QUARTERLY RESOURCE CONSERVATION AND RECOVERY ACT GROUNDWATER MONITORING DATA FOR THE PERIOD JULY THROUGH SEPTEMBER 2002.

Fifteen *Resource Conservation and Recovery Act of 1976* (RCRA) sites[1] were sampled during the reporting quarter, as listed in Table 1. Sampled sites include seven monitored under groundwater indicator evaluation ("detection") programs [40 CFR 265.93(b)], seven monitored under groundwater quality assessment programs [40 CFR 265.93(d)], and one monitored under final-status groundwater corrective action programs [WAC 173-303-645(11)].

Comparison to Concentration Limits

Contamination indicator parameter data (pH, specific conductance, total organic halides, and total organic carbon) from downgradient wells were compared to background values at sites monitored under interim-status, indicator evaluation requirements, as described in 40 CFR 265.93. Five of the sites had an exceedance in a downgradient well during the quarter, but none of these appears to indicate dangerous waste contamination from the RCRA sites, as explained below.

1301-N Liquid Waste Disposal Facility: Quadruplicate measurements of pH in downgradient well 199-N-3 averaged 7.23 in September, which is below the lower limit of the critical range for pH (7.36 to 8.42). DOE previously informed Ecology of an earlier exceedance and transmitted an assessment report. The report concluded that the relatively low pH is part of the overall distribution of pH in 100-N Area, and does not indicate contamination from the 1301-N facility. The site will remain in detection monitoring.

1324-N/NA Facilities. Specific conductance at downgradient wells 199-N-59 and 199-N-72 continued to exceed the critical mean. Groundwater quality assessment monitoring in 1992 indicated that the high specific conductance is caused by the nonhazardous constituents sulfate and sodium. 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.

1325-N Liquid Waste Disposal Facility. Specific conductance in downgradient wells 199-N-41 and 199-N-81 continued to exceed the critical mean value in September. DOE previously notified Ecology of an earlier exceedance and transmitted the results of the groundwater quality assessment. The high specific conductance is believed to originate at an upgradient source, and passed the upgradient well several years ago, so the site will remain in a detection monitoring program.

Low-Level Waste Management Area 4: The site network now consists of 3 upgradient wells and 2 downgradient wells. New wells will be needed for this WMA; numbers and locations will be negotiated during workshops with Ecology on the final status monitoring plan, which was submitted in 2002. Concentrations of total organic halides in downgradient well 299-W15-16 (1,110 ug/L) continued to exceed the critical mean value of 168.9 ug/L. This well used to be an upgradient well and the exceedance is believed to originate from an upgradient source. DOE reported an earlier exceedance in this well to Ecology and EPA, and detection monitoring will continue.

Nonradioactive Dangerous Waste Landfill: Specific conductance in three downgradient wells (699-25-34A, 699-25-34D, and 699-26-33) continued to exceed the critical mean value during the quarter. DOE notified Ecology of a previous exceedance in June 2001. The increased specific conductance is caused by increases in concentrations of nonhazardous constituents (bicarbonate, sulfate, calcium, and magnesium), likely from the adjacent Solid Waste Landfill. Therefore, detection monitoring will continue.

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[1] A site is a Treatment, Storage, and/or Disposal (TSD) unit or a waste management area associated with a TSD unit.

Table 1. Status of RCRA Sites, July-September 2002.

Site	Routine sampling?	DG Statistical exceedance?	Comments
Indicator Evaluation Sites [40 CFR 265.93(b)] (sampled semiannually)			
1301-N Liquid Waste Disposal Facility	Yes	Yes[a]	Sampling delayed at UG well N-57 (11/02) and DG well N-105A (10/02). CMs recalculated.
1325-N Liquid Waste Disposal Facility	Yes	Yes[a]	SC increased from ~400 uS/cm in 3/02 to 534 in 9/02 in well N-81.
1324-N Surface Impoundment and 1324-NA Percolation Pond	Yes	Yes[a]	
216-B-3 Pond	No	Not sampled	Trial period for alternative statistical method.
216-A-29 Ditch	No	Not sampled	
216-B-63 Trench	No	Not sampled	
216-S-10 Pond and Ditch	No	Not sampled	Only 1 UG and 1 DG well.
LERF	No	Not sampled	No statistical evaluation per Ecology direction.
LLBG WMA 1	No	Not sampled	
LLBG WMA 2	No	Not sampled	
LLBG WMA 3	Yes	No	Wells W7-8 and W10-13 went dry; CM recalculated.
LLBG WMA 4	Yes	Yes[a]	Only 2 DG wells.
SST WMA A-AX	No	Not sampled	
SST WMA C	Yes	See comment	Sampled quarterly. No statistical evaluation until 4 quarters stable data from UG well.
NRDWL	Yes	Yes[a]	
Groundwater Quality Assessment Sites [40 CFR 265.93(d)] (sampled quarterly)			
Seven sites[b]	Yes	Not required	See updates in text.
Final Status Sites [WAC 173-303-645(11)]			
300 Area Process Trenches	Yes	Yes[c]	Trial period for alternative statistical method.
183-H Solar Evaporation Basins	No	Not sampled	Sampled annually in November.

CM = Critical mean value(s)
DG = Downgradient
LERF = Liquid Effluent Retention Facility
LLBG = Low-Level Burial Grounds
NRDWL = Nonradioactive Dangerous Waste Landfill SST = Single-Shell Tanks
UG = upgradient
WMA = Waste Management Area

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

Wells Not Sampled as Scheduled

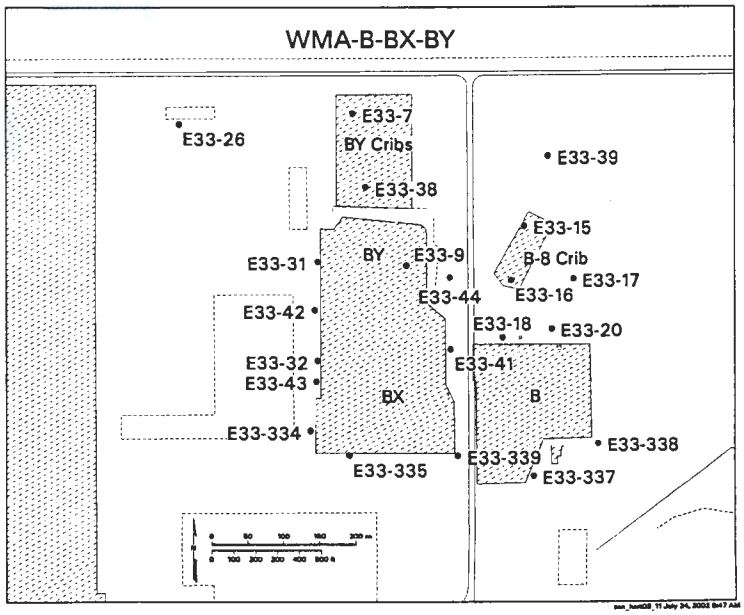
A number of wells that were scheduled to be sampled for RCRA during the reporting period were not sampled as scheduled. Some of these wells were sampled the next quarter; other wells were dry. Table 2 lists the wells that were not sampled as scheduled, and the reason why.

Table 2. Wells Not Sampled as Scheduled During July-September 2002.

Well	RCRA Site	Date Attempted	Date Sampled	Reason delayed or not sampled
199-N-57	1301-N	9/12/02 and 10/17/02	11/13/02	Pump tripped breaker.
199-N-105A	1301-N	9/23/02	10/16/02	Extraction well; System was leaking; operator shut down well.
299-W7-8	LLBG WMA-3	9/25/02	--	Dry.
299-W7-12	LLBG WMA-3	9/25/02	10/24/02	No water to surface.
299-W10-13	LLBG WMA-3	9/24/02	--	Dry.
299-W10-20	LLBG WMA-3	9/24/02	10/30/02	No water to surface.
299-W22-44	WMA S-SX	N/A	1/16/03	Logistical problems coordinating sampling staff with tank farm staff. Issue addressed to avoid problems in future.
299-W23-19	WMA S-SX	9/20/02	10/10/02	Pump not working.
699-25-34B	NRDWL	8/27/02 and 9/27/02	10/29/02	Pump tripped breaker.

Status of Assessment Programs

This section describes the seven RCRA sites currently monitored under groundwater quality assessment. Discussions of waste constituents not regulated under RCRA (e.g., radionuclides) are included where the information may provide further insight regarding the source and migration of dangerous waste constituents in groundwater.



Single-Shell Tanks Waste Management Area B-BX-BY: There was no apparent change in the direction or rate of groundwater flow during the reporting period. Based on in situ measurements, the groundwater is nearly stagnant in the north half of the waste management area, flowing slowly to the southwest. In the southern half, it flows towards the south-southeast to southeast with a faster flow rate.

Nitrate concentrations have begun to rise again in the north but remained relatively steady across most of the waste management area. The highest values are

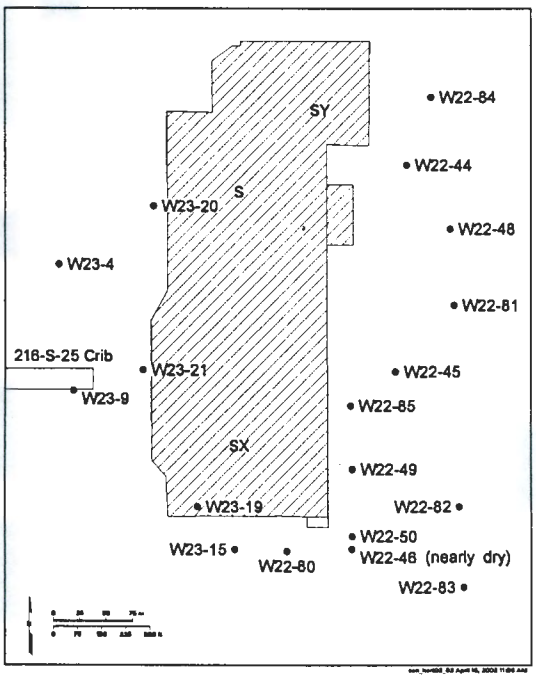
under the BY Cribs (602 mg/L) and the B-8 Crib (589 mg/L), with the lowest value in the southeast corner of the waste management area (8.8 mg/L). Nitrate continued to rise slowly in the southwest corner of the site, with values still below 30 mg/L in wells 299-E33-334, 299-E33-335, 299-E33-337 and 299-E33-339. Cyanide levels, found with the elevated nitrate, also increased during the reporting period, ranging from 299 ug/L under the BY cribs to 17.3 ugL east of the BY tank farm (maximum contaminant level is 200 ug/L).

In 2001 and 2002, the concentrations of nitrate and most other co-contaminants decreased. Changes in co-contaminants that have occurred nearly simultaneously in several wells over the past few years suggests there may be a common water driver operating across the site. These results will be discussed in more detail in the 2002 annual report.

Distinct changes with time in the nitrate-to-technetium-99 ratios indicate that the most recent contamination observed at most wells is from separate, discrete sources. This analysis also suggests the recent contamination is moving into the groundwater from the vadose zone. These results will also be discussed in more detail in the 2002 annual report.

Preliminary results from vertical depth sampling suggest a surface layer of slightly less-contaminated water within the uppermost aquifer. Specific conductance is ~407 uS/cm at the aquifer surface and 450 uS/cm in the middle of the aquifer.

Nitrite dropped sharply in well 299-E33-44 in the central part of the waste management area, from 887 ug/L in May 2002 to 122 ug/L in August 2002. Nitrite is not usually found in the groundwater, probably because it is oxidizes to nitrate before it can be detected. The presence of nitrite might suggest a recent release from the waste management area, albeit at concentration levels lower than previously observed.



Single-Shell Tanks Waste Management Area S-SX: Groundwater beneath this site is contaminated with hexavalent chromium attributed to two general source areas within the waste management area. All analytical results from groundwater samples collected in September 2002 were on trend. The water table has continued to decline but water levels in all of the monitoring wells in the network have dropped equally so the gradient is stable and the interpreted flow direction is still eastward.

The northern contaminant plume, with an apparent source in S Tank Farm and passing through well 299-W22-48, did not change during the quarter. Chromium and nitrate concentrations in well 299-W22-48 reached a constant level a year ago at about 40 μg/L and 73 mg/L, respectively (Figure 1). The bulk of the contaminant plume is limited to between well 299-W22-44 on the north and 299-W22-81 on the south.

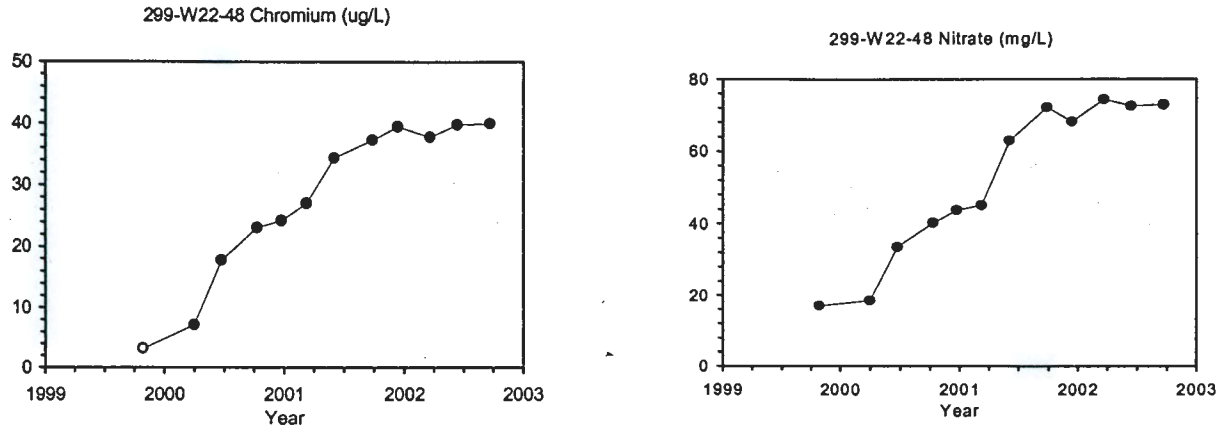


Figure 1. Chromium and Nitrate in Well 299-W22-48, WMA S-SX.

The contaminant plume migrating from the SX Tank Farm in the southern portion of the waste management area continued to spread slowly downgradient. This plume is comprised of chromium and the non-dangerous constituent nitrate, just as the S Tank Farm plume to the north. The shape and extent of the plume have changed little during the quarter. Nitrate concentrations remained high in the source area (represented by well 299-W23-19; Figure 2) and continued to rise in the middle and downgradient portions of the plume (represented by wells 299-W22-50 and 299-W22-83, respectively; Figure 3).

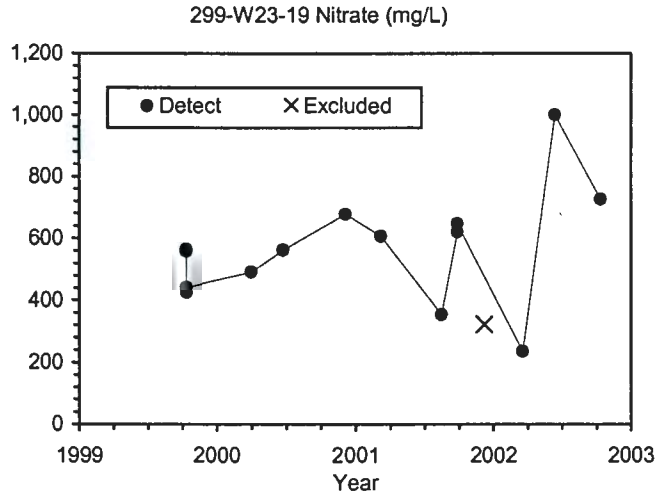


Figure 2. Nitrate in Well 299-W23-19, WMA S-SX.

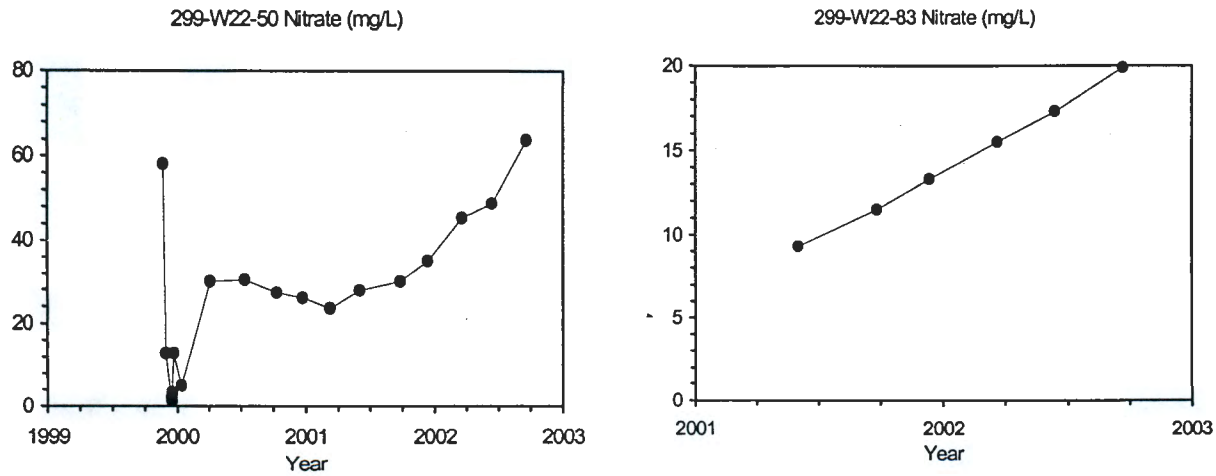


Figure 3. Nitrate in Wells 299-W22-50 and 200-W22-83, WMA S-SX.

The nitrate trend in well 299-W23-19 is almost identical to trends observed for calcium, magnesium, chloride, and elemental strontium in the same well. In the last quarterly report, it was stated that multiple constituents with different analytical methods produced similar trends, so analytical causes were eliminated from an explanation of the fluctuating constituent concentrations observed in well 299-W23-19. It was postulated that the fluctuations could be due to concentration variations in the plume or in sampling technique. Since the last report was prepared, additional data indicate that the fluctuations may be due to temporal/spatial variations in the plume.

The additional data were collected using a specific conductance probe to measure specific conductance at discrete vertical locations throughout the screened interval in well 299-W23-19. The work was coordinated with the quarterly groundwater sampling and performed at the same time. Because of pump problems, water samples could not be obtained on September 20 and so sampling was rescheduled and successfully completed on October 10. As a result, two specific conductance profiles were obtained for well 299-W23-19 (Figure 4). These profiles, measured 20 days apart, are different in both the magnitude of the specific conductance and its spatial variability over the length of the screened interval. The magnitude of the specific conductance in the two profiles spans the levels observed in previous water samples. These data indicate that there are significant temporal changes in the plume and that the plume is significantly variable in the vertical direction. The data also indicate that sampling using the portable submersible pump agreed well with the specific conductance probe and that pump installation did not perturb the sample results. As a result, historical fluctuations in plume constituents could be explained by fluctuations in plume properties and not sampling influences. These data also indicate that the chemical composition of samples collected using a pump is influenced by where the intake is placed in the screened interval and the vertical variability of contaminants in the aquifer. These data are limited and caution should be used in applying them to broad conclusions regarding the behavior of this plume. The Groundwater Project plans to install a string of four specific conductance probes in the well and monitor the aquifer to better understand these dynamics.

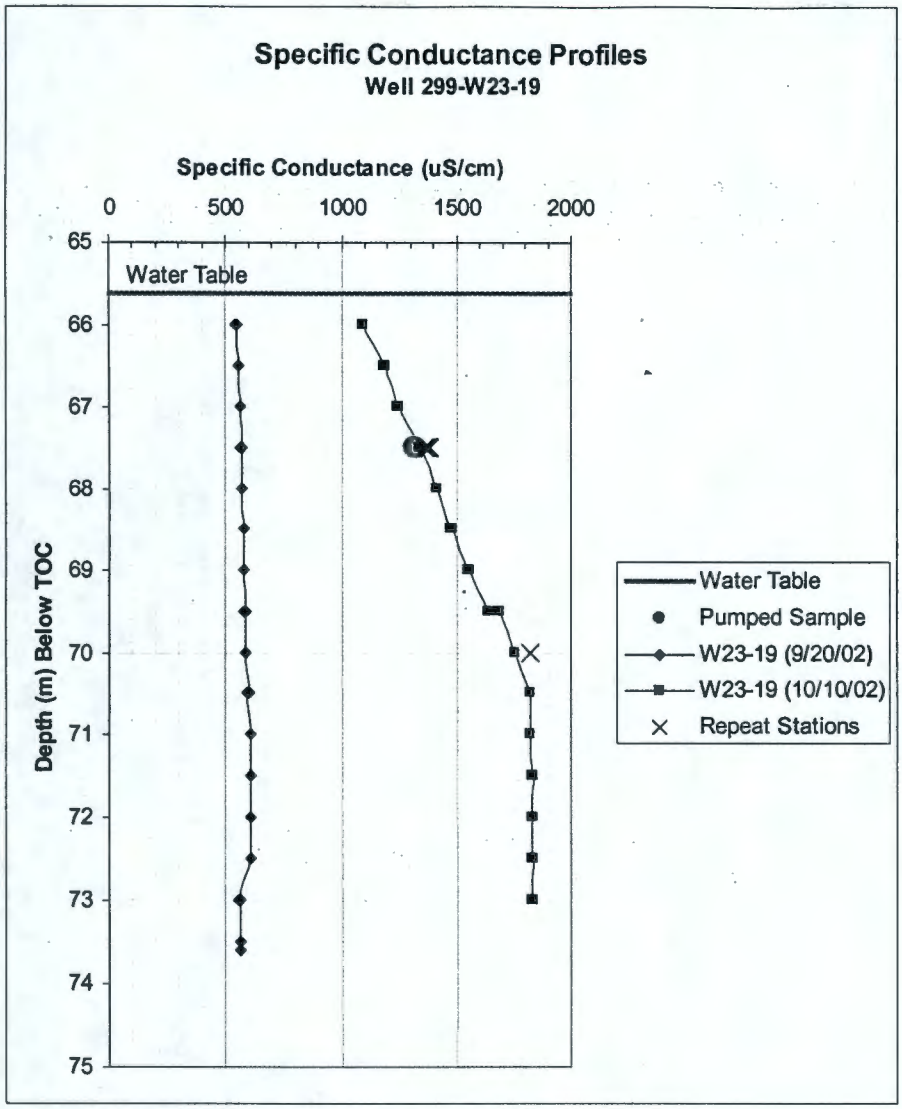


Figure 4. Specific Conductance with Depth in the Screened Interval of Well 299-W23-19, WMA S-SX.

The southern contaminant plume contains chromium, but it appears that the source for the chromium in well 299-W23-19 has decreased significantly (Figure 5). The chromium pulse that entered the groundwater and was observed to be increasing in well 299-W23-19 until 2001, has migrated downgradient to well 299-W22-50, where concentrations tripled in 2002 (Figure 6). Chromium concentrations in well 299-W23-19 began to fall while concentrations of other constituents remained high in 2001, indicating that the chromium may be from a different source than the nitrate.

Well 299-W22-83 has been used to delineate the downgradient margin of the SX Tank Farm contaminant plume. Nitrate concentrations in this well continued to increase during the quarter (nearly doubled to about 20 mg/L in the past year). Chromium remained at low levels but increased from background concentrations of about 4 μg/L to 7.5 μg/L during the quarter. This increase may reflect the arrival of chromium at this more distant well. The northern margin of the plume continued to be defined by wells 299-W22-49 and 299-W22-82, where nitrate concentrations were at levels much less than wells to the south.

Sampling well 299-W22-44 was delayed until January 2003 because tank farm support could not be scheduled during the reporting quarter (see Table 2). This well and well 299-W23-19 can be sampled only with support from tank farm personnel. This situation has been corrected by placing the sampling work on the tank farm permanent schedule.

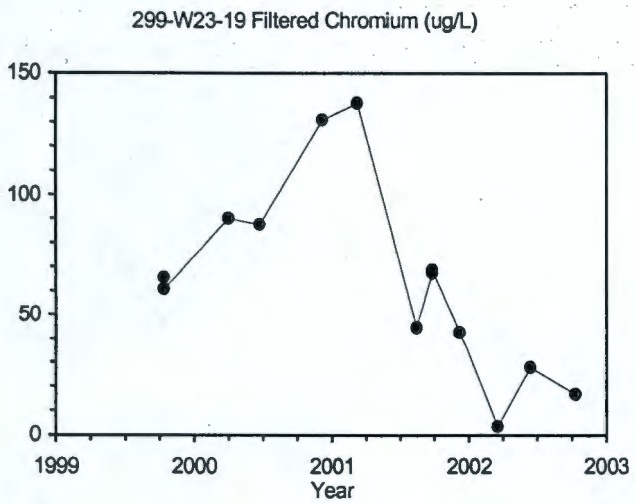


Figure 5. Chromium In Well 299-W23-19, WMA S-SX.

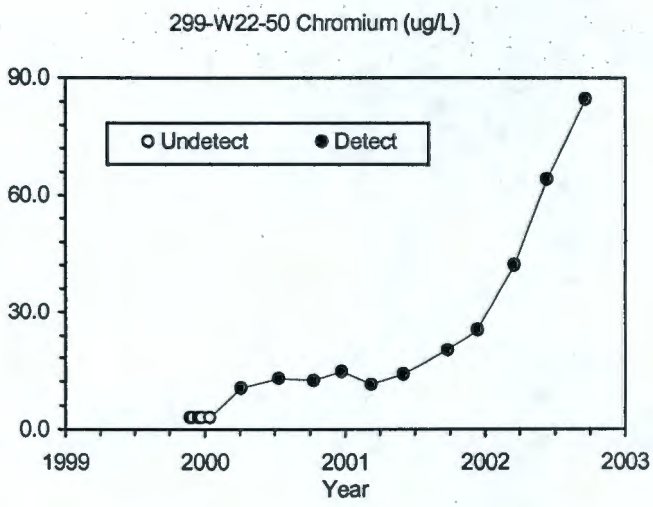
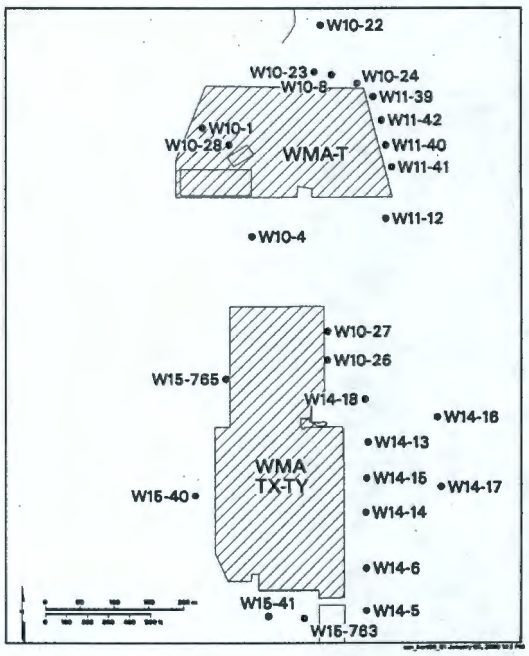


Figure 6. Chromium in Well 299-W22-50, WMA S-SX.

Single-Shell Tanks Waste Management Areas T and TX-TY: Water levels near these waste management areas continued to decline during the reporting period. However, the gradient has changed little; therefore, the rate and direction of groundwater flow has not changed appreciably during the quarter. Groundwater flow at WMA T is between about 5 degree north and 8 degrees south of east at a rate of about 0.025 meters per day. Groundwater flow at WMA TX-TY changes from the north to the south part of the waste management area. In the north, groundwater flow is approximately 20 degrees south of east at a rate of about 0.01 to 0.025 meters per day. In the south, where groundwater flow has been altered by the 200-ZP-1 pump-and-treat operations, groundwater flow is to the south or south southwest at about 0.3 meters per day.



WMA T: Chromium is the only dangerous waste constituent found in the groundwater beneath WMA T. Chromium concentrations continue to exceed the maximum contaminant level (100 µg/L) in three wells. The highest chromium concentration was in well 299-W10-4 located upgradient of the waste management area (Figure 7). The concentration of chromium in this well remained essentially unchanged during the quarter and was 242 µg/L. Well 299-W10-4 is located at the 216-T-36 crib (located south of the west end of WMA-T, not shown on the accompanying map) and the crib is the most likely source for the chromium.

Chromium also exceeded the maximum contaminant level in two downgradient wells: the chromium concentration was 129 µg/L in well 299-W11-41 and 120 µg/L in well 299-W11-42 (see Figure 7). The concentrations of chromium in both of these wells were essentially unchanged from the previous quarter. Both wells are located downgradient of well 299-W10-4 and the 216-T-36 crib. The chromium found downgradient of WMA T is most likely from the same source as that found in well 299-W10-4.

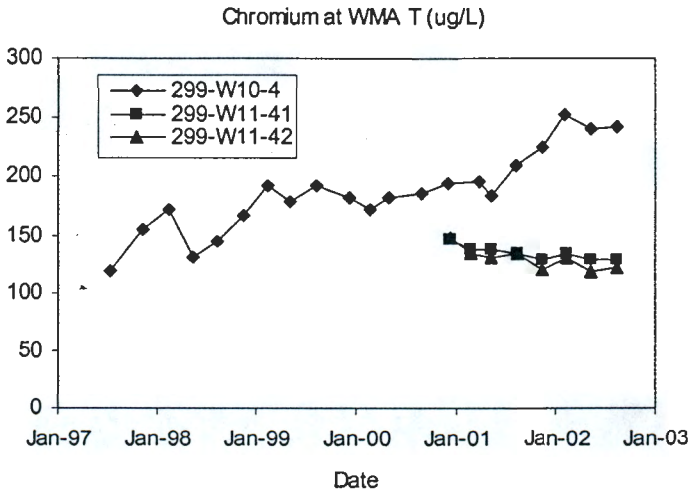


Figure 7. Chromium in Wells Monitoring WMA T.

Nitrate concentrations remained above the maximum contaminant level of 45 mg/L in all wells in the WMA T network. The highest reported concentrations of nitrate were in upgradient well 299-W10-28, where nitrate increased from 1,350 mg/L in May 2002 to 1,460 mg/L in August 2002, and in well 299-W10-4, where nitrate increased from 1,560 mg/L (in May 2002) to 1,740 mg/L. Nitrate is not a regulated, dangerous waste constituent.

Nitrate concentrations in all monitoring wells except 299-W11-39 on the downgradient (east) side of WMA T were between 189 mg/L (well 299-W11-40) and 708 mg/L (well 299-W11-42). Nitrate concentrations are increasing slightly in all downgradient wells except well 299-W10-28, where it remains fairly constant.

WMA TX-TY: Chromium is the only dangerous-waste constituent that has been detected in groundwater beneath WMA TX-TY and may be from a source within the waste management area. Chromium exceeded the maximum contaminant level of 100 µg/L in well 299-W14-13 at WMA TX-TY (Figure 8). The chromium concentration in that well was 361 µg/L during the reporting quarter, essentially unchanged from 360 µg/L the previous quarter. The chromium concentration has been above the maximum contaminant level since the well was first sampled in December 1998 and the concentration had been increasing between May 2001 and May 2002.

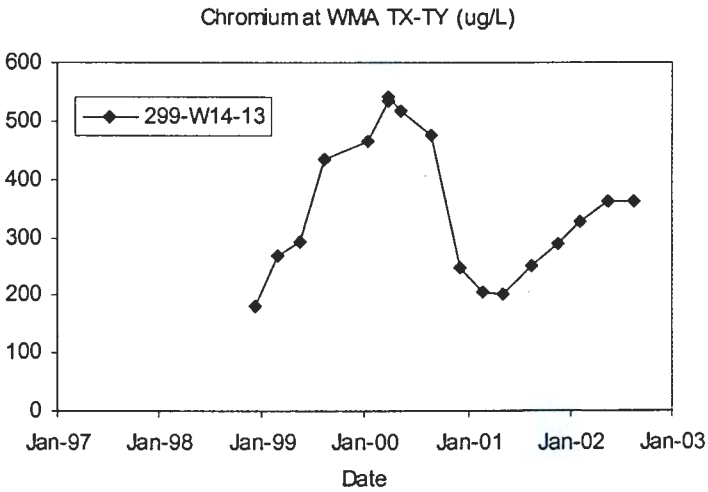
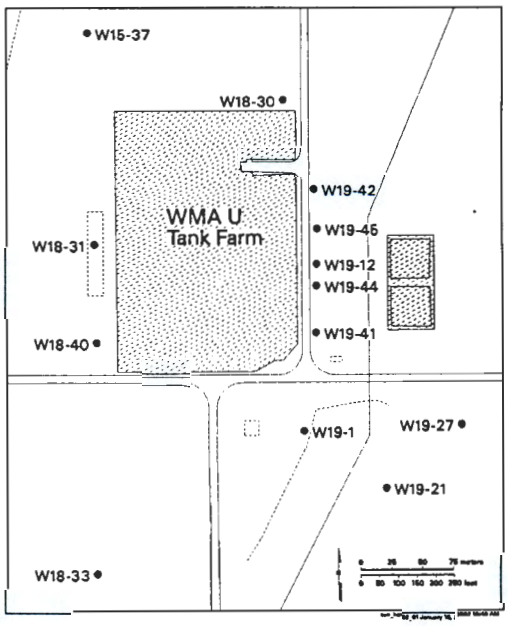


Figure 8. Chromium in Well 299-W14-13, WMA TX-TY.

Nitrate concentrations continued to exceed the maximum contaminant level in all wells in the WMA TX-TY monitoring network except 299-W15-763 during the reporting quarter. Well 299-W15-763 is located south of the waste management area and has had anomalously low (compared to other wells at WMA TX-TY) nitrate concentrations since the well was drilled in 2001. The highest nitrate concentration was found in well 299-W14-13 in the central part of the east side of the waste management area. The nitrate concentration in this well was 324 mg/L in August 2002, down slightly from 362 mg/L the previous quarter. The nitrate plume at WMA TX-TY is attributed to past disposal practices at facilities associated with the Plutonium Finishing Plant and T Plant.

Single-Shell Tanks Waste Management Area U. This waste management area, which has been in assessment monitoring since 1999, has affected groundwater quality with elevated concentrations of chromium and the non-dangerous constituent nitrate. The impact has been limited to the southern half of the downgradient (east) side of the WMA.

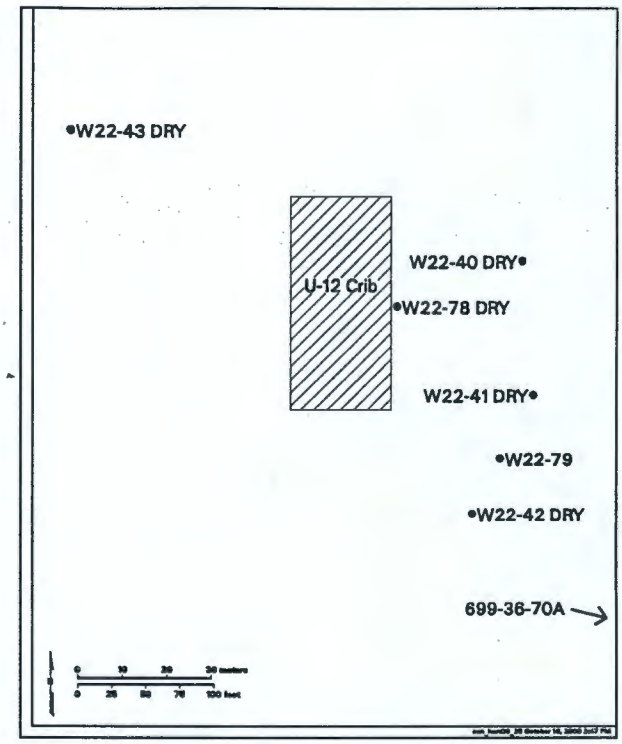


The water table elevation has continued to decline but the gradient is relatively stable and the interpreted flow direction is eastward. A recent gyroscope survey of well 299-W18-40, an upgradient well installed in 2001, showed that the horizontal deviation of the well from vertical was 23.8 feet at the bottom of the well, resulting in a 1.2 foot vertical upward correction in the water level measurements. This explains why previous water-table elevation data appears anomalously low. Corrected water levels are consistent with regional trends and other water levels measured in the waste management area.

All analytical results from groundwater samples collected in September 2002 were on trend. Chromium concentrations exceeded background levels during the quarter only in downgradient wells 299-W19-41 and 299-W19-12. The highest chromium concentrations, in well 299-W19-41, decreased from a high of 38 μg/L in 1999 to the current low of 15.6 μg/L during the reporting quarter.

Nitrate concentrations have increased over the past several years, though concentrations are below the maximum contaminant level. Accompanying nitrate are elevated concentrations of calcium, magnesium, strontium, barium, chloride, and sulfate. The greatest increases of these constituents used to delineate the area affected by the WMA have shifted north from well 299-W19-41 to well 299-W19-12. Nitrate concentrations in the two wells are nearly equal at just less than 40 mg/L.

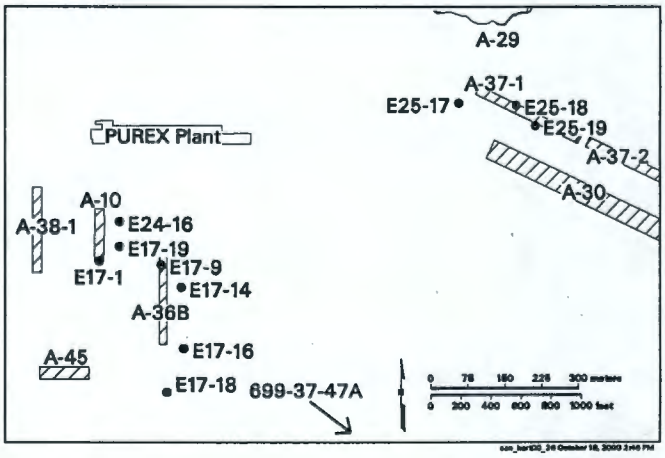
216-U-12 Crib: The current groundwater assessment monitoring network for the 216-U-12 Crib consists of only two downgradient wells (299-W22-79 and 699-36-70A), and no upgradient wells. Both wells were sampled in September 2002. Laboratory data are currently only available for 299-W22-79. Nitrate (from the 216-U-12 Crib) and specific conductance decreased this quarter after four consecutive quarters of increase.



Specific conductance in downgradient well 299-W22-79 was measured at 345 µS/cm in September, down from 370 µS/cm the previous quarter. The nitrate concentration in well 299-W22-79 decreased as well, down to 61.8 mg/L from a high of 69.5 mg/L the previous quarter, but remained above the 45 mg/L maximum contaminant level. There is currently no upgradient well available to determine potential groundwater quality impacts from upgradient sources, but previous well data indicate that no upgradient source exists. Upgradient well 299-W22-43, which went dry in 2000, never exceeded 20 mg/L for nitrate during nine years of monitoring and groundwater travel times are too slow to suggest an upgradient source could impact the area during the two year window that upgradient monitoring has not been available.

The groundwater flow rate and direction beneath the crib has remained relatively unchanged, toward the east-southeast.

PUREX Cribs (216-A-10, 216-A-36B, and 216-A-37-1): Five of the 11 near-field wells were sampled during the reporting quarter. Three of the wells (one from each crib) were sampled on schedule, and the other two wells were sampled because they were delayed from the preceding quarter. The only non-radioactive constituent exceeding its maximum contaminant level was nitrate.



The water table elevation has continued to decline but the gradient is relatively stable and the interpreted flow direction remains toward the southeast.

Concentrations of nitrate in two wells exceeded the maximum contaminant level (45 mg/L) during the reporting period: 299-E17-1 at the 216-A-10 crib and 299-E17-14 at the 216-A-36B crib. The result was 68 mg/L at well 299-E17-1, which is part of a slightly upward trend since 1995. The result at well 299-E17-14 was 124 mg/L, which is part of a steady trend at this well since 1997.

Quality Control

Highlights of the Groundwater Monitoring Project's quality control program for July-September 2002 are listed in Table 3. We are transmitting a separate attachment with more specific QC information. The quality control program indicated that the data were acceptable for use in the statistical comparisons discussed above.

Table 3. Quality Control Highlights, July-September 2002.

- Compliance with maximum recommended holding times was improved this quarter. Four nitrate results were flagged with an H due to missed holding times. The data impacts should be minor.
- Most of the field duplicate results demonstrated good precision, although the relative percent differences for six pairs of results failed to meet the acceptance criteria. Acetone, copper, gross beta, and iron were the constituents with out-of-limit results.
- Poor agreement on cyanide results was obtained from two split samples that were analyzed by STL St. Louis and Lionville Laboratory. Based on historical data, the Lionville results appear to be biased low.
- Approximately 4% of the field-blank results exceeded the QC limits. Most of the out-of-limit results were for acetone, alkalinity, chloride, methylene chloride, and tritium. In general, the field blank results should have little impact on the interpretation of 3rd quarter groundwater data.
- Severn Trent, Lionville Laboratory, and Eberline Services performed well on the analysis of blind standards. With the exception of one total organic halides result, all of the results were within the acceptance limits.
- Performance-evaluation study results were available from one InterLaB RadCheM study, two Water Pollution studies, and one Water Supply study this quarter. The majority of the labs' results were within the acceptance limits, indicating good performance overall.
- Most of the laboratory QC results for this quarter were within acceptance limits, suggesting that the analyses were in control and reliable data were generated. Parameters with more than one result that was significantly out of limits include method blanks for sulfate, aluminum, copper, and iron; laboratory control samples for acetone; matrix spikes for methylene chloride, 2,4,5-trichlorophenol, 2,4-dinitrophenol, 2-secbutyl-4,6-dinitrophenol, 4,6-dinitro-2-methylphenol, and pentachlorophenol; matrix duplicates for gross alpha; and three surrogates

Hanford Groundwater Monitoring Project
Quality Control Report
July 1 to September 30, 2002

Highlights

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- Most of the field duplicate results demonstrated good precision, although the relative percent differences for six pairs of results failed to meet the acceptance criteria. Acetone, copper, gross beta, and iron were the constituents with out-of-limit results.

- Poor agreement on cyanide results was obtained from two split samples that were analyzed by STL St. Louis and Lionville Laboratory. Based on historical data, the Lionville results appear to be biased low.

- Approximately 4% of the field-blank results exceeded the QC limits. Most of the out-of-limit results were for acetone, alkalinity, chloride, methylene chloride, and tritium. In general, the field blank results should have little impact on the interpretation of 3rd quarter groundwater data.

- Severn Trent, Lionville Laboratory, and Eberline Services performed well on the analysis of blind standards. With the exception of one total organic halides result, all of the results were within the acceptance limits.

- Performance-evaluation study results were available from one InterLaB RadCheM study, two Water Pollution studies, and one Water Supply study this quarter. The majority of the labs' results were within the acceptance limits, indicating good performance overall.

- Most of the laboratory QC results for this quarter were within acceptance limits, suggesting that the analyses were in control and reliable data were generated. Parameters with more than one result that was significantly out of limits include method blanks for sulfate, aluminum, copper, and iron; laboratory control samples for acetone; matrix spikes for methylene chloride, 2,4,5-trichlorophenol, 2,4-dinitrophenol, 2-secbutyl-4,6-dinitrophenol, 4,6-dinitro-2-methylphenol, and pentachlorophenol; matrix duplicates for gross alpha; and three surrogates.

This quality control (QC) report presents information on laboratory performance and field QC sample results for the 3rd quarter of CY 2002. Routine chemical and radiochemical analyses were performed by Severn Trent Laboratories, Inc. (St. Louis, MO and Richland, WA) for Hanford Groundwater Monitoring Project (HGWMP) samples. Supplemental analyses of split samples and blind standards were performed by Lionville Laboratory (Lionville, PA) and Eberline Services (Richmond, CA). Severn Trent, Lionville Laboratory, and Eberline Services operate under contract with Fluor Hanford, Inc. Groundwater sampling was conducted by Fluor Hanford, Inc. nuclear chemical operators (NCOs) under the direction of Duratek Federal Services Incorporated, Northwest Operations. The tasks conducted by the samplers and Duratek included bottle preparation, sample set coordination, field measurements, sample collection, sample transport and shipping, well pumping, and coordination of purgewater containment and disposal.

Table 2 summarizes the data completeness for the HGWMP. The determination of completeness is made 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-seven percent of the 3rd quarter's 9,674 results were considered valid. This percentage is approximately the same as the value from the previous quarter. Roughly 91% of the 3rd quarter flags resulted from detection of anions, metals, and volatile organic compounds 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 results that were flagged with an H dropped significantly (i.e., 4 versus 67). All of the 3rd quarter flags were associated with nitrate. Shipping delays associated with radiological screening caused the missed holding times.

Table 1. Completeness

Project	Total number of evaluated data	Number of flagged results	Percent flagged
100-K Area	184	22	12.0
216-U-12 Crib	16	0	0.0
316-5 Trenches	30	1	3.3
400 Area	64	11	17.2
LLWMA-3	582	90	15.5
LLWMA-4	502	78	15.5
LLWMA-5	58	8	13.8
Not RCRA/SURV	2473	285	11.5
PUREX Cribs	106	18	17.0
SALDS	80	16	20.0
Solid Waste Landfill	198	30	15.2
SST WMA-A-AX	16	0	0.0
SST WMA-B-BX-BY	521	91	17.5
SST WMA-C	305	48	15.7
SST WMA-S-SX	33	9	27.3
SST WMA-T	155	27	17.4
SST WMA-T3	81	12	14.8
SST WMA-TX-TY	126	22	17.5
SST WMA-U	120	36	30.0
Surveillance Central	2063	274	13.3
Surveillance Horn	726	97	13.4
Surveillance North	10	3	30.0
Surveillance South	1225	79	6.4

Field QC Data

Field QC samples include field duplicates, split samples, and field blanks. Quadruplicate samples collected at many wells for total organic carbon and total organic halides analyses also provide useful QC data. Field blanks collected during the 3rd quarter of 2002 included full trip blanks, field transfer blanks, and equipment blanks. 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. Table 2 lists the number of QC samples and their frequencies of collection for the 3rd quarter. Results from each type of QC sample are summarized below.

Table 2. Quality Control Samples for 3rd Quarter 2002

QC Samples	Number of well trips	Number of QC samples[a]	Frequency
Field Duplicates	191	17	9%
Split Samples	3[b]	3	100%
TOC Quadruplicates	61[c]	35	57%
TOX Quadruplicates	43[c]	33	77%
Full Trip Blanks	191	11	6%
Field Transfer Blanks	VOC samples collected on 24 days	24 (on 24 days)	100%[d]
Equipment Blanks	3[e]	0[f]	0%

[a] values listed do not include field duplicates and blanks collected for interim-action groundwater monitoring or nonroutine sampling events (i.e., special projects)
[b] number of well trips scheduled for split samples
[c] number of well trips in which TOC and/or TOX samples were collected
[d] number of field transfer blanks divided by the number of unique collection dates (i.e., 24/24)
[e] number of routine sampling events in which non-dedicated sampling equipment was used
[f] no equipment blanks were scheduled because the annual ratio of equipment blanks/samples collected with non-dedicated equipment had previously been met

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 3rd quarter of 2002 to produce 480 pairs of results. Overall, the results demonstrate good sampling and analysis precision. Six pairs of qualifying duplicate results had relative percent differences greater than 20% (Table 3). In general, the results in the table are consistent with historical data at the associated wells. However, the larger values for copper and iron in the sample from well 299-W18-22 appear to be slightly out of trend. Reasons for the poor precision are unknown. Laboratory contamination is the suspected source of acetone in the samples from wells 699-24-33 and 699-S28-E12. Suspended solids in the unfiltered samples may have contributed to some of the remaining discrepancies in the table.

Table 3. Field Duplicate Results that Exceeded Quality Control Limits

Constituent	Well	Method	Filtered	Result 1	Result 2	RPD
Metals						
Copper	299-W18-22	EPA 6010	Yes	23.6 µg/L B	2.2 µg/L B	166%
Iron	299-W18-22	EPA 6010	Yes	142 µg/L	50.5 µg/L B	95%
Iron	699-2-7	EPA 6010	No	173 µg/L	264 µg/L	42%
Organics						
Acetone	699-24-33	EPA 8260	No	1.3 µg/L J	4.9 µg/L J	116%
Acetone	699-S28-E12	EPA 8260	No	2 µg/L J	0.66 µg/L J	101%
Radiological Parameters						
Gross beta	299-E33-26	EPA 9310	No	803 pCi/L	1110 pCi/L	32%

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.

Three split samples were collected from 200-East area wells this quarter. Severn Trent St. Louis and Lionville Laboratory analyzed the samples for cyanide. Two of the split samples had quantifiable results, and in both cases, STL St. Louis' results were more than twice as high as the corresponding Lionville Laboratory values (263 and 128 µg/L for well 299-E33-38 and 299 and 125 µg/L for well 299-E33-7). The laboratories checked the data for errors, but no problems were identified. Based on historical data, the Lionville results appear to be biased low. Additional split samples and in-house analyses for cyanide are planned for the 1st quarter of 2003 to further investigate these discrepancies.

TOC and TOX Quadruplicates. Samples for total organic carbon and total organic halides analyses are normally 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, total organic carbon and total organic halides 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.

For the 3rd quarter, 1 out of 35 total organic carbon quadruplicates and 6 out of 33 total organic halide quadruplicates failed to meet the evaluation criteria (Table 4). Most of the quadruplicates appeared to contain an outlier (shaded values in the table). Removing the outliers drops the RSDs below the QC limits in each case. The reasons for the poor precision in the total

organic halide quadruplicates from wells 299-W15-15 and 299-W18-24 are unknown. However, in both cases, two of the four results were below the quantitation limits.

Table 4. TOC and TOX Quadruplicates with Low Precision[a]

Well	MDL (µg/L)	Result 1 (µg/L)	Result 2 (µg/L)	Result 3 (µg/L)	Result 4 (µg/L)	RSD
TOC						
299-W10-19	143	700 B	720 B	290 B	560 B	35%
TOX						
299-W15-15	3.98	15.2	33.3	24.6	13.3	43%
299-W18-24	3.98	18.1	4 U	10.2	20.8	58%
299-W10-19	3.98	37.2	40.9	38.1	20.5	27%
299-W10-21	3.98	128	90.3	67.7	107	26%
299-W7-5	3.98	19.5	4 U	26.2	24.6	55%
299-W7-4	3.98	131 N	125 N	130 N	221	30%

[a] Suspected outliers are shaded.

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. Definitions of full trip blanks, field transfer blanks, and equipment blanks are provided in the Appendix (p. 18). 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 910 results were produced from the 3rd quarter field blank samples. Approximately 4% of the results (i.e., 35 results) exceeded the QC limits for field blanks. The relative number of out-of-limit results was slightly lower than the percentage from last quarter (5%). Table 5 lists the field blank results that were greater than the QC limits. Results that exceeded the QC limits by a factor of 5 or more are shaded in gray. Most of the flagged results were for acetone, alkalinity, chloride, methylene chloride, and tritium; however, results were also flagged for chloroform, copper, fluoride, gross beta, and trichloroethene. The potential impacts on the data are minor in most cases. For example, chloride, fluoride, and gross beta had field blank results that were greater than the QC limits, but the values were significantly lower than the concentrations of these constituents in most 3rd quarter groundwater samples.

Acetone and methylene chloride were measured at levels greater than the QC limits in several field blanks. Laboratory contamination is the suspected source, because similar levels of these common contaminants were also found in method blanks. A relatively high concentration of chloroform, 21 µg/L, was measured in a field transfer blank on 9/16. Chloroform was also detected in 2 associated groundwater samples from well 199-N-3, although the well concentrations were much lower (1.9 µg/L).

Last quarter it was noted that the number of out-of-limit blank results for total organic carbon has been decreasing steadily during the past year. This quarter continued to show improved results; total organic carbon was not detected in any of the quarter's field blanks.

Table 5. Field Blank Results that Exceeded QC Limits

Constituent Name	Blank Type[(a)]	Result	QC Limit	Result/QC Limit
General Chemical Parameters				
Alkalinity	FTB	104000 µg/L	8086 µg/L	12.9
Alkalinity	FTB	130000 µg/L	8086 µg/L	16.1
Anions				
Chloride	FTB	62 µg/L	58.2 µg/L	1.1
Chloride	FTB	110 µg/L	58.2 µg/L	1.9
Fluoride	FTB	83 µg/L	62 µg/L	1.3
Metals				
Copper	FTB	3.2 µg/L	1.72 µg/L	1.9
Organics				
Acetone	FXR	1.7 µg/L	1.5 µg/L	1.1
Acetone	FXR	14 µg/L	1.5 µg/L	9.3
Chloroform	FXR	21 µg/L	0.14 µg/L	150.0
Methylene chloride	FXR	1.4 µg/L	1.2 µg/L	1.2
Methylene chloride	FTB	1.8 µg/L	1.5 µg/L	1.2
Methylene chloride	FXR	1.9 µg/L	1.5 µg/L	1.3
Methylene chloride	FXR	2 µg/L	1.5 µg/L	1.3
Methylene chloride	FXR	1.9 µg/L	1.2 µg/L	1.6
Methylene chloride	FXR	2.5 µg/L	1.5 µg/L	1.7
Methylene chloride	FXR	2 µg/L	1.2 µg/L	1.7
Methylene chloride	FXR	2 µg/L	1.2 µg/L	1.7
Methylene chloride	FXR	2 µg/L	1.2 µg/L	1.7
Methylene chloride	FXR	2.2 µg/L	1.2 µg/L	1.8
Methylene chloride	FXR	3.1 µg/L	1.5 µg/L	2.1
Methylene chloride	FXR	2.7 µg/L	1.2 µg/L	2.3
Methylene chloride	FXR	4 µg/L	1.5 µg/L	2.7
Methylene chloride	FXR	4.3 µg/L	1.5 µg/L	2.9
Methylene chloride	FXR	4.5 µg/L	1.5 µg/L	3.0
Methylene chloride	FXR	5.3 µg/L	1.5 µg/L	3.5
Methylene chloride	FXR	5.3 µg/L	1.5 µg/L	3.5
Methylene chloride	FXR	4.3 µg/L	1.2 µg/L	3.6
Methylene chloride	FXR	5.8 µg/L	1.5 µg/L	3.9
Methylene chloride	FXR	5.7 µg/L	1.2 µg/L	4.8
Methylene chloride	FXR	7.9 µg/L	1.5 µg/L	5.3
Methylene chloride	FXR	9.6 µg/L	1.5 µg/L	6.4
Trichloroethene	FTB	2.7 µg/L	0.32 µg/L	8.4
Radiological Parameters				
Gross beta	FTB	3.92 pCi/L	3 pCi/L	1.3
Tritium	FTB	5.88 pCi/L	5.8 pCi/L	1.0
Tritium	FTB	13 pCi/L	6 pCi/L	2.2

[a] FTB = Full trip blank, FXR = Field transfer blank

Laboratory QC Data

Blind Standards. Double-blind standards containing known amounts of selected anions, metals, organic compounds, and radionuclides were prepared and submitted to Severn Trent in July and August. Duplicates of the total organic carbon and gross beta standards were submitted concurrently to Lionville Laboratory and Eberline Services. In all cases, the standards were prepared using groundwater from background wells. Standards for indicator analyses were spiked using the following constituents: potassium hydrogen phthalate was used to prepare total organic carbon standards, 2,4,5-trichlorophenol was used to prepare TOX-phenol standards, and TOX-VOA standards were prepared using a mixture of carbon tetrachloride, chloroform, and trichloroethene. Gross alpha and gross beta standards were spiked with plutonium-239 and strontium-90, respectively. The standards' spiked concentrations and analytical results are listed in Table 6.

The acceptance limits for blind standard recoveries are generally 75 – 125% except for specific radionuclides, which have a ± 30% acceptance range. With the exception of one result for total organic halides, all of the 3rd quarter results were acceptable, indicating excellent analytical performance. The out-of-limit TOX result was for a standard that had been spiked with volatiles; the low recovery of 63% may have been caused by a procedural error at the laboratory that resulted in volatilization of the sample components.

Table 6. Blind Standard Results

Constituent	Spike Amount	Lab[a]	Result 1	Recovery	Result 2	Recovery	Result 3	Recovery	Mean	RSD
Indicator Parameters										
Conductivity	445uS/cm	SL	423	95%	426	96%	423	95%	424	0%
TOC[b]	2010µg/L	SL	2100	104%	1800	90%	1800	90%	1875	8%
TOC[c]	2010µg/L	LL	2000	100%	2200	109%	2200	109%	2150	5%
TOX (phenol)	45µg/L	SL	49	109%	52.4	116%	49.7	110%	50.4	4%
TOX (VOA)[d]	45µg/L	SL	37.6	84%	40.2	89%	40.4	90%	36.6	16%
Anions										
Cyanide	52µg/L	SL	45	87%	50.2	97%	55.5	107%	50.2	10%
Fluoride	2000µg/L	SL	1900	95%	1900	95%	1800	90%	1870	3%
Nitrate as N	45180µg/L	SL	52200	116%	53200	118%	51400	114%	52300	2%
Organics										
Carbon tetrachloride	20µg/L	SL	17	85%	18	90%	19	95%	18	6%
Chloroform	20µg/L	SL	18	90%	19	95%	19	95%	18.7	3%
Trichloroethene	10µg/L	SL	8.6	86%	9.1	91%	8.9	89%	8.9	3%
Radiological Parameters										
Gross alpha	99.18pCi/L	RL	74.9	76%	80.8	81%	82.9	84%	79.5	5%
Gross beta[e]	116.3pCi/L	RL	118	101%	117	101%	121	104%	119	2%
Gross beta[e]	116.3pCi/L	E	137	118%	122	105%	123	106%	127	7%
Plutonium-239	2.01pCi/L	RL	2	100%	1.94	97%	1.63	81%	1.86	11%
Strontium-90	98.48pCi/L	RL	114	116%	114	116%	111	113%	113	2%
Technetium-99	101.4pCi/L	RL	109	108%	112	110%	110	108%	110	1%
Tritium	261.5pCi/L	RL	196	75%	198	76%	197	75%	197	1%
Uranium-238	146µg/L	RL	141	97%	143	98%	148	101%	144	3%

[a] Lab codes: SL = Severn Trent St. Louis, RL = Severn Trent Richland, LL = Lionville Laboratory, E = Eberline Services

[b] TOC standards were submitted to Severn Trent St. Louis in quadruplicate. The 4th result was 1800 µg/L, and the recovery was 90%.

[c] Lionville Laboratory's 4th TOC result was 2200 µg/L, and the recovery was 109%.

[d] TOX VOA standards were submitted to Severn Trent St. Louis in quadruplicate. The 4th result was 28.3 µg/L, and the recovery was 63%.

[e] The gross beta spike amount is based on equal contributions from Sr-90 and Y-90 and has been corrected by adding the average gross beta activity of the source-water well (699-49-100C) to the original spiked amount. The average gross beta activity of well 699-49-100C was calculated from quarterly measurements made since the 3rd quarter of last year.

ERA Water Supply/Water Pollution Programs. Severn Trent, St. Louis (STL St. Louis) and Lionville Laboratory participate in the EPA sanctioned Water Supply/Water Pollution (WS/WP) Performance Evaluation studies conducted by New York State (Environmental Laboratory Approval Program [ELAP]) and Environmental Resources Associates (ERA), respectively. Every month, standard water samples are distributed as blind standards to participating laboratories. These samples contain specific organic and inorganic analytes at concentrations unknown to the participating laboratories. After analysis, the laboratories submit their results to the study administrator. Regression equations are used to determine acceptance and warning limits for the study participants. The results of these studies, expressed in this report as a percentage of the results that the PE provider found acceptable, independently verify the level of laboratory performance.

Results from one Water Pollution (WP-90) study were received from STL St. Louis. The percentage of acceptable results was 90.0%. Values were high for settleable solids, sulfide, cobalt, manganese, potassium, sodium, magnesium, calcium (hardness), orthophosphate as P, α-BHC, 4,4'-DDT, and heptachlor epoxide. Results were low for alkalinity as $CaCO_3$, chloride, cyanide, total phenolics, grease and oil, heptachlor, 4-chloro-3-methylphenol, 2,4-dichlorophenol, 4,6-dinitro-2-methylphenol, 2-nitrophenol, pentachlorophenol, and 2,4,5-trichlorophenol. An investigative report was not available for this study.

The results from one Water Pollution (WP-90) and one Water Supply (WS-72) study were received from Lionville Laboratory this quarter. The percentage of acceptable results from these studies was 99.5% and 98.5%, respectively. Values were high for methylene chloride for the second study in a row. Values were also high for chloride, and orthophosphate as P. Investigative reports were not available for either study.

Mixed Analyte Performance Evaluation Program. The Mixed Analyte Performance Evaluation Program (MAPEP) is conducted by the 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. No new MAPEP results were available this quarter.

InterLaB RadCheM Proficiency Testing Program Studies. The InterLaB RadCheM Proficiency Testing Program is conducted by Environmental Resource Associates (ERA). Control limits are based on the National Standards for Water Proficiency Testing Studies Criteria Document, December 1998.

The results from one RadCheM PE study were received from STL Richland this quarter (RAD-50). An unacceptable result was reported for cesium-134. The following were analyzed with acceptable results: cesium-137, cobalt-60, gross beta, radium-226, radium-228, strontium-89, strontium-90, and uranium. The results for barium-133 and gross alpha were acceptable with warning. Eberline Services does not participate in the RadCheM PE studies.

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. No new results were available this quarter.

Laboratory QC Data from Severn Trent Laboratories. Laboratory QC data provide a means of assessing laboratory performance and the suitability of a method for a particular sample matrix. These data are not currently used for in-house validation of individual sample results unless the laboratory is experiencing unusual performance problems with an analytical method. Laboratory QC data include the results from method blanks, laboratory control samples, matrix spikes, matrix spike duplicates, surrogates, and matrix or laboratory duplicates.

Different criteria are used to evaluate the various laboratory QC parameters. Results for method blanks are evaluated based on the frequency of detection above the blank QC limits. In general, these limits are two times the method detection limit (MDL) for chemical constituents and two times the total propagated error (MDA) for radiochemistry components. For common laboratory contaminants such as acetone, methylene chloride, 2-butanone, toluene, and phthalate esters, the QC limit is five times the MDL. Results for laboratory control samples, matrix spikes, and surrogates are evaluated by comparing the recovery percentages with minimum and maximum control limits. For matrix duplicates, only those samples with values five times greater than the MDL or MDA are considered. Quantifiable matrix duplicates are evaluated by comparing the relative percent difference (RPD) with an acceptable RPD maximum for each constituent.

As an aid in identifying the most problematic analytes, a distinction has been made between QC data that were slightly out of limits and QC data that were "significantly out-of-limits". For method blanks, "significantly out-of-limits" was defined to mean 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 3rd quarter laboratory QC results were within acceptance limits, suggesting that the analyses were in control and reliable data were generated. Table 7 provides a summary of the QC data by listing the percentage of QC results that were out of limits for each analyte category and QC parameter. Table 8 lists the individual constituents that had out-of-limit method blanks, including the concentration range for method blanks above the detection limit. Table 9 summarizes the out-of-limit results for the other QC parameters. The number of significantly out-of-limit results is also indicated in Tables 8 and 9. Finally, Table 10 lists the constituents, analysis dates, and wells having data associated with the significantly out-of-limit QC results. It should be noted that these tables incorporate all QC data that were reported for the quarter, including QC results for both original and reanalysis data. However, when samples are reanalyzed, only one set of results (i.e., either the original results or the reanalysis results) are retained in HEIS. Thus, it is possible that some of the QC data described in this report may no longer be associated with current results in HEIS.

Some of the more significant findings from the laboratory QC data include the following:

- The relative number of out-of-limit results was similar to the percentage for last quarter.
- Two or more method blank results exceeded the QC limits for conductivity, chloride, fluoride, nitrogen in nitrate, sulfate, aluminum, copper, iron, and methylene chloride.
- For several of the constituents with method blanks that were significantly out of limits (i.e., nitrogen in nitrate, sulfate, aluminum, copper, iron, and 1,2-dichloroethane), a number of Hanford groundwater sample results were less than five times the blank values. Table 10 indicates which wells have data associated with blank results that were significantly out of limits.
- Compared to last quarter, fewer volatile organic compounds had laboratory control sample results that were out of limits. The following constituents had laboratory control sample results that were significantly out of limits: 4-methyl-2-pentanone, acetone, and uranium. Table 10 indicates which wells have data associated with laboratory control sample results that were significantly out of limits.
- Total organic halides, methylene chloride, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,4-dinitrophenol, 2,6-dichlorophenol, 2-secbutyl-4,6-dinitrophenol, 4,6-dinitro-2-methyl phenol, 4-chloro-3-methylphenol, pentachlorophenol, and uranium had matrix spike results that were significantly out of limits. Of these, methylene chloride and all of the phenols also had matrix spike results that were out of limits last quarter. The phenol data that were out of limits were all from the same date (7/29/02). Phenol data were very limited for this quarter.
- Matrix spike duplicates were significantly out of limits for 2-butanone, 4-methyl-2-pentanone, bromomethane, and gross alpha. None of these constituents had matrix spike duplicate results that were also out of limits last quarter.
- Five surrogates had results that were significantly out of limits this quarter; dibromofluoromethane had 5 results in this category.

Project scientists requiring additional information about the laboratory QC data are encouraged to contact Debbie Sklarew or Chris Thompson.

Laboratory QC Data from Eberline Services and Lionville Laboratory. Third quarter QC data from Eberline are limited to gross beta. All of the QC data were within limits. Third quarter QC data from Lionville Laboratory are limited to total organic carbon and cyanide. All of the QC data were within limits; insufficient sample size was available for matrix spike and duplicate analyses for cyanide.

Constituent	Number Out of Limits[a]	Number of Analyses
2-Butanone	1(1)	11
4-Methyl-2-pentanone	1(1)	11
Acetone	2	11
Bromomethane	1(1)	1
Methylene chloride	1	11
Semivolatile Organic Compounds		
2-Methylphenol	1	4
2-Nitrophenol	1	4
4-Methylphenol	1	1
Phenol	1	4
Radiological Parameters		
Gross alpha	3(2)	12
Iodine-129	1	11
Technetium-99	1	15
Uranium	2	13
Surrogates		
Volatile Organic Compounds		
1,2-Dichloroethane-d4	2	183
α,α,α-Trifluorotoluene	2(2)	16
Dibromofluoromethane	6(5)	183
o-Terphenyl	1	14
Toluene-d8	2(1)	183
Semivolatile Organic Compounds		
2,4,6-Tribromophenol	3(3)	22
2-Fluorophenol	2(1)	22

[a] Numbers in parentheses are the number of results that were significantly out of limits as defined in the text.

Table 10. Wells Associated with Laboratory QC Parameters with Significantly Out-of-Limit Results

Constituent	Analysis Date	Wells with Associated Data
Method Blanks		
Conductivity	7/29/02	199-N-28
Chloride	8/13/02	299-E28-8, 299-E33-16, 299-E33-18, 299-E33-26, 299-E33-31, 299-E33-337, 299-E33-339
Nitrogen in Nitrate	9/26/02	299-W22-84, 299-W7-5, 299-W7-7, 299-W8-1, 699-35-70
Sulfate	7/12/02	299-W15-17, 299-W18-23
	7/13/02	199-N-28, 299-E17-1, 299-E28-8
	7/16/02	299-E24-16, 299-E25-17
	7/17/02	299-W18-22, 299-W23-10, 699-2-7, 699-8-17
	7/18/02	299-W6-3, 299-W11-6, 699-2-6A
	8/1/02	699-S30-E10A, 699-S30-E10B, 699-S34-E15
	8/8/02	199-K-29, 199-K-30, 199-K-32A, 199-K-107A, 199-K-110A
	8/16/02	299-W10-4, 299-W11-12, 299-W14-15, 299-W14-16, 299-W14-17, 299-W14-18
	9/4/02	199-F5-45, 699-25-33A, 699-25-34A, 699-26-33, 699-26-34B
	9/21/02	299-E33-28, 299-E33-29, 299-W22-45, 299-W22-46, 299-W22-48, 299-W23-15
	9/26/02	299-W7-5, 299-W7-7, 299-W8-1, 299-W22-84, 699-35-70
Aluminum	8/15/02	199-K-18, 299-E33-43, 299-E33-334, 299-E33-335, 699-42-E9B, 699-87-55
	8/24/02	299-W10-26, 299-W10-27, 299-W14-6, 299-W14-14, 299-W15-15, 299-W15-40, 299-W15-41, 299-W15-763, 299-W15-765, 299-W18-21
	8/26/02	299-E33-9, 299-W18-30, 299-W18-31, 299-W18-40, 299-W19-12, 299-W19-41
	10/28/02	299-W23-19
Copper	7/12/02	299-E25-19, 699-S6-E4A, 699-S32-E13A
	7/24/02	299-E24-16, 299-E25-17, 299-W6-3, 299-W18-22, 699-2-6A, 699-2-7, 699-8-17
	7/30/02	699-12-2C, 699-13-0A, 699-13-1E, 699-13-2D
	8/15/02	199-K-18, 299-E33-43, 299-E33-334, 299-E33-335, 699-42-E9B, 699-87-55
	10/8/02	299-E17-14, 299-W7-4, 299-W14-5, 299-W15-16, 699-24-34B, 699-89-35
Iron	8/15/02	199-K-18, 299-E33-43, 299-E33-334, 299-E33-335, 699-42-E9B, 699-87-55
	8/24/02	299-W10-26, 299-W10-27, 299-W14-6, 299-W14-14, 299-W15-15, 299-W15-40, 299-W15-41, 299-W15-763, 299-W15-765, 299-W18-21
1,2-Dichloroethane	9/5/02	699-25-33A, 699-25-34A, 699-26-33, 699-26-34B
Laboratory Control Samples		
4-Methyl-2-Pentanone	8/6/02	699-S30-E10A, 699-S30-E10B, 699-S31-E10B
Acetone	8/9/02	699-S31-E8A, 699-S34-E10

Constituent	Analysis Date	Wells with Associated Data
Acetone	8/26/02	299-W15-15, 299-W18-21
	9/3/02	699-22-35, 699-23-34A, 699-23-34B, 699-24-33, 699-24-34C, 699-24-35, 699-25-34C, 699-26-35A
	9/4/02	699-25-34D, 699-26-34A, 699-26-35C
Uranium	10/8/02	299-E33-44
Matrix Spikes or Matrix Spike Duplicates		
Total organic halides	10/9/02	299-W7-4
	10/10/02	299-W7-4
Methylene chloride	7/2/02	699-S37-E14, 1199-39-16D
	7/24/02	299-W6-3, 299-W11-6, 299-W18-22, 299-W23-10
	7/29/02	699-S27-E12A, 699-S28-E12, 699-S28-E13A, 699-S29-E10A, 699-S29-E11, 699-S29-E12, 699-S29-E13A
2,4,5-Trichlorophenol	7/29/02	299-E25-19
2,4,6-Trichlorophenol	7/29/02	299-E25-19
2,4-Dinitrophenol	7/29/02	299-E25-19
2,6-Dichlorophenol	7/29/02	299-E25-19
2-secButyl-4,6-dinitrophenol(DNBP)	7/29/02	299-E25-19
4,6-Dinitro-2-methyl phenol	7/29/02	299-E25-19
4-Chloro-3-methylphenol	7/29/02	299-E25-19
Pentachlorophenol	7/29/02	299-E25-19
Uranium	10/8/02	299-E33-44
Duplicates		
2-Butanone	9/4/02	699-24-34A, 699-25-34D, 699-26-34A, 699-26-35C
4-Methyl-2-Pentanone	9/4/02	699-24-34A, 699-25-34D, 699-26-34A, 699-26-35C
Gross alpha	9/13/02	699-13-0A, 699-13-1E, 699-13-2D, 699-S27-E12A, 699-S32-E11
	9/17/02	699-12-2C
	10/3/02	299-E33-41, 299-E33-44
Surrogates		
Dibromofluoromethane	7/24/02	299-W6-3, 299-W11-6, 299-W18-22, 299-W23-10
	9/27/02	299-W7-1, 299-W7-3, 299-W7-5, 299-W7-7, 299-W8-1, 299-W10-14, 299-W10-19, 299-W10-21, 299-W11-14, 699-35-70
	10/3/02	299-W7-4, 299-W15-16, 399-1-17A, 699-24-34B, 699-S31-1
Toluene-d8	7/25/02	699-49-100C
α,α,α-Trifluorotoluene	9/23/02	199-N-3
2,4,6-Tribromophenol	7/29/02	299-E25-19
2-Fluorophenol	7/29/02	299-E25-19

Appendix: Field Blank Definitions

Full Trip Blank (FTB) – A field blank sample that is used to check for sample contamination resulting from sample bottles, preservatives, and sample storage and handling. FTBs are initially prepared in the laboratory by filling a preserved bottle set with Type II reagent water. After the bottles have been sealed, they are transported to the field in the same storage container that will be used for groundwater samples collected that day. FTBs are not removed from the storage container until they have been delivered to the laboratory.

Field Transfer Blank (FXR) – A field blank sample that is used to check for in-the-field sample contamination by volatile organic compounds. FXRs are prepared near a well sampling site by filling preserved VOA sample bottles with Type II reagent water that has been transported to the field. FXRs are normally prepared at the same time VOA samples are being collected from the well. After collection, the FXR bottles are sealed and placed in the same sample storage container as the rest of the samples. FXRs are not removed from the storage container until they have been delivered to the lab.

EB Blank (EB) – A field blank sample that is used to check for sample contamination caused by unclean sampling equipment or the sampling equipment itself. Generally, equipment blanks are only collected at wells that are sampled using non-dedicated pumps. EBs are prepared by passing Type II reagent water through the pump or manifold after the equipment has been decontaminated (sometimes just prior to sampling a well) and collecting the rinsate in preserved bottles. EBs are placed in the same container as other field samples and are not removed from the container until they have been delivered to the lab.