SGW-56886
Revision 1

Post-Closure Corrective Action Groundwater Monitoring Report for the 183-H Solar Evaporation Basins and the 300 Area Process Trenches: July – December 2013 Second Semiannual Report

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

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Executive Summary

This is the second 2013 semiannual report on post-closure corrective action groundwater monitoring for the 183-H Solar Evaporation Basins and the 300 Area Process Trenches. It fulfills the requirement of WAC 173-303-645(11)(g)[1] to report twice each year on the effectiveness of the corrective action program.

This report covers the period from July through December 2013. Environmental data used to generate this report are available from the Environmental Dashboard Application (http://environet.hanford.gov/EDA/) or Pacific Northwest National Laboratory (PNNL) Online Environmental Information Exchange (PHOENIX) (http://phoenix.pnnl.gov). Ongoing verification and technical review and evaluation efforts may result in differences between the data used for this publication and those available after publication of this report.

183-H Solar Evaporations Basins Groundwater Monitoring

Chromium and hexavalent chromium concentrations in the unconfined aquifer remained below permit concentration limits. Hexavalent chromium in deep well 199-H4-12C resulted from historical releases, and remained near permit concentration limits and above the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*[2] (CERCLA) remedial action objectives (RAOs). With addition of Well 199-H4-12C to the pump-and-treat system, corrective action through the CERCLA interim action remains effective.

Uranium, nitrate, fluoride, and technetium-99 concentrations were all below the permit limits during the reporting period.

300 Area Process Trenches Groundwater Monitoring

Uranium concentrations continued to exceed the permit concentration limit (drinking water standard [DWS] of 30 µg/L) at three downgradient wells (399-1-10A, 399-1-16A, and 399-1-17A) screened near the water table. Uranium concentrations at Wells 399-1-10A and 399-1-16A vary inversely with water level, as is typical for wells that are

[1] WAC 173-303-645, "Dangerous Waste Regulations," "Releases from Regulated Units," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303-645.
[2] *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 42 USC 9601, et seq., Pub. L. 107-377, December 31, 2002. Available at: http://epw.senate.gov/cercla.pdf.

located near the Columbia River. Uranium concentrations at Well 399-1-17A vary positively with water level, as is typical for wells that are located farther inland from the Columbia River, near source areas.

The increase in uranium concentrations in groundwater near source areas during high water levels is caused by mobilization of residual uranium contamination in the deep vadose zone resulting from the temporary elevation of the water table. The decrease in uranium concentrations near the shoreline during high water levels is caused by dilution from the intrusion of river water into the aquifer. During seasonal low water table conditions, the highest concentrations in the plume are often observed near the river, where uranium introduced inland during the preceding period of high water table conditions has migrated downgradient to the shoreline, and the intrusion of river water into the zone beneath the shoreline is lessened because of the lower river stage.

Cis-1,2-dichloroethene remained above the 70 µg/L permit concentration limit (DWS) in one deep well (399-1-16B). Trichloroethene remained below the 5 µg/L permit concentration limit (DWS) in all of the wells.

Corrective action is being accomplished through the CERCLA remedial action for groundwater, as documented in a new Record of Decision. The remedy for groundwater includes monitored natural attenuation, enhanced attenuation, and institutional controls.

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Terms

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
DWS	drinking water standard
gpm	gallons per minute
lpm	liters per minute
OU	operable unit
PHOENIX	PNNL Hanford Online Environmental Information Exchange
PNNL	Pacific Northwest National Laboratory
RAO	remedial action objective
RCRA	*Resource Conservation and Recovery Act of 1976*
RUM	Ringold Formation upper mud

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1 Introduction

This is the second semiannual report for 2013 regarding post-closure corrective action groundwater monitoring describing the effectiveness of corrective actions at the 183-H Solar Evaporation Basins (waste site 116-H-6) and the 300 Area Process Trenches (waste site 316-5). This report fulfills the requirement of WAC 173-303-645(11)(g), "Dangerous Waste Regulations," "Releases from Regulated Units," to report twice each year on the effectiveness of the corrective action program. This report covers the period from July through December 2013. The 183-H Solar Evaporation Basins information is presented in Chapter 2 and the 300 Area Process Trenches information is presented in Chapter 3.

Environmental data used to generate this report are available from the U.S. Department of Energy's (DOE's) Environmental Dashboard Application (http://environet.hanford.gov/EDA/) or the Pacific Northwest National Laboratory (PNNL) Online Environmental Information Exchange (PHOENIX) application (http://phoenix.pnnl.gov/). Ongoing data, verification, technical review and evaluation efforts by Department of Energy (DOE) contractors could result in differences between the data used for this publication and those available after publication of this report via the electronic means referenced previously.

2 183-H Solar Evaporation Basins

Located in the 100-H Area of the Hanford Site, the former 183-H Solar Evaporation Basins consisted of four concrete basins used for waste treatment and disposal from 1973 to 1985. The waste discharged to the basins originated in the 300 Area Fuel Fabrication Facility and included solutions of neutralized chromic, hydrofluoric, nitric, and sulfuric acids. The waste solutions contained various metallic and radioactive constituents (e.g., chromium, technetium-99, and uranium). Between 1985 and 1996, the remaining waste was removed, the facility was demolished, and underlying contaminated soil was removed and replaced with clean fill.

The site is a post-closure unit in the Hanford Facility RCRA Permit (WA7890008967). Groundwater is monitored in accordance with WAC 173-303-645(11) and Part VI, Chapter 2 of the Hanford Facility RCRA Permit (WA7890008967).

The regulations in WAC 173-303-645(11) require implementation of a corrective action program to reduce contaminant concentrations in groundwater. The post-closure plan (DOE/RL-97-48, *183-H Solar Evaporation Basins Postclosure Plan*) was incorporated into Part VI of the Hanford Facility RCRA Permit (WA7890008967) in February 1998. The plan deferred further groundwater corrective action at the basins to the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) interim action for the 100-HR-3 Groundwater Operable Unit (OU). The post-closure plan (DOE/RL-97-48) also requires monitoring to be conducted as described in the Hanford Facility RCRA Permit (WA7890008967) groundwater monitoring plan for this facility (PNNL-11573, *Groundwater Monitoring Plan for the 183-H Solar Evaporation Basins*).

2.1 100-HR-3 CERCLA Interim Remedial Action

The interim remedial action for groundwater contamination in this OU is implemented under the authority of a CERCLA Interim Record of Decision (EPA et al., 1996a, *Declaration of the Record of Decision for the USDOE Hanford 100 Area 100-HR-3 and 100-KR-4 Operable Units, Hanford Site, Benton County, Washington*). The objective of the interim remedial action is to reduce the amount of chromium entering the Columbia River, where it is a potential hazard to the ecosystem. To achieve this objective, a pump-and-treat system has been implemented to extract groundwater, treat it to remove hexavalent chromium, and re-inject it into the aquifer. Figure 1 illustrates the active extraction and injection wells.

Details of the pump-and-treat system are specified in DOE/RL-96-84, *Remedial Design and Remedial Action Work Plan for the 100-HR-3 and 100-KR-4 Groundwater Operable Units' Interim Action*.

The HX pump-and-treat system handles 3,028 liters per minute (lpm) or 800 gallons per minute (gpm) and replaced the aging 1,136 lpm (300 gpm) 100-HR-3 pump-and-treat system. Together with the 2,271 lpm (600 gpm) DX pump-and-treat system, the 100-HR-3 OU interim action has the expanded capacity to hydraulically contain and remediate hexavalent chromium contaminated groundwater throughout the OU. The pump-and-treat system includes extraction from well 199-H4-12C, completed in the first water bearing unit of the Ringold Formation upper mud unit (RUM), and located downgradient of the 183-H Solar Evaporation Basins.

2.2 183-H Basins RCRA Groundwater Monitoring Program

During implementation of the CERCLA interim remedial action, RCRA corrective action monitoring will continue to evaluate analytical results relative to the permit concentration limits (Table 1). Additionally, fluoride results are evaluated relative to established trends and the drinking water standard (DWS) for fluoride[3] (Hanford Facility RCRA Permit [WA7890008967], Part VI, Chapter 2).

Table 1. Permit Concentration Limits for 183-H Solar Evaporation Basins

Dangerous Waste Constituents	Concentration Limit
Chromium (total; filtered sample)	122 µg/L – local background when the compliance monitoring plan was written (1996); upgradient sources
Nitrate[a]	45 mg/L (nitrate as NO_3^-)
Other 183-H Waste Indicators	**Concentration Limit**
Technetium-99	900 pCi/L – DWS
Uranium (total; chemical analysis)[b]	20 µg/L – proposed DWS when the monitoring plan was written (1996)

a. Nitrate is not considered a dangerous waste constituent under RCRA (WAC 173-303-9905, "Dangerous Waste Regulations," "Dangerous Waste Constituents List").

b. Current DWS for uranium is 30 µg/L

DWS = drinking water standard

The RCRA groundwater monitoring network includes Wells 199-H4-8, 199-H4-12A, 199-H4-12C, and 199-H4-84 (Figure 1). The wells are sampled annually for RCRA as specified in the conditions of the Hanford Facility RCRA Permit (WA7890008967), Part VI, Post-Closure Unit 2, as modified by Ecology (2013).

Well 199-H4-12C is an extraction well completed in the first water bearing unit of the RUM, a semi-confined aquifer. The other wells monitored under RCRA are completed in the overlying unconfined aquifer.

Following an aquifer test and rebound study (SGW-47776, *Aquifer Testing and Rebound Study in Support of the 100-H Deep Chromium Investigation*), Well 199-H4-12C was added to the 100-HR-3 interim

[3] The RCRA Permit (WA7890008967) gives the value 1,400 µg/L as the U.S. Environmental Protection Agency maximum contaminant level (DWS) for fluoride. The current limit is 4,000 µg/L.

action extraction network, replacing Well 199-H4-12A, to remediate the lower aquifer. Well 199-H4-8 has been part of the RCRA network since 2006; it replaced Well 199-H4-7, which was converted to an injection well and connected to the pump-and-treat system. Well 199-H4-84 has been in the RCRA network since May 2013 when it replaced Well 199-H4-3. Wells 199-H4-3 and 199-H4-7 were decommissioned for waste site remediation.

2.3 183-H Basins Contaminant Trends

This section discusses the concentrations of chromium, fluoride, nitrate, technetium-99, and uranium in the groundwater. Hexavalent chromium results are also included. During the reporting period, Wells 199-H4-8, 199-H4-84, 199-H4-12A, and 199-H4-12C were scheduled for RCRA and CERCLA sampling.

Well 199-H4-8 was scheduled for collection on an annual basis. During 2013, water levels in Well 199-H4-8 dropped to below the pump intake level and the well was unable to be sampled. Another attempt to sample the well following lowering of the pump was also unsuccessful. As a result, to ensure a sample was collected, samplers used a smaller pump and collected the sample with a low flow rate. A sample was obtained in early 2014. Results will be reported in the first semiannual report for 2014.

An electrical problem at the well head at monitoring Well 199-H4-84 resulted in a “stop work”, with sampling suspended at that well and other wells with a similar pump configuration. This resulted in Well 199-H4-84 being unavailable for sampling for several months. The problem was resolved; however, the sample was not collected until December 2013 instead of its regularly scheduled November event.

Chromium concentrations have remained below the 122 µg/L permit concentration limit in the RCRA wells completed within the unconfined aquifer since 2003. The maximum concentration of total chromium in the unconfined aquifer reported during this monitoring period was 21.4 µg/L (filtered sample) in Well 199-H4-12A. Hexavalent chromium concentrations in Well 199-H4-12A ranged from near detection limits in July to a maximum of 22.5 µg/L in October (Table 2; Figure 2). These concentrations remain below the permit concentration limit 122 µg/L, but exceed the CERCLA interim remedial action objective of 20 µg/L.

Total chromium concentrations in Well 199-H4-84 were reported at 14.10 µg/L and hexavalent chromium concentrations were at 9.68 µg/L (Table 2). Concentrations in this well show a seasonal variation. Opposite to what is found in former well Well 199-H4-3, which Well 199-H4-84 replaced, the concentrations of hexavalent chromium and total chromium increased with elevated groundwater elevations (Figure 3) as is expected in a monitoring well located within a source area.

Hexavalent chromium concentrations observed in Well 199-H4-12C, completed in the first water bearing unit of the RUM, are from historical releases at other sources, not releases from the 183-H Solar Evaporation Basin, as discussed further in the a previous semiannual report (SGW-52135, *First Semiannual Report for 2011 Post-Closure Corrective Action Groundwater Monitoring at the 183-H Solar Evaporation Basins and 300 Area Process Trenches*). Concentrations of hexavalent chromium measured in Well 199-H4-12C declined from about 300 µg/L in the early 1990s to approximately 90 µg/L in 2009. In late 2009, pumping was initiated at the well during an aquifer test and concentrations increased to over 120 µg/L. The exceedance of the CERCLA remedial action objectives (RAOs) (20 µg/L) and permit concentrations (122 µg/L) in Well 199-H4-12C were addressed by connecting the well to the pump-and-treat system. Hexavalent chromium ranged from 113 to 121 µg/L in Well 199-H4-12C during this reporting period (Figure 4). Filtered sample results of total chromium analyses in 199-H4-12C during the

reporting period (Table 2) were out of trend and did not agree with hexavalent chromium results or the unfiltered sample results. The data have been reviewed and were flagged as suspected errors. This well will be sampled again for metals, including total chromium, in May 2014.

Fluoride, technetium-99, and uranium were all analyzed during the reporting period. Fluoride, technetium-99 and uranium are monitored as other 183-H waste indicators, however permit concentration limits are identified in the Hanford Facility RCRA Permit [WA7890008967], Part VI, Chapter 3, Section 3.1.1.2 “WAC 173-303-645(5) Concentration Limits”. Nitrate was also analyzed during the reporting period. None of the analytical results for nitrate, fluoride, technetium-99 or uranium exceeded permit limits (Table 2) during the reporting period.

An evaluation of the data from Well 199-H4-84 indicates that nitrate concentrations increase during periods of increasing water levels. This indicates that a higher nitrate concentration may have occurred in Well 199-H4-84 during June 2013 when water levels in the well started to increase; however, no sample was collected for nitrate during that time period due to the safety concerns related with the pump (Figure 5).

During the previous reporting period (January through June 2013), the uranium concentration in Well 199-H4-84 exceeded its permit limit. Concentrations were low (2.9 µg/L) in December 2013. As with other contaminants in Well 199-H4-84, uranium concentrations vary directly with water levels.

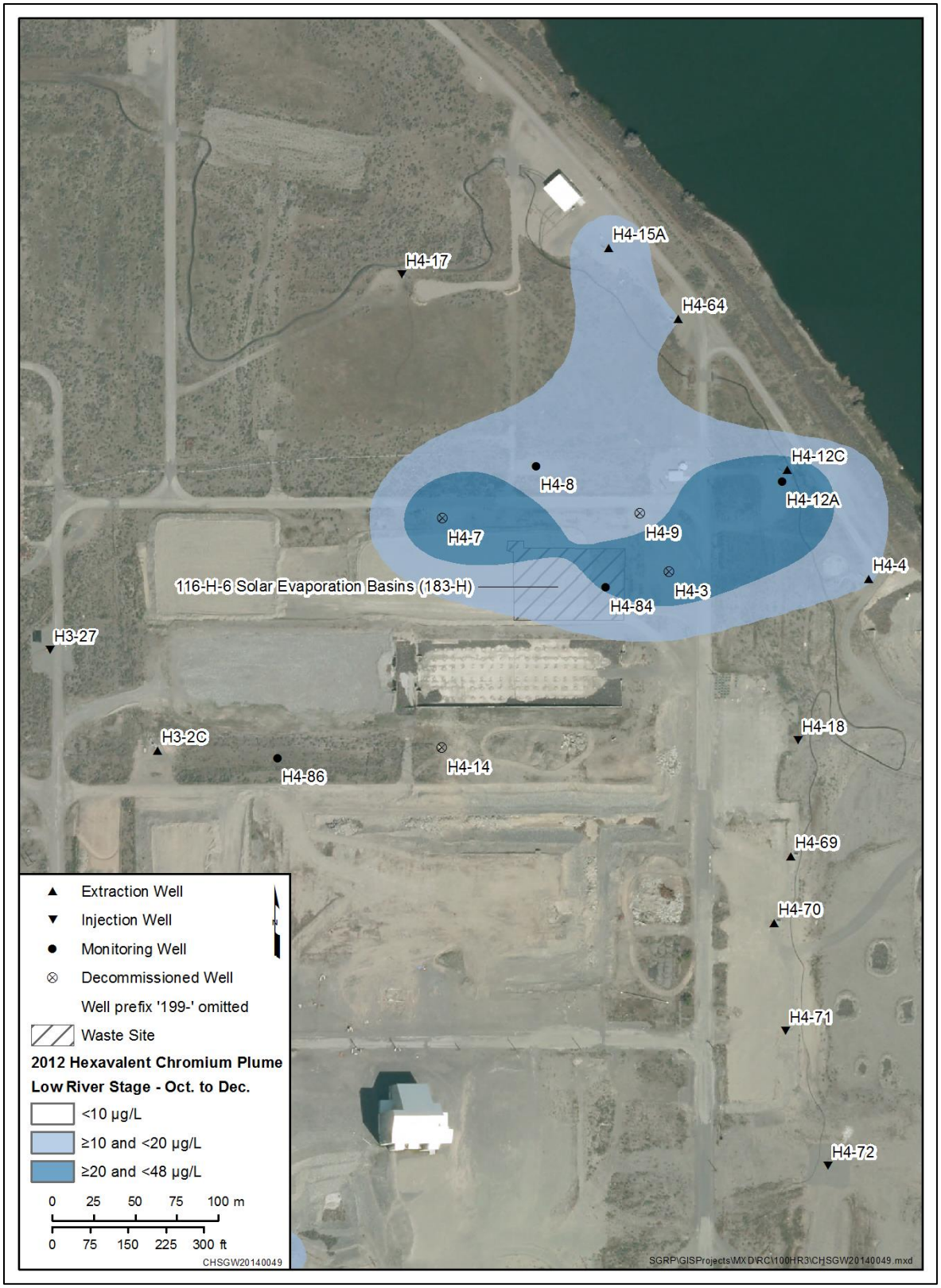

Figure 1. Monitoring Well Locations for 183-H (116-H-6) Basins

Table 2. Groundwater Data for 183-H Basins, July through December 2013

Well	Date	Dangerous Waste						Waste Indicator					
		Hexavalent Chromium (µg/L)		Total Chromium (µg/L)		Nitrate[a] (mg/L NO_3^-)		Fluoride (µg/L)		Technetium-99 (pCi/L)		Uranium (µg/L)	
Permit Concentration Limit[b]		***122***		***122***		***45***		***1400***		***900***		***20***	
199-H4-12A	7/8/2013[c]	2.5	B									0.6	D
	7/8/2013[c]	2.7	B										
	8/14/2013[c]	8.2										5.1	D
	8/14/2013[c]	7.7											
	10/25/2013	22.3		18		36	D	106	BD	45		15	
	10/25/2013	22.5		21	D							16	D
199-H4-12C	7/2/2013[c]	113											
	7/31/2013[c]	114											
	8/1/2013[c]	113											
	9/3/2013[c]	116											
	10/8/2013[c]	120											
	11/4/2013[c]	121											
	11/19/2013	118		90	DY	12	DA	141	BDA	15		1	D
	11/19/2013	121		5	DCY							0.6	D
	12/10/2013[c]	116											
199-H4-84	12/2/2013	9.68	U	14	DA	20		157		14	A	2.9	DA
	12/2/2013	9.68	U	14	DA							2.9	DA
199-H4-8	Not Sampled; pumped dry.												

Notes: Shading indicates filtered samples. Other results are from unfiltered samples. ***Italics*** indicate the permit concentration limits.

a. Nitrate is not considered a dangerous waste constituent under RCRA (WAC 173-303-9905, "Dangerous Waste Regulations," "Dangerous Waste Constituents List").

b. Concentration limits are defined in WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste* (Part VI, Post-Closure Unit 2), Chapter 3, Section 3.1.1.2. It should be noted that the current DWS for uranium is 30 µg/L.

c. These samples were collected to monitor performance of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* interim action.

A = Irregularity with field paperwork

B = Analyte detected at less than contract required detection limit but greater than method detection limit

C = Analyte detected in sample and associated QC blank

D = Analyte reported at a secondary dilution factor

U = Undetected

Y = Result is suspect

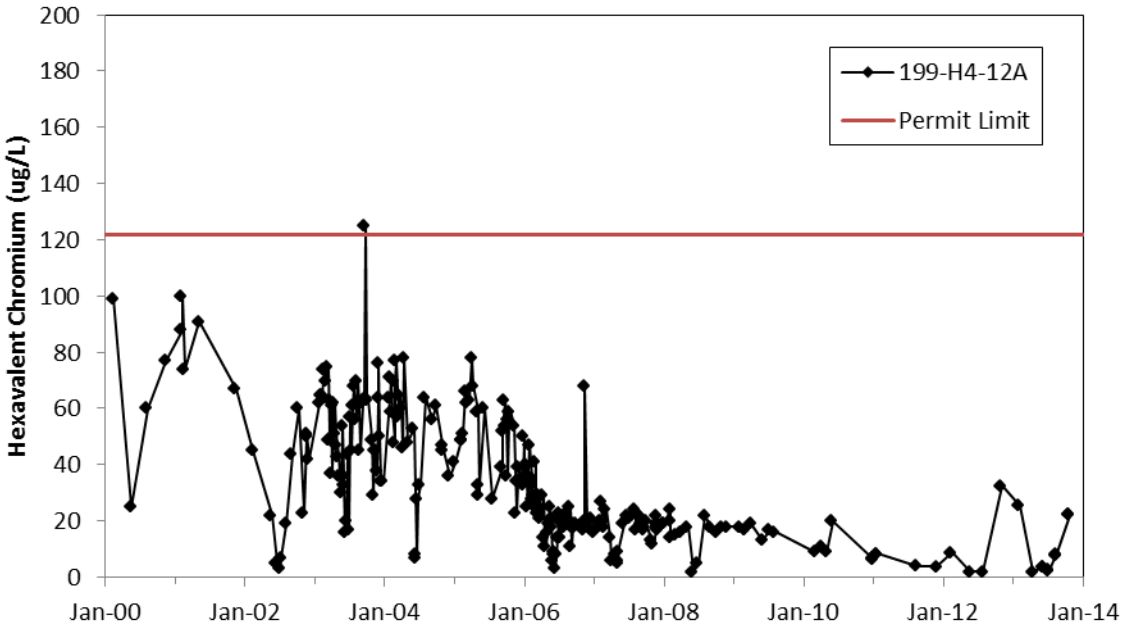

Figure 2. Hexavalent Chromium Concentrations in Well 199-H4-12A

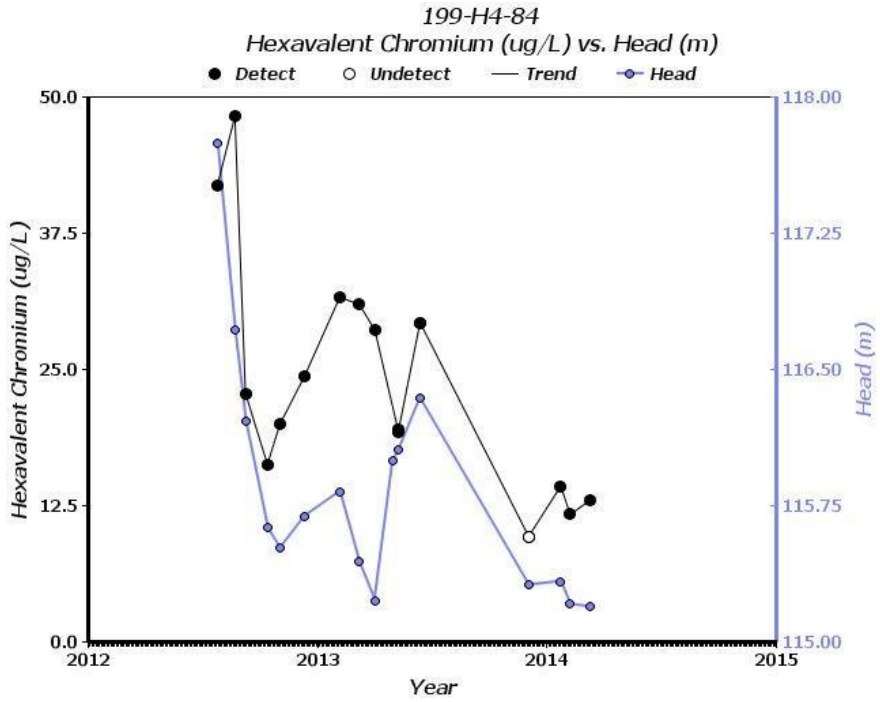

Figure 3. Hexavalent Chromium Concentrations versus Water Levels in Well 199-H4-84

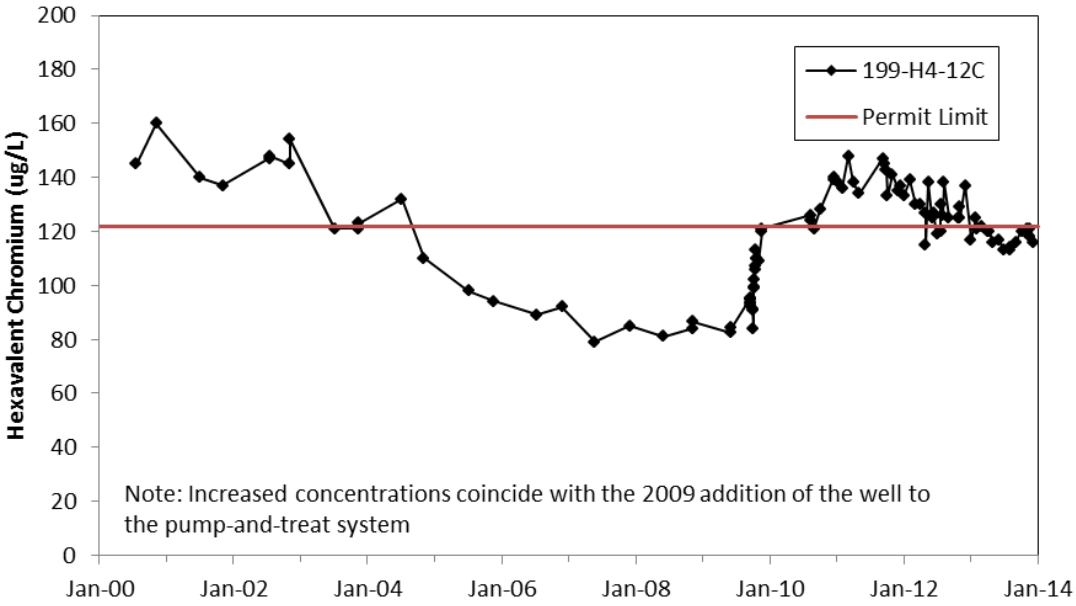

Figure 4. Hexavalent Chromium Concentrations in Well 199-H4-12C

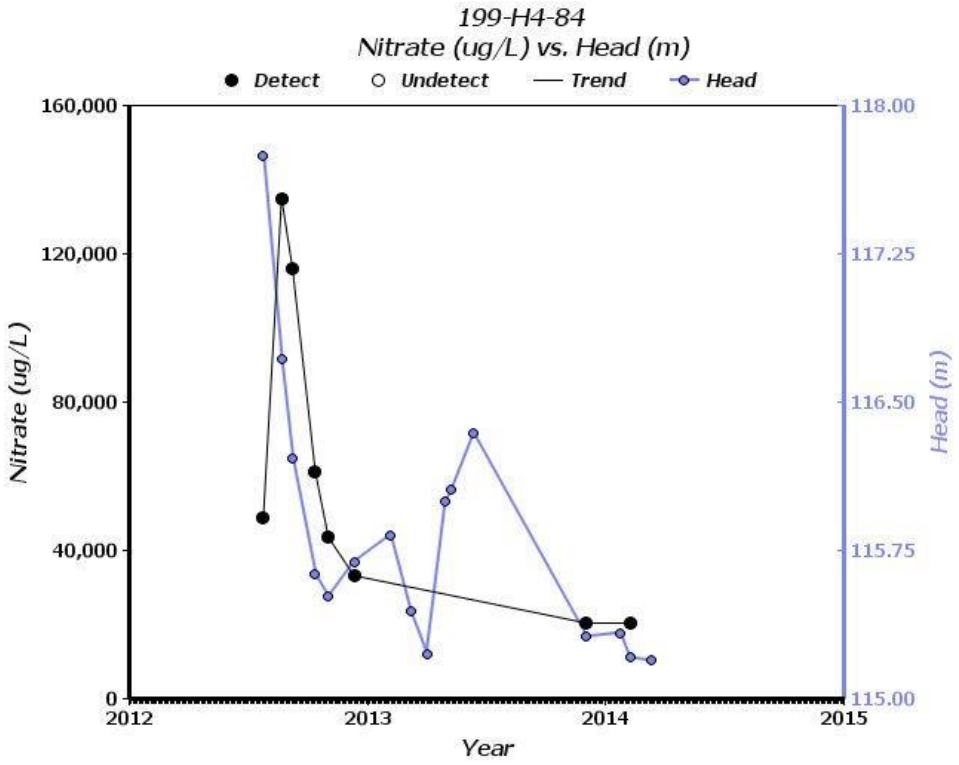

Figure 5. Nitrate Concentrations versus Water Levels in Well 199-H4-84

2.4 183-H Basins Conclusions

Several sampling issues occurred during the reporting period which delayed sample collection. During 2013, water levels in Well 199-H4-8 dropped to below the pump intake level and the well was unable to be sampled. Another attempt to sample the well following lowering of the pump was also unsuccessful. As a result, to ensure a sample was collected, samplers used a smaller pump and collected the sample with a low flow rate. A sample was obtained in early 2014. Results will be reported in the first semiannual report for 2014.

An electrical problem at the well head at monitoring Well 199-H4-84 resulted in a "stop work", with sampling suspended at that well and other wells with a similar pump configuration. This resulted in Well 199-H4-84 being unavailable for sampling for several months. The problem was resolved; however the sample was not collected until December 2013 instead of its regularly scheduled November event.

Concentrations of all analytes were below permit limits, with the exception of hexavalent chromium in Well 199-H4-12C. Concentrations in Well 199-H4-12C remain at or near the permit limit of 122 µg/L. Filtered sample results of total chromium analyses in 199-H4-12C during the reporting period (Table 2) were out of trend and did not agree with hexavalent chromium results or the unfiltered sample results. The data have been reviewed and were flagged as suspected errors. This contamination originated from historical releases. With the addition of Well 199-H4-12C to the 100-HX pump-and-treat system, corrective action through the CERCLA interim action remains effective.

Chromium, hexavalent chromium, nitrate and uranium concentrations in Well 199-H4-84 vary directly with water levels. This trend is consistent with wells located within source areas. Well 199-H4-84 replaced nearby Well 199-H4-3. Concentrations in Well 199-H4-3, located downgradient from the 183-H Solar Evaporation Basins, had increased as water levels dropped.

3 300 Area Process Trenches

The 300 Area Process Trenches are permitted as a RCRA treatment, storage, and disposal unit in post-closure corrective action monitoring. From 1975 through 1987, the trenches received effluent discharges of dangerous mixed waste from fuel fabrication and research laboratories in the 300 Area, followed by continued discharge of clean effluent until December 1994. The site was remediated through the removal of contaminated soil in the 1990s.

The 300 Area Process Trenches were closed under a modified closure/post closure plan (DOE/RL-93-73) and remain in the groundwater corrective action program because groundwater contamination continues to exceed CERCLA RAOs and Hanford Facility RCRA Permit (WA7890008967) concentration limits. Groundwater monitoring is conducted in accordance with WAC 173-303-645(11) and the Hanford Facility RCRA Permit (WA7890008967), Part VI, Chapter 1. The closure plan (DOE/RL-93-73, *300 Area Process Trenches Modified Closure Plan/Postclosure Plan*) indicates groundwater corrective action will be addressed as part of the remediation for the CERCLA 300-FF-5 Groundwater OU. The waste site designation is 316-5.

3.1 300-FF-5 CERCLA Remedial Action

Until November 2013, the interim action for groundwater in the 300 Area was monitored natural attenuation of uranium and volatile organic compounds, in accordance with the CERCLA interim record of decision (EPA et al., 1996b, *Declaration of the Record of Decision for the USDOE Hanford 300 Area 300-FF-1 and 300-FF-5 Operable Units, Hanford Site, Benton County, Washington*).

In November 2013 a record of decision for final action was signed (EPA et al., 2013, *Record of Decision for 300-FF-2 and 300-FF-5, and Record of Decision Amendment for 300-FF-1*). The selected remedy for groundwater in the 300 Area industrial complex includes monitored natural attenuation for trichloroethene and cis-1,2-dichloroethene, enhanced attenuation of uranium at the top of the aquifer, and institutional controls. Enhanced attenuation will be applied to the area with the highest uranium concentrations, located south and southeast of the 300 Area Process Trenches. Phosphate will be applied to the vadose zone and periodically rewetted zone using a combination of surface infiltration, periodically rewetted zone injection, and groundwater injection techniques.

3.2 300 Area Process Trenches RCRA Groundwater Monitoring Program

The permit concentration limits established for the 300 Area Process Trenches are provided in Table 3. RCRA corrective action monitoring will continue to evaluate analytical results relative to permit concentration limits.

The groundwater monitoring network for the 300 Area Process Trenches (WHC-SD-EN-AP-185, *Groundwater Monitoring Plan for the 300 Area Process Trenches*) includes four well pairs (Figure 6). Each of the well pairs has one shallow and one deep well. The shallow wells (with the well numbers ending in "A") are screened near the water table, and the deep wells (with the well numbers ending in "B") are screened in the lower portion of the unconfined aquifer (above the lacustrine and overbank deposits of the Ringold Formation lower mud unit).

One well pair is upgradient and the other three pairs are downgradient of the process trenches. The wells are monitored for the constituents in Table 4. The reporting period is semiannual; however, the wells are sampled four times (at monthly intervals) in each reporting period in order to collect the required number of independent samples. As a result, the wells are sampled during the months of December, January, February, March, and June, July, August, September.

Data from RCRA monitoring at the 300 Area Process Trenches are used as supplementary information to construct larger-scale water table and uranium-concentration maps that extend beyond the area of the 300 Area Process Trenches network.

Table 3. Permit Concentration Limits for 300 Area Process Trenches

Dangerous Waste Constituents	RCRA Concentration Limit[a]	CERCLA Cleanup Level[b]
cis-1,2-Dichloroethene	70 µg/L – DWS	16 µg/L – Risk assessment for drinking water
Trichloroethene	5 µg/L – DWS	4 µg/L – Risk assessment for drinking water
Other 300 Area Process Trenches Waste Constituent	**Concentration Limit**	**CERCLA Cleanup Level[b]**
Uranium (total; chemical analysis)	30 µg/L – DWS	30 µg/L – DWS

DWS = drinking water standard

a. WCH-SD-EN-AP-185

b. EPA et al., 2013 (ROD)

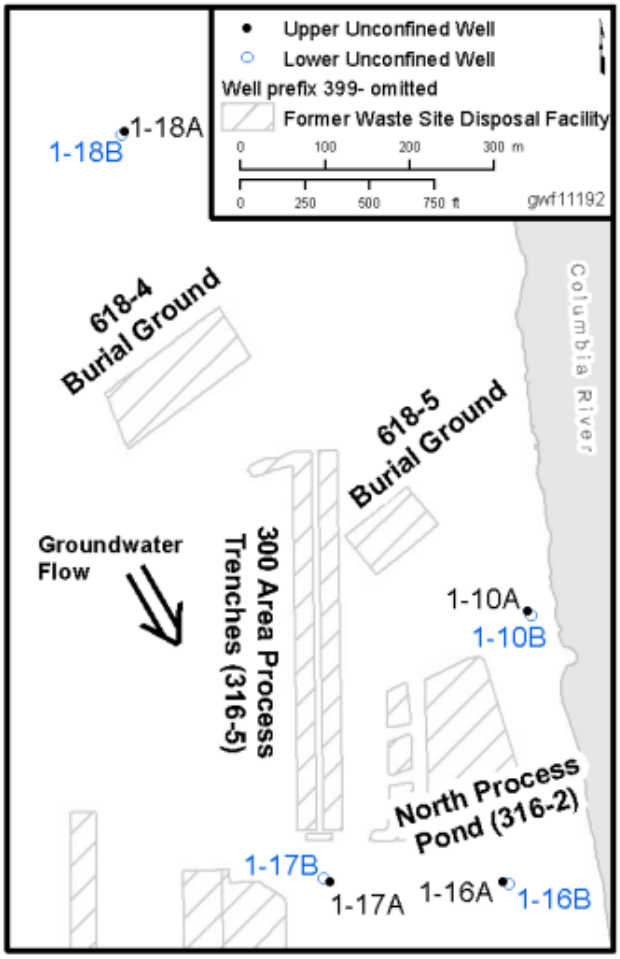

Figure 6. Monitoring Well Locations for the 300 Area Process Trenches

During the reporting period, the 300 Area Process Trenches post-closure monitoring wells were sampled during July, August, and September. The sampling event scheduled for December 2013 was delayed into January 2014 and the data are included in this report.

3.3 300 Area Process Trenches Contaminant Trends

This section discusses concentrations of cis-1,2-dichloroethene, trichloroethene, and uranium measured during the reporting period. Table 4 lists the analytical results for contaminants measured in each well.

Cis-1,2-dichloroethene continued to be detected in two wells in the 300 Area Process Trenches network during the reporting period (399-1-16B and 399-1-17B). Only Well 399-1-16B had concentrations that exceeded the 70 µg/L permit concentration limit. The trend at Well 399-1-16B was comparable to the last reporting period, ranging from 180 to 190 µg/L (Figure 7). At Well 399-1-17B, cis-1,2-dichloroethene was detected four times during this reporting period; the maximum detection of 2.8 µg/L was in January 2014 (Figure 8). Each of the values was reported by the laboratory as an estimated value (i.e., J-flagged). The method detection limit is 1 µg/L.

Table 4. Groundwater Data for 300 Area Process Trenches, July through December 2013[a]

Well	Date	Sampling Purpose	cis-1,2-Dichloroethene (µg/L)		Trichloroethene (µg/L)		Uranium (µg/L)	
Permit Concentration Limits[b]			***70***		***5***		***30***	
399-1-10A	7/15/2013	RCRA	1.0	U	0.5	U	18.0	D
	8/7/2013	RCRA	1.0	U	0.5	U	**31.4**	D
	8/7/2013	RCRA	1.0	U	0.5	U	**32.5**	D
	9/3/2013	RCRA	1.0	U	0.5	U	**35.4**	D
	1/21/2014	RCRA	1.0	U	0.5	U	26.6	D
399-1-10B	7/15/2013	RCRA	1.0	U	0.5	U	0.1	UD
	8/7/2013	RCRA	1.0	U	0.5	U	0.1	UD
	9/3/2013	RCRA	1.0	U	0.5	U	0.1	UD
	1/21/2014	RCRA	1.0	U	0.5	U	0.1	UD
399-1-16A	7/11/2013	RCRA	1.0	U	0.5	U	27.9	D
	8/7/2013	RCRA	1.0	U	0.5	U	**51.9**	D
	9/3/2013	RCRA	1.0	U	0.5	U	**70.8**	D
	1/10/2014	RCRA	1.0	U	0.5	U	**82.1**	D
399-1-16B	7/11/2013	RCRA	**190**		1.5		8.5	D
	8/7/2013	RCRA	**190**	T	1.6		8.3	D
	9/3/2013	RCRA	**190**		1.0		8.9	D
	1/10/2014	RCRA	**180**		1.7		7.9	D
399-1-17A	7/15/2013	RCRA	1.0	U	0.5	U	**95.7**	D
	8/7/2013	RCRA	1.0	UT	0.5	U	**98.2**	D
	9/3/2013	RCRA	1.0	U	0.5	U	**99.8**	D
	9/3/2013	RCRA	1.0	U	0.5	U	**102.0**	D
	1/14/2014	RCRA	1.0	U	0.5	U	**47.6**	D
399-1-17B	7/15/2013	RCRA	2.1	J	0.5	U	0.1	UD
	8/7/2013	RCRA	2.3	JT	0.5	U	0.1	UD
	9/3/2013	RCRA	1.9	J	0.5	U	0.1	UD
	1/9/2014	RCRA	2.8	J	0.5	U	0.1	UD
399-1-18A	7/1/2013	RCRA	1.0	U	0.5	U	6.6	D

Table 4. Groundwater Data for 300 Area Process Trenches, July through December 2013[a]

Well	Date	Sampling Purpose	cis-1,2-Dichloroethene (µg/L)		Trichloroethene (µg/L)		Uranium (µg/L)	
	8/7/2013	RCRA	1.0	UT	0.5	U	5.6	D
	9/5/2013	RCRA	1.0	U	0.5	U	5.6	D
	1/10/2014	RCRA	1.0	U	0.5	U	5.5	D
399-1-18B	7/15/2013	RCRA	1.0	U	0.5	U	0.1	UD
	8/7/2013	RCRA	1.0	UT	0.5	U	0.1	UD
	9/3/2013	RCRA	1.0	U	0.5	U	0.1	UD
	1/10/2014	RCRA	1.0	U	0.5	U	0.1	U

Italics indicate the Permit Concentration Limits; Permit Concentration Limit updated for uranium following promulgation of the drinking water standard.

Bold emphasis added where the result exceeded the permit concentration limit.

a. Includes wells scheduled for sampling in December 2013 but actually sampled in January 2014.

b. Concentration limits are defined in WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste* (Part VI, Post-Closure Unit 1)

D = analyte reported at a secondary dilution factor

J = estimated value

T = spike or spike duplicate sample recovery is outside control limits

U = below detection limit

During the reporting period, trichloroethene was detected only in Well 399-1-16B; concentrations ranged from 1.0 to 1.7 µg/L and did not exceed the 5 µg/L permit concentration limit (Figure 9). The method detection limit was 0.5 µg/L during the reporting period.

A persistent uranium plume underlies the 300 Area Industrial Complex. Uranium concentrations continued to exceed the permit concentration limit (30 µg/L) at three downgradient wells screened near the water table (399-1-10A, 399-1-16A, and 399-1-17A). Uranium concentrations at Wells 399-1-10A and 399-1-16A (Figures 10 and 11) tend to be highest in the fall and winter when water levels are low, and lowest in spring and early summer when water levels are high. This inverse relationship between uranium concentration and water level is typical for wells that are located near the Columbia River. Uranium concentrations at Well 399-1-17A (Figure 12) tend to be lowest in the fall and winter and highest in spring and early summer. The positive relationship between uranium concentration and water level is typical for wells that are located farther inland from the Columbia River, near source areas.

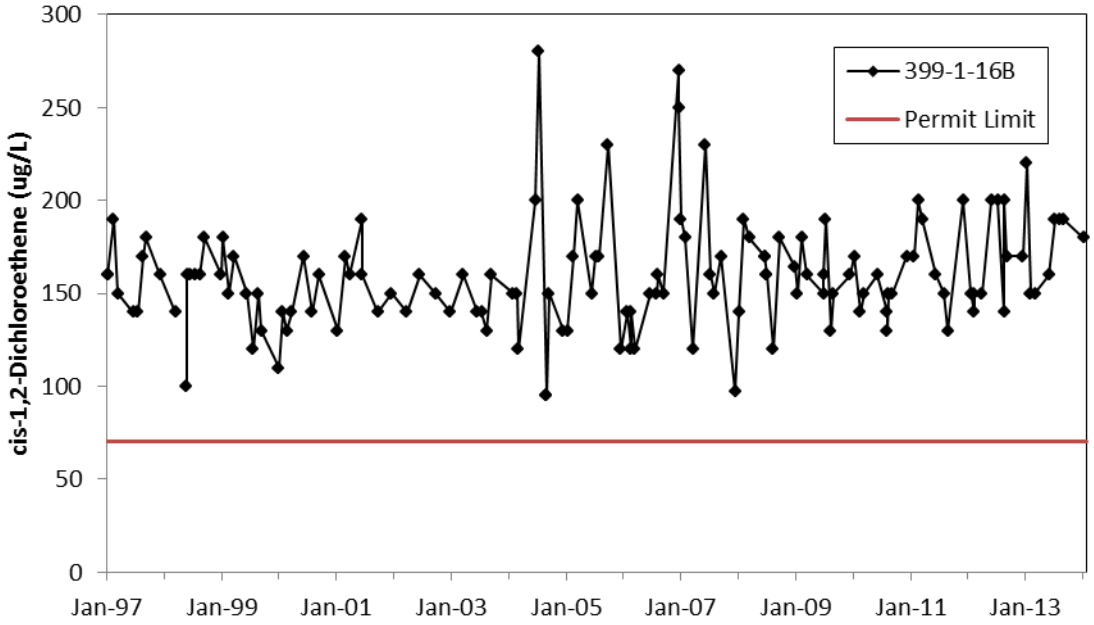

Figure 7. Cis-1,2-Dichloroethene Concentrations in Well 399-1-16B

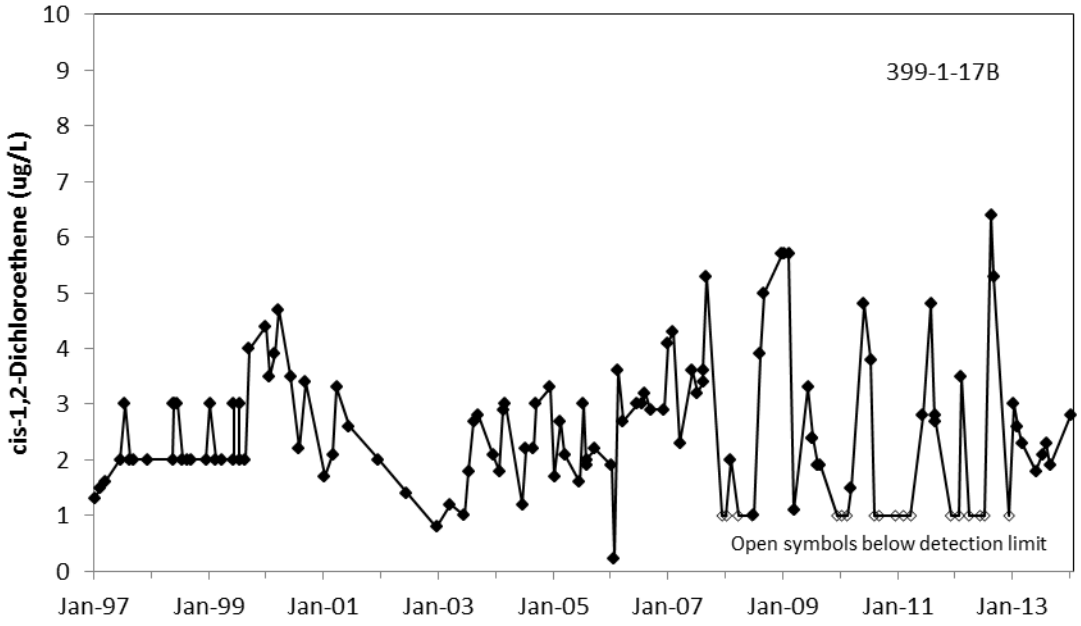

Figure 8. Cis-1,2-Dichloroethene Concentrations in Well 399-1-17B

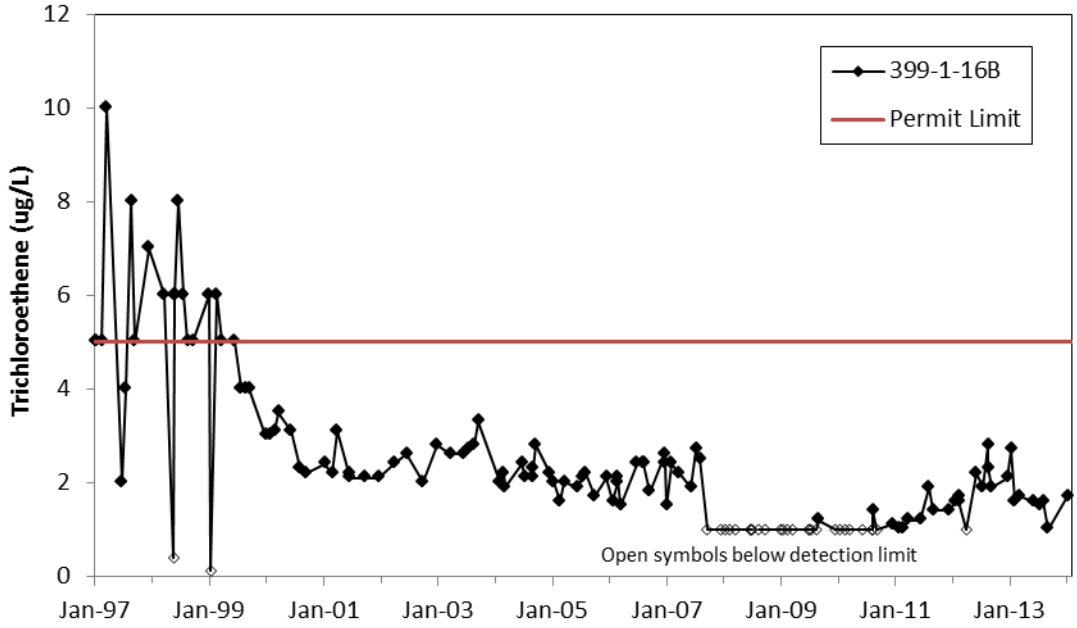

Figure 9. Trichloroethene Concentrations in Well 399-1-16B

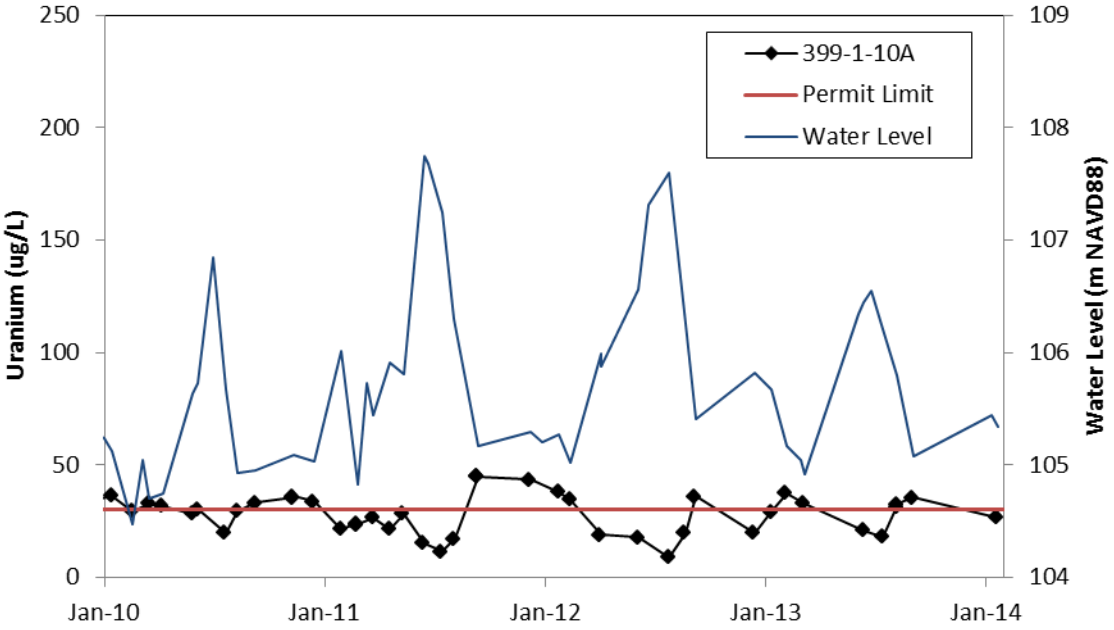

Figure 10. Inversely Related Uranium Concentrations and Water Level in Well 399-1-10A

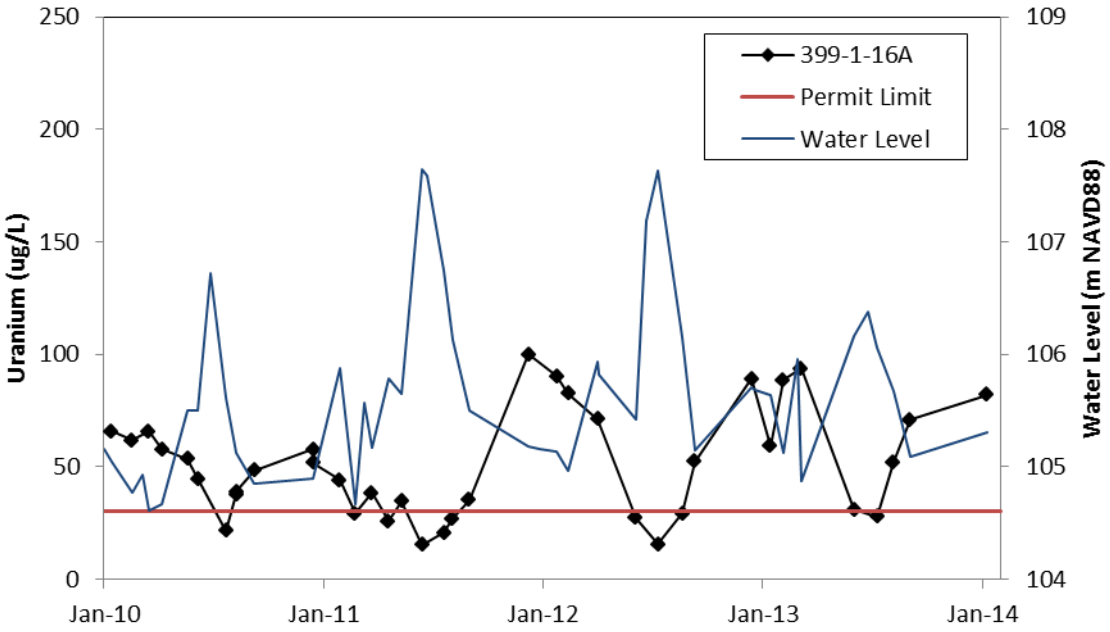

Figure 11. Inversely Related Uranium Concentrations and Water Level in Well 399-1-16A

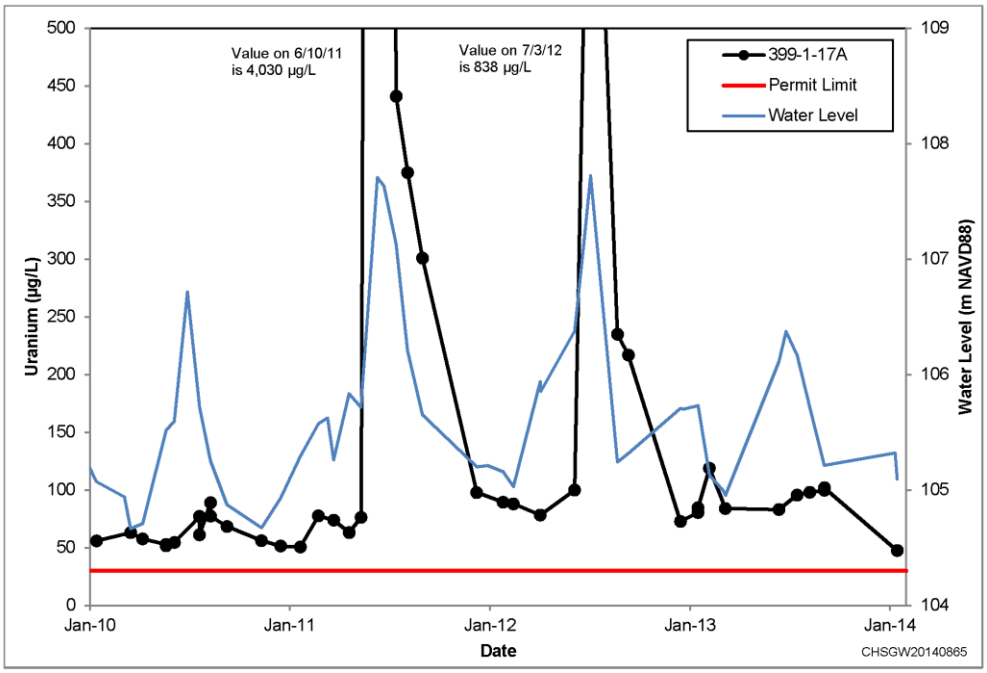

Figure 12. Positively Related Uranium Concentrations and Water Level in Well 399-1-17A

The increase in uranium concentrations near source areas during high water levels is caused by mobilization of residual contamination in the vadose zone resulting from the temporary elevation of the water table. The decrease in uranium concentrations near the shoreline during high water levels is caused by dilution from intrusion of river water into the aquifer.

During seasonally low water table conditions, the highest concentrations in the plume are often observed near the river, where uranium introduced inland during the preceding period of high water table conditions has migrated downgradient to the shoreline, and intrusion of river water into the zone beneath the shoreline is lessened because of the lower river stage. Uranium concentrations in the 300 Area are described in detail in PNNL-17034, *Uranium Contamination in the Subsurface Beneath the 300 Area, Hanford Site, Washington*, and PNNL-22048, *Updated Conceptual Model for the 300 Area Uranium Groundwater Plume*.

3.4 300 Area Process Trenches Conclusions

Concentrations of cis-1,2-dichloroethene and uranium remained above permit limits in selected wells. The concentration of cis-1,2-dichloroethene remained above the permit concentration limit (70 µg/L) in Well 399-1-16B, which is screened near the bottom of the unconfined aquifer. Concentrations in this well are not affected by river stage, as shown in a previous semiannual report (SGW-52135).

Concentrations of uranium in three wells (399-1-10A, 399-1-16A, and 399-1-17A) downgradient of the 300 Area Process Trenches and screened near the top of the unconfined aquifer remained above the permit concentration limit (30 µg/L). Uranium concentrations in Wells 399-1-10A and 399-1-16A vary inversely with seasonal fluctuations in the water table elevation; while uranium concentrations in Well 399-1-17A vary positively with seasonal fluctuations in the water table elevation. The seasonal fluctuations in the water table elevation are caused by seasonal fluctuations in the river elevation.

Trichloroethene concentrations remained below the permit concentration limit (5 µg/L) during the reporting period. However, monitoring of this volatile organic compound will continue in compliance with the groundwater monitoring plan.

RCRA corrective actions are being accomplished through the CERCLA remedial action for groundwater (monitored natural attenuation, enhanced attenuation, and institutional controls).

4 References

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq., Pub. L. 107-377, December 31, 2002. Available at: http://epw.senate.gov/cercla.pdf.

DOE/RL-93-73, 1995, *300 Area Process Trenches Modified Closure/Postclosure Plan*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196000405.

DOE/RL-96-84, 2003, *Remedial Design and Remedial Action Work Plan for the 100-HR-3 and 100-KR-4 Groundwater Operable Units' Interim Action*, Rev. 0-A, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D1348764.

DOE/RL-97-48, 1997, *183-H Solar Evaporation Basins Postclosure Plan*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D197226569.

DOE/RL-2010-99, 2013, *Remedial Investigation/Feasibility Study for the 300-FF-1, 300-FF-2, and 300-FF-5 Operable Units*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088359. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088307. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088306. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088305.

Environmental Dashboard Application, 2012, U.S. Department of Energy, Available at: http://environet.hanford.gov/EDA.

Ecology, 2013, *Ecology approves changes for Hanford's dangerous waste permit,* Washington State Department of Ecology. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088099

EPA, Ecology, and DOE, 1996a, *Declaration of Record of Decision for the USDOE Hanford 100 Area 100-HR-3 and 100-KR-4 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196097243.

EPA, Ecology, and DOE, 1996b, *Declaration of the Record of Decision for the USDOE Hanford 300 Area, 300-FF-1 and 300-FF-5 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196245781.

EPA, Ecology, and DOE, 2013, *Record of Decision for 300-FF-2 and 300-FF-5, and Record of Decision Amendment for 300-FF-1*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington. Available at: http://pdw.hanford.gov/arpir/pdf.cfm?accession=0087180

PHOENIX, 2013, PNNL Hanford Online Environmental Information Exchange, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://phoenix.pnnl.gov/.

PNNL-11573, 1997, *Groundwater Monitoring Plan for the 183-H Solar Evaporation Basins*, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D1659822.

PNNL-17034, 2008, *Uranium Contamination in the Subsurface Beneath the 300 Area, Hanford Site, Washington*, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://www.pnl.gov/main/publications/external/technical_reports/PNNL-17034.pdf.

PNNL-22048, 2012, *Updated Conceptual Model for the 300 Area Uranium Groundwater Plume*, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22048.pdf.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at: http://www.epa.gov/epawaste/inforesources/online/index.htm.

SGW-47776, 2010, *Aquifer Testing and Rebound Study in Support of the 100-H Deep Chromium Investigation*, Rev. 0, CH2M HILL Plateau Remediation Company, Richland, Washington. Available at: http://www.osti.gov/scitech/servlets/purl/1038045.

SGW-52135, 2012, *First Semiannual Report for 2011 Post-Closure Corrective Action Groundwater Monitoring at the 183-H Solar Evaporation Basins and 300 Area Process Trenches: January – June 2011*, Rev. 0, CH2M HILL Plateau Remediation Company, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0093013.

WA7890008967, 2007, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, as amended, Washington State Department of Ecology, Richland, Washington. Available at: http://www.ecy.wa.gov/programs/nwp/permitting/hdwp/Rev/8c/Final/5-15-2014/index.html.

WAC 173-303-645, "Dangerous Waste Regulations," "Release from Regulated Units," *Washington Administrative Code*. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303-645.

WAC 173-303-9905, "Dangerous Waste Regulations," "Dangerous Waste Constituents List," *Washington Administrative Code*. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303-9905.

WHC-SD-EN-AP-185, 1995, *Groundwater Monitoring Plan for the 300 Area Process Trenches*, Rev. 0A, Westinghouse Hanford Company, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196020117.

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