WCH-379
Rev. 0

River Corridor
Closure Contract

100-F Area 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

WCH
Washington
Closure
Hanford

DOCUMENT CONTROL 9/18/2012 ca8

WCH-379
Rev. 0

STANDARD APPROVAL PAGE

Title: 100-F Area Target Analyte List Development for Soil

Author Name: R. W. Ovink, Integration Project Task Lead

Approval: J. A. Lerch, Mission Completion

Signature _____ Date 9/14/12

The approval signature on this page indicates that this document has been authorized for information release to the public through appropriate channels. No other forms or signatures are required to document this information release.

WCH-379
Rev. 0

River Corridor Closure Contract

100-F Area Target Analyte List Development for Soil

March 2010

Author:
R. W. Ovink

For Public Release

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

TABLE OF CONTENTS

1.0 PURPOSE

This report documents the process used to identify source area target analytes in support of the 100-F Area 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 and 300 Area 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 and 300 Area use and the analytical methods needed to analyze the master target analytes.

2.0 APPROACH

The approach for development of vadose zone soil target analytes is a multi-step process. The first two steps develop an initial and master list of target analytes for the area. The third step is to develop location-specific (e.g., waste site) target analyte lists where additional characterization is proposed. Finally, the analyte list will receive regulatory review. During this step, concerns regarding the selection process may result in the addition of analytes by the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology, and the U.S. Department of Energy (commonly called the Tri-Parties).

Step 1 – Prepare Initial Master Target Analyte

Characterization data for vadose zone soils are not available for addressing uncertainties associated with the nature and extent of contamination in the vadose zone. Therefore, remediation and characterization information (historic and current) are identified and reviewed to develop an initial list of target analytes to represent potential contamination in the vadose zone. The following types of reference documents and information sources are evaluated:

- Focused feasibility studies (FFS), 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
- Dangerous waste permit applications
- 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 undergoes additional review steps to remove analytes using generally accepted exclusion criteria, conduct a comparison of the soil target analyte list to the groundwater COPC list, and identify the appropriate analytical methods and detection limits for the master target analyte list.

At the conclusion of this step, the master target analyte list is established. The master target analyte list is comprehensive and includes all the analytes that have the potential to be present in the vadose zone and are important for waste site remediation within the area. The following steps are taken to prepare the master target analyte list:

- Apply the following generally-accepted exclusion criteria that are listed below to the initial set of target analytes to develop the "master" target analyte list.
  - Radionuclides with a half-life of 3 years (and no significant daughters) will be eliminated as COPCs. Radionuclides with short half-lives can include antimony-125, beryllium-7, cesium-134, curium-242, radium-224, ruthenium-106, and thorium-228.
  - Naturally occurring radionuclides associated with background radiation (e.g., K-40, Th-230, Th-232, and Ra-226)
  - Essential nutrients are those chemicals considered essential for human nutrition. Recommended daily allowances are developed for essential nutrients to estimate safe and adequate daily dietary intakes (NRC, 1989, *Recommended Daily Allowances*). The following metals are considered essential nutrients: calcium, magnesium, potassium, and sodium.
  - Analytes that have no toxicity values (based on the hierarchy of toxicity values recommended by the EPA in Human Health Toxicity Values for Superfund Risk Assessments [OSWER Directive 9285.7-53).
- Compare the master target analyte list for vadose zone soil with the groundwater COPC list developed for the area. Groundwater COPCs *not* found on the master target analyte list are further evaluated to determine if there is a valid basis for their inclusion.
- Identify appropriate analytical methods for each analyte on the master target analyte list. Determine if the detection limits for each target analyte can achieve the remedial action goals for direct exposure, groundwater protection, and Columbia River protection.

Step 3 – Develop Location-Specific Target Analyte List

The master target analyte list represents all potential target analytes that could be present in the vadose zone. Location-specific target analytes will be identified from the master list using the following approach.

- Identify the contaminants of concern for the specific waste sites where characterization is proposed from the applicable interim action ROD (which reflects information from LFI and technical baseline reports). If the characterization location is not at a waste site, evaluate

information from waste sites in the vicinity (where available). Include these analytes on the location specific target analyte list.

- Identify the contaminants of concern for the specific waste site locations from the verification documentation (CVPs or RSVPs). If the characterization location is not at a waste site, evaluate information from waste sites in the vicinity (where available). Include these analytes on the location-specific target analyte list.

- Evaluate local groundwater monitoring well data (wells located within waste site "zones of influence"). Determine if groundwater COPCs have been analyzed for in these local wells.

  - If the groundwater COPCs have been analyzed for but not detected, then these analytes will not be included on the location-specific target analyte list.

  - If the groundwater COPCs have been analyzed for and have been detected, then these analytes will be included on the location-specific target analyte list.

  - If the groundwater COPCs have not been analyzed for, then an additional evaluation will be performed to determine if there is a data need. If there is a data need, these COPCs will be included on the waste-site specific target analyte list.

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

Following development of the master and location-specific target analyte lists via Steps 1, 2, and 3, the regulatory agencies will review the proposed sampling locations and their associated location-specific target analyte lists to determine if adjustments/modifications are required to address additional information needs for the area. When additional information needs are identified, the regulatory agencies will modify the locations and/or the location-specific target analyte lists to reflect the additions/modifications needed for the area.

3.0 ASSUMPTIONS

- Historical resources (e.g., LFI, qualitative risk assessment, and CVP/RSVP documents) contain contaminant lists that are comprehensive with respect to characterizing environmental impacts from 100 and 300 Area Hanford Site operations.

- 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

Initial Target Analyte Identification

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

Table 1. Documents Used to Develop the 100-F Initial Target Analyte List. (5 Pages)

Reference	Document Number	Document Type
1. Cleanup Verification Package for the 100-F-2 Strontium Garden	CVP-2001-00001	CVP
2. Cleanup Verification Package for the 100-F-19:1 and 100-F-19:3 Reactor Cooling Water Effluent Pipelines, 100-F-34 Biology Facility French Drain, and 116-F-12 French Drain	CVP-2001-00002	CVP
3. Cleanup Verification Package for the 100-F-19:2 Reactor Cooling Water Effluent Pipelines, 116-F-11 Cushion Corridor French Drain, UPR-100-F-1 Sewer Line Leak, and 100-F-29 Experimental Animal Farm Process Sewer Pipelines	CVP-2001-00003	CVP

® Microsoft and Excel are registered trademarks of Microsoft Corporation in the United States and/or other countries.

Table 1. Documents Used to Develop the 100-F Initial Target Analyte List. (5 Pages)

Reference	Document Number	Document Type
4. Cleanup Verification Package for the 116-F-2, 107-F Liquid Waste Disposal Trench	CVP-2001-00005	CVP
5. Cleanup Verification Package for the 116-F-4 Pluto Crib	CVP-2001-00006	CVP
6. Cleanup Verification Package for the 116-F-5 Ball Washer Crib	CVP-2001-00007	CVP
7. Cleanup Verification Package for the 116-F-9 Animal Waste Leaching Trench	CVP-2001-00008	CVP
8. Cleanup Verification Package for the 116-F-14 Retention Basin	CVP-2001-00009	CVP
9. Cleanup Verification Package for the 1607-F6 Septic System and Pipelines	CVP-2001-00010	CVP
10. Cleanup Verification Package for the UPR-100-F-2 Basin Leak Ditch	CVP-2001-00011	CVP
11. Cleanup Verification Package for the 100-F-4, 100-F-11, 100-F-15, and 100-F-16 French Drains	CVP-2002-00001	CVP
12. Cleanup Verification Package for the 126-F-1, 184-F Powerhouse Ash Pit	CVP-2002-00004	CVP
13. Cleanup Verification Package for the 1607-F2 Septic System	CVP-2002-00005	CVP
14. Cleanup Verification Package for the 100-F-35 Soil Contamination Site	CVP-2002-00007	CVP
15. Cleanup Verification Package for the 116-F-3 Fuel Storage Basin Trench	CVP-2002-00008	CVP
16. Cleanup Verification Package for the 116-F-1 Lewis Canal	CVP-2002-00009	CVP
17. Cleanup Verification Package for the 116-F-6 Liquid Waste Disposal Trench	CVP-2002-00010	CVP
18. Cleanup Verification Package for the 116-F-10, 105-F Dummy Decontamination French Drain	CVP-2003-00003	CVP
19. Cleanup Verification Package for the 100-F-25, 146-FR Drywell	CVP-2003-00010	CVP
20. Cleanup Verification Package for the 100-F-23, 141-C Drywell	CVP-2003-00011	CVP
21. Cleanup Verification Package for the 100-F-24, 145-F Drywell	CVP-2003-00012	CVP
22. Cleanup Verification Package for the 118-F-8:1, 105-F Reactor Below-Grade Structures and Underlying Soils; the 118-F-8:3, 105-F Fuel Storage Basin Underlying Soils; and the 100-F-10 French Drain	CVP-2003-00017	CVP
23. Cleanup Verification Package for the 118-F-7, 100-F Miscellaneous Hardware Storage Vault	CVP-2006-00007	CVP
24. Cleanup Verification Package for the 118-F-3, Minor Construction Burial Ground	CVP-2006-00008	CVP

Table 1. Documents Used to Develop the 100-F Initial Target Analyte List. (5 Pages)

Reference	Document Number	Document Type
25. Cleanup Verification Package for the 100-F-20, Pacific Northwest Laboratory Parallel Pit	CVP-2006-00009	CVP
26. Cleanup Verification Package for the 188-F-1 Burial Ground	CVP-2007-00001	CVP
27. Cleanup Verification Package for the 118-F-2 Burial Ground	CVP-2007-00002	CVP
28. Cleanup Verification Package for the 118-F-5 PNL Sawdust Pit	CVP-2007-00003	CVP
29. Cleanup Verification Package for the 118-F-8:4 Fuel Storage Basin West Side Adjacent and Side Slope Soils	CVP-2007-00004	CVP
30. Cleanup Verification Package for the 118-F-6 Burial Ground	CVP-2008-00001	CVP
31. EPA, 1999, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units*	EPA/ROD/R10-99/039	IAROD
32. Waste Site Reclassification Form for 100-F-28, January 2003	WSRF-2001-030	WSRF
33. Waste Site Reclassification Form for 132-F-4, December 2003	WSRF-2003-023	WSRF
34. Waste Site Reclassification Form for132-F-3, December 2003	WSRF-2003-025	WSRF
35. Waste Site Reclassification Form for 132-F-5, December 2003	WSRF-2003-029	WSRF
36. Waste Site Reclassification Form for 132-F-6, December 2003	WSRF-2003-032	WSRF
37. Waste Site Reclassification Form for 128-F-1, December 2003	WSRF-2003-035	WSRF
38. Waste Site Reclassification Form for 100-F-38, March 2006	WSRF-2004-093	WSRF
39. Waste Site Reclassification Form for 100-F-37, August 2004	WSRF-2004-095	WSRF
40. Waste Site Reclassification Form for 100-F-26:3 Pipelines, December 2004	WSRF-2004-118	WSRF
41. Waste Site Reclassification Form for 100-F-26:6 Pipelines, December 2004	WSRF-2004-119	WSRF
42. Waste Site Reclassification Form for 100-F-26:16 Pipelines, November 2005	WSRF-2004-120	WSRF
43. Waste Site Reclassification Form for 100-F-7, February 2005	WSRF-2004-124	WSRF
44. Waste Site Reclassification Form for 100-F-9, February 2005	WSRF-2004-125	WSRF

Table 1. Documents Used to Develop the 100-F Initial Target Analyte List. (5 Pages)

Reference	Document Number	Document Type
45. Waste Site Reclassification Form for 100-F-12, February 2005	WSRF-2004-126	WSRF
46. Waste Site Reclassification Form for 100-F-14, March 2005	WSRF-2004-127	WSRF
47. Waste Site Reclassification Form for 116-F-7:1, February 2005	WSRF-2004-128	WSRF
48. Waste Site Reclassification Form for 118-F-4, February 2005	WSRF-2004-129	WSRF
49. Waste Site Reclassification Form for 1607-F1 January 2008	WSRF-2004-130,	WSRF
50. Waste Site Reclassification Form for 1607-F4, December 2007	WSRF-2004-131	WSRF
51. Waste Site Reclassification Form for 100-F-18, February 2005	WSRF-2004-137	WSRF
52. Waste Site Reclassification Form for 100-F-26:11 Pipelines, May 2005	WSRF-2005-003	WSRF
53. Waste Site Reclassification Form for 100-F-26:2 Pipelines, May 2005	WSRF-2005-005	WSRF
54. Waste Site Reclassification Form for 100-F-26:5 Pipelines, July 2005	WSRF-2005-007	WSRF
55. Waste Site Reclassification Form for 100-F-26:1 Pipelines, July 2005	WSRF-2005-008	WSRF
56. Waste Site Reclassification Form for 100-F-26:7 Pipelines, May 2005	WSRF-2005-010	WSRF
57. Waste Site Reclassification Form for 100-F-26:13 Pipelines, March 2008	WSRF-2005-011	WSRF
58. Waste Site Reclassification Form for 182-F, September 2005	WSRF-2005-025	WSRF
59. Waste Site Reclassification Form for 132-F-4:2, November 2005	WSRF-2005-043	WSRF
60. Waste Site Reclassification Form for 116-F-7:2, November 2005	WSRF-2005-044	WSRF
61. Waste Site Reclassification Form for 126-F-2, May 2006	WSRF-2006-017	WSRF
62. Waste Site Reclassification Form for 100-F-33, August 2006	WSRF-2006-021	WSRF
63. Waste Site Reclassification Form for 141-C, May 2006	WSRF-2006-027	WSRF
64. Waste Site Reclassification Form for 132-F-1, August 2006	WSRF-2006-029	WSRF
65. Waste Site Reclassification Form for 100-F-31, August 2006	WSRF-2006-033	WSRF
66. Waste Site Reclassification Form for 116-F-8, September 2006	WSRF-2006-038	WSRF

Table 1. Documents Used to Develop the 100-F Initial Target Analyte List. (5 Pages)

Reference	Document Number	Document Type
67. Waste Site Reclassification Form for 116-F-16, September 2006	WSRF-2006-039	WSRF
68. Waste Site Reclassification Form for 1607-F7, October 2006	WSRF-2006-040	WSRF
69. Waste Site Reclassification Form for 128-F-3, October 2006	WSRF-2006-042	WSRF
70. Waste Site Reclassification Form for 1607-F5, September 2006	WSRF-2006-043	WSRF
71. Waste Site Reclassification Form for 1607-F3, April 2007	WSRF-2006-047	WSRF
72. Waste Site Reclassification Form for 100-F-41, February 2007	WSRF-2006-064	WSRF
73. Waste Site Reclassification Form for 100-F-50, April 2008	WSRF-2007-001	WSRF
74. Waste Site Reclassification Form for 100-F-36, May 2007	WSRF-2007-002	WSRF
75. Waste Site Reclassification Form for 116-F-15, May 2007	WSRF-2007-003	WSRF
76. Waste Site Reclassification Form for 100-F-44:1, April 2007	WSRF-2007-005	WSRF
77. Waste Site Reclassification Form for 100-F-44:6, April 2007	WSRF-2007-007	WSRF
78. Waste Site Reclassification Form for 100-F-44:3, June 2007	WSRF-2007-010	WSRF
79. Waste Site Reclassification Form for 100-F-44:10, October 2007	WSRF-2007-011	WSRF
80. Waste Site Reclassification Form for 100-F-44:7, August 2007	WSRF-2007-012	WSRF
81. Waste Site Reclassification Form for 100-F-26:10 Pipelines, December 2007	WSRF-2007-028	WSRF
82. Waste Site Reclassification Form for 100-F-26:14 Pipelines, February 2008	WSRF-2007-029	WSRF
83. Waste Site Reclassification Form for 100-F-53, June 2009	WSRF-2008-019	WSRF
84. Waste Site Reclassification Form for 120-F-1, May 2008	WSRF-2008-028	WSRF
85. Waste Site Reclassification Form for 128-F-2, June 2008	WSRF-2008-031	WSRF
86. Limited Field Investigation Report for the 100-FR-1 Operable Unit	DOE/RL-93-82	LFI

CVP = cleanup verification package
FFS = focused feasibility study
IAROD = Interim Action Record of Decision
LFI = limited field investigation
RSVP = remaining sites verification package
WIDS = Waste Information Data System
WSRF = waste site reclassification form

2. The initial list of target analytes presented in Table 2 was created from the review and evaluation of the Table 1 documents.

Table 2. Summary of 100-F Initial Target Analytes and References. (2 Pages)

Analyte	Reference	Analyte	Reference
Radionuclides			
1. Americium-241	CVP-2007-00001	12. Potasium-40	DOE/RL-93-82 (LFI)
2. Barium-133	CVP-2003-00017	13. Radium-226	DOE/RL-93-82 (LFI)
3. Carbon-14	CVP-2007-00001	14. Silver-108m	CVP-2007-00001
4. Cesium-137	CVP-2002-00004	15. Strontium-90	CVP-2007-00001
5. Cobalt-60	CVP-2002-00004	16. Technetium-99	CVP-2003-00017
6. Europium-152	CVP-2002-00004	17. Thorium-228	DOE/RL-93-82 (LFI)
7. Europium-154	CVP-2002-00004	18. Thorium-232	DOE/RL-93-82 (LFI)
8. Europium-155	CVP-2002-00004	19. Tritium	CVP-2007-00001
9. Nickel-63	CVP-2007-00001	20. Uranium-233/234	CVP-2003-00017
10. Plutonium-238	CVP-2007-00001	21. Uranium-235	CVP-2003-00017
11. Plutonium-239/240	CVP-2007-00001	22. Uranium-238	CVP-2003-00017
Nonradionuclides			
1. 2-butanone	DOE/RL-93-82 (LFI)	43. Cobalt	CVP-2003-00017
2. 2-hexanone	RSVP-2006-042	44. Copper	DOE/RL-93-82 (LFI)
3. 2-methyl-naphthalene	WSRF-2006-021	45. Dalapon	WSRF-2007-001
4. 4,4'-DDD	RSVP-2006-042	46. Dibenz(a,h)-anthracene	RSVP-2008-028
5. 4,4'-DDE	RSVP-2006-042	47. Dibenzofuran	WSRF-2006-029
6. 4,4'-DDT	RSVP-2006-042	48. Diethyl phthalate	WSRF-2008-031
7. 4-methyl-2-pentanone	DOE/RL-93-82 (LFI)	49. Dimethyl phthalate	WSRF-2008-031
8. Acenaphthene	WSRF-2006-017	50. Di-n-butylphalate	DOE/RL-93-82 (LFI)
9. Acetone	DOE/RL-93-82 (LFI)	51. Endosulfan I	RSVP-2008-028
10. Aldrin	RSVP-2006-042	52. Endosulfan sulfate	RSVP-2006-042
11. Anthracene	RSVP-2008-028	53. Endrin aldehyde	WSRF-2004-131
12. Antimony	RSVP-2008-028	54. Endrin ketone	RSVP-2006-042
13. Aroclor-1016 (PCB)	CVP-2007-00004	55. Ethylbenzene	RSVP-2006-042
14. Aroclor-1221(PCB)	CVP-2007-00004	56. Fluoranthene	DOE/RL-93-82 (LFI)
15. Aroclor-1232(PCB)	CVP-2007-00004	57. Fluorene	WSRF-2006-017
16. Aroclor-1242(PCB)	CVP-2007-00004	58. Fluoride	RSVP-2008-028
17. Aroclor-1248(PCB)	CVP-2007-00004	59. Heptachlor epoxide	RSVP-2006-042
18. Aroclor-1254 (PCB)	CVP-2007-00004	60. Indeno(1,2,3-cd) pyrene	WSRF-2006-017
19. Aroclor-1260 (PCB)	CVP-2007-00004	61. Lead	DOE/RL-93-82 (LFI)
20. Arsenic	DOE/RL-93-82 (LFI)	62. Manganese	CVP-2003-00017
21. Barium	CVP-2003-00017	63. Mercury	WSRF-2006-021
22. Benzo(a) pyrene	CVP-2003-00017	64. Methoxychlor	RSVP-2006-042

Table 2. Summary of 100-F Initial Target Analytes and References. (2 Pages)

Analyte	Reference	Analyte	Reference
23. Benzo(a)anthracene	CVP-2003-00017	65. Methylene chloride	DOE/RL-93-82 (LFI)
24. Benzo(b) fluoranthene	CVP-2003-00017	66. Molybdenum	WSRF-2006-021
25. Benzo(g,h,i)perylene	CVP-2003-00017	67. Napthalene	WSRF-2006-021
26. Benzo(k) fluoranthene	CVP-2003-00017	68. Nickel	CVP-2003-00017
27. Beryllium	CVP-2003-00017	69. Nitrate	WSRF-2008-028
28. BHC-Alpha	WSRF-2008-028	70. Phenanthrene	CVP-2003-00017
29. BHC-Beta	WSRF-2008-028	71. Phenol	WSRF-2006-021
30. Bis(2-ethylhexyl phthalate)	DOE/RL-93-82 (LFI)	72. Pyrene	DOE/RL-93-82 (LFI)
31. Boron	CVP-2003-00017	73. Selenium	WSRF-2006-017
32. Butyl benzyl phthalate	WSRF-2006-040	74. Silver	WSRF-2004-130
33. Cadmium	CVP-2003-00017	75. Styrene	RSVP-2006-042
34. Carbazole	WSRF-2008-031	76. Sulfate	RSVP-2008-028
35. Chlordane- Alpha	RSVP-2008-028	77. Tetrachloroethene	RSVP-2006-042
36. Chlordane-Gamma	RSVP-2008-028	78. Toluene	DOE/RL-93-82 (LFI)
37. Chloride	WSRF-2008-028	79. Total petroleum hydrocarbon	WSRF-2006-017
38. Chlorobenzene	RSVP-2006-042	80. Toxaphene	DOE/RL-93-82 (LFI)
39. Chloroform	RSVP-2006-042	81. Vanadium	CVP-2003-00017
40. Chromium (Hexavalent)	CVP-2003-00017	82. Xylene	RSVP-2006-042
41. Chromium (Total)	CVP-2003-00017	83. Zinc	DOE/RL-93-82 (LFI)
42. Chrysene	CVP-2003-00017		

NOTE: The primary references are listed for each analyte; most analytes were referenced in multiple documents.
CVP = cleanup verification package
COPC = contaminant of potential concern
LFI = limited field investigation

3. The generally accepted exclusion criteria that follow were applied to the initial soil target analyte list to identify the excluded analytes listed in Table 3 and to develop the master target analyte list presented in Table 4.

   - Radionuclides with half-lives less than 3 years (and no significant “daughters”)
   - Naturally occurring radionuclides associated with background radiation
   - Essential nutrients (minerals)
   - Analytes that have no toxicity values (per the most current CLARC Table).

Table 3. 100-F Initial Soil Analytes Excluded from Further Consideration.

Analyte	Exclusion Rationale	Half-life
Radionuclides		
1. Potasium-40	Naturally-occurring background radiation	1.28 E9 years
2. Thorium-228	Decay daughter of Th-232/Ra-228; in equilibrium with parent	1.91 years
3. Radium-226	Only potential source from naturally-occurring background radiation (insufficient in-growth time for Hanford introduced U as decay daughter of U-234/Th-230)	1.6 E3 years
4. Thorium-232	Naturally-occurring background radiation	1.4 E10 years
Nonradionuclides		
5. Chloride	Essential nutrient	
6. Sulfate	Essential nutrient	

Table 4. Master 100-F Target Analyte List. (5 Pages)

Target Analyte	Practical Quantitation Limits (PQLs)	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
Radionuclides					
1. Cesium-137	0.1	6.2	NV	NV	1. Gamma energy analysis
2. Cobalt-60	0.05	1.4	NV	NV	
3. Europium-152	0.1	3.3	NV	NV	
4. Europium-154	0.1	3.0	NV	NV	
5. Europium-155	0.1	125	NV	NV	
6. Americium-241	1	31.1	NV	NV	
7. Barium-133	0.2	11.8	NV	NV	
8. Silver-108m	0.2	2.38	NV	NV	
9. Strontium-90*	1	4.5	NV	NV	2. Gas flow proportional counting
10. Plutonium-238	1	37.4	NV	NV	3. Isotopic - plutonium
11. Plutonium-239/240	1	33.9	NV	NV	
12. Uranium-233/234	1	1.1[b]	1.1[b]	1.1[b]	4. Isotopic - uranium
13. Uranium-235	1	0.61	0.185[d]	0.185[d]	
14. Uranium-238	1	1.1[b]	1.1[b]	1.1[b]	

Table 4. Master 100-F Target Analyte List. (5 Pages)

Target Analyte	Practical Quantitation Limits (PQLs)	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
15. Carbon-14	2	5.16	NV	NV	5. Liquid scintillation counter
16. Nickel-63	30	4,026	NV	NV	
17. Technetium-99	0.25	5.7	0.46	0.46	
18. Tritium*	10	510	15.8	15.8	
Nonradionuclides					
19. Fluoride*	5	4,800	12,000	24,000	6. Anions by IC 300.0
20. Nitrate*	2.5	128,000	40	80	
21. Chromium (hexavalent)*	0.5	240	18.4	7.7	7. Cr VI 7196
22. Antimony*	6	32	5.4	25.3	8. EPA 6010 (ICP metals)
23. Arsenic*	10	20[c]	20[c]	20[c]	
24. Barium	2	16,000	1,650	3,300	
25. Beryllium*	0.5	160	63.2	126	
26. Boron	2	16,000	210	NV	
27. Cadmium*	0.5	80	0.69	0.25[d]	
28. Chromium (total)*	1	120,000	2,000	2,600	
29. Cobalt*	2	24	15.7[d]	NV	
30. Copper*	1	3,200	284	1,150	
31. Lead*	5	250	3,000	840	
32. Manganese*	5	3,760	512[c]	512[c]	
33. Molybdenum	2	400	32.3	NV	
34. Nickel*	4	1,600	130	357	
35. Selenium*	10	400	5.2[d]	1.04[d]	
36. Silver	1	400	13.6	0.884	
37. *Thallium (GW COPC)*	5	5.6	1.59	4.46	
38. Vanadium	2.5	560	2,240	NV	
39. Zinc*	1	24,000	5,970	226	
40. Mercury*	0.2	24	2.09	0.33[b]	9. EPA 7471 (Hg cold vapor)

Table 4. Master 100-F Target Analyte List. (5 Pages)

Target Analyte	Practical Quantitation Limits (PQLs)	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
41. Aroclor-1016 (PCB)	0.017	0.5	0.0942	0.000447[d]	10. EPA 8082 (PCB by GC)
42. Aroclor-1221(PCB)	0.017	0.5	0.00920[d]	0.0000437[d]	
43. Aroclor-1232(PCB)	0.017	0.5	0.00920[d]	0.0000437[d]	
44. Aroclor-1242(PCB)	0.017	0.5	0.0394	0.000187[d]	
45. Aroclor-1248(PCB)	0.017	0.5	0.0386	0.000183[d]	
46. Aroclor-1254 (PCB)	0.017	0.5	0.0664	0.000315[d]	
47. Aroclor-1260 (PCB)	0.017	0.5	0.721	0.00342[d]	
48. 2-methylnapthalene	0.33	320	2.03	4.07	11. EPA-8270 (Semi-volatiles)
49. Carbazole	0.33	50	0.314[d]	NV	
50. Dibenzofuran	0.33	160	7.36	NV	
51. Phthalate (butyl benzyl)	0.33	16,000	893	698	
52. Phthalate (bis 2-ethylhexyl)	0.33	71.4	13.9	8.01	
53. Phthalate (di-ethyl)	0.33	64,000	72.2	259	
54. Phthalate (di-methyl)	0.33	80,000	75.9	683	
55. Phthalate (di-n-butyl)	0.33	8,000	56.5	191	
56. Phenol	0.33	24,000	11	192	
57. *1,1-Dichloroethene (GW COPC)*	0.01	1.67	0.0005	0.0008	12. EPA-8260 (Volatile organics)
58. 2-butanone	0.01	48,000	19.6	NV	
59. 2-hexanone	0.02	3,200	2.73	NV	
60. 4-methyl-2-pentanone	0.01	6400	2.71	NV	
61. Acetone	0.02	72,000	28.9	NV	
62. *Carbon Tetrachloride (GW COPC)*	0.005	7.69	0.031	0.0046[c]	
63. Chlorobenzene	0.005	1,600	0.874	11.9	
64. Chloroform*	0.005	164	0.038	0.0607	
65. Ethylbenzene	0.005	8,000	6.05	53.6	
66. Methylene chloride	0.005	133	0.0218	0.0409	
67. Styrene*	0.005	33.3	0.0328	NV	
68. Tetrachloroethene*	0.005	800	0.008	0.008	

Table 4. Master 100-F Target Analyte List. (5 Pages)

Target Analyte	Practical Quantitation Limits (PQLs)	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
69. *Trichloroethene (GW COPC)*	0.005	11.2	0.00323[d]	0.0355	
70. Toluene	0.005	NV	4.65	99	
71. *Vinyl Chloride (GW COPC)*	0.001	87.5	0.00018[c]	0.0252	
72. Xylene	0.01	16,000	14.6	183	
73. Benzo(a)pyrene	0.015	0.137	2.33	0.109	13. EPA-8310 (PAH)
74. Chrysene	0.1	13.7	9.56	0.0446[d]	
75. Fluorene	0.03	3,200	101	411	
76. Indeno(1,2,3-cd)pyrene	0.03	1.37	8.33	0.389	
77. Acenaphthene	0.1	4,800	97.9	131	
78. Anthracene	0.05	24,000	1,140	9,100	
79. Benzo(a)anthracene	0.015	1.37	0.856	0.04	
80. Benzo(b) fluoranthene	0.015	1.37	2.95	0.138	
81. Benzo(g,h,i)perylene	0.03	2,400	25,700	7,070	
82. Benzo(k) fluoranthene	0.015	1.37	21.5	0.138	
83. Dibenz(a,h)anthracene	0.03	1.37	4.29	0.2	
84. Fluoranthene	0.05	3,200	631	178	
85. Napthalene	0.1	1,600	4.46	275	
86. Phenanthrene	0.05	24,000	1,140	9100	
87. Pyrene	0.05	2,400	655	2620	
88. Dalapon	0.1	2,400	0.811	1.62	14. EPA-8151 (Herbicides)
89. BHC-Alpha	0.00165	0.159	0.000545[d]	0.0006[d]	15. EPA-8081 (Pesticides)
90. Heptachlor epoxide	0.00165	0.11	0.008	0.002[d]	
91. 4,4'-DDD	0.0033	4.17	0.335	0.000464[d]	
92. 4,4'-DDE	0.0033	2.94	0.446	0.00123[d]	
93. 4,4'-DDT	0.0033	2.94	3.49	0.00965	
94. Aldrin	0.00165	0.0588	0.005	0.00016[d]	
95. Chlordane (alpha, gamma)	0.0165	2.86	2.06	0.00117[d]	
96. BHC- beta	0.00165	0.556	0.00227	0.00259	

Table 4. Master 100-F Target Analyte List. (5 Pages)

Target Analyte	Practical Quantitation Limits (PQLs)	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
97. Endosulfan I	0.00165	480	4.3	0.0833	
98. Endosulfan sulfate	0.0033	480	4.3	0.0833	
99. Endrin aldehyde	0.0033	24	0.44	0.335	
100. Endrin ketone	0.0033	24	0.44	0.335	
101. Methoxychlor	0.0165	400	64.2	26.8	
102. Toxaphene	0.165	0.909	0.153[d]	0.00173[d]	
103. Petroleum Hydrocarbons	5	2,000	2,000	NV	16. WTPH-D+

NOTE: Analytes in *italics* were added GW COPCs.

* Soil target analyte is also a GW COPC.

[a] Units are mg/kg (nonradionuclides) and pCi/g (radionuclides) unless otherwise noted. Cleanup levels are established in the most current CLARC Table (updated April 22, 2009) calculated per WAC-173-340 (Ecology 2007) using input parameters stated in the CLARC Table.

[b] Where cleanup levels are less than background, cleanup levels default to background as discussed in Sec. 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL-96-17).

[c] The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Sec. 2.1.2.1 of the 100 Area Remedial Design Report/Remedial Action Work Plan (DOE-RL-96-17).

[d] Where cleanup levels are less than PQLs, cleanup levels default to PQLs as discussed in Sec. 2.1.2.1 of the 100 Area Remedial Design Report/Remedial Action Work Plan (DOE-RL-96-17). The PQLs will be used for working levels, and will be periodically reviewed to establish if lower detection limit capabilities have become available.

Reference: Ecology, 2007, "Model Toxics Control Act Statute and Regulation," Publication No. 94-06, revised November 2007, Washington State Department of Ecology, Olympia, Washington.

AEA = alpha energy analysis
EPA = U.S. Environmental Protection Agency
GC = gas chromatograph
GW COPC = groundwater contaminant of potential concern
IC = ion chromatography
ICP = inductively coupled plasma
KPA = kinetic phosphorescence analysis
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PQL = practical quantitation limits
WTPH = Washington total petroleum hydrocarbon

NV = No value. The generic RESidual RADioactivity modeling reported in the DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* predicts the contaminant will not reach groundwater within 1,000 years.

4. This step reconciles the master soil target analytes with the groundwater COPCs developed for the area. Groundwater COPCs *not* found on the master soils list are further evaluated. The default action is to include all groundwater COPCs on the master soil target analyte list, unless there is a valid basis for their exclusion. The analytes added to Table 4 that are groundwater COPCs are presented in *italics* and labeled "*GW COPC*".

5. The appropriate analytical methods for the master target analytes, taking into account action levels and detection limits, are presented in Table 4.

Location-Specific Target Analyte Identification

1. Identify the contaminants of concern for the specific waste sites where characterization is proposed from the applicable interim action ROD (which reflects information from LFI and technical baseline reports). If the characterization location is not at a waste site, evaluate information from waste sites in the vicinity (where available). Include these analytes on the location specific target analyte list (Tables 5 through 7).

2. Identify the contaminants of concern for the specific waste site locations from the verification documentation (CVPs or RSVPs). If the characterization location is not at a waste site, evaluate information from waste sites in the vicinity (where available). Include these analytes on the location specific target analyte list (Tables 5 through 7).

3. Evaluate local groundwater monitoring well data (wells located within waste site "zones of influence"). Determine if groundwater COPCs have been analyzed for in these wells.

    a. If the groundwater COPCs have been analyzed for but not detected, then these analytes will not be included on the location specific target analyte list.

    b. If the groundwater COPCs have been analyzed for and have been detected, then these analytes are included on the location specific target analyte list.

    c. If the groundwater COPCs have not been analyzed for, then an additional evaluation will be performed to determine if there is a data need. If there is a data need, these COPCs are included on the location specific target analyte list.

The following location-specific target analyte tables present the final results of Step 3 (development of location-specific target analyte list) and Step 4 (regulatory agency review of characterization location and location-specific target analyte list).

Table 5. 116-F-14 Target Analytes, Analytical Methods, and Contract-Required Detection Limits. (2 Pages)

Target Analyte	Practical Quantitation Limits [a]	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
Radionuclides					
1. Cesium-137*	0.1	6.2	NV	NV	1. Gamma energy analysis
2. Cobalt-60	0.05	1.4	NV	NV	
3. Europium-152	0.1	3.3	NV	NV	
4. Europium-154*	0.1	3.0	NV	NV	
5. Europium-155	0.1	125	NV	NV	
6. Carbon-14*	2	5.16	NV	NV	2. Liquid scintillation counter
7. Nickel-63*	30	4,026	NV	NV	
8. *Technetium-99*	0.25	5.7	0.46	0.46	
9. *Tritium*	10	510	15.8	15.8	
10. Strontium-90*	1	4.5	NV	NV	3. Gas flow proportional counting
11. *Plutonium-238*	1	37.4	NV	NV	4. Isotopic - plutonium
Nonradionuclides					
12. *Fluoride*	5	4,800	12,000	24,000	5. Anions by IC 300.0
13. *Nitrate*	2.5	128,000	40	80	
14. *Antimony*	6	32	5.4	25.3	6. EPA 6010 (ICP metal)
15. *Arsenic*	10	20[c]	20[c]	20[c]	
16. *Barium*	2	16,000	1,650	3,300	
17. *Boron*	2	16,000	210	NV	
18. Cobalt	2	24	15.7[b]	NV	
19. Chromium (total)*	1	120,000	2,000	2,600	
20. *Copper*	1	3,200	284	1,150	
21. *Lead*	5	250	3,000	840	
22. *Manganese*	5	3,760	512[c]	512[c]	
23. *Molybdenum*	2	400	32.3	NV	
24. *Nickel*	4	1,600	130	357	
25. *Selenium*	10	400	5.2[d]	1.04[d]	
26. *Thallium*	5	5.60	1.59[d]	4.46[d]	
27. *Vanadium*	2.5	560	2,240	NV	
28. *Zinc*	1	24,000	5,970	226	

Table 5. 116-F-14 Target Analytes, Analytical Methods, and Contract-Required Detection Limits. (2 Pages)

Target Analyte	Practical Quantitation Limits [a]	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
29. Chromium (hexavalent) *	0.5	240	18.4	7.7	7. Cr VI 7196
30. *2-butanone*	0.01	48,000	19.6	NV	8. EPA-8260 (volatile organics)
31. *Acetone*	0.02	72,000	28.9	NV	
32. *Chloroform*	0.005	164	0.038	0.0607	
33. *Methylene chloride*	0.005	133	0.0218	0.0409	
34. *Trichloroethene*	0.005	11.2	0.00323[d]	0.0355	
35. *Xylene*	0.01	16,000	14.6	183	
36. *Heptachlor epoxide*	0.00165	0.11	0.008	0.002[d]	9. EPA-8081 (pesticides)

NOTE: Contaminant of potential concern from CVP-2001-00009.

* Soil target analyte is also a GW COPC.

NOTE: Analytes in *italics* were added GW COPCs.

[a] Units are mg/kg (nonradionuclides) and pCi/g (radionuclides) unless otherwise noted. Cleanup levels are established in the most current CLARC Table (updated April 22, 2009) calculated per WAC-173-340 (Ecology 2007) using input parameters stated in the CLARC Table.

[b] Where cleanup levels are less than background, cleanup levels default to background as discussed in Sec. 2.1.2.1 of the 100 Area Remedial Design Report/Remedial Action Work Plan (DOE-RL-96-17).

[c] The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Sec. 2.1.2.1 of the 100 Area Remedial Design Report/Remedial Action Work Plan (DOE-RL-96-17).

[d] Where cleanup levels are less than PQLs, cleanup levels default to PQLs as discussed in Sec. 2.1.2.1 of the 100 Area RDR/RAWP (DOE-RL-96-17).

AEA = alpha energy analysis
EPA = U.S. Environmental Protection Agency
GC = gas chromatograph
GW COPC = groundwater contaminant of potential concern
IC = ion chromatography
ICP = inductively coupled plasma
KPA = kinetic phosphorescence analysis
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PQL = practical quantitation limits

NV = No value. The generic RESidual RADioactivity modeling reported in the DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* predicts the contaminant will not reach groundwater within 1,000 years.

Table 6. 118-F-1 Location Specific Target Analyte Lists. (2 Pages)

Target Analyte	Practical Quantitation Limits [a]	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
Radionuclides					
1. Uranium-238	1	1.1[b]	1.1[b]	1.1[b]	1. Isotopic - uranium
2. Americium-241	1	31.1	NV	NV	2. Gamma energy analysis
3. Silver-108m*	0.2	2.38	NV	NV	
4. Cesium-137	0.1	6.2	NV	NV	
5. Cobalt-60	0.05	1.4	NV	NV	
6. Europium-152	0.1	3.3	NV	NV	
7. Europium-154	0.1	3.0	NV	NV	
8. Plutonium-238	1	37.4	NV	NV	3. Isotopic-Pu
9. Plutonium-239/240	1	33.9	NV	NV	
10. Strontium-90*	1	4.5	NV	NV	4. Gas flow proportional counting
11. Carbon-14*	2	5.16	NV	NV	5. Liquid scintillation counter
12. Nickel-63*	30	4,026	NV	NV	
13. *Technetium-99*	0.25	5.7	0.46	0.46	
14. Tritium*	10	510	15.8	15.8	
Nonradionuclides					
15. *Fluoride*	5	4,800	12,000	24,000	6. Anions by IC 300.0
16. *Nitrate*	2.5	128,000	40	80	
17. *Chromium (hexavalent)*	0.5	240	18.4	7.7	7. Cr VI 7196
18. *Arsenic*	10	20[c]	20[c]	20[c]	8. EPA 6010 (ICP metal)
19. *Barium*	2	16,000	1,650	3,300	
20. *Boron*	2	16,000	210	NV	
21. Cadmium	0.5	80	0.69	0.25[d]	
22. *Chromium (total)*	1	120,000	2,000	2,600	
23. *Copper*	1	3,200	284	1,150	
24. Lead*	5	250	3,000	840	
25. *Manganese*	5	3,760	512[c]	512[c]	
26. *Molybdenum*	2	400	32.3	NV	
27. *Nickel*	4	1,600	130	357	
28. *Vanadium*	2.5	560	2,240	NV	
29. *Zinc*	1	24,000	5,970	226	

Table 6. 118-F-1 Location Specific Target Analyte Lists. (2 Pages)

Target Analyte	Practical Quantitation Limits [a]	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
30. Mercury	0.2	24	2.09	0.33[b]	9. EPA 7471 (Hg cold vapor)
31. *Acetone*	0.02	72,000	28.9	NV	10. EPA-8260 (volatile organics)
32. *Chloroform*	0.005	164	0.038	0.0607	
33. *Methylene chloride*	0.005	133	0.0218	0.0409	

NOTE: Contaminant of potential concern from CVP-2007-00001.

* Soil target analyte is also a GW COPC.

NOTE: Analytes in *italics* were added groundwater COPCs.

[a] Units are mg/kg (nonradionuclides) and pCi/g (radionuclides) unless otherwise noted. Cleanup levels are established in the most current CLARC Table (updated April 22, 2009) calculated per WAC-173-340 (Ecology 2007) using input parameters stated in the CLARC Table.

[b] Where cleanup levels are less than background, cleanup levels default to background as discussed in Section 2.1.2.1 of DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*.

[c] The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*.

[d] Where cleanup levels are less than PQLs, cleanup levels default to PQLs as discussed in Section 2.1.2.1 of DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*. The PQLs will be used for working levels, and will be periodically reviewed to establish if lower detection limit capabilities have become available.

Reference: Ecology, 2007, "Model Toxics Control Act Statute and Regulation," Publication No. 94-06, revised November 2007, Washington State Department of Ecology, Olympia, Washington.

CVP = cleanup verification package
EPA = U.S. Environmental Protection Agency
GW COPC = groundwater contaminant of potential concern
IC = ion chromatography
ICP = inductively coupled plasma
PQL = practical quantitation limits
WAC = *Washington Administrative Code*

NV = No value. The generic RESidual RADioactivity modeling reported in the DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* predicts the contaminant will not reach groundwater within 1,000 years.

Table 7. 118-F-8 Location Specific Target Analyte Lists. (3 Pages)

Target Analyte	Practical Quantitation Limits	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
Radionuclides					
1. Cesium-137*	0.1	6.2	NV	NV	1. Gamma energy analysis
2. Cobalt-60*	0.05	1.4	NV	NV	
3. Europium-152	0.1	3.3	NV	NV	
4. Europium-154*	0.1	3.0	NV	NV	
5. Europium-155	0.1	125	NV	NV	
6. Americium-241*	1	31.1	NV	NV	
7. Barium-133*	0.2	11.8	NV	NV	
8. Strontium-90*	1	4.5	NV	NV	2. Gas flow proportional counting
9. Plutonium-238	1	37.4	NV	NV	3. Isotopic - plutonium
10. Plutonium-239/240	1	33.9	NV	NV	
11. Uranium-233/234	1	1.1[b]	1.1[b]	1.1[b]	4. Isotopic - uranium
12. Uranium-235	1	0.61	0.185[d]	0.185[d]	
13. Uranium-238	1	1.1[b]	1.1[b]	1.1[b]	
14. Carbon-14*	2	5.16	NV	NV	5. Liquid scintillation counter
15. Nickel-63*	30	4,026	NV	NV	
16. Technetium-99*	0.25	5.7	0.46	0.46	
17. Tritium*	10	510	15.8	15.8	
Nonradionuclides					
18. *Fluoride*	5	4,800	12,000	24,000	6. Anions by IC 300.0
19. *Nitrate*	2.5	128,000	40	80	
20. Chromium (hexavalent)*	0.5	240	18.4	7.7	7. Cr VI 7196

Table 7. 118-F-8 Location Specific Target Analyte Lists. (3 Pages)

Target Analyte	Practical Quantitation Limits	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
21. *Antimony*	6	32	5.4	25.3	8. EPA 6010 (ICP metal)
22. *Arsenic*	10	20[c]	20[c]	20[c]	
23. Barium*	2	16,000	1,650	3,300	
24. *Beryllium*	0.5	160	63.2	126	
25. *Cadmium*	0.5	80	0.69	0.25[d]	
26. *Chromium (total)*	1	120,000	2,000	2,600	
27. *Cobalt*	2	24	15.7[d]	NV	
28. *Copper*	1	3,200	284	1,150	
29. Lead*	5	250	3,000	840	
30. *Manganese*	5	3,760	512[c]	512[c]	
31. *Nickel*	4	1,600	130	357	
32. Selenium*	10	400	5.2[d]	1.04[d]	
33. *Silver*	1	400	13.6	0.884	
34. *Thallium*	5	5.6	1.59	4.46	
35. *Vanadium*	2.5	560	2,240	NV	
36. *Zinc*	1	24,000	5,970	226	
37. Mercury	0.2	24	2.09	0.33[b]	9. EPA 7471 (Hg cold vapor)
38. Aroclor-1016 (PCB)	0.017	0.5	0.0942	0.000447[d]	10. EPA 8082 (PCB by GC)
39. Aroclor-1221(PCB)	0.017	0.5	0.00920[d]	0.0000437[d]	
40. Aroclor-1232(PCB)	0.017	0.5	0.00920[d]	0.0000437[d]	
41. Aroclor-1242(PCB)	0.017	0.5	0.0394	0.000187[d]	
42. Aroclor-1248(PCB)	0.017	0.5	0.0386	0.000183[d]	
43. Aroclor-1254 (PCB)	0.017	0.5	0.0664	0.000315[d]	
44. Aroclor-1260 (PCB)	0.017	0.5	0.721	0.00342[d]	

Table 7. 118-F-8 Location Specific Target Analyte Lists. (3 Pages)

Target Analyte	Practical Quantitation Limits	Preliminary Cleanup Goals [a]			Analytical Methods
		Direct Exposure	Groundwater Protection	River Protection	
45. *Acetone*	0.02	72,000	28.9	NV	11. EPA-8260 (volatile organics)
46. *Chloroform*	0.005	164	0.038	0.0607	
47. *Methylene chloride*	0.005	133	0.0218	0.0409	
48. *Toluene*	0.005	NV	4.65	99	
49. *Trichloroethene*	0.005	11.2	0.003	0.090	
50. *Heptachlor epoxide*	0.00165	0.11	0.008	0.002[d]	12. EPA-8081 (pesticides)
51. *Uranium (total)*	1	240	3.21[b]	3.21[b]	13. U-KPA or via isotopic

NOTE: Contaminants of potential concern from CVP-2007-00004 and CVP-2003-00017.

* Soil target analyte is also a GW COPC.

NOTE: Analytes in *italics* were added groundwater COPCs.

[a] Units are mg/kg (nonradionuclides) and pCi/g (radionuclides) unless otherwise noted. Cleanup levels are established in the most current CLARC Table (updated 4/22/2009) calculated per WAC-173-340 (Ecology 2007) using input parameters stated in the CLARC Table.

[b] Where cleanup levels are less than background, cleanup levels default to background as discussed in Section 2.1.2.1 of DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*.

[c] The arsenic cleanup level of 20 mg/kg has been agreed to by the Tri-Party Agreement project managers as discussed in Section 2.1.2.1 of DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*.

[d] Where cleanup levels are less than PQLs, cleanup levels default to PQLs as discussed in Section 2.1.2.1 of DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*. The PQLs will be used for working levels and will be periodically reviewed to establish if lower detection limit capabilities have become available.

Reference: Ecology, 2007, "Model Toxics Control Act Statute and Regulation," Publication No. 94-06, revised November 2007, Washington State Department of Ecology, Olympia, Washington.

AEA = alpha energy analysis
EPA = U.S. Environmental Protection Agency
GC = gas chromatograph
GW COPC = groundwater contaminant of potential concern
IC = ion chromatography
ICP = inductively coupled plasma
KPA = kinetic phosphorescence analysis
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PQL = practical quantitation limits

NV = No value. The generic RESidual RADioactivity modeling reported in the DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* predicts the contaminant will not reach groundwater within 1,000 years.

6.0 CONCLUSIONS

This soil target analyte list development approach should be followed to identify target analytes for the other 100 and 300 Area RI/FS work plans and addenda under development

The analytical methods in Tables 4, 5, 6 and 7, particularly those identified for radionuclides, should be verified and documented in the quality assurance project plan section of the sampling and analysis plan for the 100-F Area. As additional soil data become available, other suitable exclusion criteria should be considered and evaluated for use in the target analyte list development process.

7.0 REFERENCES

The references used in this document are listed in Table 1.

APPENDIX A

100-F AREA SITE-SPECIFIC TARGET ANALYTE MEASLES CHART

Table A-1. Groundwater Measles Chart for the 116-F-14 Waste Site. (2 Pages)

Analyte Name	Analyte Class	Soil Analytical Methods	Waste Site	Groundwater Wells	
			116-F-14 Retention Basins	199-F5-1	199-F5-46
Antimony	Metal	EPA 6010 (ICP metals)	G	Nondetect	Detect
Arsenic	Metal		G	Detect	Detect
Barium	Metal			Detect	Detect
Beryllium	Metal		G	Nondetect	Nondetect
Boron	Metal			Detect	Nondetect
Cadmium	Metal		GX	Nondetect	Nondetect
Chromium (total)	Metal		CGX	Detect	Detect
Cobalt	Metal		C	Nondetect	Nondetect
Copper	Metal		G	Detect	Detect
Lead	Metal		G	Detect	Detect
Manganese	Metal		G	Detect	Detect
Molybdenum	Metal			Detect	NA
Nickel	Metal		G	Detect	Detect
Selenium	Metal		G	Detect	Detect
Thallium	Metal		G	Nondetect	Detect
Vanadium	Metal			Detect	Detect
Zinc	Metal		G	Detect	Detect
Chromium (hexavalent)	Metal	Cr VI 7196	CG	Detect	Detect
Heptachlor epoxide	Pesticides	EPA-8081		Detect	Nondetect
Cesium-137	RAD	Gamma energy analysis	CX	Detect	Nondetect
Cobalt-60	RAD		CX	Nondetect	Nondetect
Europium-152	RAD		CX	Nondetect	Nondetect
Europium-154	RAD		CX	Detect	Nondetect
Europium-155	RAD		C	Nondetect	Nondetect
Strontium-90	RAD	Gas flow proportional counting	CGX	Detect	Detect
Plutonium-238	RAD	Isotopic - plutonium		Detect	Nondetect
Plutonium-239/240	RAD		X	Nondetect	Nondetect
Carbon-14	RAD	Liquid scintillation counter	C	Nondetect	Detect
Nickel-63	RAD		C	NA	NA
Technetium-99	RAD			Detect	Nondetect
Tritium	RAD		G	Detect	Detect

Table A-1. Groundwater Measles Chart for the 116-F-14 Waste Site. (2 Pages)

Analyte Name	Analyte Class	Soil Analytical Methods	Waste Site	Groundwater Wells	
			116-F-14 Retention Basins	199-F5-1	199-F5-46
1,1-Dichloroethene	VOC	EPA-8260 (volatile organics)	G	Nondetect	Nondetect
2-butanone	VOC			Detect	Nondetect
Acetone	VOC			Detect	Detect
Carbon tetrachloride	VOC		G	Nondetect	Nondetect
Chloroform	VOC		G	Nondetect	Detect
Methylene chloride	VOC			Detect	Detect
Styrene	VOC		G	Nondetect	Nondetect
Tetrachloroethene	VOC		G	Nondetect	Nondetect
Trichloroethene	VOC		G	Nondetect	Detect
Vinyl Chloride	VOC		G	Nondetect	Nondetect
Xylene	VOC			Detect	Detect
Fluoride	WET CHEM	Anions by IC 300.0	G	Detect	Detect
Nitrate	WET CHEM		G	Detect	Detect
Sulfate	WET CHEM		G	Detect	Detect

Footnote: Nondetects represent unfiltered results.
C = identified in cleanup verification package
EPA = U.S. Environmental Protection Agency
G = identified as a groundwater contaminant of potential concern
IC = ion chromatography
ICP = inductively coupled plasma
NA = analyte was not analyzed in groundwater
RAD = radionuclide
VOC = volatile organic compound
X = Identified as an interim ROD contaminant of concern

Table A-2. Groundwater Measles Chart for the 118-F-1 Waste Site. (2 Pages)

Analyte Name	Analyte Class	Soil Analytical Methods	Waste Site	Groundwater Wells	
			118-F-1 Burial Ground	199-F8-3	199-F8-7
Antimony	Metal	EPA 6010 (ICP metals)	G	Nondetect	Nondetect
Arsenic	Metal		G	Detect	NA
Barium	Metal			Detect	Detect
Beryllium	Metal		G	Nondetect	Nondetect
Boron	Metal			Detect	NA
Cadmium	Metal		CGX	Nondetect	Nondetect
Chromium (total)	Metal		G	Detect	Nondetect
Copper	Metal		G	Detect	Detect
Lead	Metal		CGX	Detect	NA
Manganese	Metal		G	Detect	Detect
Molybdenum	Metal			Detect	NA
Nickel	Metal		G	Detect	Nondetect
Selenium	Metal		G	Nondetect	NA
Thallium	Metal		G	Nondetect	NA
Vanadium	Metal			Detect	Nondetect
Zinc	Metal		G	Detect	Nondetect
Chromium (hexavalent)	Metal	Cr VI 7196	G	Detect	Nondetect
Mercury	Metal	EPA 7471 (Hg cold vapor)	CX	Nondetect	NA
Cesium-137	RAD	Gamma energy analysis	CX	Nondetect	NA
Cobalt-60	RAD		CX	Nondetect	NA
Europium-152	RAD		CX	Nondetect	NA
Europium-154	RAD		CX	Nondetect	NA
Americium-241	RAD		C	Nondetect	NA
Silver-108m	RAD		CX	NA	NA
Strontium-90	RAD	Gas flow proportional counting	CGX	Nondetect	Detect
Plutonium-238	RAD	Isotopic - plutonium	C	Nondetect	NA
Plutonium-239/240	RAD		C	Nondetect	NA
Uranium-238	RAD	Isotopic -uranium	C	Nondetect	NA
Carbon-14	RAD	Liquid scintillation counter	CX	Detect	NA
Nickel-63	RAD		CX	NA	NA
Technetium-99	RAD			Detect	NA
Tritium	RAD		CGX	Detect	Detect

Table A-2. Groundwater Measles Chart for the 118-F-1 Waste Site. (2 Pages)

Analyte Name	Analyte Class	Soil Analytical Methods	Waste Site	Groundwater Wells	
			118-F-1 Burial Ground	199-F8-3	199-F8-7
1,1-Dichloroethene	VOC	EPA-8260 (volatile organics)	G	Nondetect	Nondetect
Acetone	VOC			Detect	Nondetect
Carbon Tetrachloride	VOC		G	Nondetect	Nondetect
Chloroform	VOC		G	Detect	Nondetect
Methylene chloride	VOC			Detect	Nondetect
Styrene	VOC		G	Nondetect	NA
Tetrachloroethene	VOC		G	Nondetect	Nondetect
Trichloroethene	VOC		G	Nondetect	Nondetect
Vinyl Chloride	VOC		G	NA	NA
Fluoride	WET CHEM	Anions by IC 300.0	G	Detect	Detect
Nitrate	WET CHEM		G	Detect	Detect
Sulfate	WET CHEM		G	Detect	Detect

Footnote: Nondetects represent unfiltered results.
C = identified in cleanup verification package
EPA = U.S. Environmental Protection Agency
G = identified as a groundwater contaminant of potential concern
IC = ion chromatography
ICP = inductively coupled plasma
NA = analyte was not analyzed in groundwater
RAD = radionuclide
VOC = volatile organic compound
X = Identified as an interim ROD contaminant of concern

Table A-3. Groundwater Measles Chart for the 118-F-8 Waste Site. (2 Pages)

Analyte Name	Analyte Class	Soil Analytical Methods	Waste Site	Groundwater Wells		
			118-F-8 Reaction Fuel Storage Basin	199-F8-2	199-F5-4	199-F5-48
Antimony	Metal	EPA 6010 (ICP Metals)	G	Nondetect	Detect	Nondetect
Arsenic	Metal		G	Detect	Detect	Detect
Barium	Metal		C	Detect	Detect	Detect
Beryllium	Metal		G	Detect	Detect	Detect
Cadmium	Metal		G	Nondetect	Detect	Nondetect
Chromium (total)	Metal		G	Detect	Detect	Detect
Cobalt	Metal			Nondetect	Detect	Nondetect
Copper	Metal		G	Detect	Detect	Detect
Lead	Metal		CG	Detect	Detect	Detect
Manganese	Metal		G	Detect	Detect	Detect
Nickel	Metal		G	Detect	Nondetect	Detect
Selenium	Metal		G	Detect	Detect	Detect
Silver	Metal			Detect	Detect	Nondetect
Thallium	Metal		G	Nondetect	Detect	Nondetect
Uranium (total)	Metal		C	Detect	Detect	Detect
Vanadium	Metal			Detect	Detect	Detect
Zinc	Metal		G	Detect	Detect	Detect
Chromium (hexavalent)	Metal	Cr VI 7196	CG	NA	NA	NA
Mercury	Metal	EPA 7471 (Hg cold vapor)	C	Nondetect	Nondetect	Nondetect
Aroclor-1016 (PCB)	PCB	EPA 8082 (PCB by GC)	C	Nondetect	Nondetect	Nondetect
Aroclor-1254 (PCB)	PCB		C	Nondetect	Nondetect	Nondetect
Aroclor-1260 (PCB)	PCB		C	Nondetect	Nondetect	Nondetect
Heptachlor epoxide	Pesticides	EPA-8081 (pesticides)		Detect	Nondetect	Nondetect
Cesium-137	RAD	Gamma energy analysis	C	Nondetect	Detect	Nondetect
Cobalt-60	RAD		C	Detect	Detect	Nondetect
Europium-152	RAD		C	Nondetect	Nondetect	Nondetect
Europium-154	RAD		C	Detect	Nondetect	Nondetect
Europium-155	RAD		C	Nondetect	Nondetect	Nondetect
Americium-241	RAD		C	Nondetect	Nondetect	Detect
Barium-133	RAD		C	NA	NA	NA

Table A-3. Groundwater Measles Chart for the 118-F-8 Waste Site. (2 Pages)

Analyte Name	Analyte Class	Soil Analytical Methods	Waste Site	Groundwater Wells		
			118-F-8 Reaction Fuel Storage Basin	199-F8-2	199-F5-4	199-F5-48
Strontium-90	RAD	Gas flow proportional counting	CG	Detect	Detect	Detect
Plutonium-238	RAD	Isotopic - plutonium	C	Nondetect	Nondetect	Nondetect
Plutonium-239/240	RAD		C	Nondetect	Nondetect	Nondetect
Uranium-233/234	RAD	Isotopic - uranium	C	Nondetect	Nondetect	Nondetect
Uranium-235	RAD		C	Nondetect	Nondetect	Nondetect
Uranium-238	RAD		C	Nondetect	Nondetect	Nondetect
Carbon-14	RAD	Liquid scintillation counter	C	Detect	Detect	Detect
Nickel-63	RAD		C	NA	NA	NA
Technetium-99	RAD		C	Nondetect	Detect	Detect
Tritium	RAD		CG	Detect	Detect	Detect
1,1-Dichloroethene	VOC	EPA-8260 (volatile organics)	G	Nondetect	Nondetect	Nondetect
Acetone	VOC			Nondetect	Detect	Nondetect
Carbon Tetrachloride	VOC		G	Nondetect	Nondetect	Nondetect
Chloroform	VOC		G	Nondetect	Detect	Detect
Methylene chloride	VOC			Detect	Detect	Detect
Styrene	VOC		G	Nondetect	Nondetect	Nondetect
Tetrachloroethene	VOC		G	Nondetect	Nondetect	Nondetect
Toluene	VOC			Detect	Nondetect	Nondetect
Trichloroethene	VOC		G	Detect	Detect	Detect
Vinyl Chloride	VOC		G	Nondetect	Nondetect	Nondetect
Fluoride	WET CHEM	Anions by IC 300.0	G	Detect	Detect	Detect
Nitrate	WET CHEM		G	Detect	Detect	Detect
Sulfate	WET CHEM		G	Detect	Detect	Detect

Footnote: Nondetects represent unfiltered results.
C = identified in cleanup verification package
EPA = U.S. Environmental Protection Agency
G = identified as a groundwater contaminant of potential concern
GC = gas chromatograph
IC = ion chromatography
NA = analyte was not analyzed in groundwater
PCB = polychlorinated biphenyl
RAD = radionuclide
VOC = volatile organic compound

DISTRIBUTION

U.S. Department of Energy
Richland Operations Office

J. Zeisloft	A3-04
G. Sinton	A3-04

Washington Closure Hanford

J. A. Lerch	H4-22
K. M. Singleton	H4-22

Document Control	H4-11
DOE-RL Public Reading Room	H2-53
Hanford Technical Library	P8-55