0097959

TRI-PARTY AGREEMENT

Change Notice Number TPA-CN- 351	TPA CHANGE NOTICE FORM	Date: 04/29/2010
Document Number, Title, and Revision: DOE/RL-2009-44, *Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study*, Rev. 0		Date Document Last Issued: March 23, 2010
Originator: John Winterhalder/Nathan Bowles		Phone: 373-2522/373-0377

Description of Change:
This change replaces pages 1-1 to 1-2, 1-5 to 1-6, 3-3 to 3-4, and 3-15 to 3-16 with the attached. These changes are in addition to those issued in TPA CN-348. Pages 3-15 to 3-16(attached) contain changes in addition to those included in TPA CN-348; and the pages supercede those issued under TPA CN-348.

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

RECEIVED
AUG 08 2011
EDMC

Note: Include affected page number(s)

Justification and Impacts of Change:
These changes remove collection and analysis of a sample from location C-7 and revise estimated total sample counts. It was concluded during meetings with DOE and EPA that numerous chromium batch leach samples from borings within the 100-BC area will be collected; so, a specific sample does not need to be planned from C-7. During verification sampling (under scope of a different document), enough sample material will be collected to run a batch leach test if determined it is desired.

Approvals:

DOE Project Manager	5-10-2010 Date	[X] Approved [ ] Disapproved
EPA Project Manager	5.13.10 Date	[X] Approved [ ] Disapproved

1 Introduction

This sampling and analysis plan (SAP) supports the remedial investigation (RI)/feasibility study (FS) process for 100-BC. The 100-BC Area is located on the Hanford Site in southeastern Washington and is associated with two source operable units (OUs), 100-BC-1 OU and 100-BC-2 OU. The 100-BC-5 Groundwater OU underlies the two-source operable units. This SAP describes the sampling and analysis to be performed associated with environmental investigation borings (boreholes), test pits, and groundwater monitoring wells. Figure 1-1 shows the location of the planned and existing boreholes, test pits, and groundwater monitoring wells within the scope of this SAP. Table 1-1 presents the intersection of data gaps discussed in the addendum and sampling and analysis activities. The 100-BC RI/FS Work Plan, Chapter 2, describes the site background and, environmental setting of 100-BC (DOE/RL-2008-46-ADD3, *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan Addendum 3: 100 BC-1, 100-BC-2, and 100-BC-5 Operable Units)*.

Table 1-1. Plan Activities and Data Gaps

Planned Activity	100-BC Quantity	100-BC Location	Data Needs No.
New boreholes (vadose zone)*	7	100-B-5 Trench 116-B-5 Crib 116-B-14 Trench 116-C-5 Retention Basin 118-B-6 Burial Ground 118-B-8:1 Reactor Fuel Storage Basin 118-C-3 Reactor Fuel Storage Basin	2, 3
New test pits (vadose zone)	3	116-B-6B Crib 116-B-9 French Drain 118-B-8:3 Process Sewer	2
New wells (unconfined aquifer)*	5	Well No. 1 Well No. 2 Well No. 3 Well No. 4 Well No. 5	4, 7
New well (Water-bearing Ringold Upper Mud Unit)*	1	Well No. 6	4, 6
Groundwater upwelling (pore water) samples	10	10 existing locations, with additional locations possible based on results	5
Sample spatial/temporal uncertainty groundwater monitoring wells	18	18 existing locations (includes 4 monitoring wells installed under DOE/RL-2009-61)	8

Notes:

* Boreholes and groundwater monitoring wells will be logged with a neutron moisture tool and the high resolution, spectral gamma ray logging system. Geologic samples also will be logged.

This revised Section 1 and Table 1-1 (pages 1-1 and 1-2) were approved under TPA-CN-351

This page intentionally left blank.

1.1 Vadose Zone Characterization

This SAP describes activities planned to characterize the vadose zone at 10 waste sites within 100-BC, and at six groundwater monitoring well locations. The following waste sites will be characterized by drilling a borehole to groundwater within the waste site boundary.

- 100-B-5 Trench
- 116-B-5 Crib
- 116-B-14 Trench
- 116-C-5 Retention Basin
- 118-B-6 Burial Ground
- 118-B-8 Reactor Fuel Storage Basin
- 118-C-3 Reactor Fuel Storage Basin

Additionally, the following waste sites will be characterized by test pit excavations.

- 116-B-6B Crib
- 116-B-9 French Drain
- 118-B-8:3 Process Sewer

Groundwater wells drilled as part of the 100-BC RI also will have vadose zone soil samples collected during drilling. Samples will be collected and analyzed to evaluate the nature and extent of contamination at the subject waste sites.

1.2 Groundwater Characterization

Groundwater samples will be collected and analyzed from new and existing groundwater monitoring wells. The groundwater monitoring wells will be sampled and analyzed to define the extent of contamination and to support evaluation of contaminant transport. Where possible, new well locations and construction have been selected to satisfy multiple project data needs, such as delineating vadose zone and groundwater contamination. In addition, pore water will be sampled as presented in Section 3.5.2.

1.3 Target Analytes and Contaminants of Potential Concern

This section presents the master soil and groundwater contaminant lists.

1.3.1 Soil Target Analytes

Table 1-2 presents the soil target analytes. The detailed bases of target analyte selection is provided in Appendix D. Waste site-specific constituents for analysis are based on the master list.

Table 1-2. Master Soil Target Analyte List for the 100-BC OUs

Radionuclides	Non-radionuclides		
Americium-241	Butylbenzylphthalate	Lindane (Gamma-BHC) (1,2,3,4,5,6-hexachlorocyclo-hexane)	Nickel
Cobalt-60	Carbazole	Heptachlor	Selenium

Table 1-2. Master Soil Target Analyte List for the 100-BC OUs

Radionuclides	Non-radionuclides		
Cesium-137	Dibenzofuran	Heptachlor epoxide	Silver
Europium-152	Diethylphthalate	Methoxychlor	Strontium
Europium-154	Di-n-octylphthalate	Technical chlordane (alpha and gamma)	Thallium
Europium-155	Isophorone	Acenaphthene	Tin
Carbon-14	Methylnaphthalene; 2-	Anthracene	Titanium
Nickel-63	Methylphenol; 4- (p-cresol)	Benzo(a)anthracene	Vanadium
Technetium-99	N-nitrosodiphenyl-amine	Benzo(a)pyrene	Zinc
Tritium	Pentachlorophenol	Benzo(b)fluoranthene	Benzene
Plutonium-238	Phenol	Benzo(k)fluoranthene	1,1-Dichloroethene
Plutonium-239/240	Trichlorobenzene; 1,2,4-	Benzo(g,h,i)perylene	1,1,2,2-Tetrachloroethane
Plutonium-241	Dalapon	Chrysene	Carbon tetrachloride
Uranium-233/234	DB;2,4- [4-(2,4-dichlorophenoxy)butanoic acid] (Butoxone)	Dibenzo(a,h) anthracene	Chloroform
Uranium-235	Dicamba	Fluoranthene	Methyl isobutyl ketone (4-Methyl-2-pentanone)
Uranium-238	Dichlorophenoxy-acetic acid; 2,4-	Fluorene	Tetrachloroethene
Iodine-129	Dichloroprop	Indeno(1,2,3-cd)pyrene	Trichloroethene
Strontium-90	Dinoseb	Naphthalene	Toluene
	Picloram	Phenanthrene	Vinyl chloride
	TP-; 2,4,5-(2,4,5-Trichlorophenoxy) Propionic acid, 2]	Pyrene	Xylenes (total)
	Trichlorophenoxy-acetic acid; 2,4,5- (2,4,5-T)	Aluminum	Nitrate
	4,4'-Dichlorodiphenyldi-chlorethane	Antimony	Nitrite
	4,4-Dichlorodiphenyldi-chloro-ethylene	Arsenic	Asbestos
	4,4-Dichlorodiphenyltri-chloro-ethane	Barium	Chromium (hexavalent)
	Aldrin	Beryllium	Mercury
	Hexachlorocyclo-hexane; alpha (alpha-BHC, HCH)	Boron	Aroclor-1016 (PCB)
	Hexachlorocyclohexane; beta (beta-BHC, HCH)	Cadmium	Aroclor-1221 (PCB)

structure and sample at 1.5 m (5 ft) intervals. The soil sampling frequency will be continuous within 3.1 m (10 ft) of the expected water table. Vadose zone samples will be collected according to the sampling scheme shown in Table 3-1. The sampling scheme for each borehole and groundwater monitoring wells includes collecting soil samples periodically throughout the vadose zone, and collecting one sample of aquifer sediments 1.5 m (5 ft) into the water table. Groundwater samples will be collected from boreholes and wells as described in Section 3.5.2. Additional samples may be collected and drilling depth may be extended based on observations made in the field.

Physical property samples will be collected to provide site-specific values to support modeling efforts. The physical property samples will be collected from lithologies representing major facies in the vadose zone. The physical property samples will be collected in conjunction with split-spoon sample intervals, where possible.

3.5.1.1 Field Screening

Radiological field screening data, visual observation of lithologies, visual observation of contamination, or site geologist professional judgment may be used to adjust sampling points presented in Table 3-1, assist in determining sample shipping requirements, and support worker health and safety monitoring. Section 3.6.3 describes radiological field screening methods.

3.5.1.2 Geophysical Logging

The planned boreholes and groundwater monitoring wells will be geophysically logged with the high resolution, spectral gamma ray logging system to determine the vertical distribution and concentration of gamma emitting radionuclides. Soil moisture will be determined using a neutron logging tool. The boreholes and groundwater monitoring wells will be logged before the casing is telescoped and before the borehole is decommissioned. The starting point for logging will be recorded; this is usually at the ground surface or the top of the casing. Boreholes will be decommissioned with RL and EPA approval, in accordance with WAC 173-160 after geophysical logging and all sampling are completed.

Table 3-1. Borehole and Groundwater Well Sample/Measurement Locations and Depths

Sampling Location	Soil/Aquifer Sediment Sample/Measurement[a]		Water Sample/Measurement	
	Sample Interval Depth (ft bgs)	Analyte Property List	Sample Interval Depth (ft bgs)	Analyte List
100-B-5 Trench One borehole to 5 ft below groundwater (approximately 73 ft bgs) Justification: The 100-B-5 Trench was selected for characterization because mercury and chromium are above screening levels for groundwater protection at a depth of 28 ft below surface. No other contaminants were above screening levels for protection of groundwater. Although, strontium and hexavalent chromium were detected below screening for groundwater protection, this site is also selected because it is located correlative to the two respective groundwater plumes. A portion of the 100-B-8 and 100-C-6 effluent pipelines are located adjacent to this site, therefore data will also be provided to characterize process pipelines.	28-30.5, 33-35.5, 38-40.5, 43-45.5, 48-50.5, 53-55.5, 58-60.5, 63-65.5, 65.5-68, 68-70.5, 70.5-73 (75.5-78 aquifer sediment sample[b]) by split spoon (12 samples [estimated])	Target analytes and field screening parameters batch leach in accordance with Table 2-2. Batch leach test in accordance with Table 2-13. Aquifer sediment sample will only be analyzed for strontium-90, metals, hexavalent chromium, and mercury.	During drilling 75.5 ft to 78 ft bgs, collect one filtered groundwater sample from unconfined aquifer[b] (1 sample). Expedited turnaround time for Cr(VI) analysis will be requested.	Table 1-3 constituents (in accordance with Table 2-14). Field screening parameters (in accordance with Table 2-14).
	Major formation and lithology changes samples by split spoon (2 samples [estimated])	Physical properties in accordance with Table 2-2.		

DOE/RL-2009-44, REV. 0

Table 3-1. Borehole and Groundwater Well Sample/Measurement Locations and Depths

Sampling Location	Soil/Aquifer Sediment Sample/Measurement[a]		Water Sample/Measurement	
	Sample Interval Depth (ft bgs)	Analyte Property List	Sample Interval Depth (ft bgs)	Analyte List
Well No. 6 Install borehole reaching a total depth approximately 50 ft within the RUM and screened in the first water bearing unit of the RUM in 100-BC	During drilling, archive samples of drill cuttings will be grab collected every 5 ft or where lithology changes occur in a pint jar and a chip tray.	Geologic archive samples[b].	Sample water-producing zone in RUM (1 sample).	Table 1-3 constituents (in accordance with Table 2-14). Field screening parameters (in accordance with Table 2-14).
	During drilling, samples to be collected every 5 ft in the RUM unit by split spoon (10 samples [estimated])	In accordance with Tables 2-12 and 2-13: • Batch leach test • Distribution coefficient • Radiological methods. • Physical properties • EPA Methods 7196 and 6010		
Sample 18 spatial/temporal uncertainty monitoring wells (Table 3-2); multiple rounds. (This includes existing wells and 4 groundwater monitoring wells installed under Sampling and Analysis Plan DOE/RL-2009-61).	None	None	Multiple sampling rounds to support remedial investigation (18 wells × 3 rounds = 54 samples).	Table 1-3 constituents at standard turnaround time in accordance with Table 2-14. Field screening parameters in accordance with Table 2-14.

DOE/RL-2009-44, REV. 0

Table 3-1. Borehole and Groundwater Well Sample/Measurement Locations and Depths

Sampling Location	Soil/Aquifer Sediment Sample/Measurement[a]		Water Sample/Measurement	
	Sample Interval Depth (ft bgs)	Analyte Property List	Sample Interval Depth (ft bgs)	Analyte List
Sample pore water at 10 (minimum) locations selected for Phase III sampling under *Remedial Investigation Work Plan for Hanford Site Releases to the Columbia River* (DOE/RL-2008-11)	None	None	A minimum of one round of sampling will occur. Exact locations to be identified in the field based on favorable flow, temperature, and conductivity measurements. (10 locations x 1 round = 10 samples).	Total chromium and hexavalent chromium in accordance with Table 1-15. Additional analytes as agreed upon by DOE and EPA.
Estimated number of samples	Soil/aquifer sediment chemical: 144 Physical property: 87 Geologic archive samples: variable		Water samples collected during drilling: 103 Spatial/temporal uncertainty samples: 54 Pore water samples: 10	
Estimated minimum number of field QC samples	Soil/aquifer sediment chemical: 25 (8 equipment rinsate blank, 8 field blank, 8 duplicate, 1 split) Physical property: 0 Geologic archive samples: 0		Water samples collected during drilling: 19 (6 equipment rinsate blank, 6 field blank, 6 duplicate, 1 split) Spatial/temporal uncertainty samples: 10 (3 equipment rinsate blank, 3 field blank, 3 duplicate, 1 split) Pore water samples: 4 (1 equipment rinsate blank, 1 field blank, 1 duplicate, 1 split)	
Total number of samples	Soil/aquifer sediment chemical: 169 Physical property: 87 Geologic archive samples: variable		Water samples collected during drilling: 122 Spatial/temporal uncertainty samples: 64 Pore water samples: 14	

DOE/RL-2009-44, REV. 0