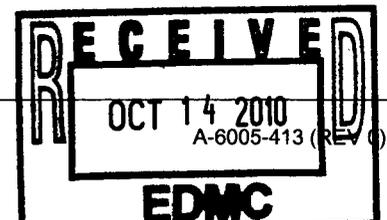


TRI-PARTY AGREEMENT

Change Notice Number TPA-CN- 359	TPA CHANGE NOTICE FORM	Date: 10/5/2010
Document Number, Title, and Revision: DOE/RL-2006-75, Rev. 1, Reissue Supplement to the 100-HR -3 and 100-KR-4 Remedial Design Report and Remedial Action Workplan for the Expansion of the 100-KR -4 Pump and Treat System (As amended by TPA-CN-273, May 20, 2009) DOE/RL-2006-52, Rev. 2, The KW Pump and Treat System Remedial Design and Remedial Action Work Plan, Supplement to the 100-KR-4 Groundwater Operable Unit Interim Action, October 2009.		Date Document Last Issued:
Originator: Scot C. Adams/ Art Lee/ Dave Erb		Phone: 376-1035
Description of Change: This TPA change revises DOE/RL-2006-75, Rev. 1 (as amended by TPA-CN-273), and DOE/RL-2006-52, Rev. 2, to: (1) incorporate Phase 3 Remediation Process Optimization (RPO) to add new wells to the 100-KR-4 Groundwater Operable Unit Pump and Treat Systems, and (2) realign existing wells (3 extraction and 2 monitoring wells) to target treatment of higher hexavalent chromium contamination in 2010.		
1) Description of Change for Phase 3 RPO wells: Phase 3 RPO adds 3 new wells for the 100-KR-4 Pump and Treat System, and one new well for the 100-KW Pump and Treat System in 2010 for the 100-KR-4 Groundwater Operable Unit. Specific document revisions to incorporate Phase 3 RPO are as follows:		
<u>DOE/RL-2006-75, Rev. 1 (as amended by TPA-CN-273)</u> <ul style="list-style-type: none"> • Section 1.3, "Modifications to the 100-KR-4 Pump-and-Treat Network Since 1997." – Update KR4 and KX well list table to add 2 new extraction wells (199-K-198 and 199-K-199) and one new monitoring well (199-K-197). Add new paragraph on RPO well addition description. Specific changes are included in Attachment 1. • Section 4.1.1, "Well Drilling" - Insert new text for description of the new Phase 3 RPO wells (199-K-197, 199-K-198, and 199-K-199) as provided in Attachment 2. • Table 5-1, and Table A-2, "100-KR-4 Pump-and-Treat Monitoring Schedule." – Add wells 199-K-197, 199-K-198, and 199-K-199 to tables as updated in Attachment 3. • Add Sampling Table for three new 100-KR-4 Wells as provided in Attachment 4. • Table B-1, "Names, Geographic Coordinates, and Extraction and Injection Rates at the Currently KR4 Pump-and-Treat System Wells." - Add wells 199-K-198 and 199-K-199 to table as updated in Attachment 5. • Add Figure 4-3 for location of three new 100-KR-4 wells as provided in Attachment 6. 		
<u>DOE/RL-2006-52, Rev. 2</u> <ul style="list-style-type: none"> • Section 1.3, "Modifications to the KW Reactor Pump-and-Treat Network Since Startup" - Add new paragraph on RPO well addition description as provided in Attachment 7. • Section 4.1.1, "Well Drilling" - Insert new text for description of the Phase 3 RPO well (199-K-196) as provided in Attachment 8. • Table 5-1, "KW Reactor Pump-and-Treat Monitoring Schedule" - Add well 199-K-196 to table as updated in Attachment 9. • Appendix A, Section A2.3, "Project/Task Description" - Add new paragraph on RPO well addition description as provided in Attachment 10. • Appendix, Table A-1, "Performance Requirements for KW Reactor Pump-and-Treat Contaminant Analysis" – Add analytical list for soil as updated in Attachment 11. • Appendix, Table A-2, "Field Sampling Requirements for KW Reactor Pump-and-Treat Well Sampling" – Add field sampling requirements for soil as updated in Attachment 12. • Appendix, Table A-3, "KW Reactor Pump-and-Treat Monitoring Schedule" – Add new 100-KW well to table as updated in Attachment 13. • Add Sampling Table for new 100-KW well as provided in Attachment 14. • Add Figure 4-3 for location of new 100-KW well as provided in Attachment 15. 		



2) Description of Change for Well Realignment to for Locations of Higher Hexavalent Chromium Contamination:

Two extraction wells to the 100-KX Pump and Treat System, 199-K-149 and 199-K-150, are changed to monitoring wells; and two monitoring wells, 199-K-152 and 199-K-182, are changed to extraction wells to connect to the 100-KX Pump and Treat System. Monitoring well 199-K-173 is changed to an extraction well to connect to the 100-KW Pump and Treat System. Specific document revisions to incorporate these well realignments are as follows:

DOE/RL-2006-75, Rev. 1 (as amended by TPA-CN-273)

- **Section 1.3, "Modifications to the 100-KR-4 Pump-and-Treat Network Since 1997."** – Update KR4 and KX well list table to change wells 199-K-149 and 199-K-150 to monitoring wells and change wells 199-K-152 and 199-K-182 to extraction wells. Add new paragraph on well realignment description. Specific changes are included in Attachment 16.
- **Table 5-1, and Table A-2, "100-KR-4 Pump-and-Treat Monitoring Schedule."** – Update tables to change wells 199-K-149 and 199-K-150 to monitoring wells and change wells 199-K-152 and 199-K-182 to extraction wells as updated in Attachment 17.
- **Table B-2, "Names, Geographic Coordinates, and Extraction and Injection Rates at the Wells Proposed for Inclusion in the 100 KX Pump-and-Treat System Expansion."** - Add wells 199-K-152 and 199-K-182 to table as updated in Attachment 18.

DOE/RL-2006-52, Rev. 2

- **Section 1.3, "Modifications to the KW Reactor Pump-and-Treat Network Since Startup"** - Add new paragraph for converting well 199-K-173 to an extraction well as provided in Attachment 19.
- **Table 5-1, "KW Reactor Pump-and-Treat Monitoring Schedule"** - Update table to change well 199-K-173 to an extraction well as updated in Attachment 20.
- **Appendix A, Section A2.3, "Project/Task Description"** - Add new paragraph for converting well 199-K-173 to an extraction well as provided in Attachment 21.
- **Appendix, Table A-3, "KW Reactor Pump-and-Treat Monitoring Schedule"** – Add new 100-KW well to table as updated in Attachment 22.

Briant Charboneau and Chris Guzzetti agree that the proposed change

DOE

Lead Regulatory Agency

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*.

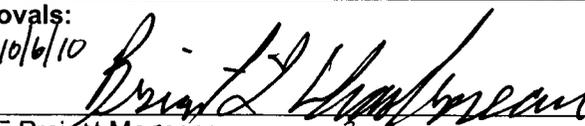
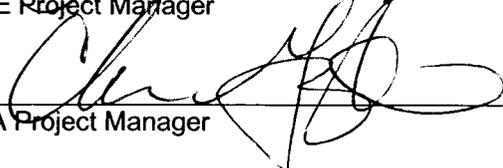
Note: Include affected page number(s)

Justification and Impacts of Change:

This TPA Change Notice provides for drilling four wells in the 100-KR-4 Groundwater Operable Unit. The changes impact DOE/RL-2006-75, Rev. 1, as amended by TPA CN-273, and DOE/RL-2006-52, Revision 2. All the wells are intended to address contamination in the near-shore area of the 100-KR-4 Operable Unit. The locations of the new RPO wells are provided in Attachments 6 and 15 for the 100-KR-4 and 100-KW wells, respectively. Locations are based upon groundwater RPO modeling and upon recent monitoring results.

(continued below)

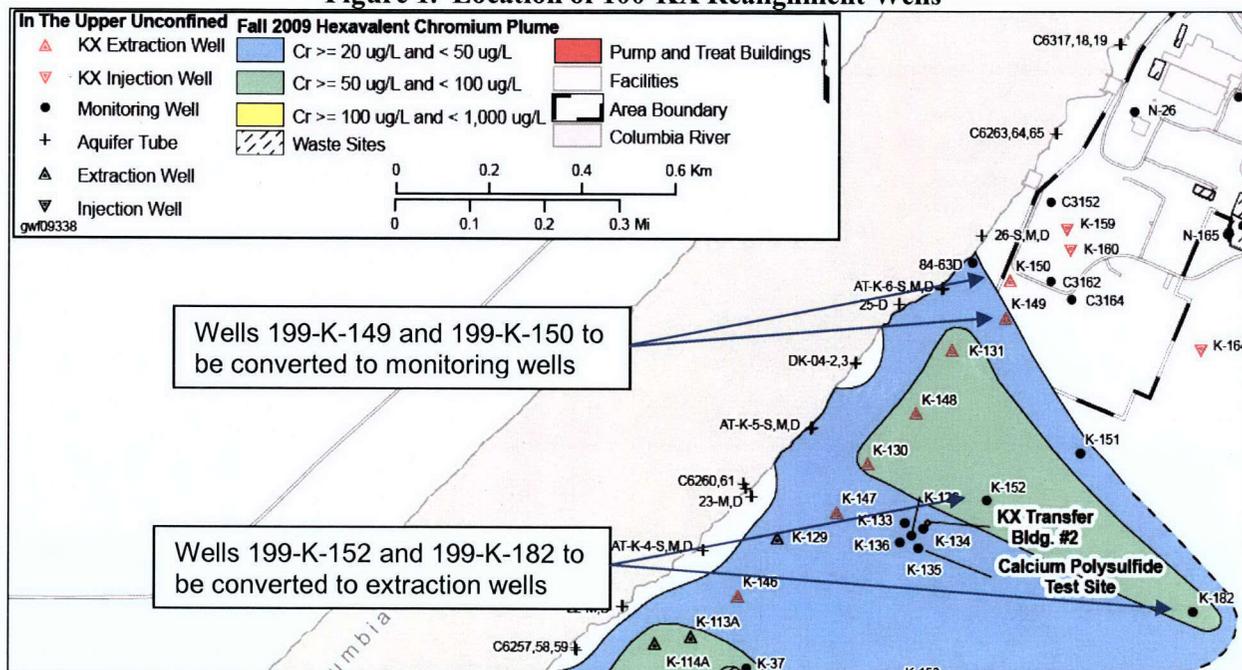
Approvals:

<i>QPA 10/6/10</i> 	<u>10-06-2010</u>	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Disapproved
DOE Project Manager	Date	
	<u>10/6/2010</u>	<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Disapproved
EPA Project Manager	Date	
_____	_____	<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved
Ecology Project Manager	Date	

Justification and Impacts of Change (continued):

This TPA Change Notice also provides for converting two extraction wells (199-K-149 and 199-K_150) to monitoring wells and two monitoring wells (199-K-152 and 199-K_182) to extraction wells to the 100-KX pump and treat system, and converting monitoring well 199-K-173 to an extraction well to the 100-KW pump and treat system. The Cr⁺⁶ concentration at well 199-K-150 has been below 10ppb since October 2009, and at well 199-K-149 the Cr⁺⁶ concentration has been <10 ppb since June. The two wells are being converted to monitoring wells to evaluate Cr⁺⁶ contamination rebound. Monitoring wells 199-K-152 and 199-K-182 which have Cr⁺⁶ concentrations above 60 ppb and will be converted to extraction wells in place of 199-K-149 and 199-K-150 to target locations of higher Cr⁺⁶ contamination. Figure 1 shows the locations of the 100-KX wells to be realigned.

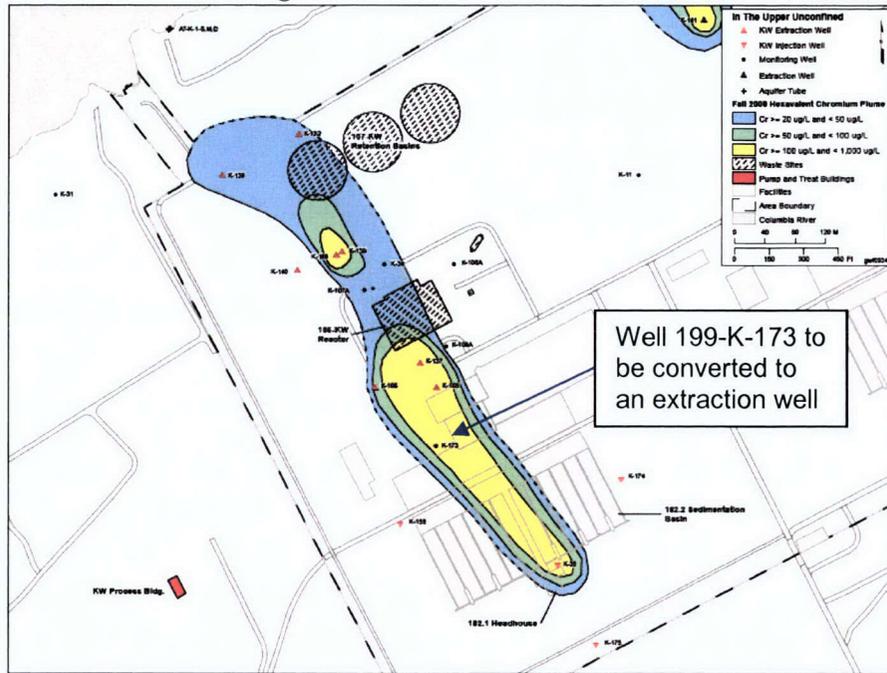
Figure 1. Location of 100-KX Realignment Wells



Justification and Impacts of Change (continued):

Groundwater samples taken at monitoring well 199-K-173 show an increase in Cr⁺⁶ contamination (over 600 ppb). This well is being converted to an extraction well to the KW pump and treat system to treat the Cr⁺⁶ contaminated groundwater at this location. Figure 2 shows the location of well 199-K-173.

Figure 2. Location of 199-K-173



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ATTACHMENT 1
RDR/RAWP, DOE/RL-2006-75, Rev. 1
Update Well List in Section 1-3

KR4 AND KX WELLS		
Extraction Wells	Injection Wells	Monitoring /Performance Wells
199-K-113	199-K-121A	199-K-11
199-K-114A	199-K-122A	199-K-18
199-K-115A	199-K-123A	199-K-19
199-K-116A	199-K-128	199-K-20
199-K-120A	199-K-143	199-K-21
199-K-127	199-K-156	199-K-22
199-K-129	199-K-159	199-K-23
199-K-130	199-K-160	199-K-32A
199-K-131	199-K-164	199-K-32B
199-K-141	199-K-169	199-K-36
199-K-144	199-K-170	199-K-37
199-K-145	199-K-172	199-K-110A
199-K-146	199-K-179	199-K-111A
199-K-147	199-K-180	199-K-119A
199-K-148		199-K-124A
199-K-152		199-K-125A
199-K-153		199-K-126
199-K-154		199-K-142
199-K-161		199-K-149
199-K-162		199-K-150
199-K-163		199-K-151
199-K-171		199-K-157
199-K-178		199-K-181
199-K-182		199-K-197
199-K-198		
199-K-199		

- Late 2010 (TPA CN-359):
 - Add two Remedial Process Optimization (RPO) extraction wells (199-K-198, and 199-K-199). These wells are being drilled nearer to the river than existing wells, and will serve as extraction wells to capture hexavalent chromium closer to the river in the river mixing zone. One monitoring well, 199-K-197, is being added to monitor contamination levels, plus drawdown induced by adjacent extraction wells. This will provide hydrologic information to the hydrologic model and will contribute to knowledge of the effectiveness of the extraction well in capturing contamination.

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ATTACHMENT 2 RDR/RAWP, DOE/RL-2006-75, Rev. 1 Insert Update to Section 4.1.1

The RDR/RAWP lists the existing wells associated with the KR4 and KX pump-and-treat areas within the 100-KR-4 Groundwater Operable Unit, identifies groundwater monitoring requirements for the wells, and identifies flow rates for wells connected to the pump-and-treat systems. The Phase 3 RPO optimization well additions in 2010 require that the RDR/RAWP be revised to add two extraction wells - C7698 (199-K-198) and C7699 (199-K-199) and one monitoring well C7697 (199-K-197). These are being drilled to contribute data on groundwater fluctuations from influences from the river, to provide design flexibility, and to improve contaminant capture with added extraction wells along the river in the KR4 and KX plume expansion areas. The three wells are located to address hexavalent chrome movement toward the river shore while protecting sensitive cultural locations from disturbance. Two new Remedial Process Optimization (RPO) extraction wells C7698 (199-K-198), and C7699 (199-K-199) will be drilled in 2010 to support the KR4/KX Pump and Treat Systems. These extraction wells are designed to capture near-river-plume flow that could otherwise be released to the river. These wells will also be drilled to determine the need to capture hexavalent chromium in a more deeply eroded part of the Ringold Upper Mud (RUM) Unit. In this area, at well 199-K-162, the unconfined Ringold E aquifer is ~105 ft thick. The new wells are expected to have a thicker saturated aquifer than holes immediately up and down river. At present, wells 199-K-144, 199-K-145 and 199-K-162 are fully penetrating and are extracting from the entire aquifer thickness. Consequently, the new wells screens will be designed, based on vertical profile sampling, to be sufficiently long to incorporate pumping from the contaminated interval. The holes will be drilled five feet into the RUM to provide sumps for the wells. C7698 and C7699 are as close as feasible to the river shore and are located in the center of the flow path of the plume. C7697 is located to intercept possible long-shore lateral flow of the plume. Samples of soil and water will be taken at 10 foot intervals as depth discreet samples to identify contaminant stratification and penetration depth. 199-K-198 and 199-K-199 are intended to capture Cr⁺⁶ between wells 199-K-144, 199-K-145, and 199-K-162 and aquifer tubes at AT-K-3, D, M, and S, plus C6248, C6249 and C6250.

199-K-198 (C7698 100-KR4/KX Extraction Well) and 199-K-199 (C7699 100-KR4/KX Extraction Well)

- These wells are being added closer to the river to help optimize extraction of Cr⁺⁶ in the mixing zone of groundwater and river water where there is extensive flux. The flux and mixing are a result of rising and falling river levels, where the groundwater surface changes by as much as seven feet.
- These wells are located to retrieve water in an area which is located near the thickest part of the Ringold E aquifer, and are down gradient from the 116-KR-2 Trench. The wells will be drilled 5 feet into the RUM.
- The wells will be screened within the aquifer, based on vertical profile sample results obtained during drilling and historic high water levels from adjacent well data and river stage.
- Screen size will be based on the results of size analysis from split spoon cores.
- Soil samples for contaminant analysis will be taken at 5 ft intervals in the vadose zone and just below the top of the Ringold Upper Mud.
- Groundwater samples for contaminant analysis will be taken at 10 ft intervals through the aquifer.

199-K-197 (C7697 100-KR4/KX monitoring well)

- This well is located to help monitor the extent of the Cr⁺⁶ on the downstream side of the KX plume near the 199-K-120A extraction well.
- The well will measure water levels that relate to the hydrodynamics of adjacent extraction wells. This should contribute to the knowledge of the capture zone of the near-river extraction wells.

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- This well is intended to monitor Cr^{+6} in the area down gradient of the existing extraction wells 199-K145, 199-K-162, and 199-K-120. It will also provide water level data useful in evaluating aquifer properties. It may be converted to an extraction well, if needed.
- The well will be screened based on vertical profile results for Cr^{+6} and historic high water levels from adjacent well data and river stage.
- Soil samples for contaminant analysis will be taken at 5 ft intervals in the vadose zone and just below the top of the Ringold Upper Mud.
- Groundwater samples for contaminant analysis will be taken at 10 ft intervals through the aquifer.

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ATTACHMENT 3
 RDR/RAWP, DOE/RL-2006-75, Rev. 1
 Revised Tables 5-1 and Table A-2

100-KR-4 OU Monitoring Schedule for Combined KR-4 and KX Pump and Treat Systems. (4 pages)

Sample Group	System Pre-Startup (Baseline) ^e			System Start Up ^d			System Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}
Extraction/Compliance Wells									
199-K-113A	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-114A	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-115A	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-116A	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-120A	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-127	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-129	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-130	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-131	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-144	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-145	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-146	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-147	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-148	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-152	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-161	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-162	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-171	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-178	--	--	--	T	W/Q	SA	T	M/SA	SA

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100-KR-4 OU Monitoring Schedule for Combined KR-4 and KX Pump and Treat Systems. (4 pages)

Sample Group	System Pre-Startup (Baseline) ^e			System Start Up ^d			System Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}
199-K-182	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-198	T	X	X	T	W/Q	SA	T	M/SA	SA
199-K-199	T	X	X	T	W/Q	SA	T	M/SA	SA
Compliance Wells^f									
199-K-18	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-19	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-20	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-32A	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-119A	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-125A	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-181	--	--	--	T	--/Q	SA	T	--/Q	SA
Extraction Wells									
199-K-141	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-153	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-154	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-163	--	--	--	T	W/Q	SA	T	M/SA	SA
Injection Wells									
199-K-121A	--	--	--	T	--	--	T	--	--
199-K-122A	--	--	--	T	--	--	T	--	--
199-K-123A	--	--	--	T	--	--	T	--	--
199-K-128	--	--	--	T	--	--	T	--	--
199-K-143	--	--	--	T	--	--	T	--	--
199-K-156	--	--	--	T	--	--	T	--	--

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100-KR-4 OU Monitoring Schedule for Combined KR-4 and KX Pump and Treat Systems. (4 pages)

Sample Group	System Pre-Startup (Baseline) ^e			System Start Up ^d			System Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}
199-K-159	--	--	--	T	--	--	T	--	--
199-K-160	--	--	--	T	--	--	T	--	--
199-K-164	--	--	--	T	--	--	T	--	--
199-K-169	--	--	--	T	--	--	T	--	--
199-K-170	--	--	--	T	--	--	T	--	--
199-K-172	--	--	--	T	--	--	T	--	--
199-K-179	T	X	X	T	--	--	T	--	--
199-K-180	T	X	X	T	--	--	T	--	--
Performance Wells^f									
199-K-19	--	--	--	T	--/SA	A	T	--/SA	A
199-K-21	--	--	--	T	--/SA	A	T	--/SA	A
199-K-22	--	--	--	T	--/SA	A	T	--/SA	A
199-K-32A	--	--	--	T	--/SA	A	T	--/SA	A
199-K-37	--	--	--	T	--/SA	SA	T	--/SA	SA
199-K-111A	--	--	--	T	--/SA	SA	T	--/SA	SA
199-K-124A	--	--	--	T	--/SA	SA	T	--/SA	SA
199-K-149	--	--	--	T	--/M	M	T	--/SA	SA
199-K-150	--	--	--	T	--/M	M	T	--/SA	SA
199-K-151	--	--	--	T	--/SA	A	T	--/SA	A
199-K-157	--	--	--	T	--/SA	SA	T	--/SA	SA
199-K-197	T	X	X	T	--/SA	SA	T	--/SA	SA
Treatment System									
Influent	--	--	--	--	W/SA	SA	--	M/SA	SA
Effluent	--	--	--	--	W/SA	SA	--	M/SA	SA

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100-KR-4 OU Monitoring Schedule for Combined KR-4 and KX Pump and Treat Systems. (4 pages)

Sample Group	System Pre-Startup (Baseline) ^e			System Start Up ^d			System Operation		
	Water Level	Cr ^{b,c}	Co-contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-contaminants and Target Analytes ^{a,c}

^a Co-contaminants, in accordance with the Declaration of the Record of Decision for the 100-HR-3 and 100-KR-4 Operable Units at the Hanford Site (Interim Remedial Actions) (EPA et al. 1996), are strontium-90 and tritium. Nitrate, carbon-14 and technetium-99 are target analytes.
^b Groundwater samples associated with routine pump-and-treat operations are analyzed for hexavalent chromium by operators using a Hach® (registered trademark of the Hach Company, Loveland, Colorado) kit. All other samples are analyzed at the Waste Sampling and Characterization Facility (WSCF) using U.S. Environmental Protection Agency (EPA) Method 7196.
^c Specific conductance, temperature, pH, turbidity, and dissolved oxygen will be measured for all laboratory samples.
^d Startup duration is approximately 5 months and consists of Acceptance and Operational Testing. Estimated start February, 2010.
^e System Pre-startup includes construction activities up to start of Acceptance Testing
^f Except for new wells, System Start-Up sampling requirements for compliance and performance wells are specified only to insure that System Operation samples are maintained during Phase 2 realignment activities.

A = annual M = monthly Q = quarterly SA = semi-annually
 T = hourly transducer or Tape During Sampling W = weekly X = one-time event Y = vertical profiling using Solinst™ sampler or similar.

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TPA-CN-359 ATTACHMENT 4

RDR/RAWP, DOE/RL-2006-75, Rev.1

Add Table for 2010 Sampling and Testing

Table 4-2. Sampling Table for Three New 2010 100-KR-4/KX Wells

Well Number	Soil/Sediment Sample Measurement		Water Sample/Measurement	
	Sample Depth (ft bgs)	Analyte List	Sample Interval Depth (ft bgs)	Analyte List
Well 199-K-197 (C7697 KR4 monitoring) Estimated depth to groundwater- 25 ft.	Every 5 ft starting at 5 ft below ground surface to the water table (estimate 5 samples), and one soil sample just below RUM contact with Ringold E unit by split spoon. Split Spoon samples for ASTM size analysis (estimate at 30, 50, 70, 90, and 110 ft bgs)	Cr ⁺⁶ , Cr-total, Sr-90 RUM sample - Cr ⁺⁶ and Cr-total	At 10 ft. intervals throughout unconfined aquifer (estimate 9 samples)	Cr ⁺⁶ , Cr-total, tritium, C-14, Sr-90, Tc-99, nitrate. Field parameters: pH, Temperature, Turbidity, Dissolved Oxygen, Specific Conductivity
Well 199-K-198 (C7698 KR4 extraction well) Estimated depth to groundwater- 25 ft.	-Every 5 ft starting at 5 ft below ground surface to the water table (estimate 5 samples), and one soil sample just below RUM contact with Ringold E unit by split spoon. Split Spoon samples for ASTM size analysis (estimate at 30, 50, 70, 90, and 110 ft bgs)	Cr ⁺⁶ , Cr-total, Sr-90 RUM sample - Cr ⁺⁶ and Cr-total	At 10 ft. intervals throughout unconfined aquifer (estimate 9 samples)	Cr ⁺⁶ , Cr-total, tritium, C-14, Sr-90, Tc-99, nitrate. Field parameters: pH, Temperature, Turbidity, Dissolved Oxygen, Specific Conductivity
Well 199-K-199 (C7699 KR4 extraction well) Estimated depth to groundwater- 25 ft.	Every 5 ft starting at 5 ft below ground surface to the water table (estimate 5 samples), and one soil sample just below RUM contact with Ringold E unit by split spoon. Split Spoon samples for ASTM size analysis (estimate at 30, 50, 70, 90, and 110 ft bgs)	Cr ⁺⁶ , Cr-total, Sr-90 RUM sample - Cr ⁺⁶ and Cr-total	At 10 ft. intervals throughout unconfined aquifer (estimate 9 samples)	Cr ⁺⁶ , Cr-total, tritium, C-14, Sr-90, Tc-99, nitrate. Field parameters: pH, Temperature, Turbidity, Dissolved Oxygen, Specific Conductivity

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ATTACHMENT 5
RDR/RAWP, DOE/RL-2006-75, Rev. 1
Appendix B - Updates to Table B-1

Table B-1. Names, Geographic Coordinates, and Extraction and Injection Rates at the Currently KR4 Pump-and-Treat System Wells.

Well Name	Type	Rate (gpm) Extraction -ve Injection +ve	Easting	Northing
199-K-113A	EW	-13	570098	148294
199-K-114A	EW	-28	570020	148281
199-K-115A	EW	-39	569940	148135
199-K-116A	EW	-46	569871	147960
199-K-120A	EW	-47	569400	147518
199-K-121A	IW	39	570017	147418
199-K-122A	IW	84	569975	147173
199-K-123A	IW	40	569931	147090
199-K-127	EW	-31	569539	147539
199-K-128	IW	80	570010	147258
199-K-129	EW	-13	570284	148503
199-K-144	EW	-75	569146	147261
199-K-145	EW	-75	569251	147420
199-K162	EW	-75	569323	147456
199-K-198	EW	TBD	TBD	TBD
199-K-199	EW	TBD	TBD	TBD

Key: TBD To be determined after pumping test

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ATTACHMENT 7

RDR/RAWP, DOE/RL-2006-52, Rev. 2

Update Section 1.3

In 2010, borehole C7696 (199-K-196) will be a Remedial Process Optimization (RPO) extraction well for the KW Pump and Treat Unit in the 100-KR-4 Groundwater Operable unit. The well is necessary to determine Cr⁺⁶ stratification or deep occurrence near the river and to provide improved capture deeper in the aquifer. This well will be drilled through the entire aquifer, and will be screened through the aquifer as determined from vertical profile sampling results obtained during drilling. The well design will be biased to cover deeper depths of the aquifer than do the adjacent extraction wells.

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ATTACHMENT 8

RDR/RAWP, DOE/RL-2006- 52, Rev. 2

Insert to Section 4.1.1

Wells 199-K-132 and 199-K-138 are the most down gradient extraction wells at the KW pump-and-treat system. The two existing wells penetrate 22 and 35 ft, respectively, into the ~85 ft thick upper unconfined aquifer, leaving the remaining ~47 to 63 ft. not characterized and not monitored. There is an unknown potential for Cr⁺⁶ deep in the aquifer to elude detection and capture in the deeper aquifer and this gap will be addressed by new well 199-K-196 (C7696). This well will be drilled as a Remedial Process Optimization (RPO) extraction well and will be located in the center of the 100-KW plume in line with and between 199-K-132 and 199-K-138. The well will be sampled to provide characterization data on the vertical distribution of Cr⁺⁶ in the aquifer. Based on analytical results, the well will be screened where contaminants are detected but with a bias for a location deeper in the aquifer.

199-K-196 (C7696)

- This well will be drilled through the unconfined aquifer and five feet into the Ringold Upper Mud (RUM).
- This well will vertically characterize the hexavalent chromium in the aquifer. Drilling will involve collection of depth discrete samples of water at ten foot intervals. The anticipated total depth of drilling is 140 feet.
- Vadose zone soil samples will be taken at 5 ft intervals below ground surface to the groundwater table (approximately 11 samples) to determine Cr⁺⁶ concentrations. This well is likely to lie west of the floodplain zone surrounding the 107-KW remediation site.
- The well will be screened through the aquifer, based on vertical profile sample results obtained during drilling and historic high water levels from adjacent well data and river stage..
- Screen size will be based on the results of size analysis from split spoon cores.
- A soil sample will be taken at the top of the RUM to determine its Cr⁺⁶ content.

Table 5-1. KW Reactor Pump-and-Treat Monitoring Schedule (2 pages)

Sample Group	Pre-Startup			Startup			Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr – Field/Laboratory ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes
Extraction/Compliance Wells									
199-K-132	T	X	X	T	W	--	T	M/Q	SA
199-K-138	T	X	X	T	W	--	T	M/Q	SA
Extraction Wells									
199-K-137	T	X	X	T	W	--	T	M/Q	SA
199-K-139	T	X	X	T	W	--	T	M/Q	SA
199-K-165	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-166	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-168	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-173	T	X	X	T	W	--	T	M/Q	SA
199-K-196	T	X	X	T	W	--	T	M/Q	SA
Injection Wells									
199-K-158	T	X	X	T	--	--	T	--	--
199-K-174	T	X	X	T	--	--	T	--	--
199-K-175	T	X	X	T	--	--	T	--	--
Performance Wells									
199-K-106A	T	A	A	T	M	--	T	--/Q	A
199-K-107A	T	A	A	T	M	--	T	--/Q	A
199-K-108A	T	X	A	T	M	--	T	--/Q	A

Table 5-1. KW Reactor Pump-and-Treat Monitoring Schedule (2 pages)

Sample Group	Pre-Startup			Startup			Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr - Field/Laboratory ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes
199-K-34	T	A	A	T	M	--	T	--/Q	A
Treatment System									
Influent	--	--	--	--	W	--	--	M/Q	SA
Effluent	--	--	--	--	W	--	--	M/Q	SA

a. Co-contaminants are strontium-90 and tritium. Target analytes for the KW Reactor pump-and-treat system are carbon-14, technetium-99, and nitrate.

b. Field samples are collected and analyzed by operations staff. Laboratory samples are analyzed by the Waste Sampling and Characterization Facility or offsite laboratory.

c. Specific conductance, temperature, pH, turbidity, and dissolved oxygen will be measured for all laboratory samples.

A = annual

M = monthly

Q = quarterly

SA = semi-annual

T = hourly transducer

W = weekly

X = one-time event

Y = vertical profiling using Solinst® (registered is a registered trademark of Solinst Canada Ltd., Georgetown, Ontario, Canada) sampler

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ATTACHMENT 10

RDR/RAWP, DOE/RL-2006-52, Rev. 2

Insert to Appendix A, Section A2.3

In 2010, borehole C7696 (199-K-196) will be drilled as an RPO extraction well for the KW pump-and-treat system. This well will characterize the unconfined aquifer and the upper-most part of the Ringold Upper Mud. Initial vertical-profiling analytical results will identify contamination distribution. The well design will address contamination in the aquifer with bias towards screening in deeper parts of the aquifer. At completion of the well, it will be used to extract groundwater for Cr⁺⁶ treatment at the KW pump-and-treat facility.

ATTACHMENT 11
 RDR/RAWP, DOE/RL-2006-52, REV. 2
 Updates to Section A2.4, QUALITY OBJECTIVES AND CRITERIA

The QA objective of this plan is to develop implementation guidance that will provide data of known and appropriate quality. Data quality is assessed by accuracy and precision. The applicable quality control (QC) guidelines, quantitative target limits, and levels of effort for assessing data quality are dictated by the intended use of the data and the nature of the analytical method. Each of these is addressed in the following subsections. Groundwater quality objectives and criteria for measurement data are presented in Table A-1.

Table A-1. Performance Requirements for KW Reactor Pump-and-Treat Contaminant Analysis (2 pages)

WATER					
Type of Contaminant	Contaminant	Analytical Methods ^{a,d}	EQL (µg/L) ^b	Precision ^c Required	Accuracy Required ^{c,e}
Metals	Hexavalent chromium	SW 7196	10	≤20%	75-125%
	Hexavalent chromium	Field Hach®	5 (estimated)	None	None
Anions	Total chromium	SW 6010A	10	≤20%	75-125%
	Nitrate and other anions	300.0	250	≤20%	75-125%
Man-made Radionuclides		Methods	MDC (pCi/L)	Precision Required	Accuracy Required
	Sr-90	Gas proportional counting	2	≤20%	75-125%
	C-14	Liquid scintillation	200	≤20%	75-125%
	Tc-99	Liquid scintillation	15	≤20%	75-125%
	Tritium	Liquid scintillation	400	≤20%	75-125%

Table A-1. Performance Requirements for KW Reactor Pump-and-Treat Contaminant Analysis (2 pages)

SOIL					
Type of Contaminant	Contaminant	Analytical Methods ^{a,d}	EQL (µg/L) ^b	Precision ^c Required	Accuracy Required ^{c,e}
Metals	Hexavalent chromium	SW 7196	500	≤20%	75-125%
	Total chromium	SW 6010A	1000	≤20%	75-125%
Anions	Nitrate and other anions	300.0	2500 (NO ₃)	±35%	75-125%
Man-made Radionuclides	Contaminant	Analytical Methods^{a,d}	EQL (pCi/L)^b	Precision^c Required	Accuracy Required^{c,e}
	Sr-90	Gas proportional counting	1	≤20%	75-125%
	C-14	Liquid scintillation	50	≤20%	75-125%
	Tc-99	Liquid scintillation	15	≤20%	75-125%
	Tritium	10028-17-8	400	≤20%	75-125%

NOTE: Hach® is a registered trademark of the Hach Company, Loveland, Colorado.

a. Analytical method selection is based on available methods by laboratories currently contracted to the Hanford Site. Equivalent methods may be substituted in future sampling and analysis plans or other documents. Four-digit methods are from EPA SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*; other methods are referenced to source.

b. Typical EQL or MDC based on current Hanford Site laboratory contracts. The EQLs in documents may decrease, depending on method selection and contract laboratory, but will not increase. Units are in "µg/L" for nonradiological COCs and "pCi/L" for future radiological COCs, unless otherwise noted.

c. Precision and accuracy are in accordance with existing requirements for the 100-KR-4 pump-and-treat system.

d. Specific procedures vary from laboratory to laboratory.

e. Field chromium accuracy is assessed by analyzing semi-annual matrix spike/matrix spike duplicate samples.

COC = contaminant of concern
 EPA = U.S. Environmental Protection Agency
 EQL = estimated quantitation limit
 MDC = minimum detectable concentration

ATTACHMENT 12

RDR/RAWP, DOE/RL-2006-52, Rev. 2

Update to Table A-2

Table A-2. Field Sampling Requirements for KW Reactor Pump-and-Treat Well Sampling (2 pages)

Analysis	Matrix	# of Bottles	Bottle Type	Amount	Preservation	Packing Requirements	Holding Time
Radionuclides							
C-14	Water	1	G/P	125 mL	None	None	6 months
Sr-89/90	Water	1	G/P	2 x 1,000 mL	None	None	6 months
Tritium (H-3)	Water	1	G	500 mL	None	None	6 months
Tc-99	Water	1	G	1,000 mL	None	None	6 months
Chemicals							
IC anions – 300.0	Water	1	G/P	120 mL	None	Cool 4°C	28 days/ 48 hours
Chromium hexavalent – 7196	Water	1	G/P	500 mL	None	Cool 4°C	24 hours
Chromium, total – SW 6010A	Water	1	G/P	500 mL	None	None	6 months
Radionuclides							
C-14	Soil	1	P	750 g	None	None	6 months
Sr-89/90	Soil	1	/P	750 g	None	None	6 months
Tritium (H-3)	Soil	1	P	750 g	None	None	6 months
Tc-99	Soil	1	P	750 g	None	None	6 months
Chemicals							
IC anions – 300.0	Soil	1	G/P	250 g	None	Cool 4°C	28 days/ 48 hours
Chromium hexavalent – 7196	Soil	1	G/P	250 g	None	Cool 4°C	24 hours

Table A-2. Field Sampling Requirements for KW Reactor Pump-and-Treat Well Sampling (2 pages)

Analysis	Matrix	# of Bottles	Bottle Type	Amount	Preservation	Packing Requirements	Holding Time
Chromium, total – SW 6010A	Soil	1	G/P	250 g	HNO ₃ pH<2	None	6 months
Soil Properties							
ASTM- D-422	Soil	1	G/P	1,000 g	None	None	None
G= glass IC= ion chromatography P = plastic							

If samples are not collected as scheduled, if insufficient quantity is collected, or if temperature controls or preservation requirements are not implemented, the 100-KR-4 area task lead will be notified. The 100-KR-4 area task lead and the Sample and Reporting Management project coordinator will determine if resampling is required or possible.

Additional details on sampling methods are provided in Chapter 5 in the main text of this document.

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ATTACHMENT 13
RDR/RAWP, DOE/RL-2006-52, Rev. 2
Update to Table A-3

Table A-3. KW Reactor Pump-and-Treat Monitoring Schedule (2 pages)

	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr – Field/Laboratory ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes
Extraction/Compliance Wells									
199-K-132	T	X	X	T	W	--	T	M/Q	SA
199-K-138	T	X	X	T	W	--	T	M/Q	SA
Extraction Wells									
199-K-137	T	X	X	T	W	--	T	M/Q	SA
199-K-139	T	X	X	T	W	--	T	M/Q	SA
199-K-165	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-166	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-168	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-173	T	X	X	T	W	--	T	M/Q	SA
199-K-196	T	X	X	T	W	--	T	M/Q	SA
Injection Wells									
199-K-158	T	X	X	T	--	--	T	--	--
199-K-174	T	X	X	T	--	--	T	--	--
199-K-175	T	X	X	T	--	--	T	--	--
Performance Wells									
199-K-106A	T	A	A	T	M	--	T	--/Q	A
199-K-107A	T	A	A	T	M	--	T	--/Q	A
199-K-108A	T	X	A	T	M	--	T	--/Q	A
199-K-34	T	A	A	T	M	--	T	--/Q	A

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	Water Level	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr – Field/Laboratory ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes
Treatment System								
Influent	--	--	--	W	--	--	M/Q	SA
Effluent	--	--	--	W	--	--	M/Q	SA

a. Co-contaminants are strontium-90 and tritium. Target analytes for the KW Reactor pump-and-treat system are carbon-14, technetium-99, and nitrate. Field samples are collected and analyzed by operations staff. Laboratory samples are analyzed by the Waste Sampling and Characterization Facility or offsite laboratory.

c. Specific conductance, temperature, pH, turbidity, and dissolved oxygen will be measured for all laboratory samples.

A = annual

M = monthly

Q = quarterly

SA = semi-annual

T = hourly transducer

W = weekly

X = one-time event

Y = vertical profiling using Solinst® (registered is a registered trademark of Solinst Canada Ltd., Georgetown, Ontario, Canada) sampler or similar.

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ATTACHMENT 14
RDR/RAWP, DOE/RL-2006-52, Rev. 2
New Table A-4

Table A-4. Sampling Requirements for New KW Well

Well Number	Soil/Sediment Sample Measurement		Water Sample/Measurement (ft bgs)	
	Sample Depth (ft bgs)	Analyte List	Sample Interval Depth (ft bgs)	Analyte List
Well 199-K-196 (C7696) KW multi-purpose well Estimated depth to groundwater- 57 ft.	Every 5 below ground surface to the water table (estimate 11 samples), and one RUM sample just below contact with Ringold E by split spoon. Split Spoon samples for ASTM size analysis (estimate at 67, 87, and 107 ft bgs)	Target analytes for soil and soil properties in accordance with Table A-2. RUM sample - Cr ⁺⁶ and Cr-total	10 ft intervals throughout unconfined aquifer (estimate 9 samples)	Target analytes for water in accordance with Table A-2 Field parameters- pH, Temperature, Turbidity, Dissolved Oxygen, Specific Conductivity

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ATTACHMENT 16
RDR/RAWP, DOE/RL-2006-75, Rev. 1
Update Well List in Section 1-3

KR4 AND KX WELLS		
Extraction Wells	Injection Wells	Monitoring /Performance Wells
199-K-113	199-K-121A	199-K-11
199-K-114A	199-K-122A	199-K-18
199-K-115A	199-K-123A	199-K-19
199-K-116A	199-K-128	199-K-20
199-K-120A	199-K-143	199-K-21
199-K-127	199-K-156	199-K-22
199-K-129	199-K-159	199-K-23
199-K-130	199-K-160	199-K-32A
199-K-131	199-K-164	199-K-32B
199-K-141	199-K-169	199-K-36
199-K-144	199-K-170	199-K-37
199-K-145	199-K-172	199-K-110A
199-K-146	199-K-179	199-K-111A
199-K-147	199-K-180	199-K-119A
199-K-148		199-K-124A
199-K-152		199-K-125A
199-K-153		199-K-126
199-K-154		199-K-142
199-K-161		199-K-149
199-K-162		199-K-150
199-K-163		199-K-151
199-K-171		199-K-157
199-K-178		199-K-181
199-K-182		199-K-197
199-K-198		
199-K-199		

- late 2010 (TPA CN-359):
 - Extraction wells 199-K-149 and 199-K-150 are being converted to monitoring wells to evaluate rebound of Cr+6 contamination which has been <10 ppb since June 2010. Monitoring wells 199-K-152 and 199-K-182 have concentrations of Cr+6 contamination above 60 ppb and will be converted to extraction wells in place of 199-K-149 and 199-K-150 to target locations of higher Cr+6 contamination.

ATTACHMENT 17

RDR/RAWP, DOE/RL-2006-75, Rev. 1
Revised Tables 5-1 and Table A-2

100-KR-4 OU Monitoring Schedule for Combined KR-4 and KX Pump and Treat Systems. (4 pages)

Sample Group	System Pre-Startup (Baseline) ^e			System Start Up ^d			System Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}
Extraction/Compliance Wells									
199-K-113A	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-114A	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-115A	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-116A	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-120A	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-127	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-129	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-130	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-131	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-144	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-145	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-146	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-147	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-148	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-152	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-161	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-162	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-171	--	--	--	T	W/Q	SA	T	M/SA	SA

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100-KR-4 OU Monitoring Schedule for Combined KR-4 and KX Pump and Treat Systems. (4 pages)

Sample Group	System Pre-Startup (Baseline) ^e			System Start Up ^d			System Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}
199-K-178	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-182	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-198	T	X	X	T	W/Q	SA	T	M/SA	SA
199-K-199	T	X	X	T	W/Q	SA	T	M/SA	SA
Compliance Wells^f									
199-K-18	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-19	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-20	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-32A	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-119A	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-125A	--	--	--	T	--/Q	SA	T	--/Q	SA
199-K-181	--	--	--	T	--/Q	SA	T	--/Q	SA
Extraction Wells									
199-K-141	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-153	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-154	--	--	--	T	W/Q	SA	T	M/SA	SA
199-K-163	--	--	--	T	W/Q	SA	T	M/SA	SA
Injection Wells									
199-K-121A	--	--	--	T	--	--	T	--	--
199-K-122A	--	--	--	T	--	--	T	--	--
199-K-123A	--	--	--	T	--	--	T	--	--
199-K-128	--	--	--	T	--	--	T	--	--
199-K-143	--	--	--	T	--	--	T	--	--
199-K-156	--	--	--	T	--	--	T	--	--

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100-KR-4 OU Monitoring Schedule for Combined KR-4 and KX Pump and Treat Systems. (4 pages)

Sample Group	System Pre-Startup (Baseline) ^e			System Start Up ^d			System Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}
199-K-159	--	--	--	T	--	--	T	--	--
199-K-160	--	--	--	T	--	--	T	--	--
199-K-164	--	--	--	T	--	--	T	--	--
199-K-169	--	--	--	T	--	--	T	--	--
199-K-170	--	--	--	T	--	--	T	--	--
199-K-172	--	--	--	T	--	--	T	--	--
199-K-179	T	X	X	T	--	--	T	--	--
199-K-180	T	X	X	T	--	--	T	--	--
Performance Wells^f									
199-K-19	--	--	--	T	--/SA	A	T	--/SA	A
199-K-21	--	--	--	T	--/SA	A	T	--/SA	A
199-K-22	--	--	--	T	--/SA	A	T	--/SA	A
199-K-32A	--	--	--	T	--/SA	A	T	--/SA	A
199-K-37	--	--	--	T	--/SA	SA	T	--/SA	SA
199-K-111A	--	--	--	T	--/SA	SA	T	--/SA	SA
199-K-124A	--	--	--	T	--/SA	SA	T	--/SA	SA
199-K-149	--	--	--	T	--/M	M	T	--/SA	SA
199-K-150	--	--	--	T	--/M	M	T	--/SA	SA
199-K-151	--	--	--	T	--/SA	A	T	--/SA	A
199-K-157	--	--	--	T	--/SA	SA	T	--/SA	SA
199-K-197	T	X	X	T	--/SA	SA	T	--/SA	SA
Treatment System									
Influent	--	--	--	--	W/SA	SA	--	M/SA	SA
Effluent	--	--	--	--	W/SA	SA	--	M/SA	SA

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100-KR-4 OU Monitoring Schedule for Combined KR-4 and KX Pump and Treat Systems. (4 pages)

Sample Group	System Pre-Startup (Baseline) ^e			System Start Up ^d			System Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}	Water Level	Cr ^{b,c} Field/Laboratory	Co-Contaminants and Target Analytes ^{a,c}

^a Co-contaminants, in accordance with the Declaration of the Record of Decision for the 100-HR-3 and 100-KR-4 Operable Units at the Hanford Site (Interim Remedial Actions) (EPA et al. 1996), are strontium-90 and tritium. Nitrate, carbon-14 and technetium-99 are target analytes.
^b Groundwater samples associated with routine pump-and-treat operations are analyzed for hexavalent chromium by operators using a Hach® (registered trademark of the Hach Company, Loveland, Colorado) kit. All other samples are analyzed at the Waste Sampling and Characterization Facility (WSCF) using U.S. Environmental Protection Agency (EPA) Method 7196.

^c Specific conductance, temperature, pH, turbidity, and dissolved oxygen will be measured for all laboratory samples.
^d Startup duration is approximately 5 months and consists of Acceptance and Operational Testing. Estimated start February, 2010.
^e System Pre-startup includes construction activities up to start of Acceptance Testing
^f Except for new wells, System Start-Up sampling requirements for compliance and performance wells are specified only to insure that System Operation samples are maintained during Phase 2 realignment activities.

A = annual M = monthly Q = quarterly SA = semi-annually
 T = hourly transducer or Tape During Sampling W = weekly X = one-time event Y = vertical profiling using Solinst™ sampler or similar.

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ATTACHMENT 18
RDR/RAWP, DOE/RL-2006-75, Rev. 1
Appendix B - Updates to Table B-2

Table B-2. Names, Geographic Coordinates, and Extraction and Injection Rates at the Wells Proposed for Inclusion in the 100-KX Pump-and-Treat System Expansion

Well Name	Type	Rate (gpm) Extraction -ve Injection +ve	Easting	Northing
199-K-130	EW	-60	570462	148657
199-K-131	EW	-60	570645	148899
199-K-141	EW	-35	569024	146818
199-K-143	IW	65	570917	148084
199-K-146	EW	-10	570180	148375
199-K-147	EW	-20	570394	148553
199-K-148	EW	-50	570567	148763
199-K-152	EW	-50	570736	148585
199-K-153	EW	-60	570530	148210
199-K-154	EW	-55	570320	148027
199-K-156	IW	65	569657	147266
199-K-159	IW	75	570894	149155
199-K-160	IW	75	570902	149112
199-K-161	EW	-30	569987	148198
199-K-163	EW	-60	570231	147948
199-K-164	IW	45	571183	148897
199-K-169	IW	60	570005	147562
199-K-170	IW	60	570019	147490
199-K-171	EW	45	570544	147187
199-K-172	IW	55	570861	147175
199-K-178	EW	-40 to -75	568953	146954
199-K-180	IW	+45	571116	147449
199-K-182	EW	-50	571185	148350

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ATTACHMENT 19
RDR/RAWP, DOE/RL-2006-52, Rev. 2
Update Section 1.3

Monitoring well 199-K-173 is being converted to an extraction well to the KW pump and treat system to treat increased Cr⁺⁶ contamination recently observed in groundwater samples taken at this location.

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ATTACHMENT 20
RDR/RAWP, DOE/RL-2006-52, Rev. 2
Update to Table 5-1

Table 5-1. KW Reactor Pump-and-Treat Monitoring Schedule (2 pages)

Sample Group	Pre-Startup			Startup			Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr – Field/Laboratory ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes
Extraction/Compliance Wells									
199-K-132	T	X	X	T	W	--	T	M/Q	SA
199-K-138	T	X	X	T	W	--	T	M/Q	SA
Extraction Wells									
199-K-137	T	X	X	T	W	--	T	M/Q	SA
199-K-139	T	X	X	T	W	--	T	M/Q	SA
199-K-165	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-166	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-168	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-173	T	X	X	T	W	--	T	M/Q	SA
199-K-196	T	X	X	T	W	--	T	M/Q	SA
Injection Wells									
199-K-158	T	X	X	T	--	--	T	--	--
199-K-174	T	X	X	T	--	--	T	--	--
199-K-175	T	X	X	T	--	--	T	--	--
Performance Wells									
199-K-106A	T	A	A	T	M	--	T	--/Q	A
199-K-107A	T	A	A	T	M	--	T	--/Q	A
199-K-108A	T	X	A	T	M	--	T	--/Q	A
199-K-34	T	A	A	T	M	--	T	--/Q	A

Table 5-1. KW Reactor Pump-and-Treat Monitoring Schedule (2 pages)

Sample Group	Pre-Startup			Startup			Operation		
	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr – Field/Laboratory ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes
Treatment System									
Influent	--	--	--	--	W	--	--	M/Q	SA
Effluent	--	--	--	--	W	--	--	M/Q	SA

a. Co-contaminants are strontium-90 and tritium. Target analytes for the KW Reactor pump-and-treat system are carbon-14, technetium-99, and nitrate. b. Field samples are collected and analyzed by operations staff. Laboratory samples are analyzed by the Waste Sampling and Characterization Facility or offsite laboratory.

c. Specific conductance, temperature, pH, turbidity, and dissolved oxygen will be measured for all laboratory samples.

A = annual

M = monthly

Q = quarterly

SA = semi-annual

T = hourly transducer

W = weekly

X = one-time event

Y = vertical profiling using Solinst® (registered is a registered trademark of Solinst Canada Ltd., Georgetown, Ontario, Canada) sampler

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ATTACHMENT 21

RDR/RAWP, DOE/RL-2006-52, Rev. 2

Insert to Appendix A, Section A2.3

Monitoring well 199-K-173 is being converted to an extraction well to the KW pump and treat system to treat increased Cr⁺⁶ contamination recently observed in groundwater samples taken at this location.

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ATTACHMENT 22
RDR/RAWP, DOE/RL-2006-52, Rev. 2
Update to Table A-3

Table A-3. KW Reactor Pump-and-Treat Monitoring Schedule (2 pages)

	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr – Field/Laboratory ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes
Extraction/Compliance Wells									
199-K-132	T	X	X	T	W	--	T	M/Q	SA
199-K-138	T	X	X	T	W	--	T	M/Q	SA
Extraction Wells									
199-K-137	T	X	X	T	W	--	T	M/Q	SA
199-K-139	T	X	X	T	W	--	T	M/Q	SA
199-K-165	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-166	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-168	T	X/Y	X	T	W	--	T	M/Q	SA
199-K-173	T	X	X	T	W	--	T	M/Q	SA
199-K-196	T	X	X	T	W	--	T	M/Q	SA
Injection Wells									
199-K-158	T	X	X	T	--	--	T	--	--
199-K-174	T	X	X	T	--	--	T	--	--
199-K-175	T	X	X	T	--	--	T	--	--
Performance Wells									
199-K-106A	T	A	A	T	M	--	T	--/Q	A
199-K-107A	T	A	A	T	M	--	T	--/Q	A
199-K-108A	T	X	A	T	M	--	T	--/Q	A
199-K-34	T	A	A	T	M	--	T	--/Q	A

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	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes	Water Level	Cr - Field/Laboratory ^{b,c}	Co-Contaminants ^{a,c} and Target Analytes
Treatment System									
Influent	--	--	--	--	W	--	--	M/Q	SA
Effluent	--	--	--	--	W	--	--	M/Q	SA

a. Co-contaminants are strontium-90 and tritium. Target analytes for the KW Reactor pump-and-treat system are carbon-14, technetium-99, and nitrate.

b. Field samples are collected and analyzed by operations staff. Laboratory samples are analyzed by the Waste Sampling and Characterization Facility or offsite laboratory.

c. Specific conductance, temperature, pH, turbidity, and dissolved oxygen will be measured for all laboratory samples.

A = annual

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Y = vertical profiling using Solinst® (registered is a registered trademark of Solinst Canada Ltd., Georgetown, Ontario, Canada) sampler or similar.