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Revision 0

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RCRA Groundwater Quarterly Report for January through March 2015

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

ch2m

P.O. Box 1600
Richland, Washington 99352

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Terms

AEA	*Atomic Energy Act of 1954*
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CHPRC	CH2M HILL Plateau Remediation Company
DOE	U.S. Department of Energy
DWS	drinking water standard
HEIS	Hanford Environmental Information System
LLWMA	low-level waste management area
NTU	nephelometric turbidity unit
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
SST	single-shell tank
Tc-99	Technetium-99
TOC	total organic carbon
TOX	total organic halides
WMA	waste management area

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1 Introduction

The CH2M HILL Plateau Remediation Company (CHPRC) Soil and Groundwater Remediation Project presents data in this project document describing sampling performed in accordance with the *Resource Conservation and Recovery Act of 1976* (RCRA) during the January through March 2015 reporting period.

Groundwater monitoring objectives of RCRA, the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), and the *Atomic Energy Act of 1954* (AEA) often differ slightly, and the contaminants monitored are not always the same. For RCRA-regulated units, monitoring focuses on nonradioactive dangerous waste constituents. While radionuclides (source, special nuclear, and byproduct materials) may be monitored in some RCRA unit wells to support objectives of monitoring under AEA and/or CERCLA, they are not subject to RCRA regulation. Pursuant to RCRA, the source, special nuclear, and byproduct material components of radioactive mixed waste are regulated by the U.S. Department of Energy (DOE), acting in accordance with its AEA authority. Therefore, while this report is used to satisfy RCRA reporting requirements, the inclusion of information on radionuclides in such a context is for information only and may not be used to create conditions or other restrictions set forth in any RCRA Permit.

Quarterly information is provided to status sampling, summarize recent and pending monitoring changes, and report statistical exceptions. 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 DOE 2015 Environmental Dashboard Application https://ehs.hanford.gov/eda/.

Chapters 2 and 3 identify any quality control (QC) or laboratory issues and the sampling and analysis status for the reporting period. Chapters 4, 5, and 6 present a general status update including sampling activity, significant results, and applicable trend charts.

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2 Quality Control and Laboratory Issues

No laboratory or QC issues were identified for the reporting period.

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3 Sampling and Analysis Status

This section lists missed or delayed samples.

3.1 Missed Sampling

Table 1 presents samples scheduled but not collected during the quarter. The table includes the site, scheduled period that was not collected, frequency of sampling, and any comments. Further information is included in the site-specific discussion.

Table 1. Sampling Not Completed

Well	Site	Scheduled	Frequency	Comments
299-W14-18	TX-TY	February	Quarterly	Water level was too low, pump will be lowered.

3.2 Sampling Completed after Quarterly Reporting Period

Table 2 shows wells scheduled but collected after completion of the quarter. The table includes the site, scheduled period that was not collected, frequency of sampling, and any comments. Further information is included in the site-specific discussion.

Table 2. Sampling Completed after Quarter

Well	Site	Scheduled	Frequency	Comments
299-E33-337	B-BX-BY	February	Quarterly	Delayed, pump was fouled, was sampled in April.

3.3 Stop Work

No stop work orders affecting groundwater sampling were in effect during the reporting period.

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4 Inactive Waste Management Areas

The following closed and inactive treatment, storage, and disposal units received nonradioactive dangerous waste for active management after RCRA regulation became jurisdictionally applicable to that activity. Groundwater monitoring around the units must continue in order to detect releases to groundwater of residual dangerous wastes in each unit. Summary status and monitoring highlights of results by exception are provided for each area.

4.1 1301-N Liquid Waste Disposal Facility (Final Status, Detection Monitoring)

All five wells were sampled as scheduled in March. Contamination indicator parameter and analytical results were loaded into the Hanford Environmental Information System (HEIS). Results did not exceed critical mean values. The next sampling event is scheduled for September.

4.2 1324-N/NA Facilities (Final Status, Detection Monitoring)

All five wells were sampled as scheduled in March. Contamination indicator parameter and analytical results were loaded into HEIS. The next sampling event is scheduled for September.

Specific conductance results continued to be above the critical mean in downgradient wells 199-N-72, 199-N-73, and 199-N-165. A previous groundwater quality assessment indicated that high specific conductance is caused by the nonregulated constituents sulfate and sodium (*Results of Groundwater Quality Assessment Monitoring at the 1301-N and 1324-N/NA Facilities* [WHC-SD-EN-EV-003]) and remains valid as reflected in the figures below showing comparison of specific conductance to sulfate trends. Results did not exceed critical mean values for the remaining indicator parameters.

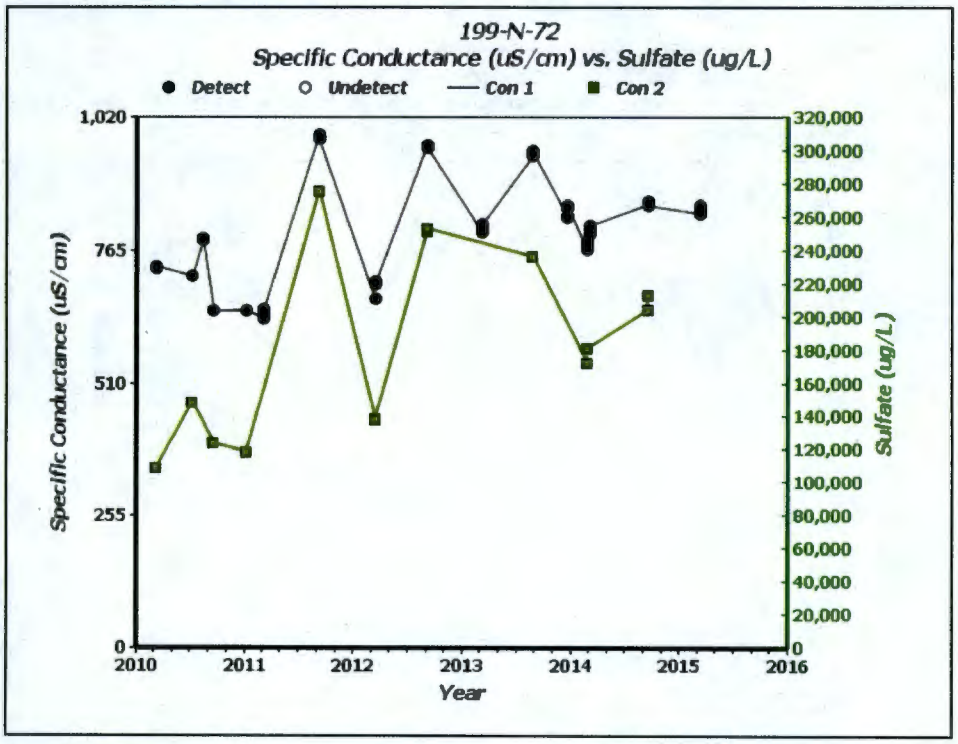

Figure 1. Specific Conductance and Sulfate in Well 199-N-72

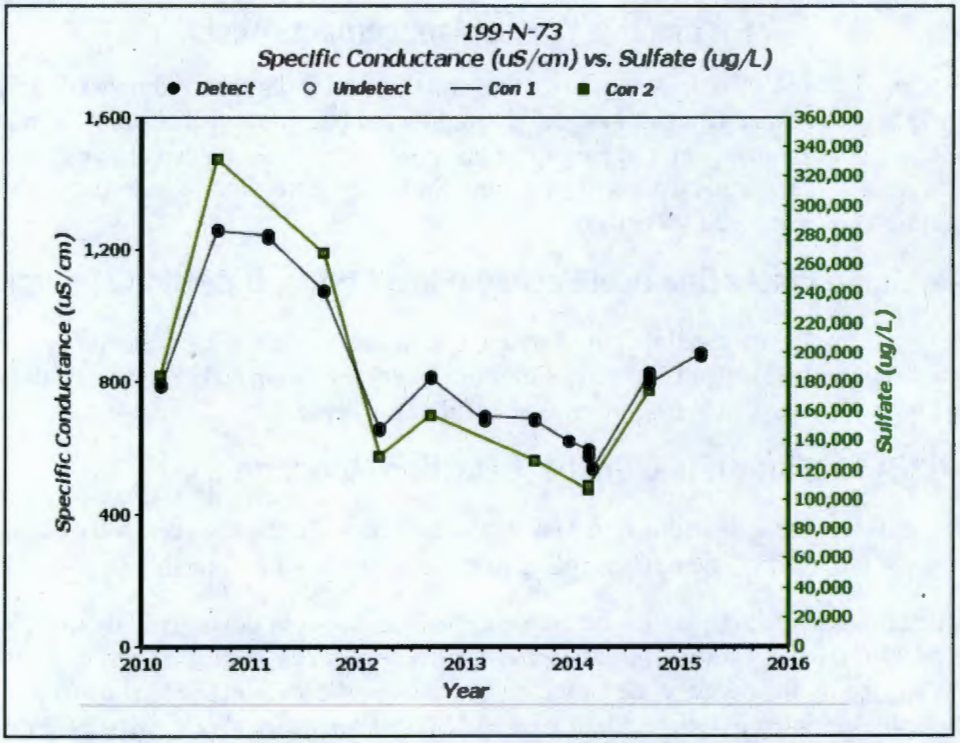

Figure 2. Specific Conductance and Sulfate in Well 199-N-73

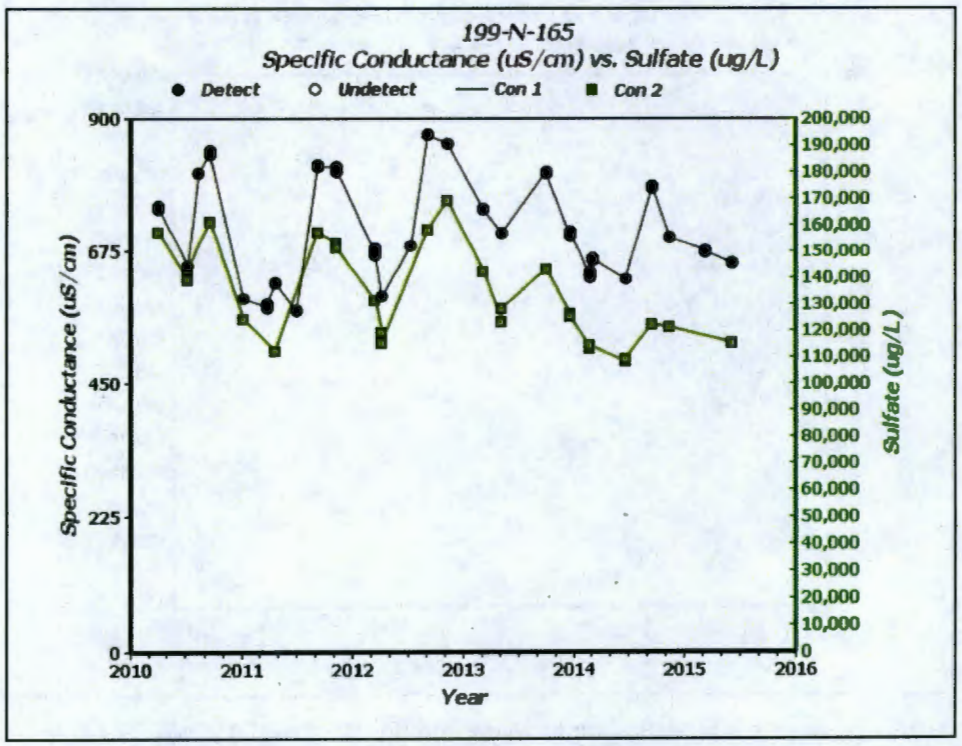

Figure 3. Specific Conductance and Sulfate in Well 199-N-165

4.3 1325-N Liquid Waste Disposal Facility (Final Status, Detection Monitoring)

All five wells were sampled as scheduled in March as scheduled. Contamination indicator parameter and analytical results were loaded into HEIS. The next sampling event is scheduled for September 2015.

Specific conductance results continued to be above the critical mean in downgradient monitoring wells. This is a continuation of previous exceedances noted since 1999. The assessment report for the original 1999 exceedance (well 199-N-41) concluded that the exceedance was caused by past discharges of nonregulated contaminants to the 120-N-1 site (00-GWVZ-054, *Results of Assessment at the 1325-N Facility*). Results did not exceed critical mean values for the remaining indicator parameters.

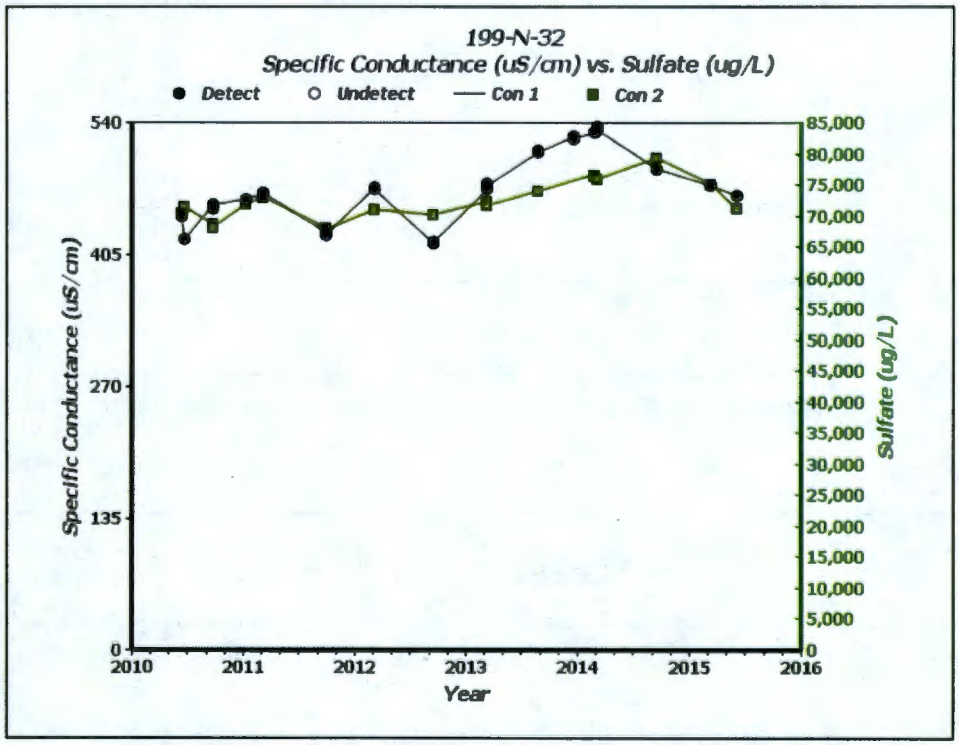

Figure 4. Specific Conductance and Sulfate in Well 199-N-32

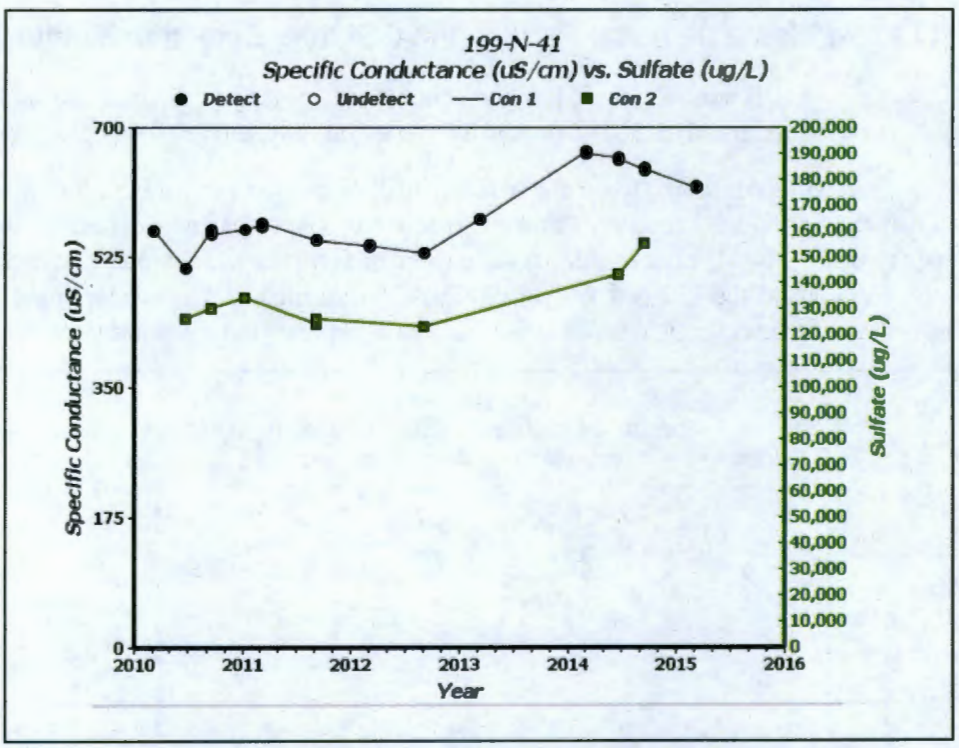

Figure 5. Specific Conductance and Sulfate in Well 199-N-41

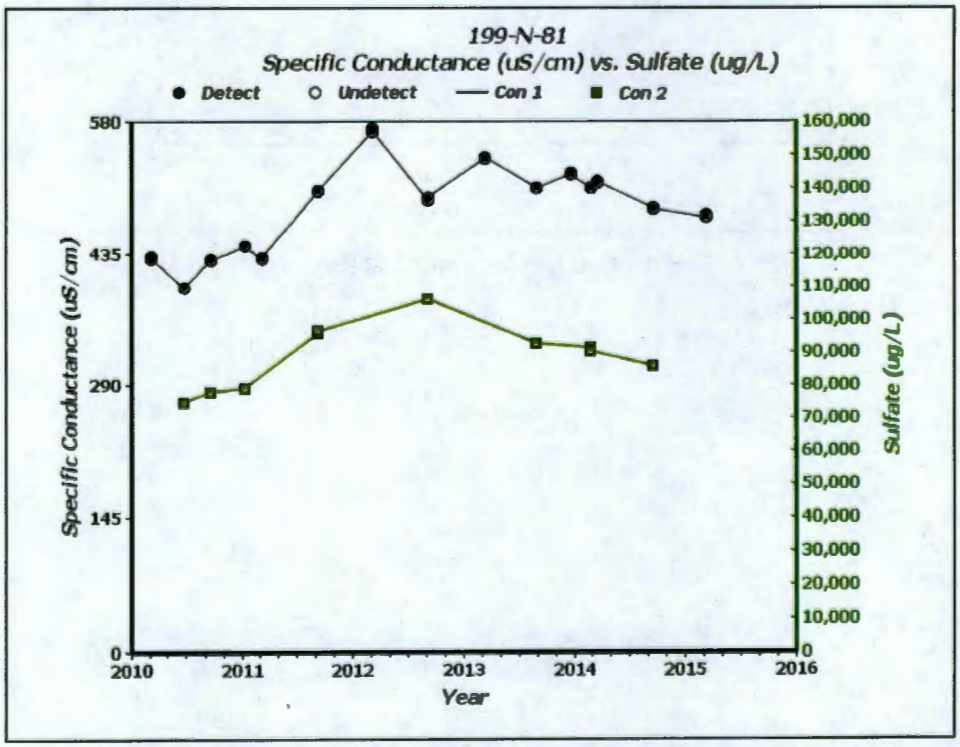

Figure 6. Specific Conductance and Sulfate in Well 199-N-81

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

No RCRA sampling was conducted during the quarter. The next scheduled sampling event is November.

4.5 300 Area Process Trenches (Final Status, Corrective Action Monitoring)

All eight wells were sampled as scheduled during the quarter. The next scheduled sampling event is June.

The concentration of cis-1, 2-dichloroethene continues to exceed the 70 µg/L drinking water standard (DWS) at well 399-1-16B (182, 154, and 185 µg/L), which is screened in the lower unconfined aquifer. The origin for cis-1, 2-dichloroethene is attributed to degradation of trichloroethene disposed to the 300 Area Process Trenches and/or North Process Pond.

The concentration of uranium continued to exceed the 30 µg/L DWS at well 399-1-17A (44.7, 43.3, 42.5, 45.8, and 54.2 µg/L) at the southern end of process trenches. The concentration of uranium also exceeded the 30 µg/L DWS at well 399-1-16A (37.7, and 41.6 µg/L), southeast of the process trenches. The concentrations at well 399-1-16A, which is near the Columbia River, increases during low river stage with the arrival of uranium that has been remobilized upgradient.

4.6 216-A-29 Ditch (Interim Status, Indicator Evaluation Monitoring)

No sampling was scheduled during the quarter. The next scheduled sampling event is April.

4.7 216-B-3 Pond (Interim Status, Indicator Evaluation Monitoring)

Sampling of the RCRA monitoring network wells was completed as scheduled in January. RCRA indicator parameters were loaded into HEIS and there were no exceedances. The next scheduled semiannual sampling event is July.

4.8 216-B-63 Trench (Interim Status, Indicator Evaluation Monitoring)

Reanalysis for nitrate from well 299-E27-19 was loaded into HEIS in February. The initial value was 203,000 µg/L, which was significantly out of trend. The reanalysis was reported at 103,000 µg/L and replaced the initial value in HEIS. No sample collection or other analytical results were received during the quarter. The next semiannual sampling event is scheduled for April.

4.9 216-S-10 Pond and Ditch (Interim Status, Indicator Evaluation Monitoring)

No sampling was scheduled during the quarter. The next scheduled sampling event is May.

4.10 Nonradioactive Dangerous Waste Landfill (Interim Status, Indicator Evaluation Monitoring)

No sampling was scheduled during the quarter. The next scheduled sampling event is April.

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

Sampling of the RCRA monitoring network wells was completed as scheduled in January. RCRA indicator parameters were loaded into HEIS and there were no exceedances. The next scheduled semiannual sampling event is July.

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

Sampling of the RCRA monitoring network wells was completed as scheduled in January. RCRA indicator parameters were loaded into HEIS and there were no exceedances. The next scheduled semiannual sampling event is July.

5 Groundwater Monitoring Single-Shell Tank Farm Waste Management Areas

RCRA units that have not yet achieved fully permitted status are monitored under interim status groundwater monitoring programs. Single-shell tank (SST) farms are all monitored under RCRA groundwater assessment and are designated as waste management areas (WMAs). Summary status and monitoring highlights of results are provided for each area.

5.1 SST WMA A-AX (Interim Status, Assessment Monitoring)

The eight RCRA network wells were successfully sampled as scheduled in March. New well 299-E25-237 has not been sampled yet and is waiting to have a pump installed. Ranges for assessment parameters are summarized in Table 3, and were generally within recent levels and trends. The next scheduled quarterly sampling event is June.

The concentration of nitrate detected in wells 299-E24-20 (62,900 ug/L) and 299-E25-93 (57,100 mg/L) was above the (DWS) of 45,000 ug/L. The concentration of technetium-99 (Tc-99) in wells 299-E24-22 (1,600 pCi/L) and 299-E25-93 (1,360 pCi/L) was above the DWS of 900 pCi/L.

Nitrate concentrations in wells 299-E24-33, 299-E25-41, and 299-E25-2 have been increasing since 2006, but remain below the nitrate DWS (Figure 7). Nitrate levels have been above the DWS in well 299-E24-20 since March 2013. In March 2013, nitrate concentrations in well 299-E25-93 dropped below the DWS. Since that time levels have fluctuated above and below the DWS. December 2014 and March 2015 concentrations were increasing in both wells (Figure 8).

Tc-99 concentrations have been increasing (Figure 9) in upgradient wells 299-E24-22 (since March 2011) and 299-E24-33 (since late 2012). Downgradient well 299-E25-41 started displaying increasing Tc-99 levels in December 2012 with concentrations near 900 pCi/L since 2013, Tc-99 concentrations in downgradient well 299-E25-93 have been decreasing, but currently are still above the Tc-99 DWS (Figure 10).

Table 3. Assessment Quality Parameter Results

Parameter	Range of March 2015 Values
pH Measurement	7.8-8.22
Specific Conductance	484-696 µS/cm
Temperature	16.7 to19.8 degrees C
Turbidity	0.16 – 4.28 NTU
Alkalinity	83,000 to 98,000 µg/L
Chromium (filtered)	1.05 to 7.9 µg/L
Lead (filtered)	<0.25 to < 0.5 µg/L
Nitrate	14,100 to **62,900** µg/L
Sodium (filtered)	17,500 to 28,200 µg/L
Sulfate	105,000 to 201,000 µg/L
TOC	<350 to 821 µg/L
Tc-99	18.5 to **1,600** pCi/L

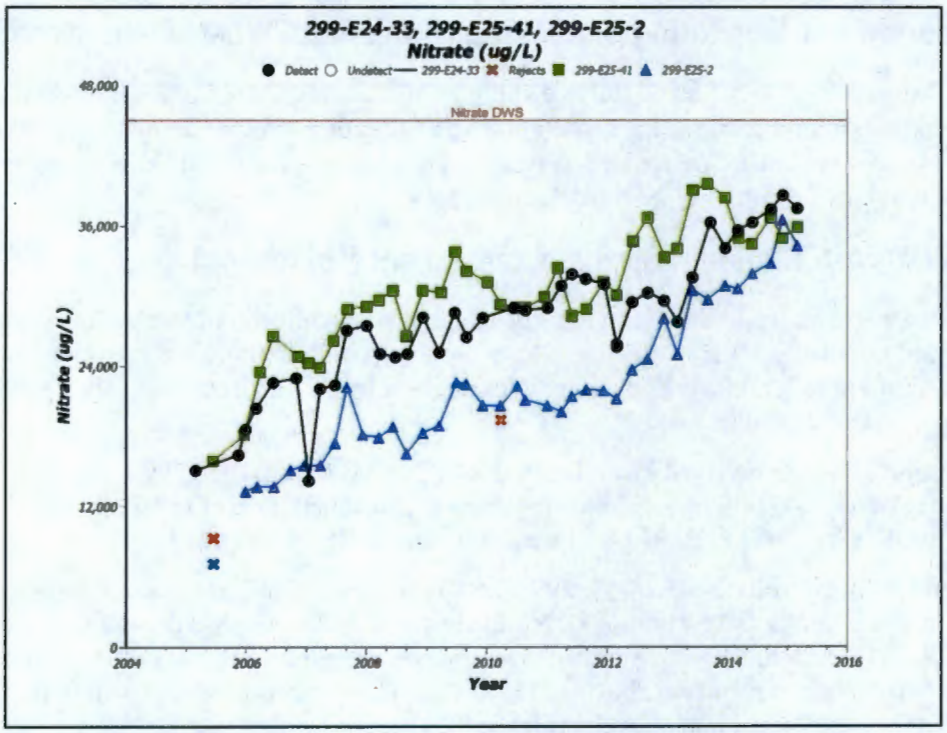

Figure 7. Nitrate at Wells 299-E24-33, 299-E25-41, and 299-E25-2

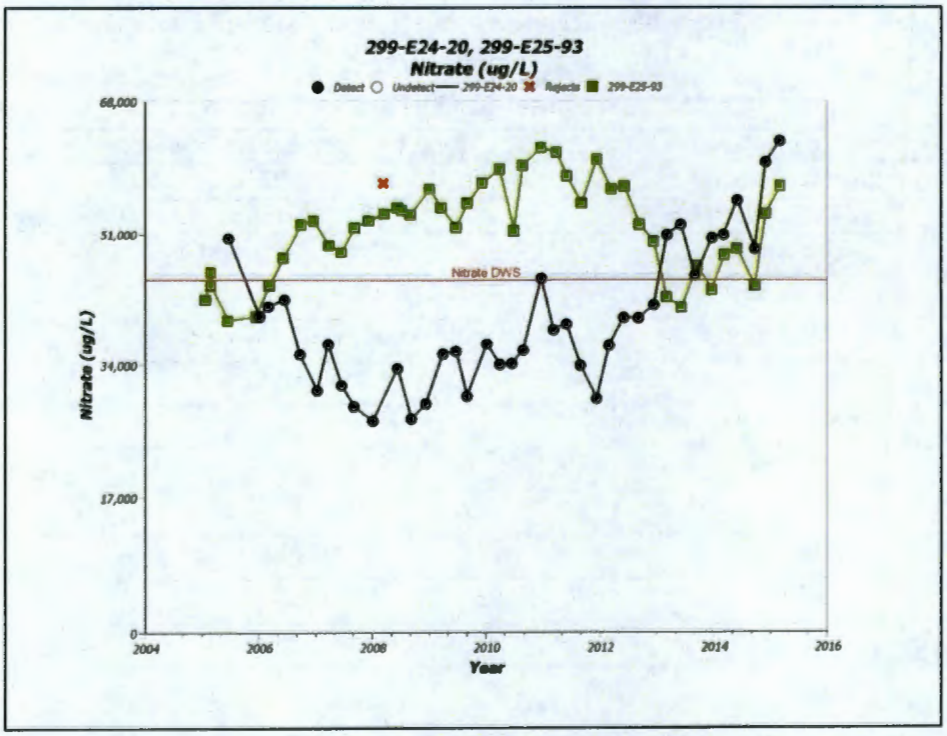

Figure 8. Nitrate at Wells 299-E24-20, and 299-E25-93

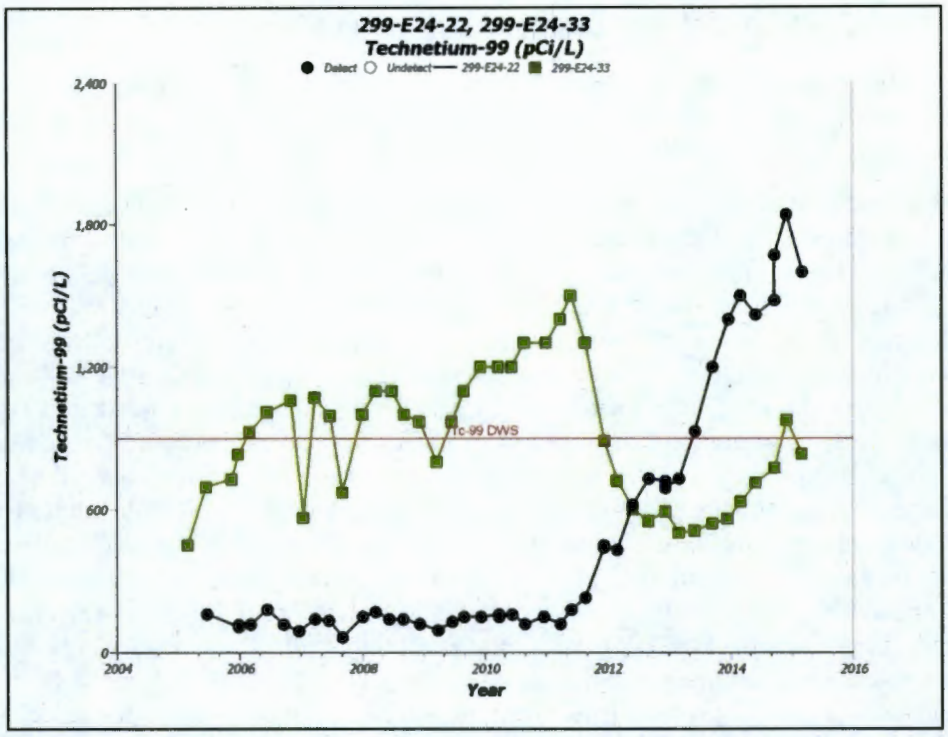

Figure 9. Technetium-99 in Upgradient Wells 299-E24-22, and 299-E24-33

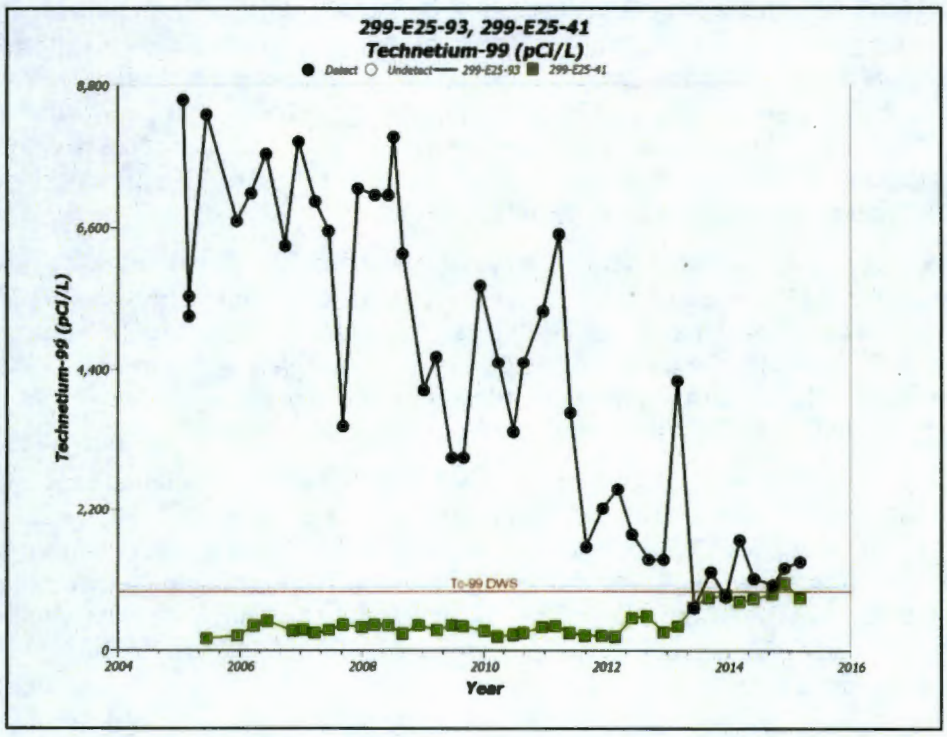

Figure 10. Technetium-99 in Downgradient Wells 299-E25-93, and 299-E25-41

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

Fourteen of the fifteen WMA B-BX-BY monitoring wells were sampled as scheduled in February 2015. Groundwater sampling at well 299-E33-337 was delayed because the hydrostar pump was fouled. The well was swabbed, purged, and sampled in April. The next sampling event is scheduled for May.

Specific conductance measurements for the 14 WMA B-BX-BY wells ranged between 591 and 3,006 µS/cm. The lowest value was observed at well 299-E33-334, located at the southwest corner of the 241-BX Tank Farm. The greatest specific conductance was observed at downgradient well 299-E33-47. Elevated specific conductance is attributed mainly to increased nitrate concentrations. Where the highest specific conductance levels are present, the chemical facies is associated with a nitrate dominated chemical facies. For example, well 299-E33-47 portrays a nitrate-sodium-calcium chemical facies. The elevated sodium milliequivalent value indicates a nearby infiltration of sodium containing waste into the aquifer, because sodium quickly equilibrates in Hanford groundwater with calcium becoming the dominant cation. The chemical facies is consistent with the apparent unplanned release of cesium scavenged waste from the 241-B Tank Farm. The remaining wells portray varying chemical facies ranging from nitrate-calcium-sodium to nitrate-calcium to calcium-nitrate to calcium-bicarbonate-nitrate. The nitrate-calcium-sodium chemical facies is associated with migrating BY Cribs scavenged waste and only appears in two wells, (299-E33-38, beneath the BY Cribs, and 299-E33-20, located to the northeast of the 241-B Tank Farm), along the primary groundwater flow path of the BY Cribs contaminant migration. The nitrate-calcium-sodium chemical facies transitions to a nitrate-calcium and calcium nitrate facies with distance from the primary BY Cribs groundwater flow path. A high milliequivalent level of sodium is also present at well 299-E33-44, but contains much more calcium than sodium and appears to reflect additional contributions from the 241-BX-102 unplanned release.

The February, 2015 pH results ranged from 7.53-8.08, which was an increase of 0.1 to 0.48 pH units from November, 2014. The difference in pH level appears to be equipment drift. The minimum pH was at well 299-E33-47, which rose 0.48 pH units from November 2014. The November 2014 pH value at well 299-E33-47 was flagged because the value was considered an extreme low outlier (more than 3 times the interquartile range [IQR][1] lower than the 25th percentile per EPA 530/R-09-007, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance*, definition for screening with box plots), when assessing pH values from August 2010 to February 2015. The high pH level was at well 299-E33-32. All pH results were within acceptable limits this quarter.

The dangerous waste constituent cyanide concentration at well 299-E33-47 continues to exceed the DWS and is associated with a localized unplanned release within the 241-B Tank Farm as discussed in DOE/RL-2012-53. The February result was 1,240 µg/L, which is a decrease from 1,500 in November 2014. Cyanide is also present at levels exceeding the DWS at other wells at WMA B-BX-BY, but is generally associated with southeast migration from the BY Cribs. The exception is well 299-E33-338, which is also associated with WMA B-BX-BY.

Nitrate values continue to exceed the DWS across WMA B-BX-BY with the highest concentration at well 299-E33-47, which is associated with a localized unplanned release within the 241-B Tank Farm as discussed in DOE/RL-2012-53. The nitrate concentration at well 299-E33-47 has continued to decrease since August 2014, decreasing from 1,430 mg/L to 1,280 mg/L. The next highest nitrate values in the network are at wells 299-E33-20 and 299-E33-44, 823 mg/L and 1,060 mg/L, respectively. Similar to specific conductivity and cyanide, the elevated nitrate at wells 299-E33-20 and 299-E33-44 is mainly associated with migration from the BY Cribs. .

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[1] IQR is the difference between the 75th and 25th sample percentile. IQR offers an alternative estimate of variability in a population because it represents the measurement range of the middle 50 percent of ordered sample values.

Filtered chromium levels are elevated but do not exceed any federal DWS or state derived cleanup standards. The elevated filtered chromium results are reflective of plume migration originating from the 216-B-8 Crib. This crib received secondary decontamination liquid waste in the late 1940s and early 1950s, and contaminants continue to infiltrate into the aquifer from this waste site. Part of the waste inventory received at the 216-B-8 Crib included hexavalent chromium, which was in the form of sodium dichromate used for plutonium oxidation.

Nickel levels are elevated in certain wells. The nickel has been determined to be well screen corrosion based on 2014 sample results, television surveys, and literature search.

5.3 SST WMA C (Interim Status, Assessment Monitoring)

All twelve WMA C wells were sampled as scheduled in March, and field results were loaded into HEIS. The next quarterly sampling event is scheduled for June.

The field results load included: dissolved oxygen, oxidation reduction potential, pH, specific conductance, temperature, and turbidity. All parameters are on trend.

The March, 2015 pH results ranged between 7.83 and 8.39. The lowest pH was at well 299-E27-155, located to the southwest of the 241-C Tank Farm and screened crossed the bottom of the aquifer.

Specific conductance results ranged between 381 and 983 µS/cm. The highest specific conductance was at well 299-E27-25 located to the east of WMA C. Other elevated specific conductance results were from wells 299-E27-14 and 299-E27-24. These wells are located to the south-southeast of the 241-C Tank Farm and screened crossed the upper and lower part of the aquifer, respectively.

The RCRA assessment sample results included alkalinity, anions, cyanide, and metals. The only dangerous waste or dangerous waste constituent associated with WMA C is cyanide. Other potential dangerous waste constituents associated with WMA C have not been found. Some metals are still evaluated for geochemical parameters, but all other dangerous waste or dangerous waste constituents have been excluded through the assessment process as discussed in Section 4 of *Groundwater Quality Assessment Plan for the Single-Shell tank Waste Management Area-C*, DOE/RL-2009-77.

The dangerous waste constituent cyanide was detected at six wells (299-E27-7, 299-E27-14, 299-E27-22, 299-E27-23, 299-E27-24, and 299-E27-155) in March, 2015. The concentrations ranged from 2.63 to 13.8 µg/L, which is significantly lower than the 200 µg/L DWS. Well 299-E27-24, screened across the lower part of the aquifer, had the highest concentration and concentrations have generally ranged between 7.9 and 15.3 µg/L since being installed in 2010. Based on the history of results, cyanide is primarily present at higher levels in the downgradient wells to the south-southeast of WMA C, and extends to the bottom of the aquifer.

Nitrate exceeded 45 mg/L at four wells in March (299-E27-14, 299-E27-21, 299-E27-24, and 299-E27-25). Three of these wells are downgradient (299-E27-14, 299-E27-21 and 299-E27-24). Nitrate concentrations in these downgradient wells have shown to be relatively stable during the past three years (Figure 11). The upgradient well, 299-E27-25, is influenced by plume migration from the north.

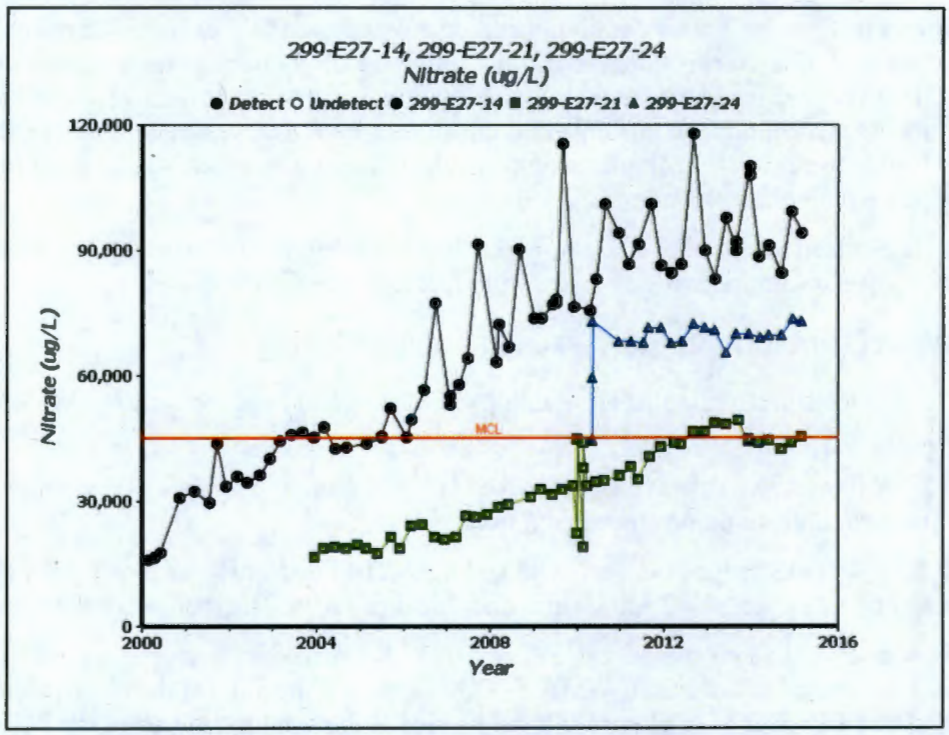

Figure 11. Nitrate in Wells 299-E27-14, 299-E27-21, and 299-E27-24

5.4 SST WMA S-SX (Interim Status, Assessment Monitoring)

Two of the network wells (299-W22-47 and 299-W23-19) were sampled as scheduled during the quarter. Results were loaded into HEIS and were all on trend. At 299-W23-19, located inside the SX Tank Farm, chromium concentrations were 406 and 395 µg/L (filtered and unfiltered, respectively). Concentrations have declined since late 2012 (Figure 12) due to operation of the WMA S-SX groundwater extraction system. The next quarterly sampling is scheduled for June.

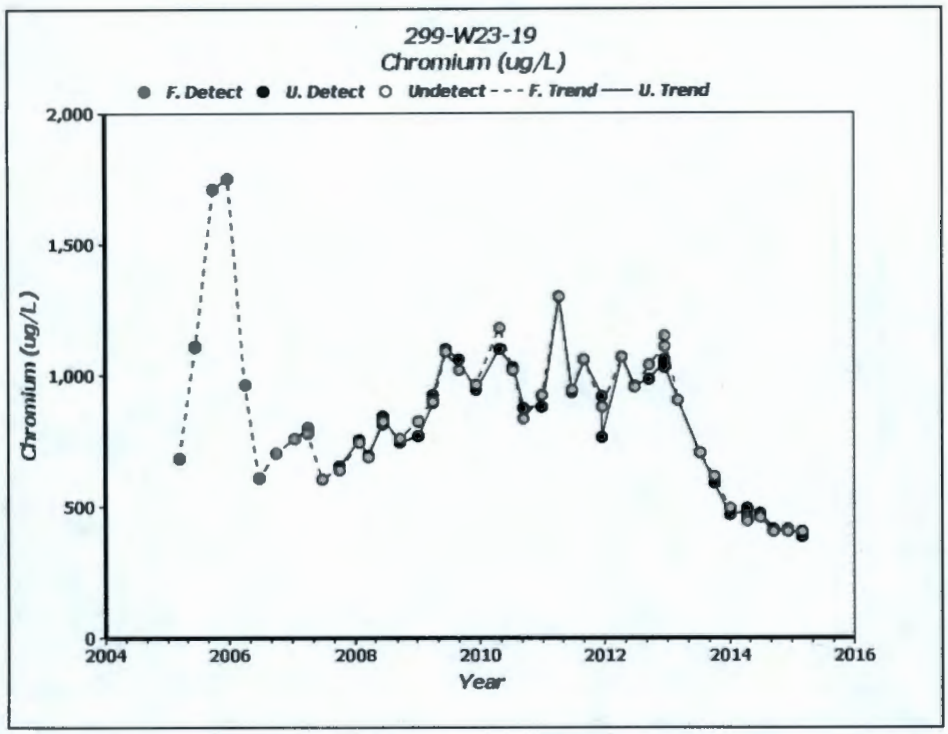

Figure 12. Chromium in Well 299-W23-19

5.5 SST WMA T (Interim Status, Assessment Monitoring)

Four wells were sampled as scheduled during the quarter. The next scheduled sampling event is May.

Chromium is a dangerous waste constituent monitored under the RCRA assessment program. Nearby 200 West extraction wells are now sending groundwater to the new facility for treatment. Changes in concentration of all analytes are expected as a result of the new wells extracting contaminated groundwater upgradient and downgradient of WMA T. Chromium concentrations are on trend.

5.6 SST WMA TX-TY (Interim Status, Assessment Monitoring)

Four of five wells were sampled as scheduled during the quarter. Well 299-W14-18 was not sampled because the water level was too low, and the pump is scheduled to be lowered. The next scheduled sampling event is May.

Chromium is a dangerous waste constituent monitored under the RCRA assessment program. Nearby 200 West extraction wells are now sending groundwater to the new facility for treatment. Changes in concentrations of all analytes are expected as a result of the new wells extracting contaminated groundwater upgradient and downgradient of WMA T and WMA TX-TY. Chromium concentrations are declining (Figure 13-16).

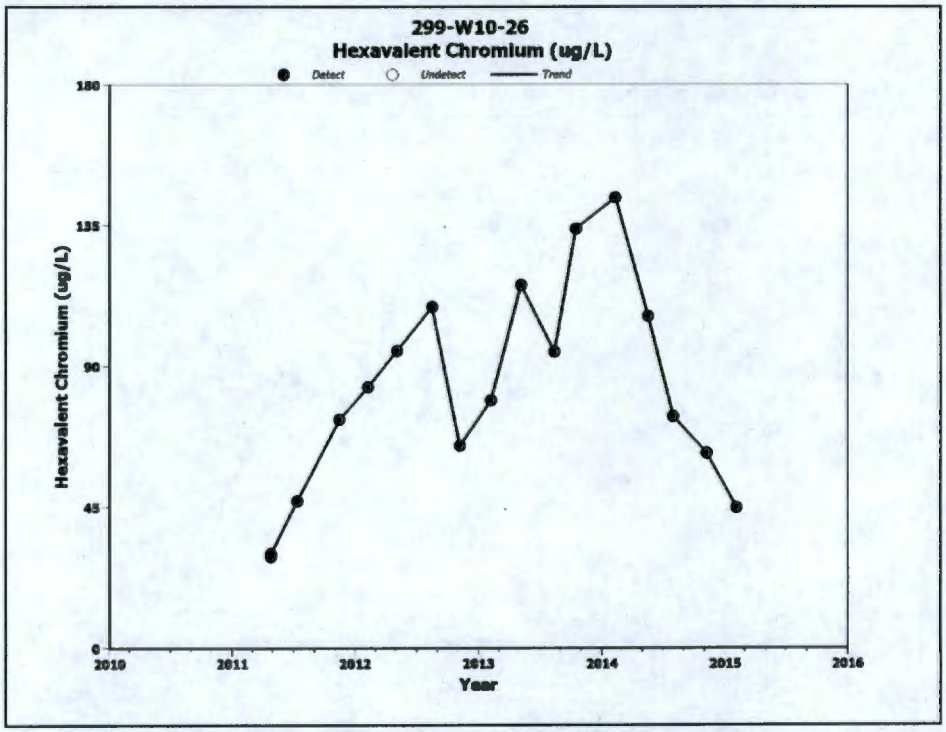

Figure 13. Hexavalent Chromium in Well 299-W10-26

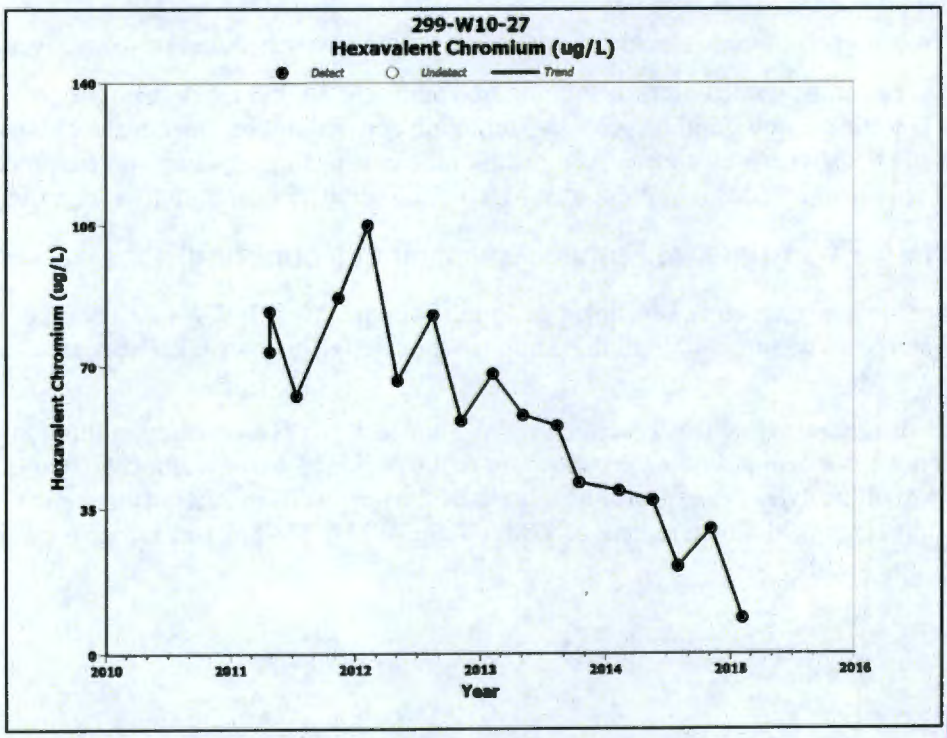

Figure 14. Hexavalent Chromium in Well 299-W10-27

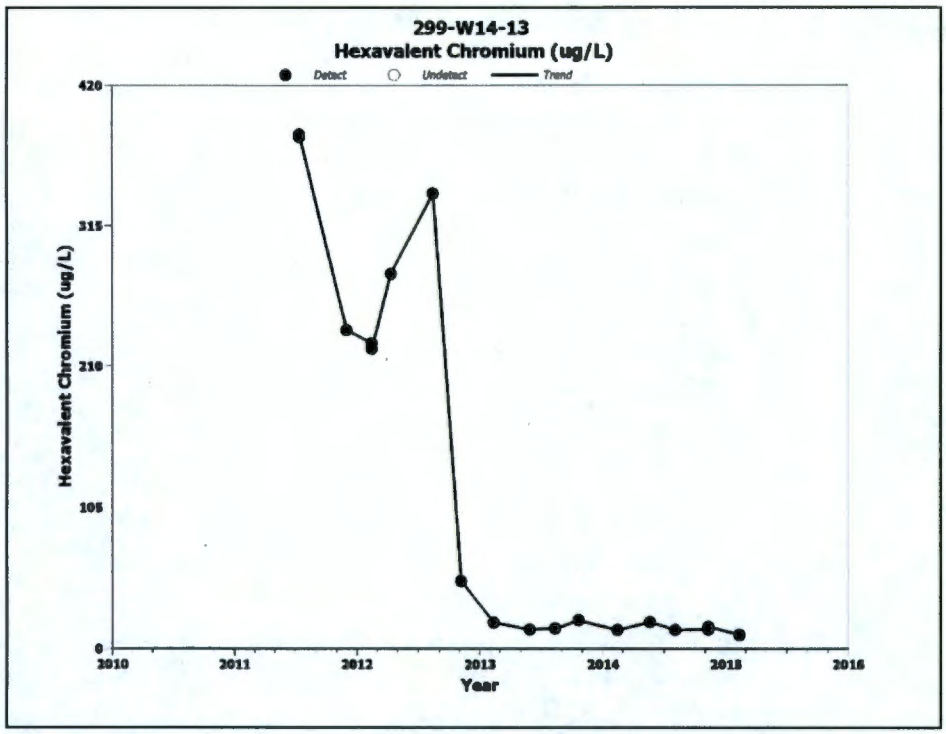

Figure 15. Hexavalent Chromium in Well 299-W14-13

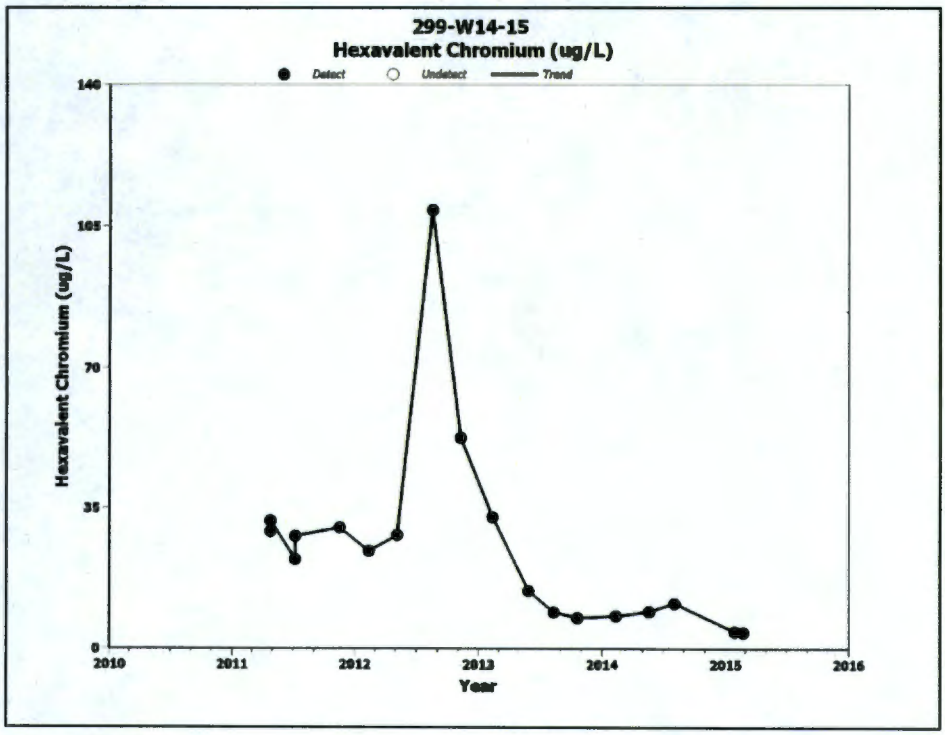

Figure 16. Hexavalent Chromium in Well 299-W14-15

5.7 SST WMA U (Interim Status, Assessment Monitoring)

Four wells were successfully sampled as scheduled in January. Concentrations of the dangerous waste constituent chromium were 5.1 and 6.9 µg/L (filtered and unfiltered, respectively) in the upgradient well, 299-W18-40. Concentrations in the downgradient wells ranged from 4.6 µg/L (unfiltered in 299-W19-47) to 11 µg/L (unfiltered in 299-W19-45). The next scheduled quarterly sampling is April.

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 for the quarterly reporting period.

6.1 Integrated Disposal Facility (Final Status, Detection Monitoring)

The annnual RCRA sampling event was completed for all seven network wells as scheduled in January. Field and indicator parameter results loaded into HEIS were consistent with historic ranges and trends. Total organic halides (TOX) maximum values were slightly lower than had previously been reported during the last few years. The next scheduled annual sampling event is January 2016.

6.2 Liquid Effluent Retention Facility (Final Status, Detection Monitoring)

Semiannual detection monitoring was completed in January 2015 per the new *Groundwater Monitoring Plan for the Liquid Effluent Retention Facility,* DOE/RL-2013-46. Wells 299-E26-14 and 299-E26-79 are the upgradient and downgradient wells, respectively. Well 299-E26-77 is sampled for geochemical parameters, but not used for statistical indicator parameter measurements.

January 2015 and April 2015 indicator parameter results (carbon tetrachloride, pH, specific conductance, total organic carbon (TOC), and TOX were compared to critical mean values (Table 4). Note, indicator parameters were resampled at LERF on April 7, 2015 because the required sequence of 4 samples was inadvertently not collected during the January 2015 sampling event. All of the indicator parameter results from the January and April 2015 sampling events were below/within the comparison values in the downgradient well. Also note, carbon tetrachloride is not associated with any of the surrounding waste sites and any detection of carbon tetrachloride would be considered an indicator of a release from LERF; therefore, the critical mean is set at the detection of carbon tetrachloride. Carbon tetrachloride and all volatile organic constituents were below detection limits. The next semiannual sampling event is scheduled for July.

TOC results exceeded the critical mean value in upgradient monitoring well 299-E26-14 (Table 4). Figure 17 shows TOC concentrations are increasing in the LERF upgradient well 299-E26-14 indicating migration through the aquifer from an upgradient location. Characterization of the elevated TOC is being planned at well 299-E26-14 in 2015.

Table 4. Derived Indicator Parameter Critical Mean Comparison

Indicator Parameter	Critical Mean	Well 299-E26-14 Upgradient	Well 299-E26-79 Downgradient
pH	<7.42 and >8.15	7.99/7.92	8.09/7.94
Specific Conductance	1005 µS/cm	804/781	724/712
Carbon Tetrachloride	Greater than Detection	<0.16/<0.13 µg/L	<0.3 µg/L
TOC	3376 µg/L	4,900/2,475 µg/L	1,050/644 µg/L
TOX	11.07 µg/L	7.3/8.5 µg/L	3.5/4.59 µg/L

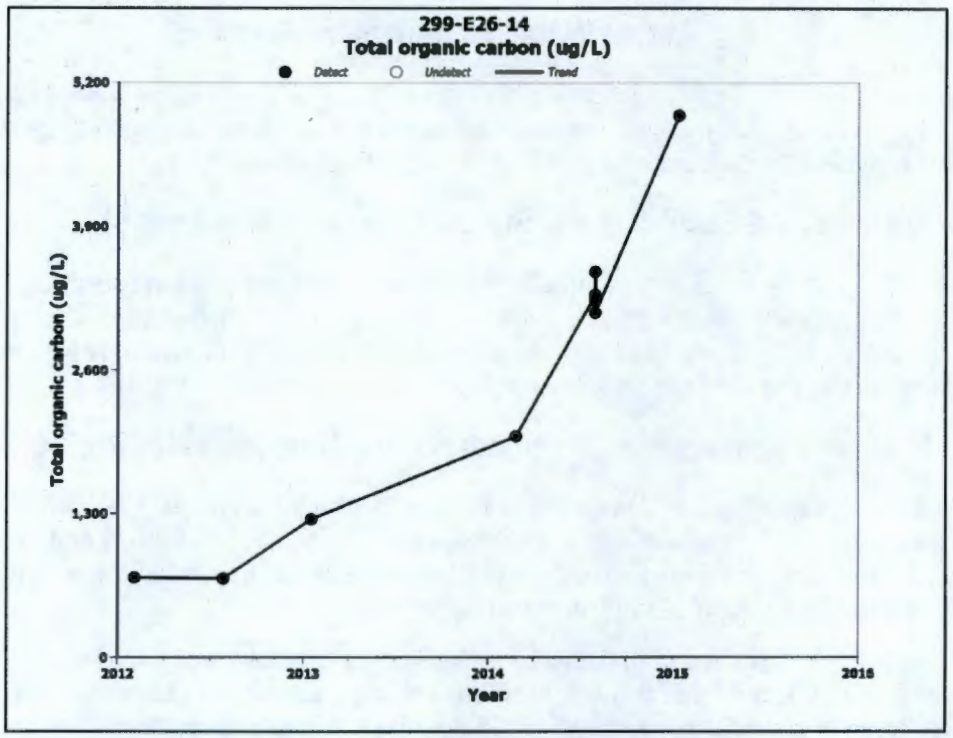

Figure 17. TOC in Upgradient Well 299-E26-14

6.3 LLWMA-1 (Interim Status, Indicator Evaluation Monitoring)

All eighteen wells were sampled as scheduled in January. Average indicator parameter results (pH, specific conductance, TOC, and TOX) and critical mean values are provided in Table 5. All indicator parameter results were below the critical mean values, except TOC. The next semiannual sampling event is scheduled for July.

The January exceedance of TOC was at well 299-E33-265. The elevated TOC at this well initiated an assessment at LLWMA-1 in 2012 and the TOC has been elevated since 2012. The assessment found no dangerous waste constituents associated with the 218-E-10 Burial Ground (DOE/RL-2013-25, *First Determination RCRA Groundwater Quality Assessment Report for Low-Level Burial Grounds Low-Level Waste Management Area-1*). As a result of the assessment findings, the continued exceedance of TOC at this well is not cause for re-entering into another assessment.

The annual groundwater quality phenol results were loaded into HEIS, all results were less than detection limits.

Filtered iron results were either less than detection or just above the detection limit of 30 µg/L. None of the filtered iron results exceeded 50 µg/L. The unfiltered iron results were generally higher than the filtered results and ranged from less than detect to 690 µg/L. The 690 µg/L result was from well 299-E32-5. The elevated unfiltered results are associated with minor well screen corrosion.

Filtered manganese results were all less than detection. The unfiltered manganese results were mainly less than detect or just above the detection limit of 2 µg/L. The highest unfiltered concentration was 11.35 µg/L at well 299-E32-5. The detected unfiltered results are associated with minor well screen corrosion.

Filtered and unfiltered sodium results are nearly the same in concentration. Concentrations for filtered results ranged from 21.4 to 43.9 µg/L and the unfiltered results ranged from 21.7 to 43.5 µg/L. The highest concentrations were in the northeast corner of the LLWMA-1 monitoring well network. The elevated concentration of sodium in the northeast corner of LLWMA-1 reflect the migration of sodium

rich contaminants from the BY Crib. Concentrations of sodium are slowly decreasing from the elevated levels seen between 2010 and 2012.

Groundwater quality anion results which include chloride and sulfate were loaded into HEIS in February. Results for each anion is discussed below.

Chloride concentrations ranged between 9,800 and 18,700 µg/L. The highest concentrations are associated with migration of BY Crib liquid contamination observed in the northeast corner of LLWMA-1 monitoring network. Concentrations of chloride are slowly decreasing from the elevated levels seen between 2010 and 2012.

Sulfate concentrations ranged between 38,400 and 110,000 µg/L. The majority of the high concentrations are associated with migration of BY Crib liquid contamination observed in the northeast corner of LLWMA-1 monitoring network. Concentrations of sulfate are slowly decreasing from the elevated levels seen between 2010 and 2012. The other well where sulfate is elevated is at well 299-E32-5. The elevated sulfate reflects past contaminant migration from the southeast.

Nitrate exceeded the (DWS) in all but three wells in January. Nitrate concentrations are decreasing across the site, and concentrations are below the DWS on the west side of the monitoring network. The contamination reflects past migration of sources of elevated nitrate to the east and south of LLWMA-1.

Table 5. Summary of Contamination Indicator Parameters for LLWMA-1

Indicator Parameter	Critical Mean	Range of January 2015 Values
pH	<7.54 and >8.36	7.93 – 8.29
Specific Conductance	2,510 µS/cm	411 - 696 µS/cm
TOC	1,031 µg/L	<350 – 3,200 µg/L
TOX	25.18 µg/L	2.38 – 4.35 µg/L

6.4 LLWMA-2 (Interim Status, Indicator Evaluation Monitoring)

No sampling scheduled during the quarter. The next scheduled sampling event is April.

6.5 LLWMA-3 (Interim Status, Indicator Evaluation Monitoring)

All four wells were sampled as scheduled during the quarter. Concentrations for indicator parameters were on trend and the range of concentrations are presented in Table 6. The next scheduled sampling event is September.

The March exceedances of specific conductance and TOX were at well 299-W10-31. As reported in previous years' Hanford Site groundwater monitoring reports, the elevated specific conductance in this well is likely related to the presence of nitrate caused by the regional movement of the nitrate plume and TOX from the extent of the 200-ZP-1 carbon tetrachloride plume. The continued exceedances of specific conductance and TOX at this well are not cause for entering into assessment. Therefore, no verification sample or assessment was initiated for this exceedance.

Table 6. Summary of Contamination Indicator Parameters for LLWMA-3

Indicator Parameter	Critical Mean	Range of January 2015 Values
pH	<7.62 and >8.31	8.03 – 8.20
Specific Conductance	453 µS/cm	384 – 466 µS/cm
TOC	3,842 µg/L	<350 – 542 µg/L
TOX	10.65 µg/L	<3.33 – 21.9 µg/L

6.6 LLWMA-4 (Interim Status, Indicator Evaluation Monitoring)

All seven wells were sampled as scheduled during the quarter. Concentrations for indicator parameters were on trend and the range of concentrations are presented in Table 7. No indicator parameters exceeded the critical mean during the quarter. The next scheduled sampling event is July.

Table 7. Summary of Contamination Indicator Parameters for LLWMA-4

Indicator Parameter	Critical Mean	Range of January 2015 Values
pH	<7.15 and >8.48	7.63 – 8.15
Specific Conductance	807 µS/cm	360 – 523 µS/cm
TOC	1,731 µg/L	<350 – 730 µg/L
TOX	47.90 µg/L	<3.33 – 37.60 µg/L

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