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Revision 0

Resource Conservation And Recovery Act Groundwater Quarterly Report For Calendar Year April Through June 2012

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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G. M. Hanson
CH2M Hill

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Terms

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CHPRC	CH2M Hill Plateau Remediation Company
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DWS	drinking water standard
Ecology	Washington State Department of Ecology
FLEDG	field logging and electronic data gathering system
HEIS	Hanford Environmental Information System
LLWMA	Low-Level waste management area
RCRA	*Resource Conservation and Recovery Act of 1976*
RDR	request for data review
S&GRP	Soil and Groundwater Remediation program
SST	single Shell Tank
TOX	total organic halides
TOC	total organic carbon
TSD	treatment, storage, and disposal
WAL	well access list
WMA	waste management area
WSCF	Waste Sampling and Characterization Facility

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1 Introduction

This document describes sampling performed in accordance with the *Resource Conservation and Recovery Act of 1976* (RCRA) during the April through June 2012 reporting period. The Soil and Groundwater Remediation program (S&GRP) presents data in a project document to more efficiently disseminate information not readily presented in the previous presentation format.

Quarterly information is provided to status sampling, summarize recent and pending changes in monitoring, and report statistical exceptions. Analytical data described in this report reflect data available at the end of the reporting period. Outstanding results will be discussed in the next report. Groundwater monitoring result highlights and site maps are provided only if changes are determined to be significant. Data are officially reported and accessed through the Environmental Dashboard Application at http://environet.hanford.gov/EDA/

Sections two and three identify any quality control or laboratory issues, and the sampling and analysis status for the reporting period. Sections four (Inactive Waste Sites), five (Groundwater Monitoring Single Shell Tank Farm Waste Management Areas), and six (Active Waste Management Areas) present a general status update including, sampling activity, any significant results, and applicable site maps and trend charts.

2 Quality Control and Laboratory Issues

Recent nitrite detected results are undergoing further review by the Waste Sampling and Characterization Facility (WSCF) Laboratory and CH2M Hill Plateau Remediation Company (CHPRC) Sample Management group. Further investigation includes CHPRC derived blind standards for analysis by WSCF, WSCF review of analytical instruments, CHPRC review of Oxidation-Reduction and dissolved oxygen field measurements and procedures. Results will be provided in the next quarterly report.

3 Sampling and Analysis Status

Documentation provided for status and effects on sampling resulting from delays or stop work orders.

3.1 Missed Sampling

Table 1 presents samples not collected during the quarter. The table includes the site, scheduled period that was not collected, frequency of sampling, and any comments.

Table 1. Sampling Not Completed

Well	Site	Scheduled	Frequency	Comments
299-E25-26	A-29 Ditch	April	Semiannually	Powerlines above need to be shielded to repair the downhole pump
299-E25-19	216-A-37-1 Crib	July	Semiannually	Tripped pump breaker

3.2 Sampling Completed After Quarter

For this reporting period there were no missed sampling trips completed after the end of the quarter.

3.3 Stop Work

One previously reported stop work remained in effect during the quarter. Stop work on use of the Field Logging and Electronic Data Gathering (FLEDG) system for water level measurements for wells. As of July 24th, actions to correct FLEDG database and software were complete and the stop work was lifted.

4 Inactive Waste Management Areas

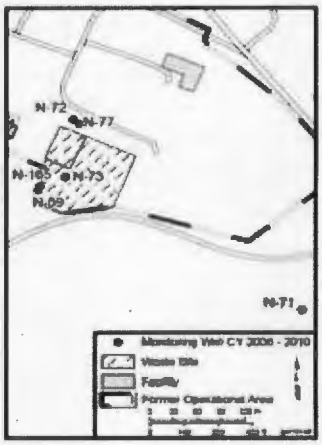
Each inactive, non-operational unit is designated as a treatment, storage, and disposal (TSD) unit because it received nonradioactive dangerous waste regulated by 40 *Code of Federal Regulations* (CFR) 261. Units are monitored under a groundwater contamination indicator evaluation monitoring program that will detect any adverse impact from past operations on groundwater quality and accordingly, update constituents and monitoring based on knowledge gained from recent monitoring data collected. Summary status and monitoring highlights of results by exception are provided for each area.

4.1 1301-N Liquid Waste Disposal Facility (Interim, Detection)

No sampling was scheduled for the quarter. The next sampling event is scheduled for September.

4.2 1324-N/NA Facilities (Interim, Detection)

No sampling was scheduled for the quarter. The next sampling event is scheduled for September.



As previously reported, in response to the elevated total organic carbon (TOC) concentrations observed in 2011 at RCRA well 199-N-165, DOE conducted additional sampling and analyses at five RCRA wells (wells 199-N-71, 199-N-72, 199-N-73, 199-N-77, and 199-N-165 at the 1324-N/NA facilities) and one CERCLA well (199-K-151) in March and at two additional CERCLA wells (199-K-152 and 199-N-189) in April and May. A fourth CERCLA well, 199-K-182, was sampled in June 2010, September 2010, and January 2011 as part of the spatial and temporal groundwater sampling for the 100-N remedial investigation. Follow-up sampling for TOC analyses will be collected at wells 199-K-151 and 199-K-152 in October. Sampling results will be evaluated after all data are received from the laboratory.

4.3 1325-N Liquid Waste Disposal Facility (Interim, Detection)

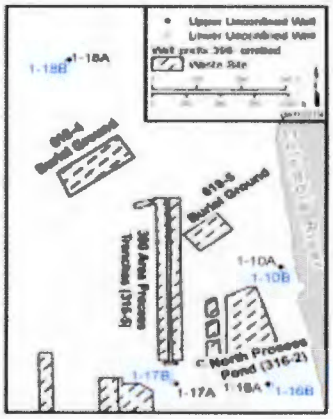
No sample collection was scheduled during this quarter. The next sampling event is scheduled for September.

4.4 183-H Solar Evaporation Basins (Final, Corrective Action)

No samples were scheduled for collection. The next sampling event is scheduled for October/November.

Well 199-H4-84 is an RI/FS characterization well drilled through the center of the basins west-southwest of 199-H4-3. The new well was cleared through Industrial Hygiene for routine sampling and was sampled in June. Well 199-H4-3 is scheduled for decommissioning in the spring to accommodate source area remediation. Additional wells are planned as replacements in the vicinity of 183-H. A permit modification for substitution of Well 199-H4-3 with Well 199-H4-84 is being negotiated for Ecology concurrence.

4.5 300 Area Process Trenches (Final, Corrective Action)



Sampling scheduled in March was delayed for a stop work requiring clarification to the well access list (WAL), and successfully completed April 2nd. Eight wells were sampled as scheduled in June. The next sampling event is scheduled for July.

Well 399-1-17A at the southern end of the trenches showed elevated uranium in the upper unconfined aquifer (Figure 1) and continued to exceed the 30µg/L drinking water standard (DWS). During this quarter, Well 399-1-16A southeast of the trenches near the river showed elevated uranium in April. The uranium increase in these wells is attributed to remobilization of uranium remaining in the lower portion of the vadose zone by the elevated water table in June 2011. The highest uranium concentration (4,030 µg/L) detected in Well 399-1-17A in June 2011 has subsequently declined.

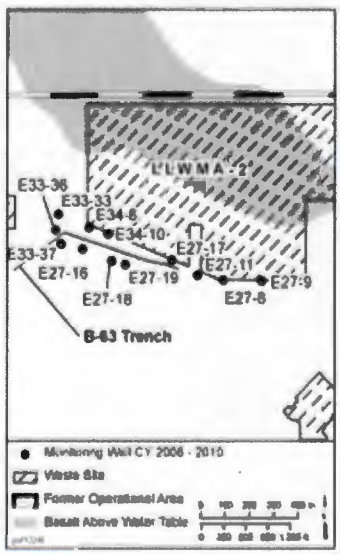
4.6 216-A-29 Ditch (Interim, Detection)

Samples were collected as scheduled in April for every well except 299-E25-26. Powerlines above need to be shielded to repair the downhole pump prior to sampling.

4.7 216-B-3 Pond (Interim, Detection)

Quadruplet indicator parameter results for pH and specific conductance were received in April for one 216-B-3 Pond well associated with semi-annual sampling at the 216-A-29 Ditch. Neither the pH nor specific conductance results exceeded the critical mean boundaries. Total organic carbon (TOC) and total organic halides (TOX) were received in late May for the 216-B-3 Pond monitoring well 699-43-45. None of the results exceeded the limit of quantification (LOQ) for these indicator parameters. The next semi-annual 216-B-3 Pond sampling event is scheduled for July.

4.8 216-B-63 Trench (Interim, Detection)



Sampling was conducted as scheduled, the next sampling event is scheduled for October.

The April semi-annual quadruplet indicator parameter results for pH, TOC, and TOX did not exceed the critical mean or limit of quantification (LOQ) boundaries as shown in the table below. Results from two wells exceeded the critical mean for specific conductance (299-E34-10 and 299-E27-19). Well 299-E34-10, is an upgradient well. Downgradient Well, 299-E27-19, and had the highest result, 650µS/cm. Split verification sample results were 448 and 439µS/cm, which are below critical mean. It was determined the elevated result was from a different well because the well ID did not correspond with the well name. The significant specific conductance increase in Well 299-E34-10 is associated with the migration of nitrate and sulfate from upgradient sources to the northwest. Significant increases of nitrate (>2X times) were seen in Wells 299-E27-16 and 299-E34-10 (Figure 2) Also anomalous antimony results were flagged and appear to be part of a larger group of anomalous results seen throughout the 200-BP-5 OU.

Table 2. 216-B-63 Trench Critical Mean Comparison and Verification Results

Derived Indicator Parameter Critical Mean Comparison						
Indicator Parameter	Critical Mean	Range of April Results				
pH	<7.56 and >8.47	7.9 – 8.25				
Specific Conductance	529.49µS/cm	418 - 650µS/cm				
TOC	995µg/L	Non-detect to 186µg/L				
TOX	28.1µg/L (LOQ)	Non-detect to 8.43µg/L				
Verification Field Sample Results for Specific Conductance						
		Quadruplet Results				
Sample	Critical Mean	1st reading	2nd reading	3rd reading	4th reading	Average
Field Sample 1	529.49µS/cm	446	447	448	449	448
Field Sample 1	529.49µS/cm	438	438	439	440	439

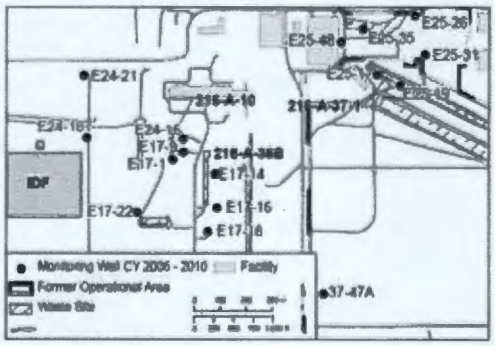
4.9 S-10 Pond and Ditch (Interim, Detection)

May sampling was completed successfully. Field parameters and analytical results were loaded into the Hanford Environmental Information System (HEIS), with no exceedances of indicator parameters. The next sampling event is scheduled for May.

4.10 NRDWL (Interim, Detection)

No sampling was scheduled during the quarter. Additional results from January and April were loaded into HEIS for Wells 699-216-35A and 699-25-34B, and are on trend. Requests for data review have been submitted for the following off trend results: Chloride, fluoride, nitrate, nitrite, and sulfate for Well 699-25-34B. The next sampling event is scheduled for July.

4.11 216-A-36B Crib (Interim, Indicator Evaluation)



Two wells (downgradient well 299-E17-14 and upgradient well 299-E17-19) were sampled in April. Sampling of 299-E17-14 was performed for CERCLA and no statistical comparisons were required. Four Wells, 299-E17-14, 299-E17-16, 299-E17-18 and 299-E17-19 were scheduled for sampling in July, and all were sampled successfully late June. Quadruplicate indicator parameter results were loaded into HEIS, results were compared and did not exceed derived critical mean values.

Strontium-90 for downgradient Well 299-E17-14 showed a significant decline (to 15pCi/L from 30pCi/L) but remained above the DWS (8pCi/L). Uranium for downgradient Well 299-E17-14 (31.7 µg/L) has increased above the DWS (30µg/L) since the last sampling event in April 2011 (Figure 3).

4.12 216-A-37-1 Crib (Interim, Indicator Evaluation)

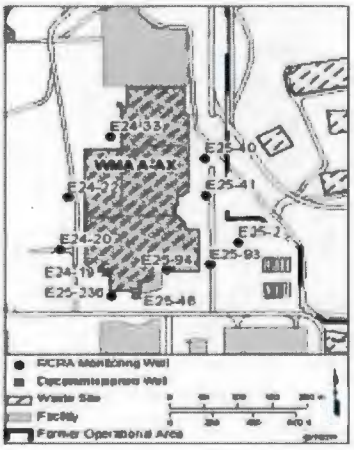
Upgradient Well 299-E25-47 was sampled in April. Wells 299-E25-17, 299-E25-19, 299-E25-20 and 299-E25-47 were scheduled for sampling in July, and were sampled in late June. Sampling was successful with the exception of Well 299-E25-19, because of a tripped breaker with the pump. The next sampling event is scheduled for January.

All analyses have been loaded into HEIS and are on trend except higher than trend iron results. A request for data review (RDR) was submitted on the iron analysis. Quadruplicate indicator parameter results were loaded into HEIS, results were compared and did not exceed derived critical mean values.

5 Groundwater Monitoring Single Shell Tank (SST) Farm Waste Management Areas

RCRA units not currently incorporated into a permit require interim status monitoring until an approved operating permit for each unit is issued. Single shell tank farms are all monitored under RCRA groundwater assessment and are designated as WMAs. Summary status and monitoring highlights of results by exception are provided for each area.

5.1 SST WMA A-AX (Interim, Assessment)

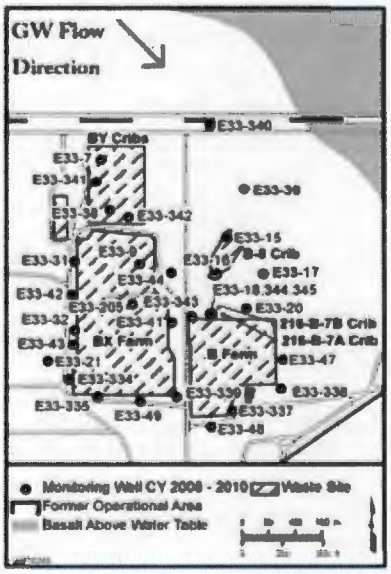


All monitoring wells were sampled as scheduled in June. The next sampling event is scheduled for September.

Groundwater flow appears to be south-southeast based on the regional sulfate plume extending from 216-B-2 Ditches, located to the north (Figure 4).Elevated nickel (>10µg/L) was seen in Wells 299-E25-40, 299-E25-41, and 299-E25-236, above background concentration at Hanford (1.98µg/L). Well casing corrosion has previously been found at two wells in this area with elevated nickel concentrations; therefore, these wells will be scheduled for television surveys.

An anomalous result of elevated lead was received for upgradient Well 299-E24-33. The result was reanalyzed and found to be non-detect.

5.2 SST WMA B-BX-BY (Interim, Assessment)



All scheduled WMA B/BX/BY monitoring wells were sampled and results were loaded into HEIS in May. The next sampling event is scheduled for August.

The specific conductance decreased in wells to the west of BY Cribs and WMA B/BX/BY, while increasing in most other wells. The increased specific conductance is consistent with a southeast migration of nitrate and sulfate from the BY Cribs, 216-B-8 Crib, 216-B-7A&B Cribs, and the 241-BX-102 unplanned release, with the most significant increases in Wells 299-E33-16, 299-E33-18, 299-E3-47, and 299-E33-338, located southeast of source sites. The results provide good correlation to average calculated flow direction and the upper range of the hydraulic conductivity.

Continued presence of elevated cyanide and nitrate at Well 299-E33-47, and lack of, or lower results in the groundwater wells to the north-northwest indicate an unidentified source within the 241-B Tank Farm. Because of the spatial difference of cyanide concentrations at Well 299-E33-47 versus the upgradient wells a determination was made that cyanide is a dangerous waste constituent associated with the

241-B tank farm. More information is provided in the new assessment report for WMA B/BX/BY, DOE/RL-2012-53, "*Groundwater Quality Assessment Plan for the Single-Shell Tank Waste Management Area B-BX-BY.*"

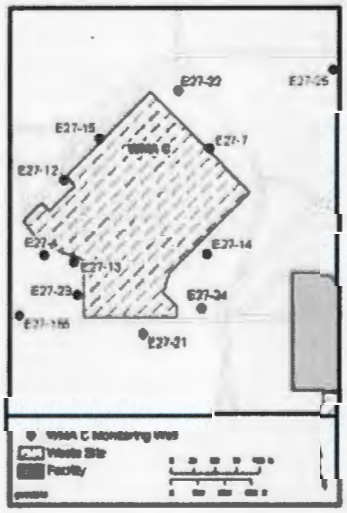
Elevated presence of chromium, cyanide, and nitrate at Well 299-E33-335 returned to levels consistent with surrounding wells. The out of trend results may suggest a laboratory issue or may be associated with a small plume from one of the BX Trenches. One trench received the same liquid waste as BY Cribs, which may be the reason for the elevated cyanide and nitrate. The results have not been flagged because future elevated results would confirm this alternative hypothesis.

Elevated nitrate is mainly associated with migration from upgradient sites and the unplanned release associated with the BX-102 Tank, except at Well 299-E33-47.

Uranium continues to increase at Well 299-E33-18. Concentrations have increased from 1,830µg/L in December, to 4,470µg/L in May, consistent with previous concentrations near Well 299-E33-343. Tritium concentrations at Well 299-E33-18 declined from 27,000pCi/L to 25,000pCi/L between January and May (Figure 5). All other wells adjacent the 241-B/-BX-BY Tank Farms are about half the concentration or less. The source of this tritium is the 241-BX-102 unplanned release based on high concentrations in the contaminated perched water horizon above this well.

5.3 SST WMA C (Interim, Detection)

All wells were sampled in June as scheduled. The next sampling event is scheduled for September.

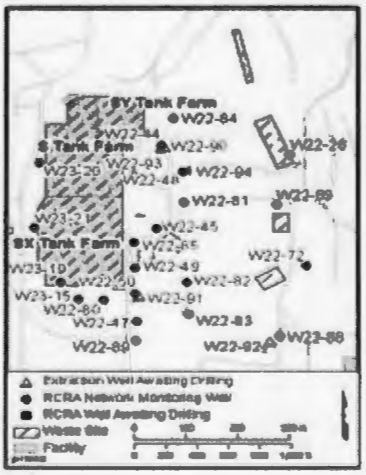


The dangerous waste constituent cyanide was found in three wells during the June sampling event: 299-E27-4, 299-E27-14, and 299-E27-24. Concentrations ranged between 6.78µg/L and 12.1µg/L. The highest concentration was in Well 299-E27-14, located along the southeast side of the 241-C Tank Farm. The three cyanide results at WMA C are significantly lower than the 200µg/L DWS.

Nitrate exceeded the drinking water standard (DWS) of 45 mg/L in the same four WMA C wells as last quarter (299-E27-14, 299-E27-23, 299-E27-24, and 299-E27-155). Sulfate exceeded the secondary DWS of 250mg/L in the same three wells as last quarter (299-E27-14, 299-E27-24, and 299-E27-25). The nitrate and sulfate exceedance of the DWS in Wells 299-E27-14 and 299-E27-24 in comparison with other WMA C wells is a clear indication of a source of origination within the 241-C Tank Farm.

5.4 SST WMA S-SX (Interim, Assessment)

All network monitoring wells scheduled for sampling were successfully sampled. The next quarterly sampling is scheduled for September.



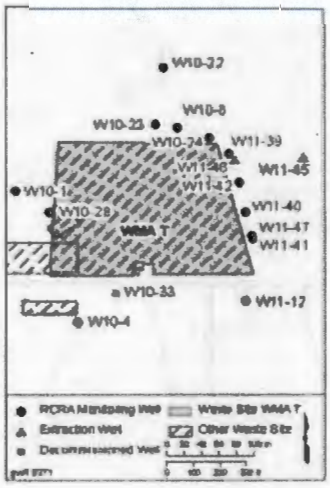
Nitrate continues to decline rapidly at 299-W22-44, the nearest downgradient well from the S Tank Farm. The March sample result was 181mg/L, a decrease from 201mg/L last December. This is further evidence recent concentration increases in this well are due to a migrating pulse of contamination.

Concentrations of mobile tank waste constituents chromium, nitrate, and technetium-99 increased slightly at 299-W23-19 compared to previous sampling in December 2011. Chromium, nitrate, technetium-99, and specific conductance results are on trend.

Chromium concentrations are increasing at 299-W22-80 (Figure 6). This is a near-field downgradient well that had mostly non-detect results prior to previous sampling in June 2011. The low concentrations were attributed to upwelling of relatively clean water from the bottom of the borehole, diluting the chromium plume around the well originating from the SX Tank Farm. However, June 2011 sample result was 18µg/L (filtered total chromium) and June 2012 result was 25.4µg/L. If upwelling is still occurring, these results indicate the plume is mixing to a greater depth at this location. Alternatively, the plume may not have been previously present at this location, but is now dispersing more to the south. Nitrate and specific conductance are also increasing slightly in this well while Technetium-99 is not increasing. It is possible the elevated chromium may indicate well corrosion. Iron and manganese are somewhat elevated, however, nickel is not. Future sample results will help distinguish if elevated chromium is due to a plume or well corrosion.

5.5 SST WMA T (Interim, Assessment)

All 8 wells scheduled for sampling in May were completed successfully. Well 299-W11-45 (an extraction well) went offline in March due to a failed adjustable frequency drive on the pump. This well and extraction well 299-W11-46 were taken offline permanently when the 200-ZP-1 interim pump-and-treat system was shut down. Sampling of these two wells cannot be accomplished until they are converted into monitoring wells which is scheduled to occur in fiscal year 2013. The next scheduled sampling event is planned for August.

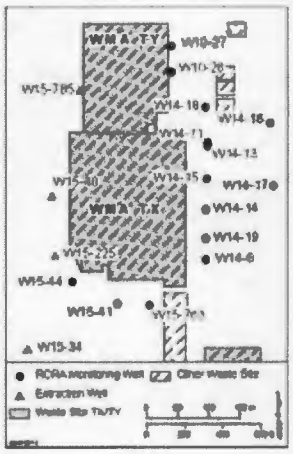


Chromium is the dangerous waste constituent monitored under the RCRA assessment program and 2012 sample results are compared to 2011 sample averages in the table below along with nitrate and other parameters of interest. Wells 299-W11-40 and 299-W11-41 had increasing chromium and nitrate concentrations with corresponding increases in specific conductance. All other analytes were stable or decreasing.

Table 4. WMA T Chromium 2012 Results Comparison to 2011 Averages

	Chromium		Hexavalent chromium		Nitrate		pH		Specific Conductance	
Well Name	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011
299-W10-24	45	58	44	52	201	217	8.63	8.56	819	856
299-W10-4	337	399	5.0	2.6	2960	2453	7.14	7.22	5355	4680
299-W11-39	61	62	61	61	239	244	8.31	8.29	898	912
299-W11-40	203	132	194	143	730	509	7.90	7.88	1604	1523
299-W11-41	167	166	174	155	646	670	7.69	7.69	1647	1577
299-W11-42	102	140	84	140	529	671	7.96	7.95	1368	1691
299-W11-46	103	115	107	119	371	425	7.86	7.67	1180	1267
299-W11-47	81.5	104	80	110	231	316	7.85	7.74	837	977

5.6 SST WMA TX-TY (Interim, Assessment)



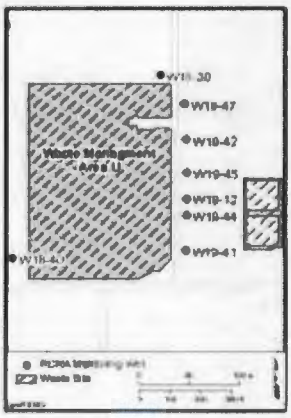
All 10 wells scheduled for sampling in May were completed successfully. Extraction wells 299-W15-40 and 299-W15-765 were taken offline permanently when the 200-ZP-1 interim pump-and-treat system was shut down. Sampling of these two wells cannot be accomplished until they are converted into monitoring wells which is scheduled to occur in fiscal year 2013. The next scheduled sampling event is planned for August.

Chromium is a dangerous waste constituent monitored under the RCRA assessment program. Sample results for 2012 are compared to sample averages from 2011 in the table below along with nitrate and other parameters of interest. Wells 299-W10-26, 299-W14-13, and 299-W14-14 had increasing chromium and nitrate along with corresponding increases in specific conductance, whereas the remaining wells had stable or decreasing chromium concentrations.

Table 5. WMA TX-TY Chromium 2012 Results Comparison to 2011 Averages

	Chromium		Hexavalent chromium		Nitrate		pH		Specific Conductance	
Well Name	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011
299-W10-26	95	89	89.5	73	531	491	7.71	7.8	1382	1246
299-W10-27	109	119	86	87	743	832	7.82	7.81	1809	1865
299-W14-11	46	65	44	61	273	314	7.70	7.70	959	1056
299-W14-13	272	224	243	237	305	221	7.95	7.98	1111	1004
299-W14-14	29	24	20	11	160	85	7.93	8.14	640	522
299-W14-15	39	45	26	30	142	116	7.90	7.86	661	667
299-W14-16	18	15	2	3.7	88	73	7.94	7.89	614	619
299-W14-17	NA	24	6.9	3.7	NA	139	8.11	8.21	633	664
299-W14-18	5	5.7	2	9	82	181	7.65	7.68	778	758
299-W14-19	19	33	5.7	3.7	138	119	7.83	7.84	644	588
299-W15-44	5	10	4	5	113	137	7.89	7.75	558	685
299-W15-763	16	22	2	3.7	470	562	7.84	7.88	1270	1272

5.7 SST WMA U (Interim, Assessment)



All 8 wells scheduled for sampling in April were completed successfully. The next sampling event is scheduled for July.

Of the 16 filtered and unfiltered metals samples from the 8 network wells, antimony was detected in all but 5. These samples are suspected false positives; the analytical laboratory is investigating.

Nitrate concentrations are increasing in the northernmost downgradient well, 299-W18-30, after having been stable since late 2008 (Figure 7). The April sample result was 40.5mg/L, an increase from 37.3mg/L in January.

Chromium continues to be detected in network monitoring wells. Concentrations range from not detected (5µg/L detection limit) to 15.4µg/L for filtered total chromium, and not detected to 18.4µg/L for unfiltered total chromium. Maximum detection in the upgradient well is 6µg/L, consistent with the WMA being a source of chromium to the groundwater.

6 Active Waste Management Areas

Permitted WMAs are monitored to determine whether dangerous waste or dangerous waste constituents from the waste sites have entered the groundwater. Summary status and monitoring highlights of results by exception are provided for each area.

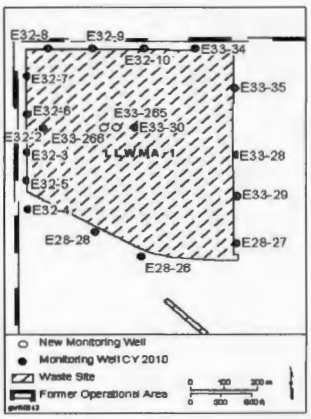
6.1 Integrated Disposal Facility (Final, Detection)

No sample collection was scheduled during this quarter, nor any results received. The next sampling event is scheduled for January.

6.2 Liquid Effluent Retention Facility (Final, Detection)

No sample collection was scheduled during this quarter, nor any results received. The next sampling event is scheduled for July.

6.3 LLWMA-1 (Interim, Detection)



Verification sampling was performed for TOC critical mean exceedance (Figure 8) in Well 299-E33-265 as reported in the previous quarter. The next sampling event is scheduled for July.

A verification sample for TOC in Well 299-E33-265 well was requested in March, collected in April, and splits were sent to separate laboratories in accordance with 40 CFR 265.93(c)(2). Based on these results, a significant increase of TOC was confirmed, notification was sent, and an assessment plan was initiated for delivery to Ecology in accordance with 40 CFR 265.93(d)(2). The assessment plan will use 40 CRF 264, Appendix IX contaminants to determine whether a hazardous waste or hazardous waste constituent has entered groundwater, and if so, concentration, migration extent, and rate.

6.4 LLWMA-2 (Interim, Detection)

Sampling was completed in April as scheduled. The next sampling event is scheduled for October.

Nitrate and sulfate continue to exceed the DWS. Elevated contaminant levels are not associated with LLWMA-2, but separate sources. Well 299-E27-10 nitrate and sulfate levels are associated with unplanned releases from 216-B-2 ditches south of LLWMA-2. Wells 299-E34-9, 299-E34-10, and 299-E34-12 nitrate levels have been impacted by sources from the northwest and are consistent with groundwater flow direction change to the southeast.

6.5 LLWMA-3 (Interim, Detection)

Well 299-W9-2, newly installed upgradient, was successfully sampled in January and again in June. January results, and results from remaining 2012 and 2013 quarterly samples, will be used to establish background statistical comparison values for this WMA. June sampling results were consistent with Hanford Site Groundwater Background (DOE/RL-92-23). The next sampling event is scheduled for September.

Wells 299-W10-31 and 299-W9-2, scheduled for indicator parameter sampling in March, were sampled in April. Results were on trend for pH,

show a decrease for TOC and TOX compared to 2010 and 2011 averages, and a slight increase in specific conductivity in table below. The increase in specific conductivity is consistent with a nitrate increase in this well. There were no exceedances.

Table 6. LLWMA-3 Indicator Parameter Averages 2010 and 2011 Comparison

Well	pH		Specific Conductance		TOC		TOX	
Timeframe	*April*	*2011*	*April*	*2011*	*April*	*2011*	*April*	*2011*
299-W10-31	7.89	7.84	630	596	297	615	26	36
299-W9-2	7.97	NA	374	NA		NA		NA

6.6 LLWMA-4 (Interim, Detection)

No sampling was scheduled for this quarter, nor any results received. The next sampling event is scheduled for July.

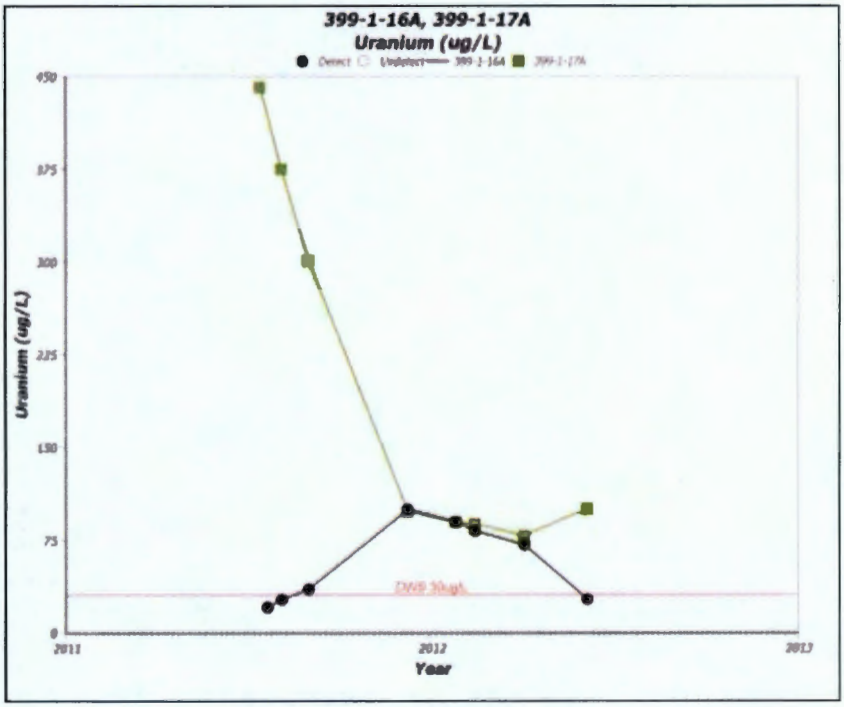


Figure 1. Wells 399-1-16A, 399-1-17A Uranium

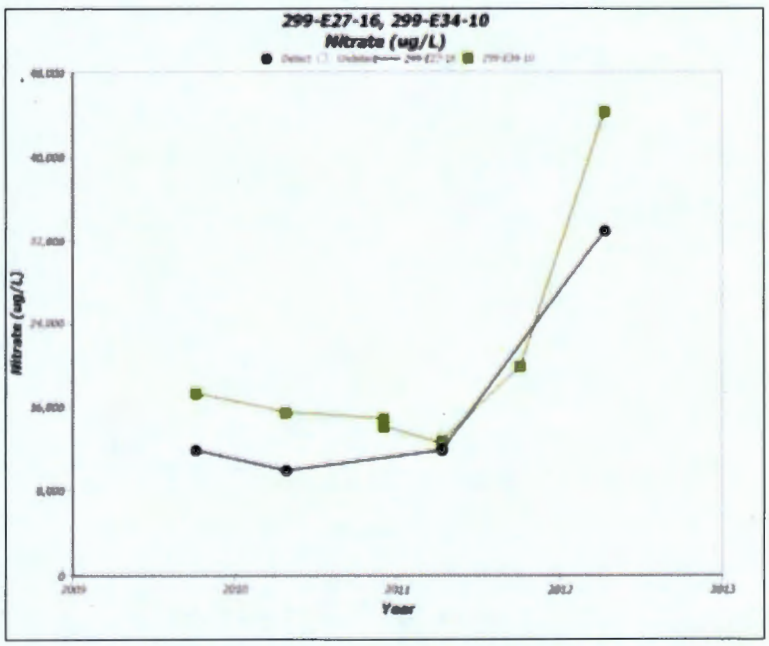


Figure 2. Wells 299-E27-16, 299-E34-10 Nitrate

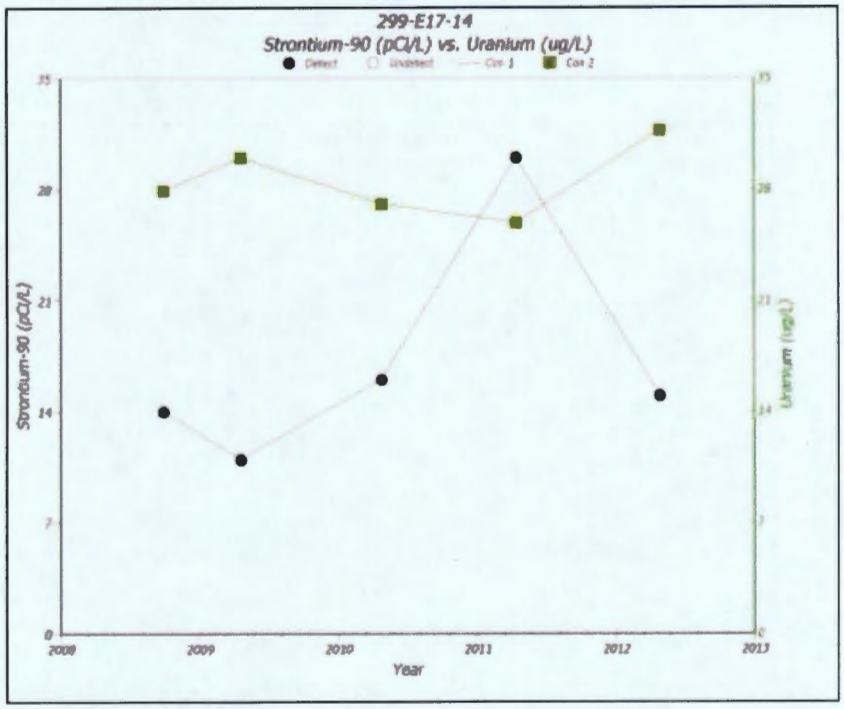


Figure 3. Well 299-E17-14 Strontium-90 and Uranium

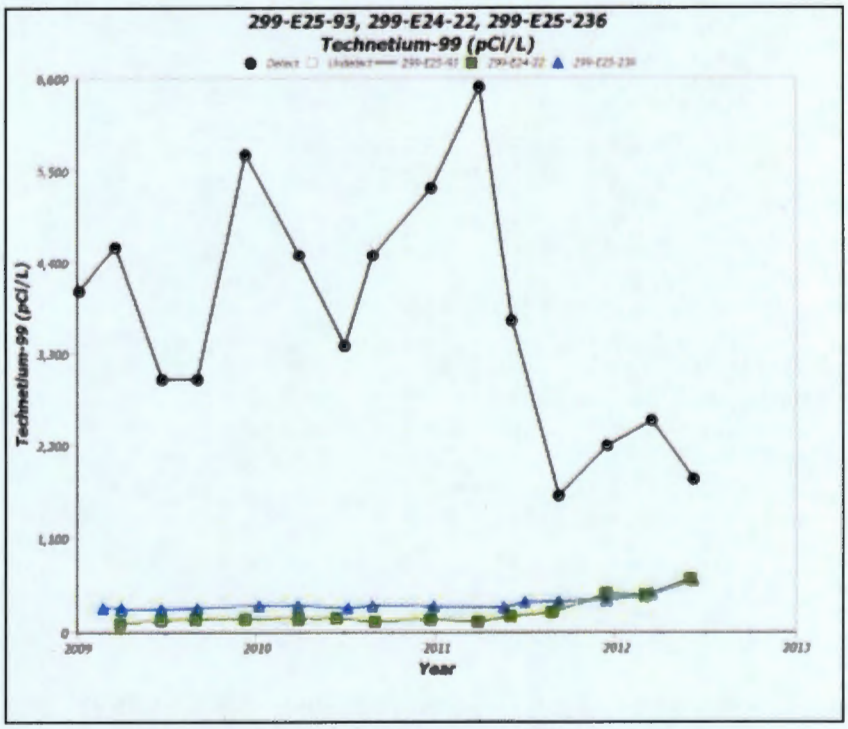


Figure 4. Wells 299-E25-93, 299-E24-22 and 299-E25-236 Technetium-99

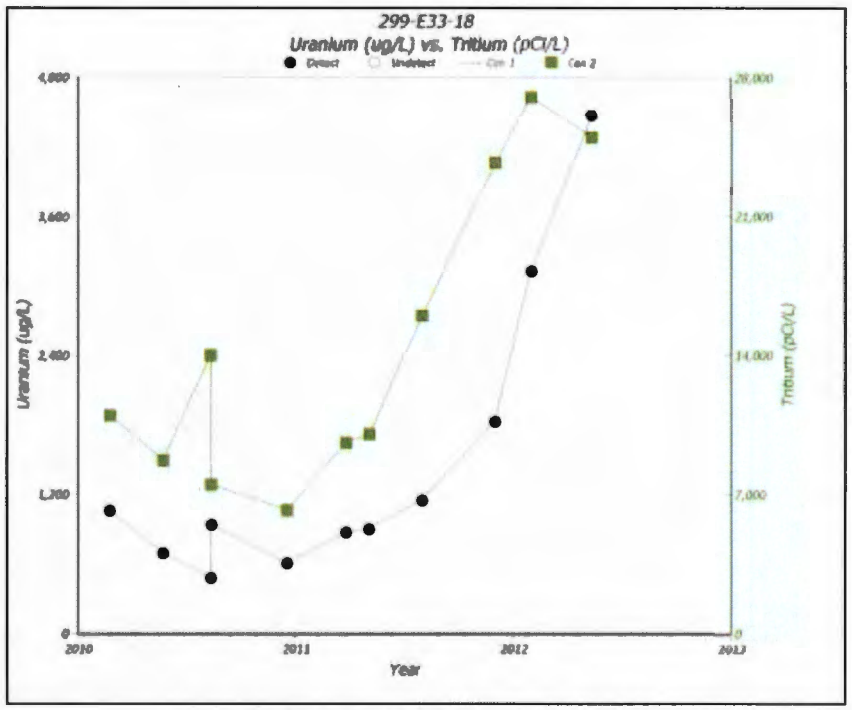


Figure 5. Well 299-E33-18 Uranium and Tritium

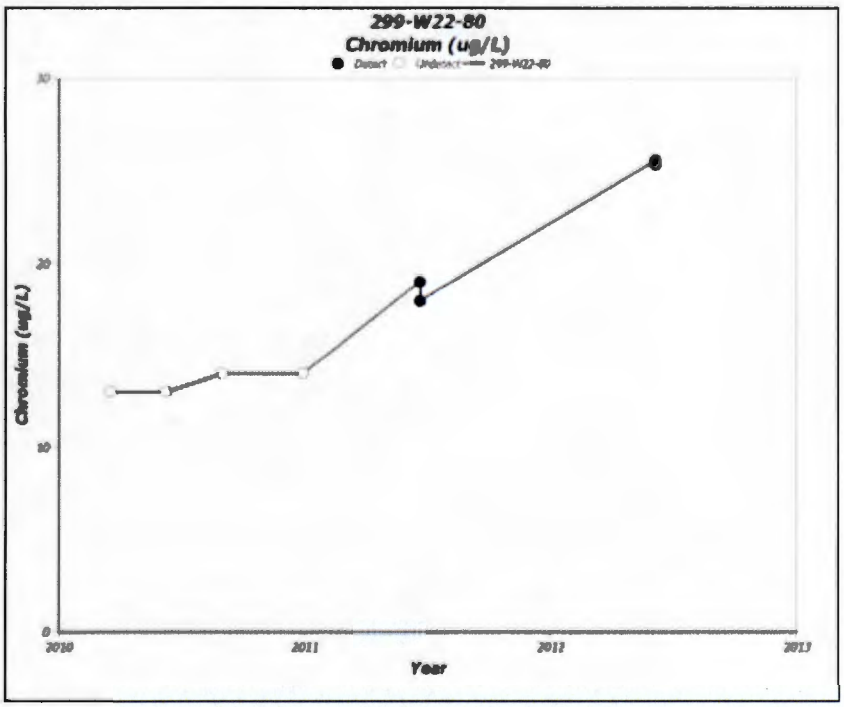


Figure 6. Well 299-W22-80 Chromium

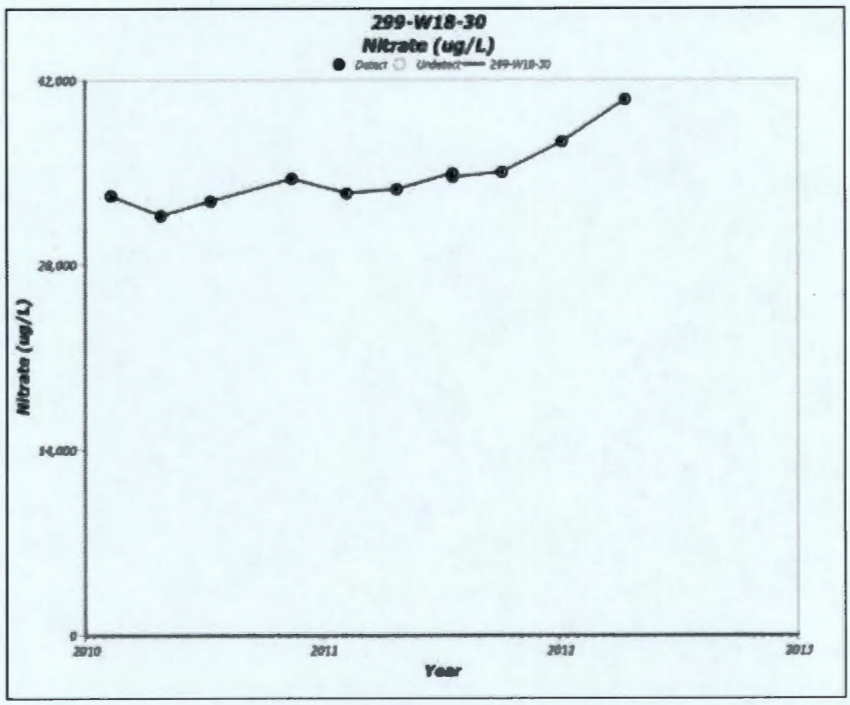


Figure 7. Well 299-W18-30 Nitrate

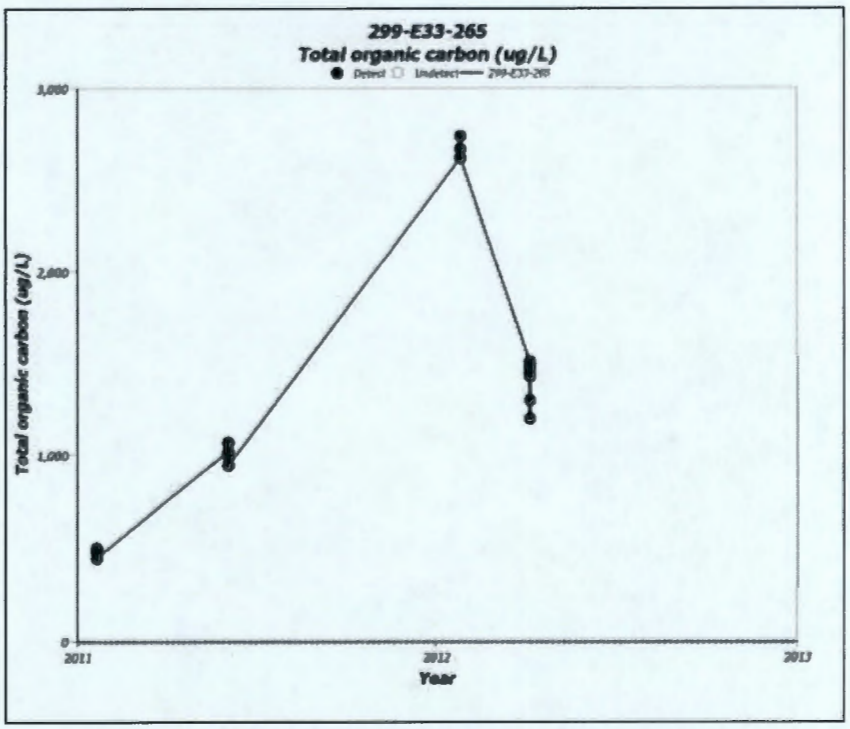


Figure 8. Well 299-E33-265 Total Organic Carbon (TOC)

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