TRI-PARTY AGREEMENT

Change Notice Number TPA-CN- 0865	TPA CHANGE NOTICE FORM	Date: September 12, 2019
Document Number, Title, and Revision: DOE/RL-2013-35-ADD10, *100-HR-3 Groundwater Operable Unit Well Installation Sampling and Analysis Plan, Addendum 10: 199-D1-1, 199-D7-7, 199-H1-12, 199-H3-21, 199-H3-31, 199-H3-32, 199-H7-1, 699-95-48C, and 699-97-47D*, Rev. 0		Date Document Last Issued: January 2018
Approved Change Notices Against this Document: N/A		
Originator: K. Ivarson		Phone: 509-376-1941

Description of Change:
DOE/RL-2013-35-ADD10 is amended to reflect the change of well 699-97-47D from unconfined extraction well to RUM extraction well. Analytical requirements are to follow the current HASQARD requirements and are added to the document.

M. W. Cline (**DOE**) and K. Welsch / L. 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.*

The following changes were made:

- The Table of Contents is updated and new Tables 8, 9, 10, and 11 are added to the Table of Tables
- The well type for well 699-97-47D is changed in Tables 1 and 2
- Changes to text in section "2 Technical Justification"
- Information for well C9925 in Table 3 is updated
- Well 699-97-47D is removed from Table 4
- A new "Table 8. RUM Extraction Well 699-97-47D Sample Analytes" is added on page 17
- A new section "3 Analytical Requirements" is added, containing new tables 9 through 11 of the analytical requirements for wells 699-97-47D, 199-D1-1, 199-D7-7, 199-H3-31, and 699-95-48C
- Section "3 References" is renumbered to section "4 References"
- The page number for section "4 References" is changed from page 17 to 23
- References cited in newly added Table 9 are added to the References section on pages 23 and 24

Additions are shown using double underline. Deletions are shown using ~~strikeout~~.

Note: Include affected page number(s): v, 1, 10, 11, 12, 16, 17, 18 through 24

Justification and Impacts of Change:
Plume conditions have changed. It has been realized that extraction in the unconfined aquifer is no longer needed. However, contamination in RUM is present in the central Horn area. Therefore, the change from unconfined extraction well to RUM extraction well is for increased hydraulic control and plume management in the RUM aquifer.

Analytical requirements are updated to follow the current HASQARD requirements, and are included in newly added analytical requirement tables for wells 699-97-47D, 199-D1-1, 199-D7-7, 199-H3-31, and 699-95-48C.

Approvals:

DOE	9/25/2019 Date	[X] Approved [ ] Disapproved
EPA	9/25/2019 Date	[X] Approved [ ] Disapproved
Ecology	9/25/2019 Date	[X] Approved [ ] Disapproved

Contents

Figures

Tables

1 Introduction

This Addendum 10 for DOE/RL-2013-35, *100-HR-3 Groundwater Operable Unit Well Installation Sampling and Analysis Plan*, contains site-specific field sampling plans for the wells proposed and identified in Table 1.

Table 1. Proposed Wells

Borehole Identification	Well			Easting (X)	Northing (Y)
	Name	Type	Diameter (cm [in.])		
C9935	199-D1-1	Unconfined injection well	15.2 (6)	574551	151048
C9722	199-D7-7	RUM monitoring well	15.2 (6)	574433	152668
C9926	199-H1-12	Unconfined monitoring well	15.2 (6)	576597.9	153898.8
C9923	199-H3-21	Unconfined extraction well	15.2 (6)	578130	152633
C9723	199-H3-31	RUM monitoring well	15.2 (6)	578151.45	152364.23
C9724	199-H3-32	RUM monitoring well	15.2 (6)	577710	153063
C9719	199-H7-1	RUM monitoring well	15.2 (6)	575643	153389
C9930	699-95-48C	RUM monitoring well	15.2 (6)	575230.4	152573.6
C9925	699-97-47D	~~Unconfined~~ RUM extraction well	15.2 (6)	575687.5	152937.7

RUM = Ringold Formation upper mud

The objectives and requirements of these wells are defined in SGW-60843, *FY2018 Plume Containment and Remediation Utilization Plan*, and described in general in this report. The following figures are included in this addendum:

- Figure 1 presents the proposed well locations.
- Figure 2 presents the well construction diagram for wells completed in the unconfined aquifer. General well construction can also found in Section 3.2.5 of DOE/RL-2013-35.
- Figure 3 presents the construction diagram for wells completed in the first water-bearing unit of the Ringold Formation upper mud (RUM). Wells encountering separate aquifers will use multiple casing strings as needed.
- Figures 4 through 8 show the sample intervals and general lithology for each well.

Post-development samples will be analyzed on an expedited turnaround time to ensure that the contaminant concentrations are as expected prior to connection to the HX or DX pump and treat (P&T) system. The wells will be added to DOE/RL-2013-30, *Sampling and Analysis Plan for 100-HR-3 Groundwater Operable Unit Monitoring*, through a Tri-Party Agreement (TPA) (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) Change Notice. Quality control and assessment elements and acceptance criteria associated with field samples for analysis of hexavalent chromium (Cr[VI]) in water will adhere to DOE/RL-2013-30.

Following completion, wells will be transitioned to the 100-HR-3 groundwater monitoring schedule for 2 years of quarterly sampling to establish baseline conditions. Samples will be collected for the same list of parameters as described for post-development unless the contaminant is below the detection limits. After the establishment of baseline conditions, the well sampling schedule will be re-evaluated and modified through a TPA Change Notice for DOE/RL-2013-30, as needed.

2 Technical Justification

P&T and monitoring wells planned for drilling in FY 2018 will help remediate known groundwater contamination in the unconfined aquifer and provide critical information on the nature and extent of Cr(VI) contamination in the RUM water-bearing unit. Characterization and monitoring samples from the water-bearing and confining layers of the RUM will provide a deeper and necessary understanding of the hydraulic and lithologic properties of this lower aquifer along with its relationships with the unconfined aquifer and Columbia River.

~~Three~~ Two of the three ~~four~~ wells planned for completion as unconfined aquifer wells (199-D1-1~~,~~and 199-H1-12~~, and 699-97-47D~~) will be drilled into the RUM aquifer to collect soil and water samples in this deeper aquifer. The RUM section of the boreholes will be sealed and decommissioned prior to final completion as unconfined aquifer wells. The technical justification for the wells is summarized in Table 2.

Table 2. Technical Needs and Justification Summary

Proposed Well	Technical Justification	Well Use (Aquifer)
199-D1-1	This well will be completed in the unconfined aquifer to increase injection capacity in the 100-D Area. Samples collected during drilling and post-development will provide characterization of contaminants on the southeastern margin of 100-D and southern boundary of 100-HR-3. Characterization samples in the RUM aquifer collected during drilling will provide additional characterization of the lower aquifer.	Injection (unconfined)
199-D7-7	This well will be completed in the uppermost RUM aquifer as a monitoring well to help define the extent of the Cr(VI) plume in the RUM aquifer between the 100-D Area and the Horn. It will also help provide additional characterization of this lower aquifer.	Monitoring (RUM)
199-H1-12	This well will be completed in the unconfined aquifer as a monitoring well to help evaluate the degree of hydraulic containment and river shoreline protection of the Cr(VI) plume at the northeastern extent of 100-HR-3. Samples collected in the RUM aquifer during drilling provide additional characterization of the lower aquifer.	Monitoring (unconfined)

Table 2. Technical Needs and Justification Summary

Proposed Well	Technical Justification	Well Use (Aquifer)
199-H3-21	This well will be completed in the unconfined aquifer as an extraction well near the former 107-H retention basin where elevated concentrations of Cr(VI) and strontium-90 persist. P&T extraction in this location will improve river protection and mass removal of Cr(VI) and strontium-90. There are existing wells drilled and completed in the RUM aquifer nearby, so additional RUM characterization sampling is not necessary in this borehole.	Extraction (unconfined)
199-H3-31	This well will be completed in the uppermost RUM aquifer as a monitoring well to assist in defining the southeastern extent of the Cr(VI) plume in the RUM aquifer in the 100-H Area. It will also help provide additional characterization of this lower aquifer.	Monitoring (RUM)
199-H3-32	This well will be completed in the uppermost RUM aquifer as a monitoring well to assist in defining the northern extent of the Cr(VI) plume in the RUM aquifer in the 100-H Area. It will also help provide additional characterization of this lower aquifer.	Monitoring (RUM)
199-H7-1	This well will be completed in the uppermost RUM aquifer as a monitoring well to assist in defining the northern extent of the Cr(VI) plume in the RUM aquifer in the central Horn area. It will also help provide additional characterization of this lower aquifer.	Monitoring (RUM)
699-95-48C	This well will be completed in the uppermost RUM aquifer as a monitoring well to assist in defining the southern extent of the Cr(VI) plume in the western Horn area. This well will be drilled and sampled through the entire RUM unit to characterize the vertical distribution of Cr(VI) and RUM lithology.	Monitoring (RUM)
699-97-47D	This well will be completed in the ~~unconfined~~ uppermost RUM aquifer as an extraction well in the central Horn area. It will provide plume management, hydraulic control, and mass removal of Cr(VI) further eastward in the Horn. Characterization samples in the RUM aquifer collected during drilling will provide additional characterization of the lower aquifer.	Extraction (~~unconfined~~ RUM)

A summary of the anticipated geology and number of samples scheduled to be collected for each well is presented in Table 3. Estimated depths and analytes for soil and water samples are presented in Tables 4 through ~~7~~8. There is no suspected contamination in the vadose zone; therefore, soil samples will be collected from the unconfined aquifer material and not from above the water table.

Table 3. Expected Hydrogeologic and Drilling Depths

Well		Expected Depth (m [ft] bgs)			Expected Screened Interval (m [ft] bgs)	Well Completion Depth (m [ft] bgs)	Expected Number of Samples	
ID	Name	To Water	To RUM	Total Drilled			Groundwater	Soil
C9935 [a]	199-D1-1	16.8 (55)	22.9 (75)	41.4 (135)	15.2 to 22.9 (50 to 75)	22.9 (75)	3	4
C9722	199-D7-7	13.4 (44)	16.5 (54)	32.0 (105)	27.4 to 30.5 (90 to 100)	32.0 (105)	2	3
C9926 [a]	199-H1-12	10.4 (34)	13.1 (43)	25.9 (85)	8.5 to 11.6 (28 to 43)	14.6 (48)	2	3
C9923	199-H3-21	10 (33)	15.2 (50)	16.7 (55)	9.1 to 15.2 (30 to 50)	16.7 (55)	1	2
C9723	199-H3-31	13.1 (43)	17 (56)	27.4 (90)	21.3 to 25.9 (70 to 85)	27.4 (90)	2	3
C9724	199-H3-32	11.9 (39)	13.7 (45)	28.9 (95)	21.3 to 27.4 (70 to 90)	28.9 (95)	3	4
C9719	199-H7-1	9.4(31)	12.2 (40)	32.0 (105)	27.4 to 30.5 (90 to 100)	32.0 (105)	3	4
C9930	699-95-48C	11.6 (38)	20.4(67)	61.0(200) [b]	22.9 to 28.9 (75 to 95)	30.5 (100)	5	6
C9925-[a]	699-97-47D	8(26)	12.2 (40)	27.4 (90)	~~7.6 to 12.2 (25 to 40)~~ 13.7 to 16.8 (45 to 55)	~~13.7 (45)~~ 18.3 (60)	3	3

a. Well will be drilled into the first water-bearing unit of the RUM for deeper characterization but completed in the unconfined aquifer.

b. Well will be drilled through the full thickness of the RUM and into the Ringold Formation unit B immediately above the Ringold Formation lower mud unit. The estimated depth and number of samples is poorly constrained because there are no nearby boreholes that penetrate this deeply.

bgs = below ground surface

Table 4. Unconfined Completion Wells 199-D1-1, and 199-H1-12, ~~699-97-47D~~ Sample Analytes

Sample Location	199-D1-1, and 199-H1-12, ~~699-97-47D~~			
Estimated Depth to Water (m [ft] bgs)	199-D1-1	16.8 (55)		
	199-H1-12	10.4 (34)		
	~~699-97-47D~~	~~8.0 (26)~~		
Projected Total Depth (m [ft] bgs)	199-D1-1	41.4 (135)		
	199-H1-12	25.9 (85)		
	~~699-97-47D~~	~~27.4 (90)~~		
Media	**Sample Type**	**Comments**	**Estimated Depth (ft bgs)**	**Analytes**
Soil/Geologic	Grab	Archival purposes	Every 5 ft and at lithologic changes	None
		Screen selection	Every 5 ft of screened interval*	Particle-size distribution (field analysis)
	Continuous core	Begin 5 ft above RUM surface to total depth	D1-1 (70) H1-12 (38) ~~97-47D (35)~~	None
		Unconfined aquifer		Particle-size distribution (laboratory analysis), total chromium, and Cr(VI) chromium
		Confining units in the RUM	D1-1 (85) H1-12 (48) ~~97-47D (45)~~	Particle-size distribution (laboratory analysis), total chromium, and Cr(VI) chromium
		Water-bearing units of the RUM	D1-1 (105, 130) H1-12 (80) ~~97-47D (80)~~	
Water	During drilling	Middle of unconfined aquifer	D1-1 (70) H1-12 (40) ~~97-47D (35)~~	Bicarbonate, carbonate, calcium, Cr(VI) (both filtered and unfiltered), total chromium (both filtered and unfiltered), chloride, fluoride, magnesium, manganese, nitrate, potassium, sodium, strontium-90, sulfate, technetium-99, and uranium
		Water-bearing units of the RUM	D1-1 (105, 130) H1-12 (80) ~~97-47D (45, 80)~~	
	Pumped	After well development	Screened interval	

*See Table 3 for estimated screen intervals.

Table 8. RUM Extraction Well 699-97-47D Sample Analytes

Sample Location	699-97-47D			
Estimated Depth to Water (m [ft] bgs)	8.0 m (26ft)			
Projected Total Depth (m [ft] bgs)	27.4 m (90ft)			
Media	**Sample Type**	**Comments**	**Estimated Depth (ft bgs)**	**Analytes**
Soil/Geologic	Grab	Archival purposes	Every 5 ft and at lithologic changes	None
		Screen selection	Every 5 ft of screened interval*	Particle-size distribution (field analysis)
	Continuous core	Begin 5 ft above RUM surface to total depth	35	None
		Unconfined aquifer		Particle-size distribution (laboratory analysis), total chromium, and Cr(VI)
		Confining units in the RUM	45	Particle-size distribution (laboratory analysis), total chromium, and Cr(VI)
		Water-bearing units of the RUM	80	
Water	During drilling	Middle of unconfined aquifer	35	Bicarbonate, carbonate, calcium, Cr(VI) (filtered), total chromium (both filtered and unfiltered), chloride, fluoride, magnesium, manganese, nitrate, potassium, sodium, strontium-90, sulfate, technetium-99, and uranium
		Water-bearing units of the RUM	45, 80	
	Pumped	After well development	Screened interval	

*See Table 3 for estimated screen intervals.

3 Analytical Requirements

Tables 9 through 11 present the analytical methods, field and laboratory QC elements and acceptance criteria, and preservation and holding time guidelines for laboratory analysis, respectively. The information presented in these tables supersedes similar material presented in DOE/RL-2013-35 and reflects current analytical standards.

Table 9. Analytical Methods for the 100-HR-3 Groundwater OU

CAS #	Waste Constituent (Alternate Name)	Analytical Method [a]	Practical Quantitation Limit	
			Water (µg/L) (pCi/L)	Soil (µg/Kg) (pCi/g)
General Chemistry				
ALKALINITY	Alkalinity, total as $CaCO_3$	310.1, Standard Methods 2320, Standard Methods 4500	5250	N/A
18540-29-9	Hexavalent chromium	7196	10.5	400
Anions [b]				
16887-00-6	Chloride	300, 9056	400	55,000
16984-48-8	Fluoride		525	25,000
14797-55-8	Nitrate, as NO_2		250	12,500
14265-44-2	Phosphate		525	5,000
14808-79-8	Sulfate		1050	27,500
Field Measurements				
--	pH	150.1, 9040, Standard Methods 4500 H+	N/A	N/A
--	Dissolved oxygen	360.1, Standard Methods 4500 O	N/A	--
--	Oxygen-reduction potential	ASTM D1498-14	N/A	--
--	Specific conductance	120.1, 9050, Standard Methods 2520 B-97	N/A	--
--	Temperature	170.1	N/A	--
--	Turbidity	180.1, Standard Methods 2130 B	N/A	--
Metals				
7440-70-2	Calcium	6010	1050	100,000
7440-47-3	Chromium	6020	10.5	1,000
7439-95-4	Magnesium	6010	1050	100,000
17439-96-5	Manganese	6020	5.25	1,000
7440-09-7	Potassium	6010	5250	500,000
7440-23-5	Sodium	6010	1050	100,000
7440-61-1	Uranium	6020	1.05	150
Radiochemistry				
12587-46-1	Gross alpha	Gas proportional counting	3	5
12587-47-2	Gross beta	Gas proportional counting	4	10

Table 9. Analytical Methods for the 100-HR-3 Groundwater OU

CAS #	Waste Constituent (Alternate Name)	Analytical Method [a]	Practical Quantitation Limit	
			Water (ug/L) (pCi/L)	Soil (ug/Kg) (pCi/g)
10098-97-2	Strontium-90	Liquid scintillation or gas proportional counting	2	2
14133-76-7	Technetium-99	Liquid scintillation or gas proportional counting	50	5
10028-17-8	Tritium	Liquid scintillation	700	30

Notes: Complete reference citations are provided in Chapter 6.

Analytical methods and practical quantitation limits provided in this table do not represent EPA or Ecology requirements but are intended solely as guidance. Equivalent or updated Ecology accredited methods may be substituted for the methods identified in this table.

a. For EPA Methods 180.1 and 300, see EPA/600/R-93/100, *Methods for the Determination of Inorganic Substances in Environmental Samples*. For EPA Methods 120.1, 150.1, 170.1, 310.1, and 360.1, see EPA/600/4-79/020, *Methods for Chemical Analysis of Water and Wastes*. For four-digit EPA methods, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium*. For standard methods, see APHA/AWWA/WEF, 2017, *Standard Methods for the Examination of Water and Wastewater*.

b. Dilutions for certain ion chromatography constituents may be necessary, potentially raising the PQL above the limits provided.

CAS = Chemical Abstracts Service

Ecology = Washington State Department of Ecology

EPA = U.S. Environmental Protection Agency

N/A = not applicable

OU = Operable Unit

PQL = practical quantitation limit

Table 10. Field and Laboratory QC Elements and Acceptance Criteria

Analyte[a]	QC Element	Acceptance Criteria		Corrective Action
		Water	Soil	
General Chemistry				
Alkalinity	MB	≤MDL ≤5% sample concentration		Flag with "C"
	LCS	80% to 120% recovery		Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	≤35% RPD	Review data[e]
	MS/MSD[d]	75% to 125% recovery		Flag with "N"
	EB, FTB	≤MDL ≤5% sample concentration		Flag with "Q"
	Field duplicate[c]	≤20% RPD	--[f]	Review data[e]
Hexavalent chromium	MB	≤MDL ≤5% sample concentration		Flag with "C"
	LCS	80% to 120% recovery		Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	≤35% RPD	Review data[e]
	MS/MSD[d]	75% to 125% recovery		Flag with "N"
	EB, FTB	≤MDL ≤5% sample concentration		Flag with "Q"
	Field duplicate[c]	≤20% RPD	--[f]	Review data[e]

Table 10. Field and Laboratory QC Elements and Acceptance Criteria

Analyte[a]	QC Element	Acceptance Criteria		Corrective Action
		Water	Soil	
Anions				
Anions by ion chromatography	MB	≤MDL ≤5% sample concentration		Flag with "C"
	LCS	80% to 120% recovery		Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	≤35% RPD	Review data[e]
	MS/MSD[d]	75% to 125% recovery		Flag with "N"
	EB, FTB	≤MDL ≤5% sample concentration		Flag with "Q"
	Field duplicate[c]	≤20% RPD	--[f]	Review data[e]
Metals				
Metals by inductively coupled plasma/atomic emission spectrometry	MB	≤MDL ≤5% sample concentration		Flag with "C"
	LCS	80% to 120% recovery		Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	≤35% RPD	Review data[e]
	MS/MSD[d]	75% to 125% recovery		Flag with "N"
	EB, FTB	≤MDL ≤5% sample concentration		Flag with "Q"
	Field duplicate[c]	≤20% RPD	--[f]	Review data[e]
Metals by inductively coupled plasma/mass spectrometry	MB	≤MDL ≤5% sample concentration		Flag with "C"
	LCS	80% to 120% recovery		Flag with "o"[b]
	DUP[c] or MS/MSD[d]	≤20% RPD	≤35% RPD	Review data[e]
	MS/MSD[d]	75% to 125% recovery		Flag with "N"
	EB, FTB	≤MDL ≤5% sample concentration		Flag with "Q"
	Field duplicate[c]	≤20% RPD	--[f]	Review data[e]
Radiochemistry				
Gross alpha/gross beta	MB	≤MDC ≤5% sample activity concentration		Flag with "B"
	LCS	80% to 120% recovery or statistically derived limits[g]		Flag with "o"[b]
	DUP[c]	≤20% RPD	≤30% RPD	Review data[e]
	EB, FTB	≤MDC ≤5% sample activity concentration		Flag with "Q"
	Field duplicate[c]	≤20% RPD	--[f]	Review data[e]

Table 10. Field and Laboratory QC Elements and Acceptance Criteria

Analyte[a]	QC Element	Acceptance Criteria		Corrective Action
		Water	Soil	
Strontium-90	MB	≤MDC ≤5% sample activity concentration		Flag with "B"
	LCS	80% to 120% recovery or statistically derived limits[g]		Flag with "o"[b]
	DUP[c]	≤20% RPD	≤30% RPD	Review data[e]
	Tracer	30%-105% recovery		Review data[d]
	Carrier	40%-110% recovery		Review data[d]
	EB, FTB	≤MDC ≤5% sample activity concentration		Flag with "Q"
	Field duplicate[c]	≤20% RPD	--[f]	Review data[e]
Technetium-99	MB	≤MDC ≤5% sample activity concentration		Flag with "B"
	LCS	80% to 120% recovery or statistically derived limit[g]		Flag with "o"[b]
	DUP[c]	≤20% RPD	≤30% RPD	Review data[e]
	MS	75%-125% recovery		Flag with "N"
	EB, FTB	≤MDC ≤5% sample activity concentration		Flag with "Q"
	Field duplicate[c]	≤20% RPD	--[f]	Review data[e]
Tritium	MB	≤MDC ≤5% sample activity concentration		Flag with "B"
	LCS	80% to 120% recovery or statistically derived limits[g]		Flag with "o"[b]
	DUP[c]	≤20% RPD	≤30% RPD	Review data[e]
	MS	75%-125% recovery		Flag with "N"
	EB, FTB	≤MDC ≤5% sample activity concentration		Flag with "Q"
	Field duplicate[c]	≤20% RPD	--[f]	Review data[e]

Notes: The information in this table does not represent EPA nor Ecology requirements; it is intended solely as guidance.

This table applies only to laboratory analyses. Field measurements (e.g., pH, dissolved oxygen, oxygen-reduction potential, specific conductance, temperature, and turbidity) are not listed because they are measured in the field.

a. See Table 9 for constituent list and analytical methods.

b. The reporting laboratory will apply the "o" flag with SMR group concurrence.

c. Applies when at least one result is greater than the laboratory PQL.

d. Either a DUP or a MS/MSD is to be analyzed to determine measurement precision (if there is insufficient sample volume, a laboratory control sample duplicate is analyzed with the acceptance criteria defaulting to the <20% RPD criteria for water and <30% RPD for soil).

e. After review, corrective actions are determined on a case-by-case basis. Corrective actions may include a laboratory recheck or flagging the data.

f. A field duplicate RPD for soil is not recommended because of possible soil matrix heterogeneity effects.

g. Laboratory determined statistically derived control limits based on historical data are used here. Control limits are reported with the data.

Table 10. Field and Laboratory QC Elements and Acceptance Criteria

Analyte[a]	QC Element	Acceptance Criteria		Corrective Action
		Water	Soil	

DUP = laboratory sample duplicate
EB = equipment blank
Ecology = Washington State Department of Ecology
EPA = U.S. Environmental Protection Agency
FTB = full trip blank
LCS = laboratory control sample
MB = method blank
MDC = minimum detectable concentration
MDL = method detection limit
MS = matrix spike
MSD = matrix spike duplicate
PQL = practical quantitation limit
QC = quality control
RPD = relative percent difference
SMR = Sample Management and Reporting

Data flags

B, C = possible laboratory contamination: analyte was detected in the associated method blank – laboratory applied. The B flag is used for organic analytes. The C flag is used for general chemical and inorganic analytes.
N = result may be biased: associated matrix spike result was outside the acceptance limits (except gas chromatograph/mass spectrometry) – laboratory applied.
o = result may be biased: associated laboratory control sample result was outside the acceptance limits – laboratory applied.
Q = problem with associated field QC blank; results were out of limits – SMR review.

Table 11. Preservation and Holding Time Guidelines for Laboratory Analyses

Constituent [a]	Preservation [b]		Holding Time for Water and Soil
	Water	Soil	
General Chemistry			
Alkalinity	Store <6°C	Store <6°C	14 days
Hexavalent chromium	Store <6°C	Store <6°C	24 hours
Anions			
Chloride, fluoride, sulfate	Store <6°C	Store <6°C	28 days
Nitrate, phosphate	Store <6°C	Store <6°C	48 hours
Metals			
Metals by inductively coupled plasma-atomic emission spectrometry	Adjust pH to <2 with nitric acid	N/A	6 months
Metals by inductively coupled plasma/ mass spectrometry	Adjust pH to <2 with nitric acid	N/A	6 months

Table 11. Preservation and Holding Time Guidelines for Laboratory Analyses

Constituent [a]	Preservation [b]		Holding Time for Water and Soil
	Water	Soil	
Radiochemicals			
Gross alpha/Gross beta	Adjust pH to <2 with nitric acid	N/A	6 months
Tritium	N/A	N/A	6 months
Other radiological analytes	Adjust pH to <2 with nitric acid	N/A	6 months

Notes: Holding times and preservation methods are dependent on the constituent and are consistent with EPA guidance and approved analytical methods. Information in this table does not represent EPA or Ecology requirements; it is intended solely as guidance.

The container type for a sample is available on the chain-of-custody documentation.

This table applies only to laboratory analyses. Field measurements (e.g., pH, dissolved oxygen, oxygen-reduction potential, specific conductance, temperature, and turbidity) are not listed because they are measured in the field.

a. See Table 9 for constituent list and analytical methods.

b. For preservation identified as stored at <6°C, the sample should be protected against freezing unless it is known that freezing will not impact the sample integrity.

Ecology = Washington State Department of Ecology
EPA = U.S. Environmental Protection Agency
N/A = not applicable

34 References

APHA/AWWA/WEF, 2017, *Standard Methods For the Examination of Water and Wastewater*, 23rd Edition, American Public Health Association, American Water Works Association, and Water Environment Federation, Washington, D.C.

DOE/RL-2013-30, 2016, *Sampling and Analysis Plan for 100-HR-3 Groundwater Operable Unit Monitoring*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0076483H.

DOE/RL-2013-35, 2013, *100-HR-3 Groundwater Operable Unit Well Installation Sampling and Analysis Plan*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0087915.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=81.

EPA/600/4-79/020, 1983, *Methods for Chemical Analysis of Water and Wastes*, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio. Available at: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=30000Q10.TXT.

EPA/600/R-93/100, 1993, *Methods for the Determination of Inorganic Substances in Environmental Samples*, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio. Available at: http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=30002U3P.txt.

SGW-60843, 2017, FY2018 Plume Containment and Remediation Utilization Plan, Rev. 0, CH2M HILL Plateau Remediation Company, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0067776H.

SW-846, 2019, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium*, as updated, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C. Available at: https://www.epa.gov/hw-sw846/sw-846-compendium.