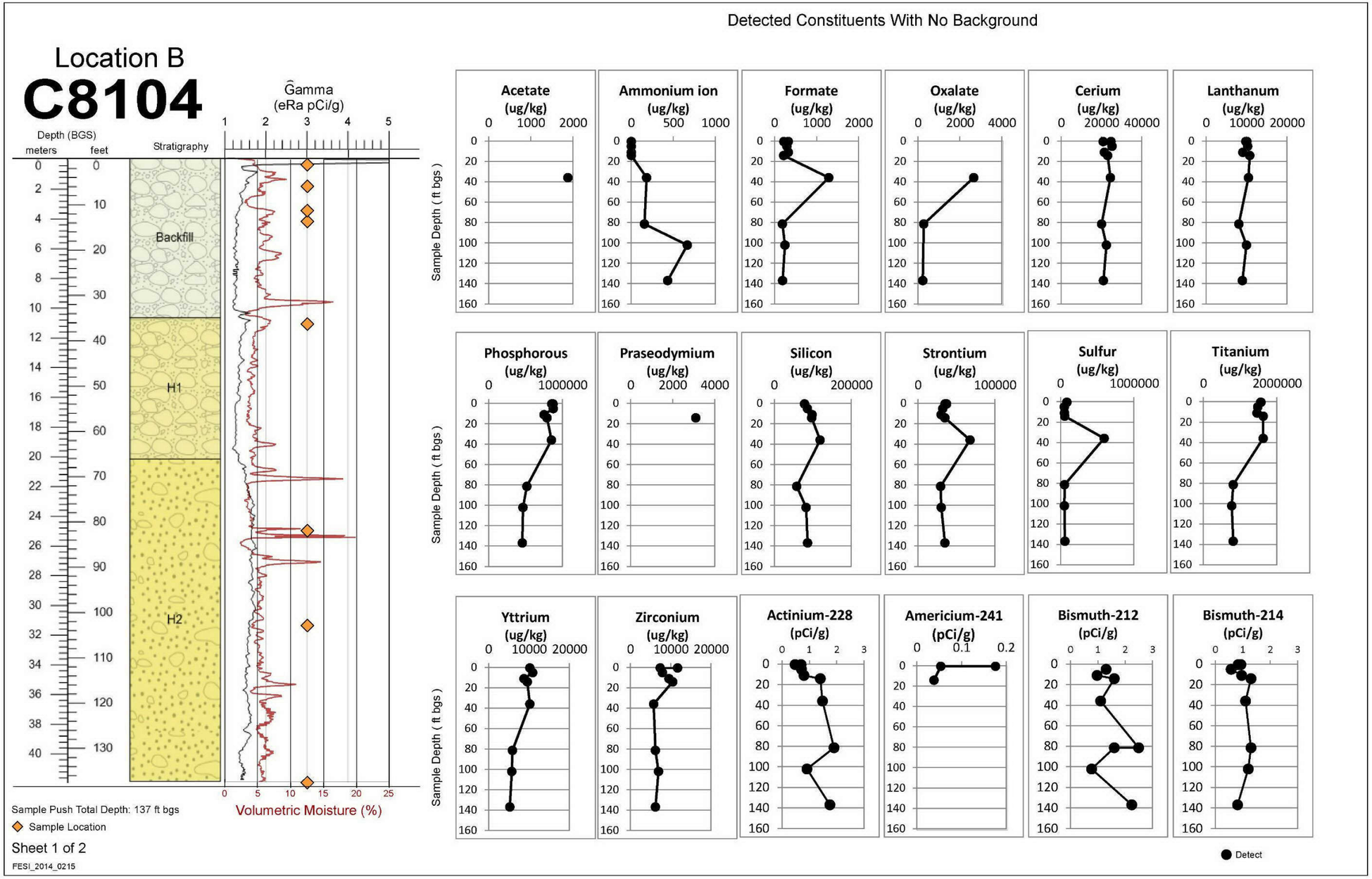


Figure O-6. Summary of Detected Constituents with No Background at Site B (C8104)

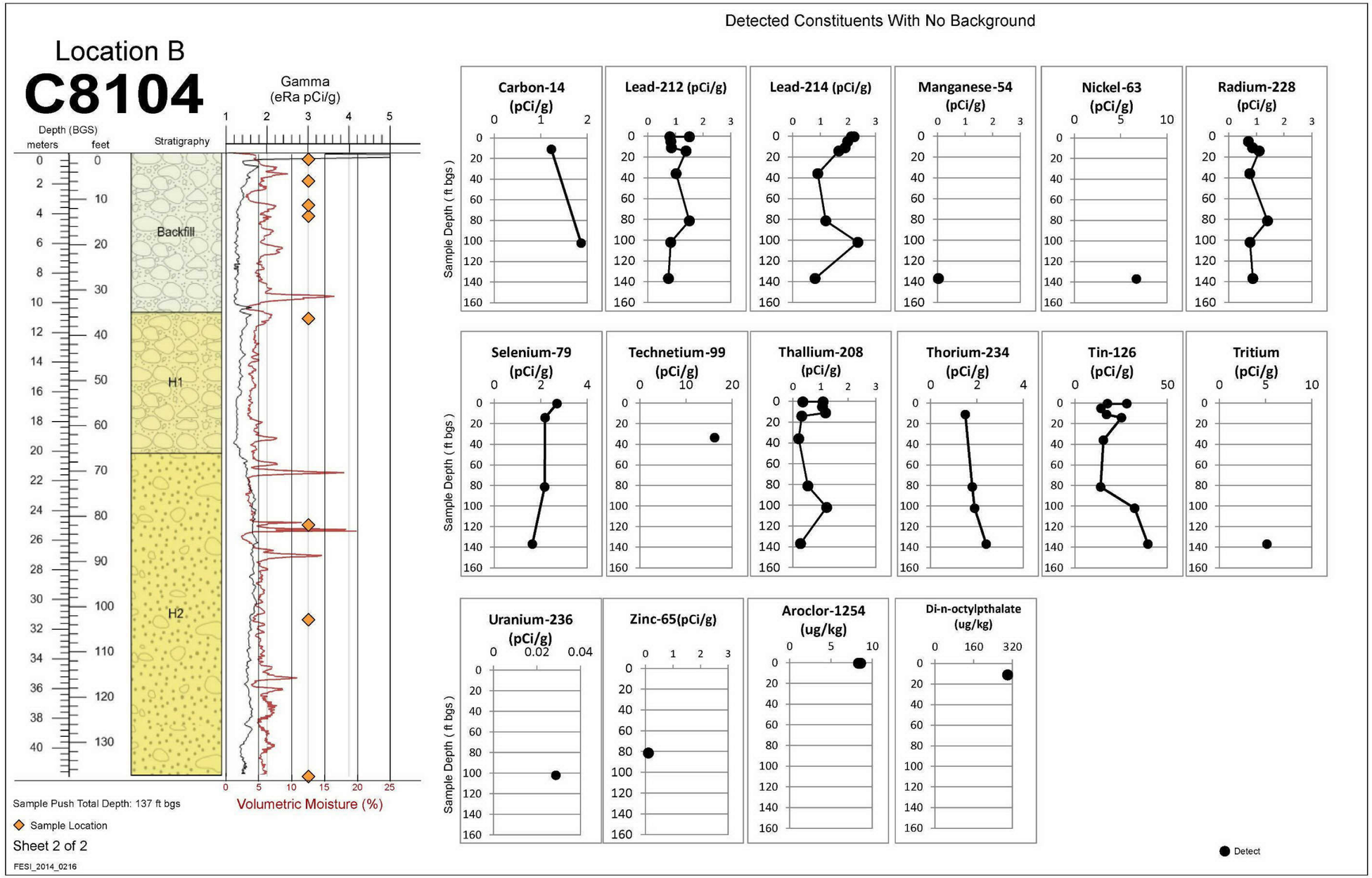


Figure O-7. Summary of Constituents Above Background at Site C (C8106)

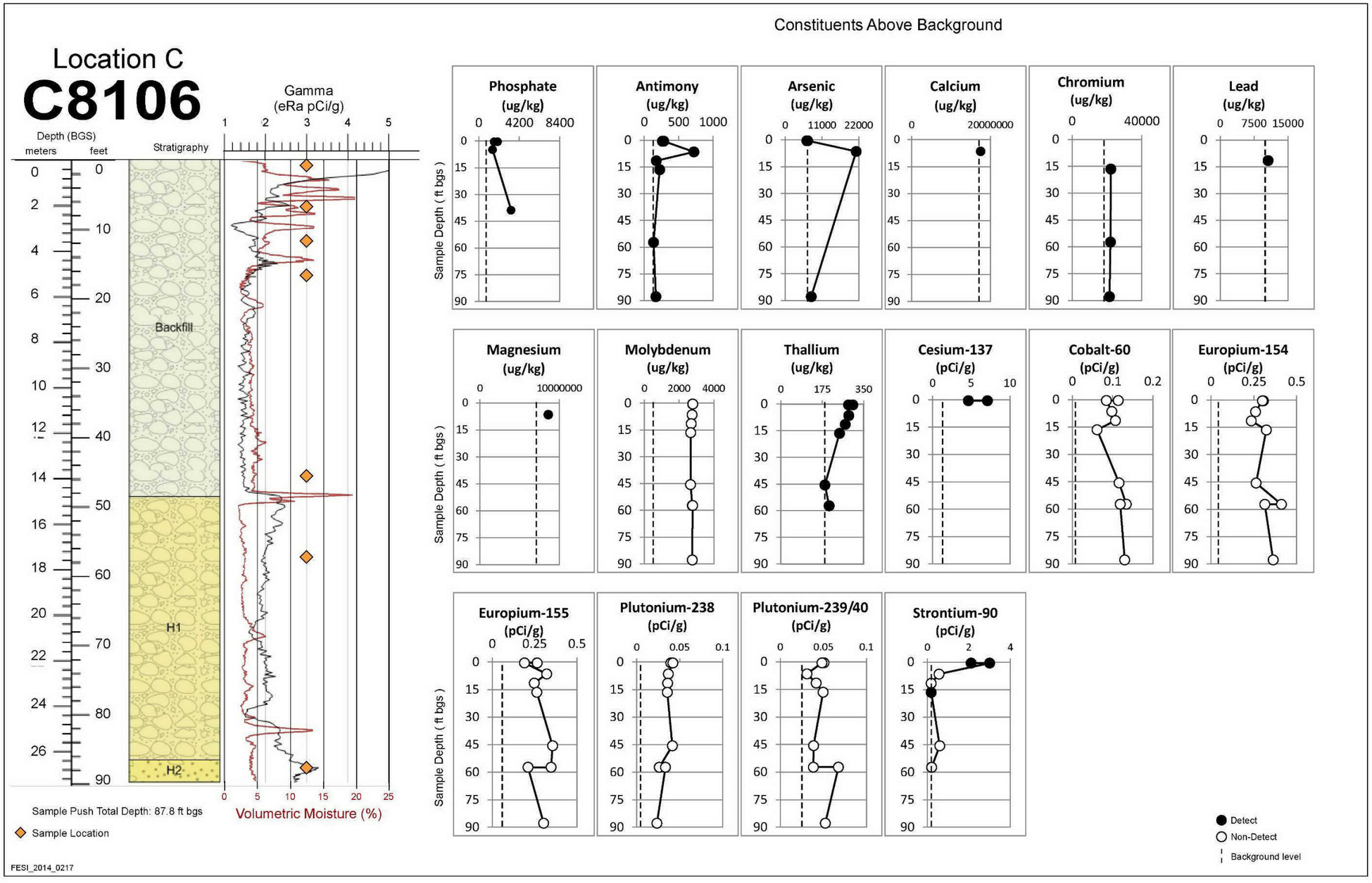


Figure O-8. Summary of Detected Constituents with No Background at Site C (C8106)

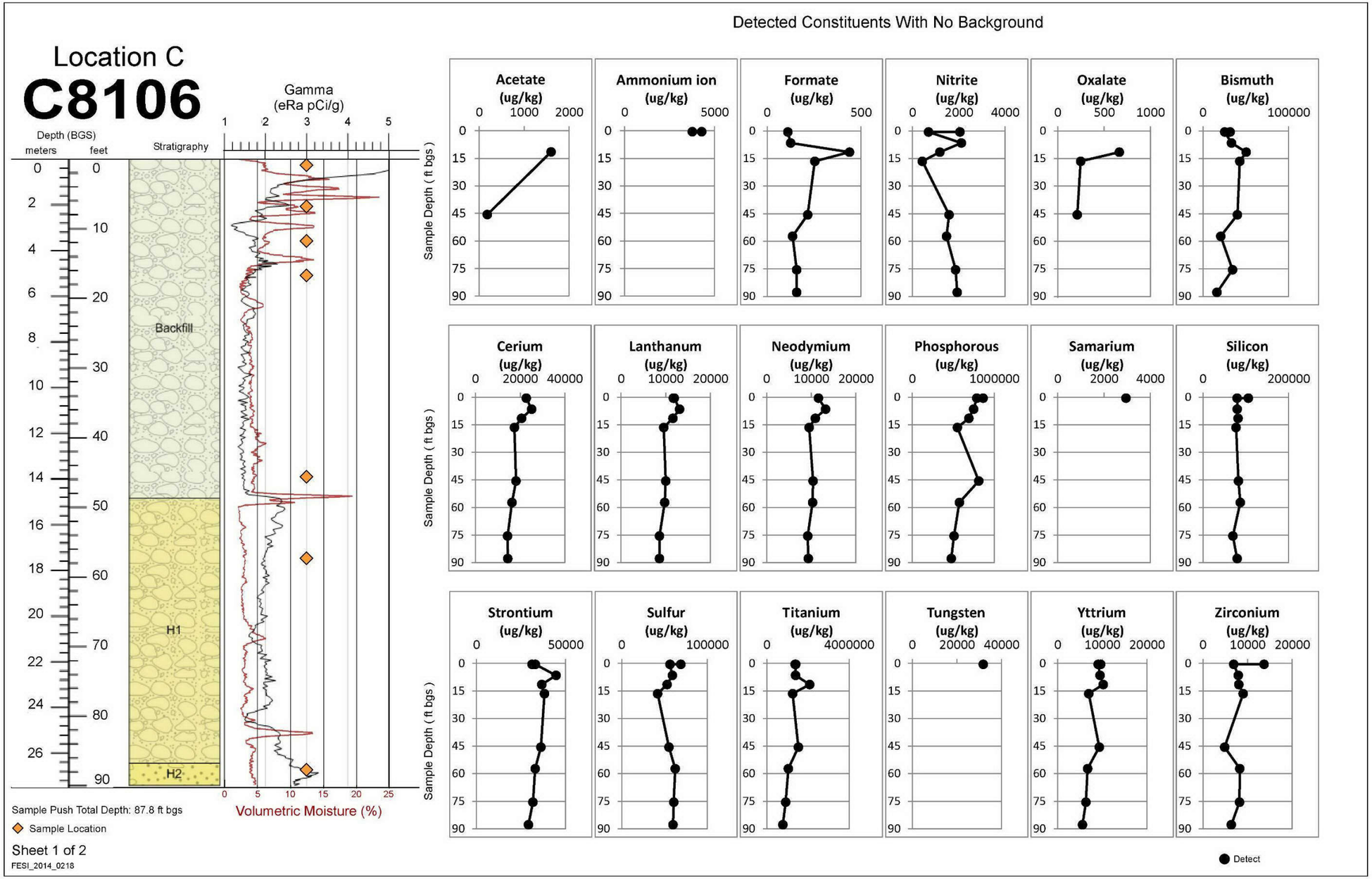


Figure O-9. Summary of Detected Constituents with No Background at Site C (C8106)

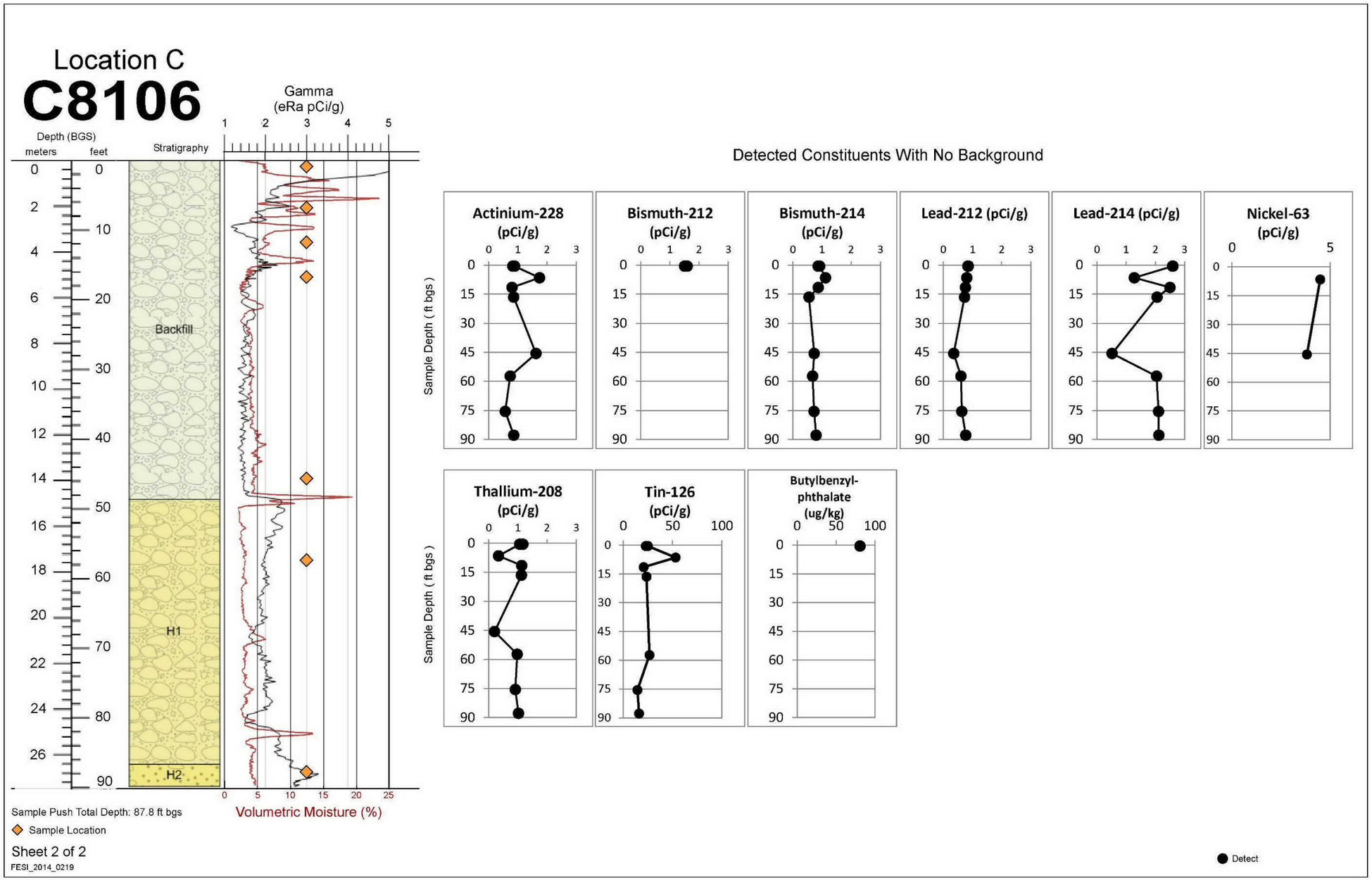


Figure O-10. Summary of Constituents Above Background at Site E (C7672)

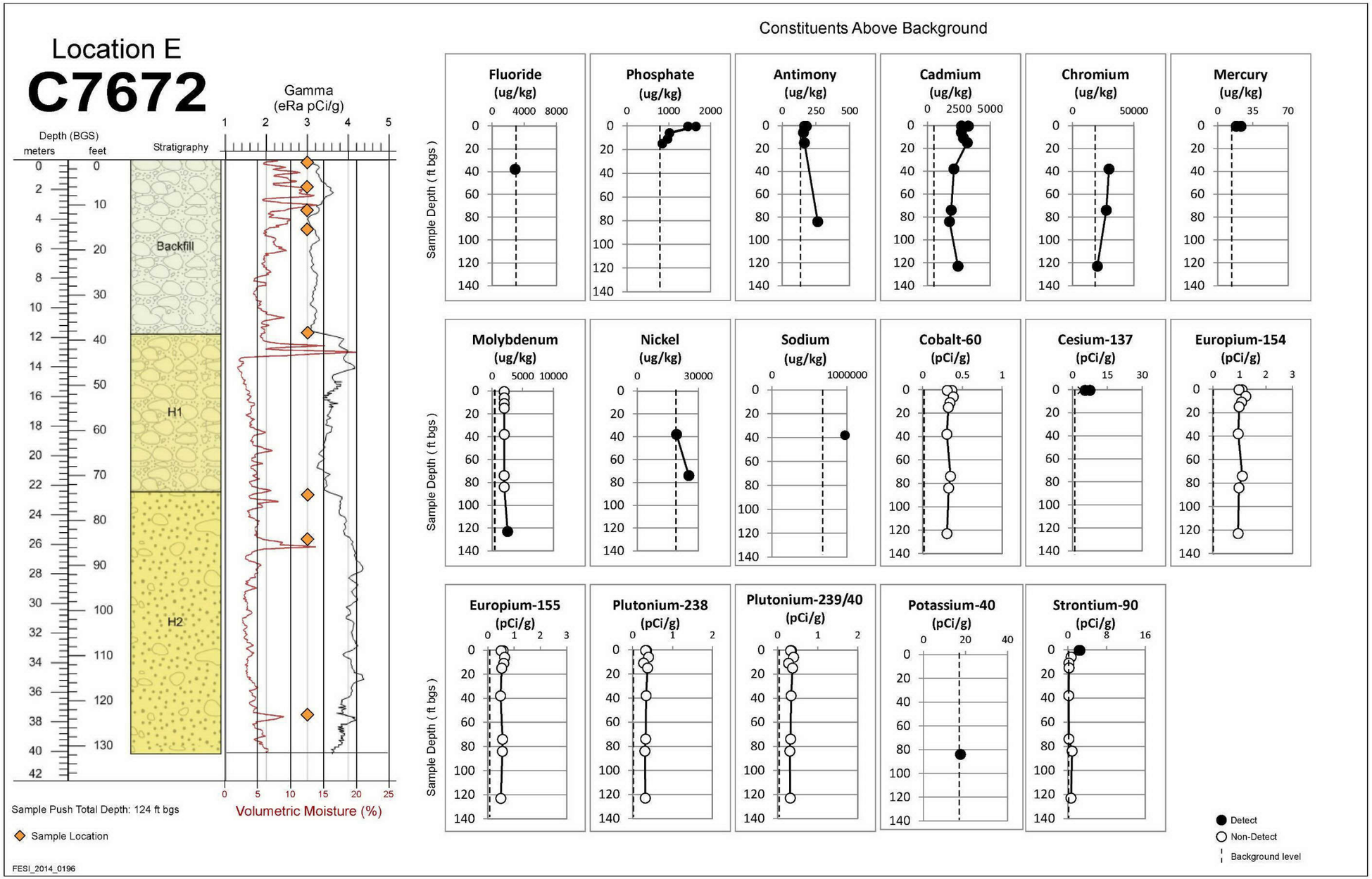


Figure O-11. Summary of Detected Constituents with No Background at Site E (C7672)

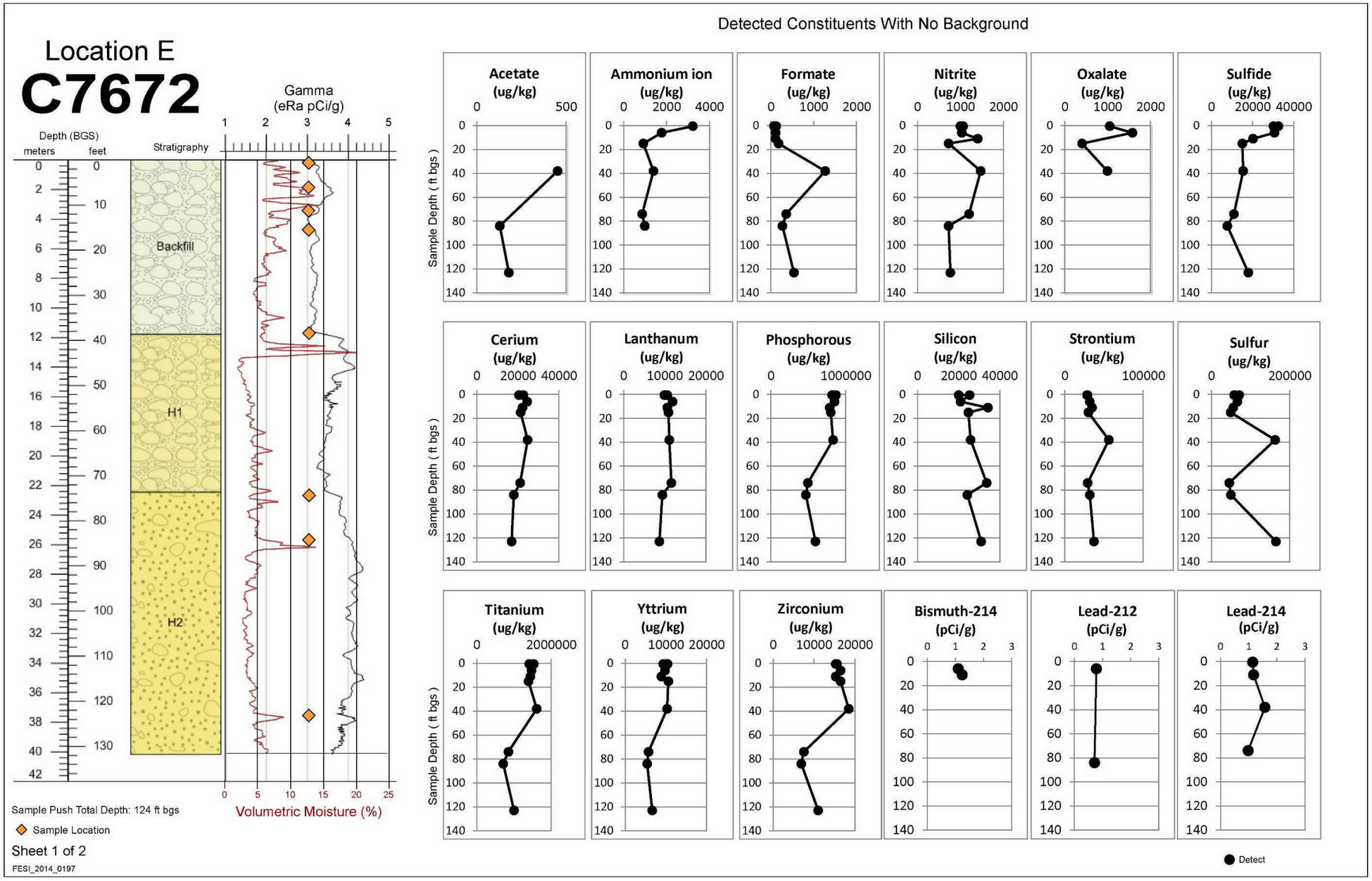


Figure O-12. Summary of Detected Constituents with No Background at Site E (C7672)

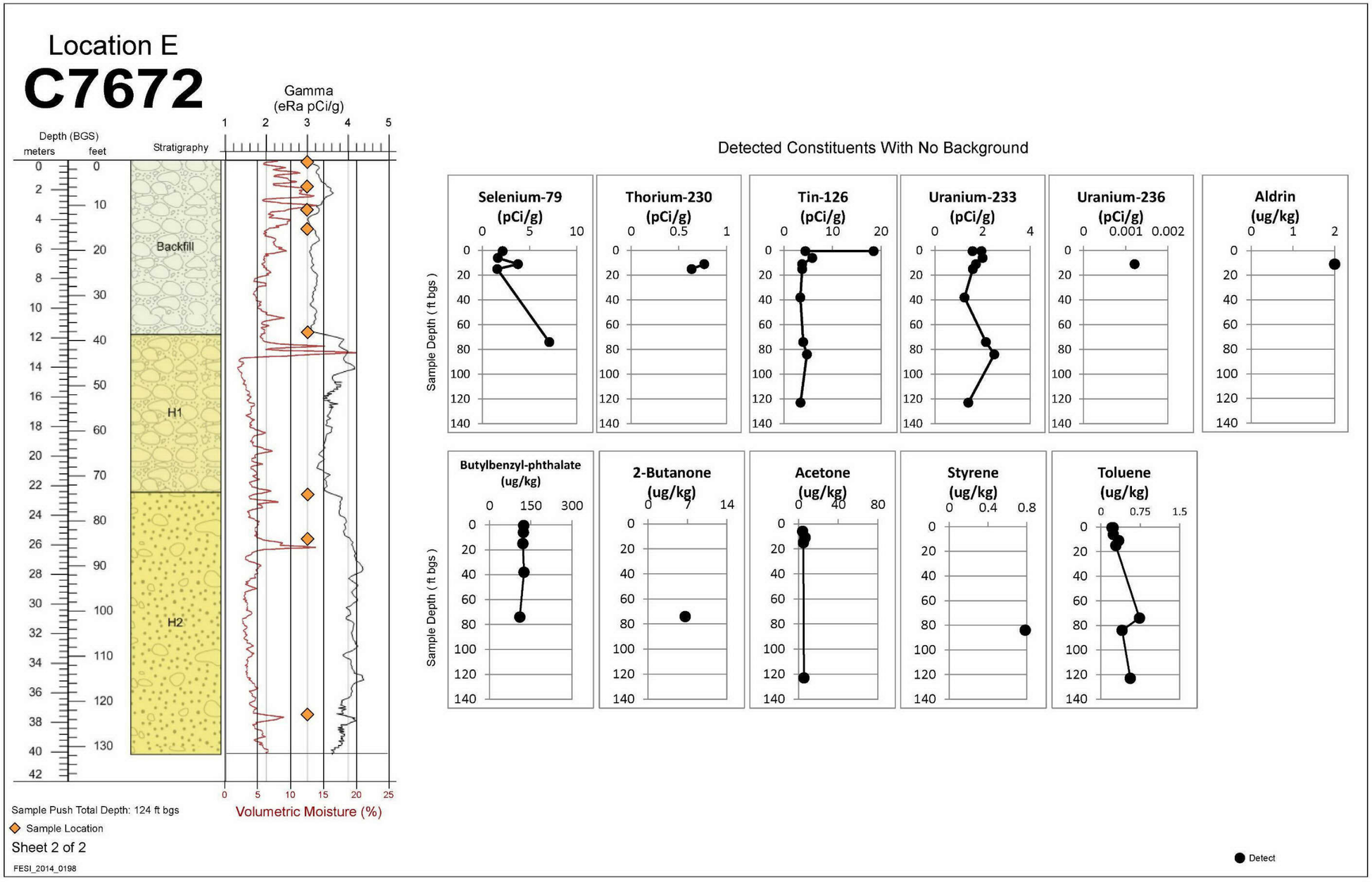


Figure O-13. Summary of Constituents Above Background at Site F (C7472)

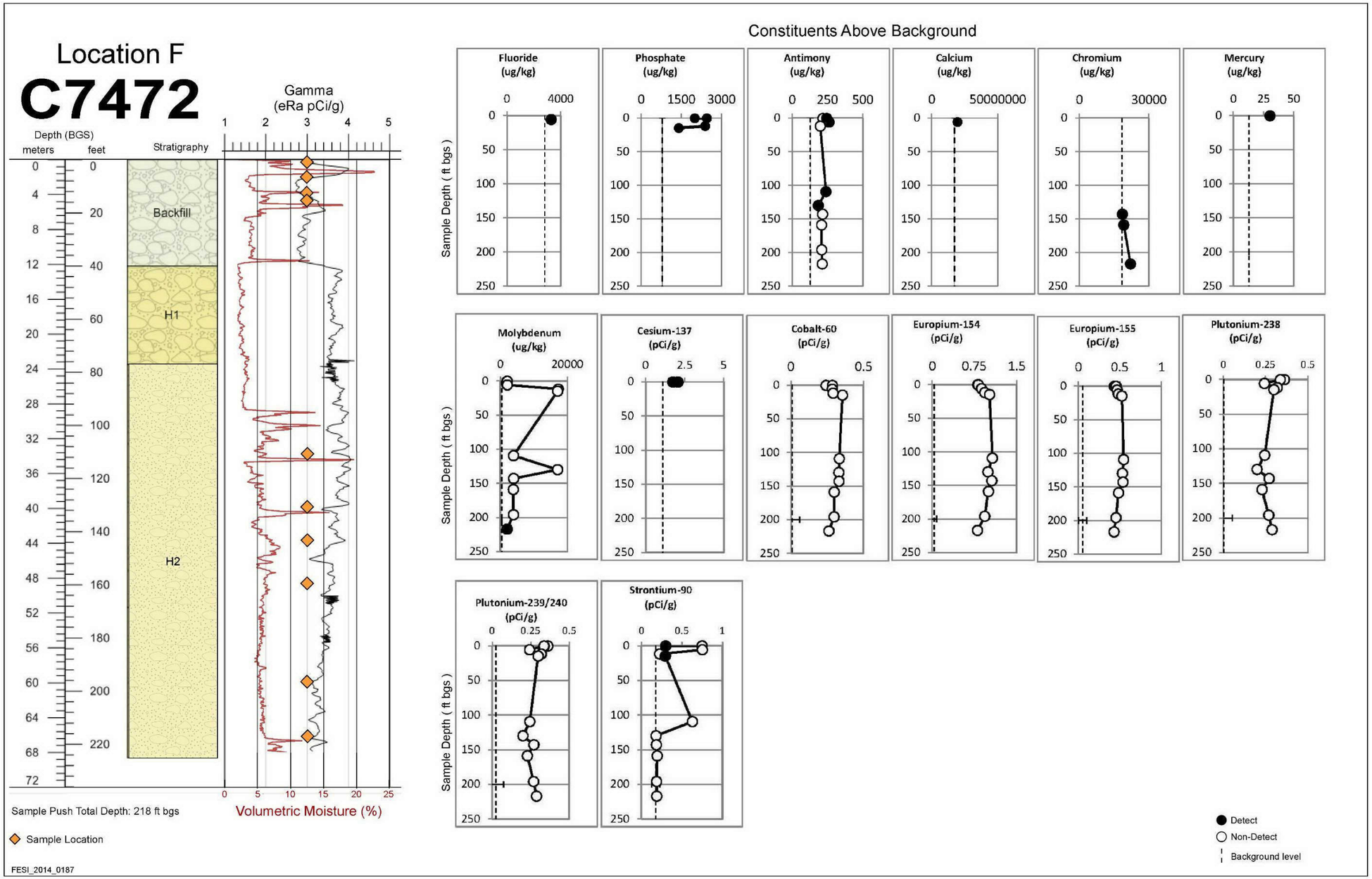


Figure O-14. Summary of Detected Constituents with No Background at Site F (C7472)

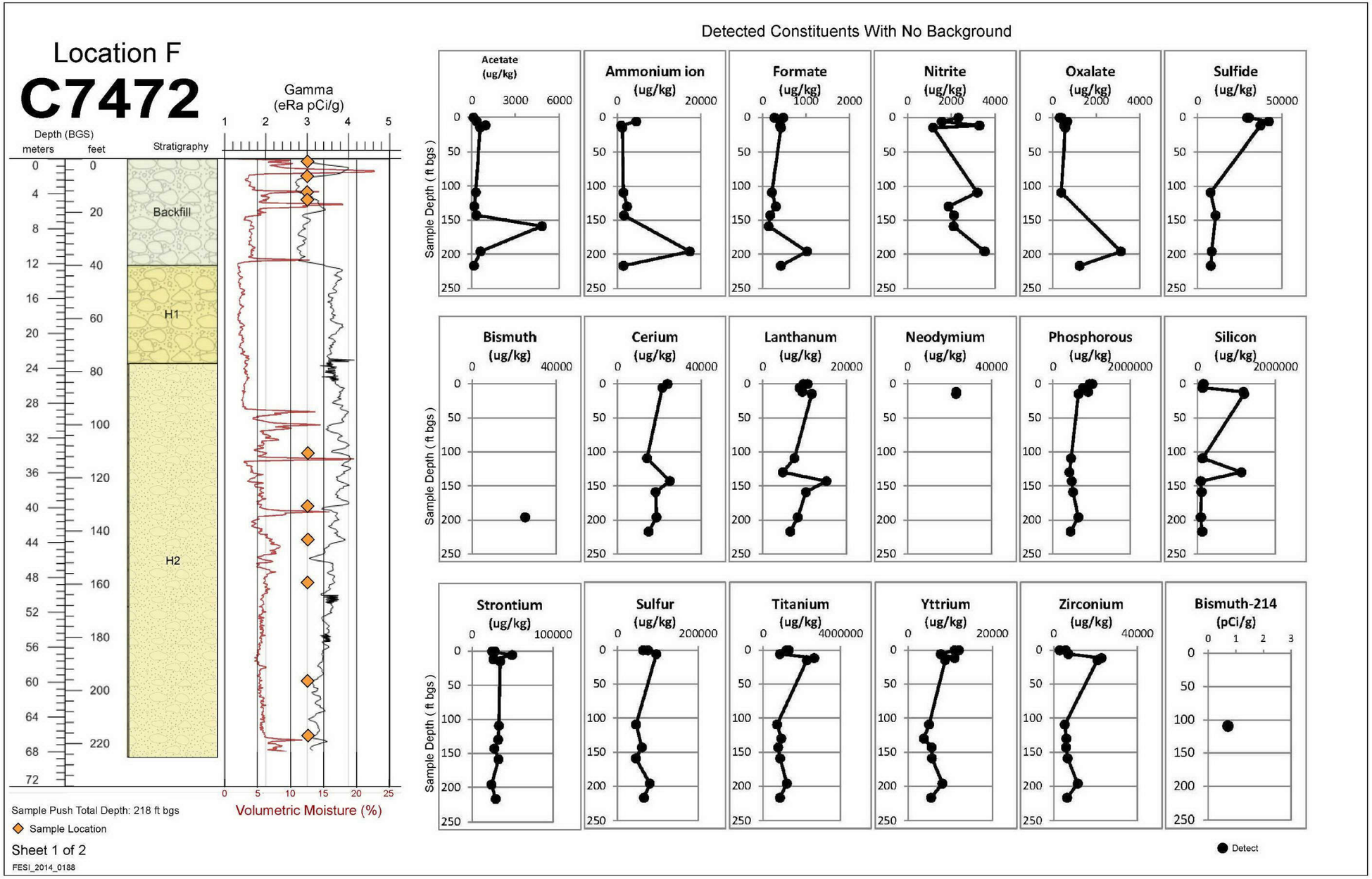


Figure O-15. Summary of Detected Constituents with No Background at Site F (C7472)

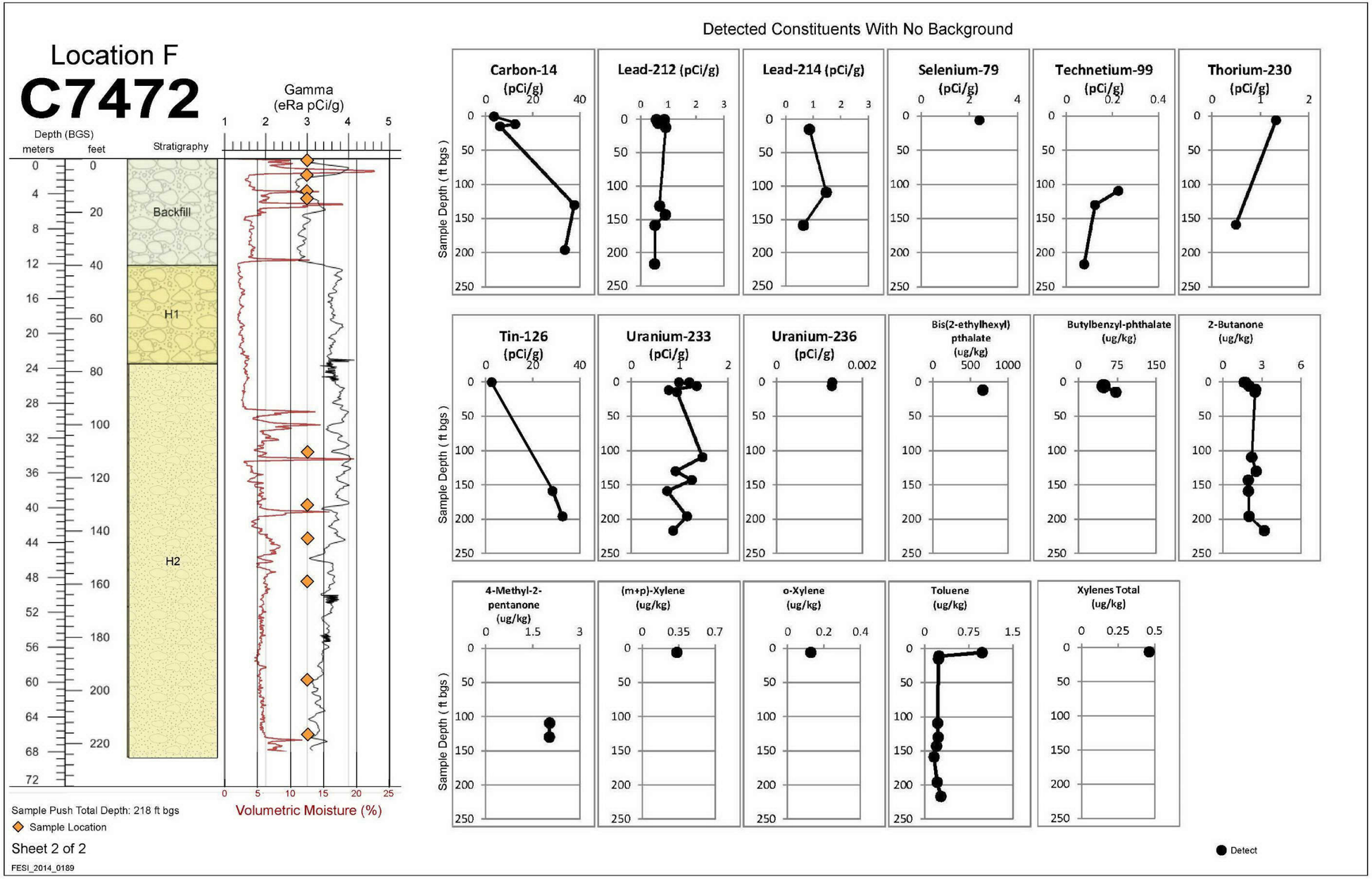


Figure O-16. Summary of Constituents Above Background at Site G (C7468)

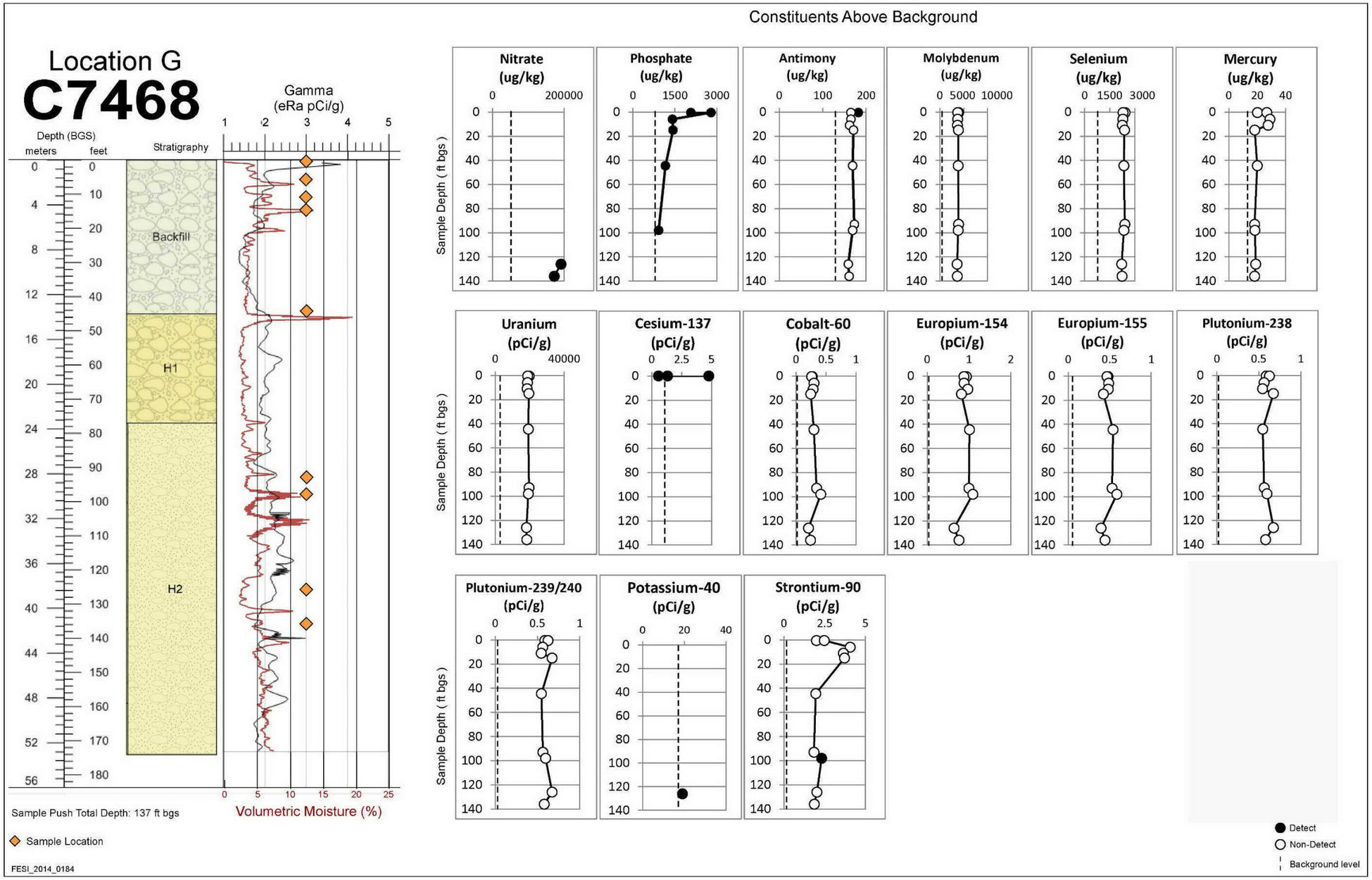


Figure O-17. Summary of Detected Constituents with No Background at Site G (C7468)

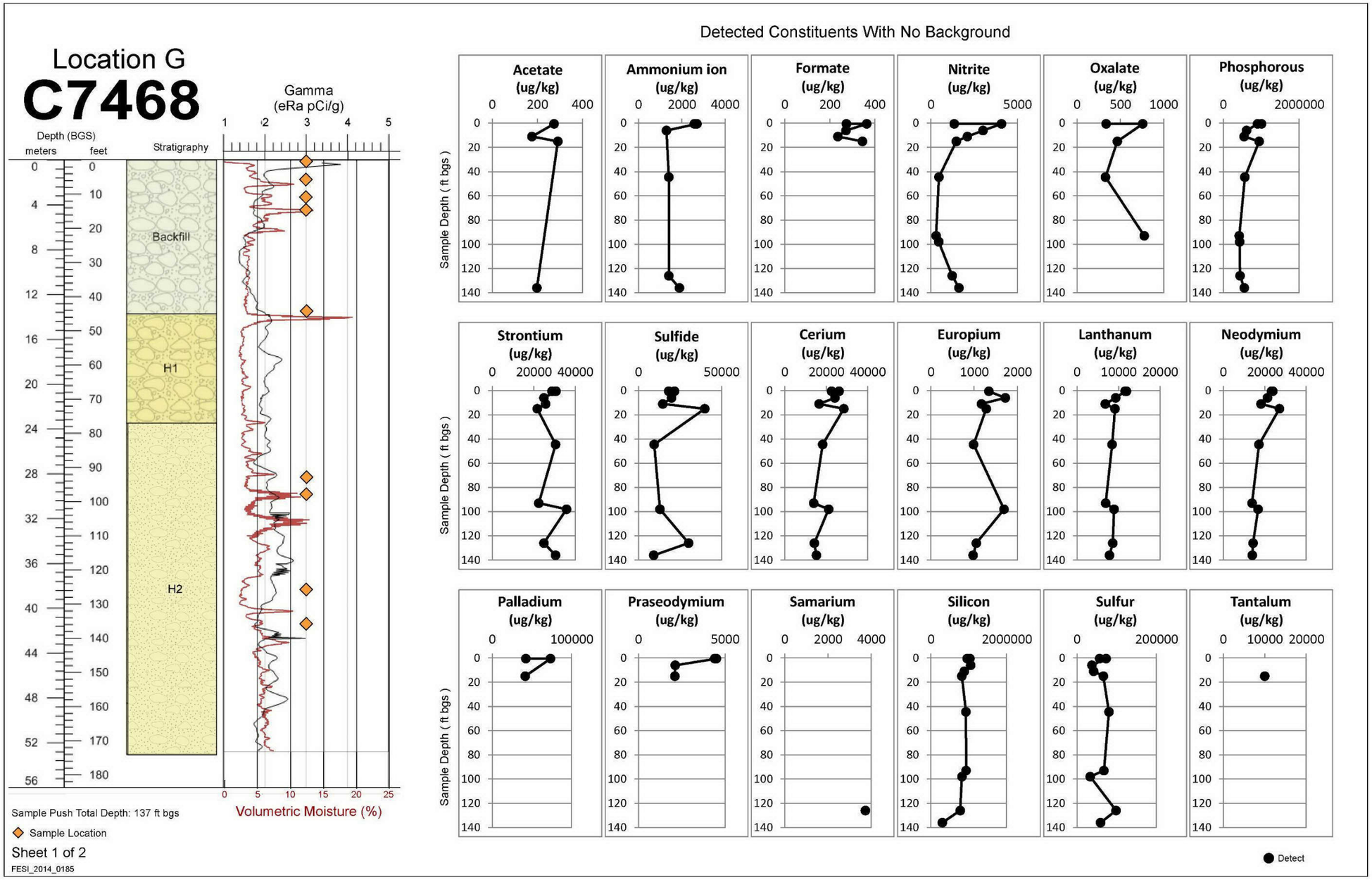


Figure O-18. Summary of Detected Constituents with No Background at Site G (C7468)

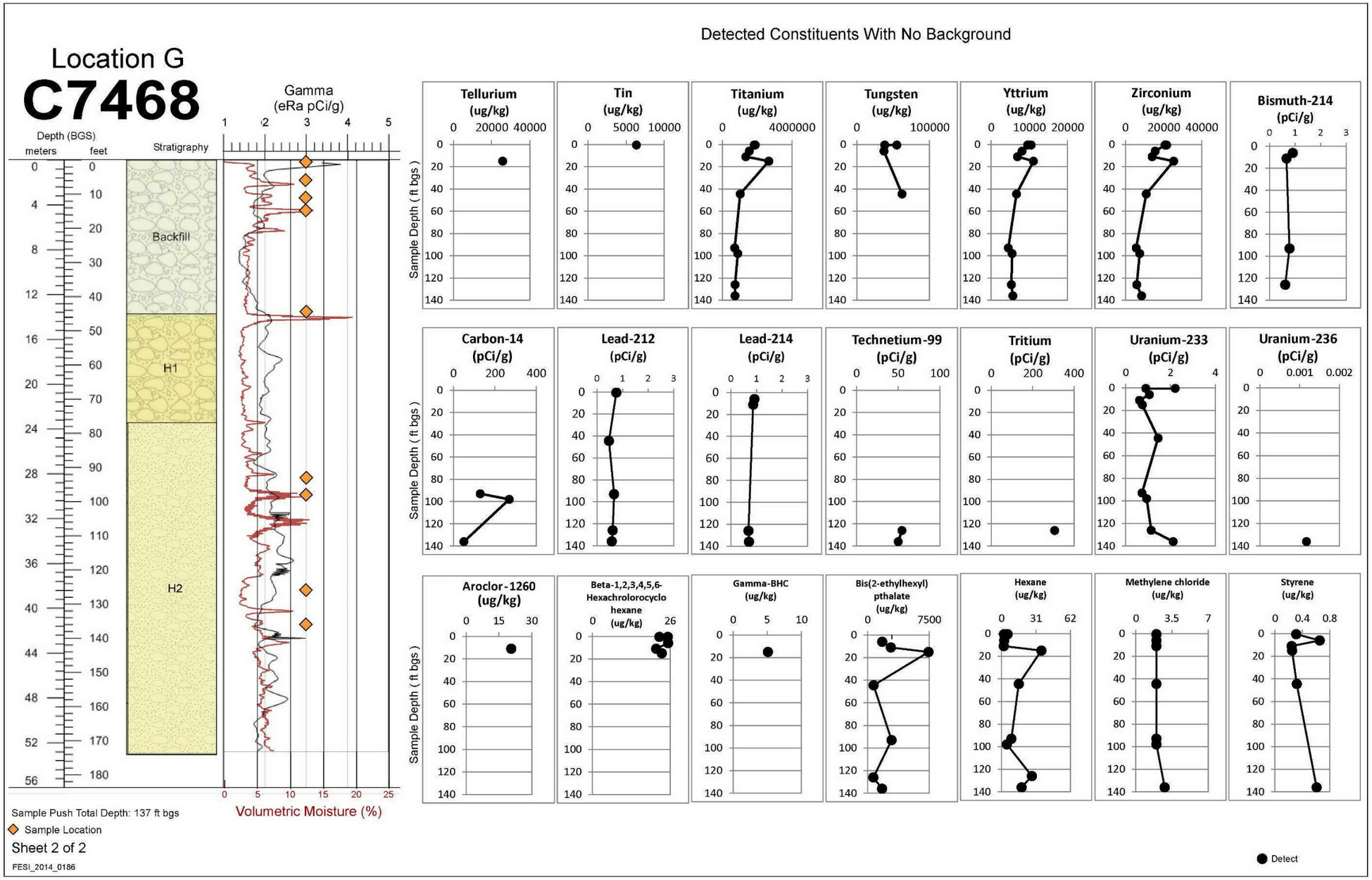


Figure O-19. Summary of Constituents Above Background at Site H (C7680)

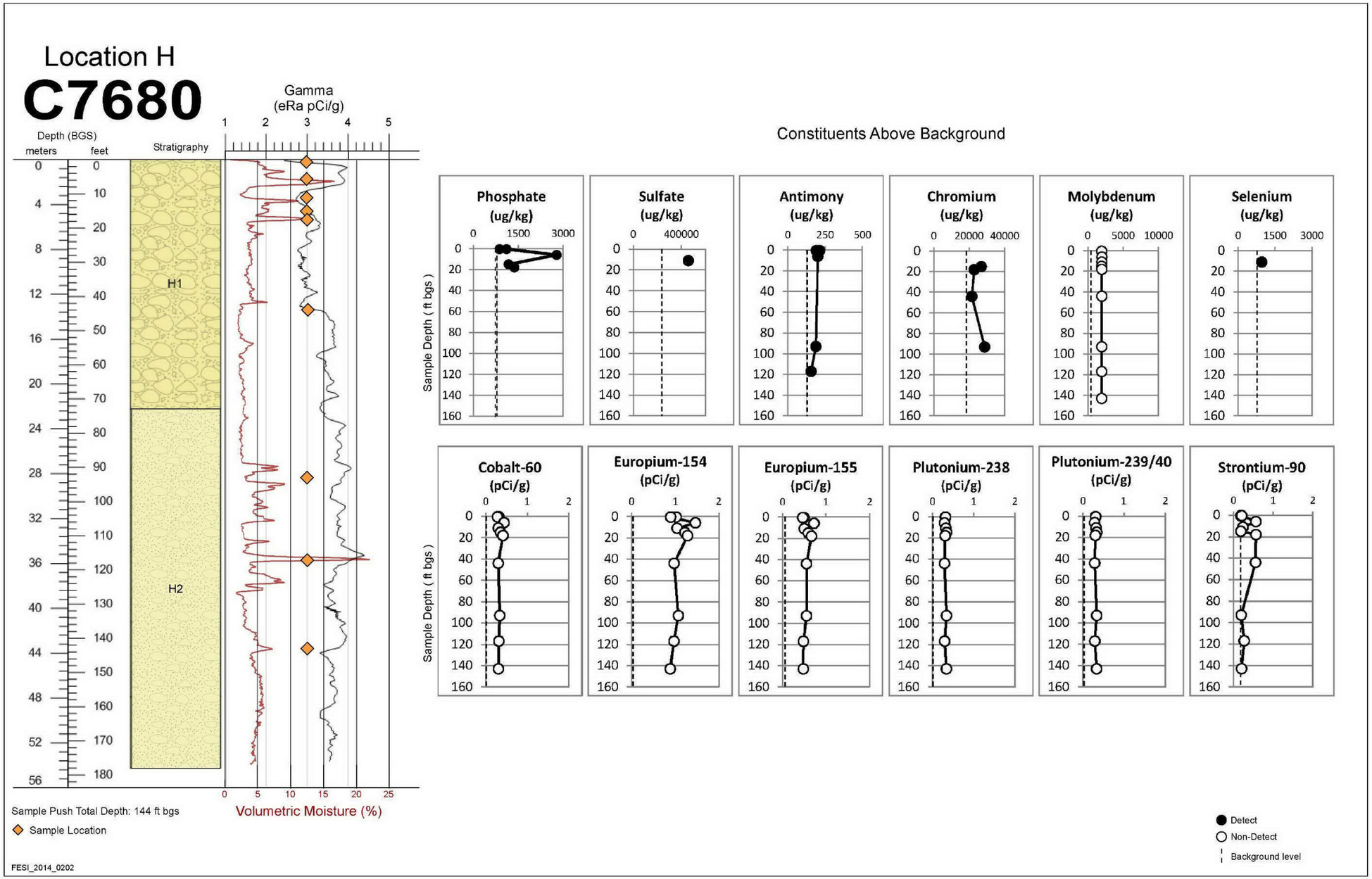


Figure O-20. Summary of Detected Constituents with No Background at Site H (C7680)

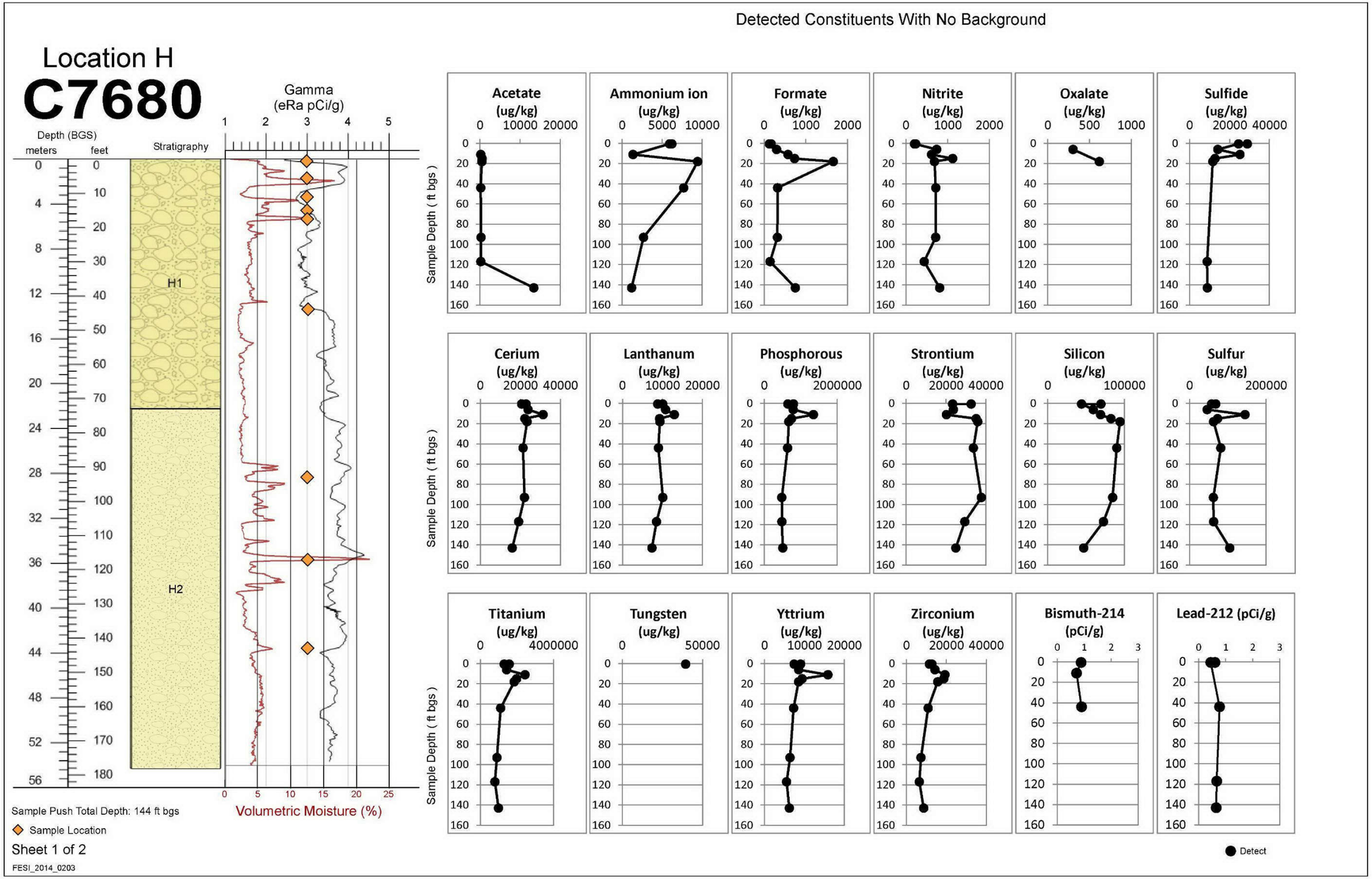


Figure O-21. Summary of Detected Constituents with No Background at Site H (C7680)

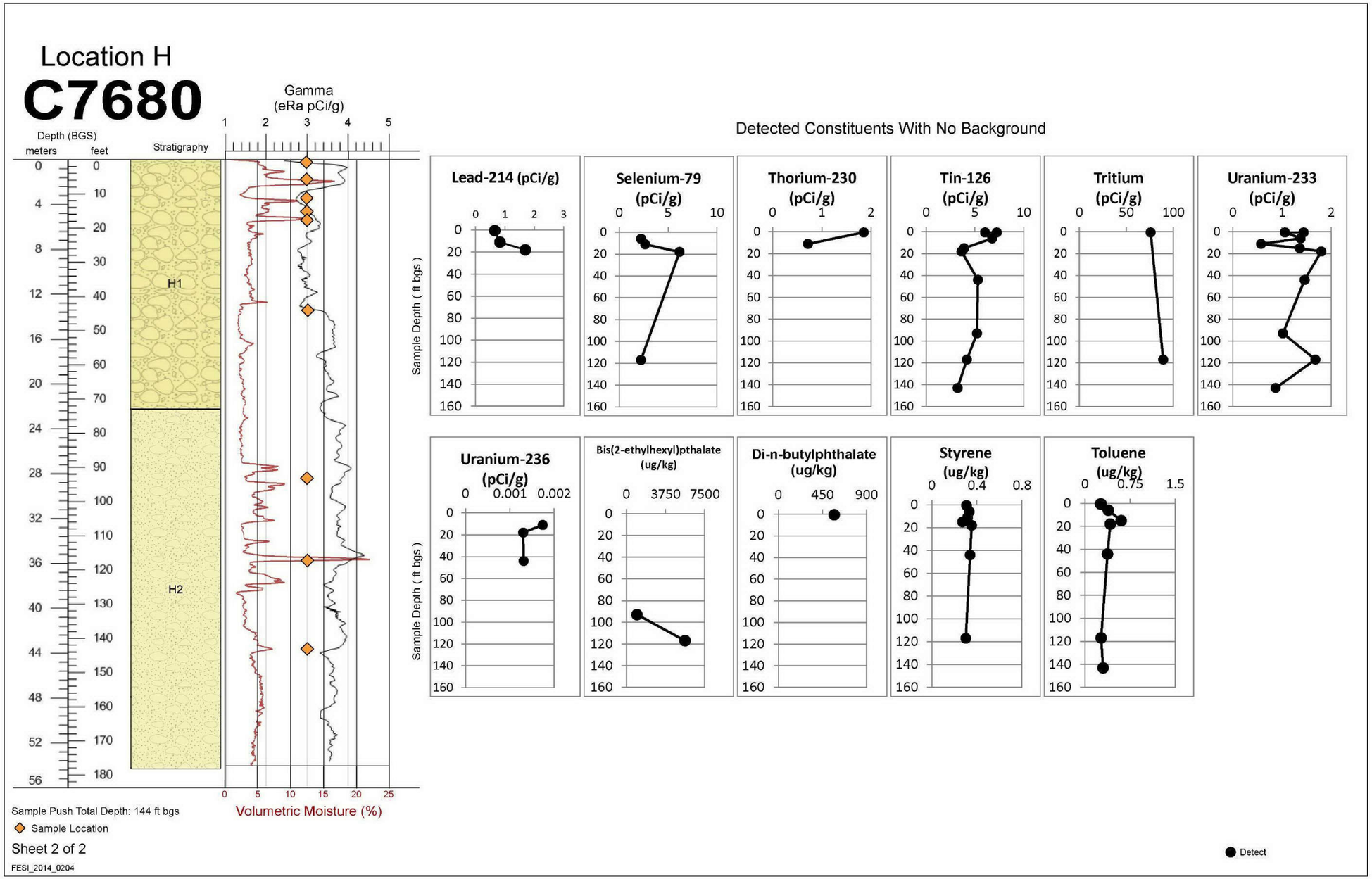


Figure O-22. Summary of Constituents Above Background at Site I (C7682)

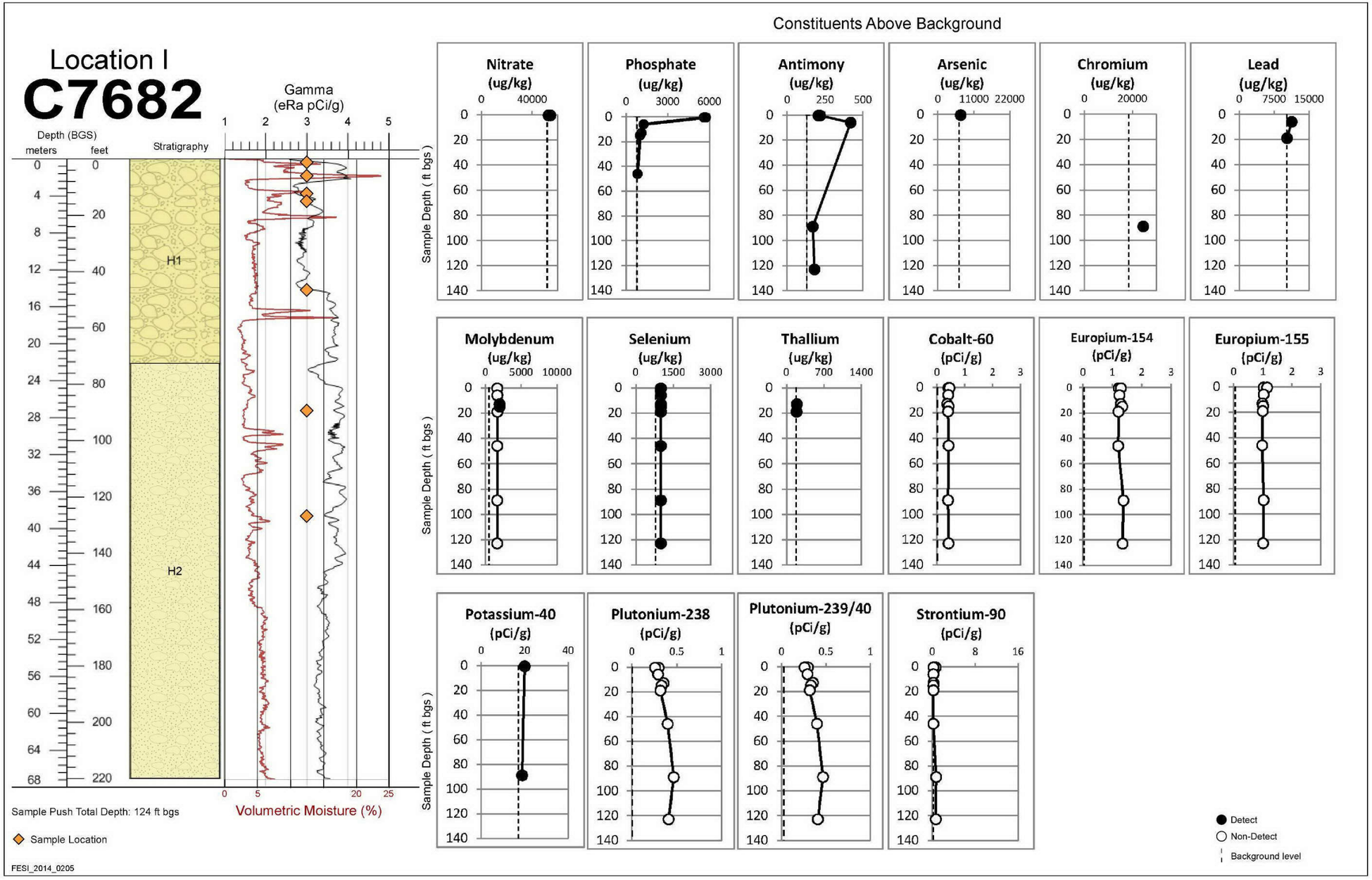


Figure O-23. Summary of Detected Constituents with No Background at Site I (C7682)

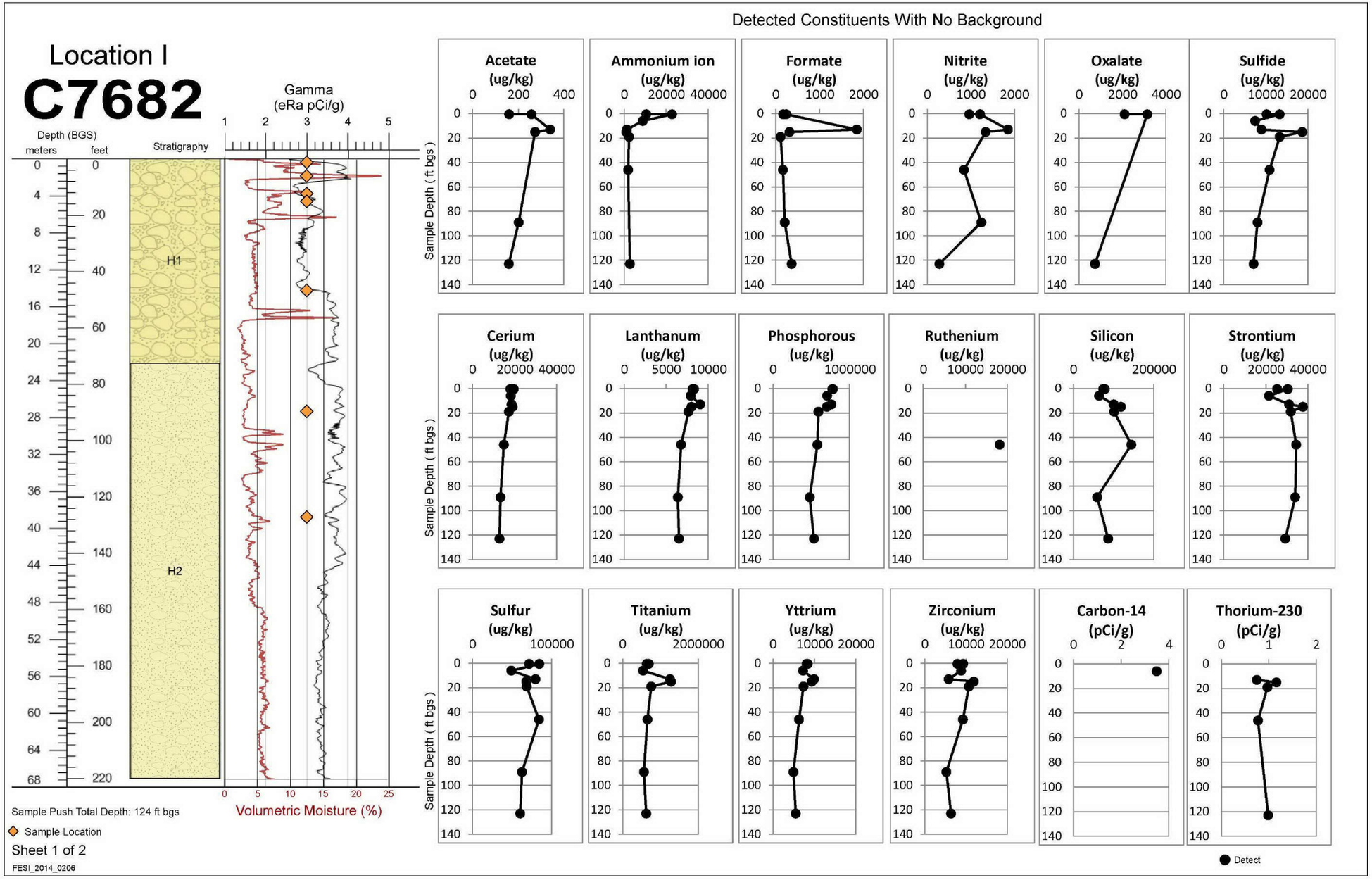


Figure O-24. Summary of Detected Constituents with No Background at Site I (C7682)

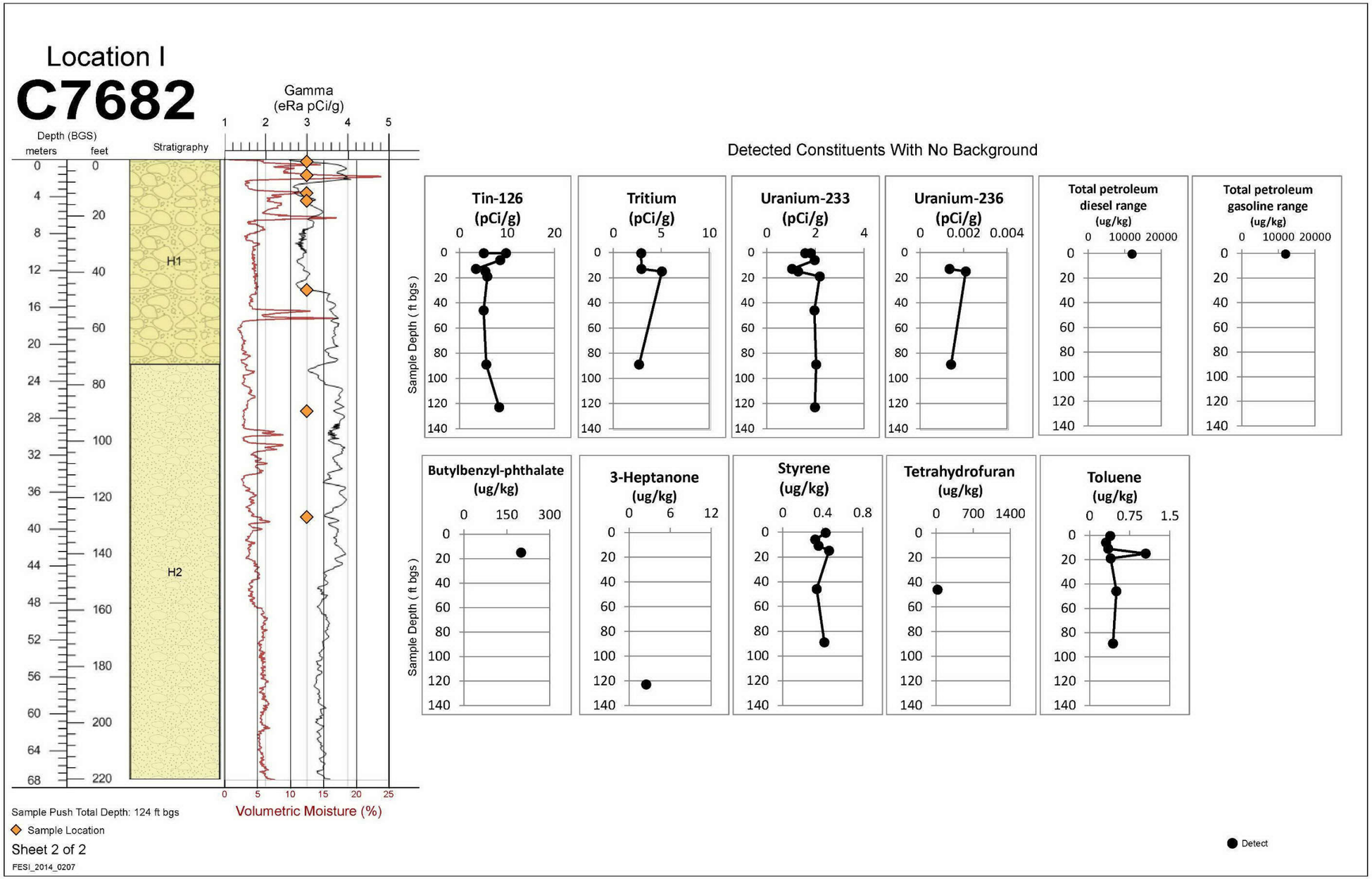


Figure O-25. Summary of Constituents Above Background at Site J (C8100)

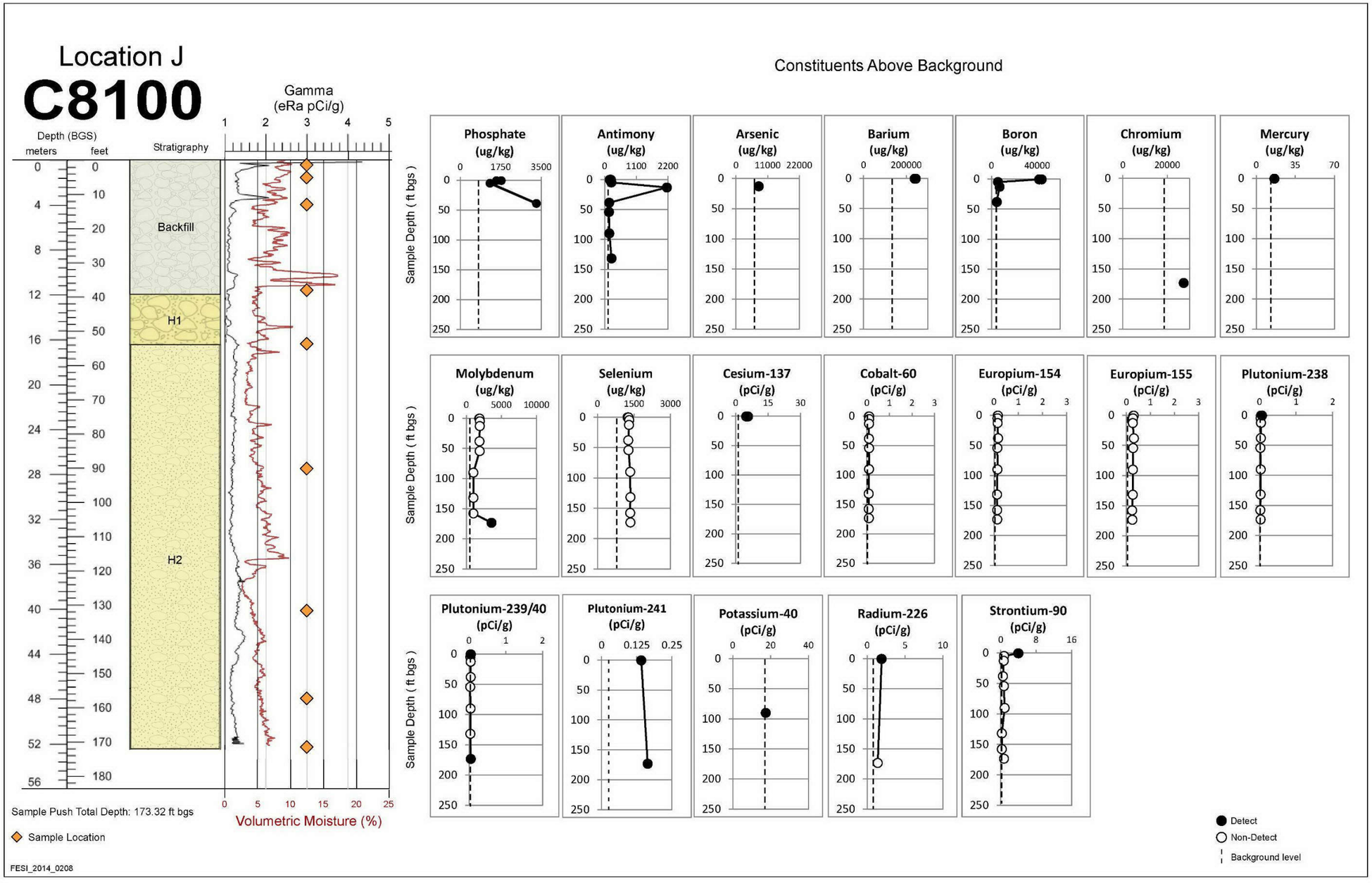


Figure O-26. Summary of Detected Constituents with No Background at Site J (C8100)

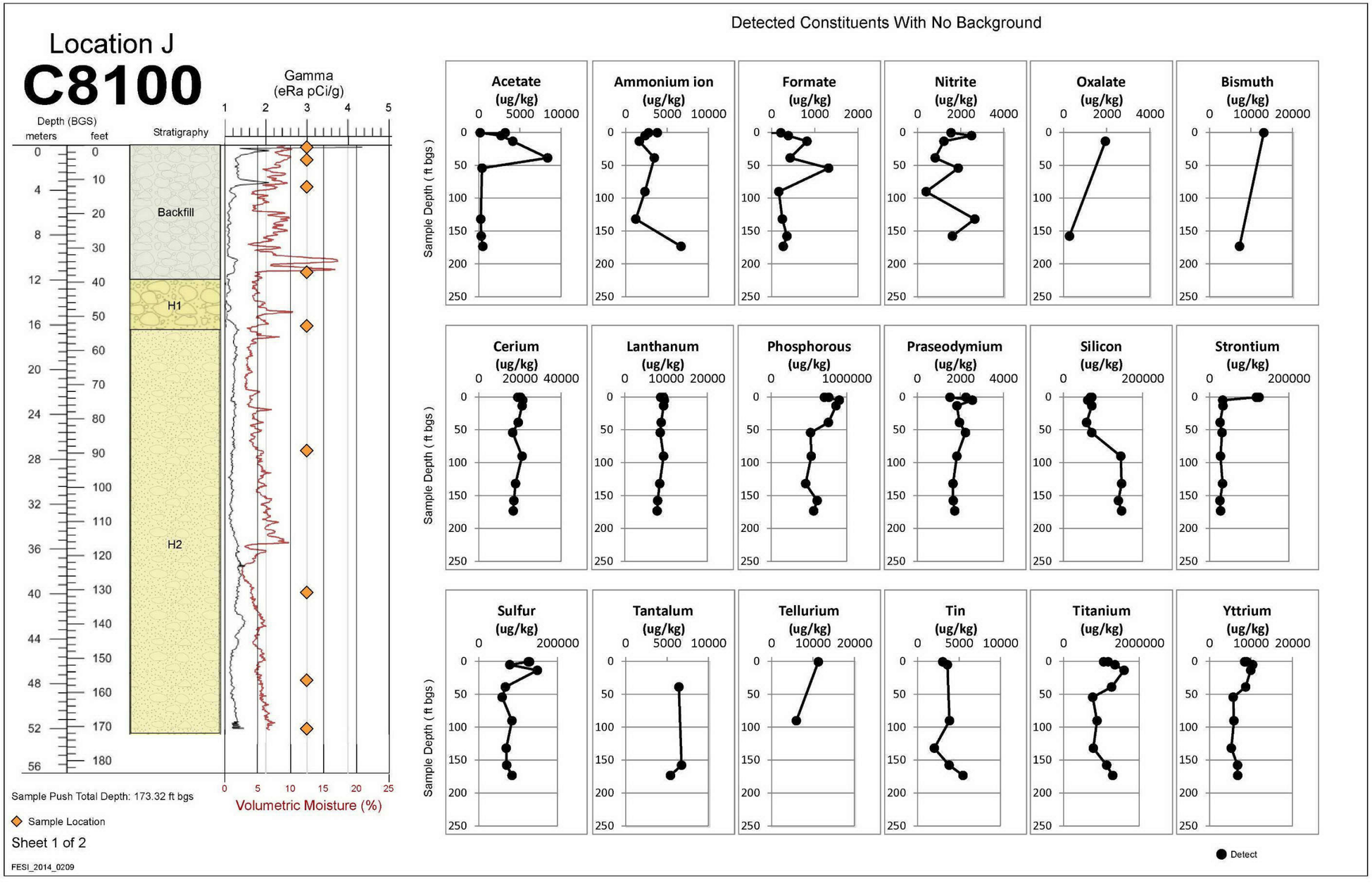


Figure O-27. Summary of Detected Constituents with No Background at Site J (C8100)

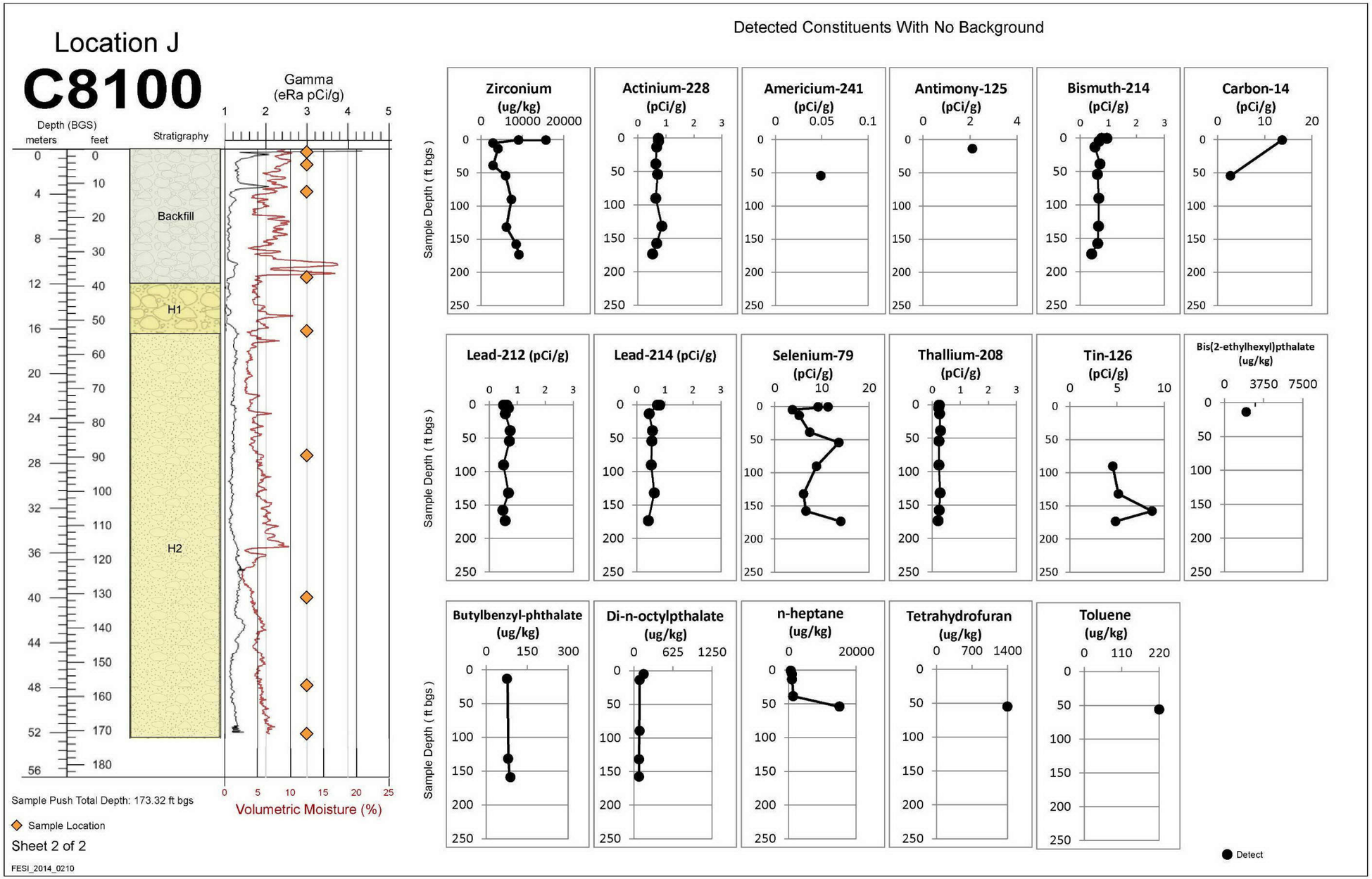


Figure O-28. Summary of Constituents Above Background at Site L1 (C7466)

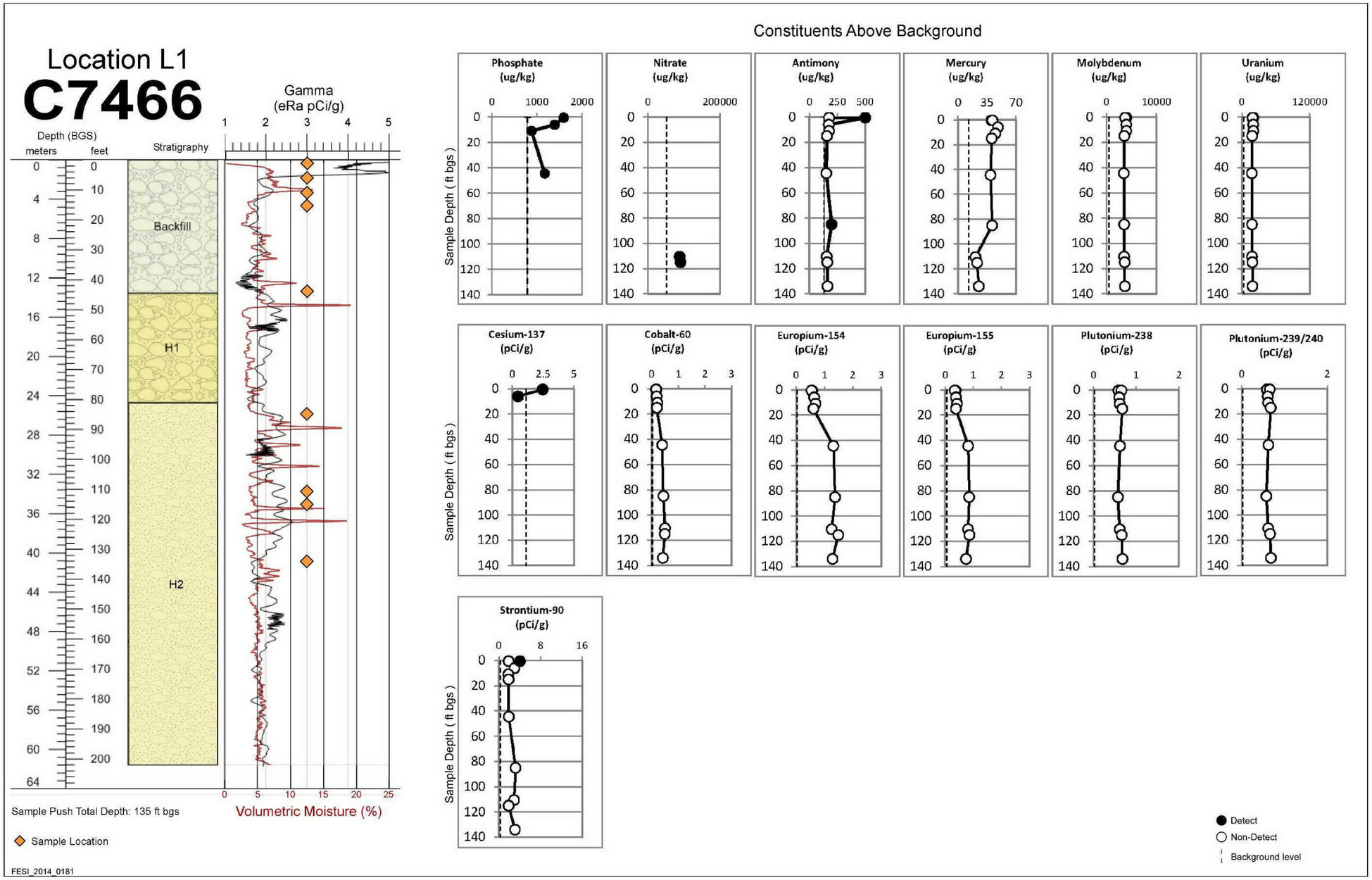


Figure O-29. Summary of Detected Constituents with No Background at Site L1 (C7466)

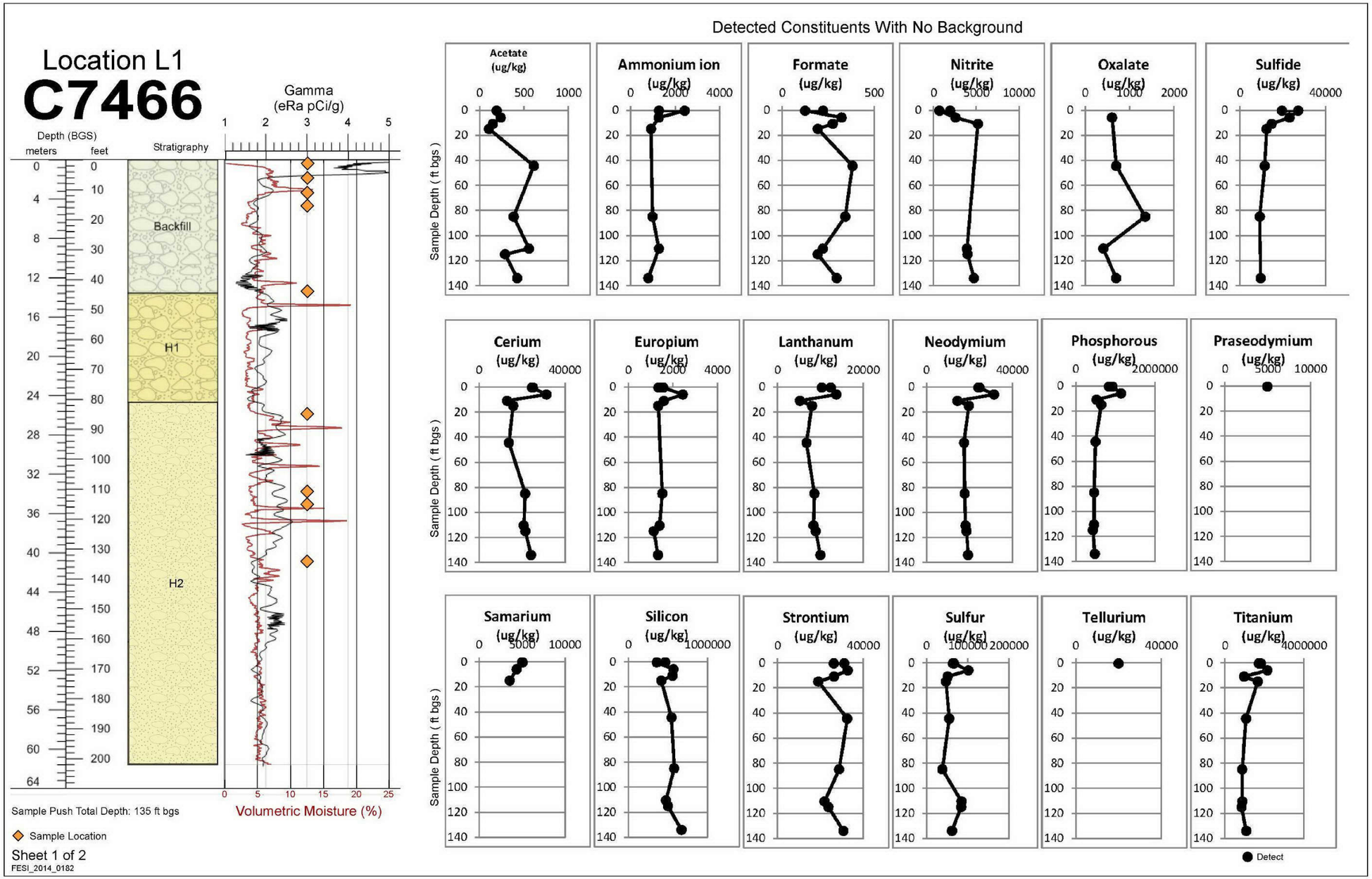


Figure O-30. Summary of Detected Constituents with No Background at Site L1 (C7466)

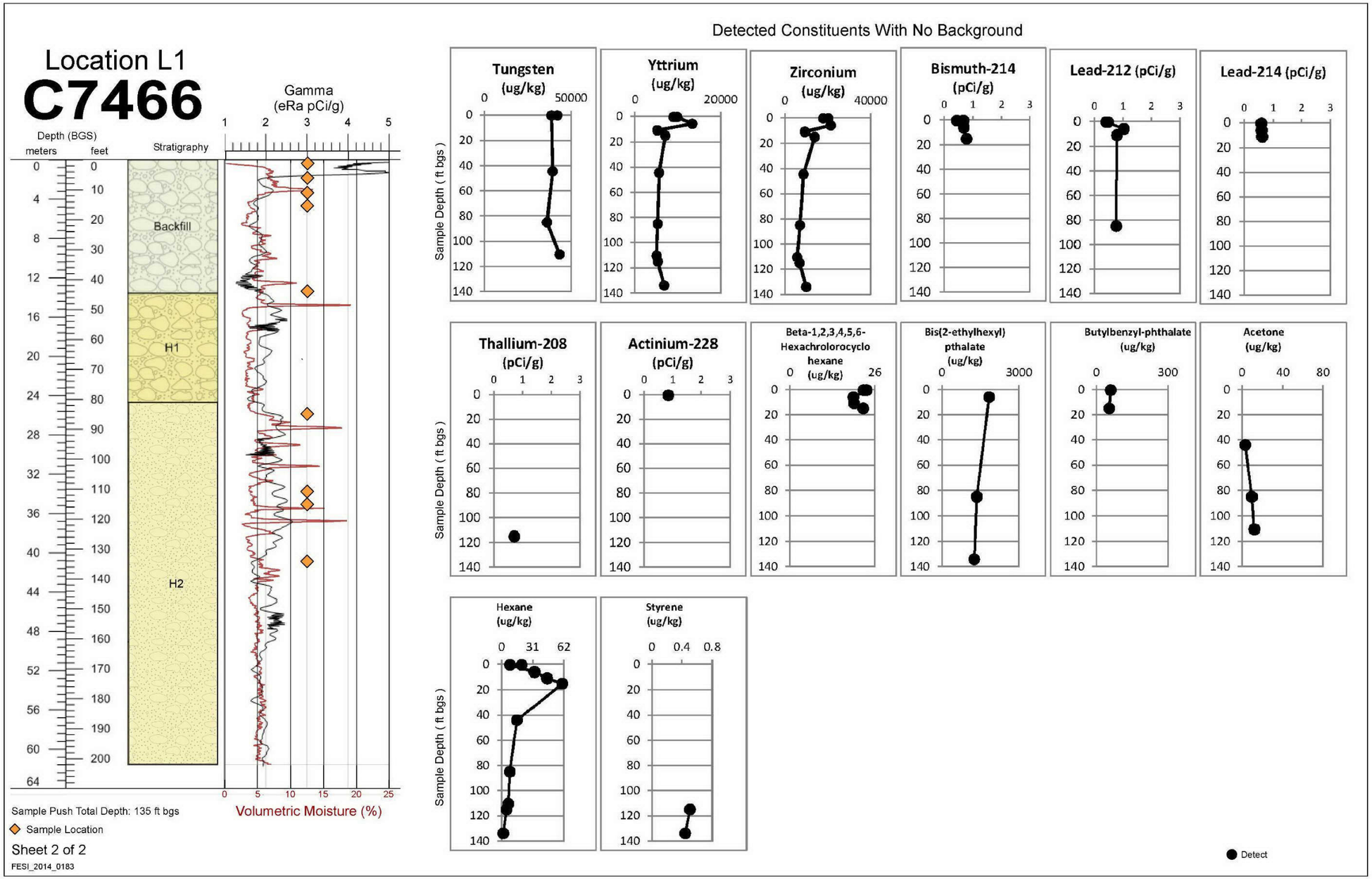


Figure O-31. Summary of Constituents Above Background at Site L2 (C7670)

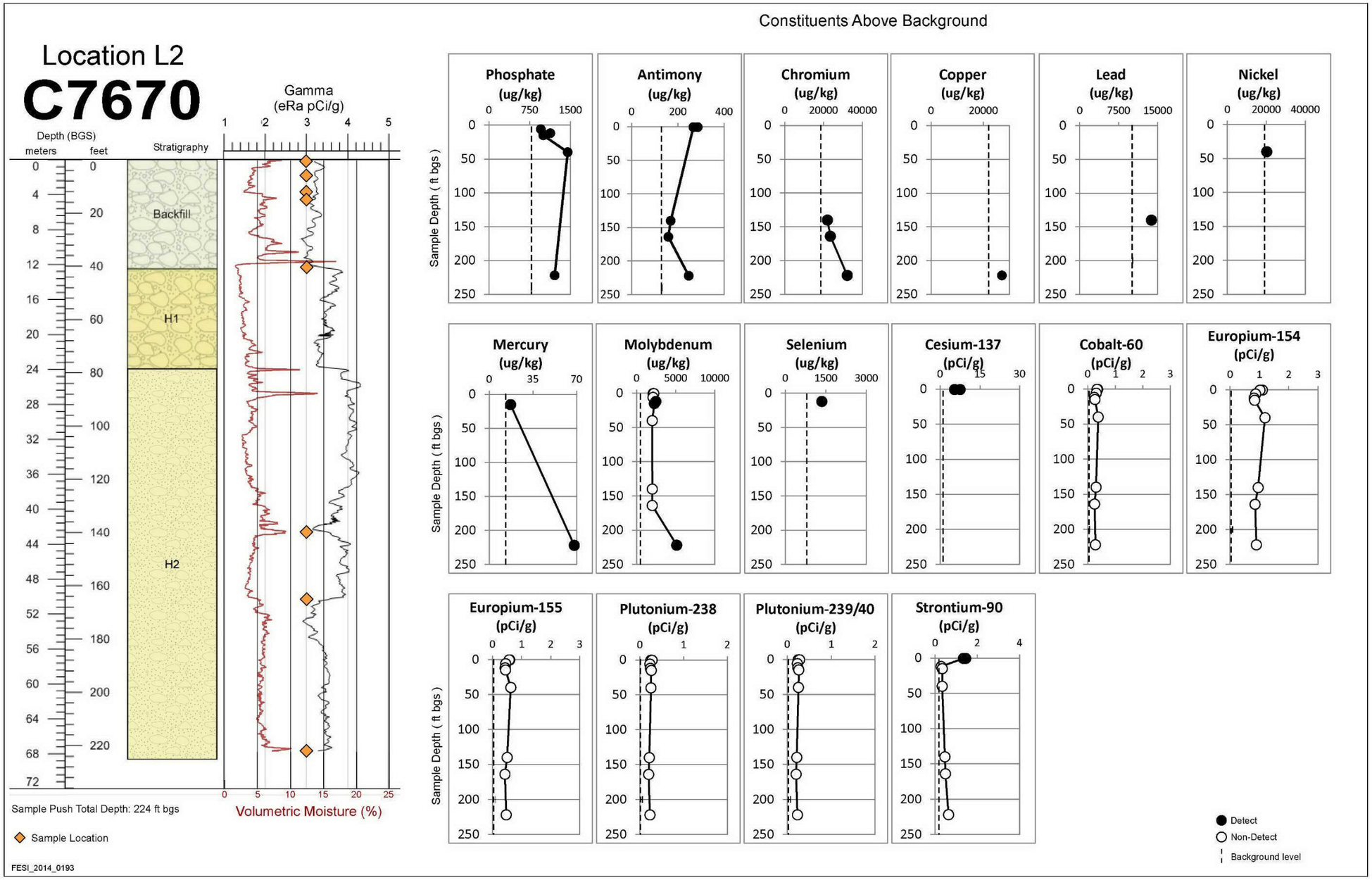


Figure O-32. Summary of Detected Constituents with No Background at Site L2 (C7670)

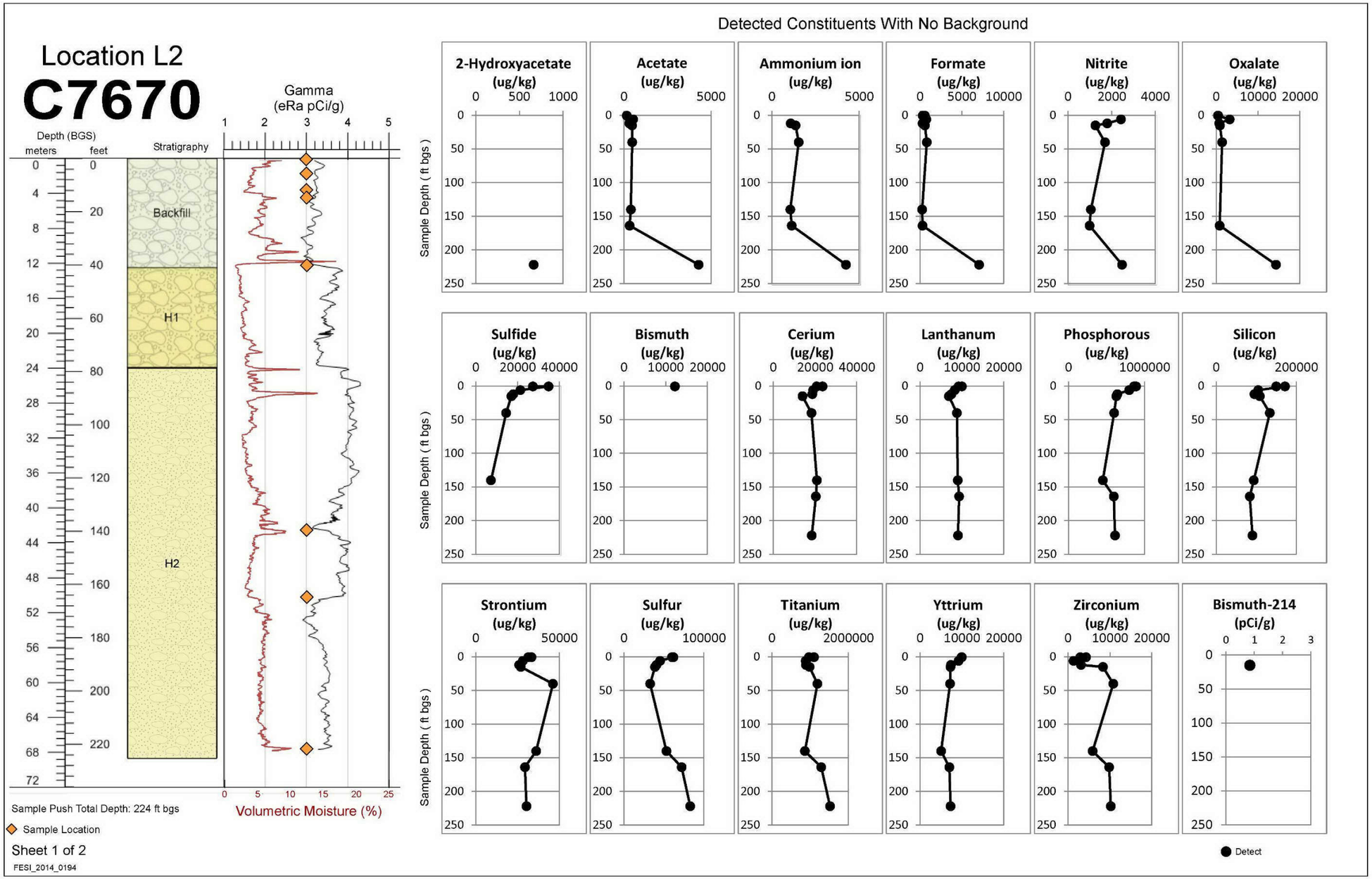


Figure O-33. Summary of Detected Constituents with No Background at Site L2 (C7670)

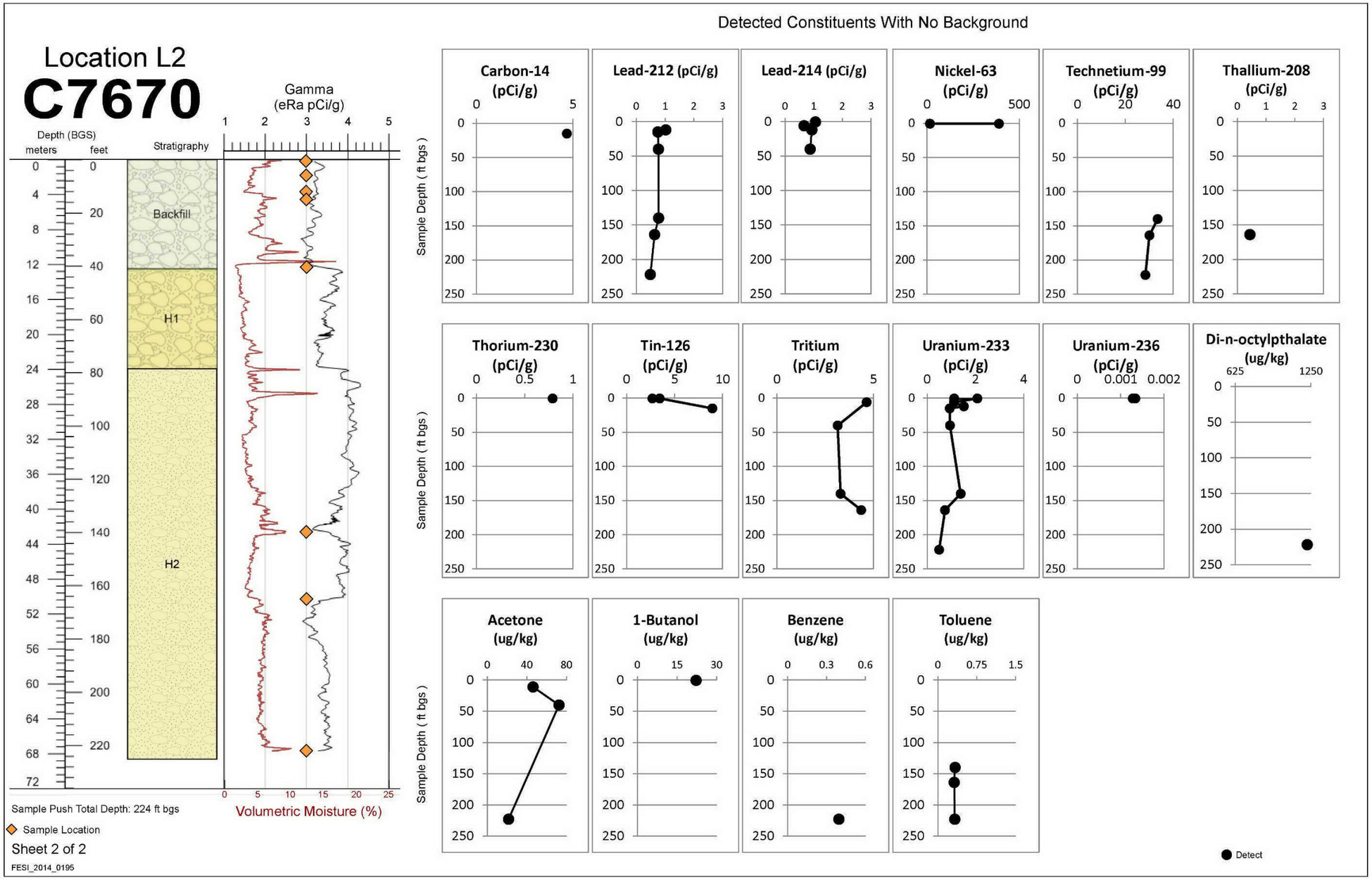


Figure O-34. Summary of Constituents Above Background at Site P (C6392)

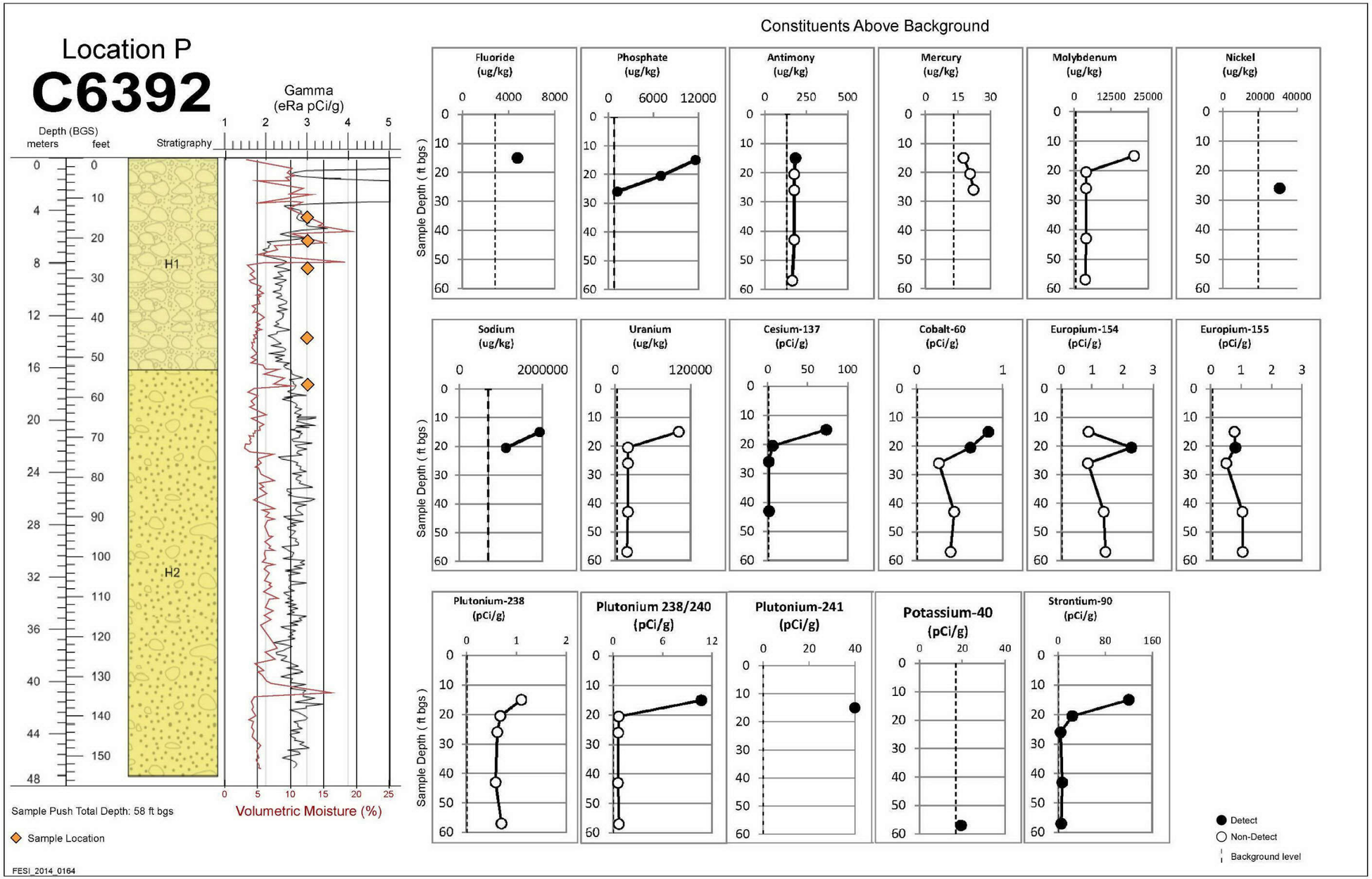


Figure O-35. Summary of Detected Constituents with No Background at Site P (C6392)

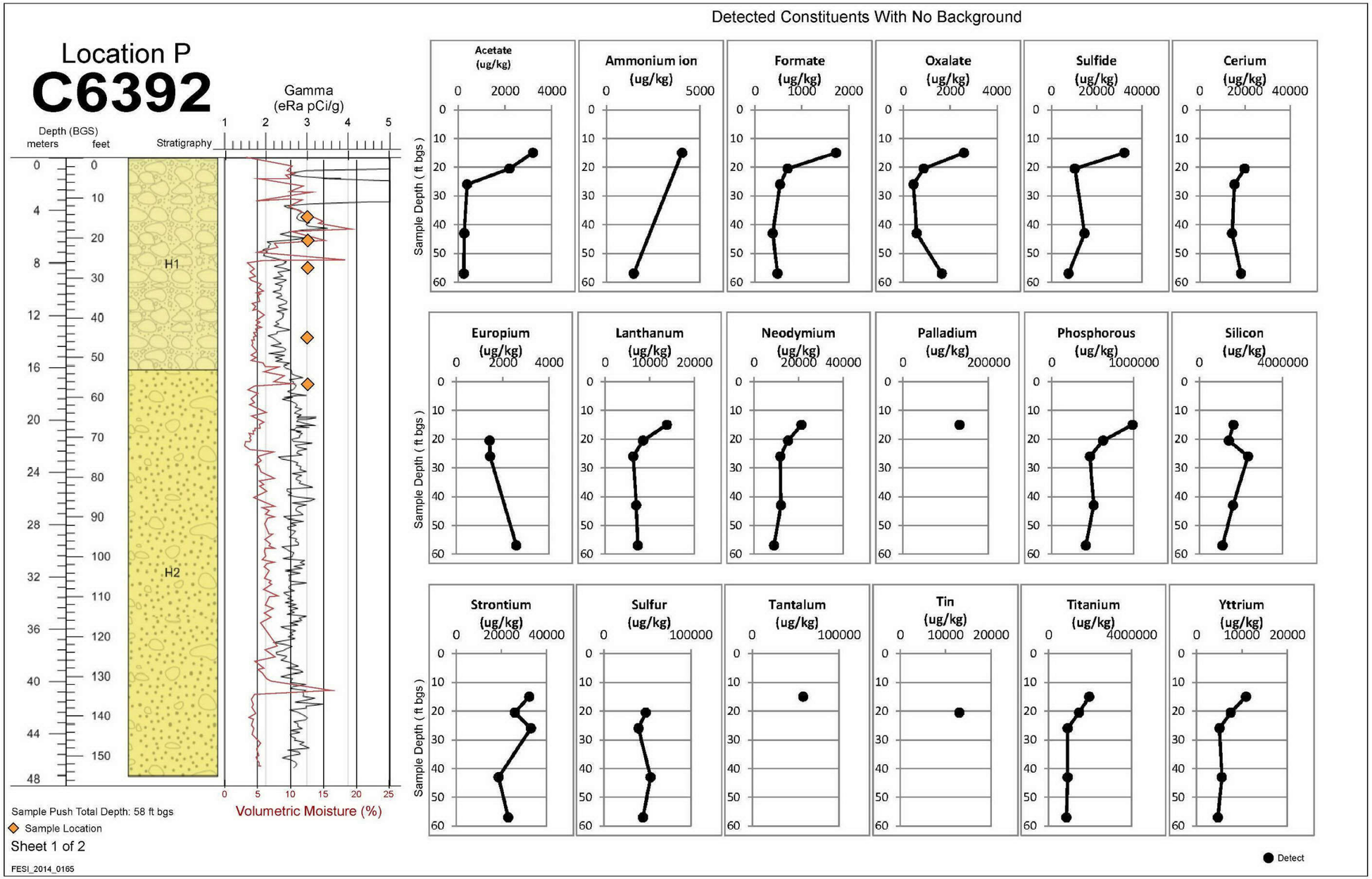


Figure O-36. Summary of Detected Constituents with No Background at Site P (C6392)

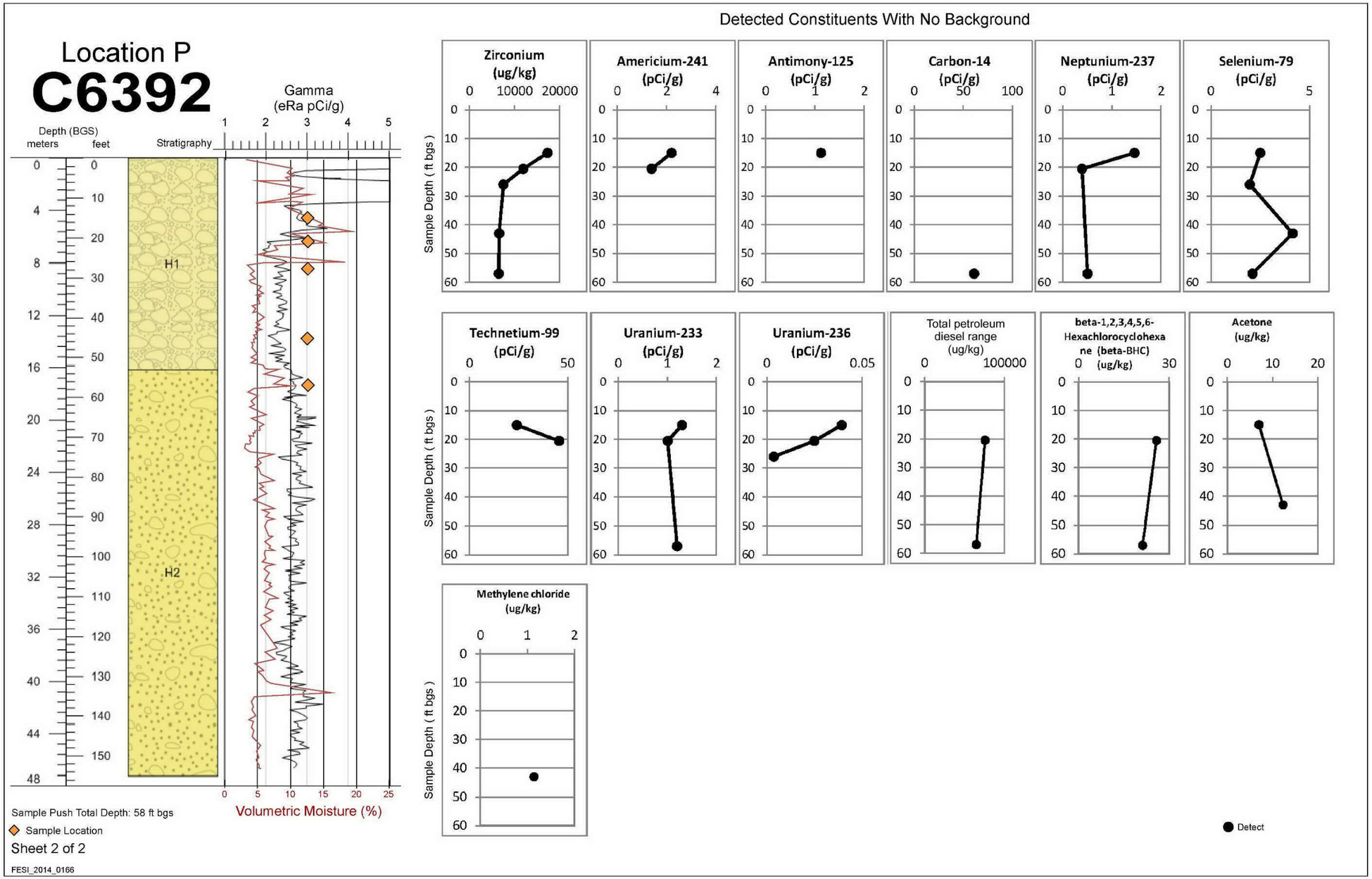


Figure O-37. Summary of Constituents Above Background at Site P (C6394)

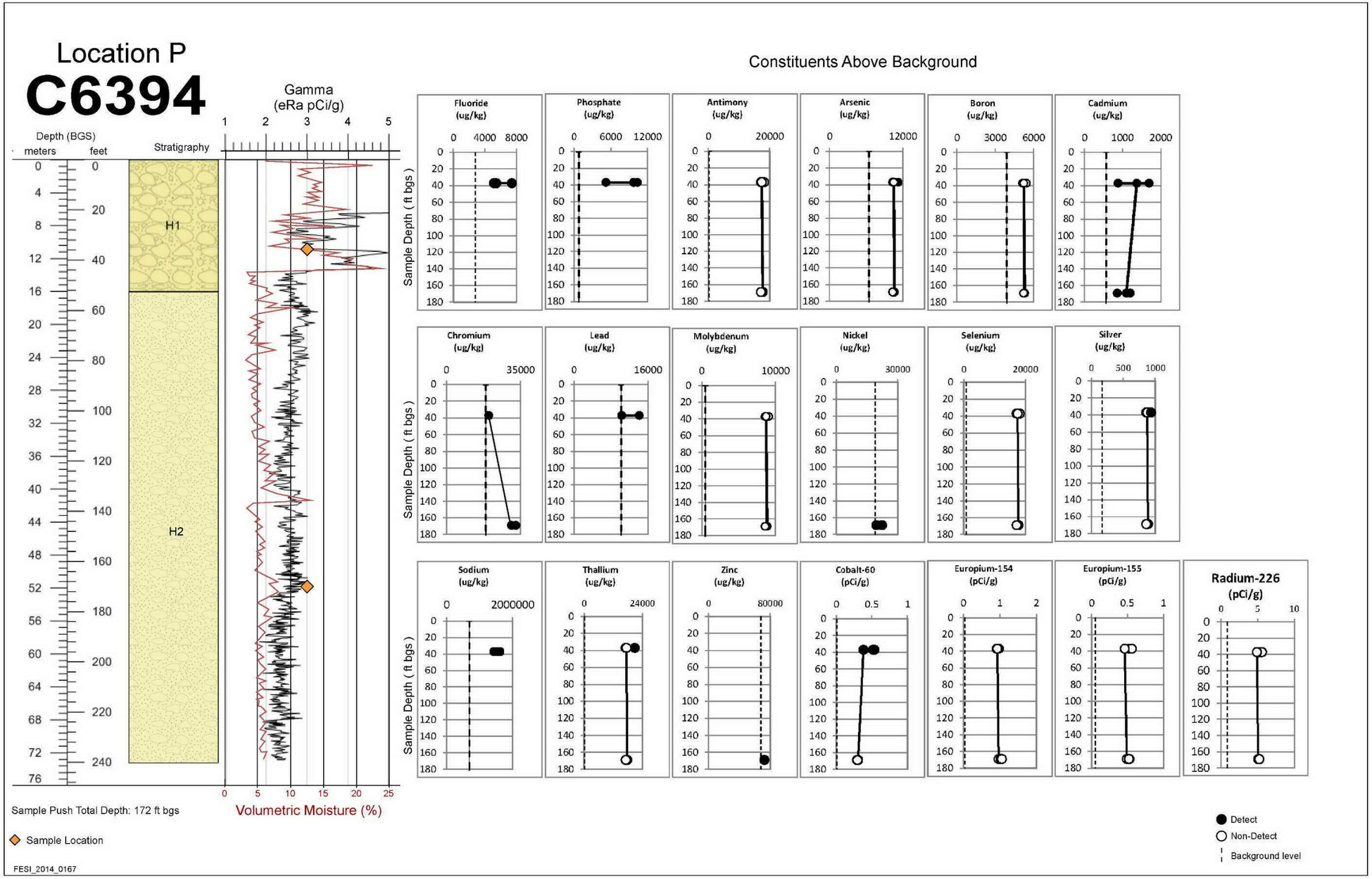


Figure O-38. Summary of Detected Constituents with No Background at Site P (C6394)

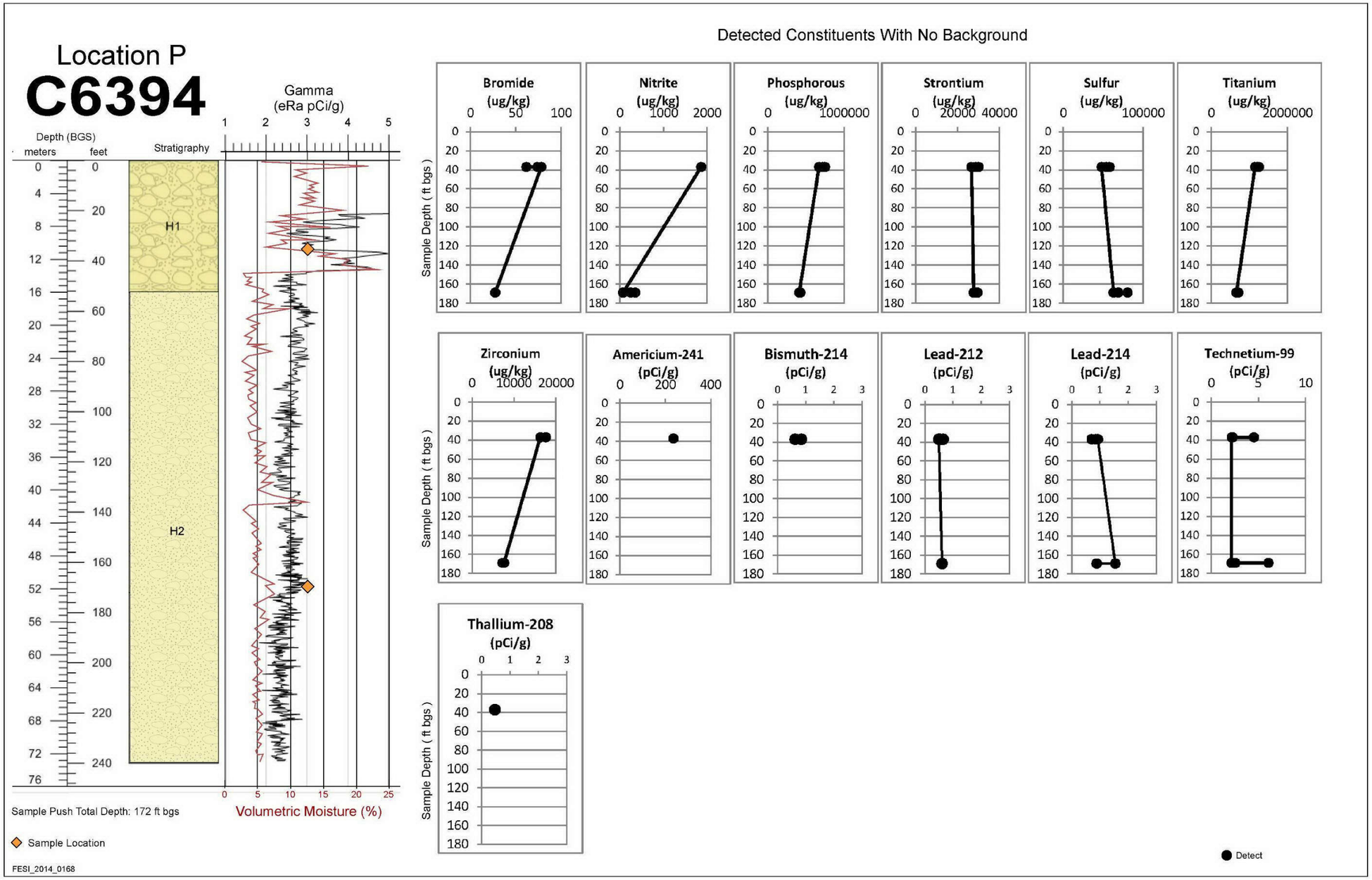


Figure O-39. Summary of Constituents Above Background at Site P (C6400)

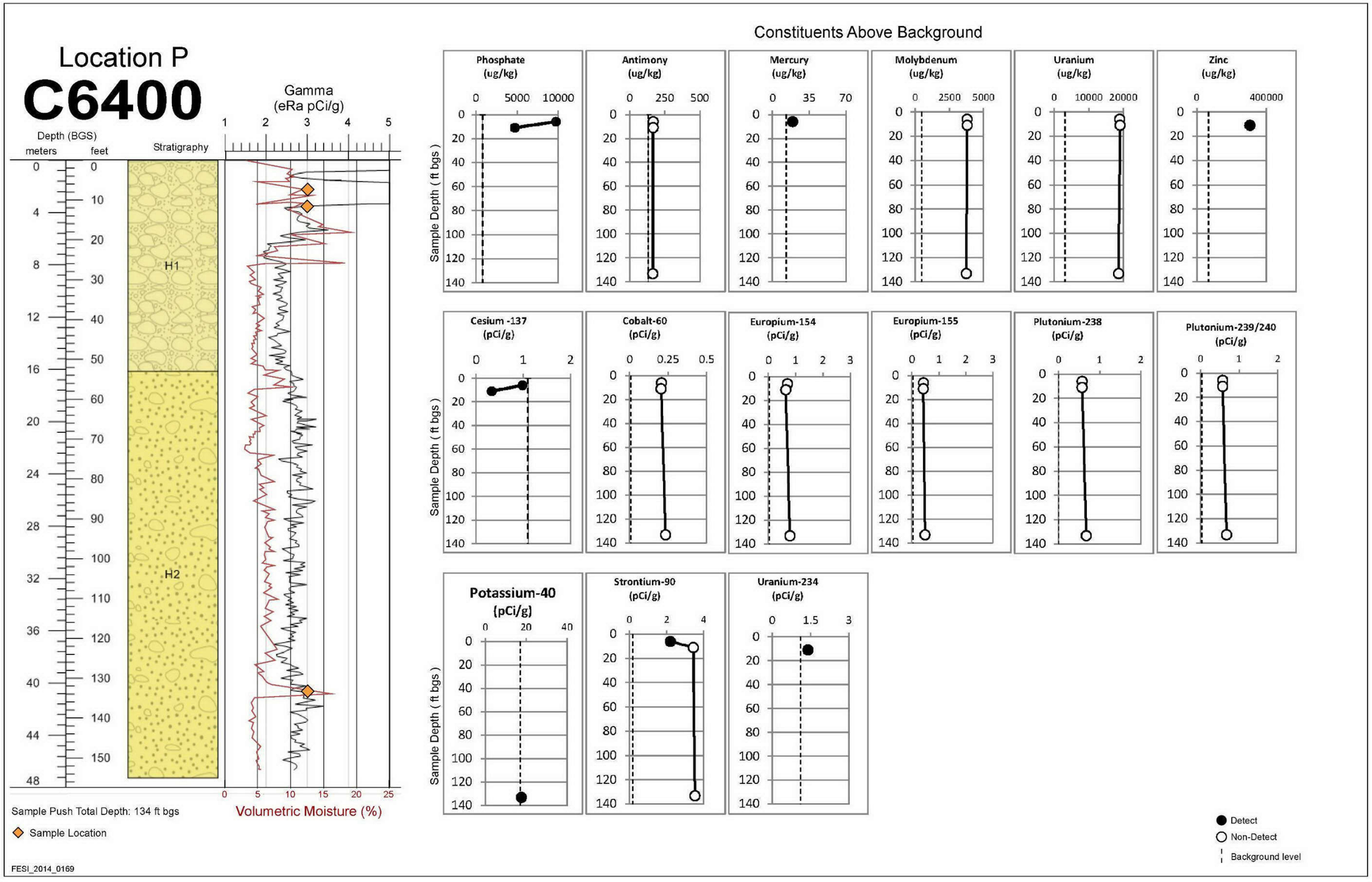


Figure O-40. Summary of Detected Constituents with No Background at Site P (C6400)

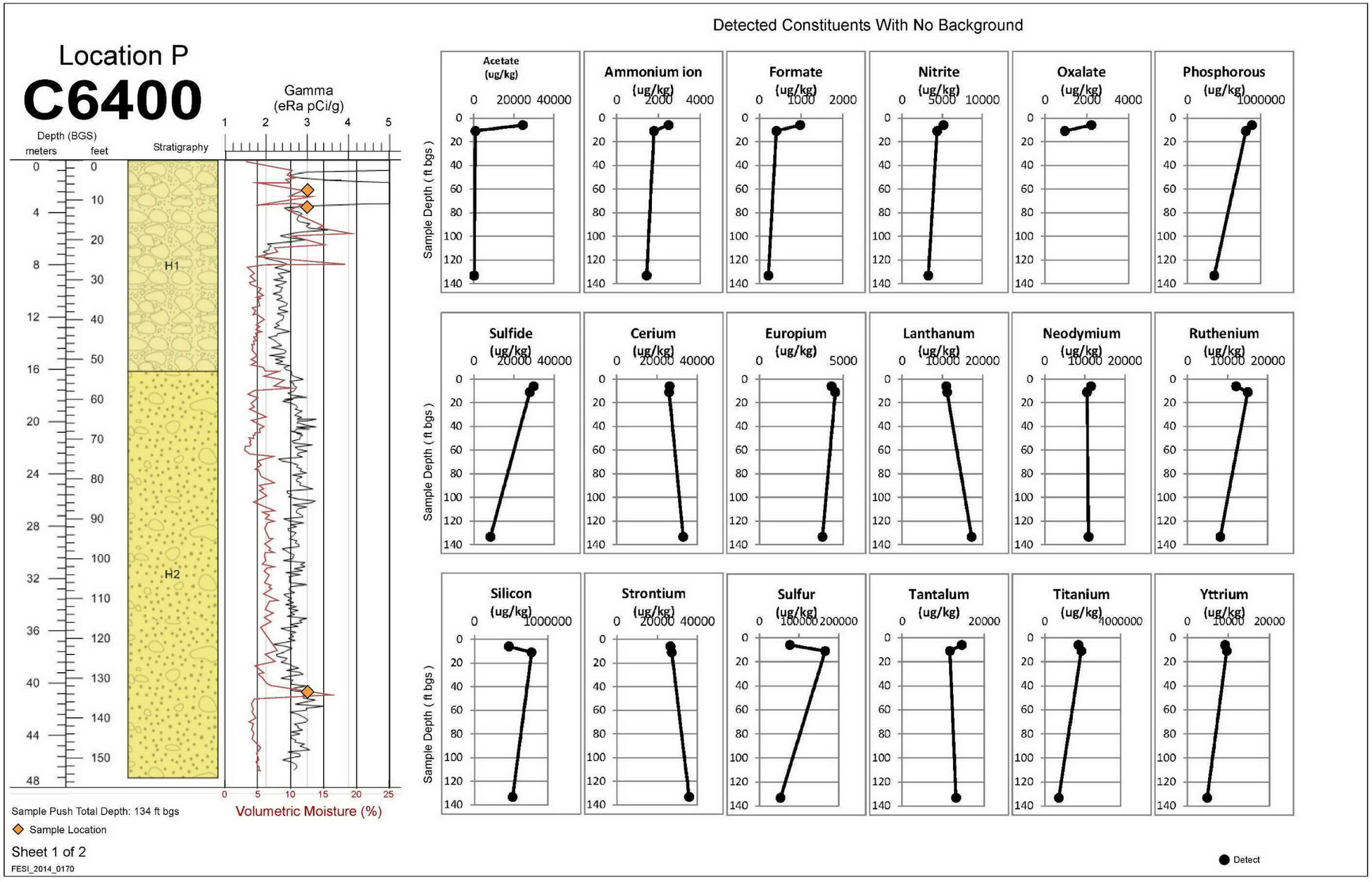


Figure O-41. Summary of Detected Constituents with No Background at Site P (C6400)

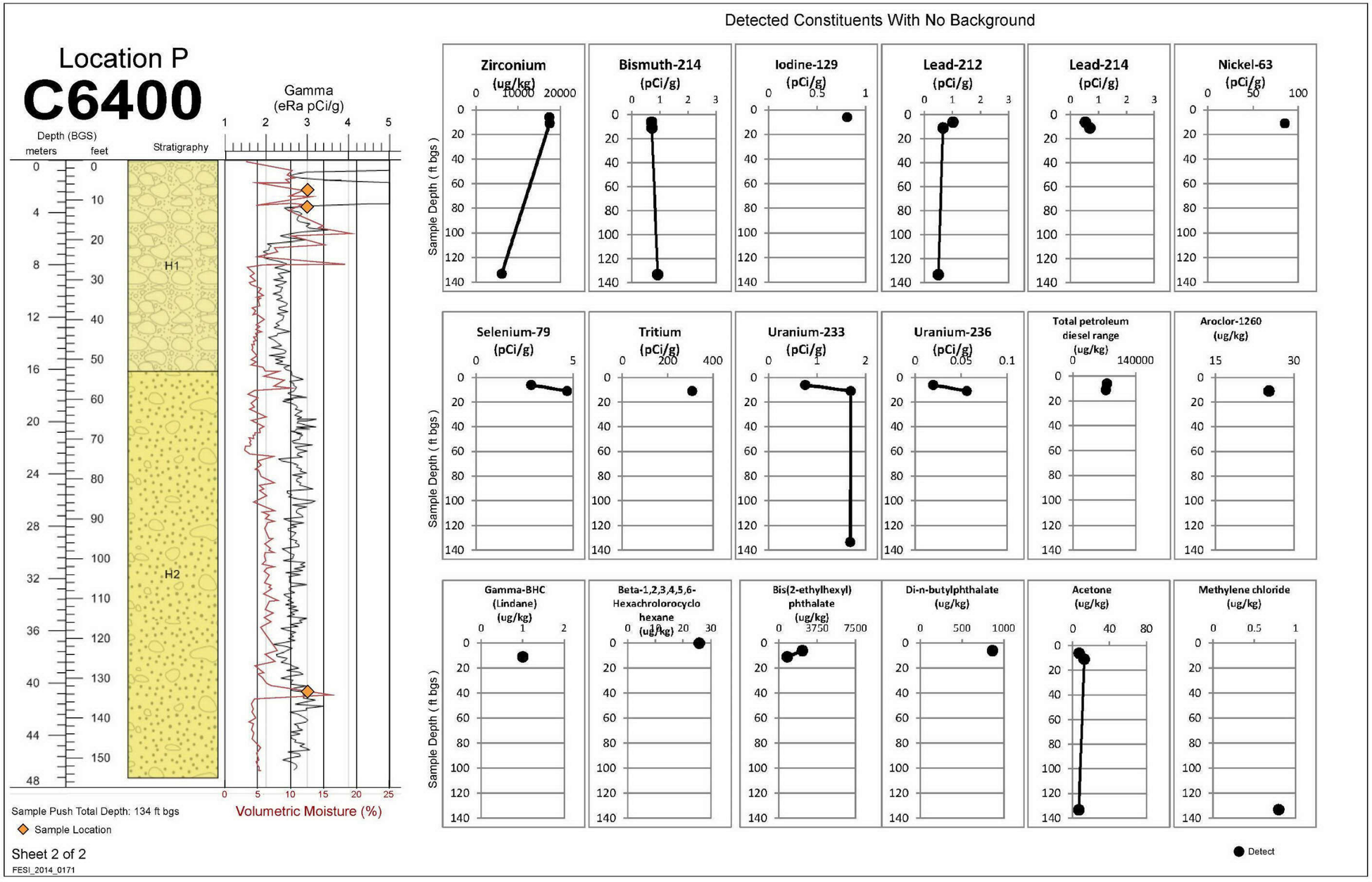


Figure O-42. Summary of Constituents Above Background at Site P (C6402)

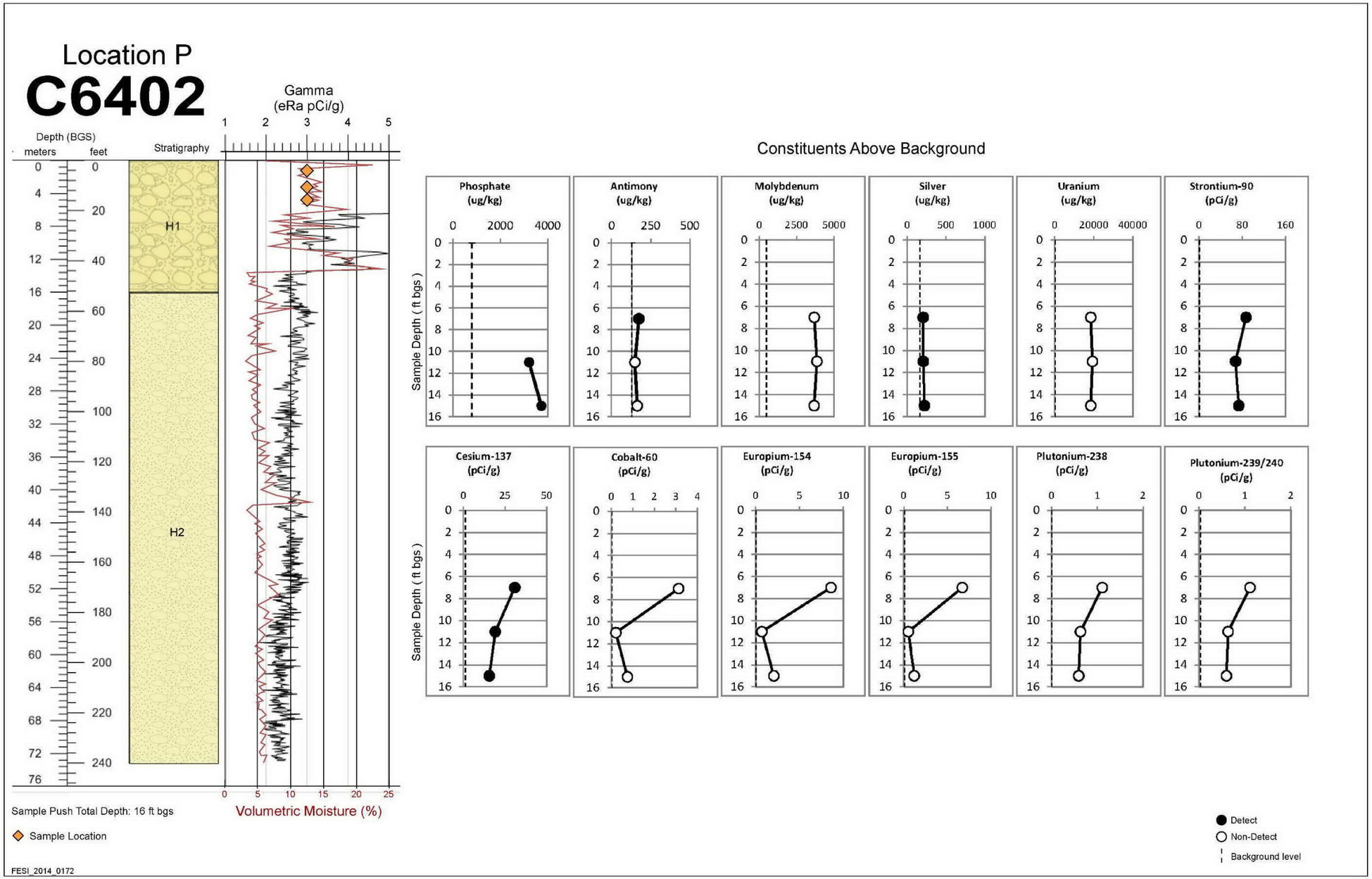


Figure O-43. Summary of Detected Constituents with No Background at Site P (C6402)

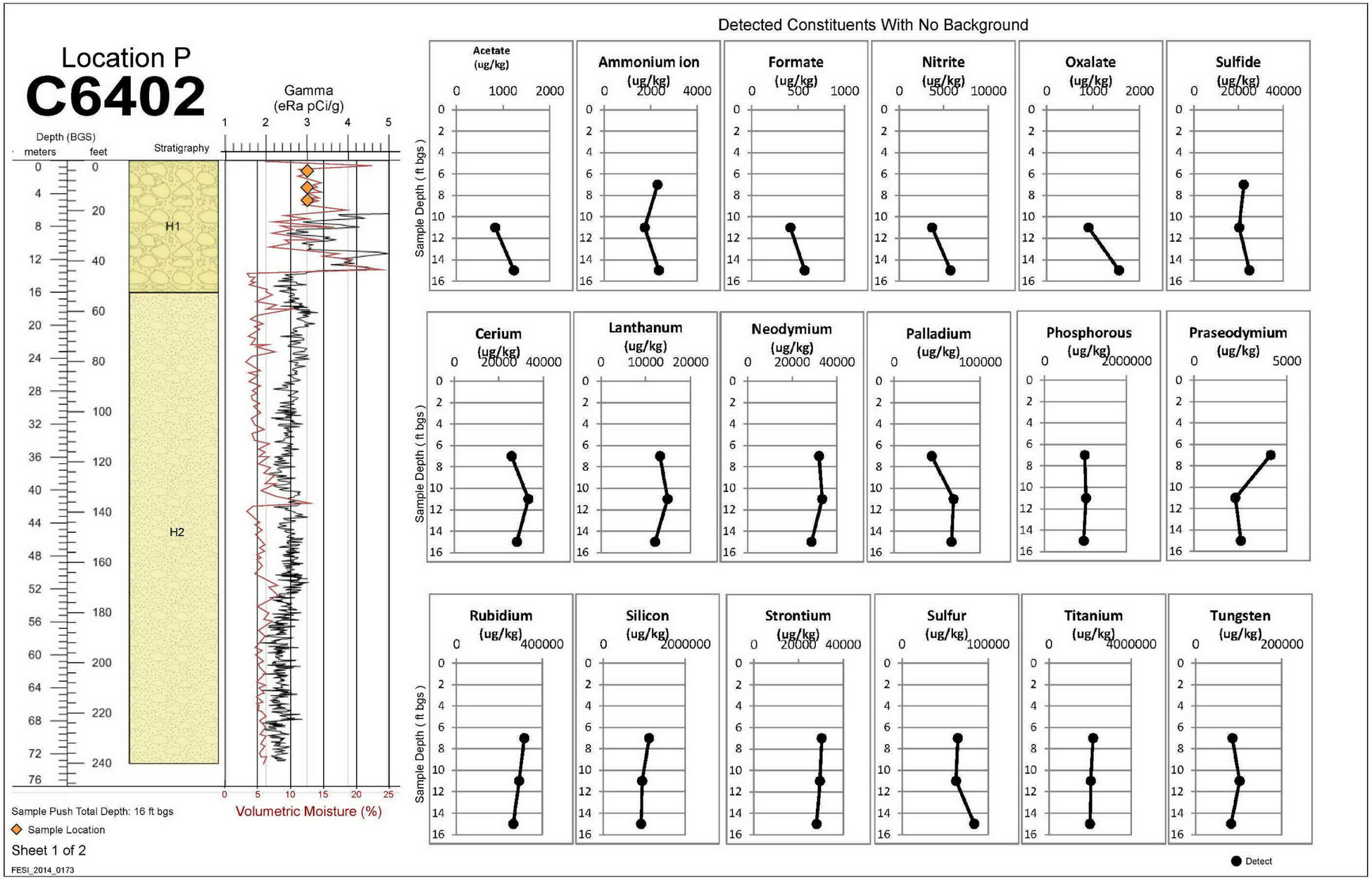


Figure O-44. Summary of Detected Constituents with No Background at Site P (C6402)

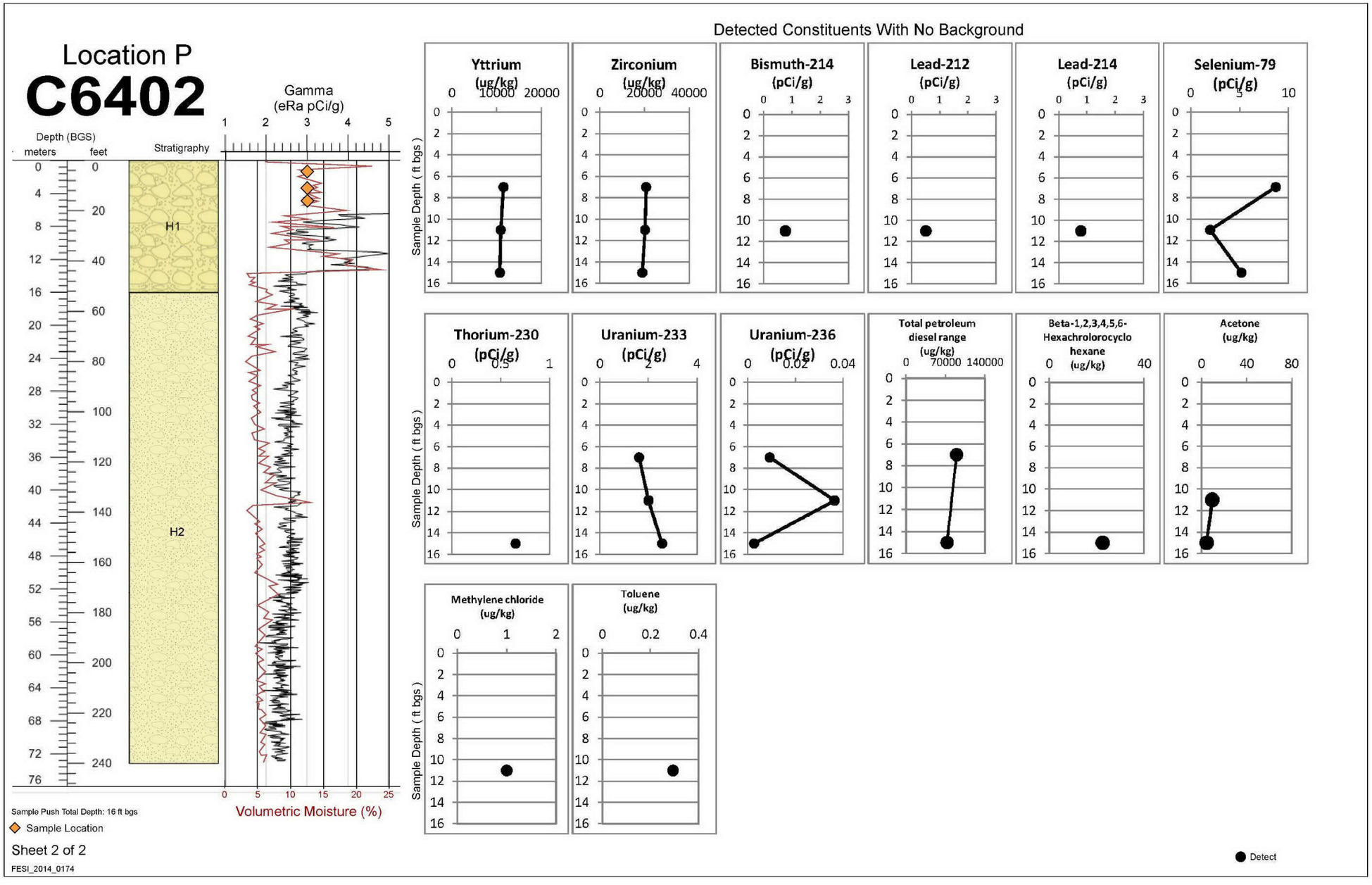


Figure O-45. Summary of Constituents Above Background at Site P (C6404)

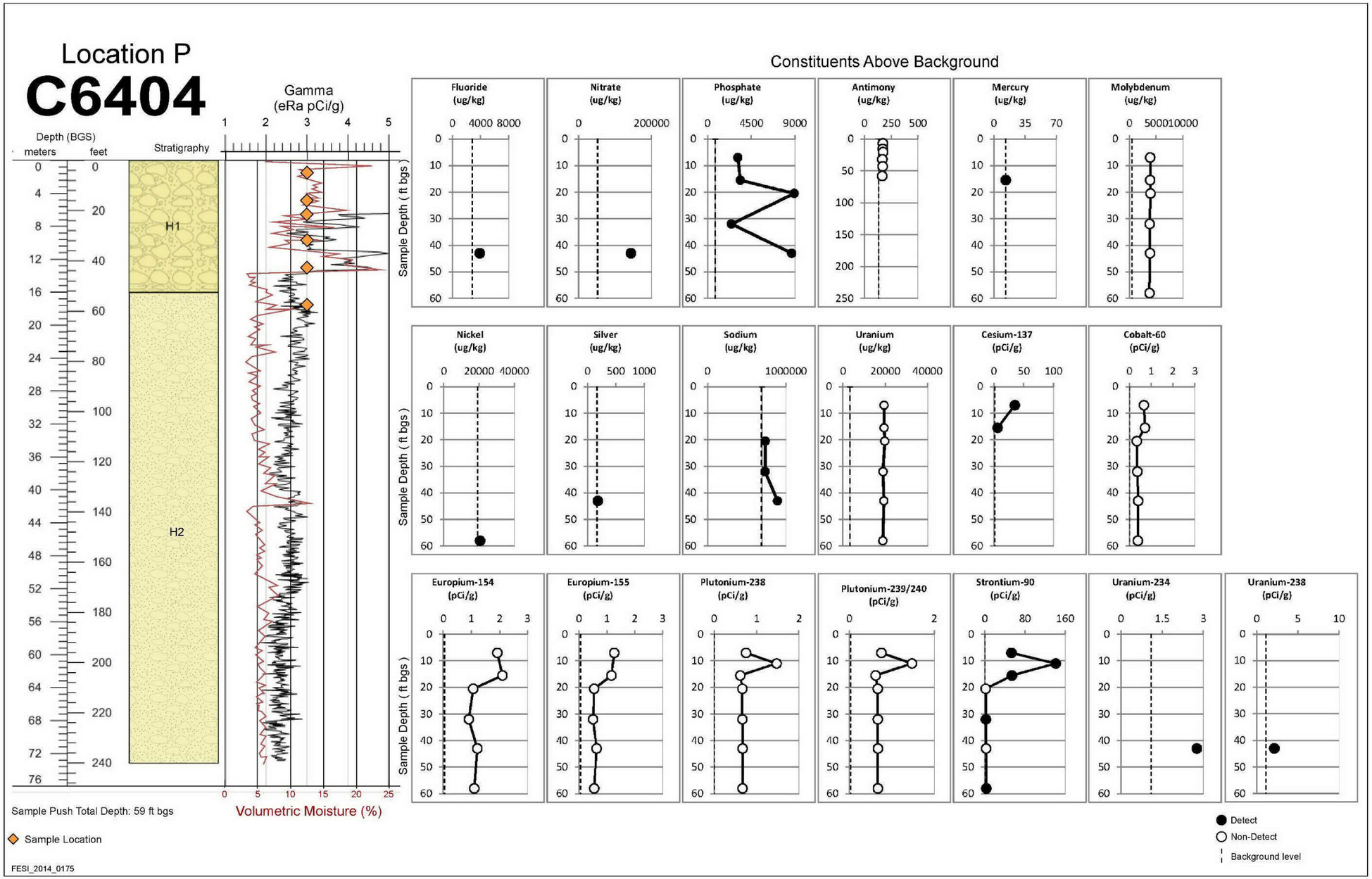


Figure O-46. Summary of Detected Constituents with No Background at Site P (C6404)

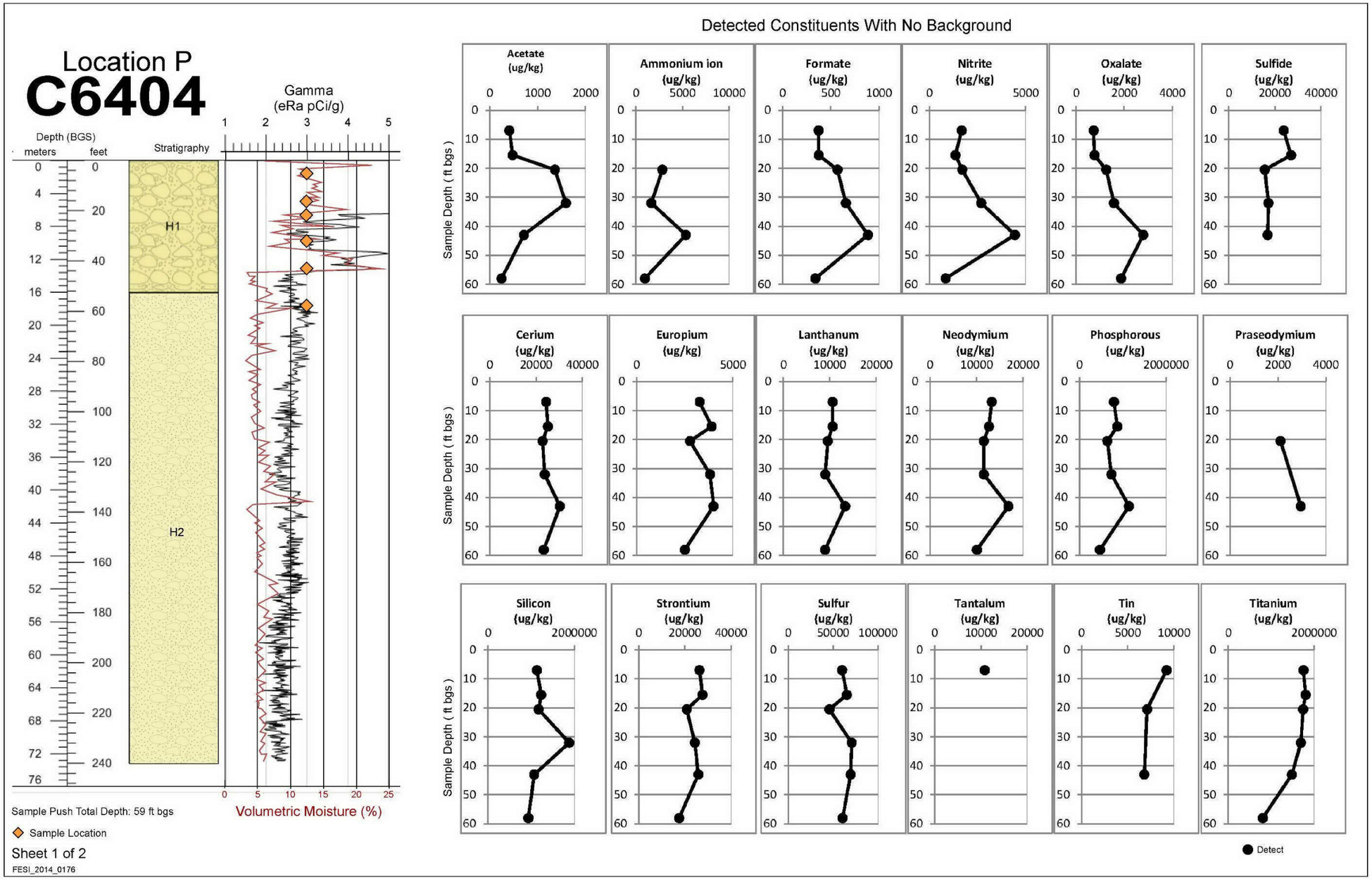


Figure O-47. Summary of Detected Constituents with No Background at Site P (C6404)

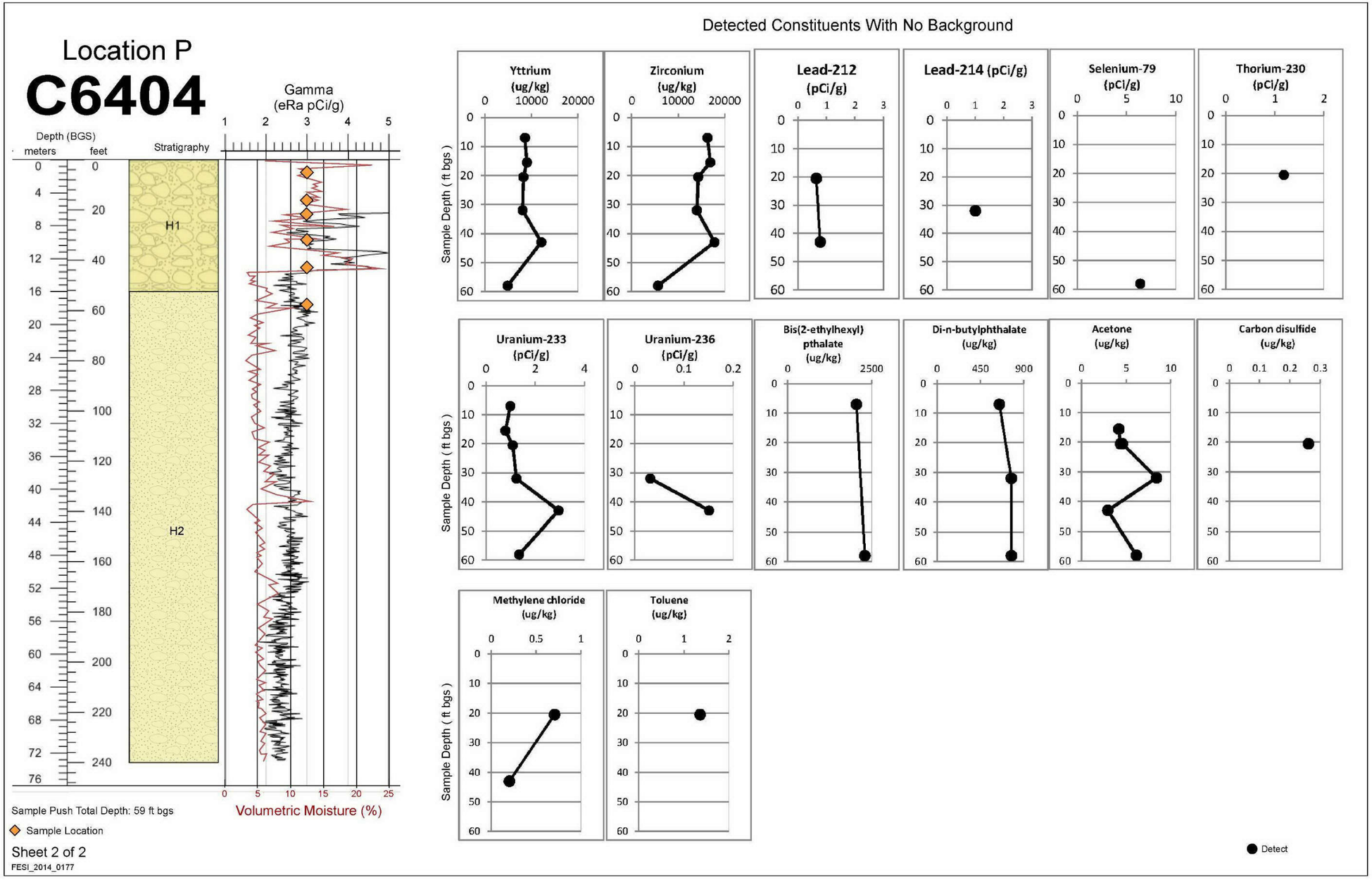


Figure O-48. Summary of Constituents Above Background at Site P (C6404)

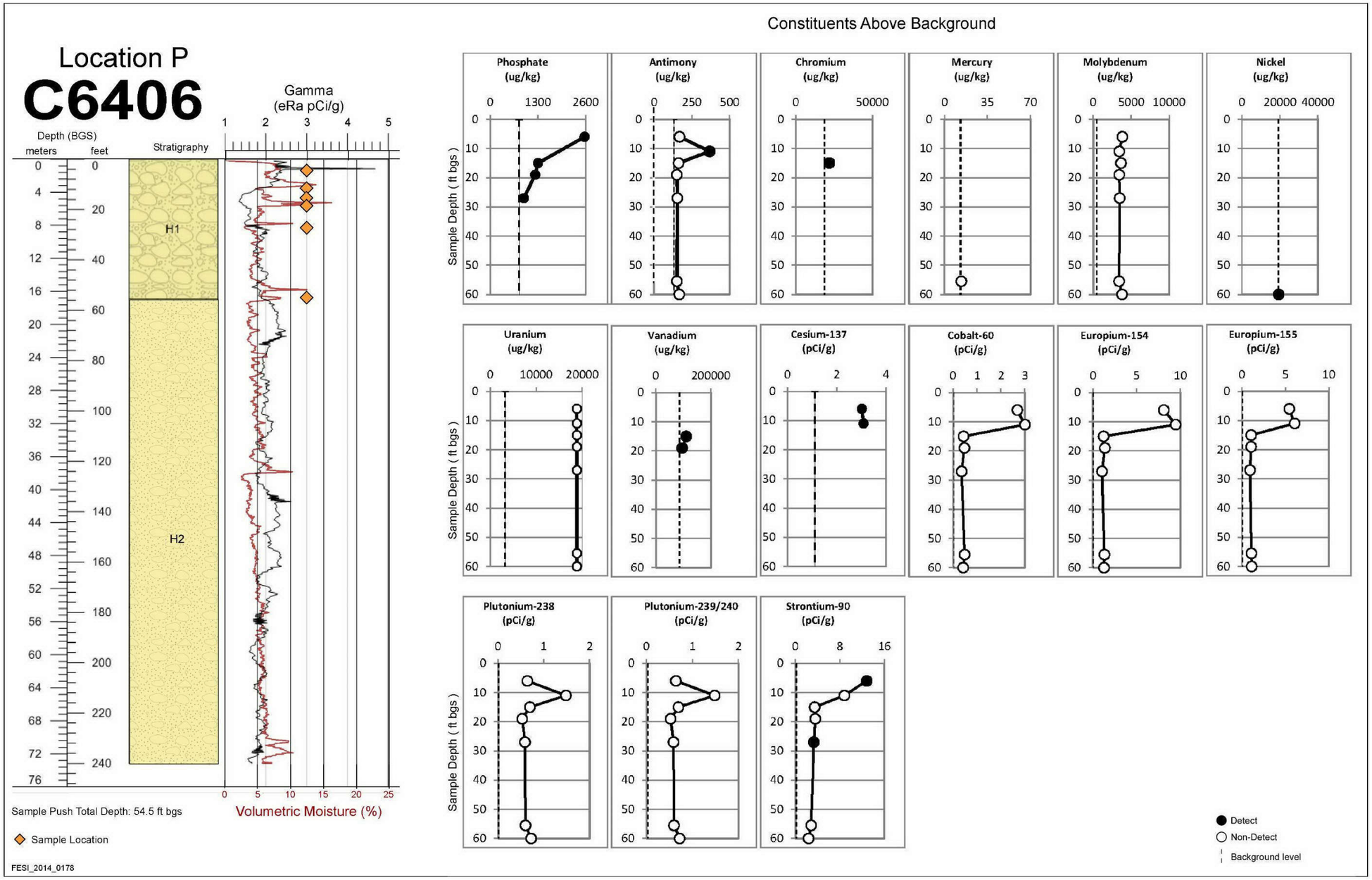


Figure O-49. Summary of Detected Constituents with No Background at Site P (C6404)

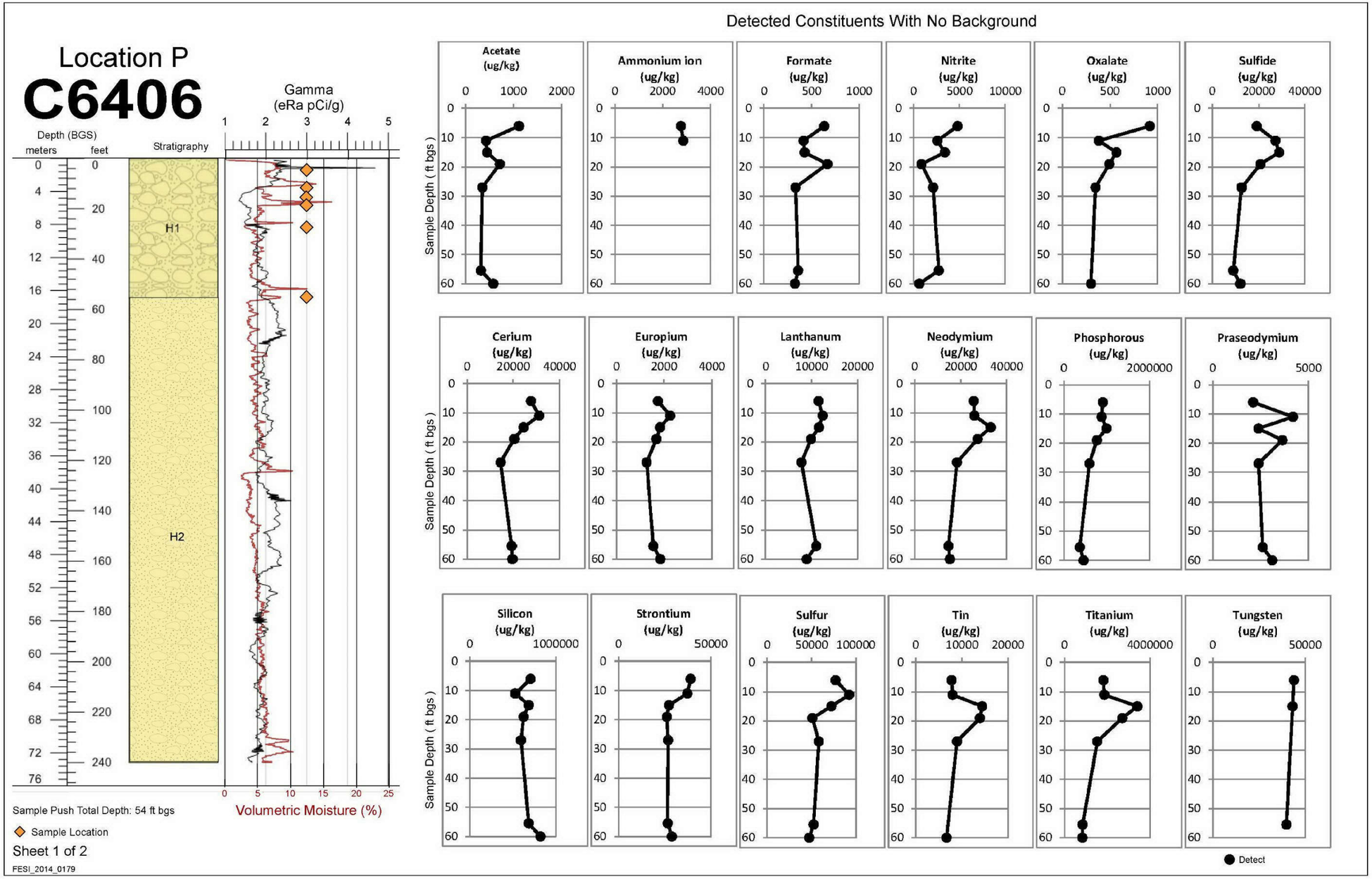


Figure O-50. Summary of Detected Constituents with No Background at Site P (C6404)

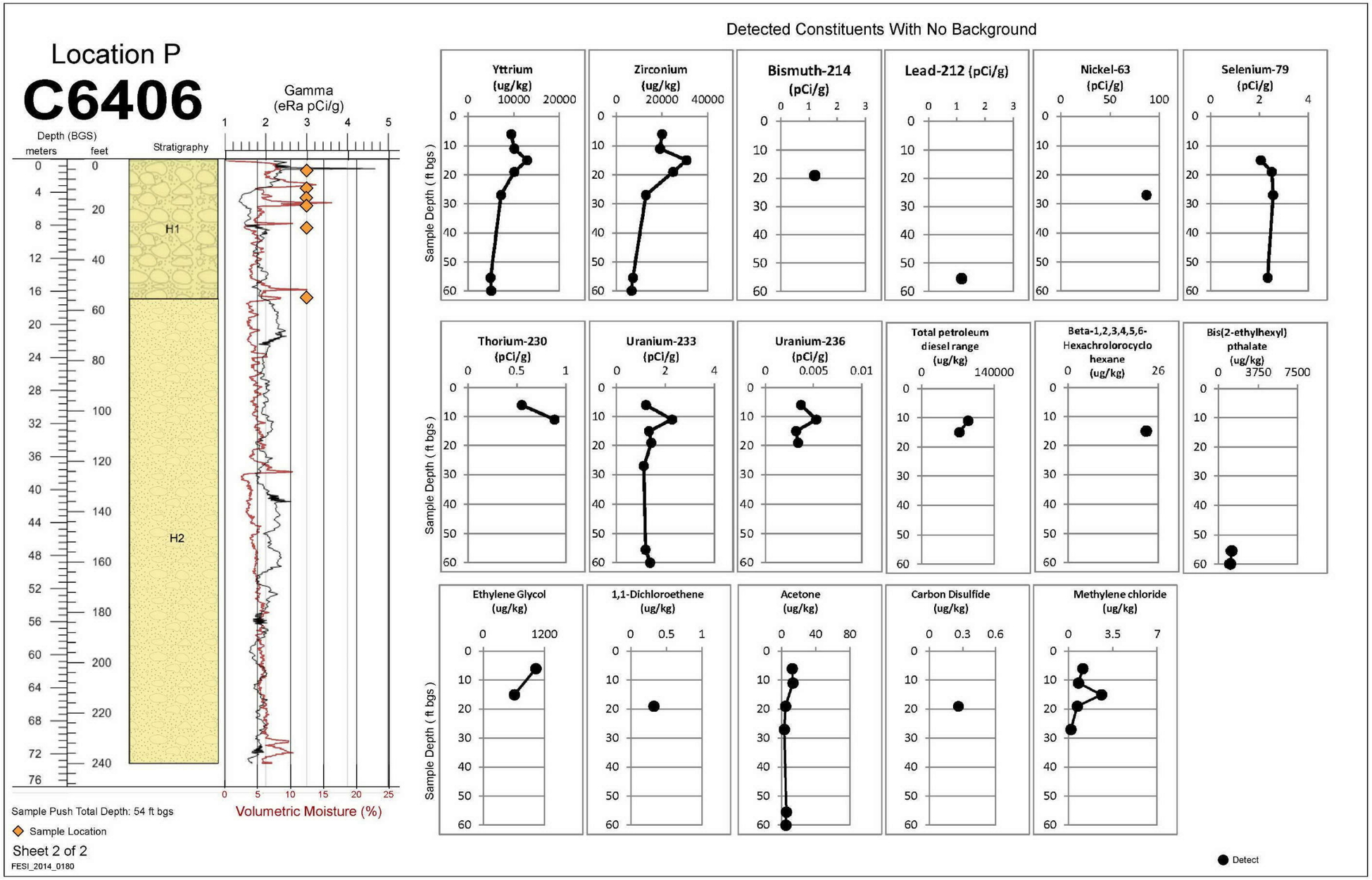


Figure O-51. Summary of Constituents Above Background at Site R (C7668)

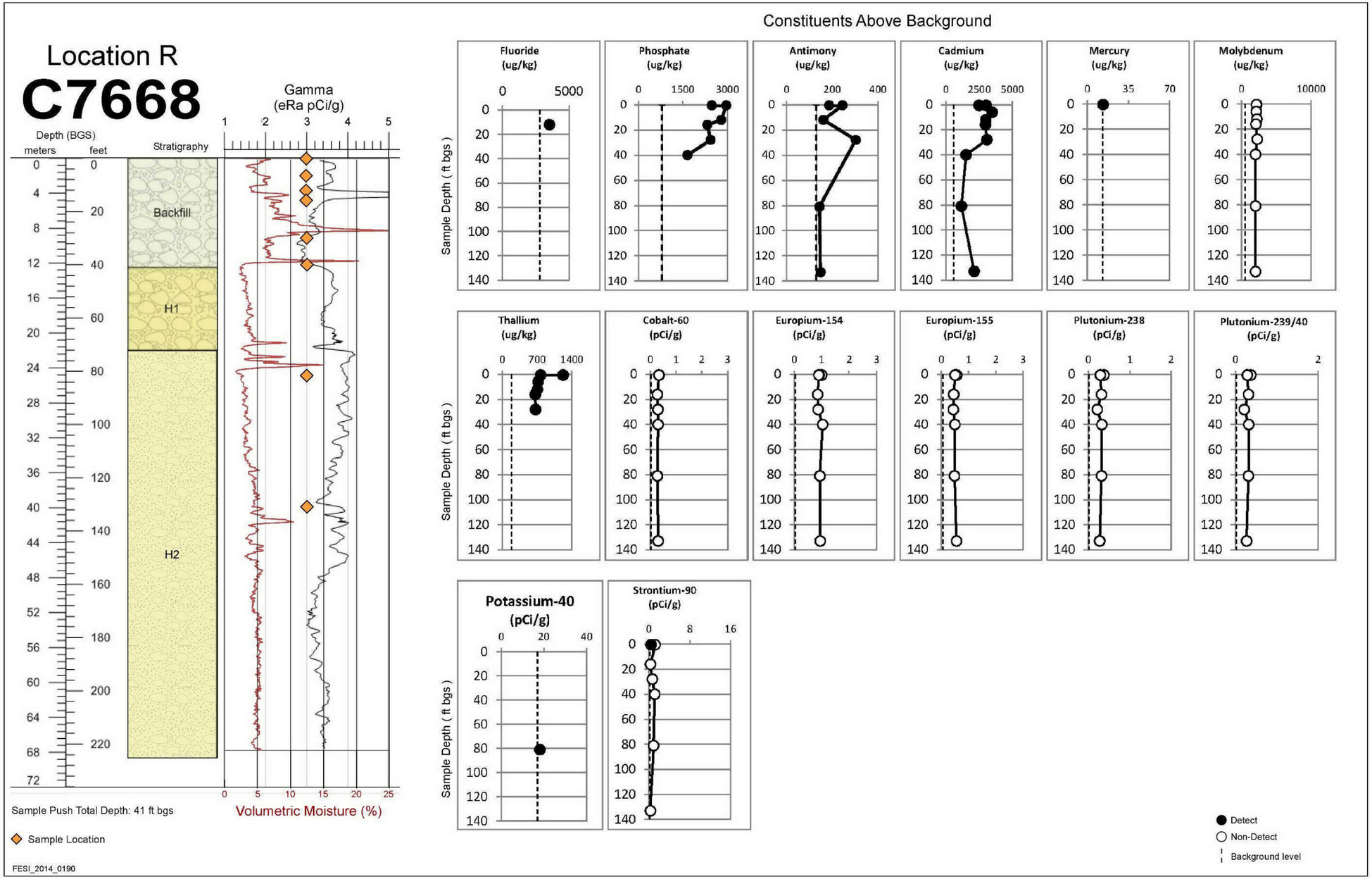


Figure O-52. Summary of Detected Constituents with No Background at Site R (C7668)

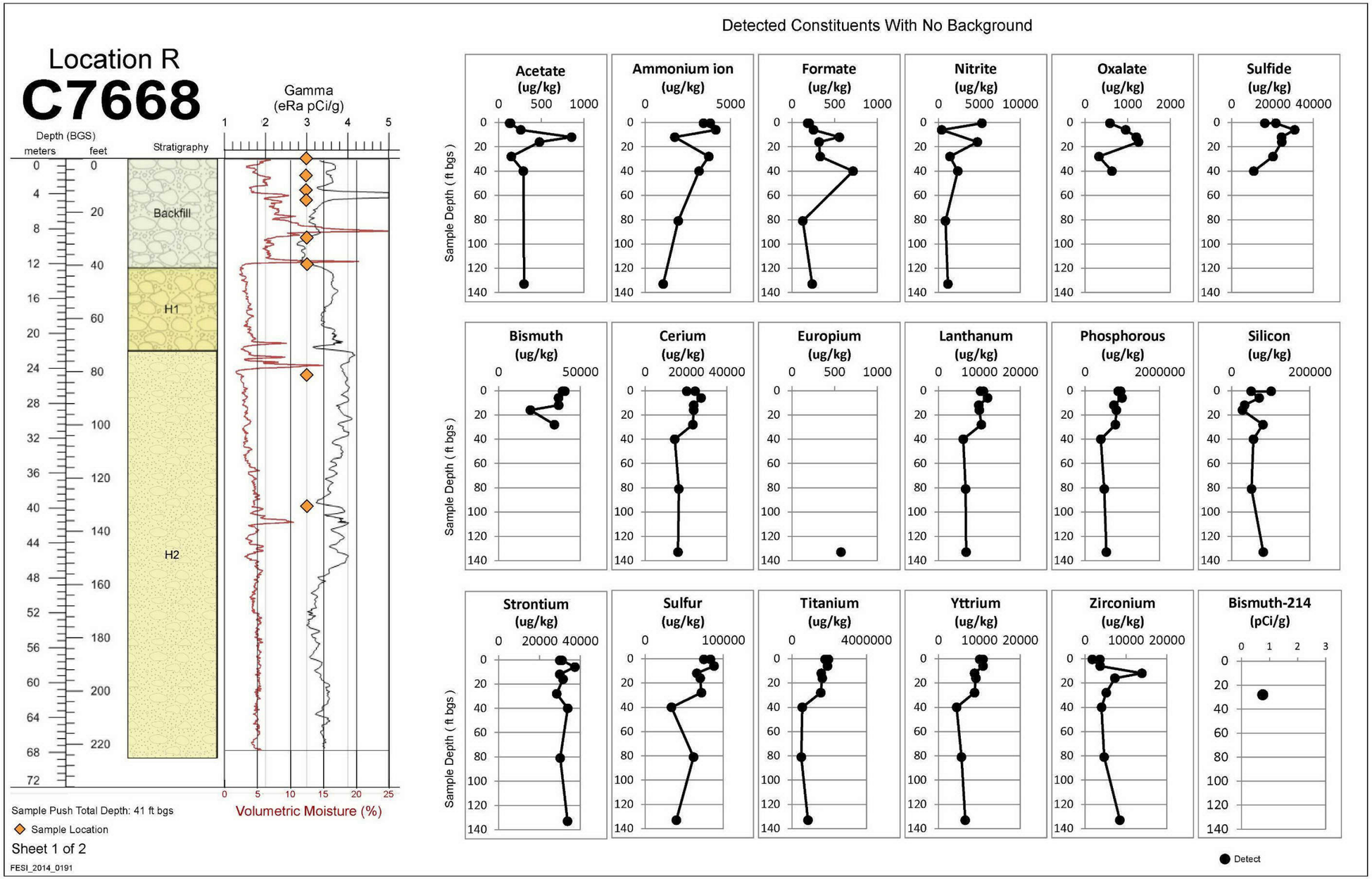


Figure O-53. Summary of Detected Constituents with No Background at Site R (C7668)

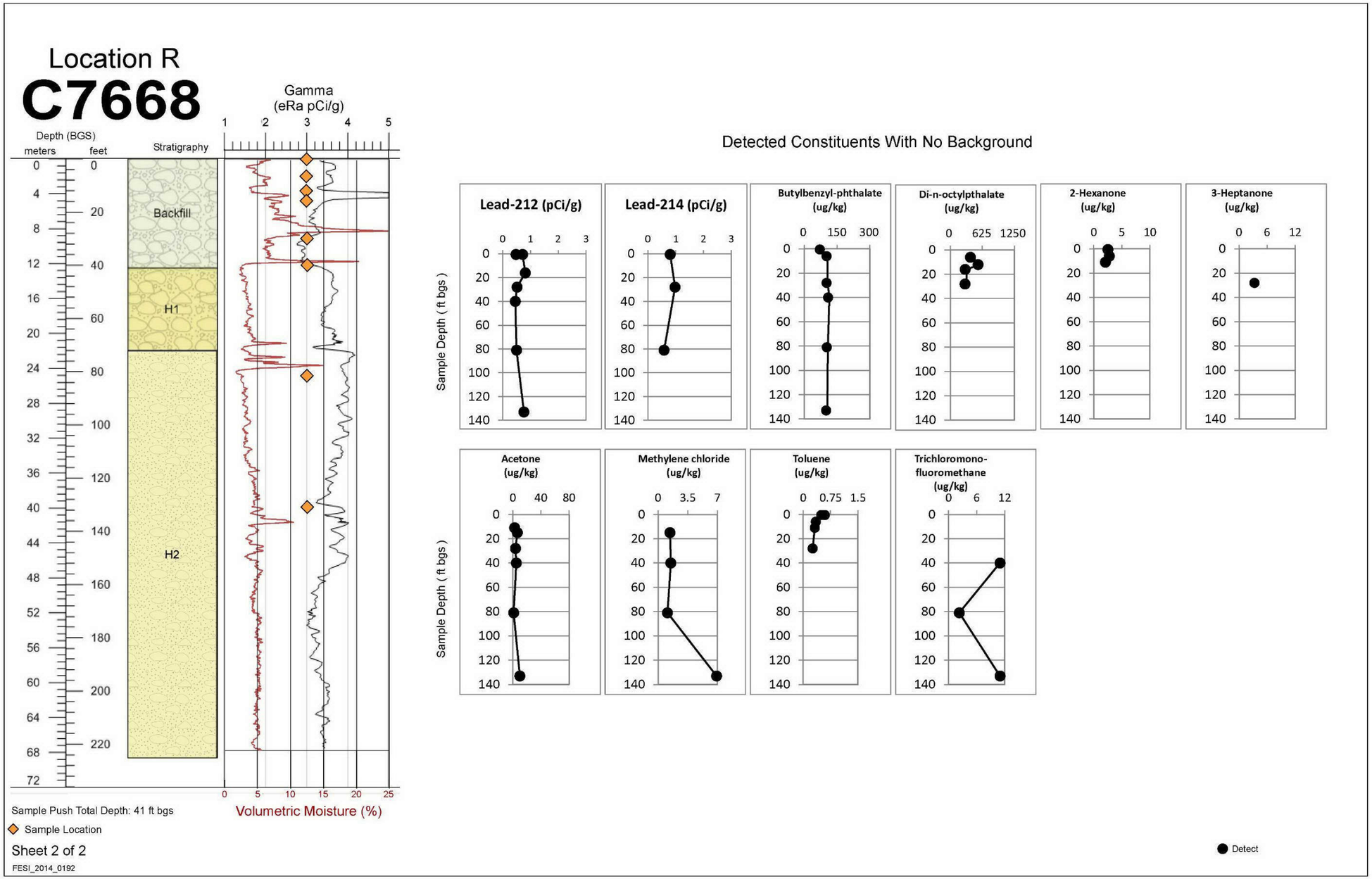


Figure O-54. Summary of Constituents Above Background at Site U (C7676)

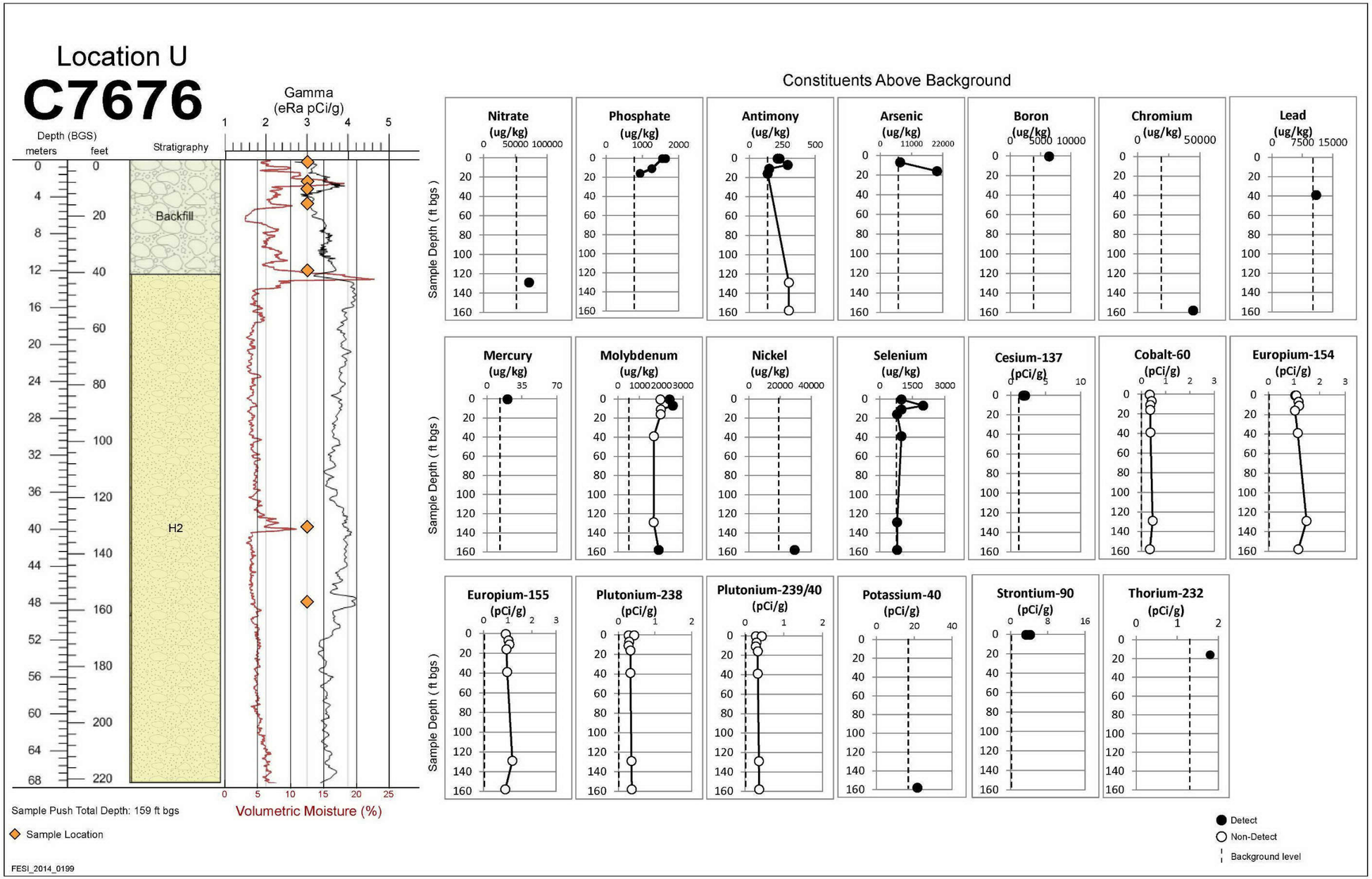


Figure O-55. Summary of Detected Constituents with No Background at Site U (C7676)

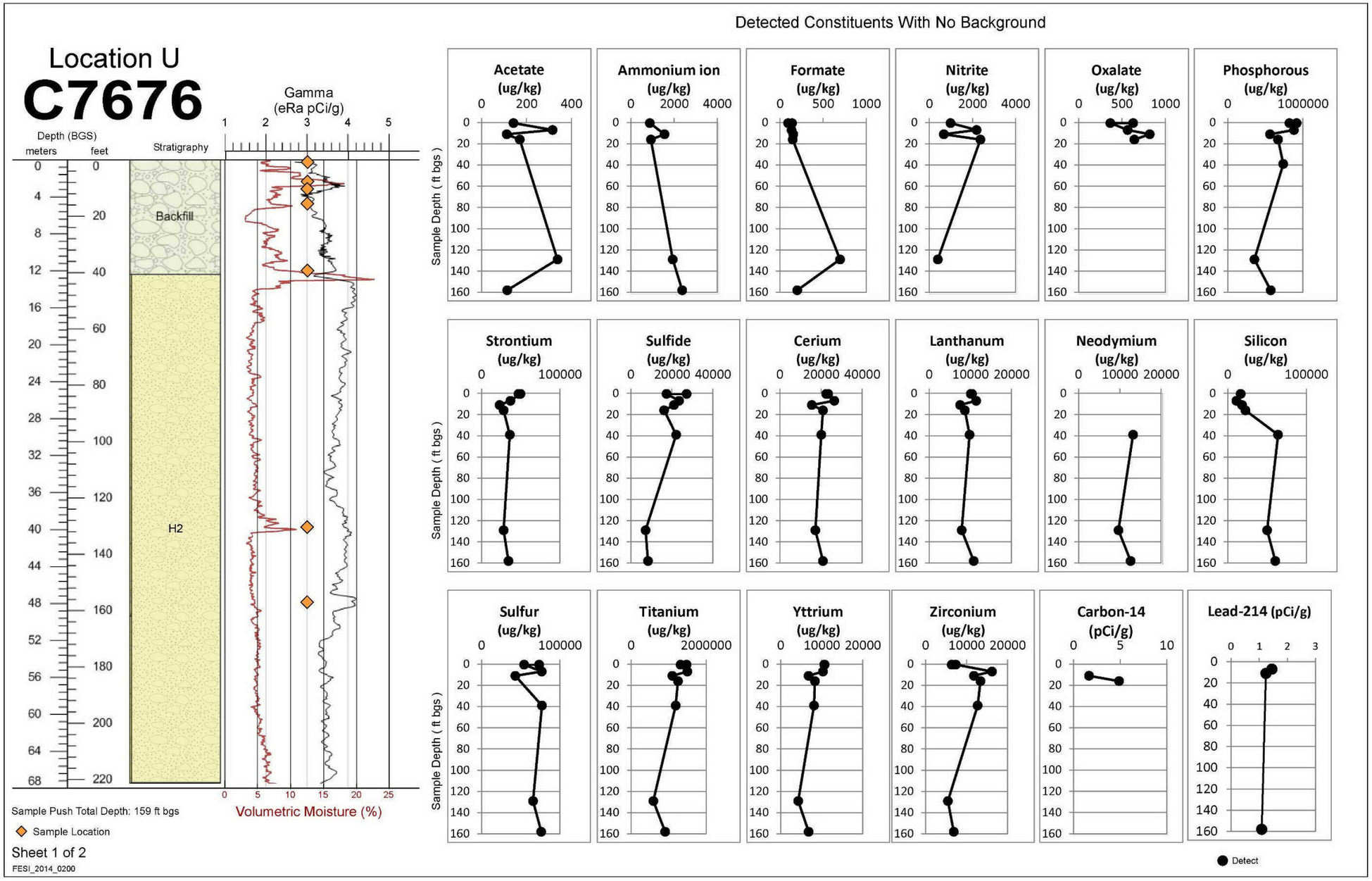
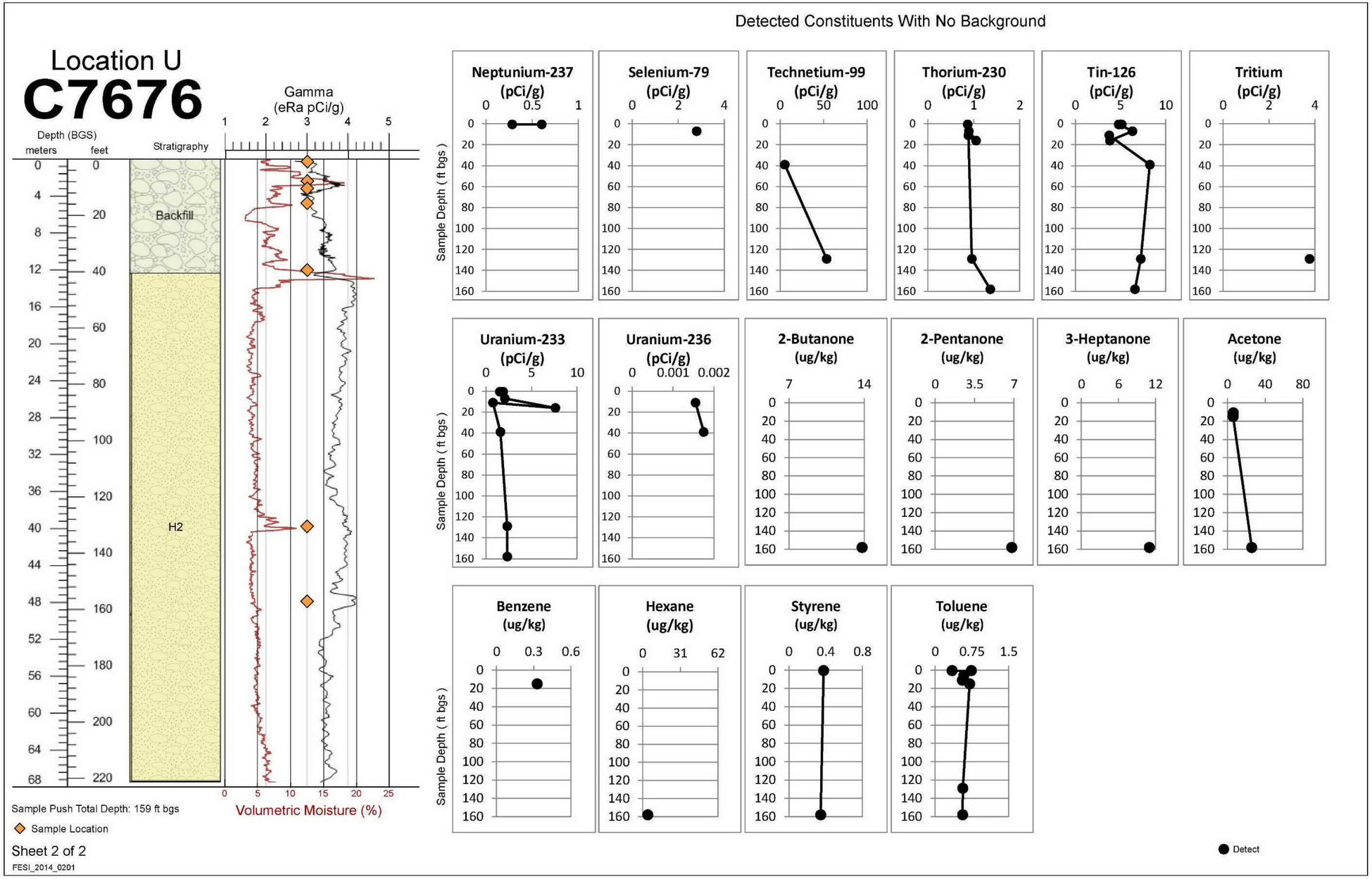


Figure O-56. Summary of Detected Constituents with No Background at Site U (C7676)



APPENDIX P

SUMMARY OF EXTENT OF SOIL CONTAMINATION ABOVE BACKGROUND BY INVESTIGATION GROUP

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APPENDIX P
SUMMARY OF EXTENT OF SOIL CONTAMINATION ABOVE BACKGROUND BY INVESTIGATION GROUP

Contents of this Appendix include 10 tables summarizing the vertical extent of contamination for constituents reported above background or reported as detected when no background value is available for comparison. Results are reported by constituent, including analyte-specific Hanford Site Background Value (if applicable), measurement reporting units, and the frequency of results reported above background (or reported as detected if no available background).

Extent of contamination is expressed in terms of the range of concentrations (minimum, maximum) with corresponding depths, and the Extent Concentration, which is the maximum depth of concentration above background (or depth of detection if no background available) and its corresponding depth.

Tables

Table P-1. Summary of Soil Results from Investigation Group A+B
Table P-2. Summary of Soil Results for Investigation Site C
Table P-3. Summary of Soil Results for Investigation Site E
Table P-4. Summary of Soil Results for Investigation Group F+G
Table P-5. Summary of Soil Results for Investigation Group H+I
Table P-6. Summary of Soil Results for Investigation Site J
Table P-7. Summary of Soil Results for Investigation Group L1+L2
Table P-8. Summary of Soil Results for Investigation Group P
Table P-9. Summary of Soil Results for Investigation Site R
Table P-10. Summary of Soil Results for Investigation Site U

Table Heading Descriptions

Qualifier	Description
Investigation Group	Identifies the Investigation Group for which the results are reported
Analyte	Analyte Name
Background Value	Hanford Site Background Value
Units	Analytical Units of Background/Result reported
Frequency greater than background	Number of results exceeding background (or detected if no background available) over the total number of results reported.
decimal frequency	Frequency greater than background reported as a decimal value
Minimum Concentration	Minimum concentration reported by location
Minimum Concentration Depth (ft bgs)	Depth where minimum concentration was encountered
Maximum Concentration	Maximum concentration reported by location

Table Heading Descriptions

Qualifier	Description
Maximum Concentration Depth (ft bgs)	Depth where maximum concentration was encountered
Extent Concentration	Value of the deepest detected result (or deepest result above background if all results were non-detect)
Extent Depth (ft bgs)	Depth of the deepest detected result

Result Qualifier Descriptions

Qualifier	Description
B	INORGANICS/WETCHEM: The analyte was detected at value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate) ORGANICS: The analyte was detected in both the associated QC blank and in the sample RADIONUCLIDES: The associated QC sample blank has a result greater than or equal to the MDA, and after corrections, the result is greater than or equal to the MDA for this sample.
C	INORGANICS/WETCHEM: The analyte was detected in both the sample and the associated QC blank and the sample concentration was less than or equal to 5X the blank concentration
E	(1) Concentration exceeds the calibration range of the instrument, or (2) Reported value is estimated due to interferences. See comment in narrative.
J	Estimated value; see case narrative for more detail
J-	(1) Estimated value due to low LCS Recovery, or (2) The sample was analyzed out of hold time but before 2X hold time
M	Duplicate precision criteria not met
N	Spike and/or duplicate sample recovery is outside control limits
T	Spike and/or spike duplicate sample recovery is outside of control limits
U	Analyzed for but not detected above limiting criteria
X	The result-specific translation of this qualifier code is provided in the hardcopy data report and/or case narrative.
Y	Same as X flag if more than one flag is required

Table P-1. Summary of Soil Results from Investigation Group A+B

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
WETCHEM	Acetate	no background	µg/kg	4/19	57 U	144.9	1880	36.0	306 B	118.7
	Ammonium ion	no background	µg/kg	13/18	92.7 U	11.1	3810 B	6.8	1100 B	169.7
	Bromide	no background	µg/kg	2/19	551 U	118.7	4500 U	36.0	1760 B	14.1
	Formate	no background	µg/kg	18/19	44.1 B	144.9	1290	42.0	316 B	169.7
	Nitrate	52000	µg/kg	2/19	1260 B	0.5	121000	137.0	121000	137.0
	Nitrite	no background	µg/kg	9/19	189 U	144.9	1080 J	0.5	357 CB	169.7
	Oxalate	no background	µg/kg	8/19	220 U	46.8	8200	11.4	234 B	137.0
	Sulfate	237000	µg/kg	2/19	620 U	0.5	592000	14.2	366000	36.0
METALS	Antimony	130	µg/kg	16/19	108	169.7	342	0.5	156	144.9
	Boron	3890	µg/kg	9/9	6500 U	0.5	6960 B	36.0	6790 U	137.0
	Calcium	17200000	µg/kg	1/19	6620000	169.7	32200000	36.0	32200000	36.0
	Cerium	no background	µg/kg	19/19	20100 B	81.4	25700 B	0.5	22700 B	169.7
	Chromium	18500	µg/kg	5/19	5970 B	14.1	27700	81.4	26400	137.0
	Lanthanum	no background	µg/kg	19/19	8110	81.4	11500	14.1	9890	169.7
	Lead	10200	µg/kg	1/19	2920	14.2	11900	36.0	11900	36.0
	Mercury	13	µg/kg	1/19	9.09 U	11.4	23 B	36.0	23 B	36.0
	Molybdenum	470	µg/kg	19/19	4330 U	0.5	4690 U	0.5	4340 U	169.7
	Phosphorus	no background	µg/kg	19/19	457000	137.0	1020000	14.1	691000	169.7
	Praseodymium	no background	µg/kg	9/9	2480 CB	0.5	4980 CB	14.1	4160 CB	169.7
	Silicon	no background	µg/kg	19/19	51000 BXN	69.7	119000 N	36.0	65000 BXN	169.7
	Strontium	no background	µg/kg	19/19	28100	144.9	67700 N	36.0	29700	169.7
	Sulfur	no background	µg/kg	19/19	46900 B	69.7	595000	36.0	88200 B	169.7
	Tin	no background	µg/kg	3/3	6900 BJ-	0.5	11600 B	11.4	9790 B	14.1
	Titanium	no background	µg/kg	19/19	772000	102.1	1980000	14.1	1130000	169.7
	Yttrium	no background	µg/kg	19/19	5250	137.0	12500	14.1	8540	169.7
	Zirconium	no background	µg/kg	19/19	1950 BN	169.7	15500 N	0.5	1950 BN	169.7
PEST/PCB	Aroclor-1254	no background	µg/kg	3/9	5.38 U	6.8	8.59 J	0.5	8.59 J	0.5
PHYSICAL	Bulk density - wet	no background	µg/L	28/28	1840000000	6.1	2430000000	36.0	2130000000	169.7
	pH Measurement	no background	unitless	19/19	7.99	0.5	11.1	36.0	8.12	169.7
	Specific Conductance	no background	µS/cm	19/19	59.4	0.5	657	36.0	244	169.7
RAD	Americium-241	no background	pCi/g	4/19	0.0164 U	0.5	0.061	11.4	0.0381	14.2
	Carbon-14	no background	pCi/g	5/19	0.604 U	36.0	3.39	11.4	1.31	144.9
	Cesium-137	1.1	pCi/g	4/19	-0.036 U	11.1	27.7	0.5	27.7	0.5
	Cobalt-60	0.0084	pCi/g	16/19	-0.017 U	5.1	0.157 U	118.7	0.0712 U	169.7
	Europium-154	0.033	pCi/g	14/19	-0.064 U	36.0	0.305 U	0.5	0.0775 U	169.7
	Europium-155	0.054	pCi/g	19/19	0.062 U	102.1	0.378 U	14.1	0.162 U	169.7
	Nickel-63	no background	pCi/g	1/19	3.13 U	118.7	7.89 U	102.1	6.71	137.0

Table P-1. Summary of Soil Results from Investigation Group A+B

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
	Plutonium-238	0.0038	pCi/g	19/19	0.022 U	0.5	0.0526 U	137.0	0.0376 U	169.7
	Plutonium-239/240	0.025	pCi/g	19/19	0.0279 U	0.5	0.313	0.5	0.0472 U	169.7
	Plutonium-241 *	no background	pCi/g	2/19	0.104 U	0.5	1.17	0.5	1.17	0.5
	Selenium-79	no background	pCi/g	4/19	1.15 U	11.4	2.7 E	0.5	1.64 E	137.0
	Strontium-90	0.18	pCi/g	15/19	0.14 U	81.4	24 J	0.5	0.537 U	169.7
	Technetium-99	no background	pCi/g	1/19	0.0171 U	0.5	16.2	36.0	3.1	137.0
	Thorium-230	no background	pCi/g	3/19	0.625 U	0.5	1.17	0.5	0.72	118.7
	Thorium-234	no background	pCi/g	4/19	0.53 U	36.0	25 U	118.7	2.4	137.0
	Tin-126	no background	pCi/g	18/19	8.39 U	0.5	281 E	118.7	35.5 E	169.7
	Tritium	no background	pCi/g	3/19	1.33 U	11.1	5.16	137.0	5.16	137.0
	Uranium-236	no background	pCi/g	1/19	0.00112 U	0.5	0.0287	102.1	0.0287	102.1
SVOA	Di-n-octylphthalate	no background	µg/kg	2/18	46.1 U	118.7	300 J	11.1	109 J	11.4
	n-Heptane	no background	µg/kg	3/3	210 BJN	118.7	340 BJN	169.7	340 BJN	169.7
SECONDARY RAD	Actinium-228	no background	pCi/g	17/17	0.477B	0.5	1.9B	81.4	0.56	169.7
	Bismuth-212	no background	pCi/g	12/12	0.77	102.1	2.49	81.4	1.3	169.7
	Bismuth-214	no background	pCi/g	19/19	0.343	169.7	1.3	81.4	0.343	169.7
	Lead-212	no background	pCi/g	19/19	0.488	169.7	1.5	81.4	0.488	169.7
	Lead-214	no background	pCi/g	16/16	0.595	0.5	2.36	102.1	1.65	169.7
	Manganese-54	no background	pCi/g	1/7	-0.00047 U	81.4	0.035	137.0	0.035	137.0
	Potassium-40	17	pCi/g	6/19	6.63 X	0.5	31	81.4	12.6	169.7
	Radium-226	0.82	pCi/g	13/16	0.67	11.1	6.98 B	69.7	5.84 B	169.7
	Radium-228	no background	pCi/g	7/7	0.71	5.1	1.4	81.4	0.77	102.1
	Thallium-208	no background	pCi/g	18/18	0.193	0.5	1.22	102.1	0.212	169.7
	Zinc-65	no background	pCi/g	1/7	0.0036 U	36.0	0.11	81.4	0.11	81.4

* Concentrations for plutonium-241were derived by multiplying the detected sampling results of plutonium-239/240 with the scaling factor of 3.73 for each sample location (SVF-3009, Pu241_Soil_Estimate.xls).

PCB = Polychlorinated biphenyl

SVOA = Semivolatile organics analysis

Table P-2. Summary of Soil Results for Investigation Site C

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
WETCHEM	Acetate	no background	µg/kg	2/9	53.7 U	57.3	1600	11.5	180 B	45.6
	Ammonium ion	no background	µg/kg	2/9	422 U	11.5	4290 B	0.5	4290 B	0.5
	Formate	no background	µg/kg	8/9	45.6 U	0.5	439	11.5	157 B	87.8
	Nitrite	no background	µg/kg	9/9	424 CB	16.5	2110	6.5	1930 B	87.8
	Oxalate	no background	µg/kg	3/9	205 U	57.3	664 B	11.5	210 B	45.6
	Phosphate	785	µg/kg	4/9	151 UN	87.8	4570 NJ	0.5	1100 BN	11.5
METALS	Antimony	130	µg/kg	7/9	55 B	45.6	721	6.5	169	87.8
	Arsenic	6470	µg/kg	3/9	2220 CB	45.6	21200	6.5	7770	87.8
	Bismuth	no background	µg/kg	9/9	16300 B	87.8	50500 B	11.5	16300 B	87.8
	Calcium	17200000	µg/kg	1/9	7520000	45.6	17500000	6.5	17500000	6.5
	Cerium	no background	µg/kg	9/9	14300 B	75.5	25100 B	6.5	14400 B	87.8
	Chromium	18500	µg/kg	3/9	8700	0.5	22200	16.5	21400	87.8
	Lanthanum	no background	µg/kg	9/9	8580	75.5	13100	6.5	8580	87.8
	Lead	10200	µg/kg	1/9	2390	45.6	10600	6.5	10600	6.5
	Magnesium	7060000	µg/kg	1/9	4370000	45.6	8620000	6.5	8620000	6.5
	Molybdenum	470	µg/kg	9/9	2660 U	45.6	2790 U	0.5	2760 U	87.8
	Neodymium	no background	µg/kg	9/9	9200 B	75.5	13200 B	6.5	9330 B	87.8
	Phosphorus	no background	µg/kg	9/9	477000	87.8	865000	0.5	477000	87.8
	Samarium	no background	µg/kg	1/1	2950 B	0.5	2950 B	0.5	2950 B	0.5
	Silicon	no background	µg/kg	9/9	69900 N	75.5	106000 NJ	0.5	79900 N	87.8
	Strontium	no background	µg/kg	9/9	29200	87.8	44700	6.5	29200	87.8
	Sulfur	no background	µg/kg	9/9	41900 BN	16.5	69100 BNJ	0.5	59900 BN	87.8
	Thallium	185	µg/kg	7/9	162 CB	87.8	304 C	0.5	204 C	57.3
	Titanium	no background	µg/kg	9/9	772000	87.8	2080000	11.5	772000	87.8
	Tungsten	no background	µg/kg	1/1	31800 B	0.5	31800 B	0.5	31800 B	0.5
	Yttrium	no background	µg/kg	9/9	5550	87.8	10200	11.5	5550	87.8
	Zirconium	no background	µg/kg	9/9	4870 BNM	45.6	13700 NMJ	0.5	6350 BNM	87.8
PHYSICAL	Bulk density - wet	no background	µg/L	12/12	1800000000	75.5	2320000000	16.5	2160000000	87.8
	pH Measurement	no background	unitless	9/9	8.18	0.5	9.33	75.5	9.17	87.8
	Specific Conductance	no background	µS/cm	9/9	124	0.5	290	11.5	151	87.8
RAD	Cesium-137	1.1	pCi/g	2/9	0.104 U	11.5	7.09	0.5	7.09	0.5
	Cobalt-60	0.0084	pCi/g	9/9	0.0614 U	16.5	0.134 U	57.3	0.13 U	87.8
	Europium-154	0.033	pCi/g	9/9	0.235 U	11.5	0.411 U	57.3	0.363 U	87.8
	Europium-155	0.054	pCi/g	9/9	0.19 U	0.5	0.356 U	45.6	0.303 U	87.8
	Nickel-63	no background	pCi/g	2/9	3.14 U	0.5	5.62 U	75.5	3.82	45.6
	Plutonium-238	0.0038	pCi/g	9/9	0.0235 U	87.8	0.0421 U	0.5	0.0235 U	87.8
	Plutonium-239/240	0.025	pCi/g	9/9	0.0309 U	6.5	0.0674 U	75.5	0.0522 U	87.8

Table P-2. Summary of Soil Results for Investigation Site C

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
	Strontium-90	0.18	pCi/g	8/9	0.169 U	87.8	3	0.5	0.208 U	75.5
	Tin-126	no background	pCi/g	8/9	7.23 U	45.6	53.1 E	6.5	16 E	87.8
SVOA	Butylbenzylphthalate	no background	µg/kg	1/9	48.3 U	6.5	80.7 J	0.5	80.7 J	0.5
SECONDARY RAD	Actinium-228	no background	pCi/g	9/9	0.567	75.5	1.74	6.5	0.857	87.8
	Bismuth-212	no background	pCi/g	2/2	1.5	0.5	1.59	0.5	1.59	0.5
	Bismuth-214	no background	pCi/g	9/9	0.555	16.5	1.12	6.5	0.798	87.8
	Lead-212	no background	pCi/g	9/9	0.358	45.6	0.855	0.5	0.769	87.8
	Lead-214	no background	pCi/g	9/9	0.518	45.6	2.6	0.5	2.12	87.8
	Potassium-40	17	pCi/g	9/9	9.95	11.5	15.8	87.8	15.8	87.8
	Thallium-208	no background	pCi/g	9/9	0.2	45.6	1.17 XJ	0.5	1.02	87.8

SVOA = Semivolatile organics analysis

Table P-3. Summary of Soil Results for Investigation Site E

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
WETCHEM	Acetate	no background	µg/kg	3/9	59.2 U	6	452 B	38	179 B	123
	Ammonium ion	no background	µg/kg	6/9	474 U	123	3220 CB	0.5	986 B	84
	Fluoride	2810	µg/kg	1/9	171 B	123	2870 BM	38	2870 BM	38
	Formate	no background	µg/kg	9/9	70.8 B	0.5	1270 B	38	540 B	123
	Nitrite	no background	µg/kg	9/9	721 B	84	1470 B	38	764 B	123
	Oxalate	no background	µg/kg	4/9	227 U	74	1580 B	6	995 B	38
	Phosphate	785	µg/kg	5/9	165 U	123	1650 B	0.5	848 B	15
	Sulfide	no background	µg/kg	9/9	7680 B	84	32500 B	0.5	17900 B	123
METALS	Antimony	130	µg/kg	5/9	92.6 BN	11	263 N	84	263 N	84
	Cadmium	563	µg/kg	9/9	1760 B	84	3260 B	0.5	2440 B	123
	Cerium	no background	µg/kg	9/9	16900 B	123	24700 B	38	16900 B	123
	Chromium	18500	µg/kg	3/9	7440	0.5	29800	38	20300	123
	Lanthanum	no background	µg/kg	9/9	8700	123	11900	6	8700	123
	Mercury	13	µg/kg	2/9	8.74 U	74	23.2 B	0.5	23.2 B	0.5
	Molybdenum	470	µg/kg	9/9	1960 U	0.5	2540 B	123	2540 B	123
	Nickel	19100	µg/kg	2/9	7820 B	6	25300	74	25300	74
	Phosphorus	no background	µg/kg	9/9	467000	84	870000	0.5	596000	123
	Silicon	no background	µg/kg	9/9	20000 BN	0.5	34200 NJ	11	30900 N	123
	Sodium	690000	µg/kg	1/9	185000	74	972000	38	972000	38
	Strontium	no background	µg/kg	9/9	28400	0.5	56200	38	37200	123
	Sulfur	no background	µg/kg	9/9	45500 B	74	165000	123	165000	123
	Titanium	no background	µg/kg	9/9	710000	84	1610000	38	1000000	123
	Yttrium	no background	µg/kg	9/9	5400	84	10600	15	6630	123
	Zirconium	no background	µg/kg	9/9	6860	84	18500	38	11000	123
PEST/PCB	Aldrin	no background	µg/kg	1/5	0.31	6	2	11	2	11
PHYSICAL	Bulk density - wet	no background	µg/L	13/13	2030000000	74	2310000000	15	2220000000	123
	pH Measurement	no background	unitless	9/9	8.67	6	9.81	38	8.92 J	123
RAD	Cesium-137	1.1	pCi/g	2/9	0.374 U	38	5.13	0.5	5.13	0.5
	Cobalt-60	0.0084	pCi/g	9/9	0.304 U	38	0.384 U	6	0.305 U	123
	Europium-154	0.033	pCi/g	9/9	0.95 U	123	1.24 U	6	0.95 U	123
	Europium-155	0.054	pCi/g	9/9	0.484 U	38	0.638 U	6	0.495 U	123
	Plutonium-238	0.0038	pCi/g	9/9	0.273 U	11	0.397 U	6	0.316 U	123
	Plutonium-239/240	0.025	pCi/g	9/9	0.273 U	11	0.397 U	6	0.316 U	123
	Selenium-79	no background	pCi/g	5/9	1.34 U	38	7.1 B	74	7.1 B	74
	Strontium-90	0.18	pCi/g	9/9	0.183 U	38	2.5	0.5	0.647 U	123
	Thorium-230	no background	pCi/g	2/9	0.567 U	0.5	0.767	11	0.635	15
	Tin-126	no background	pCi/g	9/9	3.38	38	18.5	0.5	3.41	123

Table P-3. Summary of Soil Results for Investigation Site E

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
	Uranium-233	no background	pCi/g	9/9	1.24	38	2.49	84	1.4	123
	Uranium-236	no background	pCi/g	1/9	0.00102 U	0.5	0.00121	11	0.00121	11
SVOA	Butylbenzylphthalate	no background	µg/kg	5/9	41.1 U	123	125 BJ	38	110 BJ	74
VOA	2-Butanone	no background	µg/kg	1/9	1.52 U	0.5	6.58 BJT	74	6.58 BJT	74
	Acetone	no background	µg/kg	4/9	1.71 U	0.5	6.63 J	11	5.41 J	123
	Styrene	no background	µg/kg	1/1	0.784 BJ	84	0.784 BJ	84	0.784 BJ	84
	Toluene	no background	µg/kg	8/9	0.0802 U	38	0.734 BJ	74	0.559 BJ	123
SECONDARY RAD	Bismuth-214	no background	pCi/g	2/2	1.1	6	1.24	11	1.24	11
	Lead-212	no background	pCi/g	2/3	.565U	15	0.782	6	0.716	84
	Lead-214	no background	pCi/g	5/6	.518U	123	1.57	11	0.994	74
	Potassium-40	17	pCi/g	1/7	7.62	38	17.6	84	17.6	84

PCB = Polychlorinated biphenyl

SVOA = Semivolatile organics analysis

VOA = Volatile organics analysis

Table P-4. Summary of Soil Results for Investigation Group F+G

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
WETCHEM	Acetate	no background	µg/kg	14/21	59.4 U	0.5	4800	159	137 B	217
	Ammonium ion	no background	µg/kg	14/21	466 U	98	17300 CB	196	1470 B	217
	Fluoride	2810	µg/kg	1/21	459	130	3290 J	6	3290 J	6
	Formate	no background	µg/kg	15/21	138 B	159	1020 B	196	419 B	217
	Nitrate	52000	µg/kg	2/21	1940 B	93	192000	126	173000	136
	Nitrite	no background	µg/kg	19/21	302 B	93	4080	0.5	3540	196
	Oxalate	no background	µg/kg	13/21	288 U	6	3130	196	1230 B	217
	Phosphate	785	µg/kg	10/21	183 UJ	6	2790 B	0.5	917 B	98
PHYSICAL	Bulk density - wet	no background	µg/L	19/19	1800000000	130	2270000000	159	2150000000	217
	pH Measurement	no background	unitless	21/21	8.05 J	196	9.57 J	109.5	8.58 J	217
	Sulfide	no background	µg/kg	17/21	6950 U	130	42200	6	7560 B	217
METALMULT	Antimony	130	µg/kg	20/21	120	15	262 B	6	214 U	217
	Bismuth	no background	µg/kg	1/1	25300 B	196	25300 B	196	25300 B	196
	Calcium	17200000	µg/kg	1/21	4800000	217	19600000	6	19600000	6
	Cerium	no background	µg/kg	18/21	14000 B	93	48000 CBU	12	14900 B	217
	Chromium	18500	µg/kg	3/21	4740	15	22100	217	22100	217
	Europium	no background	µg/kg	8/8	976 B	136	1720 B	6	976 B	136
	Lanthanum	no background	µg/kg	21/21	4770 B	130	15200	143	6570	217
	Mercury	13	µg/kg	11/21	8.33 U	109.5	30.4 B	0.5	18.1 U	136
	Molybdenum	470	µg/kg	21/21	2100 U	0.5	17300 U	12	2110 B	217
	Neodymium	no background	µg/kg	12/13	13900 B	93	27100	15	14000 B	136
	Palladium	no background	µg/kg	3/3	41500 B	15	73300 B	0.5	41500 B	15
	Phosphorus	no background	µg/kg	21/21	421000	93	1020000	0.5	456000	217
	Praseodymium	no background	µg/kg	4/4	2100 B	15	4500 B	0.5	2100 B	15
	Samarium	no background	µg/kg	1/1	3730 B	126	3730 B	126	3730 B	126
	Selenium	780	µg/kg	10/21	119 U	159	2410 U	0.5	2230 U	136
	Silicon	no background	µg/kg	21/21	77500 NJ	143	1190000	15	111000 NJ	217
	Strontium	no background	µg/kg	21/21	21700	15	49700	6	29400	217
	Sulfur	no background	µg/kg	18/18	33100 B	98	98200 B	126	65500 B	217
	Tantalum	no background	µg/kg	1/1	10000 BNJ	15	10000 BNJ	15	10000 BNJ	15
	Tellurium	no background	µg/kg	1/1	25800 B	15	25800 B	15	25800 B	15
	Tin	no background	µg/kg	1/1	6360 B	0.5	6360 B	0.5	6360 B	0.5
	Titanium	no background	µg/kg	21/21	709000	93	2670000	15	865000	217
	Tungsten	no background	µg/kg	4/4	37400 B	6	62100 B	44.5	62100 B	44.5
	Uranium	3210	µg/kg	10/10	18100 U	126	19700 U	0.5	18300 U	136
	Yttrium	no background	µg/kg	21/21	3750 B	130	12100	0.5	5460	217

Table P-4. Summary of Soil Results for Investigation Group F+G

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
	Zirconium	no background	µg/kg	21/21	2810 CBNJ	0.5	25300	15	6390 CNJ	217
PEST/PCB	Aroclor-1260	no background	µg/kg	1/10	6.4 U	0.5	20.6	11	20.6	11
	beta-1,2,3,4,5,6-Hexachlorocyclohexane (beta-BHC)	no background	µg/kg	5/7	0.31 U	0.5	25.3 XJ	6	23.2 XJ	15
	Gamma-BHC (Lindane)	no background	µg/kg	1/3	0.17 U	0.5	5.1 XJ	15	5.1 XJ	15
RAD	Carbon-14	no background	pCi/g	8/21	2.67 U	0.5	269	98	33.7	196
	Cesium-137	1.1	pCi/g	5/21	0.235 U	126	4.75	0.5	0.555	44.5
	Cobalt-60	0.0084	pCi/g	21/21	0.206 U	126	0.411 U	98	0.261 U	217
	Europium-154	0.033	pCi/g	21/21	0.641 U	126	1.09 U	98	0.806 U	217
	Europium-155	0.054	pCi/g	21/21	0.395 U	126	0.586 U	98	0.431 U	217
	Plutonium-238	0.0038	pCi/g	21/21	0.2 U	130	0.673 UJ	15	0.288 U	217
	Plutonium-239/240	0.025	pCi/g	21/21	0.2 U	130	0.673 UJ	15	0.288 U	217
	Selenium-79	no background	pCi/g	1/21	1.23 UJ	217	3.16 UJ	126	2.42 BJ	6
	Strontium-90	0.18	pCi/g	21/21	0.182 U	130	4.06 UJ	6	0.19 U	217
	Technetium-99	no background	pCi/g	2/21	5.27 U	0.5	54.6 Y	126	50.1 Y	136
	Thorium-230	no background	pCi/g	2/21	0.493 U	130	1.32 J	6	0.495	159
	Tin-126	no background	pCi/g	3/21	2.36 UNJ	6	32.7 B	196	32.7 B	196
	Tritium	no background	pCi/g	1/21	2.27 U	0.5	550 U	11	306	126
	Uranium-233	no background	pCi/g	21/21	0.619	11	2.21	0.5	0.864	217
	Uranium-236	no background	pCi/g	4/21	0.000867 U	159	0.0013	0.5	0.00117	136
SVOA	Bis(2-ethylhexyl) phthalate	no background	µg/kg	8/21	538 U	0.5	7420	15	1770 J	136
	Butylbenzylphthalate	no background	µg/kg	2/21	45.6 U	0.5	72.6 J	15	72.6 J	15
	(m+p)-Xylene	no background	µg/kg	1/21	0.139 UJ	0.5	0.618 U	6	0.334 J	6
	2-Butanone	no background	µg/kg	5/21	1.32 U	15	3.91 U	6	3.18 J	217
	2-Hexanone	no background	µg/kg	1/1	4.24 BJ	217	4.24 BJ	217	4.24 BJ	217
	4-Methyl-2-pentanone	no background	µg/kg	2/21	0.871 U	15	2.59 U	6	2.03 J	130
	Hexane	no background	µg/kg	10/10	2.12 J	11	35.9 J	15	18.1 J	136
	Methylene chloride	no background	µg/kg	8/21	0.053 UJ	0.5	2.8 B	136	2.8 B	136
	o-Xylene	no background	µg/kg	1/21	0.0762 UJ	0.5	0.294 U	6	0.128 J	6
	Styrene	no background	µg/kg	6/6	0.245 J	11	0.654 J	6	0.609 J	136
	Toluene	no background	µg/kg	9/21	0.119 U	15	0.978	6	0.278 J	217
	Xylenes (total)	no background	µg/kg	1/21	0.168 UJ	0.5	0.912 U	6	0.463 J	6
SECONDARY RAD	Bismuth-214	no background	pCi/g	5/5	0.61	126	0.907	6	0.61	126
	Lead-212	no background	pCi/g	13/15	0.391U	6	0.902	12	0.503	217
	Lead-214	no background	pCi/g	7/7	0.643	159	1.47	109.5	0.643	159
	Potassium-40	17	pCi/g	1/21	8.72	15	19.1	126	19.1	126

PCB = Polychlorinated biphenyl

SVOA = Semivolatile organics analysis

Table P-5. Summary of Soil Results for Investigation Group H+I

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
WETCHEM	Acetate	no background	µg/kg	13/19	59.3 U	0.5	13400	143	13400	143
	Ammonium ion	no background	µg/kg	15/18	987 CB	15	22800	0.5	1180 CB	143
	Formate	no background	µg/kg	18/19	46.6 U	6	1850 B	13	750 B	143
	Nitrate	52000	µg/kg	2/19	2750	11	54600	0.5	53000	0.5
	Nitrite	no background	µg/kg	17/19	190 U	19	1850 B	13	808 B	143
	Oxalate	no background	µg/kg	5/19	226 U	11	3140	0.5	739 B	123
	Phosphate	785	µg/kg	11/19	166 U	89	5740	0.5	834 B	46
	Sulfate	237000	µg/kg	1/19	2590 B	0.5	458000	11	458000	11
	Sulfide	no background	µg/kg	17/19	7020 U	44	28900 B	0.5	8870 B	143
PHYSICAL	Bulk density - wet	no background	µg/L	29/29	1600000000	6	2200000000	19	2170000000	143
	pH Measurement	no background	unitless	19/19	8.48	46	9.76	11	9.38	143
METALMULT	Antimony	130	µg/kg	10/19	77.9 B	11	420	6	181	123
	Arsenic	6470	µg/kg	1/19	2000	15	7000	0.5	7000	0.5
	Cerium	no background	µg/kg	19/19	12800 B	123	31300 N	11	15900 BN	143
	Chromium	18500	µg/kg	5/19	5340 M	11	28700 M	93	28700 M	93
	Lanthanum	no background	µg/kg	19/19	6390	89	13000	11	7390	143
	Lead	10200	µg/kg	2/19	2460	11	11300	6	10300	19
	Molybdenum	470	µg/kg	19/19	1650 U	0.5	2000 B	6	1970 U	143
	Phosphorus	no background	µg/kg	19/19	479000	89	1350000	11	508000	143
	Ruthenium	no background	µg/kg	1/1	18200 B	46	18200 B	46	18200 B	46
	Selenium	780	µg/kg	10/19	345 B	93	1000	0.5	1000	123
	Silicon	no background	µg/kg	19/19	44100 NM	0.5	144000	46	46900 NM	143
	Strontium	no background	µg/kg	19/19	20200 NM	11	37700	15	24900 NM	143
	Sulfur	no background	µg/kg	19/19	45800 B	6	145000	11	105000	143
	Thallium	185	µg/kg	2/19	54.1 B	117	194	13	189	19
	Titanium	no background	µg/kg	19/19	537000	6	2440000	11	990000	143
	Tungsten	no background	µg/kg	1/1	39500 B	0.5	39500 B	0.5	39500 B	0.5
	Yttrium	no background	µg/kg	19/19	4910	89	15900	11	6230	143
	Zirconium	no background	µg/kg	19/19	5240 NJ	89	19300 N	11	8670 N	143
RAD	Carbon-14	no background	pCi/g	1/19	1.29 U	15	3.49	6	3.49	6
	Cobalt-60	0.0084	pCi/g	19/19	0.277 U	0.5	0.446 U	0.5	0.304 U	143
	Europium-154	0.033	pCi/g	19/19	0.884 U	143	1.46 U	6	0.884 U	143
	Europium-155	0.054	pCi/g	19/19	0.463 U	0.5	1.15 U	0.5	0.477 U	143
	Plutonium-238	0.0038	pCi/g	19/19	0.259 U	0.5	0.467 U	89	0.335 U	143
	Plutonium-239/240	0.025	pCi/g	19/19	0.259 U	0.5	0.467 U	89	0.335 U	143
	Selenium-79	no background	pCi/g	4/19	1.38 U	0.5	6.17 B	18	2.22 BJ	117
	Strontium-90	0.18	pCi/g	19/19	0.182 U	6	0.713 U	89	0.208 U	143

Table P-5. Summary of Soil Results for Investigation Group H+I

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
	Thorium-230	no background	pCi/g	7/19	0.573 U	18	1.85 B	0.5	0.984 B	123
	Tin-126	no background	pCi/g	18/19	2.43 U	11	9.76 B	0.5	3.23 BN	143
	Tritium	no background	pCi/g	6/19	2.68	89	102 U	93	89.2	117
	Uranium-233	no background	pCi/g	19/19	0.575	11	2.18	19	0.872	143
	Uranium-236	no background	pCi/g	6/19	0.00102 U	0.5	0.0021	15	0.00142 B	89
GENORG	Total petroleum hydrocarbons - diesel range	no background	µg/kg	1/10	350 U	0.5	12000 BJ	0.5	12000 BJ	0.5
SVOA	Bis(2-ethylhexyl) phthalate	no background	µg/kg	19-Feb	568 U	0.5	5620 J	117	5620 J	117
	Butylbenzylphthalate	no background	µg/kg	1/19	48.1 U	0.5	200 J	15	200 J	15
	Di-n-butylphthalate	no background	µg/kg	1/19	541 U	0.5	570 J	0.5	570 J	0.5
VOA	3-Heptanone	no background	µg/kg	1/1	2.5 JN	123	2.5 JN	123	2.5 JN	123
	Styrene	no background	µg/kg	12/14	0.273 BJ	15	0.464 BJ	15	0.302 BJ	117
	Tetrahydrofuran	no background	µg/kg	1/1	27.4	46	27.4	46	27.4	46
	Toluene	no background	µg/kg	15/19	0.0689 UX	0.5	1.05 B	15	0.301 J	143
SECONDARY RAD	Bismith-124	no background	pCi/g	3/3	0.713	11	0.899	44	0.899	44
	Lead-212	no background	pCi/g	5/6	.439U	93	0.773	44	0.649	143
	Lead-214	no background	pCi/g	3/5	.644U	117	1.69	18	1.69	18
	Potassium-40	17	pCi/g	3/15	8.09	11	20	0.5	17	93

SVOA = Semivolatile organics analysis

VOA = Volatile organic analysis

Table P-6. Summary of Soil Results for Investigation Site J

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
WETCHEM	Acetate	no background	µg/kg	9/10	60.2 U	90.1	8380	38.8	494 B	173.3
	Ammonium ion	no background	µg/kg	8/10	474 U	157.7	6690	173.3	6690	173.3
	Formate	no background	µg/kg	9/10	166 B	90.1	10000 U	0.5	270 B	173.3
	Nitrite	no background	µg/kg	8/10	394 CB	90.1	2650	131.8	1610 CB	157.7
	Oxalate	no background	µg/kg	2/10	204 U	0.5	1940	13.5	279 B	157.7
	Phosphate	785	µg/kg	4/10	151 U	54.3	3290	38.8	3290	38.8
METALS	Antimony	130	µg/kg	8/10	121	173.3	2160	13.5	241	131.8
	Arsenic	6470	µg/kg	1/10	2160 B	173.3	7890	13.5	7890	13.5
	Barium	132000	µg/kg	2/10	55400	157.7	244000	0.5	244000	0.5
	Bismuth	no background	µg/kg	2/2	7230 B	173.3	13100 B	0.5	7230 B	173.3
	Boron	3890	µg/kg	5/9	2740 B	90.1	43900 NJ	0.5	4580 BN	38.8
	Cerium	no background	µg/kg	10/10	16500 B	54.3	21400 B	4.9	16800	173.3
	Chromium	18500	µg/kg	1/10	8490	0.5	27400	173.3	27400	173.3
	Lanthanum	no background	µg/kg	10/10	7850	173.3	9580	4.9	7850	173.3
	Mercury	13	µg/kg	1/10	8.12 U	131.8	16.2 B	0.5	16.2 B	0.5
	Molybdenum	470	µg/kg	10/10	989 U	90.1	3580 B	173.3	3580 B	173.3
	Phosphorus	no background	µg/kg	10/10	457000 X	131.8	902000	4.9	563000 X	173.3
	Praseodymium	no background	µg/kg	10/10	1520 B	0.5	2560 B	4.9	1740 B	173.3
	Selenium	780	µg/kg	10/10	1230 U	0.5	1350 U	131.8	1350 U	173.3
	Silicon	no background	µg/kg	10/10	58600 XN	38.8	147000 X	131.8	147000 XJ-	173.3
	Strontium	no background	µg/kg	10/10	26100	157.7	125000 NJ	0.5	27700	173.3
	Sulfur	no background	µg/kg	10/10	59500 CBN	54.3	149000 N	13.5	84600 NJ	173.3
	Tantalum	no background	µg/kg	3/3	5410 BX	173.3	6750 BX	157.7	5410 BX	173.3
	Tellurium	no background	µg/kg	2/2	5980 B	90.1	11300 B	0.5	5980 B	90.1
	Tin	no background	µg/kg	6/6	2020 B	131.8	5490 B	173.3	5490 B	173.3
	Titanium	no background	µg/kg	10/10	771000	54.3	1600000	13.5	1300000 X	173.3
	Yttrium	no background	µg/kg	10/10	5240	131.8	10400	4.9	6790	173.3
	Zirconium	no background	µg/kg	10/10	2930 BN	4.9	15700 NJ	0.5	9180 NJ	173.3
PHYSICAL	Bulk density - wet	no background	µg/L	14/14	1980000000	131.8	2550000000	173.3	2550000000	173.3
	pH Measurement	no background	unitless	10/10	8.66	0.5	9.23	38.8	8.75	173.3
	Specific Conductance	no background	µS/cm	10/10	189	54.3	370	173.3	370	173.3
RAD	Americium-241	no background	pCi/g	1/10	0.0317 U	90.1	0.0509 U	13.5	0.049	54.3
	Antimony-125	no background	pCi/g	1/10	0.198 U	157.7	2.1	13.5	2.1	13.5
	Carbon-14	no background	pCi/g	2/10	2.65 U	173.3	13.7	0.5	2.73	54.3
	Cesium-137	1.1	pCi/g	2/10	0.066 U	173.3	5.71	0.5	5.71	0.5
	Cobalt-60	0.0084	pCi/g	10/10	0.0795 U	131.8	0.101 U	0.5	0.0858 U	173.3
	Europium-154	0.033	pCi/g	10/10	0.122 U	131.8	0.165 U	38.8	0.131 U	173.3

Table P-6. Summary of Soil Results for Investigation Site J

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
	Europium-155	0.054	pCi/g	10/10	0.24 U	157.7	0.313 U	38.8	0.249 U	173.3
	Plutonium-238	0.0038	pCi/g	10/10	0.0216 U	157.7	0.0666	0.5	0.0288 U	173.3
	Plutonium-239/240	0.025	pCi/g	9/10	0.0226 U	157.7	0.0454 U	0.5	0.0439	173.3
	Plutonium-241 *	no background	pCi/g	2/9	0.118 U	0.5	0.164	172.3	0.164	172.3
	Selenium-79	no background	pCi/g	10/10	3.76 BE	4.9	14 BEJ	173.3	14 BEJ	173.3
	Strontium-90	0.18	pCi/g	10/10	0.247 U	157.7	4.01	0.5	0.735 U	173.3
	Tin-126	no background	pCi/g	4/10	4.55 E	90.1	12.2 U	4.9	4.84 E	173.3
SVOA	Bis(2-ethylhexyl) phthalate	no background	µg/kg	1/10	551 U	173.3	2070 J	13.5	2070 J	13.5
	Butylbenzylphthalate	no background	µg/kg	3/10	46.6 U	173.3	85.5 J	157.7	85.5 J	157.7
	Di-n-octylphthalate	no background	µg/kg	5/10	44.5 U	173.3	159 J	4.9	80 J	157.7
	n-Heptane	no background	µg/kg	6/6	420 BJN	0.5	15000 BJN	54.3	15000 BJN	54.3
VOA	Tetrahydrofuran	no background	µg/kg	1/1	1400 JN	54.3	1400 JN	54.3	1400 JN	54.3
	Toluene	no background	µg/kg	1/1	220 BJN	54.3	220 BJN	54.3	220 BJN	54.3
RAD SECONDARY	Actinium-228	no background	pCi/g	9/9	0.526	173.3	0.855	131.8	0.526	173.3
	Bismuth-214	no background	pCi/g	10/10	0.413	173.3	0.954	0.5	0.413	173.3
	Lead-212	no background	pCi/g	10/10	0.483	157.7	0.745	38.8	0.567	173.3
	Lead-214	no background	pCi/g	8/8	0.409	173.3	0.812	0.5	0.409	173.3
	Potassium-40	17	pCi/g	1/10	9.26	0.5	17.4	90.1	13.4	173.3
	Radium-226	0.82	pCi/g	3/3	1.39 U	173.3	1.91	0.5	1.91	0.5
	Thallium-208	no background	pCi/g	10/10	0.207	173.3	0.294	38.8	0.207	173.3

* Concentrations for plutonium-241 were derived by multiplying the detected sampling results of plutonium-239/240 with the scaling factor of 3.73 for each sample location (SVF-3009, Pu241_Soil_Estimate.xls).

SVOA is Semivolatile organics analysis

VOA is Volatile organic analysis

Table P-7. Summary of Soil Results for Investigation Group L1+L2

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
WETCHEM	2-Hydroxyacetate	no background	µg/kg	1/19	93 U	0.5	663 B	222	663 B	222
	Acetate	no background	µg/kg	17/19	60.3 U	0.5	4280	222	4280	222
	Ammonium ion	no background	µg/kg	13/19	474 U	115	4240 B	222	4240 B	222
	Formate	no background	µg/kg	19/19	124 B	0.5	7060	222	7060	222
	Nitrate	52000	µg/kg	2/19	1920 B	15	90300	115	90300	115
	Nitrite	no background	µg/kg	14/19	240 U	15	5180	11	2470	222
	Oxalate	no background	µg/kg	13/19	236 U	140	14300	222	14300	222
	Phosphate	785	µg/kg	10/19	207 U	134	1590 B	0.5	1210 B	222
	Sulfide	no background	µg/kg	15/19	7100 U	115	34800 B	0.5	7210 B	140
METALS	Antimony	130	µg/kg	15/19	74.1 CB	15	500 B	0.5	247	222
	Bismuth	no background	µg/kg	1/3	10200 U	12	12200 B	0.5	12200 B	0.5
	Cerium	no background	µg/kg	19/19	12900 B	11	31300 B	6	18400 B	222
	Chromium	18500	µg/kg	3/19	6960 MJ	0.5	32200	222	32200	222
	Copper	22000	µg/kg	1/19	7370 B	110.5	27100	222	27100	222
	Europium	no background	µg/kg	9/9	1140 B	115	2440 B	6	1330 B	134
	Lanthanum	no background	µg/kg	19/19	5200 BMJ	11	13700 MJ	6	9070	222
	Lead	10200	µg/kg	1/19	2580	44.5	13800	140	13800	140
	Mercury	13	µg/kg	12/19	8 U	40	68.1 B	222	68.1 B	222
	Molybdenum	470	µg/kg	19/19	1990 U	40	5120 B	222	5120 B	222
	Neodymium	no background	µg/kg	10/10	14300 BMJ	11	31400 MJ	6	19300	134
	Nickel	19100	µg/kg	1/19	7330	11	20200 MJ	40	20200 MJ	40
	Phosphorus	no background	µg/kg	19/19	430000	115	1140000	6	613000	222
	Praseodymium	no background	µg/kg	1/1	4940 B	0.5	4940 B	0.5	4940 B	0.5
	Samarium	no background	µg/kg	4/4	3550 B	15	5050 B	0.5	3550 B	15
	Selenium	780	µg/kg	1/19	210 U	44.5	1350 B	12	1350 B	12
	Silicon	no background	µg/kg	19/19	83900 XJ-	164	669000 XJ	134	90600 XJ-	222
	Strontium	no background	µg/kg	19/19	19000	15	46100	40	30300	222
	Sulfur	no background	µg/kg	19/19	32800 B	40	101000 B	6	82900 B	222
	Tellurium	no background	µg/kg	1/1	19900 B	0.5	19900 B	0.5	19900 B	0.5
	Titanium	no background	µg/kg	19/19	831000	115	2140000 NMJ	6	1520000	222
	Tungsten	no background	µg/kg	5/7	36000 B	85	43300 B	110.5	43300 B	110.5
	Uranium	3210	µg/kg	10/10	17200 U	44.5	19800 U	0.5	18300 U	134
	Yttrium	no background	µg/kg	19/19	5040	140	13400 MJ	6	7290	222
	Zirconium	no background	µg/kg	19/19	1280 CBN	6	21400 MJ	6	10200 NJ	222
RAD	Carbon-14	no background	pCi/g	3/19	2.55 U	140	82.3 U	134	4.69	15
	Cesium-137	1.1	pCi/g	4/19	0.181 U	0.5	7.52	0.5	0.444	6
	Cobalt-60	0.0084	pCi/g	19/19	0.162 U	0.5	0.497 U	110.5	0.274 U	222

Table P-7. Summary of Soil Results for Investigation Group L1+L2

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
	Europium-154	0.033	pCi/g	19/19	0.539 U	0.5	1.48 U	115	0.896 U	222
	Europium-155	0.054	pCi/g	19/19	0.339 U	0.5	0.861 U	115	0.47 U	222
	Nickel-63	no background	pCi/g	2/19	12.3 U	222	390	0.5	390	0.5
	Plutonium-238	0.0038	pCi/g	19/19	0.199 U	164	0.677 UJ	134	0.229 U	222
	Plutonium-239/240	0.025	pCi/g	19/19	0.199 U	164	0.677 UJ	134	0.229 U	222
	Selenium-79	no background	pCi/g	5/19	0.894 UJ	0.5	2.7 J	110.5	1.66 J	134
	Strontium-90	0.18	pCi/g	19/19	0.117	6	4.01 J	0.5	0.64 U	222
	Technetium-99	no background	pCi/g	3/19	5.25 U	12	76 BYUJ	115	28.4 Y	222
	Thorium-230	no background	pCi/g	5/19	0.511 U	15	1.01 U	6	0.703	134
	Tin-126	no background	pCi/g	3/19	2.37 UNJ	12	14.7 UNJ	140	8.94 NJ	15
	Tritium	no background	pCi/g	4/19	3.15	40	333 U	85	4.37	164
	Uranium-233	no background	pCi/g	19/19	0.443	11	2.08	0.5	0.495	222
	Uranium-236	no background	pCi/g	2/19	0.000919 U	15	0.00134	0.5	0.00128	0.5
PEST/PCB	beta-1,2,3,4,5,6-Hexachlorocyclohexane (beta-BHC)	no background	µg/kg	5/10	0.3 U	6	23.4 XJ	0.5	22.4 XJ	15
SVOA	Bis(2-ethylhexyl) phthalate	no background	µg/kg	3/19	531 UJ	0.5	1840 J	6	1260 JJ	134
	Butylbenzylphthalate	no background	µg/kg	2/19	45 UJ	0.5	84.4 BJU	164	53.6 J	15
	Di-n-octylphthalate	no background	µg/kg	1/19	42.9 UJ	0.5	1220 J	222	1220 J	222
VOA	1-Butanol	no background	µg/kg	1/19	7.69 U	0.5	22.2 J	0.5	22.2 J	0.5
	Acetone	no background	µg/kg	6/19	1.81 UJ	0.5	72.5 J	40	21.5 JXT	223
	Benzene	no background	µg/kg	1/19	0.121 UJ	0.5	0.395 J	223	0.395 J	223
	Hexane	no background	µg/kg	10/10	1.62 JJ	134	60.5 J	15	1.62 JJ	134
	Styrene	no background	µg/kg	2/2	0.443 J	134	0.506 J	115	0.443 J	134
	Toluene	no background	µg/kg	3/19	0.119 U	0.5	0.598 BJU	6	0.325 J	223
SECONDARY RAD	Actinium-228	no background	pCi/g	1/2	0.826 U	11	0.842	0.5	0.842	0.5
	Bismuth-214	no background	pCi/g	5/5	0.436	0.5	0.844	15	0.844	15
	Lead-212	no background	pCi/g	11/12	0.412	0.5	1.03	6	0.482 X	222
	Lead-214	no background	pCi/g	7/8	0.592	0.5	1.06	0.5	0.876	40
	Thallium-208	no background	pCi/g	2/2	0.438	164	0.71	115	0.438	164

extent = depth of result above background or detected concentration at the deepest depth

PCB = Polychlorinated biphenyl

SVOA = Semivolatile organics analysis

VOA = Volatile organic analysis

Table P-8. Summary of Soil Results for Investigation Group P

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
WETCHEM	Acetate	no background	µg/kg	23/23	135 BM	133.3	24500 M	6	135 BM	133.3
	Ammonium ion	no background	µg/kg	14/24	470 U	15	5340 C	43	1440 B	133.3
	Bromide	no background	µg/kg	4/29	23.7 U	169	725 U	6	27.5 B	169
	Fluoride	2810	µg/kg	5/29	306	169	7410	37	3870	43
	Formate	no background	µg/kg	23/23	216 B	133.3	1730 B	15	216 B	133.3
	Nitrate	52000	µg/kg	1/31	3060	60	143000 M	43	143000 M	43.0
	Nitrite	no background	µg/kg	22/29	40 U	37	5760 M	15	347	169
	Oxalate	no background	µg/kg	21/23	287 U	133.3	2790 B	43	300 B	60.0
	Phosphate	785	µg/kg	19/29	38.1 U	169	11600 M	15	8630	43
	Sulfide	no background	µg/kg	22/24	5250 U	26	32200 B	15	8180 B	133.3
METALS	Antimony	130	µg/kg	30/30	149 U	11	18100 UN	37	17700 UN	169
	Arsenic	6470	µg/kg	6/30	1730	19	11200 BN	37	10600 UN	169
	Boron	3890	µg/kg	6/6	5140 U	37	5430 U	37	5300 U	169
	Cadmium	563	µg/kg	6/30	40.2 CBUJ	43	1690 B	37	1200 B	169
	Cerium	no background	µg/kg	23/23	14200 B	43	33200 B	11	33100 B	133.3
	Chromium	18500	µg/kg	5/30	4470	11	32700	169	32700	169
	Europium	no background	µg/kg	19/20	921 U	7	4520 B	11	3760 B	133.3
	Lanthanum	no background	µg/kg	24/24	6270	26	17300	133.3	17300	133.3
	Lead	10200	µg/kg	2/30	2720 J	43	14100 B	37	14100 B	37
	Mercury	13	µg/kg	6/24	9.98 U	20.5	22.1 U	26	13.6 U	55.5
	Molybdenum	470	µg/kg	30/30	3400 U	55.5	20200 U	15	8840 U	169
	Neodymium	no background	µg/kg	24/24	8910 B	57	33400	11	10900 B	133.3
	Nickel	19100	µg/kg	5/30	6710	7	30600 J	26	22400 B	169
	Palladium	no background	µg/kg	4/4	43700 CB	7	132000 B	15	132000 B	15
	Phosphorus	no background	µg/kg	30/30	365000	133.3	1140000	43	426000	169
	Praseodymium	no background	µg/kg	12/12	2090 CB	6	4180 CB	11	3090 CB	60
	Rubidium	no background	µg/kg	3/3	265000 CBN	15	316000 CBN	7	265000 CBN	15
	Ruthenium	no background	µg/kg	3/3	8170 B	133.3	15000 B	11	8170 B	133.3
	Selenium	780	µg/kg	6/30	207 U	11	18100 U	37	17700 U	169
	Silicon	no background	µg/kg	24/30	8570 U	37	2330000 NJ	26	521000	133.25
	Silver	167	µg/kg	10/30	81.2 CBUJ	43	933 BN	37	884 UN	169
	Sodium	690000	µg/kg	8/30	140000 B	58	1930000	15	888000	43
	Strontium	no background	µg/kg	30/30	17500	58	39100 M	6	29600 N	169
	Sulfur	no background	µg/kg	29/29	39600 B	26	166000 B	11	80300 B	169
	Tantalum	no background	µg/kg	5/5	10800 B	7	58600 BJ	15	13100 BN	133.3
	Thallium	185	µg/kg	6/30	53.2 CBUJ	43	20800 BN	37	17700 UN	169
	Tin	no background	µg/kg	10/11	5100 U	55.5	14400 B	15	6670 B	60

Table P-8. Summary of Soil Results for Investigation Group P

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
	Titanium	no background	µg/kg	30/30	664000	169	3410000 M	15	708000	169
	Tungsten	no background	µg/kg	6/6	39700 BXN	55.5	102000 B	11	39700 BXN	55.5
	Uranium	3210	µg/kg	24/24	17000 U	55.5	101000 U	15	18600 U	133.3
	Vanadium	85100	µg/kg	2/30	27300	133.3	110000 M	15	95100 M	19
	Yttrium	no background	µg/kg	24/24	4690	57	12900 M	15	4800	133.3
	Zinc	67800	µg/kg	2/30	25400	43	305000	11	72300	169
	Zirconium	no background	µg/kg	30/30	5660 B	58	30700	15	7590 B	169
RAD	Americium-241	no background	pCi/g	3/31	0.852 U	15	235	37	235	37
	Antimony-125	no background	pCi/g	1/30	0.506 U	11	7.47 U	7	1.12	15
	Carbon-14	no background	pCi/g	1/24	46.3 U	7	89.2 U	43	61.1	57.0
	Cesium-137	1.1	pCi/g	13/30	0.292 U	133.3	73.1	15	1.64	43
	Cobalt-60	0.0084	pCi/g	30/30	0.2 U	11	3.13 U	7	0.309 U	169
	Europium-154	0.033	pCi/g	30/30	0.631 U	11	9.45 U	11	1.05 U	169
	Europium-155	0.054	pCi/g	30/30	0.42 U	11	6.7 U	7	0.527 U	169
	Iodine-129	no background	pCi/g	1/25	0.114 U	11	0.808 B	6	0.808 B	6.0
	Neptunium-237	no background	pCi/g	3/30	0.0255 U	37	1.46 B	15	0.506	57
	Nickel-63	no background	pCi/g	2/25	40.8 U	11	112 U	11	87.1 B	27.0
	Plutonium-238	0.0038	pCi/g	25/25	0.522 U	19	1.48 U	11	0.67 U	133.3
	Plutonium-239/240	0.025	pCi/g	25/25	0.522 U	19	10.7 J	15	0.67 U	133.3
	Plutonium-241 *	no background	pCi/g	1/25	1.94 U	19	39.9	15	39.9	15.0
	Selenium-79	no background	pCi/g	14/25	1.04 U	43	8.69 B	7	6.39	58.0
	Strontium-90	0.18	pCi/g	25/25	1.44 U	20.5	141	11	3.53 U	133.3
	Technetium-99	no background	pCi/g	8/30	2.14 Y	169	45.5 Y	20.5	6.07 Y	169
	Thorium-230	no background	pCi/g	4/24	0.532 U	7	1.46 U	15	1.18	20.5
	Tritium	no background	pCi/g	1/24	262 U	7	442 U	15	308	11.0
	Uranium-233	no background	pCi/g	22/24	0.751	6	2.94	43	1.68	133.3
	Uranium-234	1.1	pCi/g	2/24	0.116 U	57	2.76	43	2.76	43.0
	Uranium-235	0.11	pCi/g	6/30	0.00558	55.5	0.339 U	37	0.32 U	169
	Uranium-236	no background	pCi/g	14/24	0.00097 U	57	0.151	43	0.151	43.0
	Uranium-238	1.1	pCi/g	1/30	0.133	55.5	2.15	43	2.15	43
PHYSICAL	Bulk density - wet	no background	µg/L	47/47	1590000000 X	11	2480000000 X	32	2080000000	133.3
	pH Measurement	no background	unitless	30/30	7.63	169	10.3 J	20.5	7.73	169
	Specific Conductance	no background	µS/cm	6/6	233	169	1240	37	344	169
General Organics	Total petroleum hydrocarbons - diesel range	no background	µg/kg	7/8	16200 XUJ	15	135000 B	15	135000 B	15
	Total petroleum hydrocarbons - gasoline range	no background	µg/kg	1/8	100 XTJ	7	335 JXU	15	100 XTJ	7
PEST/PCB	Aroclor-1260	no background	µg/kg	2/8	10 U	15	26.8	11	26.8	11
	beta-1,2,3,4,5,6-Hexachlorocyclohexane (beta-BHC)	no background	µg/kg	4/4	21.2 XJ	7	25.8 XJ	6	22.5 XNJ	15

Table P-8. Summary of Soil Results for Investigation Group P

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
SVOC	Bis(2-ethylhexyl) phthalate	no background	µg/kg	10/22	549 U	15	5050 J	43	673 J	133.3
	Di-n-butylphthalate	no background	µg/kg	4/22	483 U	60	863 BJ	7	770 J	32.0
	Ethylene glycol	no background	µg/kg	2/13	430 JXU	27	5000 U	6	610 BJX	57.0
VOC	1,1-Dichloroethene	no background	µg/kg	1/25	0.189 U	27	0.567 U	6	0.323 JX	58.0
	Acetone	no background	µg/kg	16/25	2.88 U	7	13.1 BJ	11	6.69 BJ	133.3
	Carbon disulfide	no background	µg/kg	1/25	0.167 U	27	0.5 U	6	0.261 J	19.0
	Methylene chloride	no background	µg/kg	5/25	0.203 J	27	2.61	15	0.203 J	27.0
	Toluene	no background	µg/kg	2/25	0.133 U	27	1.36 J	20.5	1.36 J	20.5
SECONDARY RAD	Bismuth-214	no background	pCi/g	7/11	.544 U	169	1.2	19	0.918	133.3
	Lead-212	no background	pCi/g	11/13	.477 U	169	1.17	55.5	0.612	169
	Lead-214	no background	pCi/g	10/10	0.525	6	1.54	169	1.54	169
	Potassium-40	17	pCi/g	3/19	7.9	32	19.4	57	17	169
	Radium-226	0.82	pCi/g	6/6	4.9U	37	5.6 U	37	5.24 U	169
	Thallium-208	no background	pCi/g	1/6	0.265 U	169	0.457	37	0.457	37

PCB = Polychlorinated biphenyl

SVOC = Semivolatile organic compound

VOC = Volatile organic compound

Table P-9. Summary of Soil Results for Investigation Site R

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
WETCHEM	Acetate	no background	µg/kg	8/9	60 U	81	854 B	12	297 B	133
	Ammonium ion	no background	µg/kg	8/9	1050 CB	133	4130 B	6	1050 CB	133
	Fluoride	2810	µg/kg	1/9	597	81	3530	12	3530	12
	Formate	no background	µg/kg	9/9	127 B	81	717 B	40	238 B	133
	Nitrite	no background	µg/kg	7/9	208 U	0.5	5310 C	0.5	1150 CB	133
	Oxalate	no background	µg/kg	7/9	229 U	81	1250 B	16	629 B	40
	Phosphate	785	µg/kg	6/9	290 B	81	2960 B	0.5	1650 B	40
	Sulfide	no background	µg/kg	7/9	7130 U	133	30800 B	6	10800 B	40
METALS	Antimony	130	µg/kg	6/8	114	16	303 M	28	149	133
	Bismuth	no background	µg/kg	6/6	19400 BNJ	16	40500 BN	0.5	34100 BN	28
	Cadmium	563	µg/kg	9/9	1160 B	81	3470 B	6	2120 B	133
	Cerium	no background	µg/kg	9/9	14400 B	40	27300 B	6	16000 B	133
	Europium	no background	µg/kg	1/1	575 B	133	575 B	133	575 B	133
	Lanthanum	no background	µg/kg	9/9	6050	40	12000	6	6750	133
	Mercury	13	µg/kg	1/9	7.78 U	6	13.5 B	0.5	13.5 B	0.5
	Molybdenum	470	µg/kg	9/9	1980 U	40	2230 U	28	1980 U	133
	Phosphorus	no background	µg/kg	9/9	422000	40	990000	6	570000	133
	Silicon	no background	µg/kg	9/9	27500 BXJ-	16	101000 X	0.5	80800 NM	133
	Strontium	no background	µg/kg	9/9	28400	28	37300	6	33700	133
	Sulfur	no background	µg/kg	9/9	33500 BN	40	88000 B	6	39800 BN	133
	Thallium	185	µg/kg	6/9	80.6 CB	81	1220 C	0.5	667 C	28
	Titanium	no background	µg/kg	9/9	505000	81	1960000	0.5	864000	133
	Yttrium	no background	µg/kg	9/9	4440	40	10900	0.5	6530	133
	Zirconium	no background	µg/kg	9/9	1750 BN	0.5	13900 NJ	12	8490 N	133
PHYSICAL	Bulk density - wet	no background	µg/L	10/10	1950000000	81	2260000000	40	2000000000	133
	pH Measurement	no background	unitless	8/8	7.21 J	12	9.34	40	9.32	133
RAD	Cobalt-60	0.0084	pCi/g	7/7	0.27 U	81	0.337 U	0.5	0.297 U	133
	Europium-154	0.033	pCi/g	7/7	0.847 U	16	1.03 U	40	0.939 U	133
	Europium-155	0.054	pCi/g	7/7	0.43 U	28	0.554 U	0.5	0.549 U	133
	Plutonium-238	0.0038	pCi/g	7/7	0.214 U	28	0.372 U	0.5	0.27 U	133
	Plutonium-239/240	0.025	pCi/g	7/7	0.214 U	28	0.372 U	0.5	0.27 U	133
	Selenium-79	no background	pCi/g	1/7	1.36 U	0.5	3.97 B	81	3.97 B	81
	Strontium-90	0.18	pCi/g	7/7	0.26 U	133	1.19 U	0.5	0.26 U	133
	Technetium-99	no background	pCi/g	1/9	5.1 U	81	30.1 U	12	6.45 B	40
	Tin-126	no background	pCi/g	3/9	3.64 N	133	14.4 UJ	12	3.64 N	133
	Tritium	no background	pCi/g	4/8	2.5	12	4.82 U	0.5	3.46	133
	Uranium-233	no background	pCi/g	9/9	1	133	2.36	6	1	133

Table P-9. Summary of Soil Results for Investigation Site R

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
SVOA	Butylbenzylphthalate	no background	µg/kg	7/9	68.6 BJ	0.5	114 BJ	40	105 J	133
	Di-n-octylphthalate	no background	µg/kg	4/9	45.1 U	0.5	572 J	12	317 J	28
VOA	2-Hexanone	no background	µg/kg	3/3	2.08 BJ	11	2.77 BJ	6	2.08 BJ	11
	3-Heptanone	no background	µg/kg	1/1	3.3 JN	28	3.3 JN	28	3.3 JN	28
	Acetone	no background	µg/kg	6/9	1.2 J	81	10	133	10	133
	Methylene chloride	no background	µg/kg	4/9	0.0496 U	28	6.9	133	6.9	133
	Toluene	no background	µg/kg	5/9	0.256 J	28	0.6 U	15	0.256 J	28
	Trichloromonofluoromethane	no background	µg/kg	3/9	0.0729 U	28	11	40	11	133
SECONDARY RAD	Bismuth-214	no background	pCi/g	1/1	0.759	28	0.759	28	0.759	28
	Lead-212	no background	pCi/g	7/7	0.456	40	0.816	16	0.764	133
	Lead-214	no background	pCi/g	3/4	0.579 U	40	0.976	28	0.582	81
	Potassium-40	17	pCi/g	1/7	8.93	28	18.1	81	18.1	81

SVOA = Semivolatile organics analysis

VOA = Volatile organic analysis

Table P-10. Summary of Soil Results for Investigation Site U

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
WETCHEM	Acetate	no background	µg/kg	6/8	60.2 U	39	338 B	129	114 B	158
	Ammonium ion	no background	µg/kg	5/8	476 U	7	3390 CBU	39	2380 CB	158
	Formate	no background	µg/kg	7/8	46.6 U	39	696 B	129	200 B	158
	Nitrate	52000	µg/kg	1/8	4490	158	71600	129	71600	129
	Nitrite	no background	µg/kg	5/8	190 U	158	2370 B	16	393 B	129
	Oxalate	no background	µg/kg	5/8	227 U	129	819 B	11	642 B	16
	Phosphate	785	µg/kg	4/8	164 U	129	1640 BNJ	0.5	936 BN	16
	Sulfide	no background	µg/kg	8/8	7170 B	129	27200 B	0.5	8340 B	158
METALS	Antimony	130	µg/kg	7/7	139	16	300 U	129	300 U	158
	Arsenic	6470	µg/kg	2/8	3000	0.5	20000	16	20000	16
	Boron	3890	µg/kg	1/1	6420 B	0.5	6420 B	0.5	6420 B	0.5
	Cerium	no background	µg/kg	8/8	15500 BN	11	26400 BN	7	20900 BN	158
	Chromium	18500	µg/kg	1/8	7260	0.5	44500	158	44500	158
	Lanthanum	no background	µg/kg	8/8	7510	11	11400	7	10800	158
	Mercury	13	µg/kg	1/8	8.92 U	158	20.6 B	0.5	20.6 B	0.5
	Molybdenum	470	µg/kg	8/8	1650 U	129	2530 B	7	1880 B	158
	Neodymium	no background	µg/kg	3/3	9660	129	13200	39	12600	158
	Nickel	19100	µg/kg	1/8	6680 B	11	29400	158	29400	158
	Phosphorus	no background	µg/kg	8/8	354000	129	917000	0.5	571000	158
	Selenium	780	µg/kg	8/8	800	16	2000	7	800	158
	Silicon	no background	µg/kg	8/8	10800 BM	7	63800	39	60300	158
	Strontium	no background	µg/kg	8/8	23000	11	49600	0.5	34300	158
	Sulfur	no background	µg/kg	7/7	43100 B	11	77000 BNJ	39	76100 BN	158
	Titanium	no background	µg/kg	8/8	593000	129	1500000	7	907000	158
	Yttrium	no background	µg/kg	8/8	4270	129	10700	0.5	6800	158
	Zirconium	no background	µg/kg	8/8	5450	129	16200 N	7	6880	158
PHYSICAL	Bulk density - wet	no background	µg/L	10/10	1840000000	129	2430000000	11	2130000000	158
	pH Measurement	no background	unitless	8/8	8.34 J	0.5	9.37	16	8.66	158
RAD	Carbon-14	no background	pCi/g	2/8	1.25 U	0.5	4.88	16	4.88	16
	Cesium-137	1.1	pCi/g	2/8	0.486 U	158	2.06	0.5	2.06	0.5
	Cobalt-60	0.0084	pCi/g	8/8	0.338 U	0.5	0.463 U	129	0.346 U	158
	Europium-154	0.033	pCi/g	8/8	1.04 U	16	1.49 U	129	1.17 U	158
	Europium-155	0.054	pCi/g	8/8	0.898 U	158	1.19 U	129	0.898 U	158
	Neptunium-237	no background	pCi/g	2/8	0.277 U	129	0.603 B	0.5	0.603 B	0.5
	Plutonium-238	0.0038	pCi/g	8/8	0.278 U	11	0.433 U	0.5	0.365 U	158
	Plutonium-239/240	0.025	pCi/g	8/8	0.278 U	11	0.433 U	0.5	0.365 U	158
	Selenium-79	no background	pCi/g	1/8	1.44 U	158	4.86 UJ	39	2.8	7

Table P-10. Summary of Soil Results for Investigation Site U

CLASS	Analyte	Background Value	Units	Frequency greater than background	Minimum Concentration	Minimum Concentration Depth (ft bgs)	Maximum Concentration	Maximum Concentration Depth (ft bgs)	Extent Concentration	Extent Depth (ft bgs)
	Strontium-90	0.18	pCi/g	8/8	0.201 U	39	4.2	0.5	0.271 U	158
	Technetium-99	no background	pCi/g	2/8	2.55 U	0.5	53.5 Y	129	53.5 Y	129
	Thorium-230	no background	pCi/g	6/8	0.571 BU	0.5	1.36 B	158	1.36 B	158
	Thorium-232	1.3	pCi/g	1/8	0.257	11	1.8	16	1.8	16
	Tin-126	no background	pCi/g	8/8	3.75 BN	11	8.25 B	39	6.6 B	158
	Tritium	no background	pCi/g	1/8	1.5 U	16	4.92 U	158	3.77	129
	Uranium-233	no background	pCi/g	8/8	0.77	11	7.62	16	2.34	158
	Uranium-236	no background	pCi/g	2/8	0.00102 U	0.5	0.00175 B	39	0.00175 B	39
VOA	2-Butanone	no background	µg/kg	1/8	1.63 U	6	13.8 J	158	13.8 J	158
	2-Pentanone	no background	µg/kg	1/1	6.8 J	158	6.8 J	158	6.8 J	158
	3-Heptanone	no background	µg/kg	1/1	11 JN	158	11 JN	158	11 JN	158
	Acetone	no background	µg/kg	3/8	1.82 U	6	25.7 J	158	25.7 J	158
	Benzene	no background	µg/kg	1/8	0.122 U	6	0.328 J	15	0.328 J	15
	Hexane	no background	µg/kg	1/1	4.16	158	4.16	158	4.16	158
	Styrene	no background	µg/kg	2/2	0.346 BJ	158	0.377 BJ	0.5	0.346 BJ	158
	Toluene	no background	µg/kg	7/8	0.346 BJ	0.5	0.738 B	0.5	0.561 BJ	158
SECONDARY RAD	Lead-214	no background	pCi/g	3/3	1.09	158	1.45	7	1.09	158
	Potassium-40	17	pCi/g	1/6	8.84	0.5	21.7	158	21.7	158

VOA = Volatile organic analysis

APPENDIX Q

DISTRIBUTION MAPS OF EXCEEDANCES BY CONSTITUENT AT WMA C

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APPENDIX Q
DISTRIBUTION MAPS OF EXCEEDANCES BY CONSTITUENT AT WMA C

Contents of this appendix include figures summarizing the geospatial distribution of contamination for constituents reported above background or reported as detected when no background value is available for comparison. Figures are first arranged by constituent group (i.e., general chemistry, metals, radiological, organics), then alphabetically within each group. These figures report all useable results for primary and secondary constituents that were reported above background (or reported as detected without background) for all Phase 2 direct push and angle push sampling locations.

Figure Q-1. Distribution Map of Fluoride at WMA C

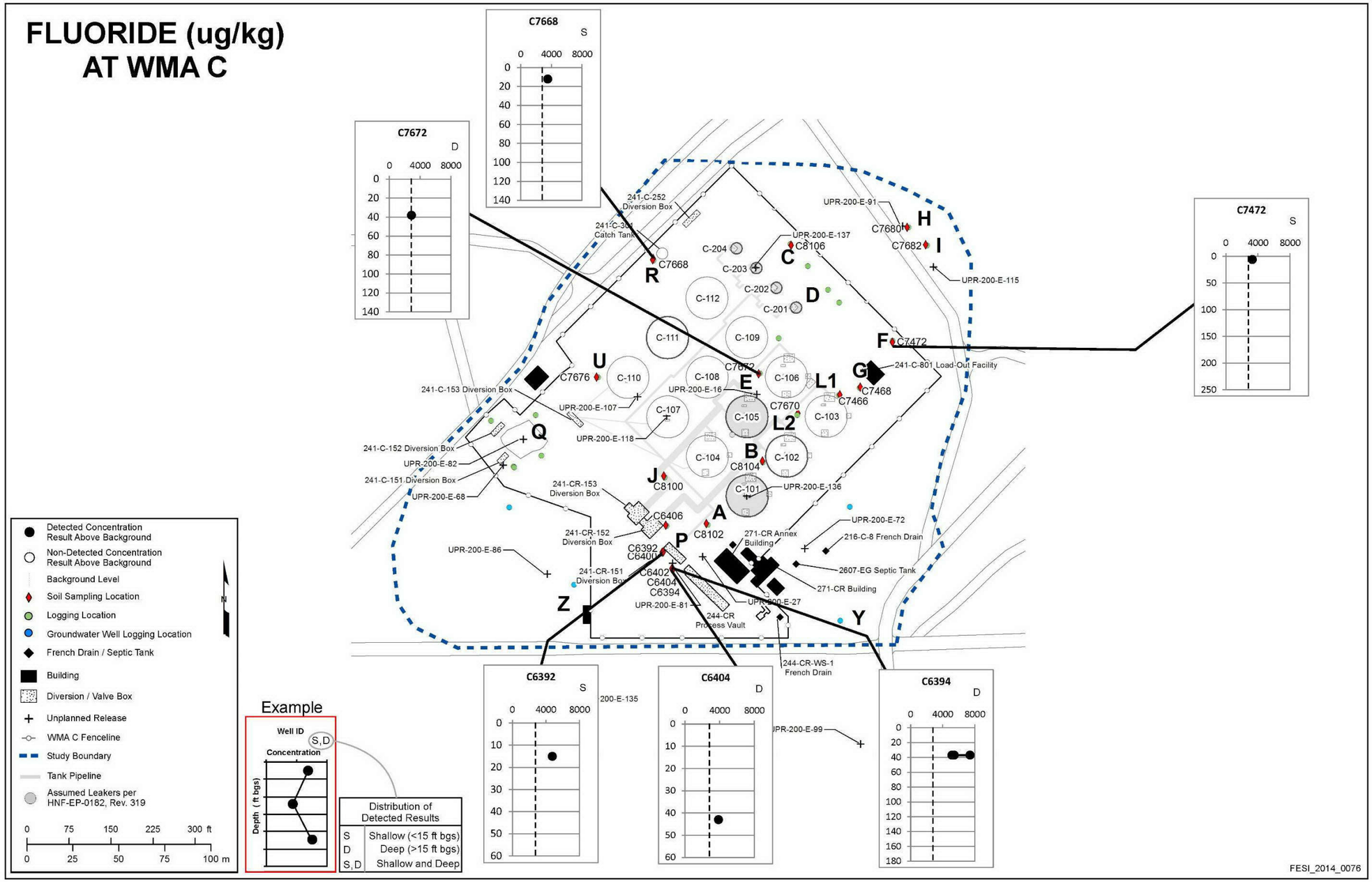

Figure Q-2. Distribution Map of Nitrate at WMA C

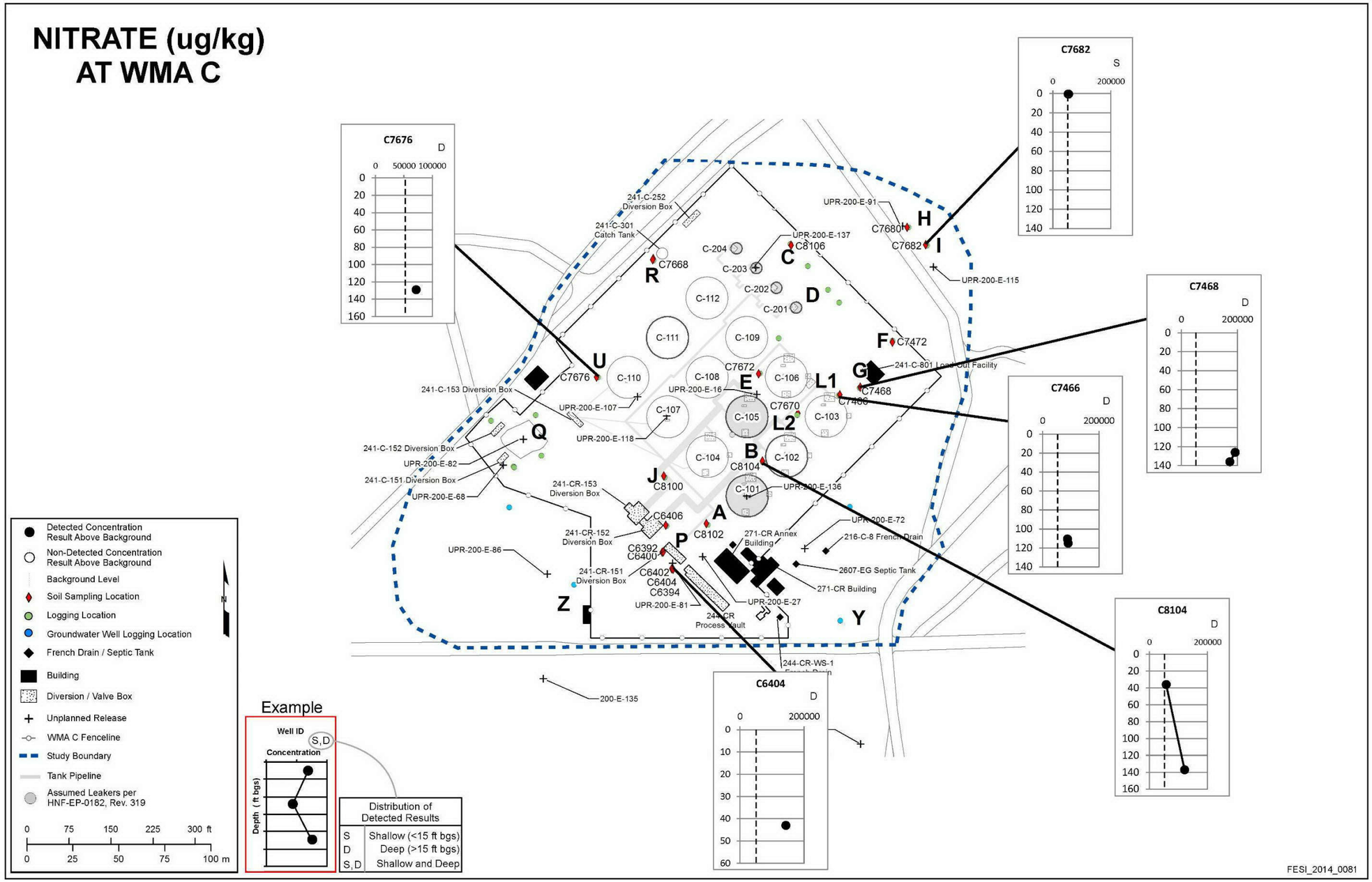

Figure Q-3. Distribution Map of Phosphate at WMA C

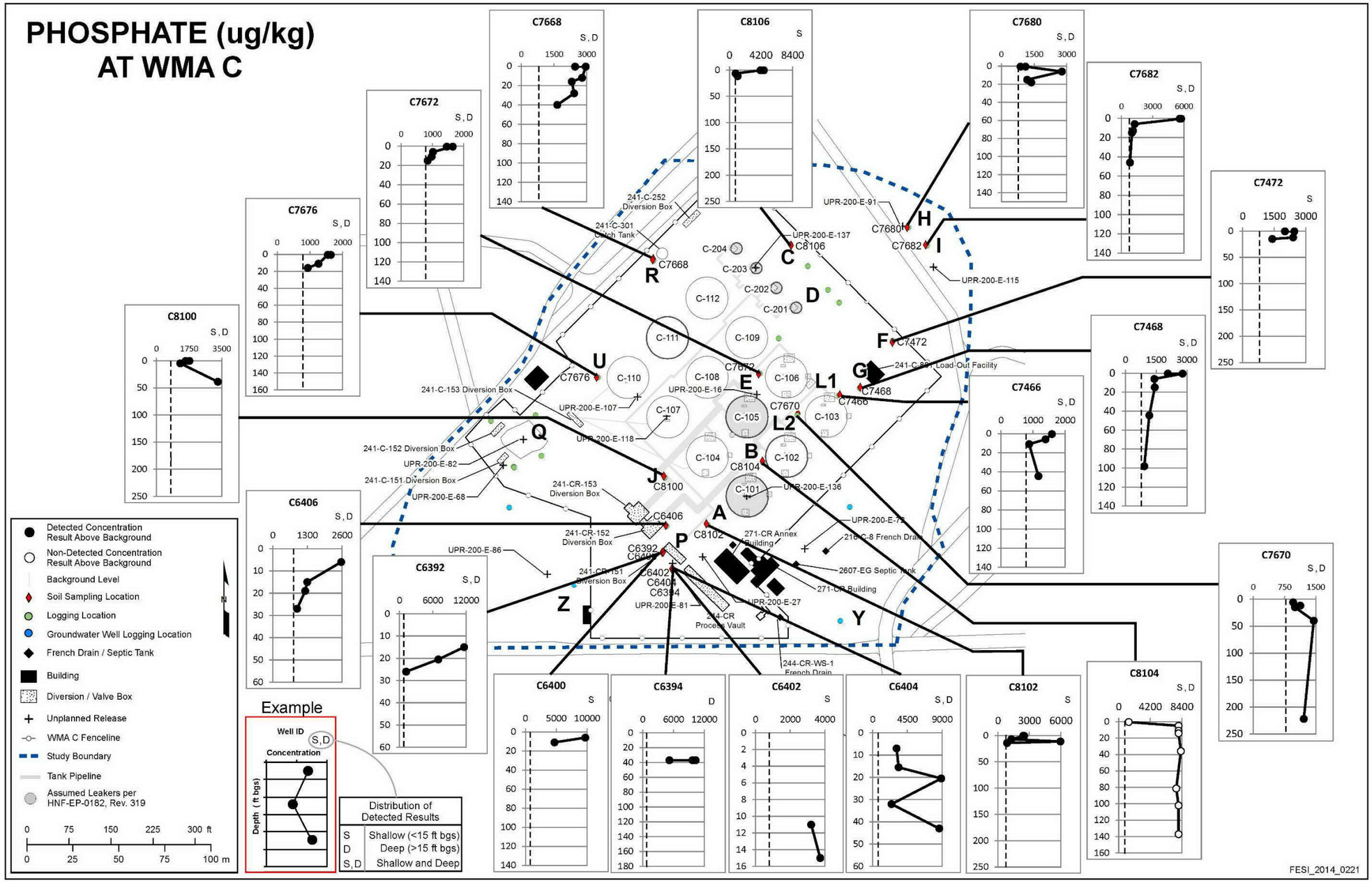

Figure Q-4. Distribution Map of Sulfate at WMA C

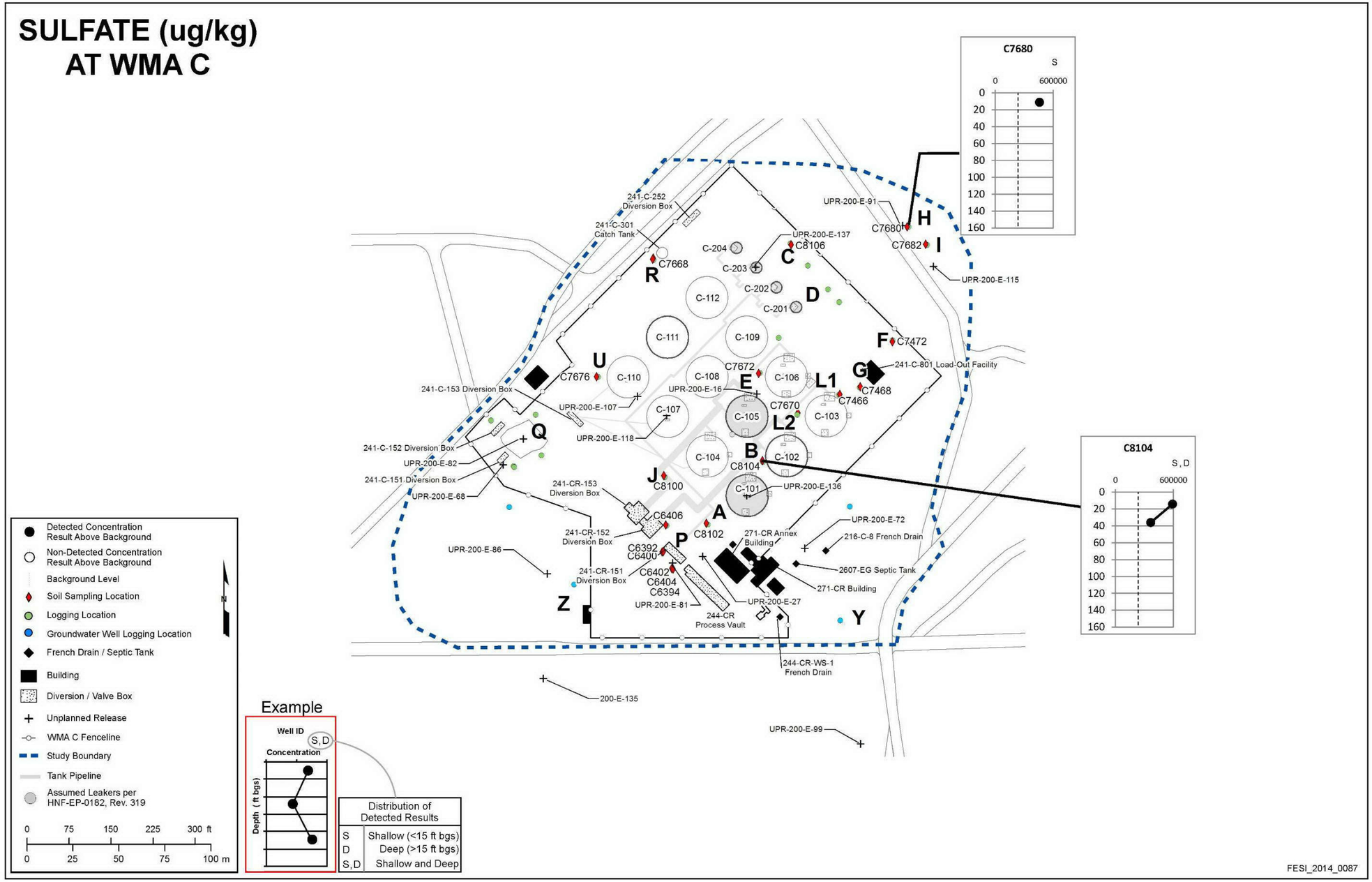

Figure Q-5. Distribution Map of Antimony at WMA C

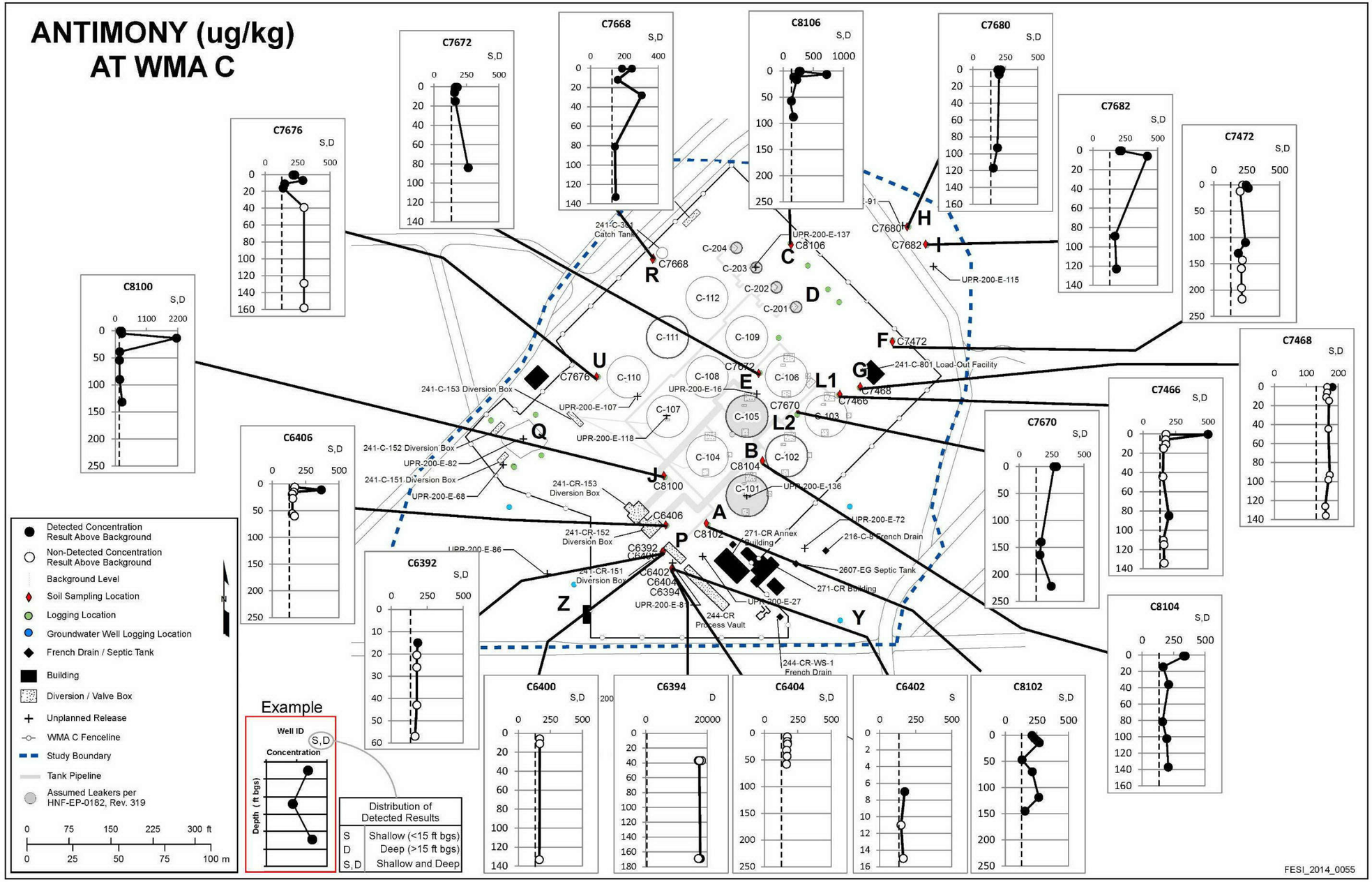

Figure Q-6. Distribution Map of Arsenic at WMA C

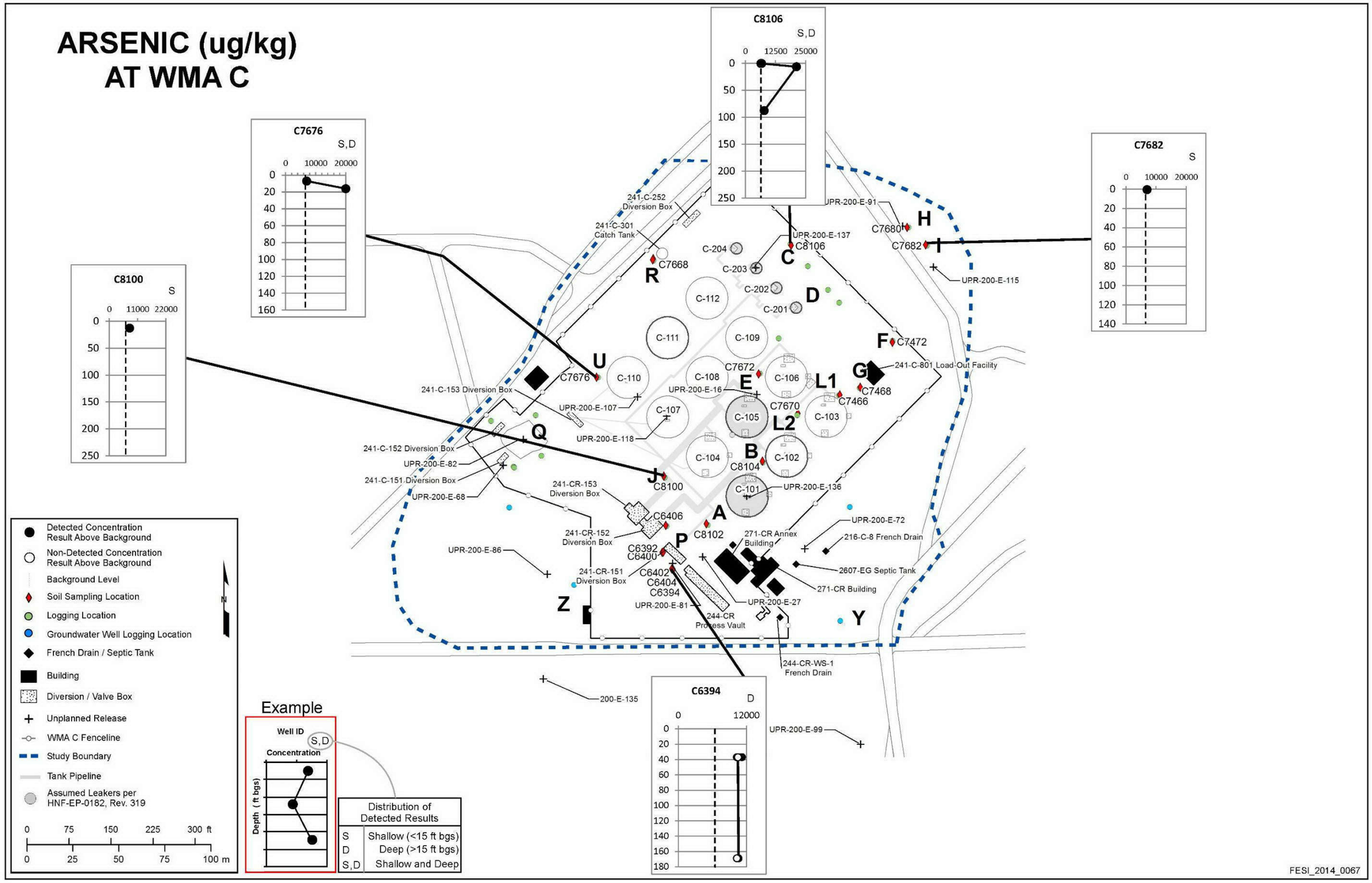

Figure Q-7. Distribution Map of Barium at WMA C

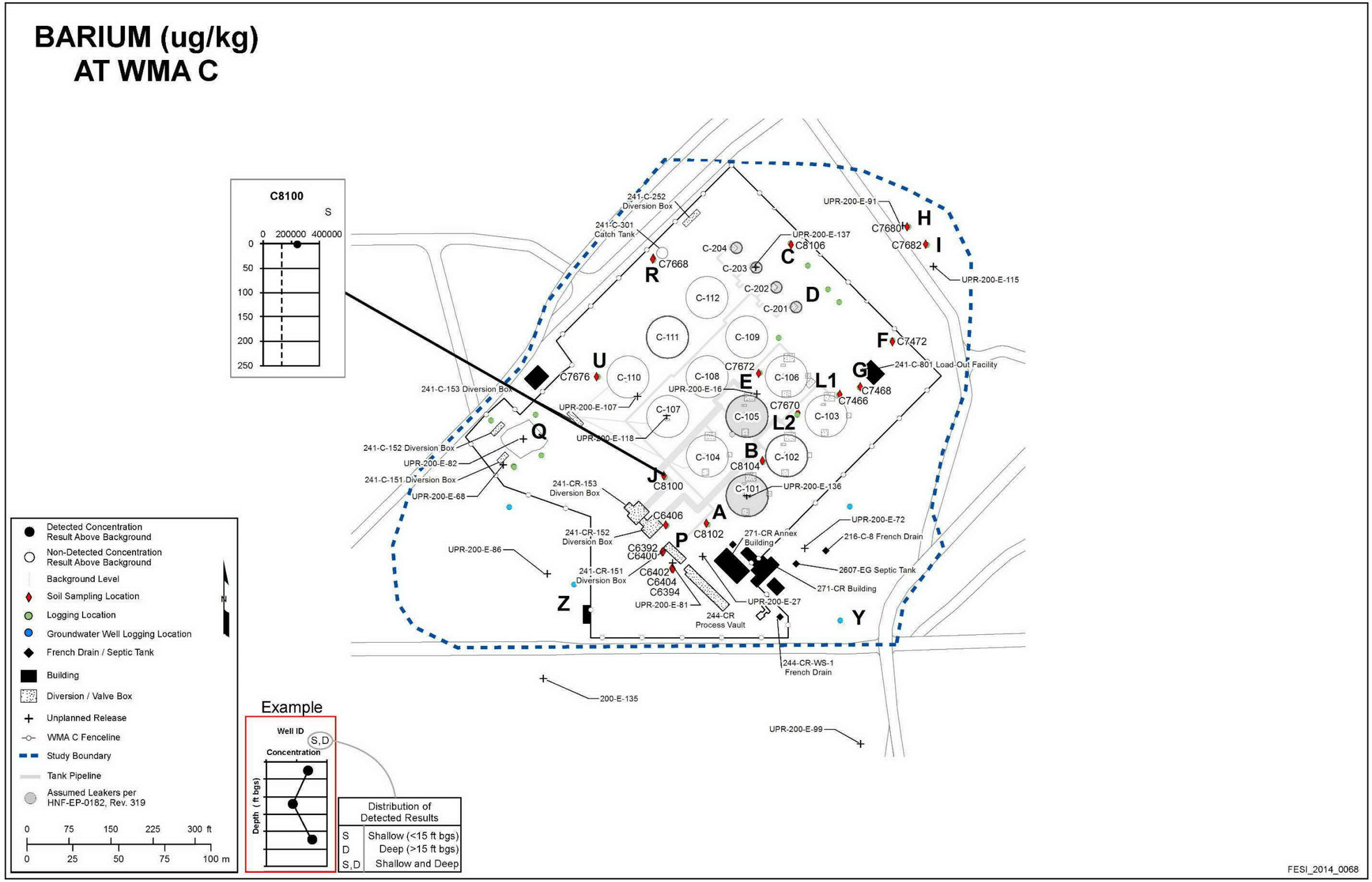

Figure Q-8. Distribution Map of Boron at WMA C

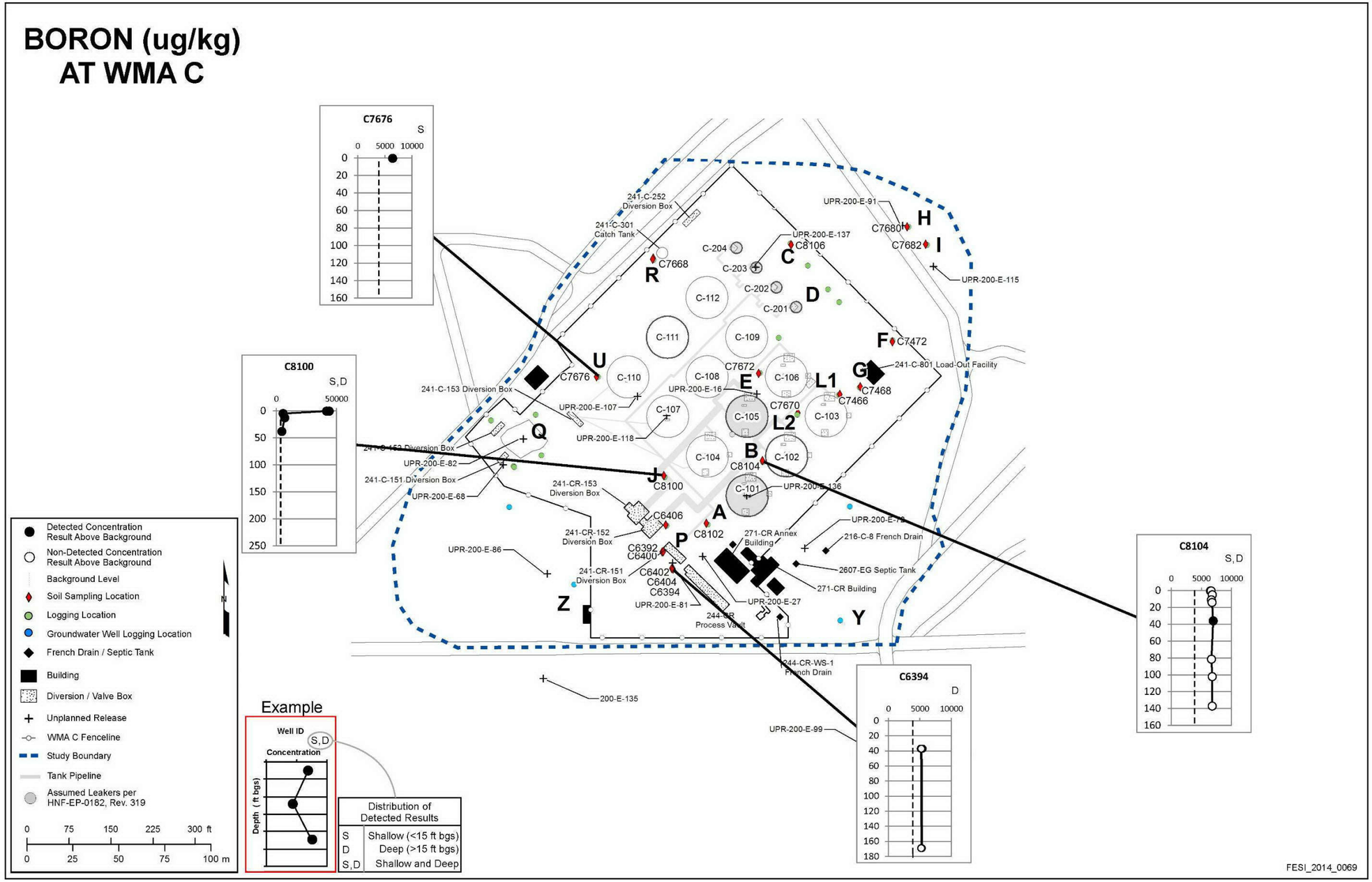

Figure Q-9. Distribution Map of Cadmium at WMA C

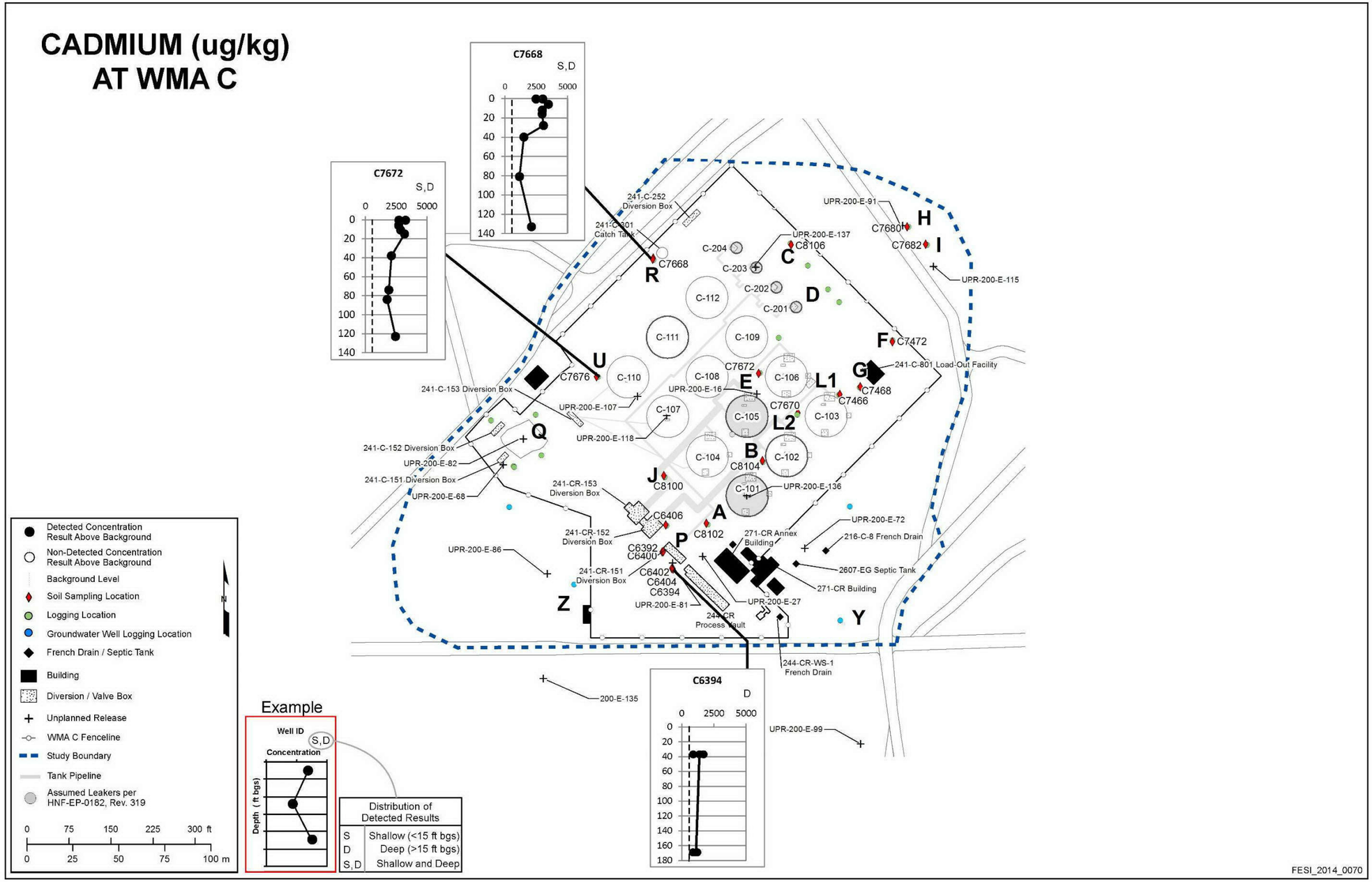

Figure Q-10. Distribution Map of Calcium at WMA C

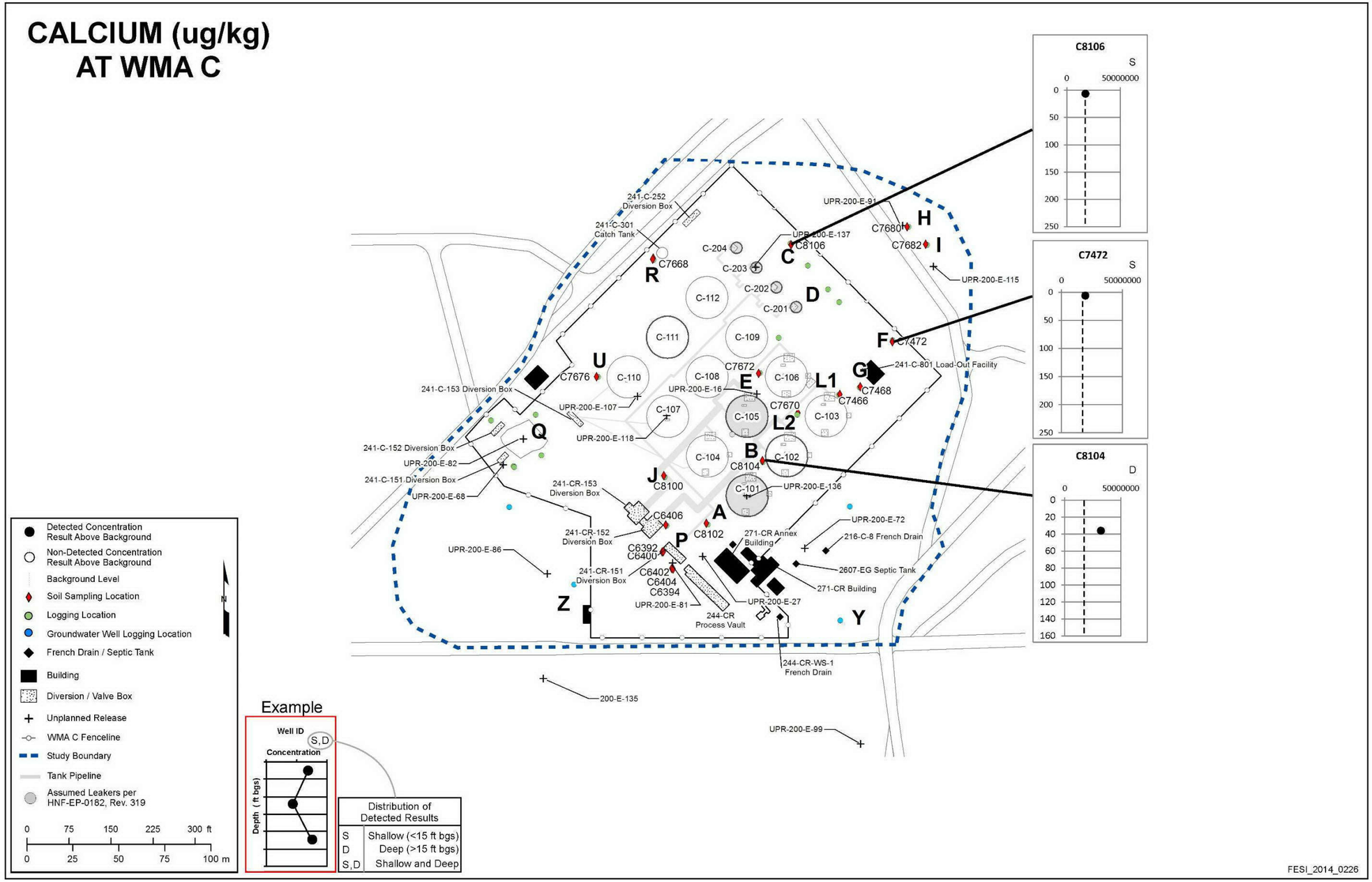

Figure Q-11. Distribution Map of Chromium at WMA C

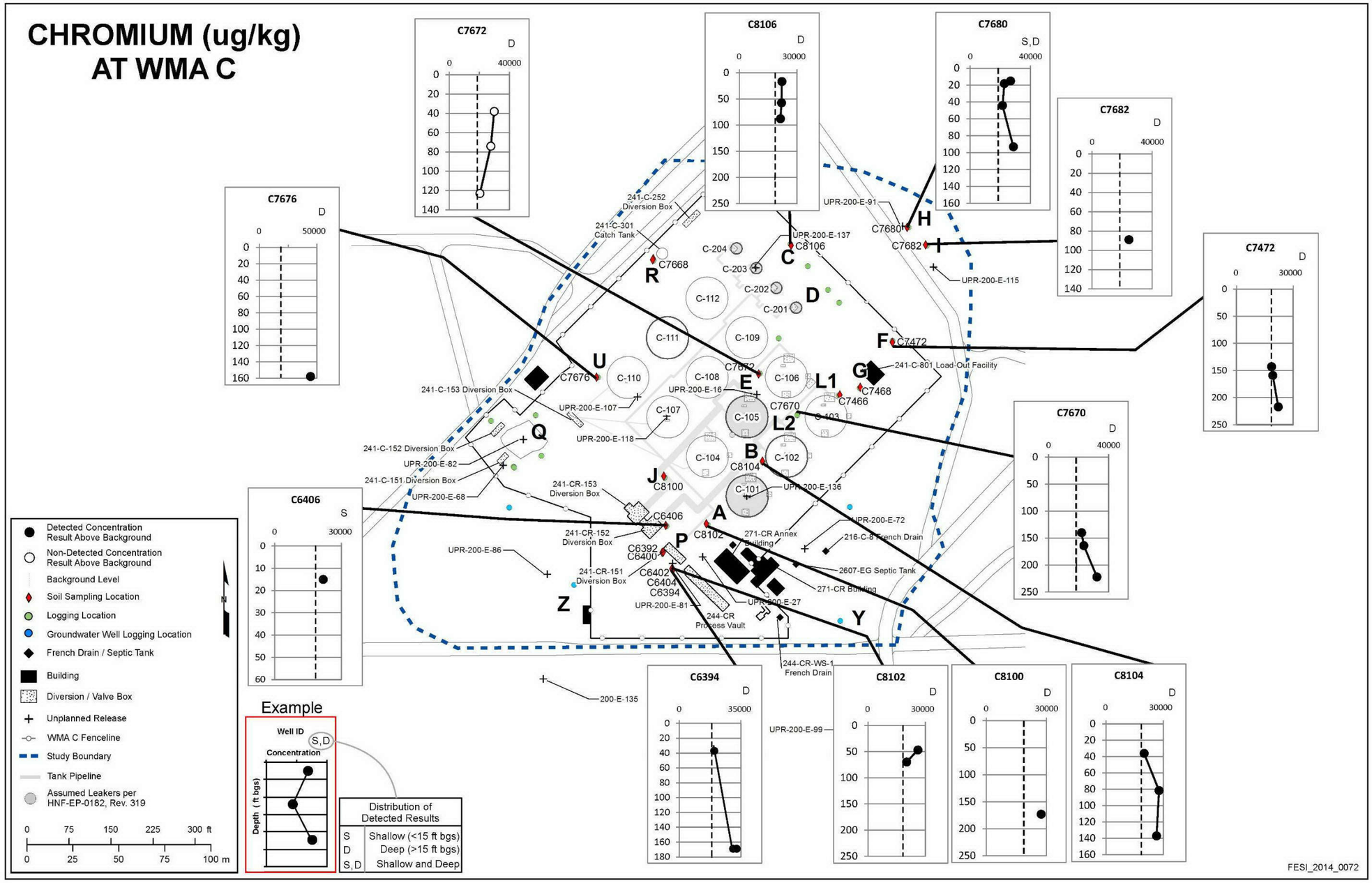

Figure Q-12. Distribution Map of Copper at WMA C

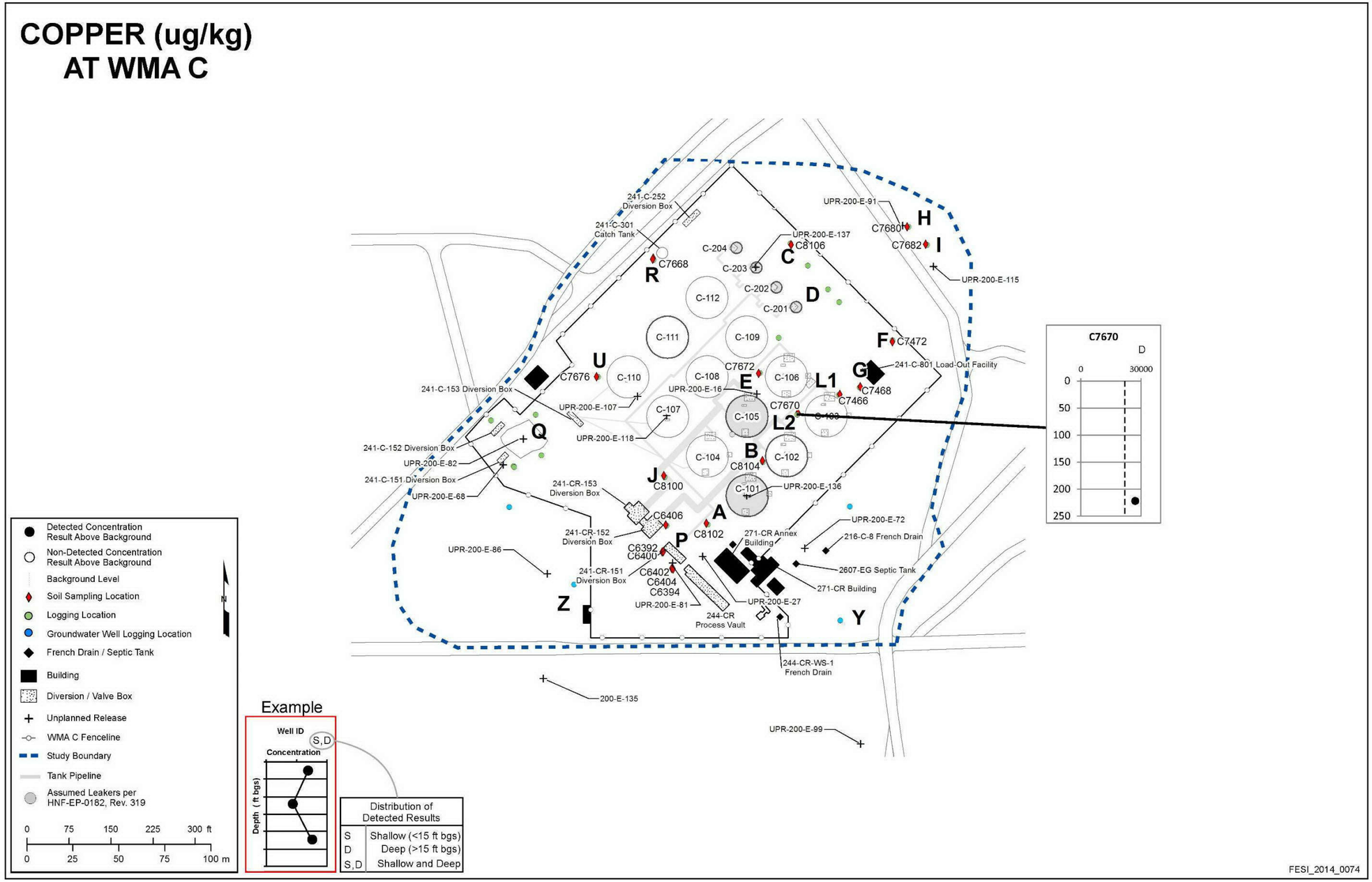

Figure Q-13. Distribution Map of Lead at WMA C

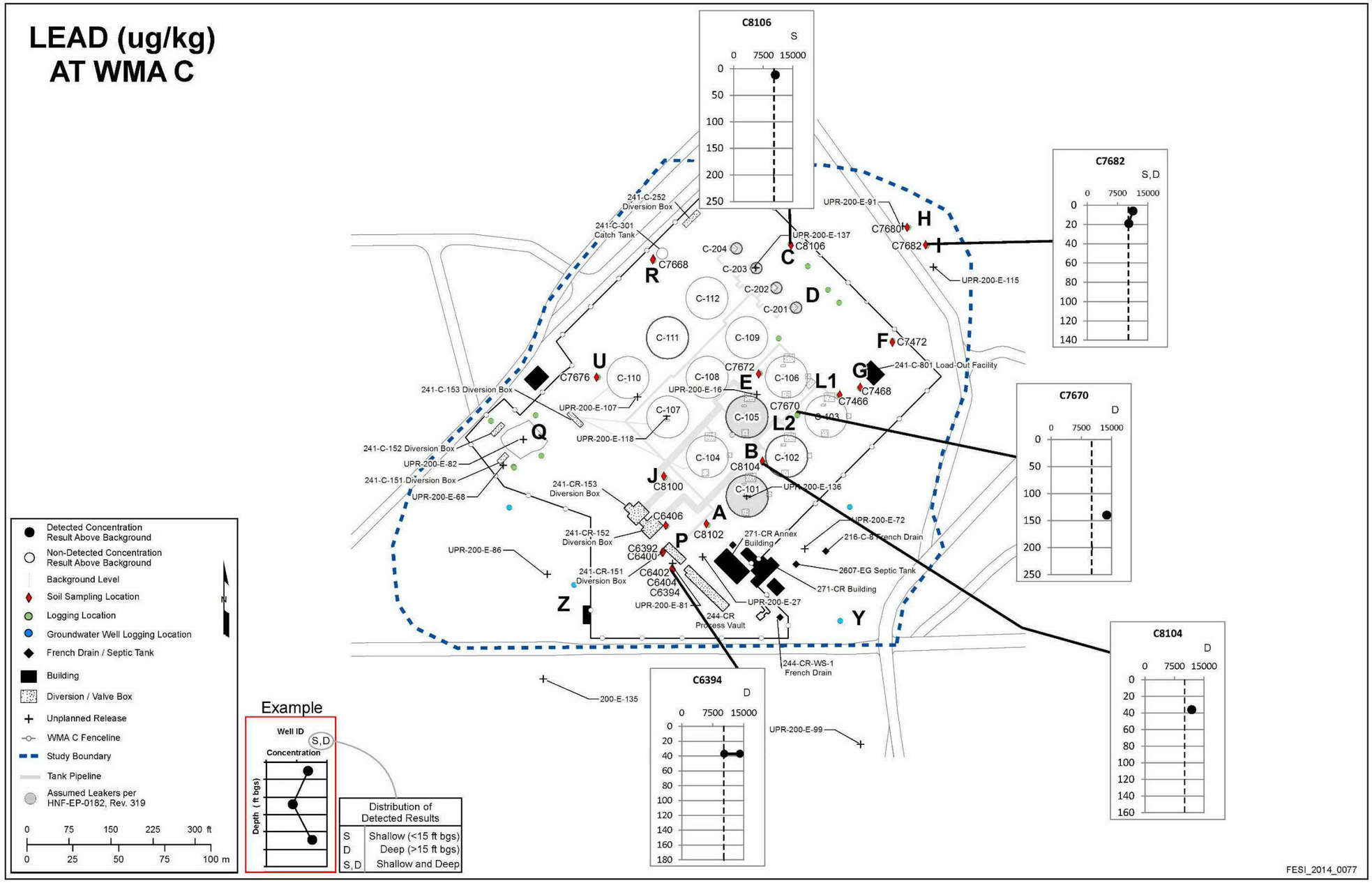

Figure Q-14. Distribution Map of Magnesium at WMA C

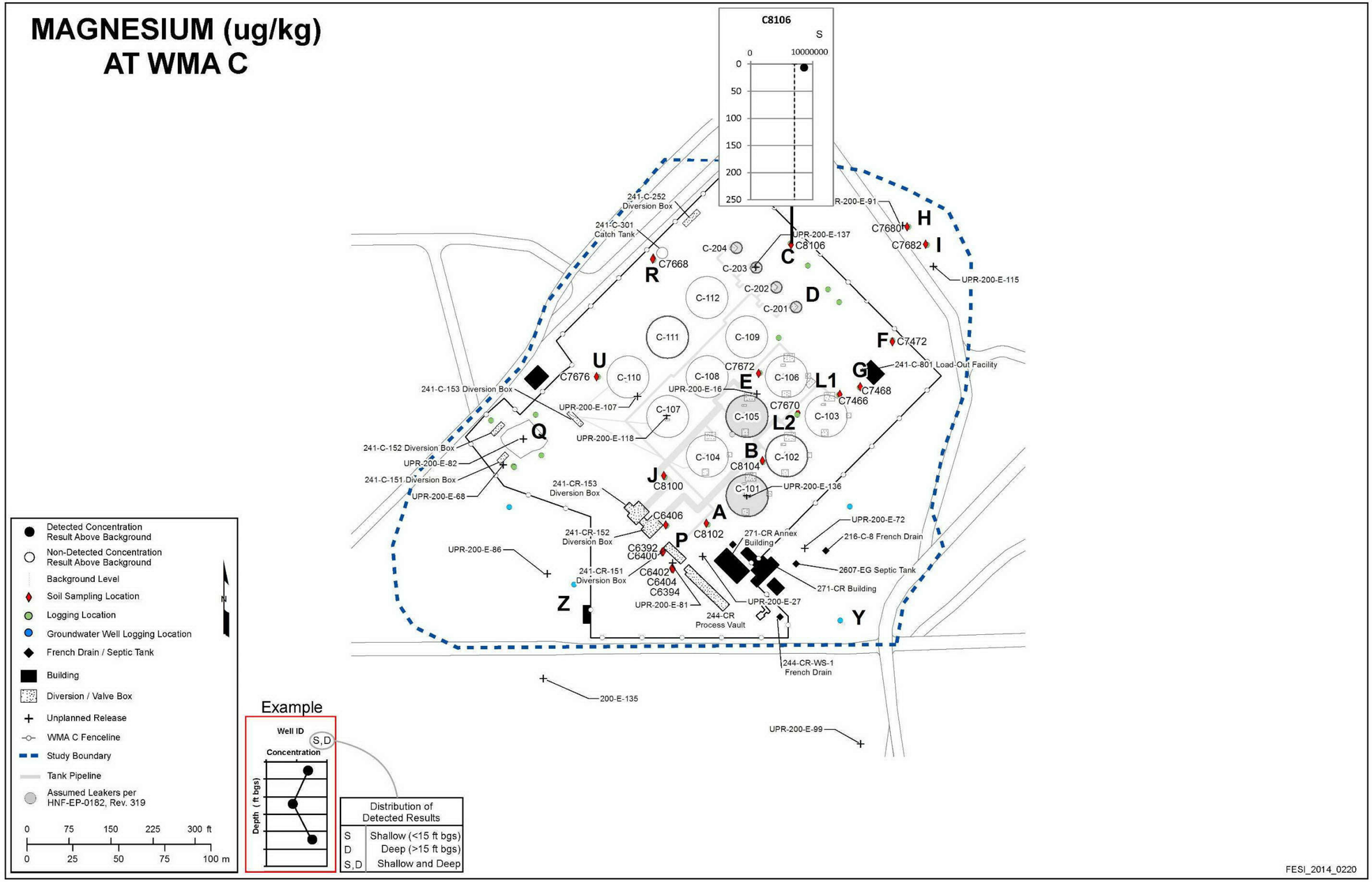

Figure Q-15. Distribution Map of Mercury at WMA C

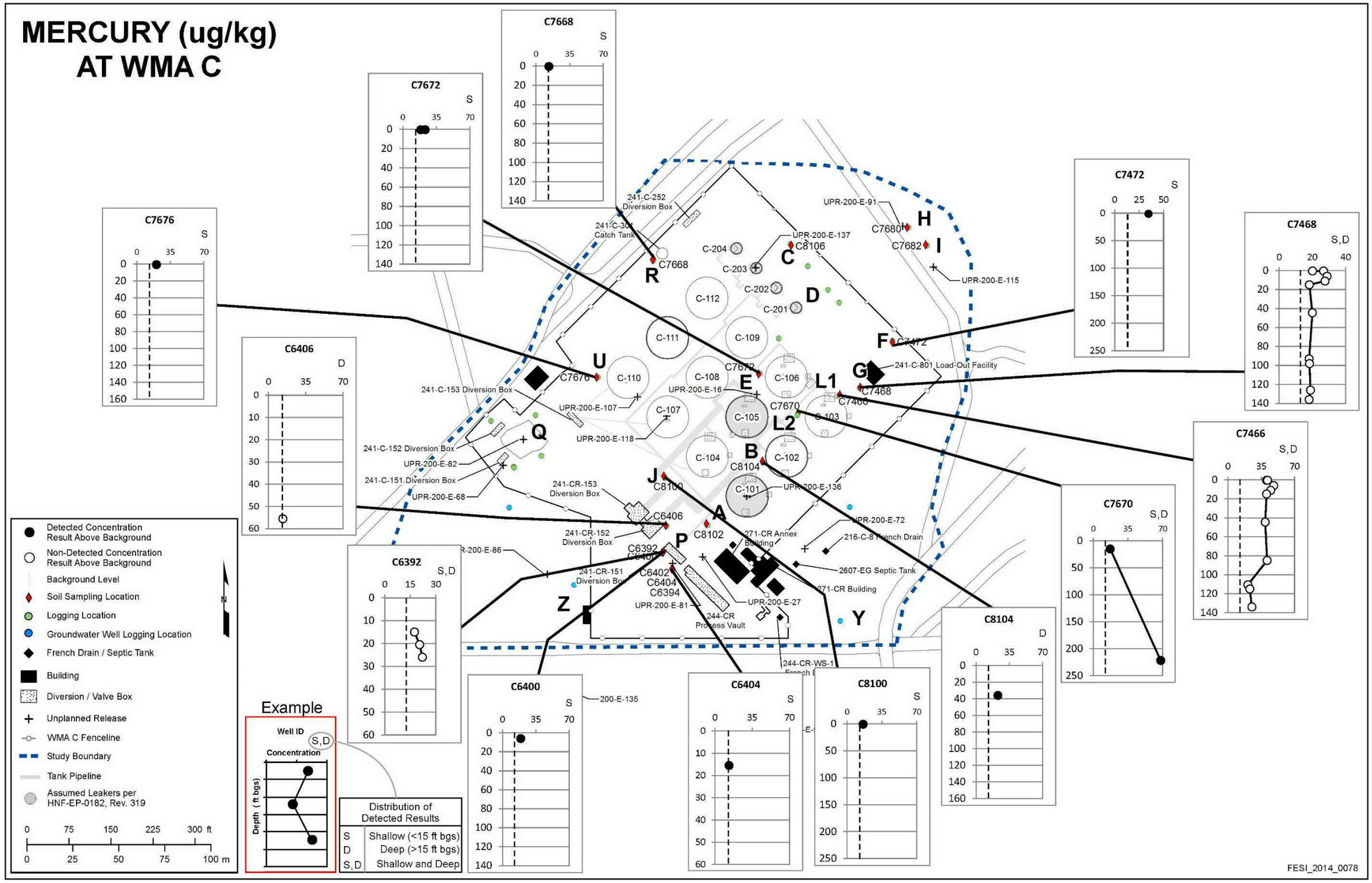

Figure Q-16. Distribution Map of Molybdenum at WMA C

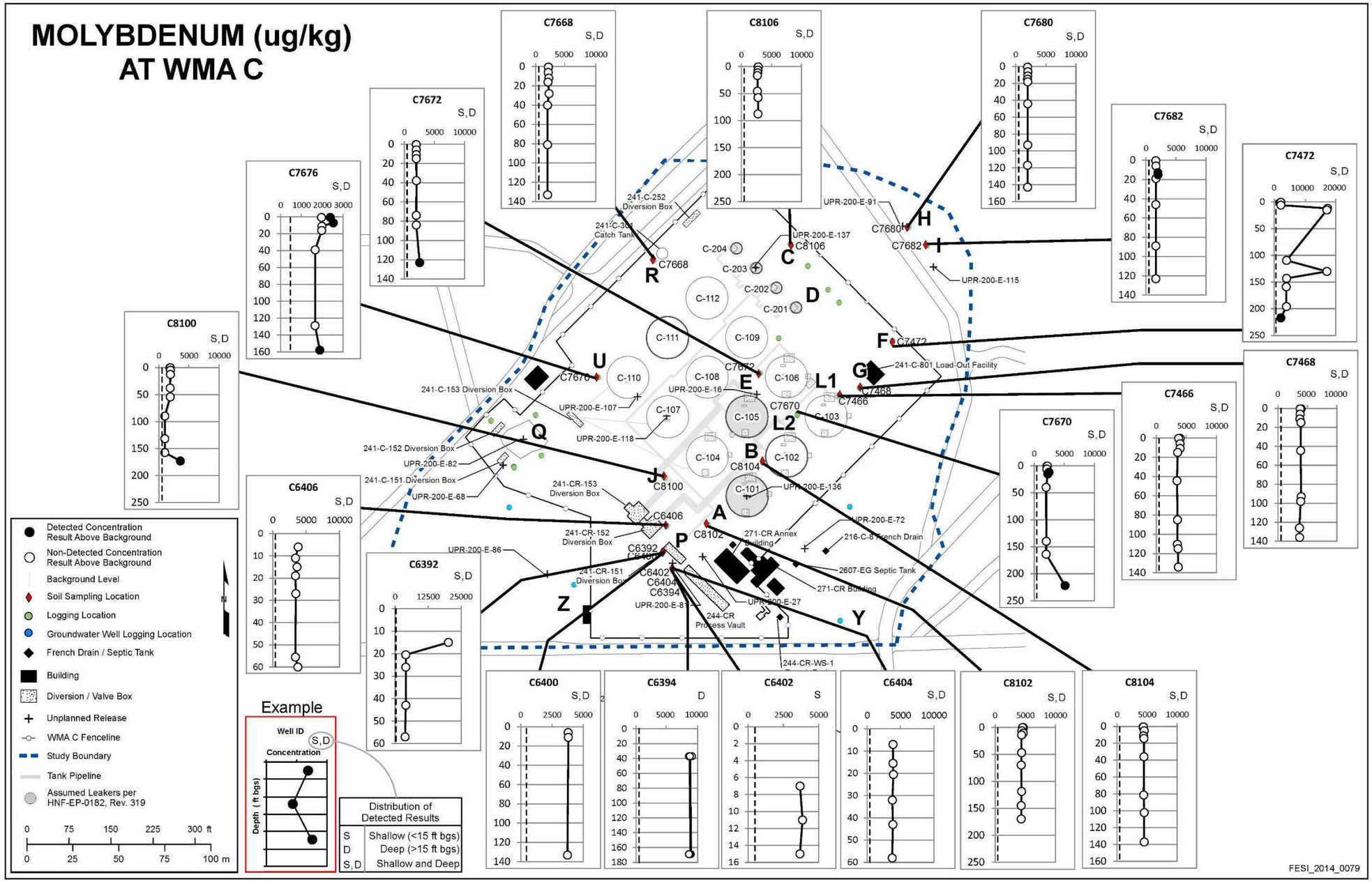

Figure Q-17. Distribution Map of Nickel at WMA C

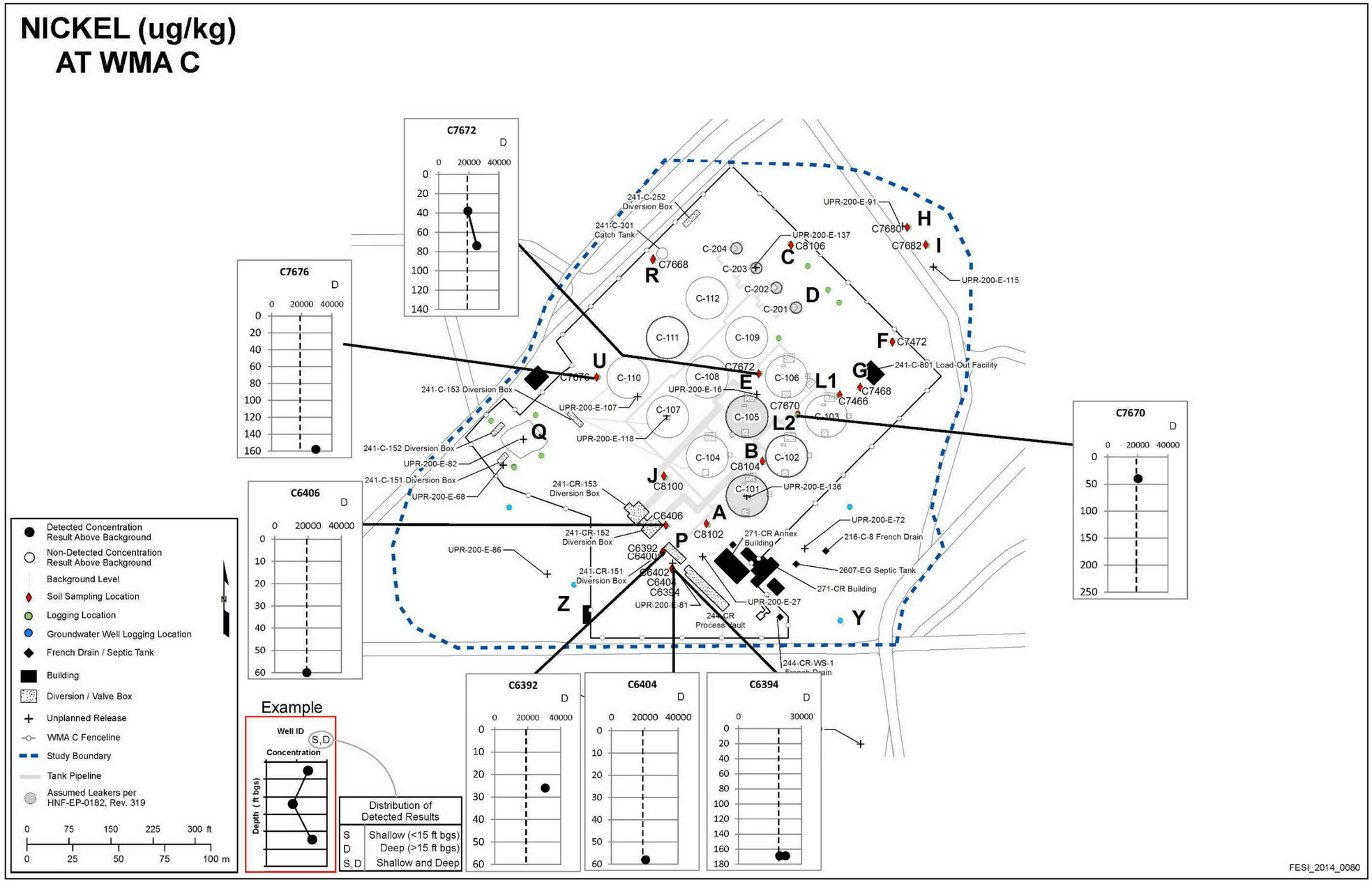

Figure Q-18. Distribution Map of Selenium at WMA C

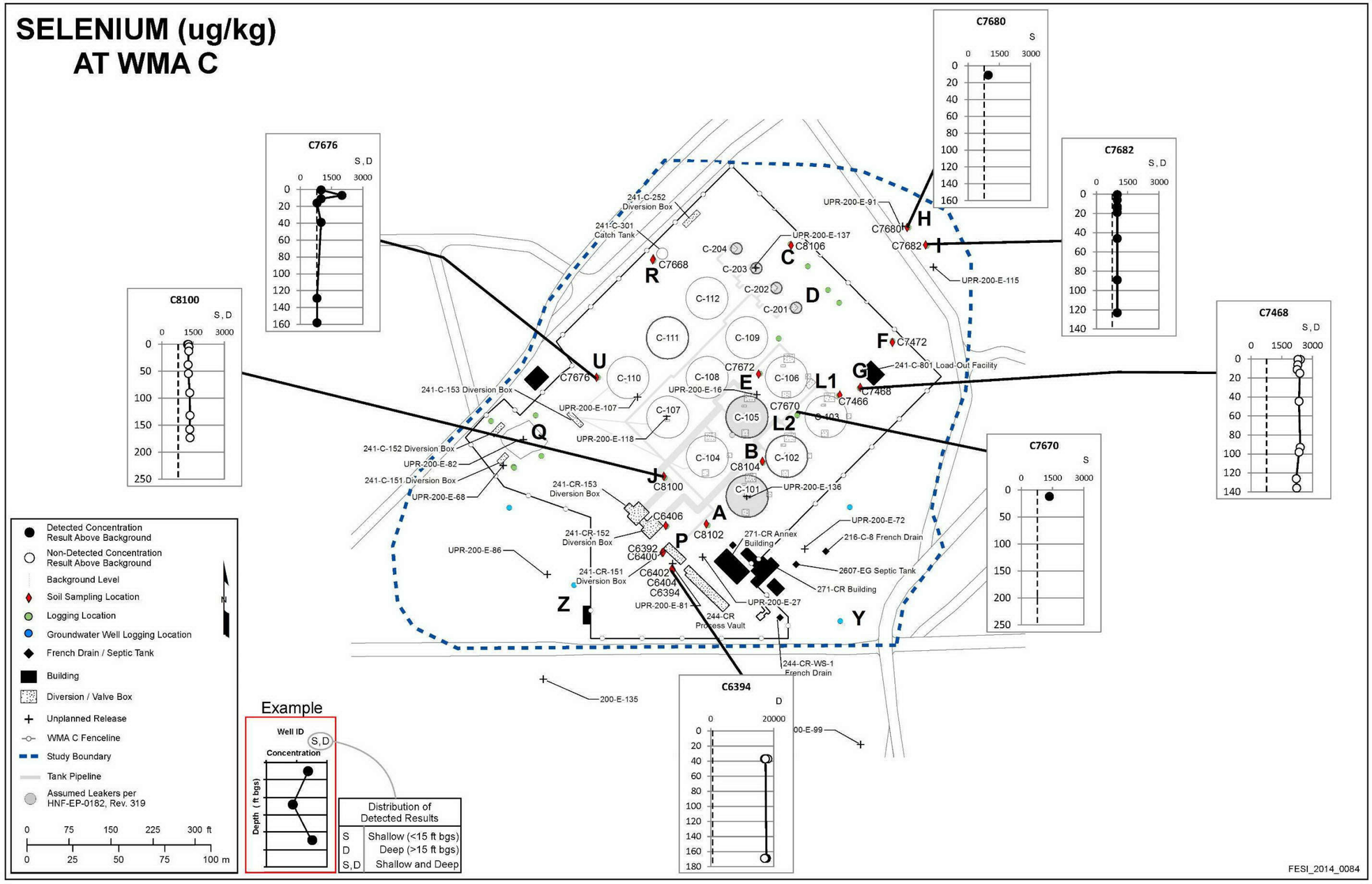

Figure Q-19. Distribution Map of Silver at WMA C

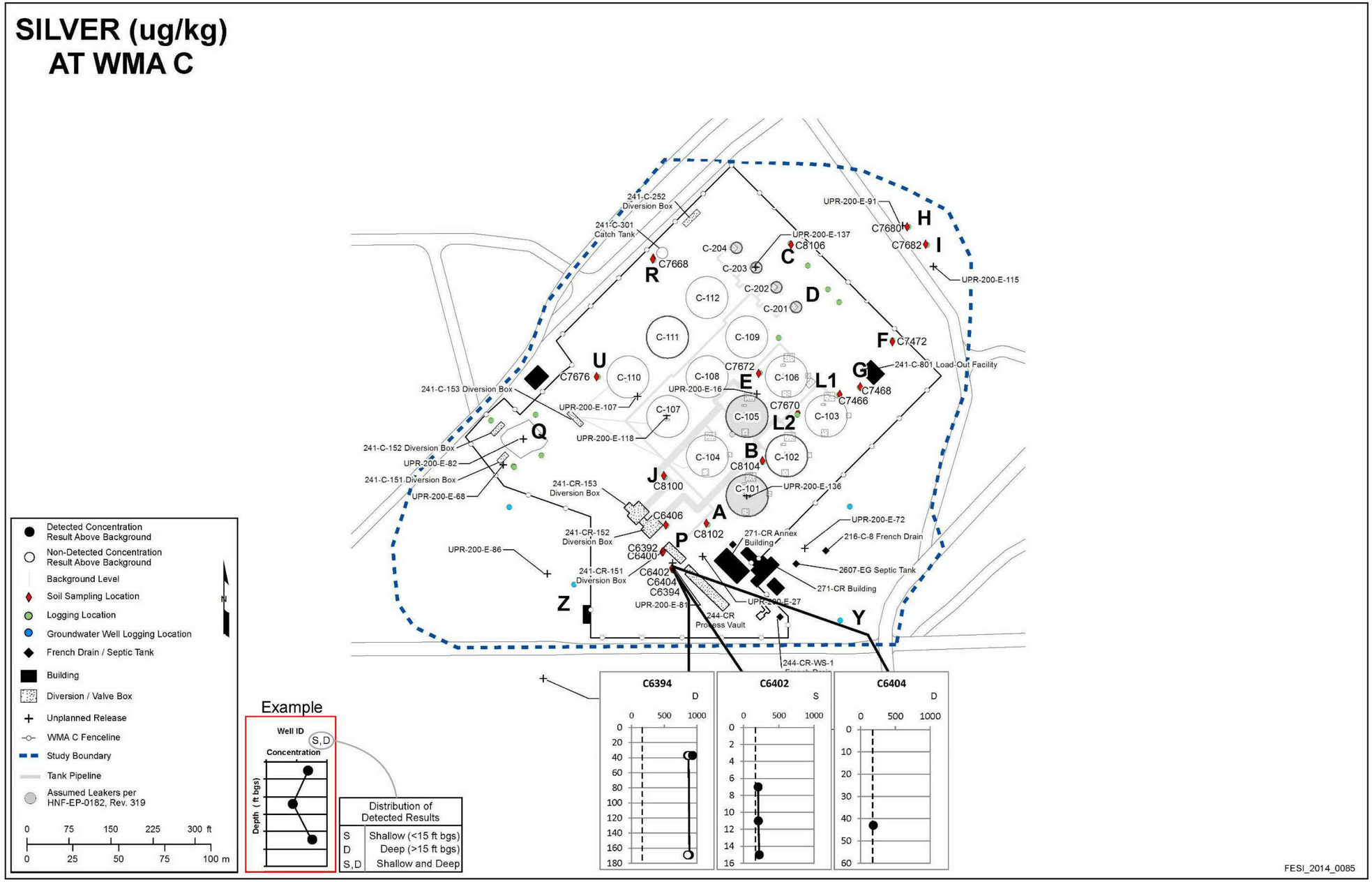

Figure Q-20. Distribution Map of Sodium at WMA C

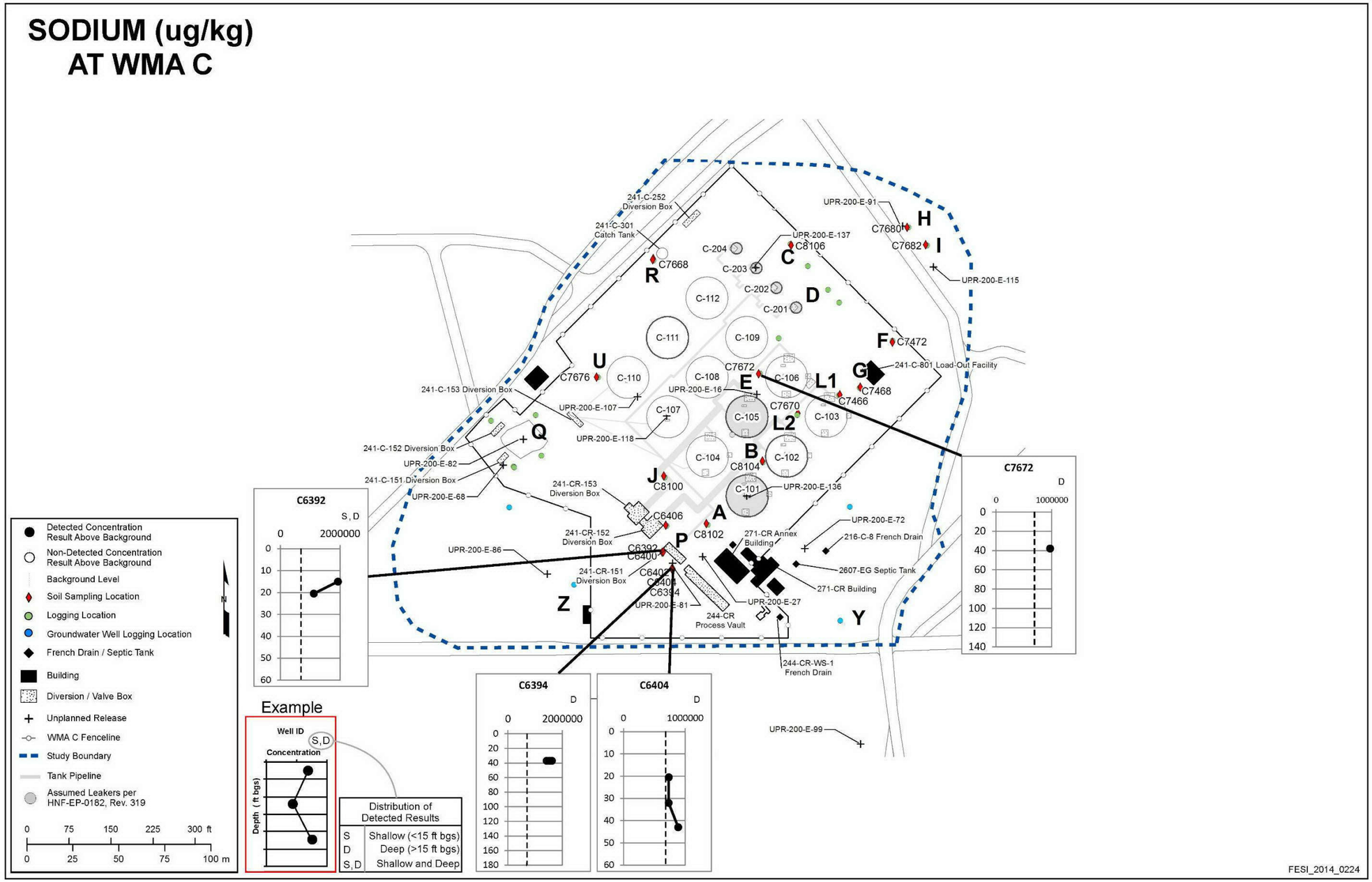

Figure Q-21. Distribution Map of Thallium at WMA C

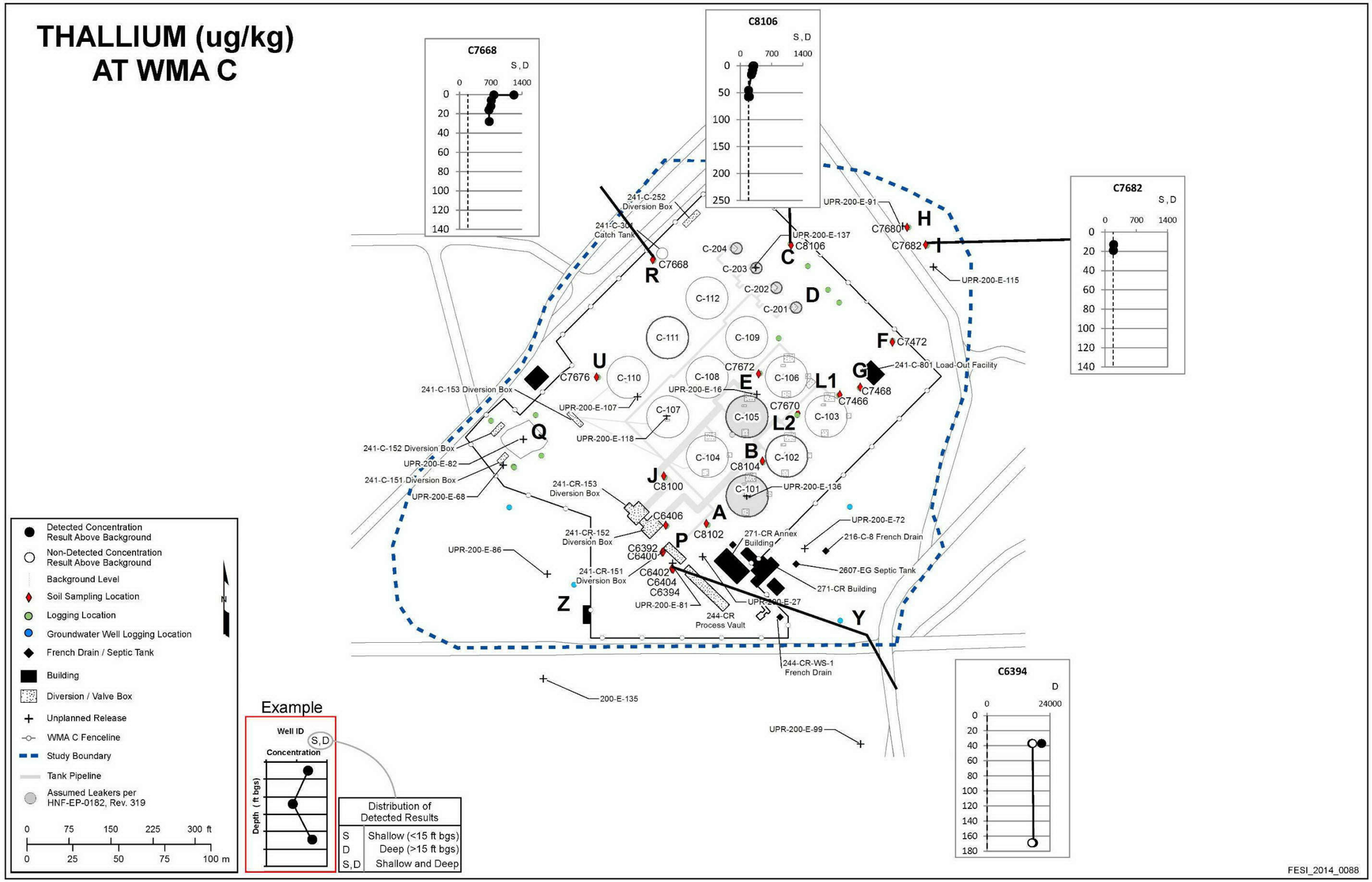

Figure Q-22. Distribution Map of Uranium at WMA C

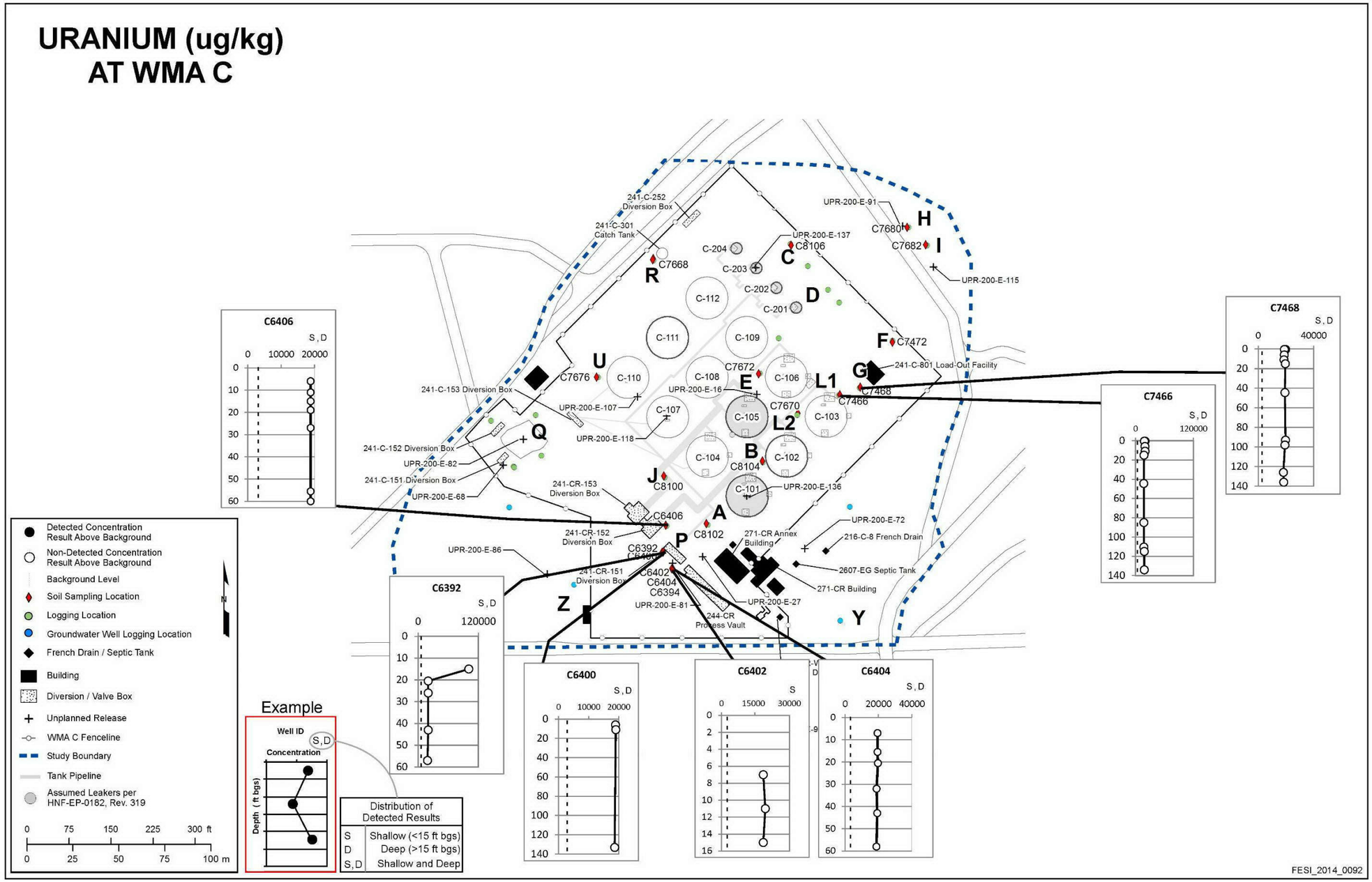

Figure Q-23. Distribution Map of Vanadium at WMA C

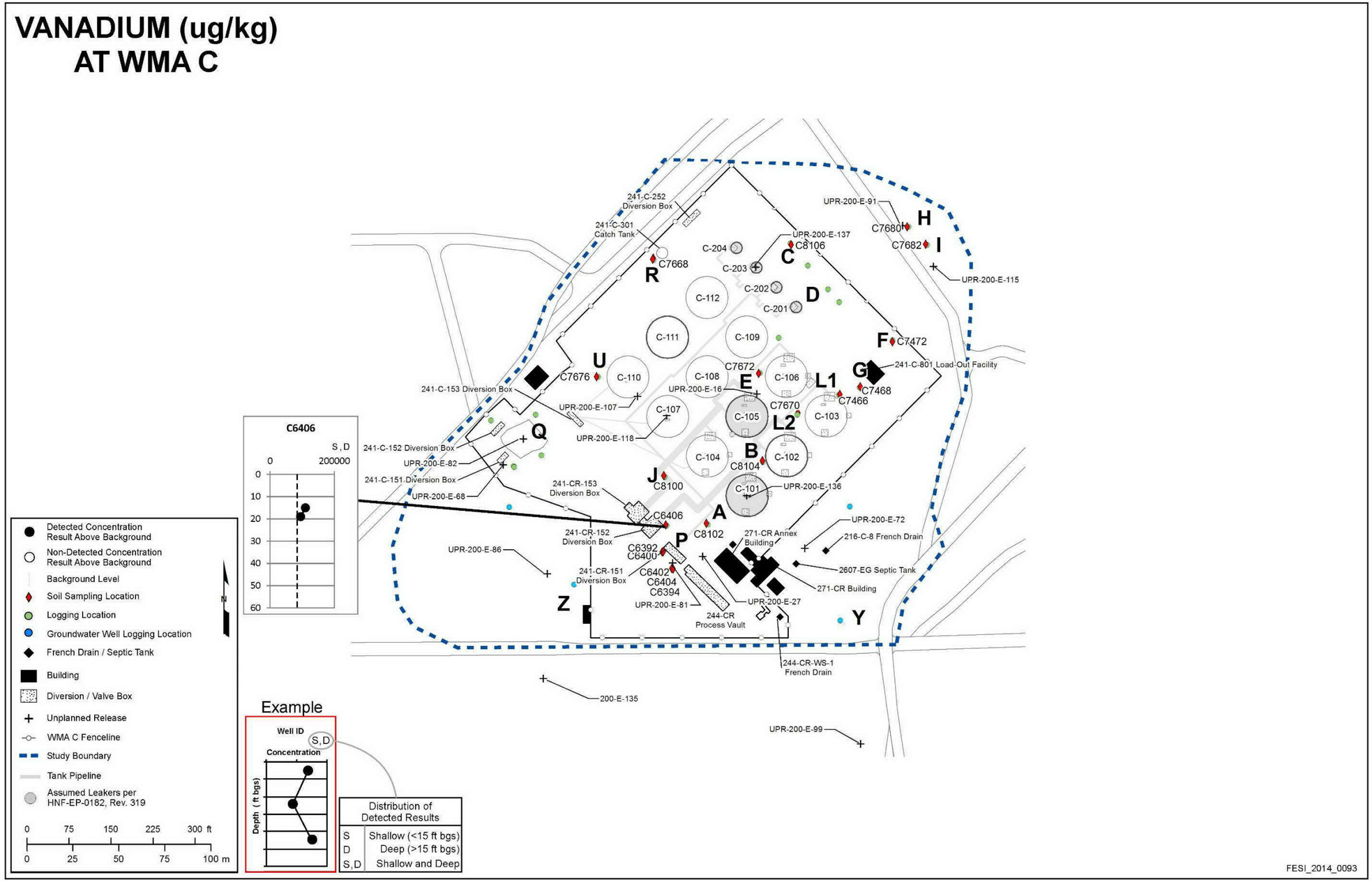

Figure Q-24. Distribution Map of Zinc at WMA C

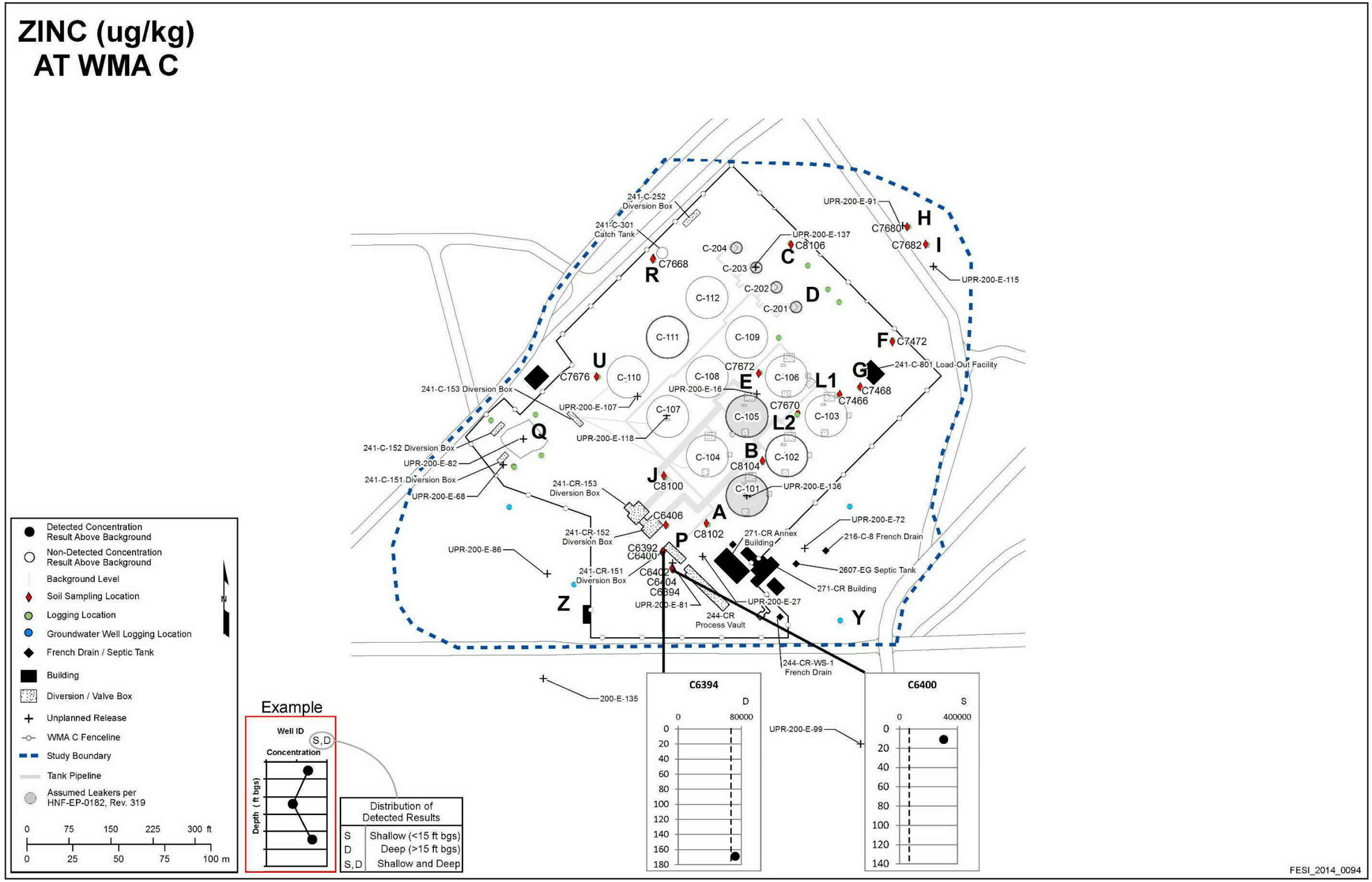

Figure Q-25. Distribution Map of Cesium-137* at WMA C

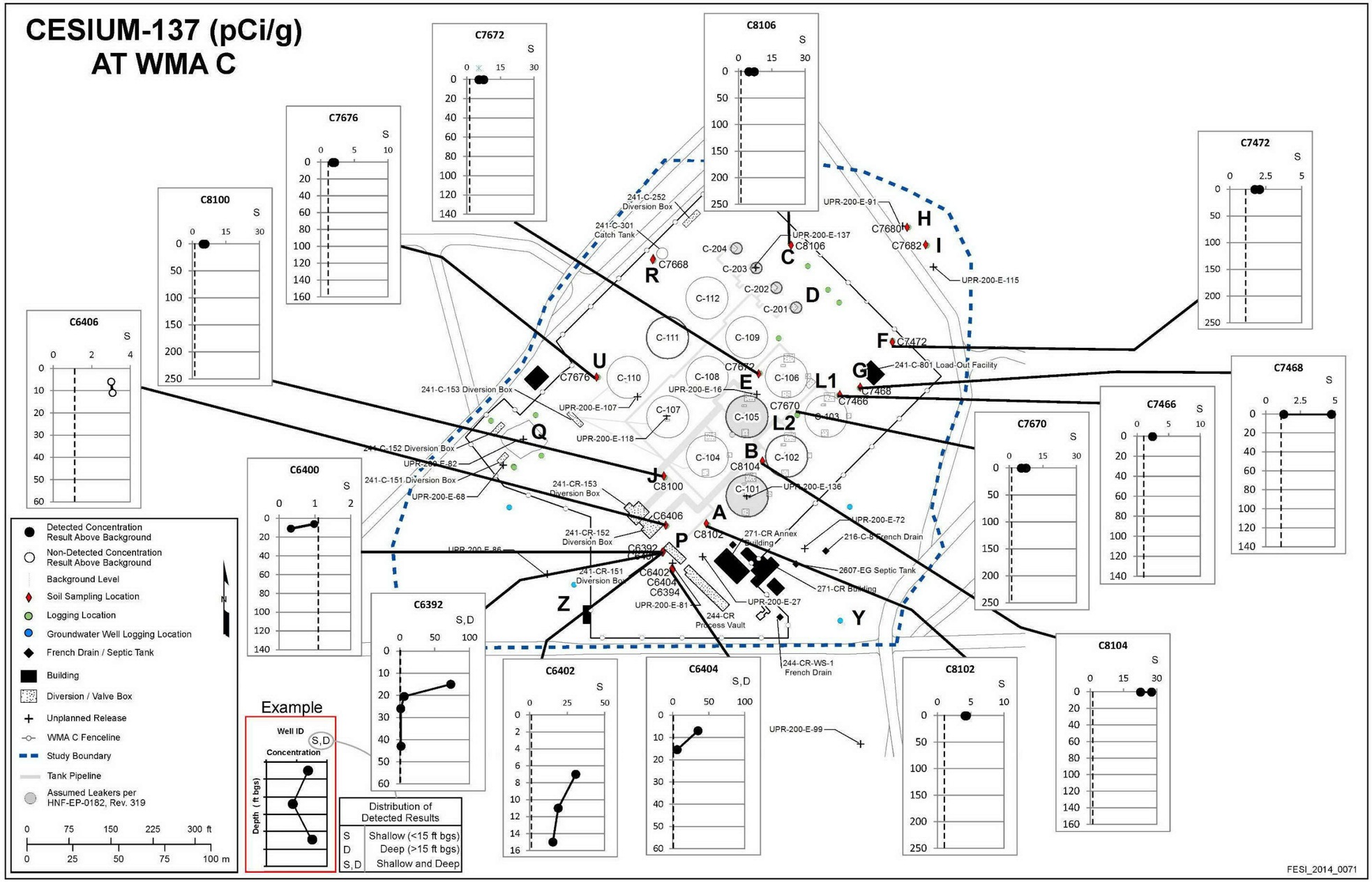

Figure Q-26. Distribution Map of Cobalt-60 at WMA C

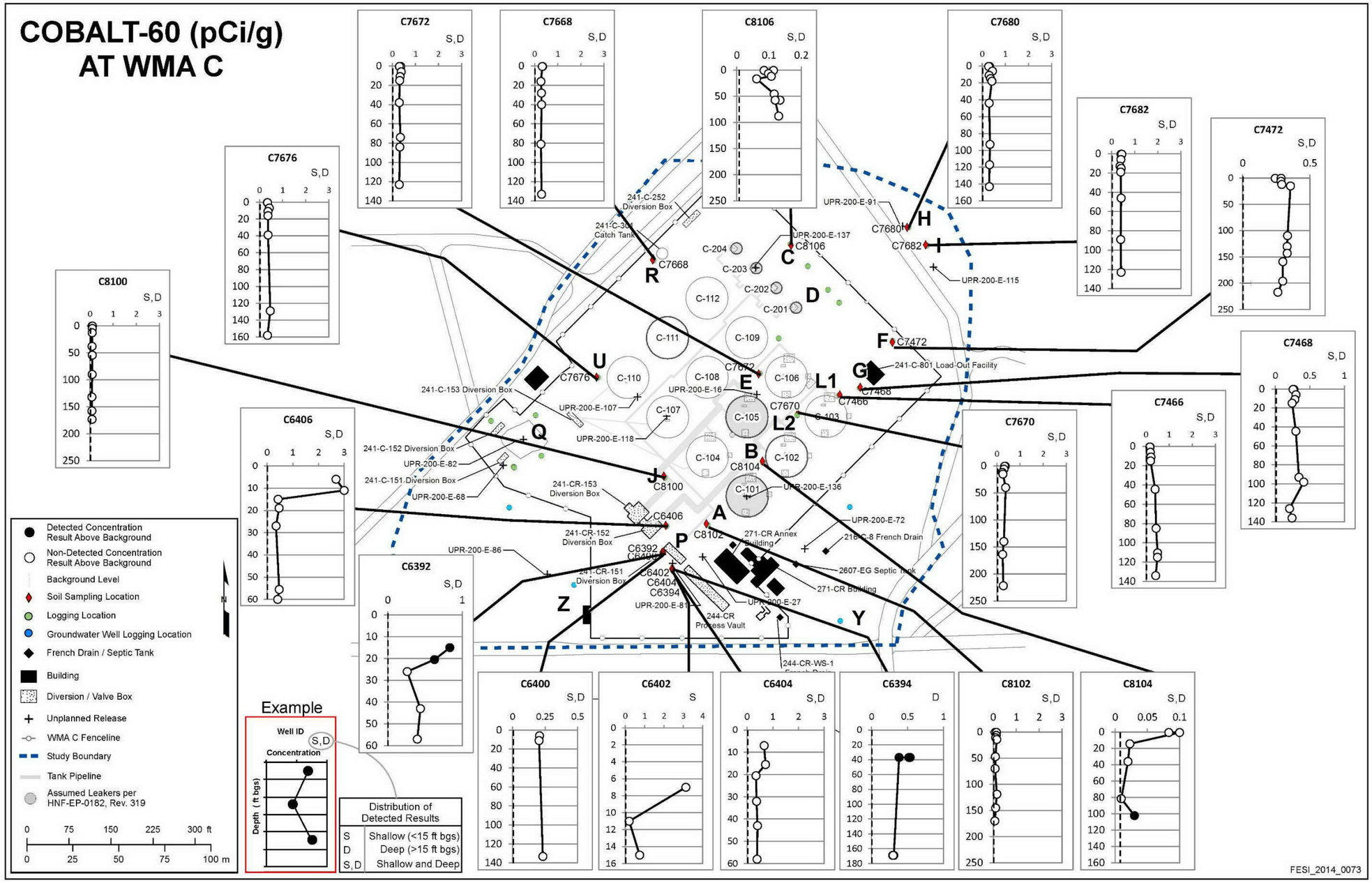

Figure Q-27. Distribution Map of Europium-154 at WMA C

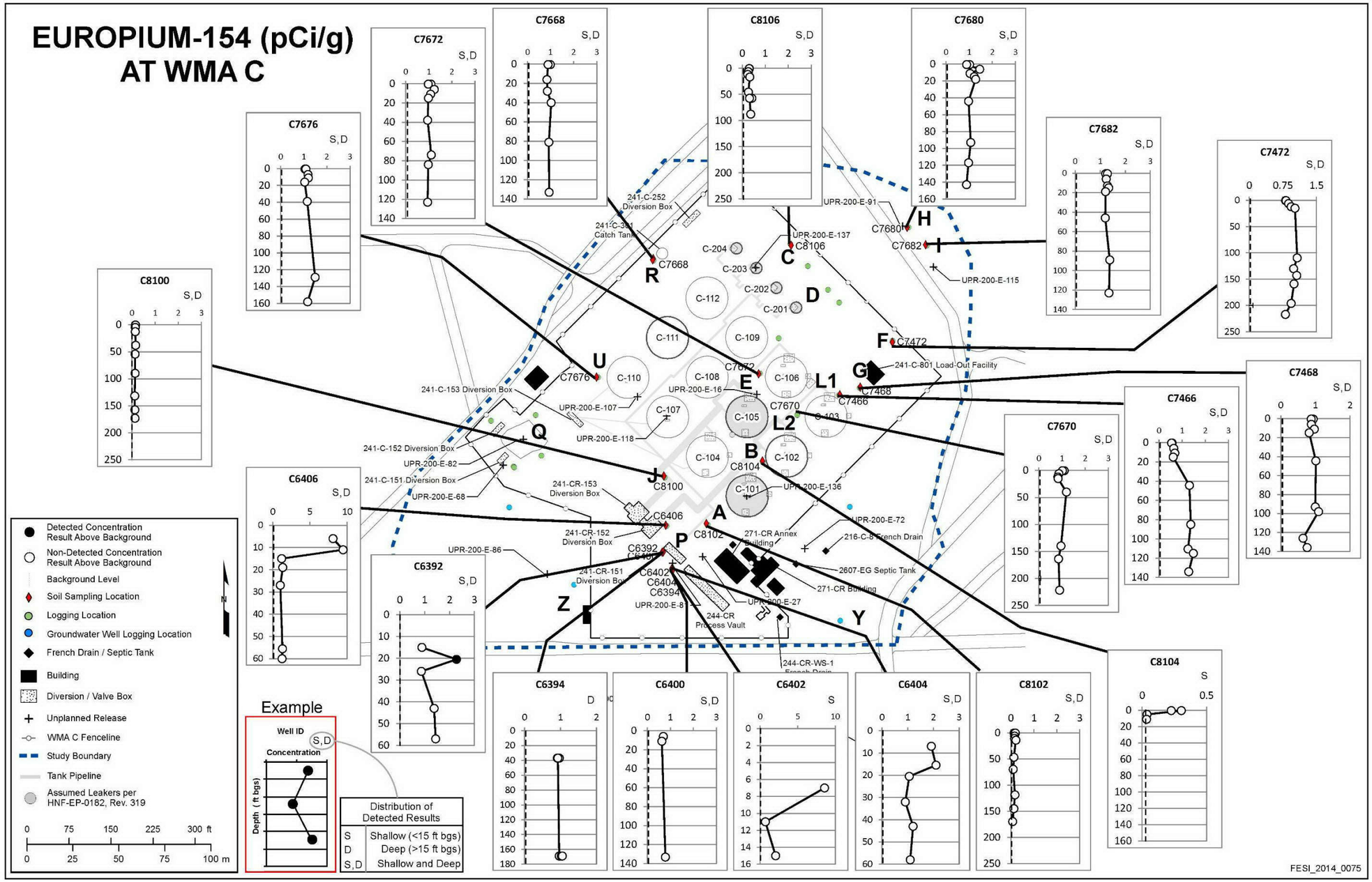

Figure Q-28. Distribution Map of Europium-155 at WMA C

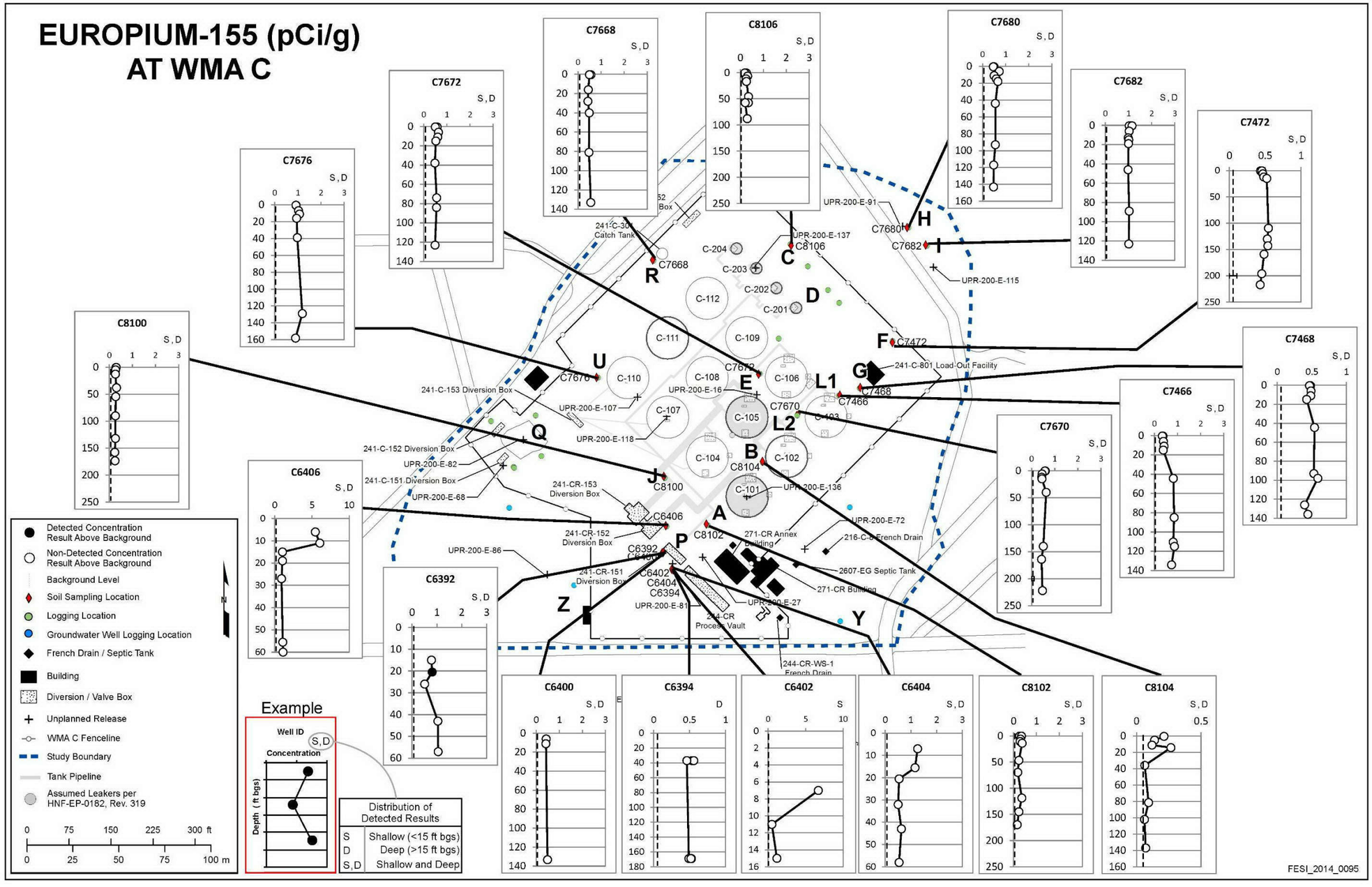

Figure Q-29. Distribution Map of Plutonium-238 at WMA C

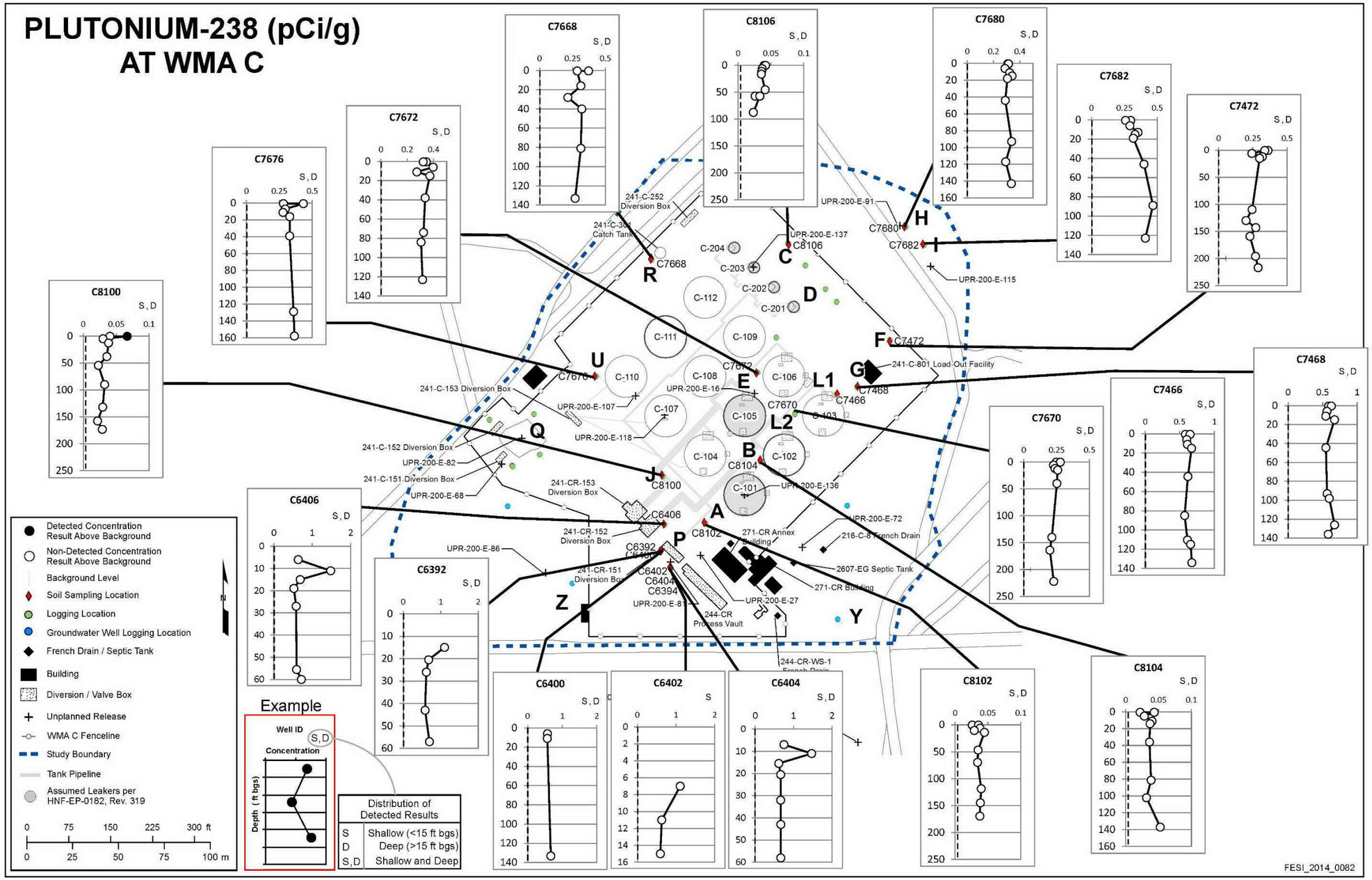

Figure Q-30. Distribution Map of Plutonium-239/240 at WMA C

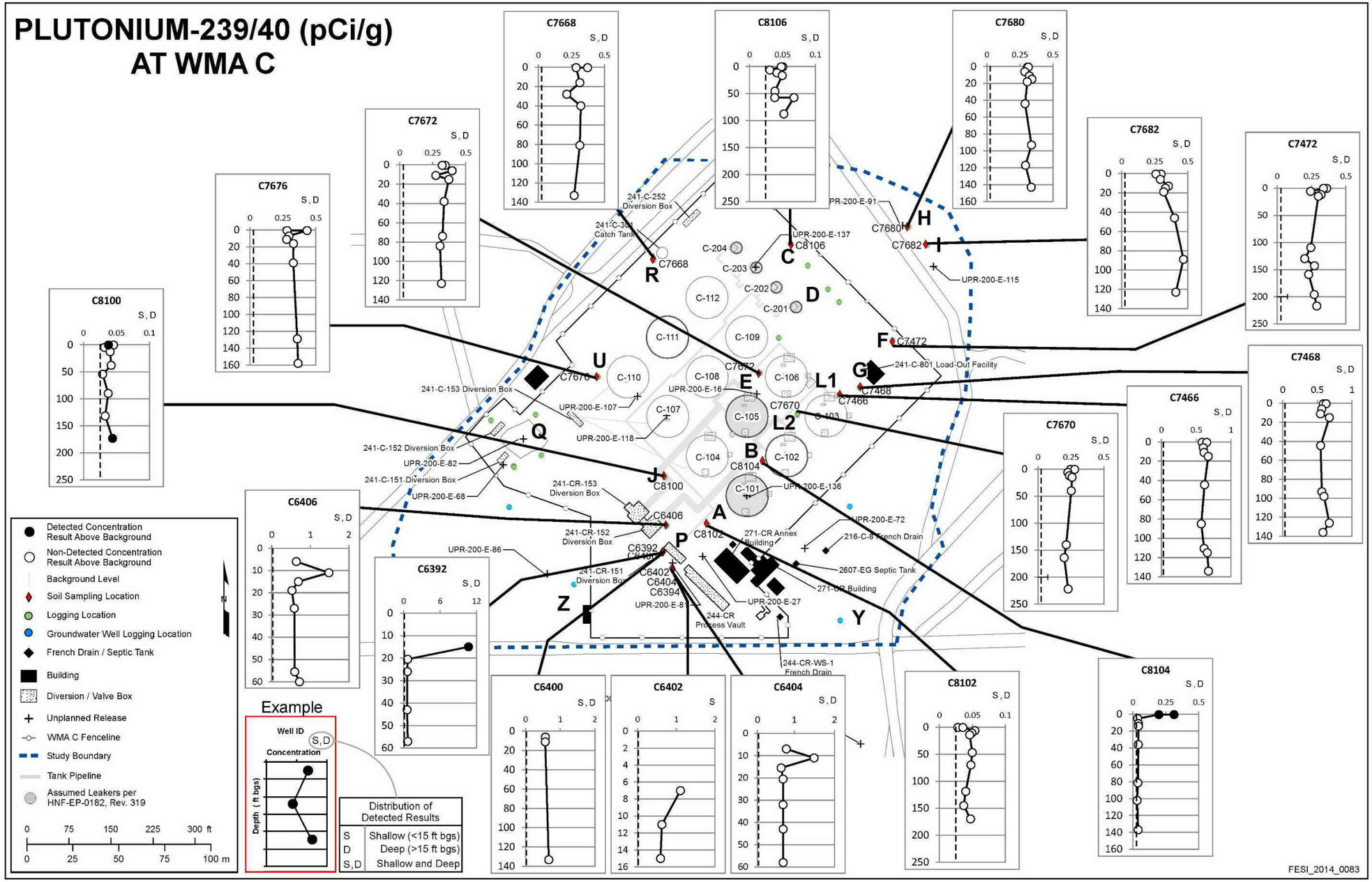

Figure Q-31. Distribution Map of Plutonium-241 at WMA C

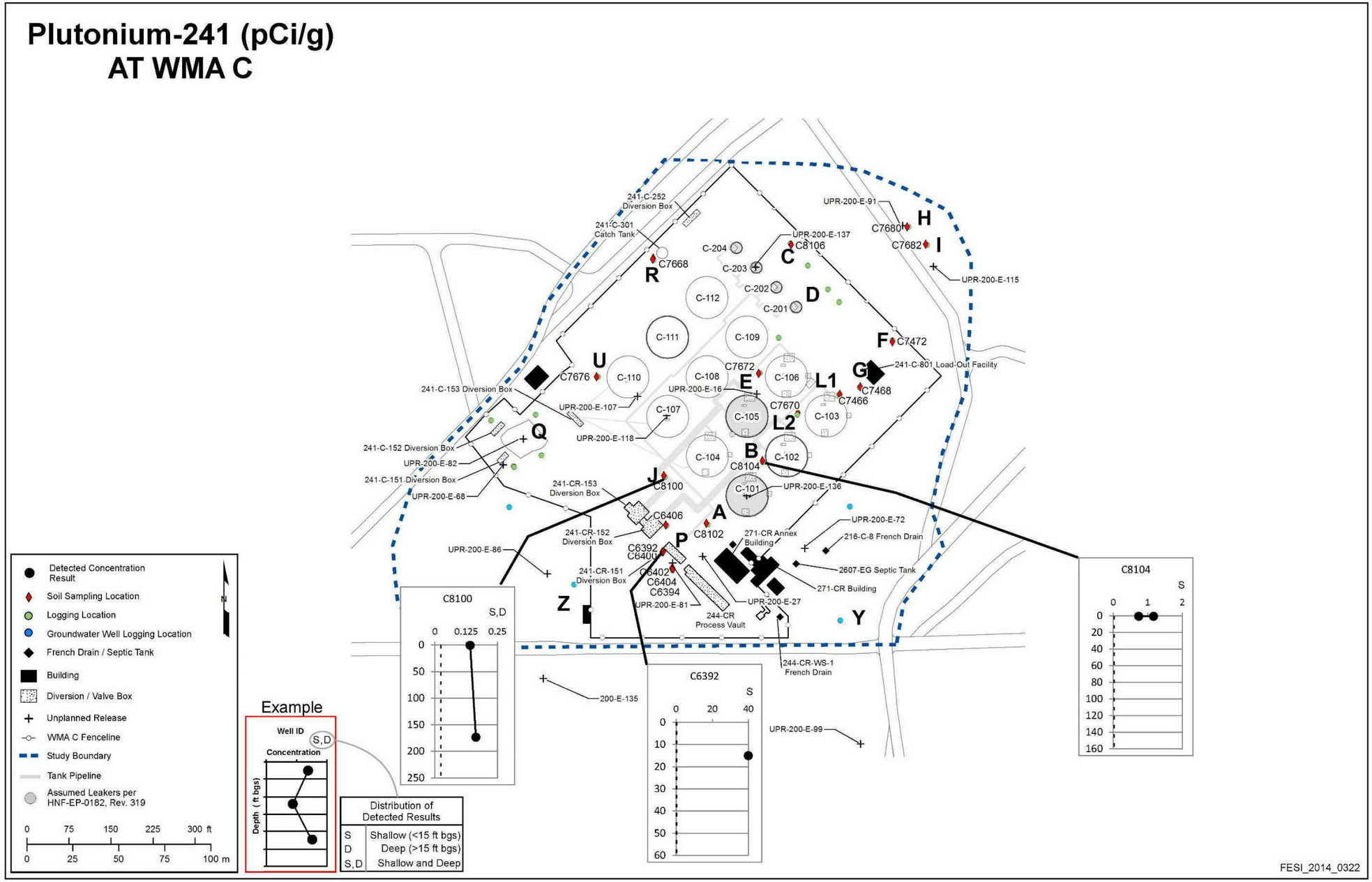

Figure Q-32. Distribution Map of Potassium-40 at WMA C

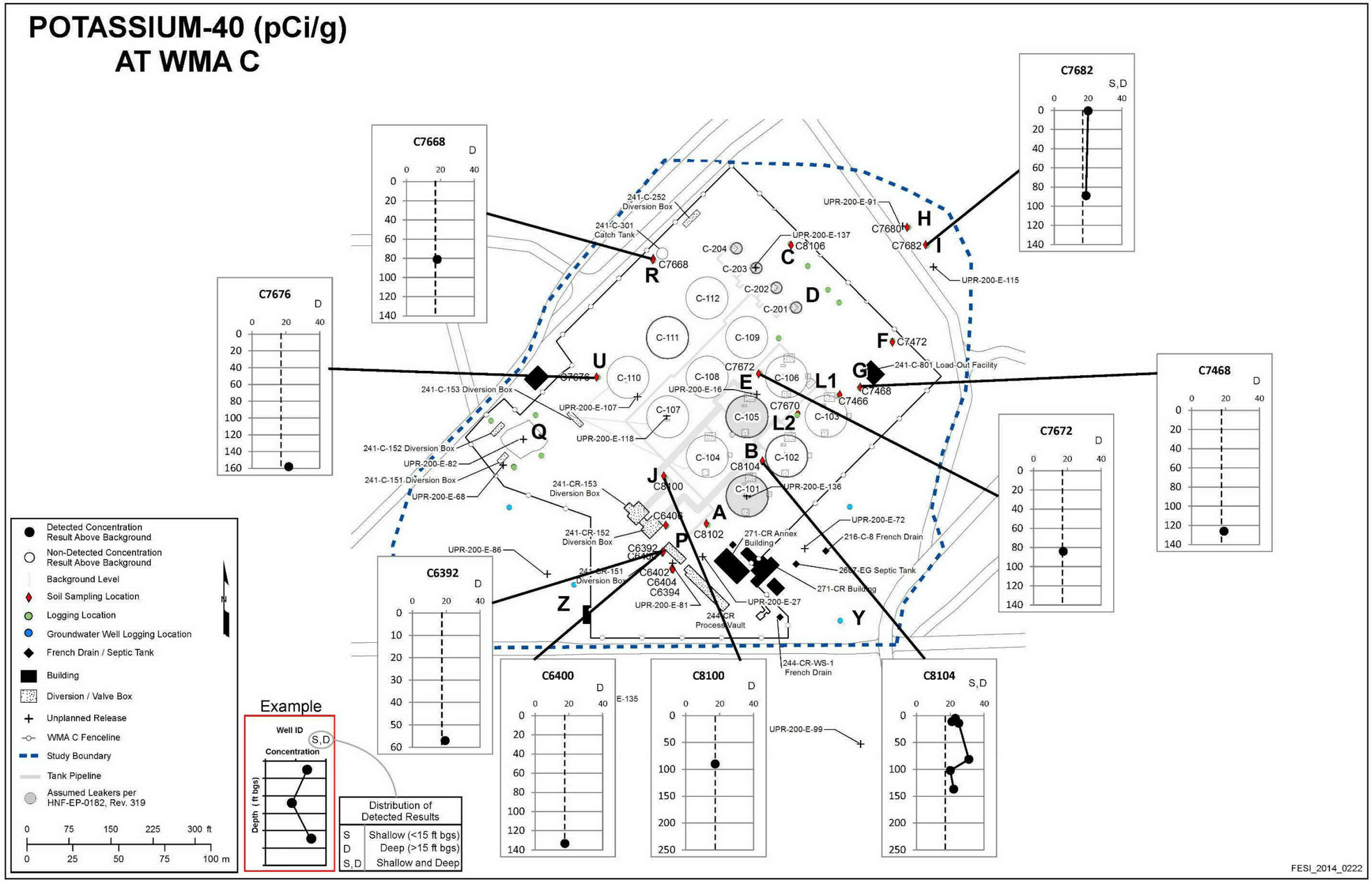

Figure Q-33. Distribution Map of Radium-226 at WMA C

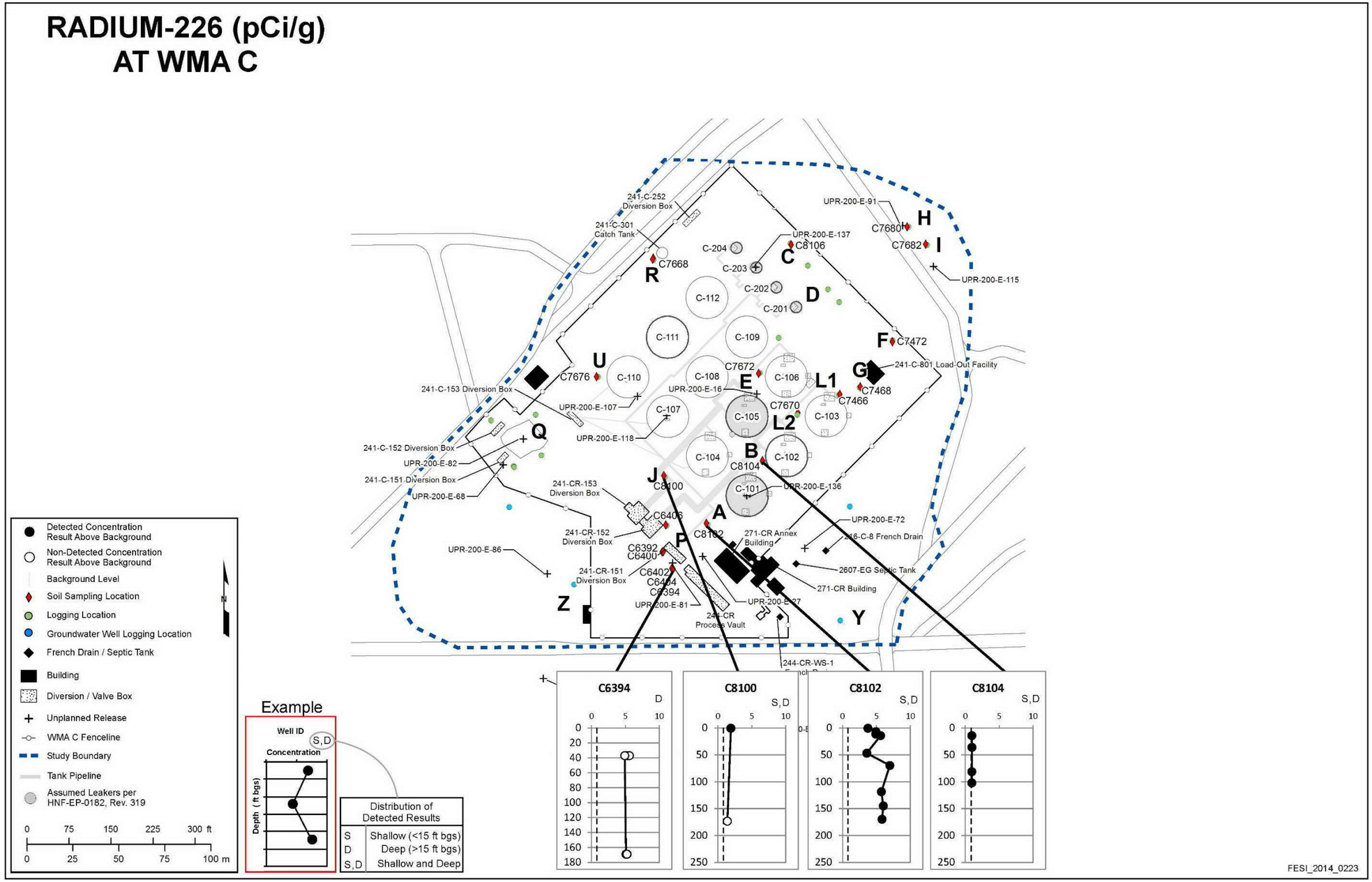

Figure Q-34. Distribution Map of Strontium-90* at WMA C

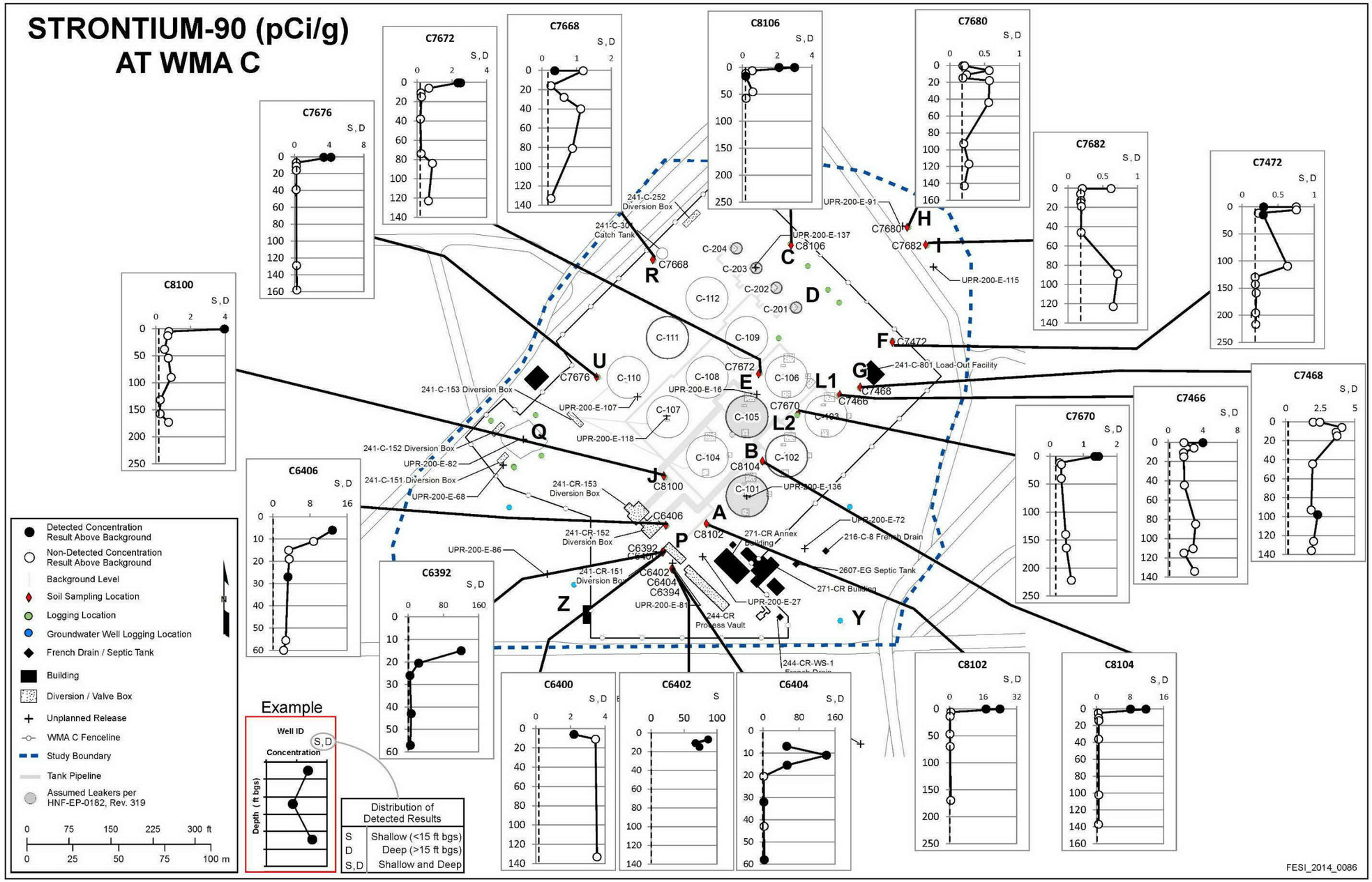

Figure Q-35. Distribution Map of Thorium-232 at WMA C

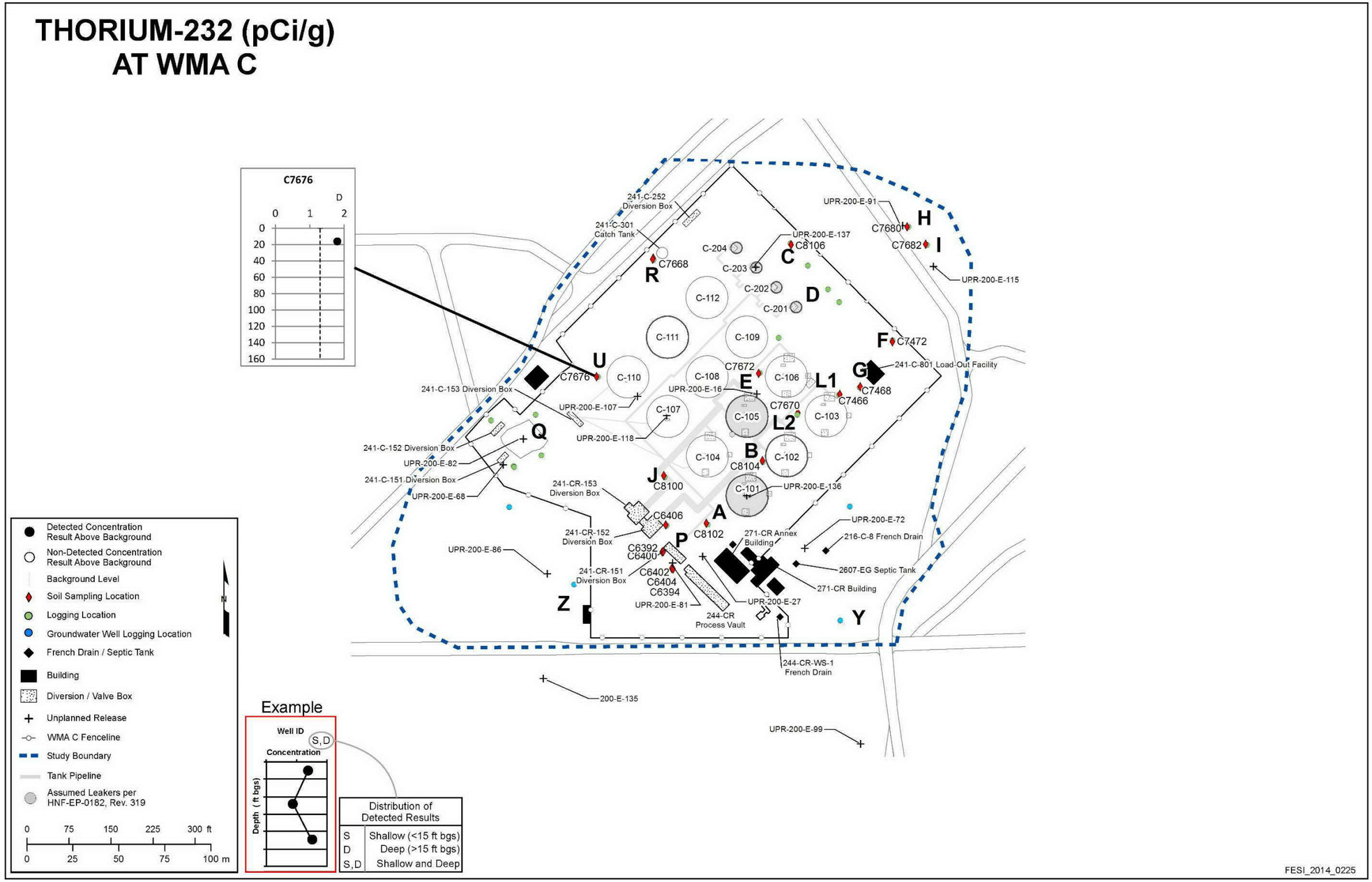

Figure Q-36. Distribution Map of Uranium-234 at WMA C

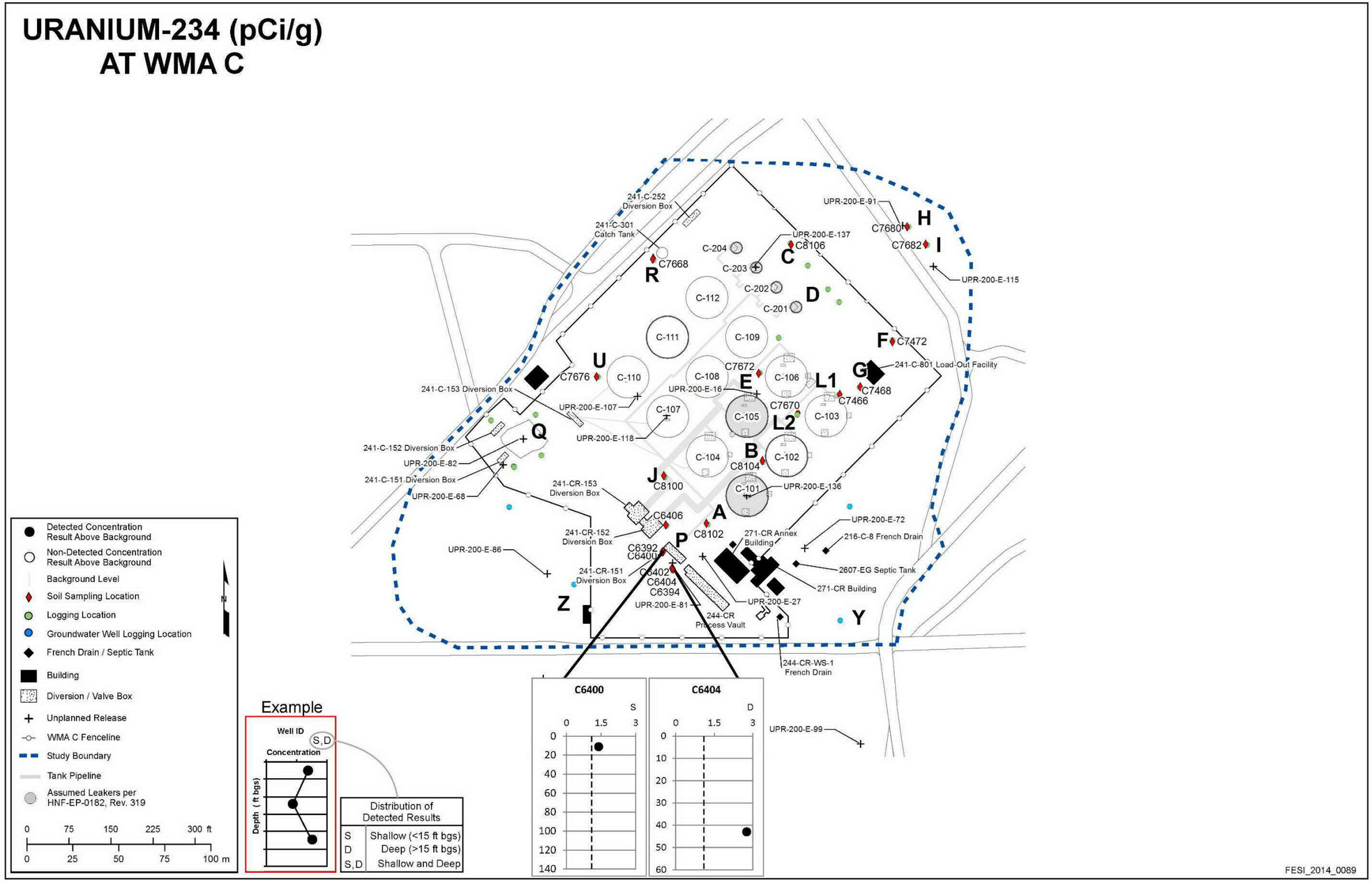

Figure Q-37. Distribution Map of Uranium-235 at WMA C

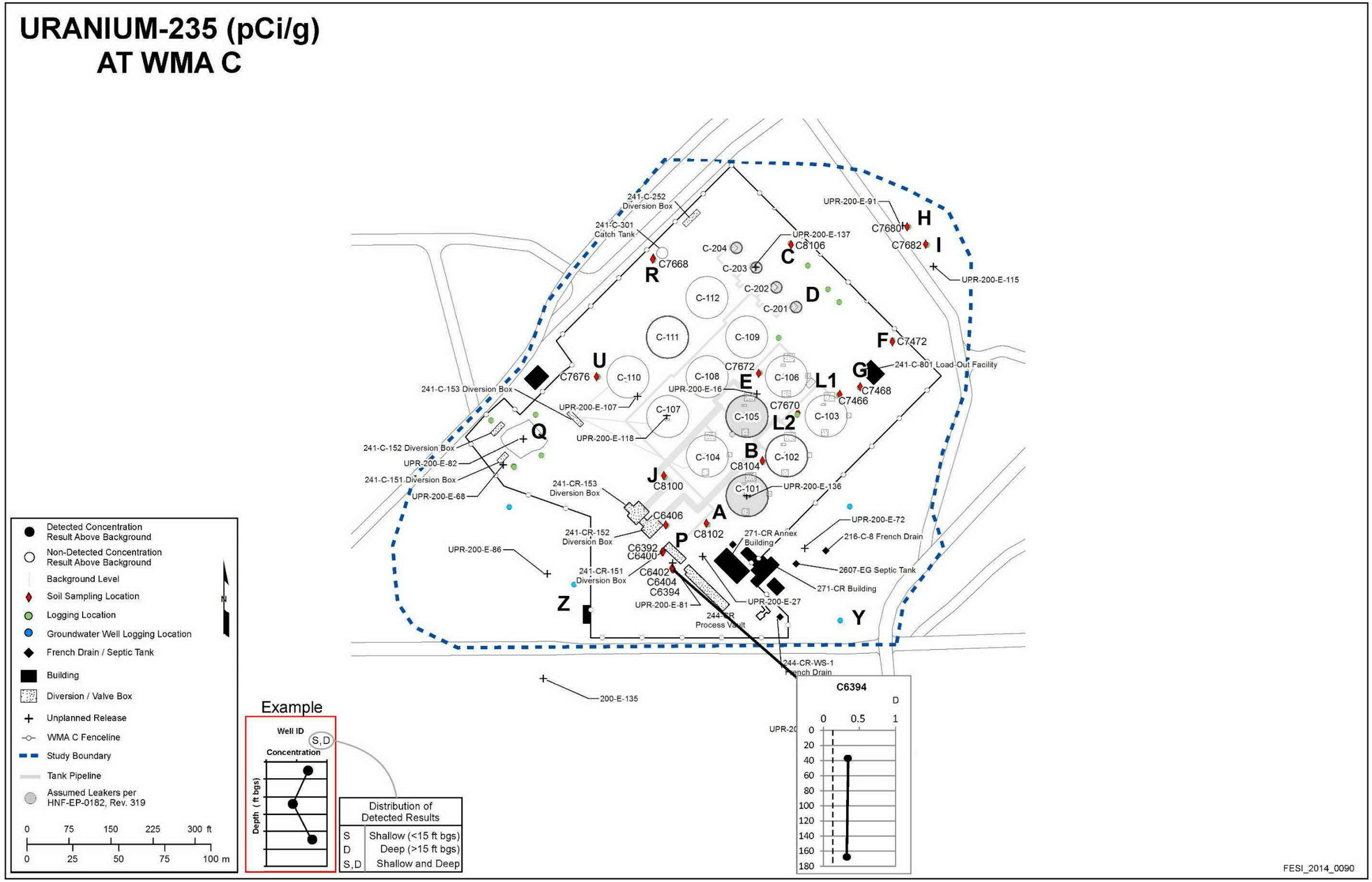

Figure Q-38. Distribution Map of Uranium-238 at WMA C

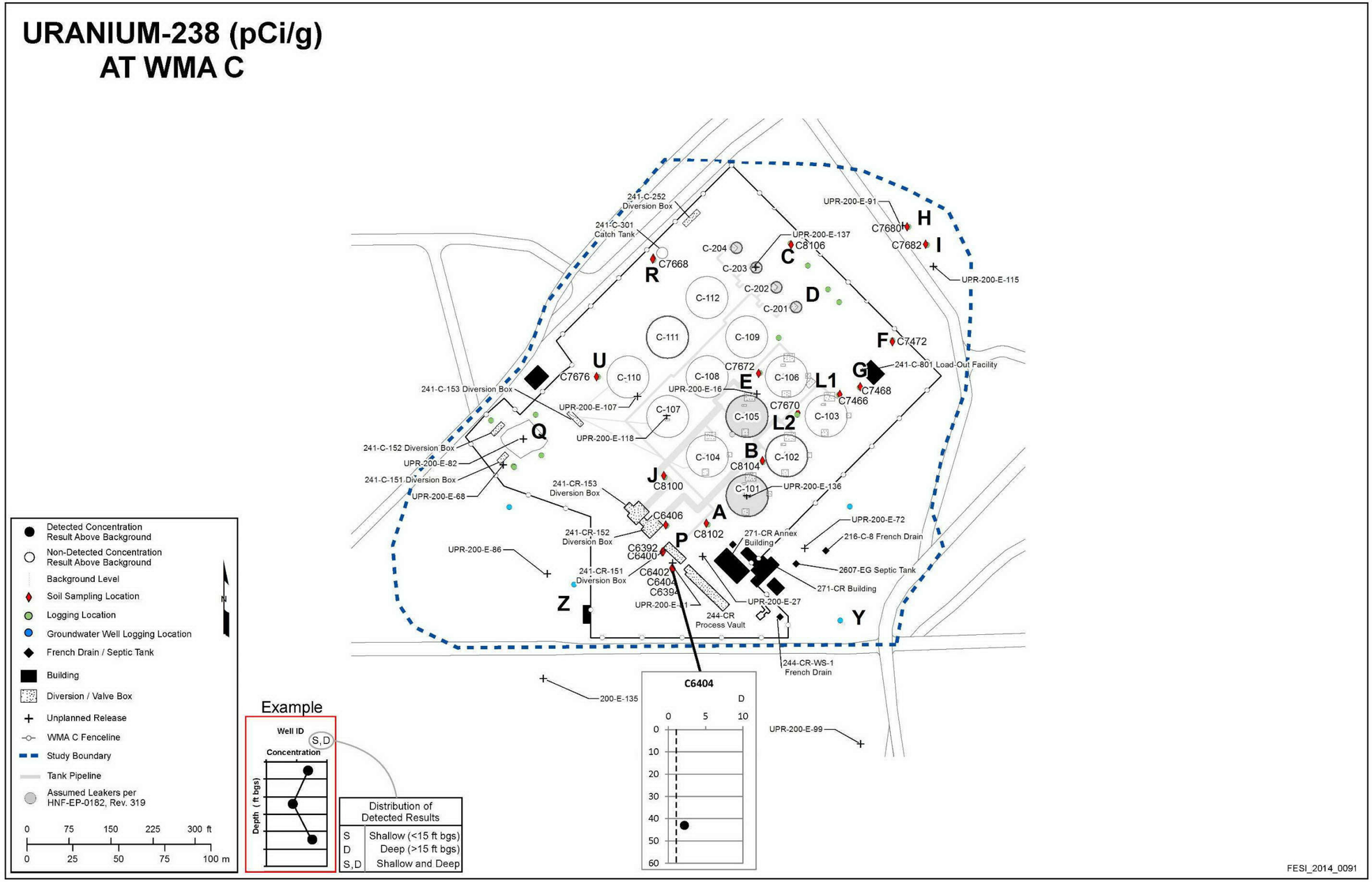

Figure Q-39. Distribution Map of Aldrin at WMA C

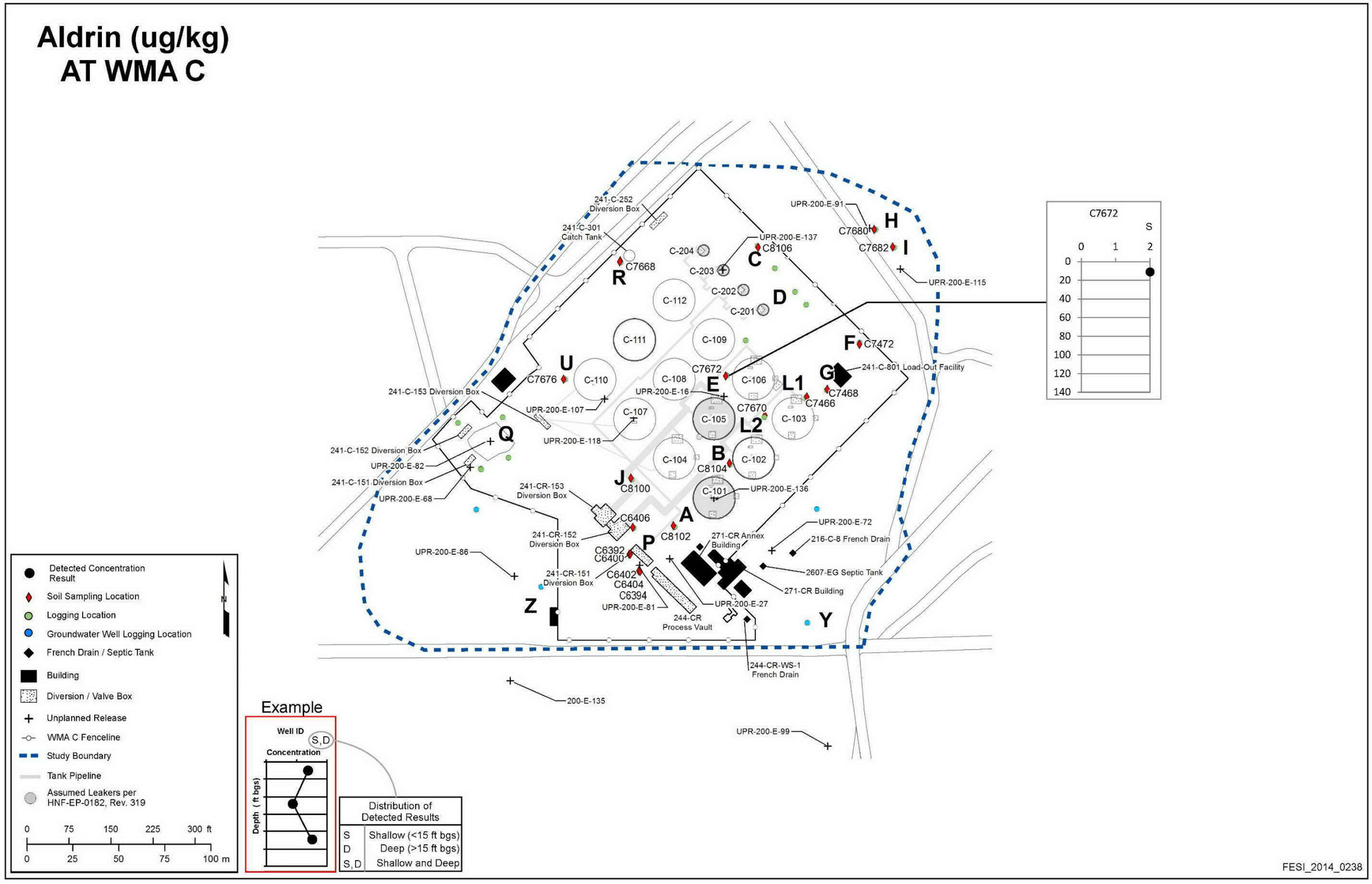

Figure Q-40. Distribution Map of Aroclor-1254 at WMA C

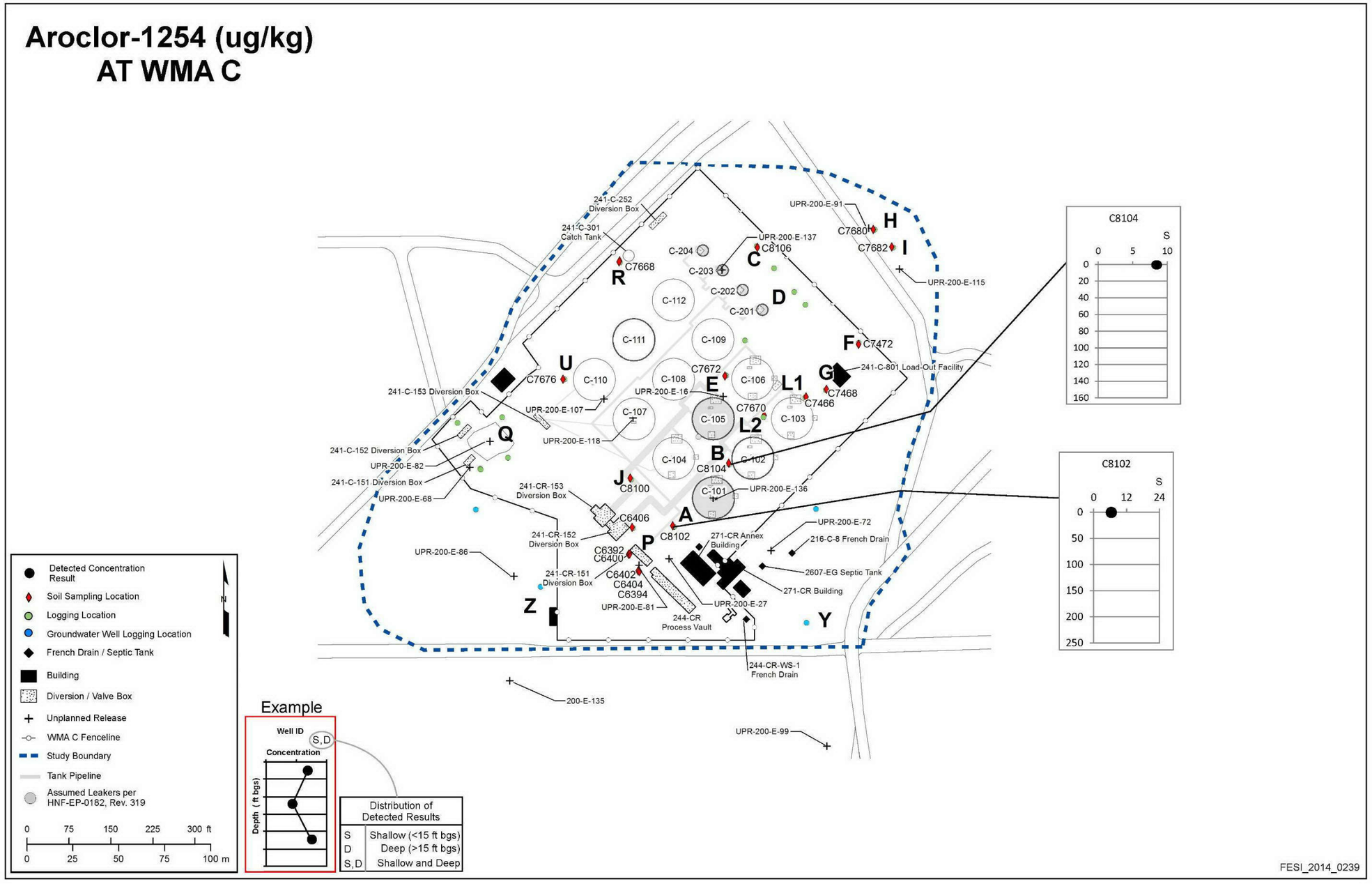

Figure Q-41. Distribution Map of Aroclor-1260 at WMA C

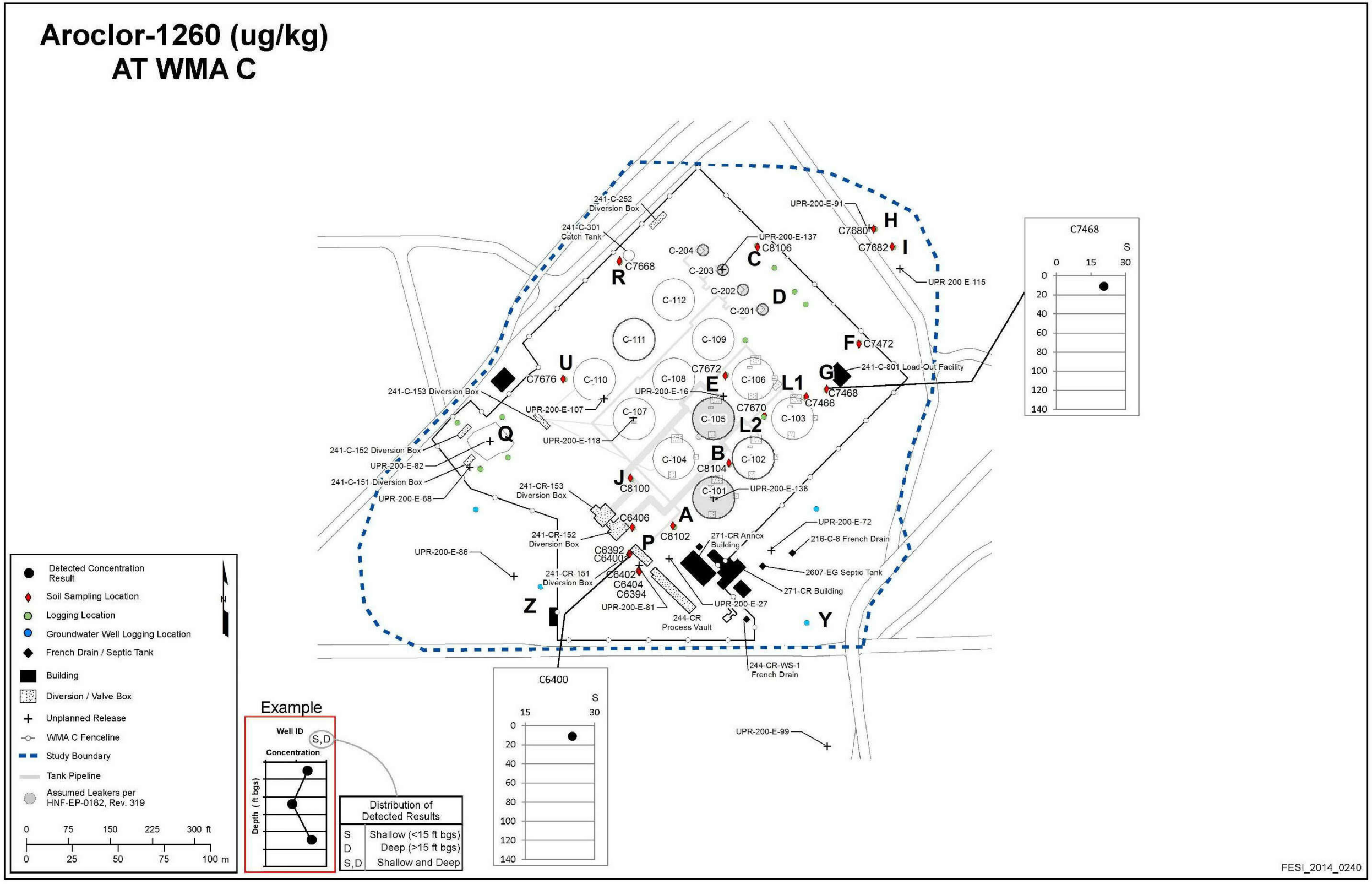

Figure Q-42. Distribution Map of beta-1,2,3,4,5,6-Hexachlorocyclohexane (beta-BHC) at WMA C

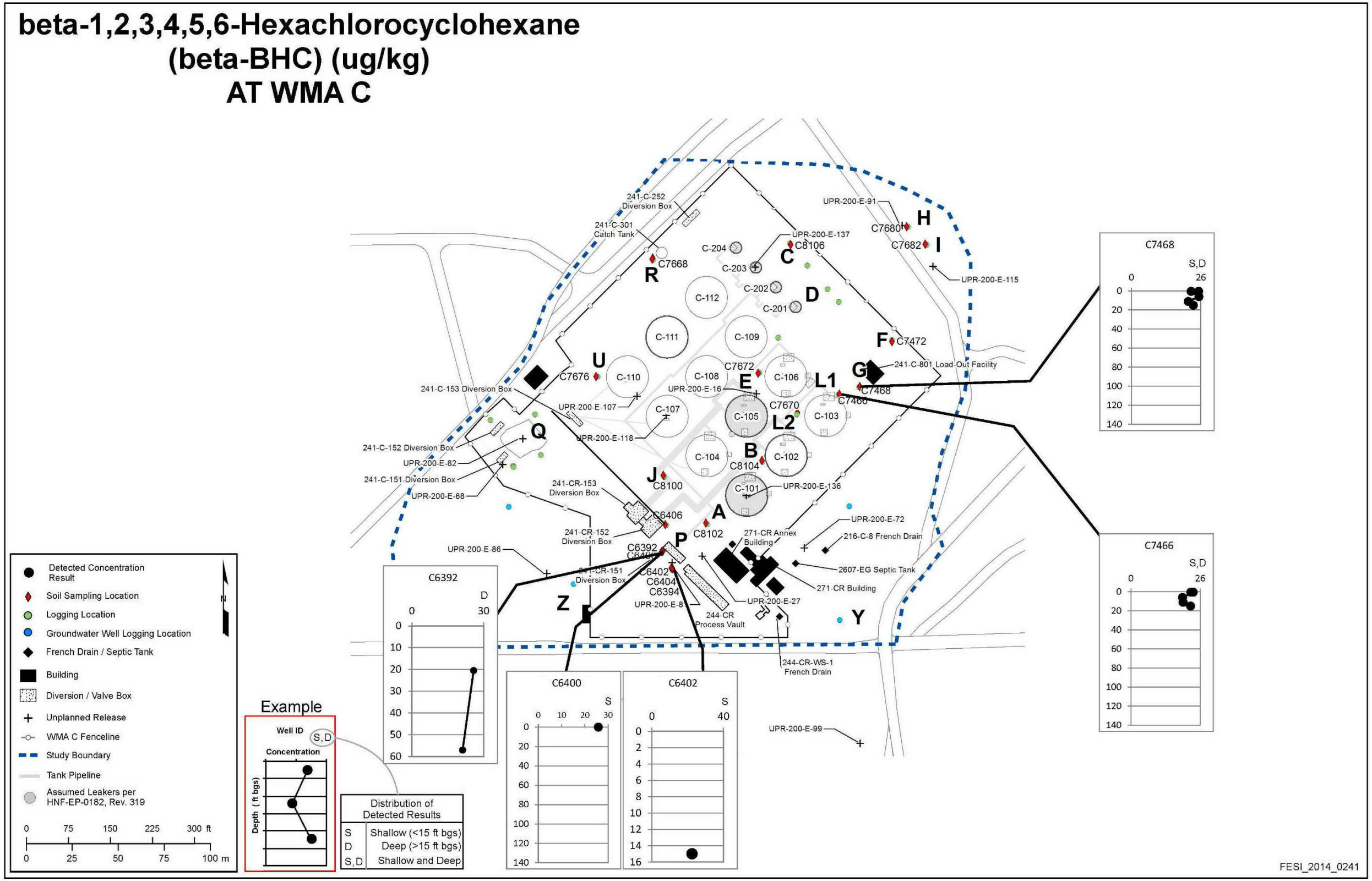

Figure Q-43. Distribution Map of Gamma-BHC (Lindane) at WMA C

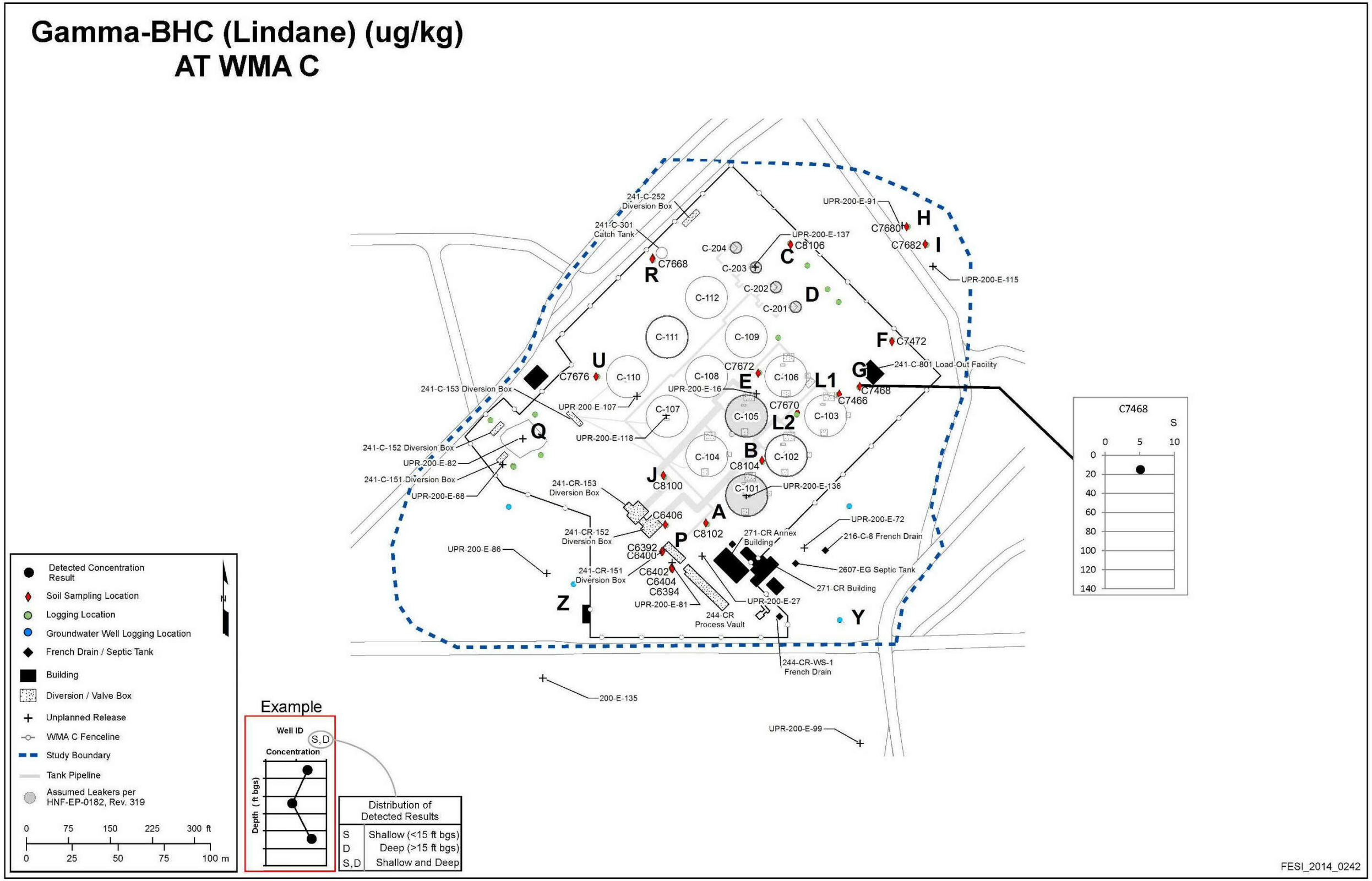
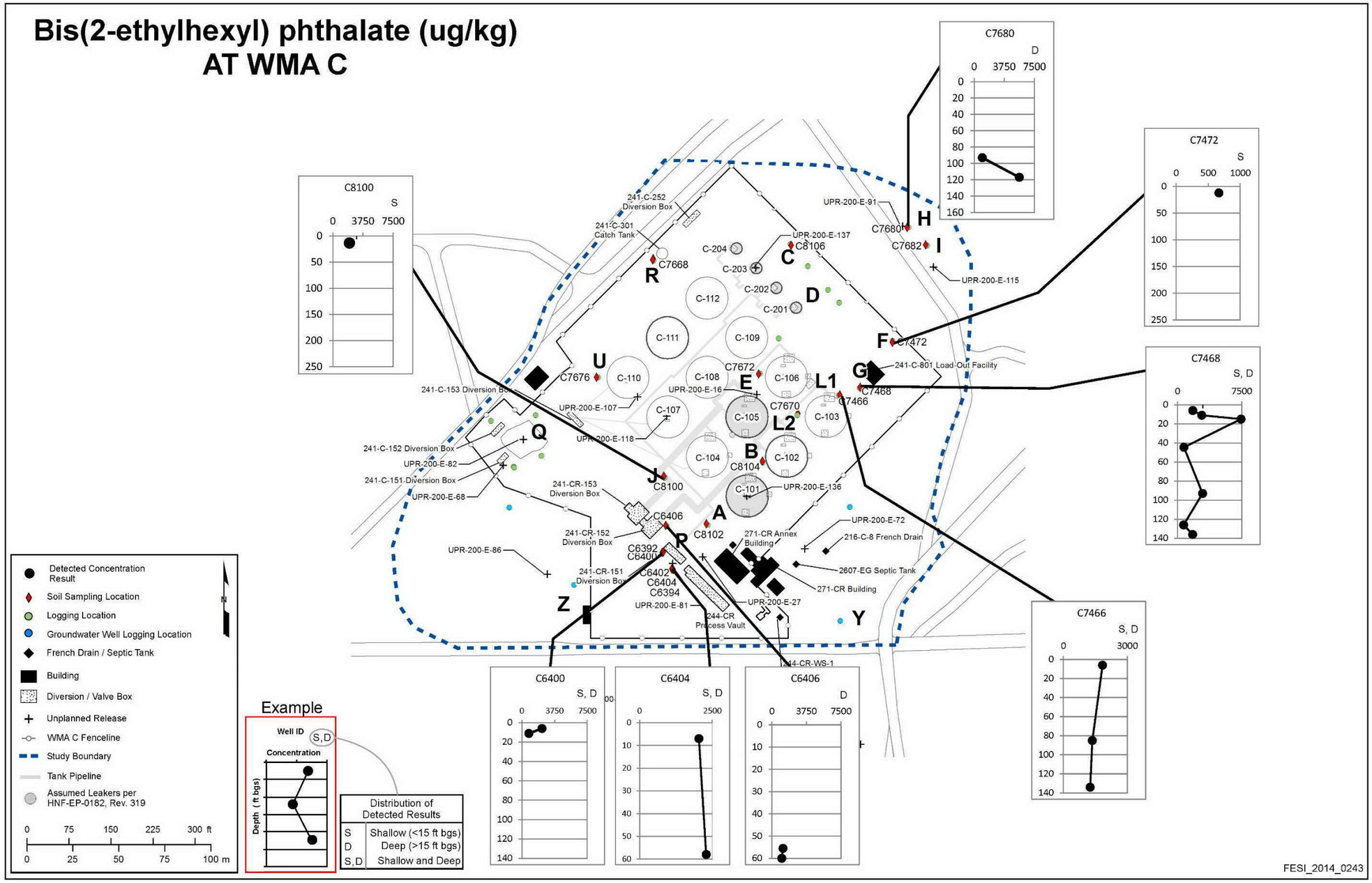
Figure Q-44. Distribution Map of Bis(2-ethylhexyl) phthalate at WMA C