TRI-PARTY AGREEMENT

Change Notice Number TPA-CN- 0892	TPA CHANGE NOTICE FORM	Date: May 5, 2020
Document Number, Title, and Revision: DOE/RL-2013-29, *Sampling and Analysis Plan for 100-KR-4 Groundwater Operable Unit Monitoring*, Rev. 0		Date Document Last Issued: July 22, 2019
Approved Change Notices Against this Document: TPA-CN-0797, TPA-CN-0831, TPA-CN-0857		
Originator: Anna Woehle		Phone: (509)373-7553

Description of Change:

This change notice amends DOE/RL-2013-29 to modify sampling frequencies based on observed monitoring results and incorporates wells drilled in 2019.

M. W. Cline (**DOE**) and L. C. 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 are made:

- Page 1-2 – Added DOE/RL-2013-36-ADD7, 100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 7: Wells 199-K-238, 199-K-239, and 199-K-240.
- Page 3-9 – Updated Table 3-3 to remove well 199-K-13.
- Page 3-13 – Updated Table 3-3 to incorporate wells: 199-K-238, 199-K-239, and 199-K-240, drilled in late 2019.
- Page 3-14 and Page 3-15– Updated Table 3-3 to remove aquifer tubes 19-D and AT-K-4-D.
- Page 3-16 – Updated Table 3-3 to remove Seep 63-2.
- Page 3-9 to 3-16 – Updated Table 3-3 to modify sampling frequencies at numerous well locations based on constituent trend analysis.
- Page 1-13, 2-17, 3-3, 3-7, 3-8, 3-9 through 3-16 (Table 3-3), 3-18, 3-23 – Removed Oxidation Reduction Potential.
- Page 6-4 – DOE/RL-2013-36-ADD7, 2019, 100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 7 to Reference Section.

Table 3-3 is included in entirety for completeness.

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

Note: Include affected page number(s): 1-2, 1-13, 2-17, 3-3, 3-7, 3-8, 3-9 through 3-16, 3-18, 3-23, and 6-4

Justification and Impacts of Change:

Per DOE/RL-2013-29, any changes in monitoring schedule or analytes will be made through a change notice or revision to the SAP, as described in Section 2.1.4. This change notice incorporates the updates to the sampling frequency based on analysis of decreasing contaminant concentrations at the well locations provided in the document. The text and tables of the document are edited to reflect these changes and adjust the sampling schedule accordingly.

Continued on Page 2

Approvals:

Michael W. Cline (Digitally signed by Michael W. Cline Date: 2020.05.05 08:45:57 -07'00')	5/5/2020	[X] Approved [ ] Disapproved
DOE Project Manager	Date	
Buelow, Laura (Digitally signed by Buelow, Laura Date: 2020.05.05 09:12:01-07'00')	5/5/2020	[X] Approved [ ] Disapproved
EPA Project Manager	Date	
N/A		[ ] Approved [ ] Disapproved
Ecology Project Manager	Date	

Changes made to Table 3-3. Summary of Monitoring Locations, Frequencies, and Constituents, fall into one or more of the following categories:

- Existing trends support reduction of sampling from triannual (TA) to Annual (A).
- Removed aquifer tubes AT-K-4-D and 19-D from sampling program. Several attempts were made to sample these tubes, which have all been unsuccessful. Attempts have also been made to repair these tubes with no success. Adjacent aquifer tubes provide adequate coverage of the groundwater plumes.
- Removed Seep 63-2 from sampling program. Seep does not provide meaningful measurements during the low river stage.

An interim groundwater remedy, consisting of three individual groundwater pump and treat (P&T) systems, is operating in the 100-KR-4 OU. The interim groundwater remedy is focused on controlling the migration and discharge of Cr(VI)-contaminated groundwater to the Columbia River. Groundwater monitoring activities have evolved over the past two decades to meet numerous programmatic requirements. Activities include characterization sampling and monitoring in support of the remedial investigation/feasibility study (RI/FS), monitoring to support U.S. Department of Energy (DOE) operation of nuclear facilities (e.g., the KE and KW Fuel Storage Basins [FSBs]), and monitoring associated with continuing operation of the groundwater interim remedial action at the 100-KR-4 OU.

This SAP consolidates requirements from and supersedes previous *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) groundwater sampling and analysis documents identified in Section 2.4 of the 100-KR-4 RD/RAWP (DOE/RL-2013-33). New wells for extraction, injection, or monitoring purposes added to the 100-KR-4 interim action are installed in accordance with DOE/RL-2013-36, *100-KR-4 Groundwater Operable Unit Well Installation Sampling and Analysis Plan*, through well-specific addenda which also provide the proposed sampling schedules:

- DOE/RL-2013-36-ADD1, 100-KR-4 Groundwater Operable Unit Well Installation Sampling and Analysis Plan Addendum 1: 199-K-202, 199-K-205, 199-K-206, and 199-K-220
- DOE/RL-2013-36-ADD2, 100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 2: 199-K-203, 199-K-204, 199-K-207, 199-K-208, 199-K-209, 199-K-210, 199-K-211, and 199-K-212
- DOE/RL-2013-36-ADD3, 100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 3: 199-K-223, 199-K-224, 199-K-225, and 199-K-226
- DOE/RL-2013-36-ADD4, 100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 4: Wells 199-K-227, 199-K-228, 199-K-229, and 199-K-230
- DOE/RL-2013-36-ADD5, 100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 5: Wells 199-K-231, 199-K-232, 199-K-233, and 199-K-234
- DOE/RL-2013-36-ADD6, 100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 6: Wells 199-K-235 and 199-K-236
- DOE/RL-2013-36-ADD7, 100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 7: Wells 199-K-238, 199-K-239, and 199-K-240

Changes in the monitoring schedule or analytes will be made through Ecology et al., 1989a, Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) change notices or revision to this SAP, as described in Section 2.1.4.

This SAP consists of six chapters. The remainder of this section addresses the project scope and objectives, background, data quality objectives (DQOs), groundwater contaminants, and project schedule. Chapter 2 presents the quality assurance project plan (QAPjP), and Chapter 3 provides the field sampling plan. Chapters 4 and 5 address waste management and health and safety requirements. Chapter 6 provides a list of the references cited. Appendix A provides the DQO summary report, Appendix Bprovides a summary of the monitoring location information, and Appendix C provides example sample forms.

Table 3-3. Summary of Monitoring Locations, Frequencies, and Constituents

Location Name	Location Type	Hexavalent Chromium	Total Chromium	Nitrate	Trichloroethene	Carbon-14	Strontium-90	Tritium	Antimony	Arsenic	Beryllium	Cadmium	Calcium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Sodium	Potassium	Bicarbonate	Carbon Tetrachloride	Chloride	Sulfate	pH	Dissolved Oxygen	~~Oxidation Reduction Potential~~	Total petroleum hydrocarbons	Water Level Measurement	Principal Study Question									
																															1	2	3	4	5a[d]	5b[e]	5c[f]	6	7	8
199-K-106A	Groundwater well	A	TA[c]	TA/M	~~T~~A[c]	TA[c]/M	A	TA[c]/M	~~T~~A[b]	~~T~~A[b]	~~T~~A[b]	~~T~~A[b]	A	~~T~~A[b]	~~T~~A[b]		~~T~~A[b]	A	—	A	A	A	A[b]	A	A	T A[c]	—	—	—	DS		X	X	X	X	X	X			
199-K-107A	Groundwater well	TA	TA[c]	~~T~~A	~~T~~A[c]	~~T~~A[c]	TA[c]/M	~~T~~A[c]	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	T A[c]	—	—	—	AWLN		X	X	X	X	X	X		X	
199-K-108A	Groundwater well	A	TA[c]	TA	~~T~~A[c]	~~T~~A[c]	A[c]	A[c]	~~T~~A[b]	~~T~~A[b]	~~T~~A[b]	~~T~~A[b]	A	~~T~~A[b]	~~T~~A[b]	—	~~T~~A[b]	A	—	A	A	A	A[b]	A	A	T A[c]	—	—	—	AWLN		X	X	X					X	
199-K-11	Groundwater well	A	TA	TA	TA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		X	X							
199-K-110A	Groundwater well	TA	TA	A	—	—	—	—	A[b]	A[b]	A[b]	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	A[b]	A	A[b]	A	A	—	—	—	—	—		X	X	X						
199-K-111A	Groundwater well	T A/M	TA	~~T~~A	—	—	—	T A/M	~~T~~A[b]	~~T~~A[b]	~~T~~A[b]	~~T~~A[b]	—	~~T~~A[b]	~~T~~A[b]	—	~~T~~A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	AWLN		X	X		X	X			X	
199-K-112A	Groundwater well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN									X	
199-K-113A	Extraction well	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X							X	
199-K-114A	Extraction well	A	A	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-115A	Extraction well	A	A	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-116A	Extraction well	T A/M	A	—	—	—	~~T~~ A/M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X		X	X	X		X	
199-K-117A	Groundwater well	A	A	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN	X	X	X						X	
199-K-118A	Groundwater well	—	A	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN			X						X	
199-K-119A	Groundwater well	~~T~~ A/M	~~T~~A[c]	—	—	~~T~~A[c]	~~T~~A[c]/M	~~T~~A[c]	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	~~T~~A[c]	—	—	—	AWLN		X	X	X	X	X	X		X	
199-K-120A	Extraction well	A	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-121A	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-122A	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-123A	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-124A	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-125A	Groundwater well	~~T~~ A/M	A	—	—	—	~~T~~A/M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X		X	X	X			
199-K-126	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	A	—	—	A	—	—	—	—	—	—	A	A	~~A~~	—	AWLN		X	X					X	X	
199-K-127	Extraction well	T A/M	TA[c]	—	—	~~T~~A[c]	~~T~~A[c]/M	TA[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	—	SCADA		X	X	X	X	X	X		X	
199-K-128	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-129	Extraction well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
~~199-K-13~~	~~Groundwater well~~	~~TA~~	~~A~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~DSBA~~		~~X~~	~~X~~						~~X~~	
199-K-130	Extraction well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	A	—	—	A	—	—	—	—	—	—	A	A	~~A~~	—	SCADA	X	X	X					X	X	
199-K-131	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN	X	X	X						X	
199-K-132	Groundwater well	TA	TA[c]	TA	T A[c]	TA[c]	~~T~~A[c]	TA[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	—	DS		X	X	X					X	

Table 3-3. Summary of Monitoring Locations, Frequencies, and Constituents

Location Name	Location Type	Hexavalent Chromium	Total Chromium	Nitrate	Trichloroethene	Carbon-14	Strontium-90	Tritium	Antimony	Arsenic	Beryllium	Cadmium	Calcium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Sodium	Potassium	Bicarbonate	Carbon Tetrachloride	Chloride	Sulfate	pH	Dissolved Oxygen	~~Oxidation Reduction Potential~~	Total petroleum hydrocarbons	Water Level Measurement	Principal Study Question									
																															1	2	3	4	5a[d]	5b[e]	5c[f]	6	7	8
199-K-133	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	A	—	—	A	—	—	—	—	—	—	A	A	~~A~~	—	DS		X	X					X	X	
199-K-134	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	A	—	—	A	—	—	—	—	—	—	A	A	~~A~~	—	—								X		
199-K-135	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	A	—	—	A	—	—	—	—	—	—	A	A	~~A~~	—	—								X		
199-K-136	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	A	—	—	A	—	—	—	—	—	—	A	A	~~A~~	—	—								X		
199-K-137	Extraction well	A	TA[c]	A	T A[c]	~~T~~A[c]	A[c]	A[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	A	SCADA		X	X	X					X	
199-K-138	Groundwater well	TA	TA[c]	A	T A[c]	A[c]	A[c]	A[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	—	DS	X	X	X	X					X	
199-K-139	Groundwater well	TA	TA[c]	A	T A[c]	~~T~~A[c]	TA[c]	A[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	—	DS		X	X	X					X	
199-K-140	Groundwater well	TA	TA[c]	A	T A[c]	A[c]	A[c]	A[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	—	DS		X	X	X					X	
199-K-141	Groundwater well	TA	TA	TA	—	—	T A/M	TA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X		X		X		X	
199-K-142	Groundwater well	A	A	A	—	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN		X	X						X	
199-K-143	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-144	Extraction well	T A/M	A	—	—	—	T A/M	A	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	SCADA	X	X	X		X	X	X		X	
199-K-145	Extraction well	A	A	—	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-146	Extraction well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-147	Extraction well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	A	—	—	A	—	—	—	—	—	—	A	A	~~A~~	—	SCADA	X	X	X					X	X	
199-K-148	Extraction well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	A	—	—	A	—	—	—	—	—	—	A	A	~~A~~	—	SCADA	X	X	X					X	X	
199-K-149	Injection Well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-150	Groundwater well	A	~~T~~A	A	A	A	A	~~T~~A	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	—	—	—	—	DSBA	X	X	X	X					X	
199-K-151	Injection Well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-152	Extraction well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X						X	
199-K-153	Extraction well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X						X	
199-K-154	Extraction well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X						X	
199-K-156	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-157	Groundwater well	A	~~T~~A[c]	—	—	A[c]	A[c]	~~T~~A[c]	A[b]	A[b]	A[b]	A[b]		A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	~~T~~A[c]	—	—	—	AWLN		X	X	X					X	
199-K-158	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-159	Groundwater well	TA	TA	A	A	~~T~~A	~~T~~A	~~T~~A	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	—	—	—	—	DS	X	X	X	X					X	
199-K-160	Groundwater well	~~T~~A	~~T~~A	A	A	~~T~~A	~~T~~A	~~T~~A	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	—	—	—	—	AWLN	X	X	X	X					X	
199-K-161	Extraction well	A	A	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-162	Extraction well	A	A	—	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	

Table 3-3. Summary of Monitoring Locations, Frequencies, and Constituents

Location Name	Location Type	Hexavalent Chromium	Total Chromium	Nitrate	Trichloroethene	Carbon-14	Strontium-90	Tritium	Antimony	Arsenic	Beryllium	Cadmium	Calcium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Sodium	Potassium	Bicarbonate	Carbon Tetrachloride	Chloride	Sulfate	pH	Dissolved Oxygen	~~Oxidation Reduction Potential~~	Total petroleum hydrocarbons	Water Level Measurement	Principal Study Question									
																															1	2	3	4	5a[d]	5b[e]	5c[f]	6	7	8
199-K-163	Extraction well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X						X	
199-K-164	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-165	Extraction well	A	TA[c]	A	T A[c]	A[c]	A[c]	A[c]	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	T A[c]	—	—	A	SCADA		X	X	X					X	
199-K-166	Extraction well	A	TA[c]	A	T A[c]	A[c]	A[c]	A[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	A	SCADA		X	X	X					X	
199-K-168	Groundwater well	TA	TA[c]	A	T A[c]	A[c]	A[c]	A[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	—	DS		X	X	X					X	
199-K-169	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-170	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-171	Extraction well	A	A	—	—	—	—	—	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	—	—	—	—	SCADA		X	X						X	
199-K-172	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-174	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-175	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-178	Extraction well	A	A	A	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-179	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-18	Groundwater well	A	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN		X	X						X	
199-K-180	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-181	Groundwater well	TA	A	A	TA	A	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DS	X	X	X						X	
199-K-182	Extraction well	A	A	—	—	—	—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X						X	
199-K-183	Groundwater well	TA	TA[c]	—	T A[c]	A[c]	A[c]	A[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	—	AWLN		X	X	X					X	
199-K-184	Groundwater well	A	TA[c]	A	T A[c]	A[c]	A[c]	A[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	A	AWLN		X	X	X					X	
199-K-185	Groundwater well	TA	TA[c]	TA	T A[c]	TA[c]	A[c]	TA[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	—	AWLN	X	X	X	X					X	
199-K-186	Groundwater well	TA	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	A	AWLN		X	X						X	
199-K-187	Groundwater well	A	A	—	A	—	—	—	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	AWLN		X	X						X	
199-K-188	Groundwater well	T A/M	T A/M	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		X	X		X	X	X			
199-K-189	Groundwater well	T A/M	A	TA	—	A	A/M	T A/M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		X	X		X	X	X			
199-K-19	Groundwater well	T A/M	TA[c]	—	—	~~T~~A[c]	TA[c]/M	~~T~~A[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	T A[c]	—	—	—	AWLN		X	X	X	X	X	X		X	
199-K-190	Groundwater well	TA	A	A	TA	A	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN		X	X						X	
199-K-191	Groundwater well	A	A	—	—	—	—	A	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	AWLN/DSBA		X	X						X	
199-K-192	Groundwater well	A	A	—	—	—	—	A	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	DS		X	X						X	
199-K-193	Extraction Well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X						X	

Table 3-3. Summary of Monitoring Locations, Frequencies, and Constituents

Location Name	Location Type	Hexavalent Chromium	Total Chromium	Nitrate	Trichloroethene	Carbon-14	Strontium-90	Tritium	Antimony	Arsenic	Beryllium	Cadmium	Calcium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Sodium	Potassium	Bicarbonate	Carbon Tetrachloride	Chloride	Sulfate	pH	Dissolved Oxygen	~~Oxidation Reduction Potential~~	Total petroleum hydrocarbons	Water Level Measurement	Principal Study Question									
																															1	2	3	4	5a[d]	5b[e]	5c[f]	6	7	8
199-K-194	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN		X	X						X	
199-K-196	Extraction well	TA	TA[c]	TA	TA	TA[c]	A[c]	~~T~~A[c]	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	T A[c]	—	—	—	SCADA	X	X	X	X					X	
199-K-197	Groundwater well	A	A	—	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN	X	X	X						X	
199-K-198	Extraction well	A	A	—	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-199	Extraction well	A	A	—	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-20	Groundwater well	TA	A	—	—	—	A	A	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	AWLN	X	X	X						X	
199-K-200	Groundwater well	T A/M	TA[c]	—	—	TA[c]	TA[c]/M	TA[c]	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	T A[c]	—	—	—	DS		X	X	X	X	X	X		X	
199-K-201	Groundwater well	T A/M	A	—	—	—	T A/M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DSBA		X	X		X	X	X		X	
199-K-202	Groundwater well	A	TA	—	A	TA	~~T~~ A/M	TA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN		X	X		X		X		X	
199-K-203	Groundwater well	A	TA	TA/M	—	T A/M	A	T A/M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DSBA		X	X		X		X		X	
199-K-204	Groundwater well	A	TA[c]	TA/M	T A[c]	TA[c]/M	A[c]	TA[c]/M	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	T A[c]	—	—	—	DSBA		X	X	X	X		X		X	
199-K-205	Extraction well	T A/M	TA[c]/M	A	T A[c]	A[c]	A[c]	A[c]	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	T A[c]	—	—	—	SCADA		X	X	X	X	X	X		X	
199-K-206	Injection well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA									X	
199-K-207	Groundwater well	T A/M	TA[c]	—	—	A[c]	A[c]	TA[c]/M	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	T A[c]	—	—	—	AWLN		X	X	X	X	X			X	
199-K-208	Extraction well	TA	TA	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X						X	
199-K-209	Groundwater well	A	A	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DSBA		X	X						X	
199-K-21	Groundwater well	TA	A	—	—	—	A	—	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	AWLN	X	X	X						X	
199-K-210	Extraction well	A	A	—	—	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-212	Extraction well	A	A	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA	X	X	X						X	
199-K-22	Groundwater well	T A/M	A	—	—	—	T A/M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN		X	X		X	X	X		X	
199-K-220	Extraction well	T A/M	T A/M	—	—	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X		X	X	X		X	
199-K-221	Groundwater well	TA	A	A	—	TA	T A/M	TA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DS		X	X		X	X	X		X	
199-K-222	Groundwater well	TA	A	A	—	TA	T A/M	TA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DS		X	X		X	X	X		X	
199-K-223	Groundwater Well	T A/M	T A/M	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	TA	—	—	—	AWLN		X	X	X	X	X	X		X	
199-K-224	Extraction Well	T A/M	T A/M	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	TA	—	—	—	SCADA		X	X	X	X	X			X	
199-K-225	Extraction Well	T A/M	T A/M	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X		X				X	
199-K-226	Extraction Well	T A/M	TA[c]	A	A	TA[c]	A	TA[c]/M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SCADA		X	X		X				X	
199-K-227	Groundwater Well	TA	TA	A	A	A	A	TA	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	TA	—	—	—	DS		X	X	X	X	X	X		X	

Table 3-3. Summary of Monitoring Locations, Frequencies, and Constituents

Location Name	Location Type	Hexavalent Chromium	Total Chromium	Nitrate	Trichloroethene	Carbon-14	Strontium-90	Tritium	Antimony	Arsenic	Beryllium	Cadmium	Calcium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Sodium	Potassium	Bicarbonate	Carbon Tetrachloride	Chloride	Sulfate	pH	Dissolved Oxygen	~~Oxidation Reduction Potential~~	Total petroleum hydrocarbons	Water Level Measurement	Principal Study Question									
																															1	2	3	4	5a[d]	5b[e]	5c[f]	6	7	8
199-K-228	Groundwater Well	TA	TA	A	A	A	A	TA	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	TA	—	—	—	DS		X	X	X	X				X	
199-K-229	Groundwater Well	~~T~~A	~~T~~A	A	TA	~~T~~A	~~T~~A	~~T~~A	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	TA	—	—	—	DS		X	X	X					X	
199-K-230	Groundwater Well	TA	TA	TA	TA	~~T~~A	A	~~T~~A	A	A	A	A	A	A	A	—	A	A	—	A	A	A	A	A	A	TA	—	—	—	DS	X	X	X	X	X		X		X	
199-K-231	Groundwater well	TA	TA	~~T~~A	—	~~T~~A	~~T~~A	~~T~~A	—	—	—	—	TA	—	—	—	—	TA	—	TA	TA	TA	—	TA	TA	TA	—	—	—	DS		X	X	X					X	
199-K-232	Groundwater well	TA	TA	~~T~~A	—	~~T~~A	~~T~~A	~~T~~A	—	—	—	—	TA	—	—	—	—	TA	—	TA	TA	TA	—	TA	TA	TA	—	—	—	AWLN		X	X	X	X		X		X	
199-K-234	Extraction well	TA	TA	TA	TA	TA	TA	TA	—	—	—	—	TA	—	—	—	—	TA	—	TA	TA	TA	—	TA	TA	TA	—	—	—	~~DS~~SCADA		X	X	X					X	
199-K-235	Groundwater well	TA	TA	—	A	A	A	A	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	A	—	—	—	AWLN/DS		X	X	X	X					
199-K-236	Groundwater well	TA	TA	—	A	A	A	A	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	A	—	—	—	AWLN/DS		X	X	X	X					
199-K-238	Extraction well	TA	TA	A	—	—	—	TA	—	—	—	—	A	—	—	—	—	A	A	A	A	A	—	A	A	TA	—	—	—	SCADA		X	X						X	
199-K-239	Groundwater well	TA	TA	TA	TA	—	—	A	—	—	—	—	A	—	—	—	—	A	A	A	A	A	—	A	A	TA	—	—	—	DS		X	X						X	
199-K-240	Groundwater well	TA	TA	A	A	—	—	—	—	—	—	—	A	—	—	—	—	A	A	A	A	A	—	A	A	TA	—	—	—	DS					X		X			
199-K-31	Groundwater well	TA	A	A	A	—	—	—	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	A	—	—	—	—	AWLN	X	X	X						X	
199-K-32A	Groundwater well	A	A	A	—	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN		X	X						X	
199-K-32B	Groundwater well	A	A	A	—	A	A	A	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	AWLN		X	X						X	
199-K-34	Groundwater well	TA	A	TA/M	A	~~T~~A/M	TA	~~T~~A/M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		X	X		X	X	X			
199-K-36	Groundwater well	TA	A	A	A	~~T~~A/M	—	A	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	AWLN		X	X		X	X	X		X	
199-K-37	Groundwater well	A	A	—	—	—	A	—	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	AWLN		X	X						X	
199-N-164	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
199-N-165	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DSBA		X	X						X	
199-N-183	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
199-N-189	Extraction Well	TA	TA	A	—	—	A	A	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	A	—	—	—	SCADA		X	X	X					X	
199-N-27	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X

Table 3-3. Summary of Monitoring Locations, Frequencies, and Constituents

Location Name	Location Type	Hexavalent Chromium	Total Chromium	Nitrate	Trichloroethene	Carbon-14	Strontium-90	Tritium	Antimony	Arsenic	Beryllium	Cadmium	Calcium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Sodium	Potassium	Bicarbonate	Carbon Tetrachloride	Chloride	Sulfate	pH	Dissolved Oxygen	~~Oxidation Reduction Potential~~	Total petroleum hydrocarbons	Water Level Measurement	Principal Study Question									
																															1	2	3	4	5a[d]	5b[e]	5c[f]	6	7	8
199-N-28	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
199-N-373	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
199-N-41	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
199-N-50	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
199-N-51	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
199-N-71	Groundwater well	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN/DSBA		X							X	
199-N-74	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DSBA									X	X
199-N-77	Groundwater well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN									X	
199-N-80	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
199-N-96A	Groundwater well	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
699-70-68	Groundwater well	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DSBA		X							X	
699-71-52	Groundwater well	T	A	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DS			X						X	X
699-73-61	Groundwater well	A	A	—	T	—	—	—	A[b]	A[b]	A[b]	A[b]	—	A[b]	A[b]	—	A[b]	—	—	—	—	—	A[b]	—	—	—	—	—	—	DSBA		X	X						X	X
699-74-44	Groundwater well	T	A	—	T	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DS			X						X	X
699-77-54	Groundwater well	A	A	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DSBA			X						X	X
699-78-62	Groundwater well	A	TA[c]	—	—	TA[c]	TA[c]	TA[c]	—	—	—	—	A	—	—	—	—	A	—	A	A	A	—	A	A	T A[c]	—	—	—	AWLN		X	X	X					X	
699-81-58	Groundwater well	A	A	—	T	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DSBA		X	X						X	X
699-81-62	Groundwater well	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	AWLN									X	
699-83-47	Groundwater well	T	T	—	T	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	DS									X	X
699-87-42A	Groundwater well	T	T	—	T	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
699-87-55	Groundwater well	A	A	—	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—										X
17-D	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
17-M	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
18-S	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							

Table 3-3. Summary of Monitoring Locations, Frequencies, and Constituents

Location Name	Location Type	Hexavalent Chromium	Total Chromium	Nitrate	Trichloroethene	Carbon-14	Strontium-90	Tritium	Antimony	Arsenic	Beryllium	Cadmium	Calcium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Sodium	Potassium	Bicarbonate	Carbon Tetrachloride	Chloride	Sulfate	pH	Dissolved Oxygen	~~Oxidation Reduction Potential~~	Total petroleum hydrocarbons	Water Level Measurement	Principal Study Question									
																															1	2	3	4	5a[d]	5b[e]	5c[f]	6	7	8
~~19-D~~	~~Aquifer tube~~	~~A[a]~~	~~A~~	~~A~~	~~A~~	~~A~~	~~A~~	~~A~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~X~~	~~X~~	~~X~~							
19-M	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	X	X	X							
21-M	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
22-D	Aquifer tube	TA[a]	TA	—	—	—	TA	TA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
22-M	Aquifer tube	TA[a]	TA	—	—	—	TA	TA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
23-M	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
25-D	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
26-D	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
26-M	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
26-S	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-1-D	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-1-M	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-1-S	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-2-D	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-2-M	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-2-S	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-3-D	Aquifer tube	TA[a]	TA	—	—	—	TA	TA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-3-M	Aquifer tube	TA[a]	TA	—	—	—	TA	TA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-3-S	Aquifer tube	TA[a]	TA	—	—	—	TA	TA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
~~AT-K-4-D~~	~~Aquifer tube~~	~~A[a]~~	~~A~~	~~—~~	~~—~~	~~—~~	~~A~~	~~A~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~X~~	~~X~~	~~X~~							
AT -K-4-M	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-4-S	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-5-D	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-5-M	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-5-S	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
AT -K-6-D	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	X	X	X							
AT -K-6-S	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6236	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6237	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6238	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6239	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6240	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6241	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6242	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6243	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6244	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6245	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6246	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6247	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							

Table 3-3. Summary of Monitoring Locations, Frequencies, and Constituents

Location Name	Location Type	Hexavalent Chromium	Total Chromium	Nitrate	Trichloroethene	Carbon-14	Strontium-90	Tritium	Antimony	Arsenic	Beryllium	Cadmium	Calcium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Sodium	Potassium	Bicarbonate	Carbon Tetrachloride	Chloride	Sulfate	pH	Dissolved Oxygen	~~Oxidation Reduction Potential~~	Total petroleum hydrocarbons	Water Level Measurement	Principal Study Question									
																															1	2	3	4	5a[d]	5b[e]	5c[f]	6	7	8
C6248	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6249	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6250	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6251	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6252	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6253	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6254	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6255	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6256	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6258	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		—	—	X	X	X							
C6259	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6260	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6261	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C6265	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C7641	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C7642	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
C7643	Aquifer tube	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
DK-04-3	Aquifer tube	A[a]	A	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
SK-063-1	Seep	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
~~SK-063-2~~	~~Seep~~	~~Aa~~	~~A~~	~~A~~	~~A~~	~~A~~	~~A~~	~~A~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~—~~	~~X~~	~~X~~	~~X~~							
SK-068-1	Seep	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
SK-077-1	Seep	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							
SK-082-2	Seep	A[a]	A	A	A	A	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	X	X	X							

a. The need for continued sampling of aquifer tubes will be evaluated annually, and sampling will be discontinued when remedial process optimization indicates that plumes are sufficiently controlled such that river protection decisions can be made using data collected from monitoring wells inland of the river shore.

b. Monitoring for potential COCs will be evaluated after the collection of nine sampling events, or 3 years of monitoring, whichever occurs first; and a decision will be made to either include or exclude these constituents as COCs for the 100-KR-4 OU.

c. Monitoring the effects of treatment effluent injection will be evaluated annually and may be discontinued after establishing final system operating conditions and confirmation that the effluent effects are adequately described at downgradient locations.

d. Monitoring contributions from vadose zone sources will be evaluated annually; monitoring may be discontinued if observations and measurements confirm no indication of continuing contributions.

e. Monitoring of potential impacts from source area remedial actions will be initiated prior to the start of source actions and will be evaluated monthly during the remedial action. Remedial action monitoring may continue for up to 12 months after completion of source remediation.

f. Monitoring contributions from aquifer sources will be evaluated annually and may be discontinued if observations and measurements confirm no indication of continuing contributions.

g. Total petroleum hydrocarbons will be analyzed for the following: Total petroleum hydrocarbons - diesel range, Total petroleum hydrocarbons - gasoline range, Total petroleum hydrocarbons - kerosene range, and Total petroleum hydrocarbons - motor oil (high boiling).

A = annual sampling (preferred schedule of fall [September to November])
AWLN = automated water level network water level measurements (collected hourly)
COC = contaminant of concern
DS = manual water level measurement during each sampling event
DSBA = manual water level measurement during sampling/synoptic event (collected only two times per year; preferred schedule of summer and fall)
M = monthly sampling only during identified source area remedial actions (Table 3-4)
SCADA = Supervisory Control and Data Acquisition water level measurements (collected continuously)
T = triennial sampling (preferred schedule of summer for identified contaminants)
TA = triannual sampling (preferred schedule of spring, summer, and fall)

Table 3-5. Treatment Process Water Monitoring for Co-Contaminants

Parameters	Location	Data Use	Frequency
Totalchromium, nitrate, strontium-90, carbon-14, pH, tritium, and trichloroethene	Influent/effluent tanks, select extraction wells	Monitor remedialaction effects on co-contaminantconcentrations in treatment water	Quarterly

3.4 Sampling Methods

Sampling activities may include the collection of specific types of samples and the performance of field measurements. The types of samples and measurements performed may include, but are not limited to, the following:

- Field screening measurements
- Radiological screening
- Groundwater sampling
- Aquifer tubesampling
- Water level measurements

All individuals performing groundwater sampling are trained in the proper handling of defensible samples, paperwork, and related documentation necessary to fulfill the established requirements (see Section 2.1.3 for training and certification requirements). Groundwater samples will be collected in accordance with the current revision of applicable operating procedures, using dedicated sampling pumps, pre-cleaned bailers, or pre-cleaned portable pumps.

Calibrated field screening equipment is used for collection of all field measurements. Water samples are collected after field measurements of purged groundwater have stabilized:

- **pH:** Two consecutive measurements agree within 0.2 pH units.
- **Temperature:** Two consecutive measurements agree within 0.2°C.
- **Conductivity:** Two consecutive measurements agree within 10 percent.
- **Turbidity:** Less than 5 nephelometric turbidity units (NTUs) prior to sampling (or project scientist recommendation).

Dissolved oxygen ~~and oxidation-reduction potential~~ may also be specified.

For certain types of samples, preservatives are required. While the preservative may be added to the collection bottles before their use in the field, it is allowable to add the preservative at the sampling vehicle immediately after collection. Samples may require filtering in the field, as noted on the chain-of-custody forms.

To ensure sample and data usability, sampling associated with this SAP will be performed in accordance with HASQARD (DOE/RL-96-68) pertaining to sample collection, collection equipment, and sample handling.

- SAF
- HEIS number
- Sample collection date and time
- Collector's name or initials
- Analysis required
- Preservation method (if applicable)
- Chain-of-custody number
- Bottle type and size
- Laboratory performing the analyses
- Sample location

In addition, sample records must include the following information:

- Analysis required
- Source of sample
- Matrix (water, including indication if sample is field filtered)
- Field data (pH, temperature, turbidity, and conductivity)
- Radiological readings

Dissolved oxygen ~~and oxidation-reduction potential~~ may be specified by the project as a nonroutine field request.

Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained. A chain-of-custody record will be initiated in the field at the time of sampling and will accompany each set of samples shipped to any laboratory.

Shipping requirements will determine how sample shipping containers are prepared for shipment. The analyses requested for each sample will be indicated on the accompanying chain-of-custody form. Each time the responsibility for the custody of the sample changes, the new and previous custodians will sign the record and note the date and time. The sampler will make a copy of the signed record before sample shipment and will transmit the copy to the SMR organization within 48 hours of shipping.

The following information is required on a completed chain-of-custody form:

- Project name
- Signature of sampler
- HEIS sample number
- Date and time of collection
- Matrix (including indication if groundwater sample is field filtered)
- Preservatives
- Signatures of individual involved in sample transfer
- Requested analyses
- Number of containers associated with each analysis (if greater than one)
- Company contact information (phone number, email address, etc.)

DOE/RL-2013-36-ADD3, 2016, *100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 3: 199-K-223, 199-K-224, 199-K-225, and 199-K-226*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0076983H.

DOE/RL-2013-36-ADD4, 2016, *100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 4: Wells 199-K-227, 199-K-228, 199-K-229 and 199-K-230*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/pdf.cfm?accession=0068824H

DOE/RL-2013-36-ADD5, 2018, *100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 5: Wells 199-K-231, 199-K-232, 199-K-233, and 199-K-234*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: https://pdw.hanford.gov/arpir/pdf.cfm?accession=0066276H

DOE/RL-2013-36-ADD6, 2018, *100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 6: Wells 199-K-235 and 199-K-236*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: https://pdw.hanford.gov/arpir/pdf.cfm?accession=0064702H.

DOE/RL-2013-36-ADD7, 2019, *100-KR-4 Groundwater Operable Unit New Well Installation Sampling and Analysis Plan Addendum 7: Wells 199-K-238, 199-K-239, and 199-K-240*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: https://pdw.hanford.gov/document/AR-03041.

DOE/RL-2013-48, 2018, *Operations and Maintenance Plan for the 100-KR-4 Pump and Treat Systems*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: https://pdw.hanford.gov/arpir/pdf.cfm?accession=0064706H.

DOE/RL-2013-47, 2014, *Hanford Site Environmental Report for Calendar Year 2013*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0083590.

DOE/RL-2016-09, 2016, *Hanford Site Groundwater Monitoring Report for 2015*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0075774H.

DOE/RL-2016-19, 2016, *Calendar Year 2015 Annual Summary Report for the 100-HR-3 and 100-KR-4 Pump and Treat Operations, and 100-NR-2 Groundwater Remediation*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0075364H.

Ecology, EPA, and DOE, 1989a, *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.

Ecology, EPA, and DOE, 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, 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=82.