

River Corridor Closure Contract

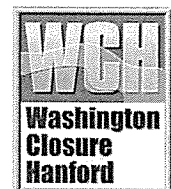
100-B/C Target Analyte List Development for Soil

March 2010

For Public Release

Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor



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DOCUMENT CONTROL 3/15/10 DD

WCH-329
Rev. 0

STANDARD APPROVAL PAGE

Title: 100-B/C Target Analyte List Development for Soil

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Date 3/15/2010

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Closure Contract** 

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TABLE OF CONTENTS

1.0	PURPOSE.....	1
2.0	APPROACH.....	1
3.0	ASSUMPTIONS.....	3
4.0	SOFTWARE CONSIDERATIONS.....	4
5.0	SOIL TARGET ANALYTE LIST DEVELOPMENT.....	4
6.0	CONCLUSIONS.....	37
7.0	REFERENCES.....	37

TABLES

1.	Documents Used to Develop the 100-B/C Target Analyte List.....	4
2.	Summary of 100-B/C Initial Target Analytes and References.....	8
3.	100-B/C Soil Analytes Broadly Excluded from Further Consideration.....	11
4.	Master 100-B/C Target Analyte List.....	12
5.	Analytes Excluded for All Proposed Characterization Locations.....	17
6.	100-B-5 Trench Target Analytes.....	19
7.	116-B-5 Crib Target Analytes.....	21
8.	116-B-6B Crib Target Analytes.....	23
9.	116-B-9 French Drain Target Analytes.....	25
10.	116-B-14 Trench Target Analytes.....	27
11.	118-B-6 Burial Ground Target Analytes.....	29
12.	118-B-8:1 Reactor Fuel Storage Basin and 118-B-8:3 Process Sewer Target Analytes.....	31
13.	118-C-3:2 Reactor Fuel Storage Basin Target Analytes.....	33
14.	116-C-5 Retention Basin Target Analytes.....	35

1.0 PURPOSE

This report documents the process used to identify source area target analytes in support of the 100-B/C remedial investigation/feasibility study (RI/FS) addendum to DOE/RL-2008-46, *Integrated 100 Area Remedial Investigation/Feasibility Study (RI/FS) Work Plan*. A "target analyte" is defined as a constituent suspected of being site-related that is carried into an investigation plan for characterization through sampling and analysis by approved laboratory methods. Target analytes identified for 100 Area operable units must support RI/FS nature and extent characterization plus final remedial action decisions for source areas. This report also establishes the analyte exclusion criteria applicable for 100-B/C use and the analytical methods needed to analyze the target analytes.

2.0 APPROACH

The approach for development of vadose zone soil target analytes was a multi-step process. In Steps 1 and 2, initial target and master analyte lists were developed. The third step developed location-specific target analyte lists for waste sites where additional characterization is planned. Finally, the analyte list received regulatory review and input. This resulted in final location-specific target analytes.

Step 1 – Prepare Initial Target Analyte List

Remediation and characterization information (historic and current) were identified and reviewed to develop an initial list of target analytes. The list of initial target analytes represents potential contaminants in the vadose zone. The following types of reference documents and information sources were evaluated:

- Focused feasibility studies (FFSs), limited field investigation (LFI) reports
- Interim action records of decision (IARODs)
- Cleanup verification documents (cleanup verification packages [CVPs], remaining sites verification packages [RSVPs])
- Technical baseline reports
- Databases containing analytical data resulting from these activities (i.e., characterization, remediation, waste management information)
- Other pertinent documents.

Step 2 – Prepare Master Target Analyte List

After the initial target analyte list is compiled, the information underwent additional evaluation to refine the list to a master target analyte list. The master target analyte list is comprehensive and includes all analytes with credible potential to be present in the vadose zone above action thresholds. The following steps were taken to prepare the master decision unit target analyte list:

- Apply the following exclusion criteria to the initial set of target analytes.
 - Radionuclides with a half-life of 3 years or less (and no significant daughters).
 - Naturally occurring radionuclides that are not associated with past Hanford processes in the 100 Area (e.g., potassium-40).
 - Radionuclides potentially present only as trace impurities in solid irradiated materials.
 - Essential nutrients for human nutrition. Recommended daily allowances are developed for essential nutrients to estimate safe and adequate daily dietary intakes (NRC 1989, *Recommended Daily Allowances*).
 - Analytes that have no toxicity values (based on the hierarchy of toxicity values recommended by the U. S. Environmental Protection Agency (EPA) in Human Health Toxicity Values for Superfund Risk Assessments [OSWER Directive 9285.7-53]).
 - Common laboratory contaminants.
- Compare the resulting list for vadose zone soil with the contaminant of potential concern (COPC) list developed for the groundwater operable unit. Groundwater COPCs not found on the soil target analyte list were further evaluated to determine if there is a valid basis for their inclusion.

Appropriate analytical methods and estimated quantitation limits were then identified for the resulting master target analyte list.

Step 3 – Develop Location-Specific Target Analyte List

Location-specific target analytes were identified for each waste site from the master list using the following approach.

- Identify contaminants of concern (COCs) and COPCs for each specific waste site where characterization is proposed from the applicable IAROD (which reflects information from LFI and technical baseline reports). The default decision was to carry these analytes forward as target analytes for characterization unless a specific basis was available to eliminate them.
- Identify COCs and COPCs for each specific waste site where characterization is proposed from the site-specific interim cleanup verification documentation (typically developed based on the applicable IAROD). The default decision was to carry these analytes forward as target analytes for characterization unless a specific basis was available to eliminate them.

- Retain any analyte identified globally as a 100-B/C groundwater COPC as a soil target analyte.
- Remaining analytes on the master list were then considered individually on a site-specific basis. The default decision was to carry these analytes forward as target analytes for characterization unless a specific basis was available to eliminate them.

Step 4 – Agency Review of Locations and Location-Specific Target Analyte Lists

The lead regulatory agency for the 100-B/C Area (EPA) was consulted during the process to determine if adjustments were required to address additional information needs for each site. General process and site-specific input from EPA has been included in the final lists developed for each waste site.

3.0 ASSUMPTIONS

- Older analytical data (e.g., pre-*Comprehensive Environmental Response, Compensation, and Liability Act of 1980* [CERCLA]) reflect laboratory state-of-the-art procedures. Analytical methods have improved, resulting in lower detection limits for many analytes and better data quality assurance/quality control.
- Characterization activities implemented since initiating remediation under the IARODs may provide additional contaminant information that should be considered during pending RI/FS field investigations.
- Post-remediation characterization and cleanup verification data reflect focused lists of analytes that are unique to each waste site and have been evaluated against IAROD cleanup requirements.
- Examining existing data and waste site process information will be useful in developing laboratory analytical needs for RI/FS characterization tasks.
- Universally-accepted exclusion criteria may be applied to the initial target analyte list to develop a “master” target analyte list.
- Additional exclusion criteria (e.g., statistical Hanford Site background comparisons, infrequently detected analytes, and analytes not detected at concentrations/activities exceeding required cleanup levels) may be applied during the RI/FS process as more data become available.

4.0 SOFTWARE CONSIDERATIONS

No statistical or algebraic calculations were performed for this activity. The evaluations conducted included analyte comparisons/sorting using Microsoft® Excel®.

5.0 SOIL TARGET ANALYTE LIST DEVELOPMENT

Step 1 – 100-B/C Initial Target Analyte List

1. The documents listed in Table 1 were used to develop the 100-B/C target analyte list.

Table 1. Documents Used to Develop the 100-B/C Target Analyte List. (5 Pages)

Reference	Document Number	Document Type
1. Cleanup Verification Package for the 116-B-5 Crib	100 NPL Agreement/ Change Form: Control Number 111	CVP
2. Cleanup Verification Package for the 116-C-1 Process Effluent Trench	CVP-98-00006	CVP
3. Cleanup Verification Package for the 116-B-14 North Sludge Trench	CVP-99-00003	CVP
4. Cleanup Verification Package for the 116-B-10 Dry Well/Quench Tank	CVP-99-00010	CVP
5. Cleanup Verification Package for the 116-B-4 Dry French Drain	CVP-99-00014	CVP
6. Cleanup Verification Package for the 116-B-7, 132-B-6 and 132-C-2 B/C Area Outfalls	CVP-2002-00003	CVP
7. Cleanup Verification Package for the 1607-B-10 Septic Tank System	CVP-2003-00007	CVP
8. Cleanup Verification Package for the 118-C-4, 105-C Horizontal Control Rod Cave	CVP-2003-00015	CVP
9. Cleanup Verification Package for the 118-B-5 Burial Ground	CVP-2004-00003	CVP
10. Cleanup Verification Package for the 118-B-6, 108-B Solid Waste Burial Ground	CVP-2006-00002	CVP
11. Cleanup Verification Package for the 105-C Reactor Building Below-Grade Structures and Underlying Soils	CVP-98-00009	CVP
12. Cleanup Verification Package for the 116-C-5 Retention Basin	CVP-99-00004	CVP

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Table 1. Documents Used to Develop the 100-B/C Target Analyte List. (5 Pages)

Reference	Document Number	Document Type
13. Cleanup Verification Package for the 118-B-3 and 118-B-2 Burial Ground	CVP-2005-00001	CVP
14. Cleanup Verification Package for the 118-B-4 Spacer Burial Ground	CVP-2004-00002	CVP
15. Cleanup Verification Package for the 100-B-5 Effluent Vent Disposal Trench	CVP-2003-00014	CVP
16. Cleanup Verification Package for the 1607-B-9 Septic Tank System	CVP-2003-00006	CVP
17. Cleanup Verification Package for the 116-C-2A Pluto Crib, 116-C-2B Pump Station, 116-C-2C Sand Filter, and Overburden Soils from Group 3 Sites at the 100-B/C Area Pluto Crib	CVP-99-00019	CVP
18. Cleanup Verification Package for the 116-B-3 Pluto Crib	CVP-99-00013	CVP
19. Cleanup Verification Package for the 116-B-6A Crib and 116-B-16 Fuel Examination Tank	CVP-99-00011	CVP
20. Cleanup Verification Package for the 118-C-1, 105-C Solid Waste Burial Ground	CVP-2006-00011	CVP
21. Cleanup Verification Package for the 118-B-10 Burial Ground	CVP-2004-00004	CVP
22. Cleanup Verification Package for the 100-B-8:2, 100-C-6:2, 100-C-6:3, and 100-C-6:4 100-B/C North Effluent Pipelines	CVP-2003-00019	CVP
23. Cleanup Verification Package for the 116-B-2 Fuel Storage Basin Trench	CVP-99-00015	CVP
24. Cleanup Verification Package for the 1607-B-7 Septic Tank System	CVP-2003-00004	CVP
25. Cleanup Verification Package for the 1607-B-11 Septic Tank System	CVP-2003-00008	CVP
26. Cleanup Verification Package for the 116-B-11 Retention Basin	CVP-99-00001	CVP
27. Cleanup Verification Package for the 116-B-12 Seal Pit Crib	CVP-99-00008	CVP
28. Cleanup Verification Package for the 116-B-1 Process Effluent Trench	CVP-99-00012	CVP
29. Cleanup Verification Package for the 116-B-6B Crib	CVP-99-00017	CVP
30. Cleanup Verification Package for the 1607-B-8 Septic Tank System	CVP-2003-00005	CVP
31. Cleanup Verification Package for the 100-C-3 French Drain	CVP-2003-00009	CVP
32. Cleanup Verification Package for the 100-B-8:1 and 100-C-6:1, 100-B/C South Effluent Pipelines	CVP-2003-00022	CVP
33. Cleanup Verification Package for the 118-C-2 Burial Ground	CVP-2004-00005	CVP

Table 1. Documents Used to Develop the 100-B/C Target Analyte List. (5 Pages)

Reference	Document Number	Document Type
34. Cleanup Verification Package for the 116-B-13 South Sludge Trench	CVP-99-00002	CVP
35. Cleanup Verification Package for the 116-B-9 French Drain	CVP-99-00009	CVP
36. Cleanup Verification Package for the 118-B-1, 105-B Solid Waste Burial Ground	CVP-2007-00006	CVP
37. Remaining Sites Verification Package for the 100-B-1 Surface Chemical And Solid Waste Dumping Area	RSVP-2006-003	RSVP
38. Remaining Sites Verification Package for the 100-B-14:1 Process Sewer	RSVP-2004-005	RSVP
39. Remaining Sites Verification Package for the 1607-B2 Septic System And 100-B-14:2 Sanitary Sewer System	RSVP-2006-055	RSVP
40. Remaining Sites Verification Package for the 100-B-16 Utility Poles And Fixtures Debris Pile	RSVP-2005-009	RSVP
41. Remaining Sites Verification Package for the 100-B-18, 184-B Power House Debris Pile	RSVP-2007-020	RSVP
42. Remaining Sites Verification Package for the 100-B-20, 1716-B Maintenance Garage Underground Tank	RSVP-2006-019	RSVP
43. Remaining Sites Verification Package for the 100-B-21:2 Subsite (100-B/C Discovery Pipeline DS-100B/C-002	RSVP-2008-003	RSVP
44. Remaining Sites Verification Package for the 100-B-22:1 Pipelines and Associated Soils	RSVP-2005-042	RSVP
45. Remaining Sites Verification Package for the 100-B-23, 100-B/C Area Surface Debris Waste Site	RSVP-2008-027	RSVP
46. Remaining Sites Verification Package for the 100-B-24 Spillway	RSVP-2006-051	RSVP
47. Remaining Sites Verification Package for the 100-B-26 Spillway	RSVP-2006-052	RSVP
48. Remaining Sites Verification Package for the 116-C-3, 105-C Chemical Waste Tanks	RSVP-2008-002	RSVP
49. Remaining Sites Verification Package for 118-B-9 104-B-1 Tritium Vault and 104-B-2 Tritium Laboratory (104-B2 Storage Building) Site	RSVP-2004-004	RSVP
50. Remaining Sites Verification Package for 100-B-11 115-B/C Caisson, Sump, Drywell, Tank, and Caisson Valve Pit Site	RSVP-2004-003	RSVP
51. Remaining Sites Verification Package for 100-B-14:3 West Process Sewer Pipelines Site	RSVP-2004-007	RSVP
52. Remaining Sites Verification Package for 100-B-14:6 184-B Powerhouse Pipelines Site	RSVP-2004-010	RSVP

Table 1. Documents Used to Develop the 100-B/C Target Analyte List. (5 Pages)

Reference	Document Number	Document Type
53. Remaining Sites Verification Package for 100-B-14:7 185-B/190-B Sump and Pipelines Site	RSVP-2004-011	RSVP
54. Remaining Sites Verification Package for the 100-C-9:1 Main Process Sewer Collection Line	RSVP-2004-012	RSVP
55. Remaining Sites Verification Package for the 100-C-9:2 Sanitary Sewer Pipelines	RSVP-2004-013	RSVP
56. Remaining Sites Verification Package for the 100-C-9:3 183-C Clearwells Site	RSVP-2004-014	RSVP
57. Remaining Sites Verification Package for the 118-C-3:3, 105-C French Drains	RSVP-2006-016	RSVP
58. Remaining Sites Verification Package for the 120-B-1, 105-B Battery Acid Sump	RSVP-2006-057	RSVP
59. Remaining Sites Verification Package for the 126-B-2, 183-B Clearwells	RSVP-2007-004	RSVP
60. Remaining Sites Verification Package for the 126-B-3, 184-B Coal Pit Dumping Area	RSVP-2005-028	RSVP
61. Remaining Sites Verification Package for the 128-B-2, 100-B Burn Pit #2 Waste Site	RSVP-2005-038	RSVP
62. Remaining Sites Verification Package for the 128-B-3 Burn Pit Site	RSVP-2006-058	RSVP
63. Remaining Sites Verification Package for the 128C-1 Burn Pit Waste Site	RSVP-2005-019	RSVP
64. Remaining Sites Verification Package for the 1607-B1 Septic System	RSVP-2007-015	RSVP
65. Remaining Sites Verification Package for the 1607-B2 Septic System and 100-B-14:2 Sanitary Sewer System	RSVP-2006-055	RSVP
66. Remaining Sites Verification Package for the 600-233 Waste Site, Vertical Pipe Near 100-B Electrical Laydown Area	RSVP-2005-041	RSVP
67. Limited Field Investigation Report for the 100-B/C-2 Operable Unit	DOE/RL-94-42	LFI
68. Limited Field Investigation Report for the 100-B/C-1 Operable Unit	DOE/RL-93-06	LFI
69. Hazards Summary Report, Volume 3- Description of the 100-B, 100-C, 100-D, 100-DR, 100-F and 100-H Production Reactor Plants	HW-74094	HSR
70. Remedial Investigation Feasibility Study Work Plan for the 100-B/C-2 Operable Unit, Hanford Site, Richland, Washington	DOE/RL-91-07	RI/FS
71. Remedial Investigation Feasibility Study Work Plan for the 100-B/C-1 Operable Unit, Hanford Site, Richland, Washington	DOE/RL-90-07	RI/FS

Table 1. Documents Used to Develop the 100-B/C Target Analyte List. (5 Pages)

Reference	Document Number	Document Type
72. Remedial Investigation Feasibility Study Work Plan for the 100-B/C-5 Operable Unit, Hanford Site, Richland, Washington	DOE/RL-90-08	RI/FS
73. Qualitative Risk Assessment for the 100-B/C-1 Source Operable Unit	WHC-SD-EN-RA-003	RA
74. 100 Area Source Operable Unit Focused Feasibility Study	DOE/RL-94-61	FFS
75. Radiological Characterization of the Retired 100 Areas/Dorian and Richards	UNI-946	Dorian/Richards
76. 100-B Area Technical Baseline Report	WHC-SD-EN-TI-220	Technical baseline
77. Interim Action Record of Decision for the 100-B/C-1, 100-B/C-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site	EPA/ROD/R10-99/039	IAROD
78. Declaration of the Record Of Decision for the 100-B/C-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site	EPA/ROD/R10-95/126	IAROD
79. Amended Record of Decision for the 100 Area	DOE-RL 1997	IAROD
80. Declaration of the Record of Decision for the 100-B/C-1, 100-B/C-2, 100-DR-1, and 100-DR-2, 100-HR-2, 100-KR-2 (100 Area Burial Grounds) Operable Units, Hanford Site	EPA et. al 2000	IAROD
81. 100-B/C Area Ecological Risk Assessment Sampling and Analysis Plan	DOE/RL-2003-08	SAP

CVP = cleanup verification package	RA = risk assessment
FFS = focused feasibility study	RI/FS = remedial investigation/feasibility study
HSR = hazards summary report	ROD = record of decision
IAROD = interim action record of decision	RSVP = remaining sites verification package
LFI = limited field investigation	SAP = sampling and analysis plan

- The initial list of target analytes presented in Table 2 was created from the review and evaluation of the Table 1 documents. Note that, where an analyte was identified in multiple documents, only one reference is provided for simplicity.

Table 2. Summary of 100-B/C Initial Target Analytes and References. (4 Pages)

Analyte	Example Reference	Analyte	Example Reference
Radionuclides			
1. Americium-241	CVP-98-00006	15. Potassium-40	DOE/RL-94-42
2. Carbon-14	CVP-2004-00003	16. Radium-226	DOE/RL-94-42

Table 2. Summary of 100-B/C Initial Target Analytes and References. (4 Pages)

Analyte	Example Reference	Analyte	Example Reference
3. Cobalt-58	DOE/RL-94-42	17. Radium-228	DOE/RL-94-42
4. Cobalt-60	CVP-98-00006	18. Ruthenium-106	DOE/RL-91-07
5. Cesium-134	DOE/RL-94-42	19. Silver-108m	CVP-2006-00011
6. Cesium-137	CVP-98-00006	20. Sodium-22	DOE/RL-94-61
7. Europium-152	CVP-98-00006	21. Strontium-90	CVP-98-00006
8. Europium-154	CVP-98-00006	22. Technetium-99	CVP-98-00009
9. Europium-155	CVP-98-00006	23. Thorium-228	DOE/RL-94-42
10. Iodine-129	DOE/RL-91-07	24. Thorium-232	DOE/RL-94-42
11. Nickel-63	CVP-98-00006	25. Tritium	CVP-2002-00003
12. Plutonium-238	CVP-98-00006	26. Uranium-233/234	CVP-99-00010
13. Plutonium-239/240	CVP-98-00006	27. Uranium-235	CVP-2002-00003
14. Plutonium-241	CVP-2006-00011	28. Uranium-238	CVP-98-00006
Nonradionuclides			
1. 4-Methyl-2-pentanone	CVP-2007-00006	51. Gamma-BHC (lindane)	RSVP-2006-055
2. 4-Methylphenol (p-cresol)	RSVP-2004-014	52. Di-n-octylphthalate	RSVP-2006-055
3. Acetone	RSVP-2007-020	53. Dinoseb	RSVP-2006-055
4. Acenaphthene	RSVP-2007-020	54. Endosulfan I	RSVP-2006-055
5. Aldrin	CVP-2007-00006	55. Endosulfan II	RSVP-2006-055
6. Alpha-BHC	RSVP-2006-055	56. Endosulfan sulfate	RSVP-2006-055
7. Alpha-chlordane	RSVP-2006-055	57. Endrin	RSVP-2006-055
8. Aluminum	DOE/RL-94-42	58. Endrin aldehyde	RSVP-2006-055
9. Anthracene	RSVP-2006-055	59. Endrin ketone	RSVP-2006-055
10. Antimony	CVP-2006-00011	60. Fluoranthene	RSVP-2006-055
11. Arsenic	CVP-2003-00015	61. Fluorene	RSVP-2006-055
12. Asbestos	RSVP-2005-038	62. Gamma-chlordane	RSVP-2006-055
13. Barium	CVP-2003-00015	63. Heptachlor	CVP-2007-00006
14. Benzene	CVP-2006-00011	64. Heptachlor epoxide	RSVP-2006-003
15. Benzo(a)anthracene	RSVP-2006-055	65. Indeno(1,2,3-cd)-pyrene	RSVP-2006-055
16. Benzo(a)pyrene	RSVP-2006-055	66. Iron	DOE/RL-94-42
17. Benzo(b)fluoranthene	RSVP-2006-055	67. Isophorone	RSVP-2004-014
18. Benzo(k)fluoranthene	RSVP-2006-055	68. Lead	CVP-98-00006

Table 2. Summary of 100-B/C Initial Target Analytes and References. (4 Pages)

Analyte	Example Reference	Analyte	Example Reference
19. Benzo(g,h,i)perylene	RSVP-2006-055	69. Lithium	RSVP-2006-055
20. Beryllium	CVP-2006-00011	70. Magnesium	DOE/RL-94-42
21. Beta-BHC	RSVP-2006-055	71. Manganese	CVP-2006-00011
22. Bis[2-ethylhexyl]phthalate	CVP-2003-00008	72. Mercury	CVP-98-00006
23. Boron	CVP-2006-00011	73. Molybdenum	CVP-2006-00011
24. Butylbenzylphthalate	RSVP-2006-055	74. Naphthalene	RSVP-2007-020
25. Cadmium	CVP-2003-00015	75. Nickel	CVP-2006-00011
26. Calcium	DOE/RL-94-42	76. Nitrate (as nitrogen)	RSVP-2008-002
27. Carbazole	RSVP-2006-003	77. Nitrite	DOE/RL-91-07
28. Carbon tetrachloride	CVP-2007-00006	78. N-nitrosodiphenyl-amine	RSVP-2005-028
29. Chromium (total)	CVP-98-00006	79. Polychlorinated biphenyls	CVP-2003-00008
30. Chromium (hexavalent)	CVP-98-00006	80. Pentachlorophenol	RSVP-2006-055
31. Chrysene	RSVP-2006-055	81. Phenol	RSVP-2005-038
32. Cobalt	CVP-2006-00011	82. Phenanthrene	RSVP-2006-055
33. Copper	CVP-2006-00011	83. Picloram	CVP-2007-00006
34. Dalapon	CVP-2007-00006	84. Potassium	DOE/RL-94-42
35. DB;2,4- [4-(2,4-dichlorophenoxy)butanoic acid] (Butoxone)	RSVP-2006-055	85. Pyrene	RSVP-2006-055
36. Delta-BHC	RSVP-2006-003	86. Selenium	CVP-2003-00015
37. Dibenzo(a,h)anthracene	RSVP-2007-020	87. Silver	CVP-2003-00015
38. Dibenzofuran	RSVP-2006-055	88. Strontium	RSVP-2006-055
39. Dicamba	CVP-2007-00006	89. Sulfate	DOE/RL-94-42
40. Dichlorodiphenyldichlorethane (4,4'-DDD)	RSVP-2006-055	90. Tin	RSVP-2006-055
41. Dichlorodiphenyldichloroethylene (4,4'-DDE)	RSVP-2006-055	91. Titanium	RSVP-2006-055
42. Dichlorodiphenyltrichloroethane (4,4'-DDT)	RSVP-2006-055	92. Toluene	RSVP-2005-038
43. Dichlorophenoxyacetic acid; 2,4-	RSVP-2006-055	93. Total petroleum hydrocarbons	CVP-2006-00011
44. Dichloroprop	CVP-2007-00006	94. 1,2,4-Trichlorobenzene	RSVP-2005-028
45. Dieldrin	CVP-2003-00006	95. 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	RSVP-2006-055

Table 2. Summary of 100-B/C Initial Target Analytes and References. (4 Pages)

Analyte	Example Reference	Analyte	Example Reference
46. Diethylphthalate	RSVP-2006-003	96. 2,4,5-Tp- [silvex; (2,4,5-Trichlorophenoxy) Propionic Acid, 2]	RSVP-2006-055
47. Di-n-butylphthalate	RSVP-2006-003	97. Uranium	DOE/RL-2003-08
48. Methylene chloride	RSVP-2006-058	98. Vanadium	CVP-2006-00011
49. Methoxychlor	RSVP-2006-055	99. Xylenes (total)	RSVP-2006-058
50. Methyl-naphthalene; 2-	RSVP-2005-028	100.Zinc	CVP-2006-00011

CVP = cleanup verification package

RSVP = remaining sites verification package

Step 2 – 100-B/C Master Target Analyte List

The exclusion criteria identified in Section 2 were applied to the initial soil target analyte list to identify the excluded analytes listed in Table 3. The list of groundwater COPCs was then reviewed to reconcile potential gaps. This resulted in the addition of thallium, 1,1-dichloroethene, 1,1,2,2-tetrachloroethane, chloroform, tetrachloroethene, trichloroethene, and vinyl chloride for soil. Radium-228 was identified as a groundwater COPC but was not added for soil based on soil exclusion criteria.

Exclusion of the analytes listed in Table 3 and inclusion of additional groundwater COPCs resulted in the master target analyte list presented in Table 4.

Table 3. 100-B/C Soil Analytes Broadly Excluded from Further Consideration. (2 Pages)

Analyte	Exclusion Rationale
Radionuclides	
1. Cobalt-58	Half-life less than 3 years (70.856 d), stable daughter product
2. Cesium-134	Half-life less than 3 years (2.0662 y), stable daughter product
3. Ruthenium-106	Half-life less than 3 years (1.0235 y), stable daughter product
4. Sodium-22	Half-life less than 3 years (2.6036 y), stable daughter product
5. Potassium-40	Naturally-occurring background radiation not associated with 100 Area processes
6. Radium-226	Naturally-occurring background radiation not associated with 100 Area processes (insufficient in-growth time for potential introduction as decay daughter of Hanford U-234/Th-230)
7. Radium-228	Naturally-occurring background radiation not associated with 100 Area processes (present in secular equilibrium with parent Th-232 isotope)
8. Silver 108m	Present only as a potential trace impurity in certain irradiated materials; no confirmed detections in 100 Area samples to-date

Table 3. 100-B/C Soil Analytes Broadly Excluded from Further Consideration. (2 Pages)

Analyte	Exclusion Rationale
9. Thorium-228	Naturally-occurring background radiation not associated with 100 Area processes (present in secular equilibrium with parent Ra-228 isotope)
10. Thorium-232	Naturally-occurring background radiation not associated with 100 Area processes
Nonradionuclides	
11. Acetone	Laboratory contaminant
12. bis[2-Ethylhexyl]phthalate	Laboratory contaminant
13. Di-n-butylphthalate	Laboratory contaminant
14. Methylene chloride	Laboratory contaminant
15. Calcium	Essential nutrient
16. Iron	Essential nutrient
17. Magnesium	Essential nutrient
18. Potassium	Essential nutrient
19. Sulfate	No toxicity information available
20. delta-BHC	No toxicity information available

Table 4. Master 100-B/C Target Analyte List. (5 Pages)

Target Analyte	Estimated Quantitation Limit (pCi/g)	Preliminary Remediation Goals ^a			Analytical Methods
		Direct Exposure (pCi/g)	Groundwater Protection (pCi/g)	River Protection (pCi/g)	
Radionuclides					
1. Americium-241 ^b	1	32.1	-- ^c	-- ^c	1. Gamma energy analysis
2. Cobalt-60 ^d	0.05	1.4	13,900	27,800	
3. Cesium-137 ^d	0.1	6.2	1,465	2,930	
4. Europium-152	0.1	3.3	-- ^c	-- ^c	
5. Europium-154	0.1	3.0	-- ^c	-- ^c	
6. Europium-155 ^d	0.1	125	-- ^c	-- ^c	
7. Carbon-14 ^d	2	8.69	-- ^c	-- ^c	
8. Nickel-63 ^d	30	4,013	-- ^c	-- ^c	
9. Technetium-99 ^d	0.25	5.8	0.46	0.92	
10. Tritium ^d	10	459	12.6	25.2	
11. Plutonium-238	1	38.8	-- ^c	-- ^c	6. Alpha energy analysis
12. Plutonium-239/240	1	35.1	-- ^c	-- ^c	
13. Plutonium-241	15	854	-- ^c	-- ^c	

Table 4. Master 100-B/C Target Analyte List. (5 Pages)

Target Analyte	Estimated Quantitation Limit (pCi/g)	Preliminary Remediation Goals ^a			Analytical Methods
		Direct Exposure (pCi/g)	Groundwater Protection (pCi/g)	River Protection (pCi/g)	
14. Uranium-233/234	1	1.1	1.1	1.1	8. Alpha energy analysis
15. Uranium-235	0.5	0.61	0.5	0.5	
16. Uranium-238	1	1.1	1.1	1.1	
17. Iodine-129 ^d	2	2	2	2	9. Low energy-gamma energy analysis
18. Strontium-90 ^d	1	4.5	27.6	55.2	10. Gas flow proportional counting
Target Analyte	Estimated Quantitation Limit (mg/kg)	Preliminary Remediation Goals ^a			Analytical Methods
		Direct Exposure (mg/kg)	Groundwater Protection (mg/kg)	River Protection (mg/kg)	
Nonradionuclides					
1. Butylbenzylphthalate	0.33	16,000	893	698	11. EPA 8270 (SVOA)
2. Carbazole	0.33	50	0.33	--	
3. Dibenzofuran	0.33	160	7.36	--	
4. Diethylphthalate	0.33	64,000	72.2	259	
5. Di-n-octylphthalate	0.33	1,600	532,000	--	
6. Isophorone	0.33	1,050	0.33	15.4	
7. Methylnaphthalene; 2-	0.33	320	2.03	4.07	
8. Methylphenol; 4-(p-cresol)	0.33	400	0.507	1.01	
9. N-nitrosodiphenylamine	0.33	204	--	--	
10. Pentachlorophenol	0.33	8.33	0.33	0.33	
11. Phenol	0.33	24,000	11.0	192	
12. Trichlorobenzene; 1,2,4-	0.33	800	2.98	5.22	
13. Dalapon	0.1	2,400	0.811	1.62	
14. DB;2,4- [4-(2,4-dichlorophenoxy)butanoic acid] (Butoxone)	0.1	640	0.768	--	
15. Dicamba	0.1	2,400	2.20	4.39	
16. Dichlorophenoxyacetic acid; 2,4-	0.4	800	0.4	0.642	
17. Dichloroprop	0.1	640	0.321	0.642	
18. Dinoseb	0.33	80.0	0.524	1.05	
19. Picloram	0.1	5,600	2.18	4.36	
20. TP-; 2,4,5-(2,4,5-Trichlorophenoxy) Propionic acid, 2]	0.02	640	0.280	0.561	
21. Trichlorophenoxyacetic acid; 2,4,5-(2,4,5-T)	0.02	800	0.761	1.59	

Table 4. Master 100-B/C Target Analyte List. (5 Pages)

Target Analyte	Estimated Quantitation Limit (mg/kg)	Preliminary Remediation Goals ^a			Analytical Methods	
		Direct Exposure (mg/kg)	Groundwater Protection (mg/kg)	River Protection (mg/kg)		
22. Dichlorodiphenyldichlorethane (4,4'-DDD)	0.0033	4.17	0.335	0.0033	13. EPA 8081 (pesticides)	
23. Dichlorodiphenyldichloro-ethylene (4,4'-DDE)	0.0033	2.94	0.446	0.0033		
24. Dichlorodiphenyltrichloro-ethane (4,4'-DDT)	0.0033	2.94	3.49	0.00965		
25. Aldrin	0.00165	0.0588	0.00504	0.00165		
26. Hexachlorocyclohexane; alpha (alpha-BHC, HCH)	0.00165	0.159	0.00165	0.00165		
27. Hexachlorocyclohexane; beta (beta-BHC, HCH)	0.00165	0.556	0.00227	0.00259		
28. Dieldrin	0.0033	0.0625	0.0033	0.0033		
29. Endosulfan I	0.00165	480	4.3	0.0833		
30. Endosulfan II	0.0033	480	4.3	0.0833		
31. Endosulfan sulfate	0.0033	480	4.3	0.0833		
32. Endrin	0.0033	24.0	0.440	0.335		
33. Endrin aldehyde	0.0033	24	0.2	0.039		
34. Endrin ketone	0.0033	24	0.2	0.039		
35. Lindane (Gamma-BHC) (1,2,3,4,5,6-hexachlorocyclohexane)	0.00165	0.769	0.00209	0.00238		
36. Heptachlor	0.00165	0.222	0.0370	0.00165		
37. Heptachlor epoxide	0.00165	0.110	0.008	0.00165		
38. Methoxychlor	0.0165	400	64.2	26.8		
39. Technical chlordane (alpha and gamma)	0.0165	2.86	2.06	0.0165		
40. Acenaphthene	0.1	4,800	97.9	131		14. EPA-8310 (PAH)
41. Anthracene	0.05	2,270	1,140	9,100		
42. Benzo(a)anthracene	0.015	1.37	0.856	0.040		
43. Benzo(a)pyrene	0.015	0.137	2.33	0.109		
44. Benzo(b)fluoranthene	0.015	1.37	2.95	0.138		
45. Benzo(k)fluoranthene	0.015	1.37	21.5	0.138		
46. Benzo(g,h,i)perylene	0.03	2,400	25,700	7,070		
47. Chrysene	0.1	13.7	9.56	0.1		
48. Dibenzo(a,h)anthracene	0.03	1.37	4.29	0.200		
49. Fluoranthene	0.05	3,200	631	178		
50. Fluorene	0.03	3,200	101	411		
51. Indeno(1,2,3-cd)pyrene	0.03	1.37	8.33	0.389		
52. Naphthalene	0.1	1,600	4.46	275		
53. Phenanthrene	0.05	24,000	1,140	9,100		
54. Pyrene	0.05	2,400	655	2,620		

Table 4. Master 100-B/C Target Analyte List. (5 Pages)

Target Analyte	Estimated Quantitation Limit (mg/kg)	Preliminary Remediation Goals ^a			Analytical Methods
		Direct Exposure (mg/kg)	Groundwater Protection (mg/kg)	River Protection (mg/kg)	
55. Aluminum	5	80,000	480,000	960,000	15. EPA 6010 (ICP metals)
56. Antimony ^d	6	32	5.4	25.3	
57. Arsenic ^d	10	20 ^e	20 ^e	20 ^e	
58. Barium	2	16,000	1,650	3,300	
59. Beryllium ^d	0.5	160	63.2	126	
60. Boron	2	16,000	210	--	
61. Cadmium ^d	0.5	80	0.69	0.5	
62. Chromium (total) ^d	1	120,000	2,000	2,600	
63. Cobalt ^d	2	24	15.7	--	
64. Copper ^d	1	3,200	284	1,150	
65. Lead ^d	5	250	3,000	840	
66. Lithium	2.5	160	192	--	
67. Manganese ^d	5	3,760	512	512	
68. Molybdenum	2	400	32.3	--	
69. Nickel ^d	4	1,600	130	357	
70. Selenium ^d	1	400	5.2	1.04	
71. Silver	1	400	13.6	1	
72. Strontium	1	48,000	2,920	--	
73. Thallium ^d	5	5.6	1.59	4.45	
74. Tin	10	48,000	48,000	--	
75. Titanium	0.5	320,000	1,280,000	--	
76. Vanadium	2.5	560	2,240	--	
77. Zinc ^d	1	24,000	5,970	226	
78. Benzene ^d	0.005	18.2	0.005	0.014	16. EPA 8260 (volatile organics)
79. 1,1-Dichloroethene ^d	0.01	1.67	0.01	0.028	
80. 1,1,2,2-Tetrachloroethane ^d	0.005	5	0.005	0.005	
81. Carbon tetrachloride ^d	0.005	7.69	0.031	0.005	
82. Chloroform ^d	0.005	164	0.0381	0.0607	
83. Methyl isobutyl ketone (4-Methyl-2-pentanone)	0.01	6,400	2.71	--	
84. Tetrachloroethene ^d	0.005	800	0.0086	0.0083	
85. Trichloroethene ^d	0.005	11.2	0.0032	0.035	
86. Toluene	0.005	--	4.65	99	
87. Vinyl chloride ^d	0.01	240	0.01	0.025	
88. Xylenes (total)	0.01	16,000	14.6	183	
89. Nitrate ^d	2.5	128,000	40	80	17. EPA 300.0 (IC Anions) or EPA 353.2 (N in Nitrate and Nitrite)
90. Nitrite	2.5	8,000	4.0	8	
91. Asbestos	1%	--	--	--	18. Microscopy
92. Chromium (hexavalent) ^d	0.5	2.1 ^f	18.4 ^e	7.70 ^e	19. EPA 7196 (Cr-VI)
93. Mercury ^d	0.2	24	2.09	0.33	20. EPA 7471 (Hg cold vapor)

Table 4. Master 100-B/C Target Analyte List. (5 Pages)

Target Analyte	Estimated Quantitation Limit (mg/kg)	Preliminary Remediation Goals ^a			Analytical Methods
		Direct Exposure (mg/kg)	Groundwater Protection (mg/kg)	River Protection (mg/kg)	
94. Aroclor-1016 (PCB)	0.017	0.5	0.094	0.017	21. EPA 8082 (PCB by GC)
95. Aroclor-1221 (PCB)	0.017	0.5	0.017	0.017	
96. Aroclor-1232 (PCB)	0.017	0.5	0.017	0.017	
97. Aroclor-1242 (PCB)	0.017	0.5	0.0394	0.017	
98. Aroclor-1248 (PCB)	0.017	0.5	0.0386	0.017	
99. Aroclor-1254 (PCB)	0.017	0.5	0.0664	0.017	
100. Aroclor-1260 (PCB)	0.017	0.5	0.721	0.017	
101. Total petroleum hydrocarbons ^d	5	2000	2000	--	22. NWTPH-D+
102. Uranium (total) ^d	1	240	3.21	3.21	23. U-KPA or via isotopic analysis

^a Preliminary remediation goals for individual radionuclides are based on attainment of total radionuclide excess dose rates as well as radionuclide-specific requirements. Additional details for the determination of these values are provided in DOE/RL-96-17. Preliminary remediation goals for human health for chemicals are calculated per WAC 173-340, Method B for (Ecology 2007) using input parameters from the most current values from Ecology's Cleanup Levels and Risk Calculations database (updated February 12, 2009) and including appropriate consideration of background and achievable quantitation limits per WAC 173-340 (Ecology 2007). Calculated soil values for protection of the Columbia River assume a groundwater-to-river dilution attenuation factor of 2 based on practice for interim remedial actions.

^b If strong gamma emissions interfere with analysis of Am-241, Am-241 can be analyzed using a Cm/Am Alpha Emission Analysis method.

^c Radionuclide is not predicted to impact groundwater (and, thus, the Columbia River) in 1,000 years based on modeling assuming no uncontaminated vadose zone.

^d Analyte identified as a groundwater contaminant of potential concern.

^e Tasks are included in DOE/RL-2008-46, *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan* to reevaluate arsenic and hexavalent chromium cleanup levels. Values listed for arsenic are based on the use of WAC 173-340, Method A for approved interim remedial action goals, further described in DOE/RL-96-17.

^f Carcinogenic cleanup level calculated based on the inhalation exposure pathway per WAC 173-340-750 (Method B for air quality) and an airborne particulate mass loading rate of 0.0001 g/m³.

-- = not applicable

EPA = U.S. Environmental Protection Agency

GC = gas chromatograph

IC = ion chromatography

ICP = inductively coupled plasma

KPA = kinetic phosphorescence analysis

LSC = liquid scintillation counting

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyl

SVOA = semi-volatile organic analysis

VOA = volatile organic analysis

WAC = Washington Administrative Code

Steps 3 and 4 – Location Specific Target Analyte Identification and Agency Input

1. The IAROD COCs and COPCs for each specific waste site where characterization is proposed were identified (which reflects information from LFI and technical baseline reports). The default decision was to carry these analytes forward as target analytes for site-specific characterization unless a specific basis was available to eliminate them.
2. The interim cleanup verification COCs and COPCs for each specific waste site where characterization is proposed were identified. The default decision was to carry these analytes forward as target analytes for site-specific characterization unless a specific basis was available to eliminate them.
3. Global 100-B/C groundwater COPCs were identified. These analytes were retained for site-specific characterization without further consideration, with the exception of total uranium,

total petroleum hydrocarbons, and radionuclides for the 118-B-6 Burial Ground. Radioactive risk is a greater driver for uranium in soil than chemical risk; uranium isotopes were evaluated on a site-by-site basis, and total uranium was excluded for all sites. Total petroleum hydrocarbons were identified as a groundwater COPC based on inclusion in the soil master target analyte list and limited available groundwater data. Total petroleum hydrocarbons were evaluated for inclusion for soils on a site-specific basis. Sufficient basis is available from remediation of the 118-B-6 Burial Ground to preclude the need for additional analysis for all radionuclides.

4. The remaining analytes from the 100-B/C master list were considered individually on a site-specific basis. The default decision was to carry these analytes forward as target analytes for characterization unless a specific basis was available to eliminate them. Specific lead agency input was incorporated in these considerations.

Analytes that were not retained for site-specific characterization at any of the proposed waste sites at the conclusion of this process are listed in Table 5 for convenience.

Table 5. Analytes Excluded for All Proposed Characterization Locations. (3 Pages)

Analyte	Exclusion Basis
1. Plutonium-241	Component of spent nuclear fuel that does not measurably contribute to potential risk relative to its ratio to other constituents of spent nuclear fuel
2. Phenol	No environmental persistence – readily biodegradable organic compound
3. Dalapon	No known discharges of herbicides to waste sites proposed for characterization. No significant detections of herbicides (relative to action thresholds) in 100 Area soil samples collected to-date.
4. DB;2,4- [4-(2,4-dichlorophenoxy)butanoic acid] (Butoxone)	
5. Dicamba	
6. Dichlorophenoxy-acetic acid; 2,4-	
7. Dichloroprop	
8. Dinoseb	
9. Picloram	
10. TP-; 2,4,5-(2,4,5-Trichlorophenoxy) Propionic acid, 2]	
11. Trichlorophenoxy-acetic acid; 2,4,5-(2,4,5-T)	
12. Aldrin	
13. Dichlorodiphenlydi-chlorethane (4,4'-DDD)	
14. Dichlorodiphenyl-di-chloro-ethylene (4,4'-DDE)	
15. Dichlorodiphenyltri-chloro-ethane (4,4'-DDT)	
16. Dieldrin	
17. Endosulfan I	
18. Endosulfan II	

Table 5. Analytes Excluded for All Proposed Characterization Locations. (3 Pages)

Analyte	Exclusion Basis
19. Endosulfan sulfate	No known discharges of pesticides to waste sites proposed for characterization. Potential incidental discharges would not be significant relative to other waste streams.
20. Endrin	
21. Endrin aldehyde	
22. Endrin ketone	
23. Hexachlorocyclo-hexane; alpha (alpha-BHC, HCH)	
24. Hexachlorocyclohexane; beta (beta-BHC, HCH)	
25. Hexachlorocyclo-hexane; delta (delta-BHC, HCH)	
26. Lindane (Gamma-BHC) (1,2,3,4,5,6-hexachlorocyclo-hexane)	
27. Heptachlor	
28. Heptachlor epoxide	
29. Methoxychlor	
30. Technical chlordane (alpha and gamma)	
31. Butylbenzylphthalate	
32. Dibenzofuran	
33. Diethylphthalate	
34. Di-n-octylphthalate	
35. Isophorone	
36. Methyl naphthalene; 2-	
37. Methyl isobutyl ketone (4-Methyl-2-pentanone)	
38. Methyl phenol; 4-	
39. N-nitrosodiphenyl-amine	
40. Pentachlorophenol	
41. Toluene	
42. Trichlorobenzene; 1,2,4-	
43. Xylenes (total)	
44. Carbazole	These organics are potentially present only in association with oils and solid bituminous materials used in construction. These compounds do not represent a significant potential contributor to cumulative risk in the quantities they would be present in relative to other polycyclic aromatic hydrocarbons.
45. Acenaphthene	
46. Anthracene	
47. Fluorene	
48. Molybdenum	Not associated with Hanford processes except as solid metals in equipment and in trace impurities.
49. Tin	
50. Titanium	
51. Vanadium	

Table 5. Analytes Excluded for All Proposed Characterization Locations. (3 Pages)

Analyte	Exclusion Basis
52. Strontium	Not significant as a non-radionuclide. Radioactive risk is a greater driver for strontium-90 than chemical risk.
53. Asbestos	Potentially present in mastic coatings and facilities, but would not have an impact to remaining soils.
54. Uranium (total)	Radioactive risk is a greater driver for uranium than chemical risk. Uranium isotopes are addressed on a site-by-site basis.
55. Nitrite	Limited environmental persistence; not associated with waste sites proposed for characterization.

The product of steps three and four is the identification of location-specific target analyte lists for the remedial investigation. Tables 6 through 14 present the target analytes that were retained and analytes that were excluded on a site-specific basis.

Table 6. 100-B-5 Trench Target Analytes. (3 Pages)

<i>Retained Analytes</i>	
Target Analyte	Inclusion Rationale
1. Americium-241	IAROD/CVP
2. Cesium-137	IAROD/CVP; groundwater COPC
3. Cobalt-60	IAROD/CVP; groundwater COPC
4. Europium-152	IAROD/CVP
5. Europium-154	IAROD/CVP
6. Europium-155	IAROD/CVP; groundwater COPC
7. Nickel-63	Potentially present with other fission products as a contributor to cumulative risk; groundwater COPC
8. Plutonium-238	IAROD/CVP
9. Plutonium-239/240	IAROD/CVP
10. Strontium-90	IAROD/CVP; groundwater COPC
11. Iodine-129	Groundwater COPC
12. Tritium	Groundwater COPC
13. Carbon-14	Groundwater COPC
14. Technetium-99	Groundwater COPC
15. Antimony	Groundwater COPC
16. Arsenic	Groundwater COPC
17. Beryllium	Groundwater COPC
18. Boron	Incomplete basis for exclusion – potentially present due to use in reactor and potential ecological risk driver
19. Cadmium	Groundwater COPC

Table 6. 100-B-5 Trench Target Analytes. (3 Pages)

20. Chromium (total)	IAROD/CVP; groundwater COPC
21. Cobalt	Groundwater COPC
22. Copper	Groundwater COPC
23. Lead	Groundwater COPC
24. Manganese	Groundwater COPC
25. Nickel	Groundwater COPC
26. Selenium	Groundwater COPC
27. Silver	Incomplete basis for exclusion
28. Thallium	Groundwater COPC
29. Zinc	Groundwater COPC
30. Mercury	IAROD/CVP; groundwater COPC
31. Chromium (hexavalent)	IAROD/CVP; groundwater COPC
32. 1,1-Dichloroethene	Groundwater COPC
33. 1,1,2,2-Tetrachloroethane	Groundwater COPC
34. Benzene	Groundwater COPC
35. Carbon tetrachloride	Groundwater COPC
36. Chloroform	Groundwater COPC
37. Tetrachloroethene	Groundwater COPC
38. Trichloroethene	Groundwater COPC
39. Vinyl chloride	Groundwater COPC
40. Nitrate	Groundwater COPC
Excluded Analytes	
Target Analyte	Exclusion Rationale
1. Uranium-233/234	Not present at activities significant for potential cumulative dose risk near the preliminary remediation goal relative to other isotopes in general radioactive liquid effluent waste. Uranium-238 was not detected above background levels in previous cleanup verification sampling.
2. Uranium-235	
3. Uranium-238	
4. Aluminum	Not associated with reactor cooling systems except as solid metals and in trace impurities.
5. Barium	
6. Lithium	
7. Benzo(a)anthracene	May have been present in former pipe mastic coatings and sealants. No significant discharge of organic chemicals to radioactive liquid effluent process sewers.
8. Benzo(a)pyrene	
9. Benzo(b)fluoranthene	
10. Benzo(k)fluoranthene	
11. Benzo(g,h,i)perylene	
12. Chrysene	
13. Dibenzo(a,h)anthracene	
14. Fluoranthene	
15. Indeno(1,2,3-cd)pyrene	

Table 6. 100-B-5 Trench Target Analytes. (3 Pages)

16. Naphthalene	Potentially present in radioactive liquid waste only as a trace impurity from sealing compounds. Past water leakage from pipelines would not contain an environmentally significant total inventory.
17. Phenanthrene	
18. Pyrene	
19. Total petroleum hydrocarbons	
20. Aroclor-1016	
21. Aroclor-1221	
22. Aroclor-1232	
23. Aroclor-1242	
24. Aroclor-1248	
25. Aroclor-1254	
26. Aroclor-1260	

COPC = contaminant of potential concern
 CVP = cleanup verification package
 IAROD = interim action Record of Decision

Table 7. 116-B-5 Crib Target Analytes. (3 Pages)

<i>Retained Analytes</i>	
Target Analyte	Inclusion Rationale
1. Cesium-137	IAROD/closure documentation; groundwater COPC
2. Cobalt-60	IAROD/closure documentation; groundwater COPC
3. Europium-152	IAROD/closure documentation
4. Europium-154	IAROD/closure documentation
5. Europium-155	IAROD/closure documentation; groundwater COPC
6. Nickel-63	Potentially present with other fission products as a contributor to cumulative risk; groundwater COPC
7. Technetium-99	Groundwater COPC
8. Tritium	Associated with site process history; groundwater COPC
9. Iodine-129	Groundwater COPC
10. Strontium-90	Groundwater COPC
11. Carbon-14	Groundwater COPC
12. Antimony	Groundwater COPC
13. Arsenic	Groundwater COPC
14. Barium	IAROD/closure documentation
15. Beryllium	Groundwater COPC
16. Boron	Incomplete basis for exclusion – potential ecological risk driver
17. Cadmium	Groundwater COPC
18. Chromium (total)	Groundwater COPC
19. Cobalt	Groundwater COPC

Table 7. 116-B-5 Crib Target Analytes. (3 Pages)

20. Copper	Groundwater COPC
21. Lead	Groundwater COPC
22. Manganese	Groundwater COPC
23. Nickel	Groundwater COPC
24. Selenium	Groundwater COPC
25. Silver	Incomplete basis for exclusion
26. Thallium	Groundwater COPC
27. Zinc	Groundwater COPC
28. Mercury	IAROD/closure documentation; groundwater COPC
29. Chromium (hexavalent)	Groundwater COPC
30. 1,1-Dichloroethene	Groundwater COPC
31. 1,1,2,2-Tetrachloroethane	Groundwater COPC
32. Benzene	Groundwater COPC
33. Carbon tetrachloride	Groundwater COPC
34. Chloroform	Groundwater COPC
35. Tetrachloroethene	Groundwater COPC
36. Trichloroethene	Groundwater COPC
37. Vinyl Chloride	Groundwater COPC
38. Nitrate	Groundwater COPC
Excluded Analytes	
Target Analyte	Exclusion Rationale
1. Americium-241	Not associated with tritium separation/production process.
2. Plutonium-238	
3. Plutonium-239/240	
4. Uranium-233/234	
5. Uranium-235	
6. Uranium-238	
7. Aluminum	Associated with tritium production process only as solid metals; no credible potential for discharge to crib.
8. Lithium	
9. Benzo(a)anthracene	May have been present in former pipe mastic coatings and sealants. No known or expected discharges of oils to crib.
10. Benzo(a)pyrene	
11. Benzo(b)fluoranthene	
12. Benzo(k)fluoranthene	
13. Benzo(g,h,i)perylene	
14. Chrysene	
15. Dibenzo(a,h) anthracene	
16. Fluoranthene	
17. Indeno(1,2,3-cd)pyrene	
18. Naphthalene	
19. Phenanthrene	
20. Pyrene	

Table 7. 116-B-5 Crib Target Analytes. (3 Pages)

21. Total Petroleum Hydrocarbons	No known or expected discharges of oils to crib.
22. Aroclor-1016	No known or expected usage of polychlorinated biphenyls associated with crib. Not detected at waste site during the limited field investigation.
23. Aroclor-1221	
24. Aroclor-1232	
25. Aroclor-1242	
26. Aroclor-1248	
27. Aroclor-1254	
28. Aroclor-1260	

COPC = contaminant of potential concern
IAROD = interim action Record of Decision

Table 8. 116-B-6B Crib Target Analytes. (3 Pages)

<i>Retained Analytes</i>	
Target Analyte	Inclusion Rationale
1. Americium-241	Potentially present - limited available characterization data
2. Cesium-137	Potentially present - limited available characterization data; groundwater COPC
3. Cobalt-60	Potentially present - limited available characterization data; groundwater COPC
4. Europium-152	Potentially present - limited available characterization data
5. Europium-154	Potentially present - limited available characterization data
6. Europium-155	Potentially present - limited available characterization data; groundwater COPC
7. Carbon-14	Potentially present - limited available characterization data; groundwater COPC
8. Nickel-63	Potentially present with other fission products as a contributor to cumulative risk; groundwater COPC
9. Technetium-99	Groundwater COPC
10. Tritium	Groundwater COPC
11. Plutonium-238	Potentially present - limited available characterization data
12. Plutonium-239/240	Potentially present - limited available characterization data
13. Iodine-129	Groundwater COPC
14. Strontium-90	Potentially present - limited available characterization data; groundwater COPC
15. Antimony	Groundwater COPC
16. Arsenic	Groundwater COPC
17. Beryllium	Groundwater COPC

Table 8. 116-B-6B Crib Target Analytes. (3 Pages)

18. Boron	Incomplete basis for exclusion – potentially present due to use in reactor and potential ecological risk driver
19. Cadmium	Groundwater COPC
20. Chromium (total)	Groundwater COPC
21. Cobalt	Groundwater COPC
22. Copper	Groundwater COPC
23. Lead	IAROD/CVP; groundwater COPC
24. Manganese	Groundwater COPC
25. Nickel	Groundwater COPC
26. Selenium	Groundwater COPC
27. Silver	Incomplete basis for exclusion
28. Thallium	Groundwater COPC
29. Zinc	Groundwater COPC
30. Mercury	Groundwater COPC
31. Chromium (hexavalent)	Groundwater COPC
32. 1,1-Dichloroethene	Groundwater COPC
33. 1,1,2,2-Tetrachloroethane	Groundwater COPC
34. Benzene	Groundwater COPC
35. Carbon tetrachloride	Groundwater COPC
36. Chloroform	Groundwater COPC
37. Tetrachloroethene	Groundwater COPC
38. Trichloroethene	Groundwater COPC
39. Vinyl Chloride	Groundwater COPC
40. Nitrate	Groundwater COPC
Excluded Analytes	
Target Analyte	Exclusion Rationale
1. Uranium-233/234	Not present at activities significant for potential cumulative dose risk near the preliminary remediation goal relative to other isotopes in general radioactive liquid effluent waste. Uranium-238 was not detected above background levels in previous cleanup verification sampling.
2. Uranium-235	
3. Uranium-238	
4. Aluminum	Not associated with irradiated spacers or general contaminated equipment except as solid materials.
5. Barium	
6. Lithium	
7. Benzo(a)anthracene	May have been present in former pipe mastic coatings and sealants. No known or expected discharges of oils to crib.
8. Benzo(a)pyrene	
9. Benzo(b)fluoranthene	
10. Benzo(k)fluoranthene	
11. Benzo(g,h,i)perylene	
12. Chrysene	
13. Dibenzo(a,h) anthracene	

Table 8. 116-B-6B Crib Target Analytes. (3 Pages)

14. Fluoranthene	No known usage of polychlorinated biphenyls at the 111-B facility or other basis for potential discharge to the crib.
15. Indeno(1,2,3-cd)pyrene	
16. Naphthalene	
17. Phenanthrene	
18. Pyrene	
19. Total petroleum hydrocarbons	
20. Aroclor-1016	
21. Aroclor-1221	
22. Aroclor-1232	
23. Aroclor-1242	
24. Aroclor-1248	
25. Aroclor-1254	
26. Aroclor-1260	

COPC = contaminant of potential concern
 CVP = cleanup verification package
 IAROD = interim action Record of Decision

Table 9. 116-B-9 French Drain Target Analytes. (3 Pages)

<i>Retained Analytes</i>	
Target Analyte	Inclusion Rationale
1. Americium-241	Incomplete basis for exclusion
2. Cesium-137	IAROD/CVP; groundwater COPC
3. Cobalt-60	IAROD/CVP; groundwater COPC
4. Europium-152	IAROD/CVP
5. Europium-154	IAROD/CVP
6. Europium-155	IAROD/CVP; groundwater COPC
7. Carbon-14	Groundwater COPC
8. Nickel-63	Potentially present with other fission products as a contributor to cumulative risk; groundwater COPC
9. Technetium-99	Groundwater COPC
10. Tritium	IAROD/CVP; groundwater COPC
11. Plutonium-238	Incomplete basis for exclusion
12. Plutonium-239/240	Incomplete basis for exclusion
13. Iodine-129	Groundwater COPC
14. Strontium-90	Incomplete basis for exclusion; groundwater COPC
15. Antimony	Groundwater COPC
16. Arsenic	Groundwater COPC
17. Beryllium	Groundwater COPC
18. Boron	Incomplete basis for exclusion – potential ecological risk driver
19. Cadmium	Groundwater COPC

Table 9. 116-B-9 French Drain Target Analytes. (3 Pages)

20. Chromium (total)	Groundwater COPC
21. Cobalt	Groundwater COPC
22. Copper	Groundwater COPC
23. Lead	Groundwater COPC
24. Lithium	Associated with site process history (solid irradiated lithium targets)
25. Manganese	Groundwater COPC
26. Nickel	Groundwater COPC
27. Selenium	Groundwater COPC
28. Silver	Incomplete basis for exclusion
29. Thallium	Groundwater COPC
30. Zinc	Groundwater COPC
31. Mercury	Groundwater COPC
32. Chromium (hexavalent)	Groundwater COPC
33. 1,1-Dichloroethene	Groundwater COPC
34. 1,1,2,2-Tetrachloroethane	Groundwater COPC
35. Benzene	Groundwater COPC
36. Carbon tetrachloride	Groundwater COPC
37. Chloroform	Groundwater COPC
38. Tetrachloroethene	Groundwater COPC
39. Trichloroethene	Groundwater COPC
40. Vinyl chloride	Groundwater COPC
41. Nitrate	Groundwater COPC
Excluded Analytes	
Target Analyte	Exclusion Rationale
1. Uranium-233/234	Not associated with tritium separation/production process.
2. Uranium-235	
3. Uranium-238	
4. Aluminum	Associated with tritium production process only as solid metals; no credible potential for discharge to crib.
5. Barium	
6. Benzo(a)anthracene	May have been present in former pipe mastic coatings and sealants. No known or expected discharges of oils to crib.
7. Benzo(a)pyrene	
8. Benzo(b)fluoranthene	
9. Benzo(k)fluoranthene	
10. Benzo(g,h,i)perylene	
11. Chrysene	
12. Dibenzo(a,h) anthracene	
13. Fluoranthene	
14. Indeno(1,2,3-cd)pyrene	
15. Naphthalene	
16. Phenanthrene	
17. Pyrene	
18. Total petroleum hydrocarbons	

Table 9. 116-B-9 French Drain Target Analytes. (3 Pages)

19. Aroclor-1016	No known or expected usage of polychlorinated biphenyls associated with crib.
20. Aroclor-1221	
21. Aroclor-1232	
22. Aroclor-1242	
23. Aroclor-1248	
24. Aroclor-1254	
25. Aroclor-1260	

COPC = contaminant of potential concern

CVP = cleanup verification package

IAROD = interim action Record of Decision

Table 10. 116-B-14 Trench Target Analytes. (3 Pages)

<i>Retained Analytes</i>	
Target Analyte	Inclusion Rationale
1. Americium-241	IAROD/CVP
2. Cesium-137	IAROD/CVP; groundwater COPC
3. Cobalt-60	IAROD/CVP; groundwater COPC
4. Europium-152	IAROD/CVP
5. Europium-154	IAROD/CVP
6. Europium-155	IAROD/CVP; groundwater COPC
7. Carbon-14	Incomplete basis for exclusion; groundwater COPC
8. Nickel-63	Potentially present with other fission products as a contributor to cumulative risk; groundwater COPC
9. Technetium-99	Groundwater COPC
10. Tritium	Groundwater COPC
11. Plutonium-238	IAROD/CVP
12. Plutonium-239/240	IAROD/CVP
13. Iodine-129	Groundwater COPC
14. Strontium-90	IAROD/CVP; groundwater COPC
15. Uranium-238	Vadose Zone COC
16. Chromium (hexavalent)	IAROD/CVP; groundwater COPC
17. Aluminum	Incomplete basis for exclusion
18. Antimony	Groundwater COPC
19. Arsenic	Groundwater COPC
20. Beryllium	Groundwater COPC
21. Boron	Incomplete basis for exclusion – potential ecological risk driver
22. Cadmium	Groundwater COPC
23. Chromium (total)	IAROD/CVP; groundwater COPC
24. Cobalt	Groundwater COPC
25. Copper	Groundwater COPC

Table 10. 116-B-14 Trench Target Analytes. (3 Pages)

26. Lead	IAROD/CVP; groundwater COPC
27. Manganese	Groundwater COPC
28. Nickel	Groundwater COPC
29. Selenium	Groundwater COPC
30. Silver	Incomplete basis for exclusion
31. Thallium	Groundwater COPC
32. Zinc	Groundwater COPC
33. Mercury	IAROD/CVP; groundwater COPC
34. Benzene	Groundwater COPC
35. Carbon tetrachloride	Groundwater COPC
36. Chloroform	Groundwater COPC
37. 1,1-Dichlorethene	Groundwater COPC
38. Tetrachloroethene	Groundwater COPC
39. Trichloroethene	Groundwater COPC
40. 1,1,2,2-Tetrachloroethane	Groundwater COPC
41. Vinyl Chloride	Groundwater COPC
42. Nitrate	Groundwater COPC
26. Aroclor-1221	Potentially present in disposed sludge, incomplete basis for exclusion
27. Aroclor-1232	
28. Aroclor-1242	
29. Aroclor-1248	
30. Aroclor-1254	
31. Aroclor-1260	
32. Aroclor-1221	
Excluded Analytes	
Target Analyte	Exclusion Rationale
1. Uranium-233/234	Not present at activities significant for potential cumulative dose risk near the preliminary remediation goal relative to other isotopes in general radioactive liquid effluent waste. Uranium-238 was not detected was not detected above background levels in previous cleanup verification sampling.
2. Uranium-235	
3. Barium	Not associated with reactor cooling systems except as solid metals and in trace impurities.
4. Lithium	

Table 10. 116-B-14 Trench Target Analytes. (3 Pages)

5. Benzo(a)anthracene	May have been present in former pipe and facility mastic coatings and sealants. No significant discharge of organic chemicals to radioactive liquid effluent process sewers.
6. Benzo(a)pyrene	
7. Benzo(b)fluoranthene	
8. Benzo(k)fluoranthene	
9. Benzo(g,h,i)perylene	
10. Chrysene	
11. Dibenzo(a,h)anthracene	
12. Fluoranthene	
13. Indeno(1,2,3-cd)pyrene	
14. Naphthalene	
15. Phenanthrene	
16. Pyrene	
17. Total petroleum hydrocarbons	

COPC = contaminant of potential concern
 CVP = cleanup verification package
 IAROD = interim action Record of Decision

Table 11. 118-B-6 Burial Ground Target Analytes. (3 Pages)

<i>Retained Analytes</i>	
Target Analyte	Inclusion Rationale
1. Tritium	IAROD/CVP; groundwater COPC
2. Iodine-129	Groundwater COPC; limited available characterization data for beta-emitters
3. Strontium-90	Groundwater COPC; limited available characterization data for beta-emitters
4. Aluminum	Associated with site process history (solid aluminum wastes)
5. Antimony	Groundwater COPC
6. Arsenic	Groundwater COPC
7. Beryllium	Groundwater COPC
8. Cadmium	Groundwater COPC
9. Chromium (total)	Groundwater COPC
10. Cobalt	Groundwater COPC
11. Copper	Groundwater COPC
12. Lead	IAROD/CVP; groundwater COPC
13. Lithium	Associated with site process history (solid lithium wastes)
14. Manganese	Groundwater COPC
15. Nickel	Groundwater COPC
16. Selenium	Groundwater COPC
17. Thallium	Groundwater COPC

Table 11. 118-B-6 Burial Ground Target Analytes. (3 Pages)

18. Zinc	Groundwater COPC
19. Mercury	IAROD/CVP; groundwater COPC
20. Chromium (hexavalent)	Groundwater COPC
21. 1,1-Dichlorethene	Groundwater COPC
22. 1,1,2,2-Tetrachloroethane	Groundwater COPC
23. Benzene	Groundwater COPC
24. Carbon tetrachloride	Groundwater COPC
25. Chloroform	Groundwater COPC
26. Tetrachloroethene	Groundwater COPC
27. Trichloroethene	Groundwater COPC
28. Vinyl chloride	Groundwater COPC
29. Nitrate	Groundwater COPC
Excluded Analytes	
Target Analyte	Exclusion Rationale
1. Americium-241	The 118-B-6 Burial Ground received a unique radionuclide waste stream by design, limited to specific tritium separation project wastes. Field-screening during remediation confirmed the absence of other potential radionuclides.
2. Cobalt-60	
3. Cesium-137	
4. Europium-152	
5. Europium-154	
6. Europium-155	
7. Carbon-14	
8. Nickel-63	
9. Technetium-99	
10. Plutonium-238	
11. Plutonium-239/240	The 118-B-6 Burial Ground received a unique radionuclide waste stream by design, limited to specific tritium separation project wastes. Field-screening during remediation confirmed the absence of other potential radionuclides.
12. Uranium-233/234	
13. Uranium-235	
14. Uranium-238	
15. Silver	Not associated with solid wastes formerly disposed at site.
16. Boron	
17. Barium	
18. Benzo(a)anthracene	
19. Benzo(a)pyrene	
20. Benzo(b)fluoranthene	
21. Benzo(k)fluoranthene	
22. Benzo(g,h,i)perylene	
23. Chrysene	
24. Dibenzo(a,h)anthracene	
25. Fluoranthene	

Table 11. 118-B-6 Burial Ground Target Analytes. (3 Pages)

26. Indeno(1,2,3-cd) pyrene	
27. Naphthalene	
28. Phenanthrene	
29. Pyrene	
30. Total petroleum hydrocarbons	
31. Aroclor-1016	
32. Aroclor-1221	
33. Aroclor-1232	
34. Aroclor-1242	
35. Aroclor-1248	
36. Aroclor-1254	
37. Aroclor-1260	

COPC = contaminant of potential concern
CVP = cleanup verification package
IAROD = interim action Record of Decision

Table 12. 118-B-8:1 Reactor Fuel Storage Basin and 118-B-8:3 Process Sewer Target Analytes. (3 Pages)

<i>Retained Analytes</i>	
Target Analyte	Inclusion Rationale
1. Americium-241	IAROD/RSVP
2. Cobalt-60	IAROD/RSVP; groundwater COPC
3. Cesium-137	IAROD/RSVP; groundwater COPC
4. Europium-152	IAROD/RSVP
5. Europium-154	IAROD/RSVP
6. Europium-155	IAROD/RSVP; groundwater COPC
7. Carbon-14	IAROD/RSVP; groundwater COPC
8. Nickel-63	IAROD/RSVP; groundwater COPC
9. Technetium-99	Groundwater COPC
10. Tritium	Groundwater COPC
11. Plutonium-238	IAROD/RSVP
12. Plutonium-239/240	IAROD/RSVP
13. Uranium -234	IAROD/RSVP
14. Uranium-235	IAROD/RSVP
15. Uranium-238	IAROD/RSVP
16. Iodine-129	Groundwater COPC
17. Strontium-90	IAROD/RSVP; groundwater COPC
18. Chromium (hexavalent)	IAROD/RSVP; groundwater COPC
19. Antimony	Groundwater COPC
20. Arsenic	IAROD/RSVP; groundwater COPC
21. Barium	IAROD/RSVP
22. Beryllium	IAROD/RSVP; groundwater COPC

Table 12. 118-B-8:1 Reactor Fuel Storage Basin and 118-B-8:3 Process Sewer Target Analytes. (3 Pages)

23. Boron	IAROD/RSVP
24. Cadmium	IAROD/RSVP; groundwater COPC
25. Chromium (total)	IAROD/RSVP; groundwater COPC
26. Cobalt	IAROD/RSVP; groundwater COPC
27. Copper	IAROD/RSVP; groundwater COPC
28. Lead	IAROD/RSVP; groundwater COPC
29. Manganese	IAROD/RSVP; groundwater COPC
30. Nickel	IAROD/RSVP; groundwater COPC
31. Selenium	IAROD/RSVP; groundwater COPC
32. Silver	IAROD/RSVP; groundwater COPC
33. Thallium	Groundwater COPC
34. Zinc	IAROD/RSVP; groundwater COPC
35. Mercury	IAROD/RSVP; groundwater COPC
36. Nitrate	Groundwater COPC
37. 1,1-Dichlorethene	Groundwater COPC
38. 1,1,2,2-Tetrachloroethane	Groundwater COPC
39. Benzene	Groundwater COPC
40. Carbon tetrachloride	Groundwater COPC
41. Chloroform	Groundwater COPC
42. Tetrachloroethene	Groundwater COPC
43. Trichloroethene	Groundwater COPC
44. Vinyl chloride	Groundwater COPC
45. Aroclor-1016	IAROD/RSVP
46. Aroclor-1221	IAROD/RSVP
47. Aroclor-1232	IAROD/RSVP
48. Aroclor-1242	IAROD/RSVP
49. Aroclor-1248	IAROD/RSVP
50. Aroclor-1254	IAROD/RSVP
51. Aroclor-1260	IAROD/RSVP
52. Benzo(a)anthracene	IAROD/RSVP
53. Benzo(a)pyrene	IAROD/RSVP
54. Benzo(b)fluoranthene	IAROD/RSVP
55. Benzo(ghi)perylene	IAROD/RSVP
56. Benzo(k)fluoranthene	IAROD/RSVP
57. Chrysene	IAROD/RSVP
58. Dibenzo(a,h)anthracene	IAROD/RSVP
59. Fluoranthene	IAROD/RSVP
60. Indeno(1,2,3-cd)-pyrene	IAROD/RSVP
61. Naphthalene	IAROD/RSVP
62. Phenanthrene	IAROD/RSVP
63. Pyrene	IAROD/RSVP

Table 12. 118-B-8:1 Reactor Fuel Storage Basin and 118-B-8:3 Process Sewer Target Analytes. (3 Pages)

64. Total petroleum hydrocarbons	Incomplete basis for exclusion - potentially present based on polycyclic aromatic hydrocarbon detections
65. Nitrate	Groundwater COPC
Excluded Analytes	
Target Analyte	Exclusion Rationale
1. Aluminum	Not associated with fuel storage basin or process sewers except as solid materials and in trace impurities.
2. Lithium	

COPC = contaminant of potential concern
IAROD = interim action Record of Decision
RSVP = remaining sites verification package

Table 13. 118-C-3:2 Reactor Fuel Storage Basin Target Analytes. (3 Pages)

Retained Analytes	
Target Analyte	Inclusion Rationale
1. Americium-241	IAROD/CVP
2. Cesium-137	IAROD/CVP; groundwater COPC
3. Cobalt-60	IAROD/CVP; groundwater COPC
4. Europium-152	IAROD/CVP
5. Europium-154	IAROD/CVP
6. Europium-155	IAROD/CVP; groundwater COPC
7. Carbon-14	IAROD/CVP; groundwater COPC
8. Nickel-63	IAROD/CVP; groundwater COPC
9. Technetium-99	Groundwater COPC
10. Tritium	Groundwater COPC
11. Plutonium-238	IAROD/CVP
12. Plutonium-239/240	IAROD/CVP
13. Uranium-233/234	IAROD/CVP
14. Uranium-235	IAROD/CVP
15. Uranium-238	IAROD/CVP
16. Iodine-129	Groundwater COPC
17. Strontium-90	IAROD/CVP; groundwater COPC
18. Antimony	Groundwater COPC
19. Arsenic	IAROD/CVP; groundwater COPC
20. Barium	IAROD/CVP
21. Beryllium	IAROD/CVP; groundwater COPC
22. Boron	IAROD/CVP
23. Cadmium	Groundwater COPC
24. Chromium (total)	IAROD/CVP; groundwater COPC
25. Cobalt	IAROD/CVP; groundwater COPC
26. Copper	IAROD/CVP; groundwater COPC

**Table 13. 118-C-3:2 Reactor Fuel Storage Basin
Target Analytes. (3 Pages)**

27. Lead	IAROD/CVP; groundwater COPC
28. Manganese	IAROD/CVP; groundwater COPC
29. Nickel	IAROD/CVP; groundwater COPC
30. Selenium	IAROD/CVP; groundwater COPC
31. Silver	Incomplete basis for exclusion
32. Thallium	Groundwater COPC
33. Zinc	IAROD/CVP; groundwater COPC
34. Chromium (hexavalent)	IAROD/CVP; groundwater COPC
35. Mercury	IAROD/CVP; groundwater COPC
36. Benzene	Groundwater COPC
37. 1,1-Dichlorethene	Groundwater COPC
38. 1,1,2,2-Tetrachloroethane	Groundwater COPC
39. Carbon tetrachloride	Groundwater COPC
40. Chloroform	Groundwater COPC
41. Tetrachloroethene	Groundwater COPC
42. Trichloroethene	Groundwater COPC
43. Vinyl chloride	Groundwater COPC
44. Aroclor-1016	IAROD/CVP
45. Aroclor-1221	IAROD/CVP
46. Aroclor-1232	IAROD/CVP
47. Aroclor-1242	IAROD/CVP
48. Aroclor-1248	IAROD/CVP
49. Aroclor-1254	IAROD/CVP
50. Aroclor-1260	IAROD/CVP
51. Benzo(a)anthracene	Incomplete basis for exclusion – potentially present due to use of mastics and oils
52. Benzo(a)pyrene	
53. Benzo(b)fluoranthene	
54. Benzo(g,h,i)perylene	
55. Benzo(k)fluoranthene	
56. Chrysene	
57. Dibenzo(a,h)anthracene	
58. Fluoranthene	
59. Indeno(1,2,3-cd)-pyrene	
60. Pyrene	
61. Total petroleum hydrocarbons	Incomplete basis for exclusion – potentially present due to use of mastics and oils
62. Nitrate	Groundwater COPC
Excluded Analytes	
Target Analyte	Exclusion Rationale
1. Aluminum	Not associated with fuel storage basin or process sewers except as solid materials and in trace impurities.
2. Lithium	

**Table 13. 118-C-3:2 Reactor Fuel Storage Basin
Target Analytes. (3 Pages)**

3. Naphthalene	These compounds do not represent a significant potential contributor to cumulative risk in the quantities they would be present in relative to other polycyclic aromatic hydrocarbons.
4. Phenanthrene	

COPC = contaminant of potential concern

CVP = cleanup verification package

IAROD = interim action Record of Decision

Table 14. 116-C-5 Retention Basin Target Analytes. (3 Pages)

<i>Retained Analytes</i>	
Target Analyte	Inclusion Rationale
1. Americium-241	IAROD/CVP
2. Cobalt-60	IAROD/CVP; groundwater COPC
3. Cesium-137	IAROD/CVP; groundwater COPC
4. Europium-152	IAROD/CVP
5. Europium-154	IAROD/CVP
6. Europium-155	IAROD/CVP; groundwater COPC
7. Carbon-14	Groundwater COPC
8. Nickel-63	IAROD/CVP; groundwater COPC
9. Technetium-99	Groundwater COPC
10. Tritium	Groundwater COPC
11. Plutonium-238	IAROD/CVP
12. Plutonium-239/240	IAROD/CVP
13. Uranium-238	IAROD/CVP
14. Iodine-129	Groundwater COPC
15. Strontium-90	IAROD/CVP; groundwater COPC
16. Chromium (hexavalent)	IAROD/CVP; groundwater COPC
17. Antimony	Groundwater COPC
18. Arsenic	Groundwater COPC
19. Beryllium	Groundwater COPC
20. Boron	Incomplete basis for exclusion – potential ecological risk driver
21. Cadmium	Groundwater COPC
22. Chromium (total)	IAROD/CVP; groundwater COPC
23. Cobalt	Groundwater COPC
24. Copper	Groundwater COPC
25. Lead	IAROD/CVP; groundwater COPC
26. Manganese	Groundwater COPC
27. Nickel	Groundwater COPC
28. Selenium	Groundwater COPC
29. Silver	Incomplete basis for exclusion
30. Thallium	Groundwater COPC

Table 14. 116-C-5 Retention Basin Target Analytes. (3 Pages)

31. Zinc	Groundwater COPC
32. Mercury	IAROD/CVP; groundwater COPC
33. Nitrate	Groundwater COPC
34. 1,1-Dichlorethene	Groundwater COPC
35. 1,1,2,2-Tetrachloroethane	Groundwater COPC
36. Benzene	Groundwater COPC
37. Carbon tetrachloride	Groundwater COPC
38. Chloroform	Groundwater COPC
39. Tetrachloroethene	Groundwater COPC
40. Trichloroethene	Groundwater COPC
41. Vinyl chloride	Groundwater COPC
42. Benzo(a)anthracene	Incomplete basis for exclusion – may be present due to use of bituminous mastics and sealants; previously detected at trace concentrations
43. Benzo(a)pyrene	
44. Benzo(k)fluoranthene	
45. Chrysene	
46. Fluoranthene	
47. Total petroleum hydrocarbons	Incomplete basis for exclusion - potentially present based on polycyclic aromatic hydrocarbon detections
Excluded Analytes	
Target Analyte	Exclusion Rationale
1. Uranium-233/234	Not present at activities significant for potential cumulative dose risk near the preliminary remediation goal relative to other isotopes in general radioactive liquid effluent waste. Uranium-238 was not detected was not detected above background levels in previous cleanup verification sampling.
2. Uranium-235	
3. Aluminum	Not associated with reactor cooling systems except as solid metals and in trace impurities.
4. Barium	
5. Lithium	
6. Benzo(b)fluoranthene	Potentially formerly present in mastics and bituminous sealants, but not detected in previous characterization sampling.
7. Benzo(g,h,i)perylene	
8. Dibenzo(a,h)anthracene	
9. Indeno(1,2,3-cd)pyrene	
10. Naphthalene	
11. Pyrene	
12. Phenanthrene	

Table 14. 116-C-5 Retention Basin Target Analytes. (3 Pages)

13. Aroclor-1016	Not detected during previous limited field investigation characterization.
14. Aroclor-1221	
15. Aroclor-1232	
16. Aroclor-1242	
17. Aroclor-1248	
18. Aroclor-1254	
19. Aroclor-1260	

COPC = contaminant of potential concern
 CVP = cleanup verification package
 IAROD = interim action Record of Decision

6.0 CONCLUSIONS

This approach provides for a systematic identification of analytes of potential interest, considering available data and recognized potential deficiencies. The analytical methods identified in Table 4 should be verified and documented in the quality assurance project plan section of the sampling and analysis plan for the 100-B/C area remedial investigation. As additional soil and groundwater data become available, other suitable exclusion criteria should be considered and evaluated for use in the target analyte list development process.

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