



**Department of Energy**  
Richland Operations Office  
P.O. Box 550  
Richland, Washington 99352

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FEB 12 1999

Mr. Stanislaw Leja  
Acting Perimeter Areas Section Manager  
Nuclear Waste Program  
State of Washington  
Department of Ecology  
1315 W. Fourth Avenue  
Kennewick, Washington 99336-6018

Mr. Douglas R. Sherwood  
Hanford Project Manager  
U.S. Environmental Protection Agency  
712 Swift Boulevard, Suite 5  
Richland, Washington 99352-0539



Dear Messrs. Leja and Sherwood:

**QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)  
GROUNDWATER (GW) MONITORING DATA FOR THE PERIOD JULY 1, 1998,  
THROUGH SEPTEMBER 30, 1998**

Please find enclosed the subject report. The RCRA groundwater chemistry and water level data for the subject period has been verified and evaluated. The information contained in the report is submitted to the State of Washington Department of Ecology in accordance with WAC 173-303-400 and WAC 173-303-645. The data are publicly available in electronic form in the Hanford Environmental Information System database. The electronic availability of the data and the summary provided fulfill the reporting requirements of WAC 173-303 (and by reference 40 CFR 265.94). Verification of data included a completion check (requested analyses were received), quality control checks (field blanks, field duplicates, and blind samples), and project scientist evaluation.

Sixteen RCRA sites were sampled during the reporting quarter (see enclosure, Attachment 1). Sampled sites include nine monitored under indicator evaluation programs, six monitored under GW quality assessment programs, and one monitored under final-status corrective action.

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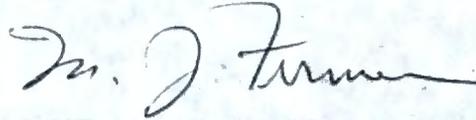
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Messrs. Leja and Sherwood

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If you have questions about this quarterly data transmittal, please contact me at 373-9630.

Sincerely,



M. J. Furman, Project Manager  
Groundwater Project

GWP:MJF

Enclosure

cc w/encl:

S. L. Dahl-Crumpler, Ecology

J. Donnelly, Ecology

D. N. Goswami, Ecology

M. J. Hartman, PNNL

M. Jaraysi, Ecology

S. P. Luttrell, PNNL

A. B. Stone, Ecology

T. Valero, Ecology

QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)  
GROUNDWATER (GW) MONITORING DATA FOR THE PERIOD JANUARY 1, 1998,  
THROUGH MARCH 31, 1998

- References:
- (1) M. J. Hartman, 1992, Results of Ground Water Quality Assessment Monitoring at the 1301-N Liquid Waste Disposal Facility and 1324-N/NA Facilities, WHC-SD-EN-EV-003, Rev. 1, Westinghouse Hanford Company, Richland, Washington..
  - (2) E:Mail to Marvin J. Furman and Donna M. Wanek from Phillip R. Staats, "Ground water monitoring plan," dtd. June 22, 1998.
  - (3) RL ltr. to Steve M. Alexander and Douglas R. Sherwood "Exceedance of Critical Mean for Total Organic Halogen at Waste Management Area-U," dtd. August 25, 1998 (CCN 060927).

Comparison to Concentration Limits

Contamination indicator parameter data (pH, specific conductance, total organic halogen [TOX], and total organic carbon [TOC]) from downgradient wells were compared to background values at sites monitored under interim-status, indicator evaluation requirements, as described in 40 CFR 265.93. As reported last quarter, faulty specific conductance probes caused some measurements to be biased low. The suspect data were not formally evaluated, and wells with results that appeared out of trend were resampled.

Specific conductance at downgradient wells for the 1324-N/NA site exceeded the critical mean. The current exceedances were expected, because the data are in trend with previous conductivity measurements. Previous GW quality assessment monitoring indicated that the high conductivity is caused by the nonhazardous constituents sulfate and sodium (Reference 1). Because an assessment has already been completed and the high conductivity is caused by nonhazardous constituents, verification sampling and additional assessment monitoring will not be conducted.

GW in one downgradient well for 1324-N/NA continued to exceed the critical mean for TOC, as it has since the fall of 1997. The State of Washington Department of Ecology (Ecology) has agreed that the contamination is from another source so that assessment monitoring is not required. This agreement was sent via electronic mail (Reference 2) with the stipulation that a formal letter would follow. No letter has been received to date.

One downgradient well for the 1301-N facility (199-N-3) exceeded the critical mean value for TOC. The exceeding value (1,525  $\mu\text{g/L}$  compared to a critical mean value of 1,405  $\mu\text{g/L}$ ) was greater than the historical trend for the well. The well has been resampled to confirm or refute the exceedance; results have not yet been evaluated. Organic chemicals were not disposed of in the 1301-N facility.

At 100-D Ponds, the upgradient well exceeded the critical mean value for TOC in September 1998 (1,610  $\mu\text{g/L}$  compared to critical mean of 1,483  $\mu\text{g/L}$ ). Verification sampling is not necessary because the site has been incorporated into the Hanford Facility RCRA Permit and will be clean-closed, and GW monitoring will no longer be required when the permit modification becomes effective in 1999.

Verification sampling was conducted for the Liquid Effluent Retention Facility in July and August 1998, because TOX exceeded its critical mean in the upgradient well during a previous quarter. The recent samples had values below the critical mean, indicating that the earlier result was erroneous.

As reported previously (reference 3), one downgradient well for Single-Shell Tanks Waste Management Area (WMA)-U continued to exceed the critical mean value for TOX because of an encroaching plume of carbon tetrachloride from other waste sites.

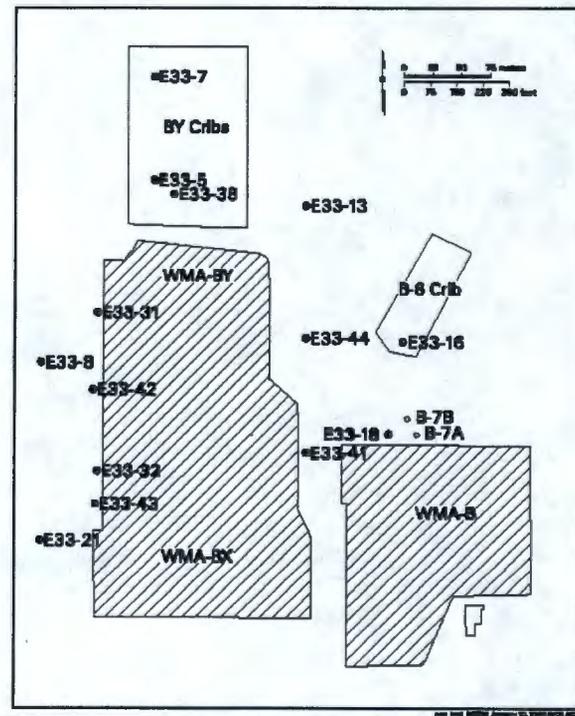
Contamination indicator parameters in downgradient wells were below the critical mean values for all other sites monitored under indicator evaluation requirements that were sampled during the quarter. Hence, there is no indication that these sites are impacting GW quality.

### Status of Assessment Programs

**Single-Shell Tanks WMA B-BX-BY:** A new monitoring well, 299-E33-44, was installed east of the WMA to supplement the network.

Technetium-99 in well 299-E33-41 rose from ~1,480 pCi/L in October 1997 to 2,720 pCi/L in March 1998, then declined to 1,180 pCi/L in August 1998. The drinking water standard is 900 pCi/L. Other wells near the 216-B-7A and 216-B-8 cribs also have technetium-99 above the standard (299-E33-16 at 1,830 and 299-E33-18 at 1,040 pCi/L). This part of the local technetium-99 plume is bracketed on the north, east and southeast by wells with low technetium-99 (~10 to 189 pCi/L).

The region north and west of WMA B-BX-BY saw overall increases in technetium-99, creating another local center for high technetium-99. The large increase observed in well 299-E33-7 (from 2,120 pCi/L in June 1997 to 7,030 pCi/L in June 1998) was followed by another high value in August 1998 (6,820 pCi/L). Corresponding increases were seen south of well 299-E33-7 and along the west side of the WMA. Until recently, wells 299-E33-43 and 299-E33-21 were used to bracket the local technetium-99 plume on the southwest side of the site. However, activities appear to be rising in these wells, and are currently at 50-80 pCi/L. With the uncertainties in the flow direction, it is, as yet, premature to discern a definitive pattern to the contaminant changes.



In August 1998, nitrate exceeded the 45,000- $\mu\text{g/L}$  maximum contaminant level in most of the wells monitored for WMA B-BX-BY. The highest concentration was 460,000  $\mu\text{g/L}$  in well 299-E33-16. Nitrate continued to rise across the site, except in wells 299-E33-33 and 299-E33-36, located east of WMA-B and considered upgradient (not shown on inset figure). The August 1998 value for well 299-E33-43 did not show an increase; however, this data point is suspect and is presently being checked at the laboratory.

Uranium concentrations in well 299-E33-41 showed two sharp spikes in fiscal year 1998, reaching levels as high as 80  $\mu\text{g/L}$  in November 1997 and February 1998. In August 1998 the concentration had declined to  $\sim 27$   $\mu\text{g/L}$ . The pattern is similar to technetium-99 in this well during fiscal year 1997 but with a time lag. No other well has shown this pattern of contamination for any constituents.

Uranium levels remained fairly stable in well 299-E33-18 (137  $\mu\text{g/L}$  in August 1998) and remained low at the other wells on the east side of the WMA. Well 299-E33-16 showed a slight increase from 4.87  $\mu\text{g/L}$  in August 1997 to 6.95  $\mu\text{g/L}$  in August 1998.

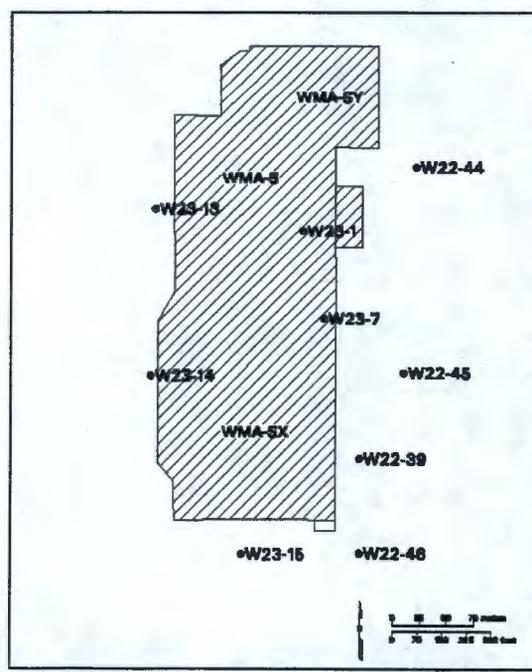
Uranium contamination has decreased during the past year in well 299-E33-13, the well showing the highest fiscal year 1997 uranium concentrations. Concentrations declined from 203  $\mu\text{g/L}$  in April 1997 to 18.4  $\mu\text{g/L}$  in August 1998. There were small increases in uranium concentration on the west side of the WMA. Values in well 299-E33-42 increased from background (2.67  $\mu\text{g/L}$ ) in February 1998 to 10.5  $\mu\text{g/L}$  in September 1998. Smaller increases were observed in wells 299-E33-31, 299-E33-32 and 299-E33-8. Other changes included increases in uranium in wells 299-E33-38 and 299-E33-5, located in the south half of the BY cribs, where concentrations increased from 48.7 and 30.1  $\mu\text{g/L}$  in November 1997 to 67.9 and 58.7  $\mu\text{g/L}$  in August 1998.

Cobalt-60 was detected in three wells in the BY cribs: 299-E33-7, 299-E33-5, and 299-E33-38. The highest activity in July 1998 through September 1998 was 61.1 pCi/L in well 299-E33-7, the well with the highest technetium-99 activity and one of the greatest nitrate concentrations. Cobalt-60 activities at wells 216-E33-5 and 299-E33-38 were 36.8 and 30.2 pCi/L, respectively, in August 1998. All levels were below the 100-pCi/L drinking water standard.

#### Single-Shell Tanks WMA S-SX:

Technetium-99 continued to exceed the 900-pCi/L drinking water standard in one downgradient RCRA well (299-W22-46). The reported concentration (4,330 pCi/L) in August 1998 was the same as for the previous quarter. There is also a continuing, gradual upward trend in downgradient well 299-W22-45. Activities increased from  $<10$  pCi/L before 1996 to 679 pCi/L in August 1998.

The 45,000- $\mu\text{g/L}$  maximum contaminant level for nitrate was exceeded in downgradient well 299-W22-46, the same well with the elevated technetium-99. The nitrate concentration for this well was 49,600  $\mu\text{g/L}$  in August 1998 compared to 47,400  $\mu\text{g/L}$  in February 1998.



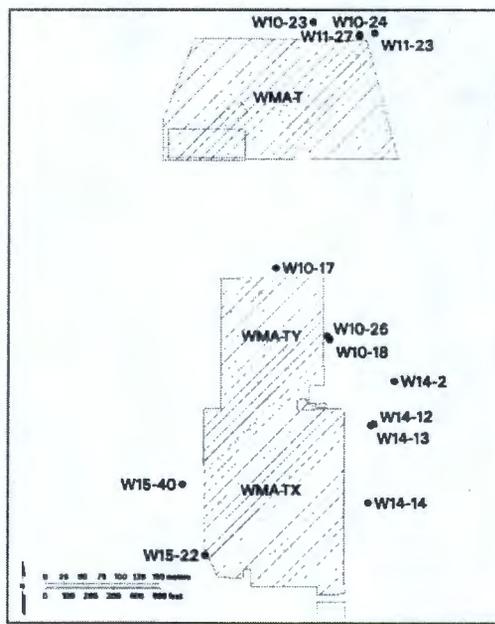
The standard also was exceeded in a nearby, upgradient, non-RCRA well located west of the WMA (121,000 µg/L in well 299-W23-9 in September 1998; not shown on inset figure).

Tritium continued to exceed the 20,000-pCi/L drinking water standard in August 1998 in upgradient well 299-W23-14 (382,000 pCi/L) and in downgradient well 299-W22-46 (52,300 pCi/L). Activities in the downgradient well appear to be declining from the maximum of 65,200 pCi/L in May 1997, while the upgradient well continues to exhibit an increasing trend. The latter is attributed to residual contamination from upgradient cribs (216-S-21 and/or 216-S-25).

There were no detections of strontium-90 or cesium-137 in the RCRA monitoring wells in the network, except for well 299-W22-45. This well had 2.5 pCi/L strontium-90 in August 1998 (compared to the 8-pCi/L drinking water standard). Cesium-137 continued to be detected in non-RCRA well 299-W23-7, located inside the S-SX tank farm fence line. A concentration of 38 pCi/L (unfiltered) was observed in September 1998. The occurrence of cesium-137 in this well has been previously shown to be particulate in nature, and a high turbidity was associated with this sample. Gross alpha (247 pCi/L) and uranium (90 µg/L) were also elevated in this well. The well will be resampled and isotope-specific analyses on filtered and unfiltered samples were requested.

**Single-Shell Tanks WMA T and WMA TX-TY:**

Water levels near these waste management areas continued to decline. Six new monitoring wells have been completed to replace dry wells or fill gaps in monitoring coverage resulting from changes in GW flow directions: 299-W10-23 and -24 (WMA-T), 299-W10-26, 299-W14-13, 299-W14-14, and 299-W15-40 (WMA-TX-TY). Two of the wells, 299-W10-24 and 299-W14-14, were drilled through the Ringold lower mud, sampled at various depths, and completed as water table monitoring wells.



Discrete level sampling during the drilling of well 299-W10-24 in October 1998 indicated significant concentrations of contaminants through the entire thickness of the suprabasalt aquifer. The following table indicates GW concentrations and activities at various depths beneath the water table. The deepest sample in this well, 61 m below the water table, was taken immediately beneath the Ringold lower mud unit. Preliminary results for well 299-W14-14 indicate similar contaminant distributions with depth.

Depth Below Water Table	Carbon Tetrachloride	Tritium	Tc-99	Unit
16.9 m	490 µg/L	29,500 pCi/L	358 pCi/L	Ringold E
30.8 m	1600 µg/L	28,000 pCi/L	337 pCi/L	Ringold E
46.3 m	760 µg/L	20,600 pCi/L	204 pCi/L	Ringold E
52.1 m	360 µg/L	12,100 pCi/L	126 pCi/L	Ringold E
61.0 m (mud)	220 µg/L	8,600 pCi/L	101 pCi/L	Ringold A (below lower mud)

Technetium-99 activities in WMA T downgradient well 299-W11-27 have stopped their decline, and measured 13,000 pCi/L in August 1998. Specific conductance was 866  $\mu\text{S}/\text{cm}$ , below the critical mean for the site (1,175  $\mu\text{S}/\text{cm}$ ).

Technetium-99 activity in well 299-W11-23, a non-RCRA well located approximately 30 m east of 299-W11-27, rose to 5,920 pCi/L in August 1998. This increase in technetium-99 was accompanied by increases in nitrate, chromium, and calcium, consistent with the contaminant fingerprint in well 299-W11-27.

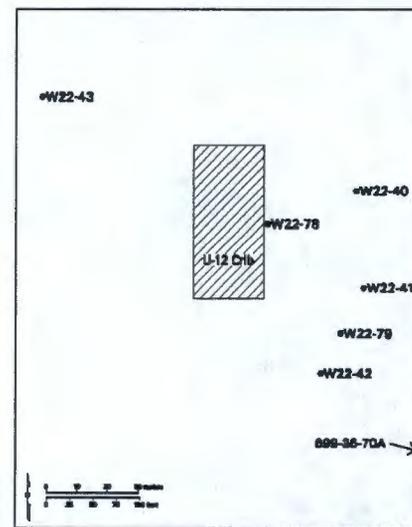
GW chemistry in WMA TX-TY well 299-W10-17 did not change significantly since the last sampling. Well 299-W10-17, one of the wells that initially placed WMA TX-TY in assessment, is no longer downgradient to the WMA, but is sidegradient or marginally upgradient to the northeast corner of the WMA. GW flow directions at WMA TX-TY have been strongly influenced by the 200-ZP-1 Pump-and-Treat Operation, located south of the WMA. As a result of the pump and treat activity GW flow directions are now easterly to slightly south of east in the northern portion of the WMA, southeasterly in the middle portion of the WMA, and southerly at the south end of the WMA. Because of this change in flow directions, well 299-W10-17 has not been replaced. A new well (299-W14-14), initially planned as a replacement for 299-W10-17, has been drilled along the southeastern margin of the WMA to fill a gap in the monitoring network in that area.

The decreasing trend in contaminant concentrations in downgradient well 299-W14-12, evident since 1995, appears to have reversed. Specific conductance in this well was 601  $\mu\text{S}/\text{cm}$  in August 1998, below the critical mean for the site (668  $\mu\text{S}/\text{cm}$ ). However, technetium-99 increased to 2,880 pCi/L, tritium to 415,000 pCi/L, iodine-129 to 22.1 pCi/L, and TOC to 3,710  $\mu\text{g}/\text{L}$ . The recent increases in well 299-W14-12 may be related to high tritium and iodine-129 in nearby well 299-W14-2 in June 1998, representing a regional contaminant plume that surrounds the WMA.

**216-U-12 Crib:** New well 299-W22-79 has been completed and added to the network to replace well 299-W22-42, which is going dry. Monitoring at the new well will begin next quarter.

Specific conductance in downgradient wells 699-36-70A and 299-W22-41 continued to exceed the critical mean value (437  $\mu\text{S}/\text{cm}$ ). Specific conductance in well 299-W22-42 continued to fluctuate near the critical mean.

Results for nitrate (maximum contaminant level = 45,000  $\mu\text{g}/\text{L}$ ), the principal constituent causing elevated conductivity at the crib, were 238,000, and 89,500  $\mu\text{g}/\text{L}$  for wells 299-W22-41 and 299-W22-42, respectively.

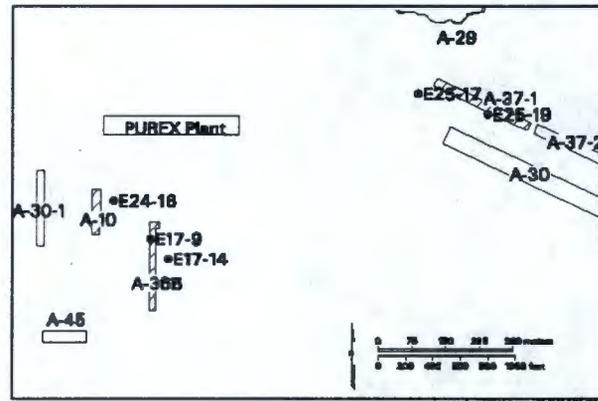


Technetium-99 (a constituent associated with the site) remained elevated above background and increased in well 699-36-70A (77.4 pCi/L), and decreased in wells 299-W22-41 (77.6 pCi/L) and 299-W22-42 (21.2 pCi/L). These trends are consistent with nitrate and conductivity trends for the wells. Tritium and iodine-129, two regional contaminants, remained elevated above their drinking water standards in wells 699-36-70A and 299-W22-42. Tritium values in 299-W22-41 (12,700 pCi/L) and 299-W22-42 (48,800 pCi/L) continued to increase. Tritium in 699-36-70A has leveled off (95,900 pCi/L).

In the upgradient well, 299-W22-43, specific conductance (322  $\mu\text{mho/cm}$ ) and the associated nitrate (15,100  $\mu\text{g/L}$ ) concentration increased slightly over the last three quarters. Technetium-99 and gross beta continued to increase. The technetium-99 activity for this quarter was 37.8 pCi/L.

**PUREX Cribs (216-A-36B, 216-A-10, and 216-A-37-1):** One well at each of the three cribs was sampled during the third quarter of 1998. Monitoring results from these three wells showed that the drinking water standards for iodine-129, manganese, nitrate, tritium, and strontium-90 continued to be exceeded.

Iodine-129 (drinking water standard = 1.0 pCi/L) remained elevated at all three cribs. The well at 216-A-36B Crib (299-E17-14) had an iodine-129 activity of 11.6 pCi/L. Well 299-E24-16, at 216-A-10 Crib, measured 10.7 pCi/L, and well 299-E25-19, at 216-A-37-1 Crib, measured 1.62 pCi/L.



Manganese concentrations have increased near the 216-A-37-1 Crib (well 299-E25-19) from  $\sim 20$   $\mu\text{g/L}$  or less before 1998 to 58  $\mu\text{g/L}$  during the third quarter of 1998. The maximum contaminant level for manganese is 50- $\mu\text{g/L}$ .

Nitrate concentrations remained above the drinking water standard (45,000  $\mu\text{g/L}$ ) near the 216-A-36B crib. The concentration during the third quarter was 124,000  $\mu\text{g/L}$  in well 299-E17-14.

Tritium activity remained above the drinking water standard (20,000 pCi/L) at all three of the PUREX cribs. The results were 1,100,000 pCi/L (well 299-E17-14), 458,000 pCi/L (well 299-E24-16), and 95,500 pCi/L (well 299-E25-19).

Strontium-90 (drinking water standard = 8 pCi/L) remained elevated in concentration near the 216-A-36B and 216-A-10 cribs. Activities were 17.2 and 5.32 pCi/L at wells 299-E17-14 and 299-E24-16, respectively. The strontium-90 results are consistent with elevated gross beta in the same wells (68.3 pCi/L in well 299-E17-14 and 40.8 pCi/L in well 299-E24-16).

#### Other Monitoring Changes

Background values were re-calculated based on data from a single upgradient well at Low-Level WMA-3 because the other upgradient well (299-W7-2) went dry during the past quarter.

Two new wells were installed at WMA U to replace wells that are going dry: 299-W19-42 and 299-W19-32.

#### Quality Control

Results of the RCRA quality control program for the July 1998 through September 1998 quarter will be discussed in the annual report for fiscal year 1998. Highlights are summarized in the Attachment 2. Quality control data that are not available in Hanford Environmental Information

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System are available in electronic form upon request. The quality control program indicated that the data were acceptable for use in the statistical comparisons discussed above.

Table 1. Status of RCRA Sites, July through September 1998.

Site	Routine sampling July-Sept 1998	Statistical exceedance
<b>Indicator Evaluation Sites [40 CFR 265.93(b)] (sampled semiannually)</b>		
100-D Ponds	Yes	Yes <sup>1</sup>
1301-N Facility	Yes	Yes
1325-N Facility	Yes	No
1324-N/NA Site	Yes	Yes <sup>2</sup>
B-Pond	No	Not applicable
A-29 Ditch	No	Not applicable
B-63 Trench	No	Not applicable
S-10 Pond and Crib	No	Not applicable
LERF	Yes	No
LLBG WMA 1	No	Not applicable
LLBG WMA 2	No	Not applicable
LLBG WMA 3	Yes	No
LLBG WMA 4	Yes	No
SST WMA A-AX	No	Not applicable
SST WMA C	No	Not applicable
SST WMA U	Yes	Yes <sup>3</sup>
NRDWL	Yes	No <sup>4</sup>
<b>Groundwater Quality Assessment Sites [40 CFR 265.93(d)] (sampled quarterly)</b>		
Six sites <sup>5</sup>	Yes	Not required
<b>Final Status Sites (WAC 173-303-645)</b>		
300 Area Process Trenches	Yes	Yes <sup>6</sup>
183-H Basins	No	Not applicable

LERF = Liquid Effluent Retention Facility

LLBG = Low-Level Burial Grounds

NRDWL = Nonradioactive Dangerous Waste Landfill

SST = Single-Shell Tanks

WMA = Waste Management Area

<sup>1</sup> Upgradient well.

<sup>2</sup> Conductivity exceedance caused by non-hazardous constituents (sodium, sulfate). TOC exceedance caused by contamination from another waste site.

<sup>3</sup> TOX exceeded critical mean in one downgradient well; caused by carbon tetrachloride plume from upgradient sources. No assessment required.

<sup>4</sup> TOX results were not formally evaluated because the samples exceeded the recommended holding times. The averages of quadruplicate values were all below the upgradient/downgradient comparison value.

<sup>5</sup> U-12 Crib, PUREX Crib, SST WMA B-BX-BY, SST WMA S-SX, SST WMA T, SST WMA TX-TY.

<sup>6</sup> Site has entered corrective action because of previous exceedances.

### Quality Control (QC) Results, April 1998 through June 1998

**Completeness:** Completeness of data is determined by dividing the number of results that have not been rejected or flagged as suspect because of associated QC concerns by the total number of results received during the quarter. Greater than 90 percent completeness is considered acceptable. The suspect data may be useful for general interpretive use but should not be used to make regulatory decisions. Out of a total of 18,235 results, 89 percent of the results were considered valid for the July 1998 through September 1998 quarter. This percentage is slightly lower than usual due to several missed holding times for total organic halogen (TOX) and a large number of positive field and method blanks, discussed below. The laboratory recently acquired a new TOX analyzer, which should prevent missed TOX holding times in the future. Last quarter it was noted that the laboratory failed to meet the holding-time requirements for a large number of organic analyses. The lab's performance in this area was much better during third quarter, when none of the organic analysis hold times were exceeded.

**Field QC data.** 466 pairs of results were generated from 20 duplicate samples during the quarter. Fifteen pairs of quantifiable duplicate results had a relative percent difference greater than  $\pm 20$  percent. Five duplicate sample pairs had unacceptable precision for more than one constituent. Three pairs also exhibited poor precision for more than one analytical method, which suggests a potential problem with the samples (e.g. differences in the amount of suspended solids in unfiltered duplicates) rather than an analytical failure.

Re-analyses of uranium and  $^{129}\text{I}$  in out-of-limit duplicate samples from last quarter showed much better agreement (i.e., RPDs of 1 and 12 percent, respectively) than was observed in the original results. The reason for the discrepancies in the original results for these samples is unknown.

A total of 1400 results were produced from the third quarter field blank samples. One hundred fifteen of the results exceeded the QC limits for field blanks (i.e., about 8 percent of the field blanks were outside of the QC limits). Approximately half of the out-of-limit results were from equipment blanks. Most of the flagged results were for ICP metals and volatile organics; however, results were also flagged for alkalinity, total dissolved solids (TDS), total organic carbon (TOC), total organic halides, anions, 4,6-dinitro-2-methyl phenol, and tritium.

Alkalinity, total dissolved solids, and total organic halides each had one or more unusually high field blank results. Most of these results were from equipment blanks, which, in the cases of alkalinity and total dissolved solids, may indicate a problem with the decontamination of non-dedicated sampling equipment. These data will be discussed with sampling personnel in an effort to determine the source of the problem. The project will also closely monitor the alkalinity results of future equipment blanks to determine if the problem persists. It is suspected that the high total organic halide result ( $47.4 \mu\text{g/L}$ ) associated with one of the equipment blanks resulted from a mislabeled or swapped sample.

Thirty-two field blanks exceeded the QC limits for metals, but most of the exceedances were within a factor of two of the QC limits. The relative number of exceedances (32 out of 369 results) was similar to that observed for the second quarter of 1998 (i.e., 29 out of 405 results). The majority of the field blank results that exceeded the QC limits were for calcium, magnesium, sodium, and zinc. As noted in previous reports, these elements are common mineral contaminants, and it is suspected that the laboratory's reported instrument detection limits are unrealistically low for these metals.

**Blind Standards.** Blind standards were prepared and submitted to the primary laboratory in August 1998. GW matrix samples were spiked with known concentrations of cyanide, fluoride, nitrate, chromium,  $^{137}\text{Cs}$ ,  $^{60}\text{Co}$ ,  $^{129}\text{I}$ ,  $^{239}\text{Pu}$ ,  $^{90}\text{Sr}$ ,  $^{99}\text{Tc}$ ,  $^3\text{H}$ , and  $^{238}\text{U}$ . In addition, organic-free, deionized water was spiked with known amounts of carbon tetrachloride, chloroform, and trichloroethene for Volatile Organic Compound (VOC) standards and one set of TOX standards. A second set of TOX standards was spiked with 2,4,6-trichlorophenol, the compound used to calibrate the TOX analyzer. Standards for gross alpha analysis were spiked with  $^{239}\text{Pu}$ , and standards for gross beta analysis were spiked with strontium-90. Four standards containing potassium hydrogen phthalate were also sent to the lab for TOC analysis.

The acceptance limits for blind standard recoveries vary by constituent but are generally 75 – 125 percent except for chromium, which has limits of 80 – 120 percent, and specific radionuclides, which have a  $\pm 30$  percent acceptance range. Results were out of limits for one VOC standard, one TOX standard containing the VOC mixture, two  $^{239}\text{Pu}$  standards, and all three of the cyanide standards. The laboratory has been asked to reanalyze the  $^{239}\text{Pu}$  samples that were out of limits. A reanalysis of the VOC standard that had low recoveries resulted in even lower concentrations than the original results. This may be due to the age of the sample at the time of the reanalysis. The relatively poor precision of the original VOC results is of concern and could be the result of poor sample-dilution technique at the laboratory. The project will monitor the precision of GC/MS analyses during the next quarter to determine if further action is warranted. It is suspected that the low recoveries associated with high-level TOX-VOA samples may be caused by the need to analyze such samples multiple times using successively smaller sample aliquot sizes (analogous to dilutions). The measured concentrations from successive analyses are expected to be lower since headspace is introduced into the sample bottle and volatilization may occur. Supplying the laboratory with an additional sample bottle may circumvent this potential problem and will be considered for future high-level TOX blinds containing volatiles. Cyanide recoveries continue to be biased low by approximately the same amount as seen in previous quarters. The project is developing a protocol for in-house verification of the blind standards' cyanide concentrations. Plans have also been made to submit a blind standard prepared using cyanide from an alternate vendor during the first quarter of 1999.

**Laboratory QC Data.** The primary laboratory provides the results of method blanks, laboratory control samples, matrix spikes, matrix spike duplicates, surrogates, and matrix duplicates. This information provides a means of assessing laboratory performance and the suitability of a method for a particular sample matrix. The metals category had the greatest percentage of method blank results exceeding the QC limits, with 20.3 percent exceeding twice the instrument detection limit. Most of these results were for aluminum, calcium, iron, magnesium, sodium, vanadium, and zinc. For all other categories, the QC limits were exceeded by fewer than 6 percent of the method blanks. However, chloride and several VOC's, including 1,4-dichlorobenzene, 2-butanone, acetone, and methylene chloride had one or more significant positive blank results. Laboratory control sample recoveries were excellent for all evaluated categories. For matrix spike and matrix spike duplicates, the percentages of out-of-limit results were as follows: 11 percent for indicator parameters, 6.3 percent for ammonia and anions, 4 percent for metals, and 0 percent for radiochemistry parameters. Constituents with more than 10 measurements that had greater than 10 percent of matrix spikes outside QC limits included total organic halides, nitrate, lead, and silver.

**EPA Water Supply/Water Pollution Programs.** The primary analytical laboratory participates in the EPA Water Supply/Water Pollution (WS/WP) programs. In these programs, the U.S. Environmental Protection Agency (EPA) distributes standard water samples as blind samples to participating laboratories. These samples contain specific organic and inorganic analytes at concentrations unknown to the participating laboratories. After analysis, the labs submit their results to the EPA. Regression equations are used to determine acceptance and warning limits. The results of these studies independently verify the level of laboratory performance and are expressed as a percentage of EPA-acceptable results.

Results from the EPA WS/WP studies were received for WP samples analyzed in September 1998. Most of the results, including those for ICP metals, TOC, and herbicides were within the EPA's acceptance limits. Six of the 64 reported results were unacceptable, namely, orthophosphate, bromoform, chlorodibromomethane, total trihalomethanes, dichloromethane, and total cyanide. After reviewing their data, the laboratory found that the cyanide result was reported incorrectly. After correction, the result was within the acceptance limits. The dichloromethane result was biased high due to low-level dichloromethane background contamination in the laboratory, as discussed in a previous quarterly report. The laboratory was unable to ascertain the cause of the low results for the three trihalomethanes, but suspects an error in dilution or a calibration bias. The orthophosphate has had unacceptable results several times in the last two years; in two cases a calculation error was found. However, it should be noted that orthophosphate is measured by Method 365.1 for drinking water certification in the WS/WP studies and is measured by Method 300.0 (ion chromatography) for project samples. While the drinking water method gave an unacceptable result, the IC method gave a result in the acceptable range in the current study.

**National Exposure Research Laboratory Performance Evaluation (NERL PE) Studies.** The National Exposure Research Laboratory sends out gamma, iodine-131, gross alpha, gross beta, tritium, radium, strontium, and uranium samples in a water matrix semi-annually to participating laboratories. Plutonium samples are sent out annually. Warning limits for laboratory results are at 2 normalized standard deviations above and below the known value. Control limits are at 3 normalized standard deviations above and below the known value.

The results from 2 NERL PE studies were reported since the last quarterly letter was written. In the first study, analyses were performed for gross alpha, natural uranium,  $^{226}\text{Ra}$ , and  $^{228}\text{Ra}$ . In the second study, analyses were performed for gross beta,  $^{89}\text{Sr}$ ,  $^{90}\text{Sr}$ ,  $^{60}\text{Co}$ ,  $^{134}\text{Cs}$ , and  $^{137}\text{Cs}$ . All of the results for both studies were within the control limits established by the EPA.

**U.S. Department of Energy Quality Assessment Program.** This program is conducted by the Environmental Measurements Laboratory (EML) and is designed to evaluate the performance of participating laboratories through the analysis of air filter, soil, vegetation, and water samples containing radionuclides. Only the water results are considered in this report. Acceptable results should fall within the fifteenth and eighty-fifth percentile of the cumulative normalized distribution. Results are within warning limits if they fall between the fifth and fifteenth percentile or the eighty-fifth and ninety-fifth percentile. Results less than the fifth percentile or greater than the ninety-fifth percentile are "not acceptable." During the current reporting period, results were received for gross alpha, gross beta,  $^3\text{H}$ ,  $^{54}\text{Mn}$ ,  $^{60}\text{Co}$ ,  $^{90}\text{Sr}$ ,  $^{137}\text{Cs}$ ,  $^{234}\text{U}$ ,  $^{238}\text{U}$ , total uranium,  $^{238}\text{Pu}$ ,  $^{239}\text{Pu}$ , and  $^{241}\text{Am}$ . The  $^{60}\text{Co}$  result was within the warning limits, but all the other results were acceptable.