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NOV 2 1 2000

01-GWVZ-002

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Addressees:

QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) GROUNDWATER MONITORING DATA FOR THE PERIOD APRIL 1, 2000, THROUGH JUNE 30, 2000

Please find enclosed the subject report. The RCRA groundwater chemistry and water level data for the subject period have been verified and evaluated. 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 below 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, Table 1). Sampled sites include eight monitored under indicator evaluation programs, seven monitored under groundwater quality assessment programs, and one monitored under final-status corrective action. Detailed information on salient issues during this quarter is included in the enclosure.

If you have questions about this quarterly data transmittal, please contact Marvin J. Furman at (509) 373-9630.

Sincerely,

John G. Morse, Program Manager
Groundwater/Vadose Zone Project

GWVZ:MJF

Enclosure

cc w/encl:
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QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT GROUNDWATER MONITORING DATA FOR THE PERIOD APRIL 1 THROUGH JUNE 30, 2000.

Sixteen RCRA sites were sampled during the reporting quarter, as listed in Table 1. Sampled sites include eight monitored under indicator evaluation programs, seven monitored under groundwater quality assessment programs, and one monitored under final-status corrective action.

Comparison to Concentration Limits

Contamination indicator parameter data (pH, specific conductance, total organic halides [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. There were several exceedances, but none indicated hazardous contamination from the RCRA units, as explained below.

Liquid Effluent Retention Facility: Specific conductance measurements in downgradient well 299-E26-10 (571 uS/cm) exceeded the critical mean value in June. An assessment report, previously submitted to Ecology, addressed an earlier exceedance in this well. The current exceedance is believed to be caused by the same nonhazardous constituents. No further action is necessary.

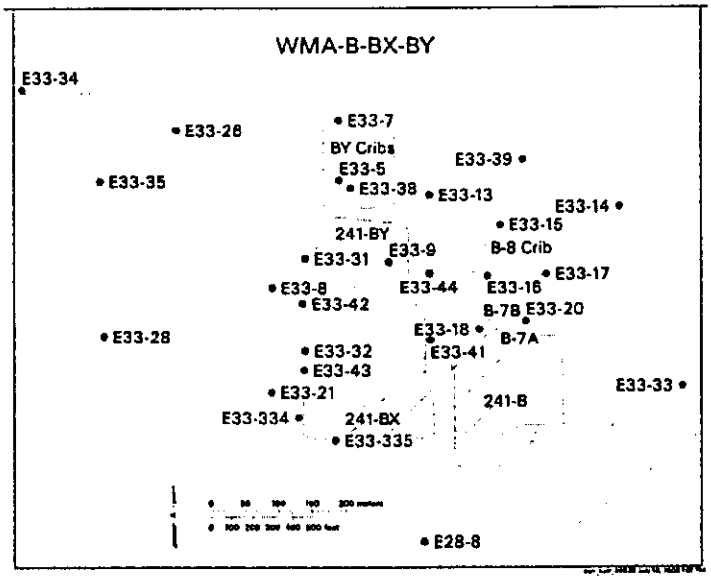
Low-Level Waste Management Area 1. Specific conductance in downgradient well 299-E33-34 continued to exceed the critical mean value in May. An assessment report was submitted previously. The source of the high conductivity is a nitrate plume from an upgradient source.

Low Level Waste Management Area 2. Results of specific conductance, TOC, and TOX in upgradient well 299-E34-7 exceeded their critical mean values in April. The upward trends in specific conductance and TOC were reported earlier. Sulfate and calcium contribute to the high specific conductance. The cause of the elevated TOC is unknown. Analyses for volatile organic compounds showed no detections. Additional analyses will be run on future samples.

Status of Assessment Programs

Single-Shell Tanks WMA B-BX-BY: Chemical ratios, chemical suites, contaminant locations, and trend analyses provide evidence of at least three distinct regions of contamination in proximity to the WMA.

Direct measurements of flow direction were collected in August 2000. The results are being incorporated with other relevant



data sets to form a more complete evaluation of flow direction. The data indicate that the flow direction along the southern border is to the southeast. These results are in agreement with apparent contaminant migration and hydrographs. There was no perceptible change in flow rate this quarter.

Technetium-99. In the region of highest technetium-99 contamination north of the WMA, concentrations rose in well 299-E33-7 from 8,400 pCi/L in January to 11,200 pCi/L in May. Technetium-99 concentrations continued to increase to the west, with the highest activities in well 299-E33-26 and well 299-E33-34. Concentrations are lower to the south, although values are still increasing. The groundwater in these wells continues to show elevated cobalt-60 and cyanide. Cobalt-60 increased from 75.3 pCi/L in February to 87 pCi/L in May at well 299-E33-7. Values for cyanide remained level at 349 ug/L in well 299-E33-38 in May. The cyanide value for well 299-E33-7 is currently under review. Farther west, the cyanide concentration rose in well 299-E33-26 from 76 ug/L in March to 155 ug/L in early May. Along the west side of the WMA, technetium-99 concentrations continue to increase although at lower levels than in the north.

The second area of contamination is represented by well 299-E33-16. This well is associated with the B-8 Crib and tile field. The technetium-99 concentration fell slightly from 2,030 pCi/L in February to1,940 pCi/L in May. Overall, the contamination at this well is rising slowly and is probably associated with a residual plume left from liquid effluent releases at the B-8 Crib. Other wells directly to the north, and east have much lower technetium-99 concentrations that continued to rise slowly this quarter.

The third apparent area of contamination is represented by wells 299-E33-44 and 299-E33-9. Technetium-99 concentrations continued to rise from 5,640 pCi/L in December 1999 to 6,640 pCi/L in May 2000 at well 299-E33-44. In well 299-E33-9, the technetium-99 level rose to 6,080 pCi/L in May. These wells have a low nitrate: technetium-99 ratio and a unique chemical suite, consisting of high levels of uranium, technetium-99, nitrate and elevated nitrite (at almost 2 mg/L in well 299-E33-44). In February, results from special sampling indicated about 5 pCi/L of cesium-137 in ionic form exists in the groundwater at well 299-E33-9. A low level (highest sensitivity) reanalysis of the December 1999 sample confirmed a low concentration of cesium-137 in the groundwater at this well. Further testing is planned for this well.

Cobalt-60 contamination has risen in well 299-E33-44 to 28 pCi/L and in well 299-E33-9 to 48 pCi/L in May. Along with the cobalt-60 is 28 ug/L of cyanide in well 299-E33-9, and low levels of cyanide in well 299-E33-44. Low levels of cyanide were also detected in well 299-E33-31, located on the northwest side of the WMA. This cyanide and cobalt-60 are believed to be moving into these areas from farther north in the BY Cribs.

Nitrate. Nitrate concentrations are increasing in many wells monitored for WMA B-BX-BY. Concentrations in wells 299-E33-7 and 299-E33-38 approached 500 mg/L in April and May. West of well 299-E33-7, nitrate also rose in wells 299-E33-26, 299-E33-34, 299-E33-35 and 299-E33-28. Farther south along the west side of the WMA, nitrate concentrations also rose, ranging from 187-103 mg/L in wells 299-E33-31, -32, and -42 this quarter. In well 299-E33-43, nitrate concentrations increased sharply along with the technetium-99 from 49 mg/L in February

to 91 mg/L in May. Concentrations in well 299-E33-13, east of the BY Cribs, increased from 287 mg/L in February to 336 mg/L in May.

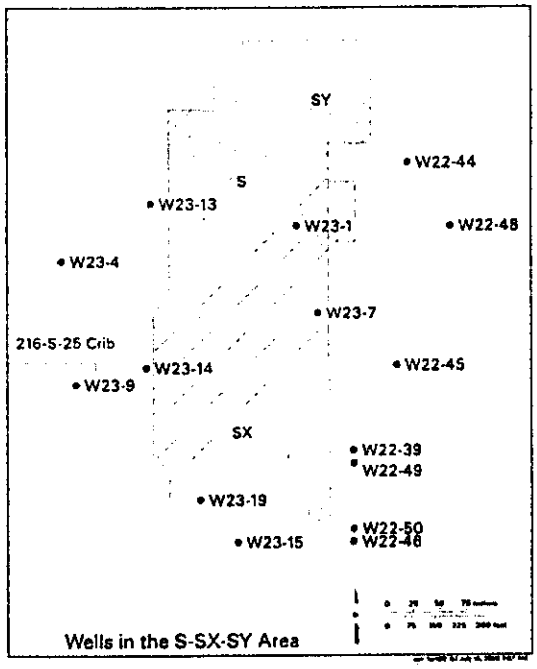
In well 299-E33-16, the center of greatest nitrate concentration, the nitrate values remained level from 562 mg/L in February to 558 mg/L in May. Nitrate concentrations in surrounding wells, 299-E33-15 and -17, ranged from 216 mg/L to 358 mg/L, a slight increase from last quarter. Concentrations in well 299-E33-41 increased from 36 mg/L in February to 45 mg/L in May.

Finally, nitrate levels continued to rise in well 299-E33-44 from 161 mg/L in February to 173 mg/L in May. Nearby well 299-E33-9 (inside the 241-BY Tank Farm) showed nitrate concentrations increasing from 166 mg/L in December 1999 to 181 mg/L in May 2000.

Uranium. This contaminant is found in the groundwater above the 20 µg/L maximum contaminant level east of 241-BY Tank Farm, in the southern part of the BY cribs and west of the BY Cribs in wells 299-E33-26 and -34. Uranium is found within the 241-BY Tank Farm in well 299-E33-9. Much of the May data set is under review due to disparities between uranium and gross alpha data.

In the BY cribs, the uranium concentration continued to decrease in well 299-E33-38 from 121 ug/L in February to 109 ug/L in May. In well 299-E33-18 values remained level from 173 ug/L in December 1999 to 175 in May 2000.

Single-Shell Tanks WMA S-SX: Groundwater beneath this WMA is contaminated with technetium-99, nitrate, and hexavalent chromium, primarily from sources assumed to be within the WMA. High concentrations of tritium and carbon tetrachloride are also present from upgradient sources. The water table elevation has continued to decline but the gradient is relatively stable. The inferred flow direction has gradually shifted from southeastward to a more eastward direction with the decline in water table. The calculated groundwater flow rate remained unchanged for the quarter.



Wells in the S-SX-SY Area

The technetium-99 drinking water standard of 900 pCi/L continued to be exceeded in new well 299-W23-19, which is located inside of the SX tank farm. This well has the highest concentration in the WMA (63,700 pCi/L in June), and is located immediately adjacent to tank SX-115, where a leak occurred in the early 1960s. The proximity of this well to a known source, and the occurrence of high technetium-99 in the vadose zone at this well location, indicates this area of the SX tank farm is the source of the observed groundwater contamination in well 299-W23-19. Technetium-99 concentrations also continued to exceed the standard in downgradient wells 299-W22-45, 299-W22-46, 299-W22-48 and 299-

W22-50. The upward trend observed earlier in well 299-W22-45 appears to have reached a maximum concentration in January and declined or leveled out in March and June (see Figure 1).

Nitrate continued to exceed the 45-mg/L maximum contaminant level in upgradient wells 299-W23-9 and 299-W23-14 and in downgradient well 299-W23-19. However, concentrations were below 45 mg/L in downgradient well 299-W22-46. An upward trend at 299-W22-45 continues (see Figure 1). High nitrate concentrations in well 299-W23-19 (562 mg/L in June) are consistent with the high technetium-99 in this well. The technetium-99/nitrate ratio is similar to the expected ratio for the contents of the single shell tanks adjacent to the well.

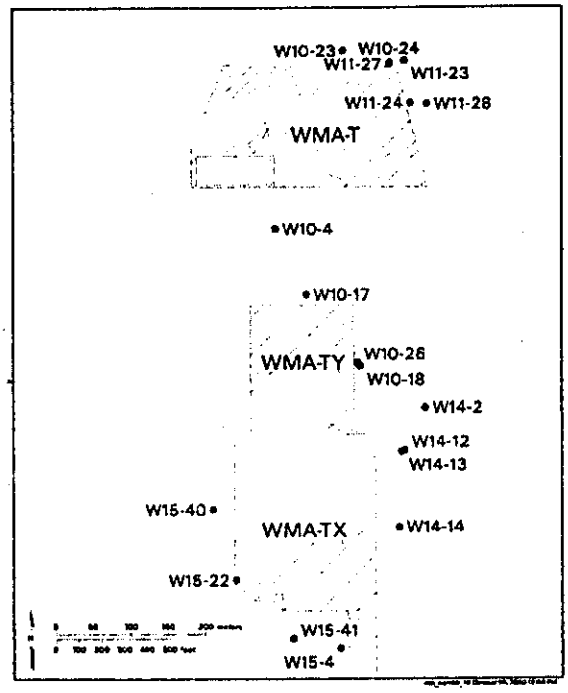
The tritium drinking water standard of 20,000 pCi/L continued to be exceeded in both upgradient and downgradient wells. The highest concentrations for this quarter occurred in wells closest to and directly downgradient from the 216-S-25 crib (wells 299-W23-9, 299-W23-14 and 299-W23-19 detected concentrations of 417,000, 208,000 and 92,000 pCi/L, respectively). Concentrations in downgradient wells 299-W22-45 and 299-W22-46 are declining, while increasing trends are observed in upgradient well 299-W23-9 and downgradient well 299-W22-39. The primary source of tritium in these wells is attributed to residual contamination from past-practice discharges to the 216-S-25 crib as well as from tank leakage sources.

There was one reported detection (1.5 pCi/L) of strontium-90 in new well 299-W22-50 in July. Otherwise, neither strontium-90 nor cesium-137 was detected in any other monitoring wells in the network during the quarter. The apparent detection in well 299-W22-50 may have been related to removal of the pump and tracer testing that was done in this well prior to the sampling event (i.e., fall-in of contamination on fugitive dust particles).

Carbon tetrachloride exceeded the 5-µg/L maximum contaminant level in both upgradient and downgradient wells. The highest concentration, 130 µg/L, occurred in upgradient well 299-W23-4 and the next highest concentration, 120 ug/L, occurred in downgradient well 299-W23-15. Carbon tetrachloride in groundwater beneath WMA S-SX is attributed to past-practice liquid waste disposal to various Plutonium Finishing Plant cribs, trenches and ponds. The specific location of the groundwater source area and pathway to WMA S-SX wells is unclear.

Uranium exceeded the proposed 20-µg/L maximum contaminant level in upgradient well 299-W23-4 (25 µg /L) and downgradient well 299-W23-19 (24 µg/L).

Single-Shell Tanks WMA T and TX-TY: Water levels near these waste management areas continued to decline this quarter. While the water table has continued to drop, the gradient has changed little; therefore the rate and direction of groundwater flow have not changed during the quarter. As reported previously, groundwater flow directions have been affected by the 200-ZP-1 groundwater remediation. Groundwater flow is to the east or slightly north of east beneath T tank farm, to the east or east-southeast beneath TY tank farm, and to the south or south-southeast beneath the TX tank farm.



WMA T. Technetium-99 concentrations in well 299-W10-24, the replacement well for 299-W11-27, decreased to 1,460 pCi/L in May. Technetium-99 in well 299-W11-23, a non-RCRA well located ~30 meters west of 299-W10-24, increased to 2,390 pCi/L in May. The highest recorded technetium-99 value in this well was 8,540 pCi/L in November 1998. This well is almost dry and is being sampled with a Kabis Sampler.

The nitrate concentration in well 299-W10-4, a non-RCRA well located south of WMA T, increased to 788 mg/L in May. Nitrate had been increasing in this well over the past several years and reached 1,049 mg/L in December 1999. Specific conductance increased to 1,929 µS/cm in May, after declining from a high of 2,250 µS/cm in December 1999. Co-contaminant chromium increased slightly and co-contaminant fluoride decreased. Carbon tetrachloride, reported at 1,300 µg/L in December 1999, was not analyzed this quarter. The probable origin of these contaminants is waste disposal at facilities associated with the Plutonium Finishing Plant.

Well 299-W10-3, located within the tank farm fence, was sampled in July, prior to decommissioning. Analyses for the samples indicate that the well is intercepting the same high nitrate, fluoride, chromium plume found in well 299-W10-4, and to a lesser extent in wells north of the WMA. However, concentrations in well 299-W10-3 were higher than reported for other wells in the area. Reported concentrations were 1,213 mg/L for nitrate, 9,800 µg/L for fluoride, and 257 µg/L for chromium. The reported specific conductance was 3,111 µS/cm. The well was originally drilled to monitor contaminants from the T-7 Crib and Tile Field and the T-32 Crib which received supernatant from tank cascades in the T Tank Farm. However, a relatively low technetium-99 activity of 409 pCi/L indicates that the cribs are not the source of the observed contamination.

Nitrite concentrations in downgradient wells 299-W11-24 and 299-W11-28, on the east side of WMA T, continued to be high. Nitrite is normally undetected in Hanford Site groundwater, but in well 299-W11-24 nitrite was reported at 23 mg/L in May, exceeding the maximum contaminant level of 3.3 mg/L. In well 299-W11-28 nitrite was reported at 0.72 mg/L in May. In

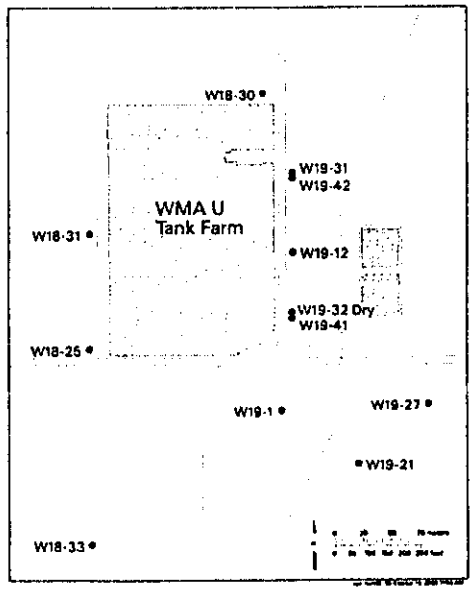
addition, in May well 299-W11-23, located approximately 60 meters to the north, the reported nitrite concentration was 0.36 mg/L. These wells consistently have elevated concentrations of iron, manganese, and nickel. Chromium is relatively low.

WMA TX-TY. Groundwater chemistry in well 299-W10-17 did not change significantly since the last sampling. Nitrate, which has been slowly increasing over the past several years continued to exceed the maximum contaminant level, reaching 249 mg/L in May, while chromium and technetium-99 were below applicable standards. Reported fluoride was 2,400 µg/L. This was one of the wells that initially placed WMA TX-TY in assessment but it is no longer downgradient of the WMA. It is apparently intercepting part of the high nitrate plume discussed above with respect to wells 299-W10-3 and 299-W10-4.

Technetium-99 concentrations decreased in well 299-W14-13 and increased in well 299-W14-2 in May (Figure 2). Nitrate in well 299-W14-13 was 376 mg/L, exceeding the maximum concentration level. Chromium was also elevated in well 299-W14-13 (516 µg/L), exceeding the maximum contaminant level. Technetium-99 and chromium are similar to the contaminant signature initially detected in well 299-W14-12; however, the chromium/technetium-99 ratio seems to have increased. Previous high values of technetium-99 and chromium were detected when groundwater flowed toward the northeast. Presently groundwater flow in the area around well 299-W14-13 is toward the southeast. Thus, the recent increases in technetium-99 and chromium may represent a different source within the tank farms.

The high tritium groundwater plume first noted in well 299-W14-2 now includes well 299-W14-13. This quarter, tritium levels decreased in wells 299-W14-2 and -13 (see Figure 2). Iodine-129 concentrations also continued to be elevated in these wells during the quarter, up to 51 pCi/L in well 299-W14-2 and 45 pCi/L in 299-W14-13. The source of the high tritium/iodine-129 component is unclear, but the most likely source is operational leaks from the nearby 242-T Evaporator, which was closed in the early 1970s. The lack of elevated technetium-99 in well 299-W14-2 indicates the presence of at least two plumes in the area.

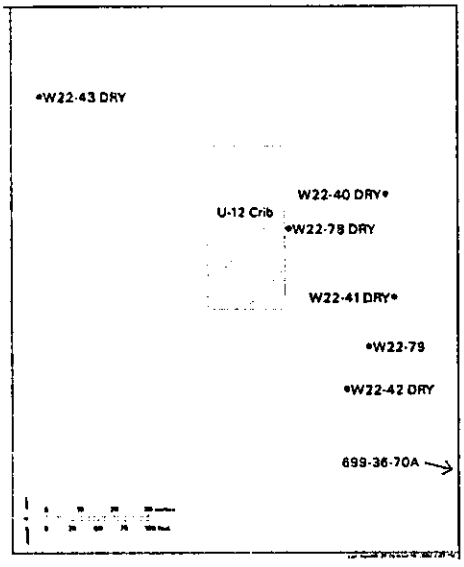
The first sampling of new well 299-W15-41, located along the southern margin of WMA TX-TY, in March 2000 indicated a technetium-99 concentration of 1,980 pCi/L. Sampling in May indicates that the concentration had decreased to 847 pCi/L. Nearby dry well 299-W15-4 previously had concentrations up to 982 pCi/L.



Single-Shell Tanks Waste Management Area U. This WMA was placed into assessment after specific conductance in downgradient well 299-W19-41 exceeded the critical mean value. An assessment report (Reference 1) was submitted to Ecology in August 2000. The assessment report concluded that there is no evidence for an upgradient source for

chromium, nitrate, and technetium-99 detected in downgradient well 299-W19-41; therefore, a source within the WMA must be assumed.

216-U-12 Crib: The groundwater-monitoring network has been revised because of continued regional groundwater decline. This modified network contains four fewer wells than the former network and will not meet the minimum groundwater requirements of one upgradient and three downgradient wells [40 CFR 265.91 (a)]. The Washington State Department of Ecology has temporarily acknowledged and agreed to the reduced network and deferred the installation of new wells indefinitely. In accordance with the Tri-Party Agreement, an interim milestone will be established for the proposed new wells when negotiated/agreed with Ecology. The current assessment monitoring network consists of only two downgradient wells (299-W22-79 and 699-36-70A). These wells were sampled during June.



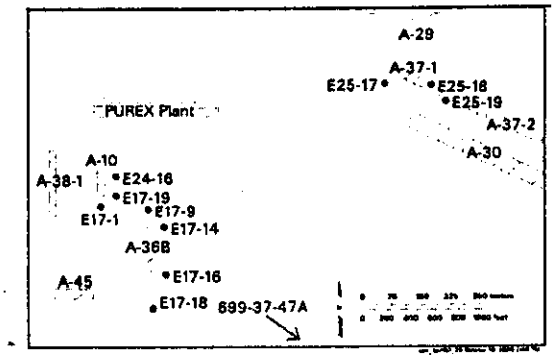
The current direction of groundwater flow is to the east-southeast. The water table gradient between the wells has not changed significantly even as the regional water table declines and therefore the rate of flow has not changed.

Specific conductance results in downgradient wells 299-W22-79 and 699-36-70A averaged 382 and 565 µS/cm, respectively. Specific conductance in 299-W22-79 remained below the critical mean (457.8 µS/cm), and specific conductance in 699-36-70A remained above the critical mean. Nitrate values for the two wells continued to exceed the 45-mg/L maximum contaminant level. Results from June were 59 and 101 mg/L in 200-W22-79 and 699-36-70A, respectively, a slight decline from the previous quarter. Technetium-99 values remained above background for the two wells. The values for 299-W22-79 and 699-36-70A were 33.3 and 85.7 pCi/L, respectively.

Regional contaminants tritium and carbon tetrachloride (not associated with the crib) continued to exceed maximum contaminant levels in the wells. Tritium values are 17,000 and 81,200 pCi/L in 299-W22-79 and 699-36-70A, respectively. The carbon tetrachloride concentration in well 699-36-70A was 7.10 ug/L, which exceeds the 5 ug/L maximum contaminant level value.

PUREX Cribs (216-A-10, 216-A-36B, 216-A-37-1): Concentrations of nitrate, iodine-129, tritium, strontium-90, and gross beta continued to exceed drinking water standards at near-field wells in April. In the vicinity of the PUREX Cribs, the differences in water table elevations from well to well are very small. Therefore, the water table gradient is too low to determine groundwater flow rate or flow direction reliably. However, groundwater flow directions determined from the movement of contaminant plumes indicate that the regional flow is toward the southeast.

Two of the near-field monitoring wells were not sampled during the current reporting period because of deteriorating well conditions. Well 299-E17-9 near the 216-A-36B Crib and well 299-E25-17 near the 216-A-37-1 Crib are being replaced with other existing wells. Neither of these wells meet the requirements of WAC 173-160 as resource protection wells. Well 299-E17-9 consistently had tritium concentrations that exceeded any other well in the 200 East Area. This well can be replaced by well 299-E17-16, which meets the requirements of WAC 173-160 and is in an advantageous downgradient position. Well 299-E25-18 will temporarily replace well 299-E25-17. Well E25-18 does not meet the requirements of WAC 173-160, and it is located on the immediate northeast side (upgradient) of the 216-A-37-1 Crib so it is not an ideal replacement.



Nitrate concentration remained above the maximum contaminant level (45 mg/L) during the current reporting period at two wells near the 216-A-10 Crib [299-E17-1 (81.9 mg/L) and 299-E17-19 (46.9 mg/L], and the overall trend is decreasing. Nitrate concentration was 102.7 mg/L at well 299-E17-14, near the 216-A-36B Crib, and the overall trend is steady to slightly increasing in concentration. The two wells sampled near the 216-A-37-1 Crib have nitrate concentrations that remain steady and below the maximum contaminant level.

Iodine-129 concentrations remained elevated at levels above the drinking water standard (1.0 pCi/L) at all of the near-field monitoring wells for the PUREX Cribs. The overall trend is steady to decreasing. The range in values for the current reporting period was 1.08 pCi/L at well 299-E25-19 (216-A-37-1 Crib) to 9.13 pCi/L at well 299-E24-16 (216-A-10 Crib).

Strontium-90 remained above the drinking water standard (8 pCi/L) at only one well during the current reporting period (17.1 pCi/L at well 299-E17-14 near the 216-A-36B Crib). Levels at this well have been increasing since 1997. Another well (299-E24-16 near the 216-A-10 Crib) had a reported value of 6.9 pCi/L and also shows a rising trend. Trends in the other wells at the PUREX cribs are either holding steady or decreasing. Because strontium-90 is a beta-emitter, the strontium-90 results are consistent with elevated gross beta (drinking water standard = 50 pCi/L). The reported gross beta result for well 299-E17-14 was 53.0 pCi/L, and for well 299-E24-16 was 28.6 pCi/L.

Tritium concentrations remained above the 20,000-pCi/L drinking water standard at all three of the PUREX Cribs, but are generally decreasing in activity at the 216-A-10 and 216-A-36B, and remaining steady at the 216-A-37-1 Crib. The highest reported value during the reporting period was 705,000 pCi/L at well 299-E17-14 near the 216-A-36B Crib. This value is greater than 10 times the drinking water standard but less than the derived concentration guide of 2,000,000 pCi/L. Four other wells have tritium values that are 10 times the drinking water standard.

Two wells at the 216-A-10 Crib (299-E17-1 and 299-E24-16) and one well at the 216-A-36B Crib (299-E17-18) have increasing levels of gross alpha, but levels remain below the 15-pCi/L

drinking water standard. The most likely alpha-emitter is uranium, which is not currently an analyte in the PUREX Cribs monitoring well network. Gross alpha was retained as an indicator parameter for uranium, and will be monitored closely to determine if the increasing trend continues.

The reported manganese concentration (45.8 ug/L) at well 299-E25-19 near the 216-A-37-1 Crib is near the 50 ug/L maximum contaminant level for the current reporting period. Well 299-E25-19 was the only well sampled at the 216-A-37-1 Crib during the current reporting period so the result cannot be corroborated by other wells at this crib. Manganese values at well 299-E25-19 increased from 1994 to 1998 when it peaked at 64 ug/L. Subsequently, the concentration in that well decreased to levels near 40 ug/L since 1998 and has remained steady during 1999 and the first part of 2000.

Quality Control

Results of the RCRA quality control program for the January-March quarter are discussed in the Appendix. Quality control data that are not available in HEIS 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.

References:

(1) Hodges, F.N. and C.J. Chou, 2000. Groundwater Quality Assessment for Waste Management Area U: First Determination. PNNL-13282. Pacific Northwest National Laboratory, Richland, Washington.

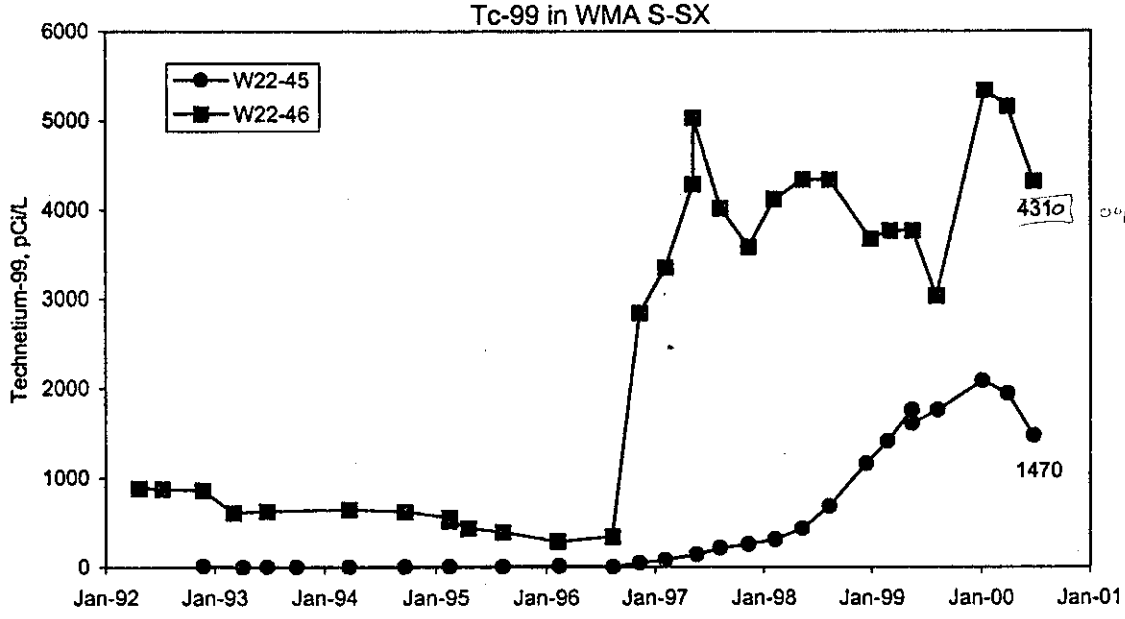
Table 1. Status of RCRA Sites, April-June 2000.

Site	Routine sampling April-June 2000	Statistical exceedance
Indicator Evaluation Sites [40 CFR 265.93(b)] (sampled semiannually)		
1301-N Facility	No	Not applicable
1325-N Facility	No	Not applicable
1324-N/NA Site	No	Not applicable
B-Pond	Yes	No
A-29 Ditch	Yes	No
B-63 Trench	Yes	No
S-10 Pond and Crib	No	Not applicable
LERF	Yes	Yes[1]
LLBG WMA 1	Yes	Yes[1]
LLBG WMA 2	Yes	Yes[1]
LLBG WMA 3	No	Not applicable
LLBG WMA 4	No	Not applicable
SST WMA A-AX	Yes	No
SST WMA C	Yes	No
NRDWL	No	Not applicable
Groundwater Quality Assessment Sites [40 CFR 265.93(d)] (sampled quarterly)		
Seven sites[2]	Yes	Not required
Final Status Sites (WAC 173-303-645)		
300 Area Process Trenches	Yes	Yes[3]
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

[1] No indication of hazardous waste contamination from facility; see text for explanation.
[2] U-12 Crib, PUREX Cribs, SST WMAs B-BX-BY, S-SX, T, TX-TY, and U.
[3] Site has entered corrective action because of previous exceedances.

Figure 1. Contaminant Trends in WMA S-SX Monitoring Wells.



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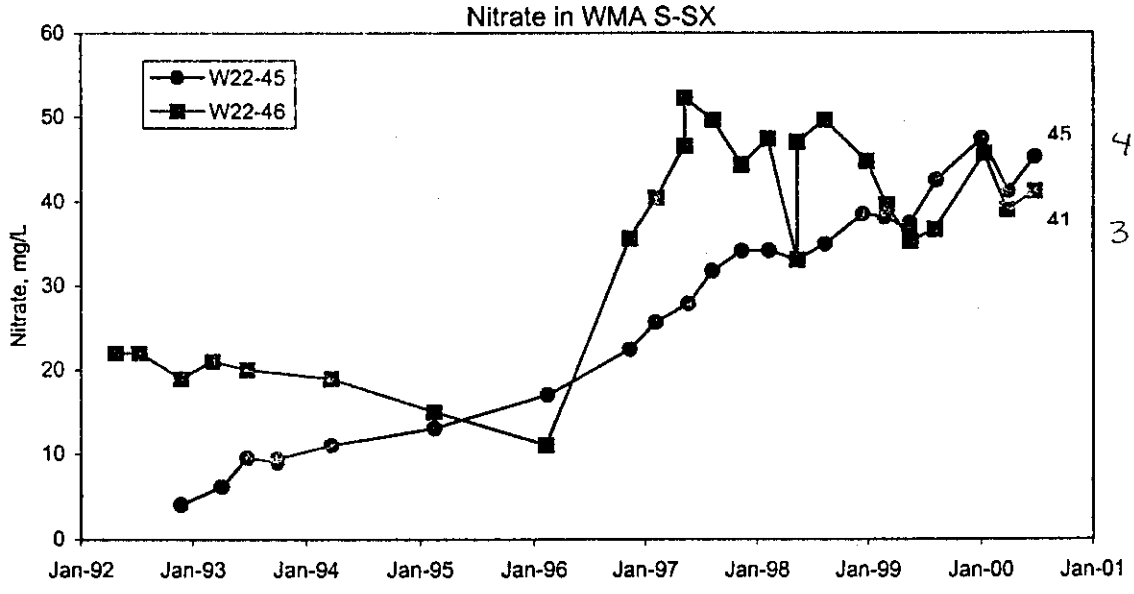
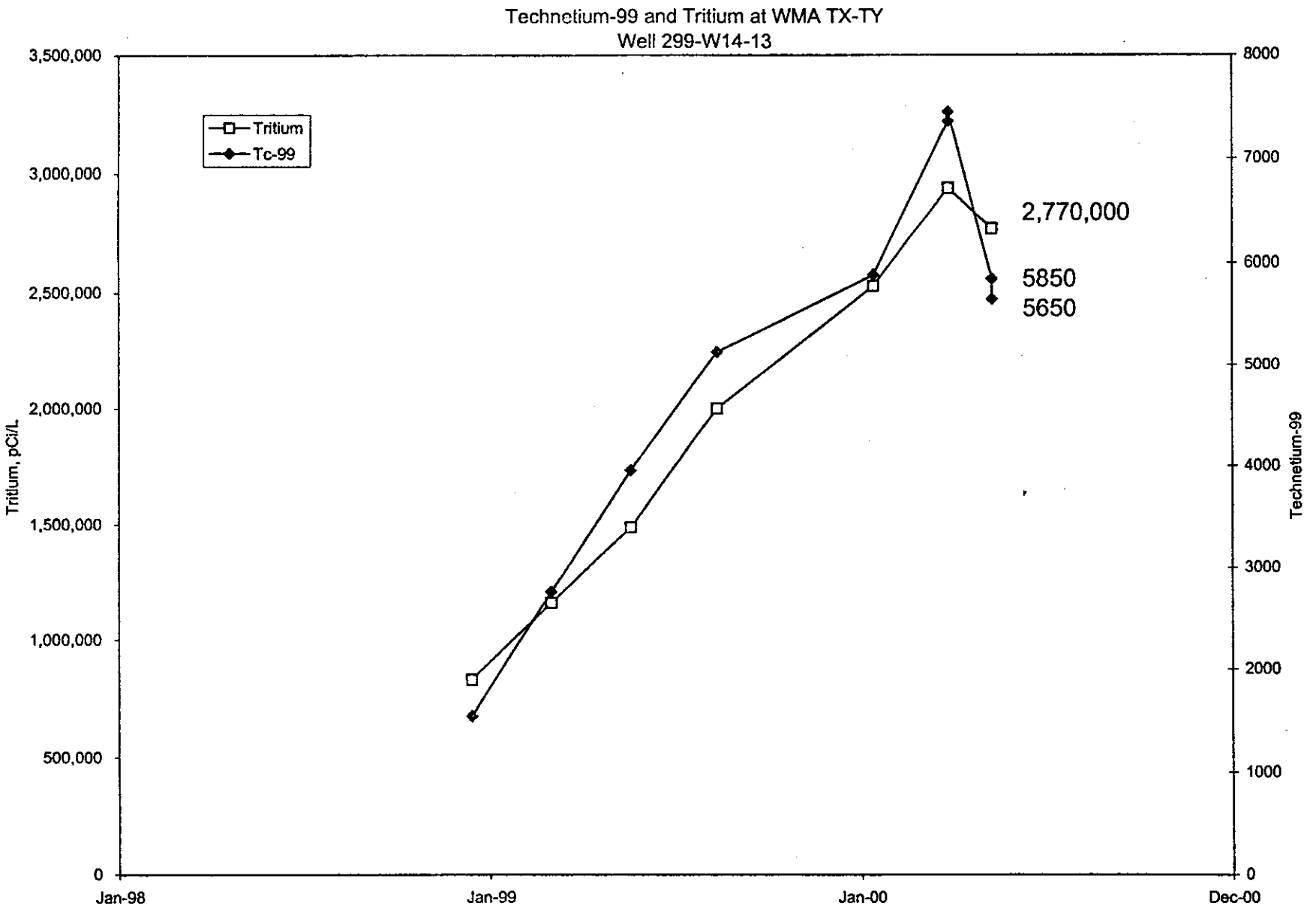


46,038 10/10

37,628 10/16


Technetium-99 and Tritium at WMA TX-TY
Well 299-W14-13
Tritium
Tc-99
2,770,000
5850
5650
Tritium, pCi/L
Technetium-99
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
8000
7000
6000
5000
4000
3000
2000
1000
0
Jan-98
Jan-99
Jan-00
Dec-00

Appendix: Quality Control Results, April through June 2000.

This quality control (QC) report presents information on laboratory performance and field QC sample results for the 2nd quarter of CY 2000.

Completeness. Completeness is determined by dividing the number of results judged to be valid by the total number of results evaluated and multiplying by 100. Data judged to be valid are data that have not been flagged with a Y, R, Q, or H, or qualified to indicate laboratory blank contamination. Eighty-nine percent of the 2nd quarter's 15,745 results were considered valid. This percentage is approximately the same as the value from the previous quarter (88%), and is slightly below the project's goal of 90%. Roughly 88% of the 2nd quarter flags resulted from detection of anions, metals, and total organic carbon in field and method blanks. The majority of these results were at levels near the method detection limits; thus, the overall impact of sample contamination or false-detection on data quality is believed to be minor.

Compared to the previous quarter, the number of "suspect" (i.e., Y-flagged) data points was reduced significantly (4 vs. 30). Most of the suspect data points from the 1st quarter were related to instrument and laboratory contamination problems associated with ICP metals. These problems appear to have been corrected; no metal results were flagged with a Y for the 2nd quarter.

No 2nd quarter results were flagged with an H to signify missed hold times. This is consistent with the previous quarter and demonstrates a significant improvement over the previous calendar year.

Field QC Data

Field QC samples include field duplicates, split samples, and field blanks. Quadruplicate samples collected at many wells for total organic carbon (TOC) and total organic halides (TOX) analyses also provide useful QC data. Field blanks collected during the 2nd quarter of 2000 included full trip blanks and field transfer blanks. No equipment blanks were collected due to a scheduling oversight. In general, the desired collection frequency for field duplicates and full trip blanks is one sample per 20 well trips. The target collection frequency for field transfer blanks is one blank on each day in which routine well samples are collected for analysis of volatile organic compounds. Equipment blanks are normally collected once per 10 well trips for portable Grundfos pumps or as needed for special projects. Split samples are also collected on an as-needed basis. The results from each type of QC sample are summarized below.

Field duplicates. Field duplicates provide a measure of the overall sampling and analysis precision. Evaluation of field-duplicate data is based on the relative percent difference (RPD) statistic, which is calculated for each matching pair of results. Field duplicates with at least one result greater than 5 times the method detection limit (MDL) or minimum detectable activity (MDA) must have RPDs less than 20% to be considered acceptable. Duplicates with RPDs outside this range are flagged with a Q in the database.

Seventeen field duplicates were collected and analyzed during the 2nd quarter of 2000 to produce 490 pairs of results. Overall, the results demonstrate excellent sampling and analysis precision. Nineteen pairs of qualifying duplicate results had relative percent differences greater than 20%. Sample reanalyses resulted in acceptable precision for 5 duplicate result pairs (total dissolved solids, sulfate, vanadium, and 2 pairs of uranium results). None of the remaining values are obvious outliers based on historical trends at the associated wells. The samples from well 699-2-6A were reanalyzed for chromium and iron, and the reanalysis results confirmed that the samples were of different composition. Similarly, reanalysis of samples from well 699-2-7 for iron did not improve the agreement between results. It is suspected that the poor precision resulted from suspended solids in these unfiltered samples. Reanalyses for iron were also performed on the filtered samples from well 699-56-53; the results confirmed the original concentrations. Low sample concentrations probably explain the poor precision in the iron results for well 299-W7-11, the uranium results for well 399-1-10B, and all of the manganese and potassium results.

Split samples. Split samples are replicate samples that are sequentially collected from the same location and analyzed by different laboratories. The results from split samples are useful for confirming out-of-trend results and assessing one laboratory's performance relative to another laboratory. Like field duplicates, split samples should have RPDs less than 20% to be considered acceptable. However, because the two laboratories can have different

detection limits, concentrations that are quantifiable at one laboratory may go undetected at the other laboratory. Therefore, the 20% RPD criterion applies only to those results that are quantifiable at both laboratories.

During the 2nd quarter of 2000, a single pair of split samples was collected from a non-RCRA well. The samples were analyzed for low-level tritium by Severn Trent-Richland and the University of Miami. Results from the analyses indicated excellent agreement between the two laboratories—Severn Trent obtained 174 pCi/L, and the University of Miami obtained 179 pCi/L.

TOC and TOX Quadruplicates. Samples for TOC and TOX analyses are collected in quadruplicate in accordance with RCRA requirements. While these samples are not intended as QC samples, quadruplicates may provide useful information about the overall sampling and analysis precision for organic indicator parameters. For the purposes of this discussion, TOC and TOX quadruplicate data were evaluated based on the relative standard deviation (RSD) for each set of quadruplicate results. Each quadruplicate set having an RSD greater than 20% and at least one result greater than 5 times the method detection limit was considered to have poor precision. Most of the quadruplicate data sets did not include a result greater than 5 times the MDL. Three out of 102 TOC quadruplicates and 1 out of 101 TOX quadruplicates failed to meet the evaluation criteria. Most of the TOC results were relatively low; some imprecision in the results is expected at these concentrations. However, outliers are apparent in the TOC results for wells 299-E33-335 and 299-E34-11. Removing these outliers drops the RSDs to less than 15%. The reasons for the large variance in the TOC results for well 299-E27-14 and the TOX results for well 299-W22-79 are unknown.

Field Blanks. Full trip blanks, field transfer blanks, and equipment blanks are used to check for contamination resulting from field activities and/or bottle preparation. In general, the QC limit for blank results is 2 times the method detection limit (MDL) or instrument detection limit for chemistry methods and 2 times the total propagated error for radiochemistry methods. For common laboratory contaminants such as acetone, methylene chloride, 2-butanone, toluene, and phthalate esters, the QC limit is 5 times the MDL. Blank results that exceed these limits may indicate a contamination or false-detection problem for regular groundwater samples. Results from groundwater samples that are associated with an out-of-limit field blank are flagged with a Q in the database.

A total of 1578 results were produced from the 2nd quarter field blank samples. Approximately 3% of the results (i.e., 52 results) exceeded the QC limits for field blanks. This is the lowest percentage of out-of-limit results that has occurred during the past 4 quarters. Most of the flagged results were for TOC, chloride, and volatile organic compounds; results were also flagged for total dissolved solids, cyanide, sulfate, ICP metals, and tritium. The potential impacts on the data are minor in most cases. Several constituents (chloride, magnesium, sodium, elemental strontium, sulfate, and total dissolved solids) had field blank results that were greater than the QC limits, but the values were much lower than the concentrations of these constituents in almost all 2nd quarter groundwater samples. Some additional observations about the field blanks are noted below.

Seven out of 24 field-blank results for TOC were greater than 2 times the MDL. The highest result of 8 mg/L appears to be an anomaly that resulted from an isolated sample-contamination problem or a lab error. None of the wells sampled during the 2nd quarter had total organic carbon results greater than 3.8 mg/L. The remaining out-of-limit field blank results were less than 1 mg/L. While these values are below the laboratory's required reporting limit, the values are of concern when evaluating detection-monitoring data. The laboratory has investigated possible reasons for the field blank detections but has been unable to determine a specific cause. Daily fluctuations in instrument performance may explain some of the elevated results. Groundwater Project staff will continue to monitor the results for this analysis and will work with the laboratory to improve performance.

Several metal results exceeded the QC limits, but the relative number of exceedances (5%) was down from the previous quarter (14%). This may be a result of the laboratory's efforts to clean their fume hoods near the end of the 1st quarter. All of the out-of-limit field-blank results were within a factor of 5 of the QC limits. However, results for manganese, vanadium, and zinc, were greater than the concentrations found in groundwater samples from some sites.

Twenty-four volatile organic compound results were greater than the QC limits for blanks. Most of these results were within a factor of 2 of the QC limits, and the impacts on associated sample results should be minor. Methylene chloride had the greatest number of out-of-limit results. Laboratory contamination is the suspected source of this compound along with 1,4-dichlorobenzene and 2-butanone. Chloroform was measured at levels

ranging from approximately 1–11 µg/L in 3 field transfer blanks. As noted in previous quarters, it is suspected that chloroform was present in the water used to prepare some of the field blanks due to incomplete removal by the water purification system.

Laboratory QC Data

Blind Standards. Double blind standards containing known amounts of selected anions, organic compounds, and radionuclides were prepared and submitted to Severn Trent in May. Splits of the TOX and gross beta standards were submitted to Recra and Thermo NUtech. In addition, a special low-level tritium standard was prepared, split, and set to Severn Trent and the University of Miami in June to support a non-RCRA low-level tritium investigation. All of the standards except those for cyanide were prepared using groundwater from background wells. Cyanide standards were prepared in deionized water.

The acceptance limits for blind standard recoveries are generally 75 – 125% except for chromium, which has limits of 80 – 120%, and specific radionuclides, which have a ± 30% acceptance range. The majority of the 2nd quarter results were acceptable, indicating good analytical performance overall. However, Severn Trent had low recoveries for cyanide and high recoveries for TOX and gross beta. Recra also had unacceptable results for TOX. These out-of-limit results are discussed in more detail below.

Six out of Severn Trent's seven TOX results were acceptable. The one out-of-limit result was biased slightly high. These results are not unreasonable since the standards were spiked at a level close to (i.e., about 3 times greater than) the MDL. All of Recra's TOX results were approximately an order of magnitude too high. Recra performed a data recheck on the results but did not find any mistakes. Nevertheless, a calculation error is suspected as the cause of the high values. The raw data for these results will be requested from Recra for an in-house review.

Severn Trent's results for cyanide were biased low by approximately 35%. Similar recoveries have been observed in previous quarters. This problem appears to be related to the procedure used to prepare the standards. In July, a set of cyanide standards was prepared gravimetrically using a cyanide salt and submitted to Severn Trent. Preliminary results from the analysis of these samples indicated an average recovery of 89%. These results, combined with the laboratory's excellent performance in recent PE studies (discussed last quarter), suggest that the laboratory is producing reliable data for cyanide.

One of Severn Trent's gross beta was out-of-limits, although all three results were biased high. Thermo NUtech's results for gross beta were also biased high by approximately the same amount, suggesting that the standards were spiked at a higher concentration than expected.

ERA Water Supply/Water Pollution Programs. Severn Trent-St. Louis (STL-St. Louis) and Recra participate in the Environmental Resource Associates (ERA) Water Supply/Water Pollution (WS/WP) programs. No new results for these programs were received from STL-St. Louis or Recra this quarter.

Mixed Analyte Performance Evaluation Program. The Mixed Analyte Performance Evaluation Program (MAPEP) is conducted by the U.S. Department of Energy. In this program, samples containing metals, volatile and semivolatile organic compounds, and radionuclides are sent to participating laboratories in January and July. MAPEP results for aqueous samples were available this quarter from STL-St. Louis, STL-Richland, Thermo NUtech, and Recra from studies conducted in January 2000 (MAPEP-99-W7). One result for STL-Richland, nickel-63 with a +42% bias, was unacceptable. All other results were within limits.

InterLaB RadCheM Proficiency Testing Program Studies. The InterLaB RadCheM Proficiency Testing Program, conducted by Environmental Resource Associates (ERA), is a replacement for the EPA's National Exposure Research Laboratory PE studies. Control limits are based on the National Standards for Water Proficiency Testing Studies Criteria Document, December 1998.

The results from four RadCheM PE studies were reported in July, August, and September 2000 (RAD-21A, 22, 23and 25). All of the results from STL-Richland were within the control limits. Thermo NUtech does not participate in the RadCheM PE studies.

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. Control limits established by the EML are based on historic data distributions from data collected by the EML from 1982 to 1992. Acceptable results should fall within the 15th and 85th percentile of the cumulative normalized distribution. Results are within warning limits if they fall between the 5th and 15th percentile or the 85th and 95th percentile. Results less than the 5th percentile or greater than the 95th percentile are "not acceptable" (DOE 1995). Results were reported in June 2000 for QAP 52. All of the results for STL-Richland were acceptable, although americium-241, gross alpha, gross beta, and uranium were within the warning limits. All of the results for Thermo NUtech were acceptable, but gross alpha was within the warning limits.

Laboratory QC Data from STL. Laboratory QC data includes the results from 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. Laboratory QC data are not currently used for in-house validation of individual sample results unless the lab is experiencing unusual performance problems with an analytical method. Most of the 2nd quarter laboratory QC results were within acceptance limits, suggesting that the analyses were in control and reliable data were generated. Nevertheless, several parameters had unacceptable results, and some were "significantly" out of limits. For method blanks, "significantly out-of-limits" means some results were greater than twice the QC limit. For laboratory control samples, matrix spikes, and duplicates, significantly out-of-limits means the results were outside the range of the QC limits plus or minus 10 percentage points (e.g., if the QC limits are 80-120%, significantly out-of-limits would mean less than 70% or greater than 130%). Most of the results that were significantly out-of-limits were matrix spikes for anions, metals and radiological constituents.

Results for method blanks were evaluated based on the frequency of detection above the blank QC limits. In general, these limits are 2 times the MDL or instrument detection limit (IDL) for chemical constituents and 2 times the total propagated error for radiochemistry components. For common laboratory contaminants such as acetone, methylene chloride, 2-butanone, toluene, and phthalate esters, the QC limit is 5 times the MDL. The metals category had the greatest percentage of method blank results exceeding the QC limits, with 5.1% exceeding twice the IDL. Most of the out-of-limit results for metals were for copper, iron, manganese, sodium, and vanadium. Aluminum, barium, chromium, and magnesium each had one or two out-of-limit values as well. For all other categories, the QC limits were exceeded by fewer than 4% of the method blanks. For general chemistry parameters, all of the high method blank results were for conductivity, with 57.1% above the QC limit. However, the out-of-limit method blank results for conductivity are not a significant problem because all 2nd quarter groundwater samples had conductivity values that were much higher than the highest blank value. The only constituent in the other categories with ten or more measurements that had greater than 10% of method blanks outside the QC limits was chloride (21.1%). The highest method blank result for chloride was 0.11 mg/L (less than two times the QC limit). 1,4-dichlorobenzene and tritium were the other parameters that had out-of-limit results. Neither had results that were significantly out-of-limits as defined in the preceding paragraph.

All laboratory control sample recoveries were acceptable this quarter.

For matrix spikes and matrix spike duplicates, the percentages of out-of-limit results were as follows: 3.4% for general chemistry parameters, 21.6% for ammonia and anions, 3.2% for metals, 0.7% for volatile organic compounds, 8.3% for semivolatile organic compounds, and 33.3% for radiochemistry parameters. Constituents with 10 or more measurements that had greater than 10% of matrix spikes outside QC limits included chloride, nitrate, nitrite, sulfate, cadmium, lead, technetium-99, and uranium. Each of these constituents except chloride and lead had one or more matrix spikes that were significantly outside the QC limits. Additional parameters that had out-of-limit results are as follows: TOX, chromium, strontium, chlorobenzene, and many of the alkylated, chlorinated or nitro-containing phenols. Of these, TOX, chromium, strontium, and twelve of the phenols had results that were significantly outside the QC limits.

For matrix duplicates with values five times greater than the MDL or MDA, percentages of out-of-limit results were as follows: 0% for general chemistry parameters, 0.9% for ammonia and anions, 0.3% for metals, 5.6% for volatile organic compounds, 17.8% for semivolatile organic compounds, and 1.3% for radiochemistry parameters. The only constituent with at least 10 measurements that had greater than 10% of matrix duplicates outside QC limits

was chlorobenzene. Other parameters that had out-of-limit results are as follows: bromide, strontium, benzene, trichloroethene, many of the alkylated, chlorinated, or nitro-containing phenols, gross alpha, gross beta, plutonium 239/240, and uranium-235. Of these, bromide, strontium, fifteen of the phenols, gross beta, and uranium-235 had results that were significantly outside QC limits.

Surrogate recoveries were also evaluated. The percentages of out-of-limit results were as follows: 0.2% for volatile organic compounds and 1.3% for semivolatile organic compounds. No constituents had greater than 10% of matrix duplicates outside QC limits. Constituents with out-of-limit results included 1,2-dichloroethane-d4, 4-bromofluorobenzene, 2,4,6-tribromophenol, and 2-fluorophenol. The latter two surrogates had at least one result that was significantly outside the QC limits.

Laboratory QC Data from ThermoNUtech and Recra. Second quarter QC data from ThermoNUtech are limited to gross alpha and gross beta. All the QC data were within limits for these parameters. Second quarter QC data from Recra are limited to TOC and TOX. All the associated laboratory QC data were within limits.