



## U.S. Department of Energy

Grand Junction Office  
2597 B<sup>3</sup>/<sub>4</sub> Road  
Grand Junction, CO 81503

AUG 19 2002

Daniel M. Gillen, Chief  
U.S. Nuclear Regulatory Commission  
Fuel Cycle Licensing Branch  
Division of Fuel Cycle Safety & Safeguards  
Mail Stop T8A33  
Washington, D.C. 20555-0001

Subject: Transmittal of the Update 2002 *Verification Monitoring Report, Riverton, Wyoming, UMTRA Project Site.*

Dear Mr. Gillen:

Enclosed is a copy of the Update 2002 *Verification Monitoring Report, Riverton, Wyoming, UMTRA Project Site* (GJO-2001-255-TAR, issued in September 2001). This update is based on results of the annual ground water and surface water sampling event performed during May 2002.

Analytical results from the 2002 sampling event indicate that concentrations of constituents in ground water in the shallow unconfined aquifer are continuing to decrease as predicted, showing that the natural flushing compliance strategy is effective. Updated figures, along with analytical results from this sampling event, are included in this report.

If you have any questions, please call me at 970/248-7612.

Sincerely,

A handwritten signature in black ink, appearing to read "Donald R. Metzler".

Donald R. Metzler  
Program Manager

Enclosure

cc w/enclosure:  
D. Aragon, WREQC  
J. Erickson, WYDEQ

cc w/o enclosure:  
R. Heydenburg, Stoller  
S. Marutzky, Stoller  
Riverton Library  
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GJO-2002-352-TAC  
GJO-GWRIV 2.0-2



# Verification Monitoring Report for the Riverton, Wyoming, UMTRA Project Site

## Update for 2002

August 2002

Prepared by the  
U.S. Department of Energy  
Grand Junction Office



**UMTRA Ground Water Project**

**Verification Monitoring Report for the  
Riverton, Wyoming, UMTRA Project Site**

**Update for 2002**

August 2002

Prepared by  
U.S. Department of Energy  
Grand Junction Office  
Grand Junction, Colorado

Work Performed Under DOE Contract No. DE-AC13-02GJ79491

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## 1.0 Purpose of Report

The purpose of this report is to provide an update to the *Verification Monitoring Report, Riverton, Wyoming, UMTRA Project Site* issued in September 2001 (DOE 2001). A summary of site conditions and the monitoring program at the Riverton site is provided in the above referenced report. This update is based on results of the annual ground water and surface water sampling event performed at the Riverton site during May 2002.

## 2.0 Results of 2002 Monitoring

Ground water and surface water monitoring locations at the Riverton site are shown on Figure 1. Uranium concentration contours in ground water in the unconfined aquifer, based on the 2002 sampling results, are also shown on Figure 1. Ground water elevations from dataloggers in monitor wells in the unconfined aquifer (RVT-707 and RVT-716) and the semiconfined aquifer (RVT-709), and streamflow plots from the U.S. Geological Survey gaging stations along the Little Wind River and Wind River adjacent to the Riverton site are shown on Figure 2. Time versus concentration plots for uranium and molybdenum in ground water in the unconfined and semiconfined aquifers, and surface water at the Riverton site are shown on Figures 3 through 6. Ground water and surface water quality data by parameter for locations sampled during May 2002 are provided in Appendices A and B.

Results of the monitoring program to date show that concentrations of uranium and molybdenum in ground water in the surficial unconfined aquifer are still above the respective maximum concentration limits (MCL) in the contaminant plume, which is migrating southeastward from the former processing site toward the Little Wind River (Figures 1, 3, and 4). However, concentrations are decreasing as predicted, indicating that natural flushing is occurring in the surficial aquifer. Concentrations of uranium and molybdenum in ground water in the semiconfined aquifer are still significantly below the respective MCLs, indicating no impact of site-related contamination to this unit (Figures 3 and 4).

Contaminated ground water discharges to the Little Wind River, but there is no evidence of impact to surface water quality in the river (Figures 5 and 6). Concentrations of uranium are elevated in surface water in the oxbow lake, which was formed by a shift in the river path in 1994 (Figures 1 and 5). Data indicate that the oxbow lake is recharged by contaminated ground water.

## 3.0 Conclusions

Uranium and molybdenum are the indicator constituents for compliance monitoring at the Riverton site (DOE 1998). While concentrations of both uranium and molybdenum in ground water in the shallow unconfined aquifer are still above their respective MCLs, levels are generally decreasing, indicating that natural flushing is occurring in the aquifer. Surface water in the oxbow lake has been impacted by the site as it is recharged by shallow ground water from the contaminant plume. Concentrations of uranium in surface water are decreasing as concentrations in ground water continue to decrease.

Comparison of concentrations of uranium and molybdenum in ground water in the unconfined aquifer predicted by probabilistic hydrogeologic modeling, versus actual concentrations determined by analysis of samples from monitor well RVT-707, are shown in Figures 7 and 8, respectively.

Verification monitoring of ground water and surface water from designated locations will continue on an annual basis for another 2 years (through May 2004) as specified in the Ground Water Compliance Action Plan (DOE 1998). At the end of this period a Confirmation Report will be compiled and the site will be transferred to the Long-Term Surveillance and Maintenance Group for long-term management.

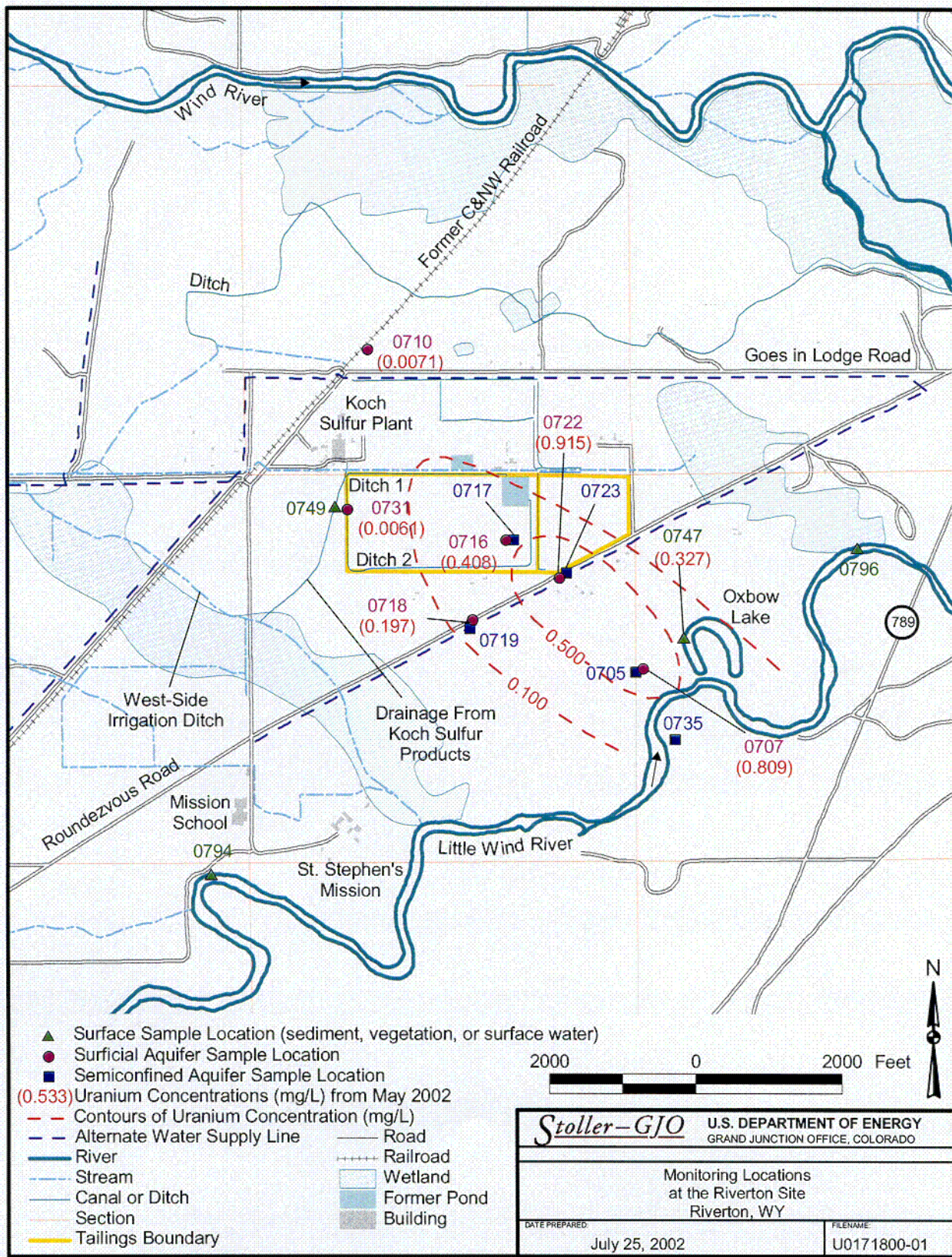
#### 4.0 References

U.S. Department of Energy (DOE), 1998. *Final Ground Water Compliance Action Plan for the Riverton, Wyoming, Title I UMTRA Project Site*, attached to letter from DOE to NRC of September 22, 1998.

\_\_\_\_\_, 2001. *Verification Monitoring Report, Riverton, Wyoming, UMTRA Project Site*, GJO-2001-255-TAR, September.

\_\_\_\_\_, 2002. *Data Validation for the Riverton, Wyoming UMTRA Site*, August.





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Figure 1. Monitoring Locations at the Riverton Site

001



### Ground Water Elevations and Streamflow at the Riverton Site

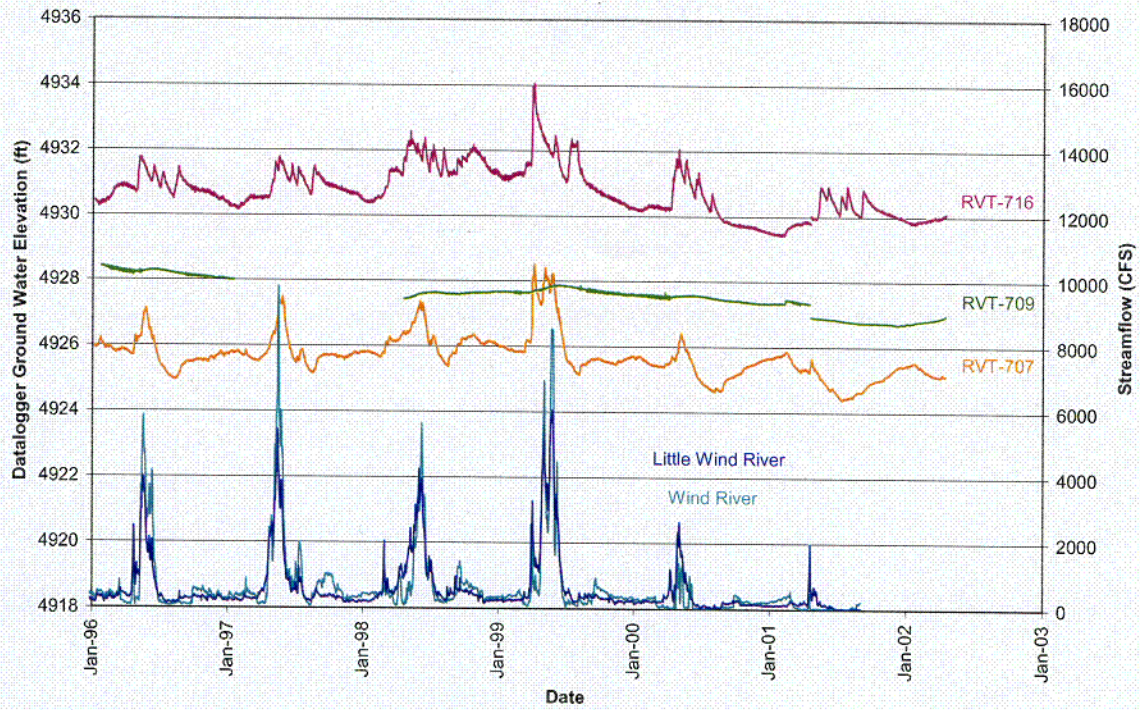
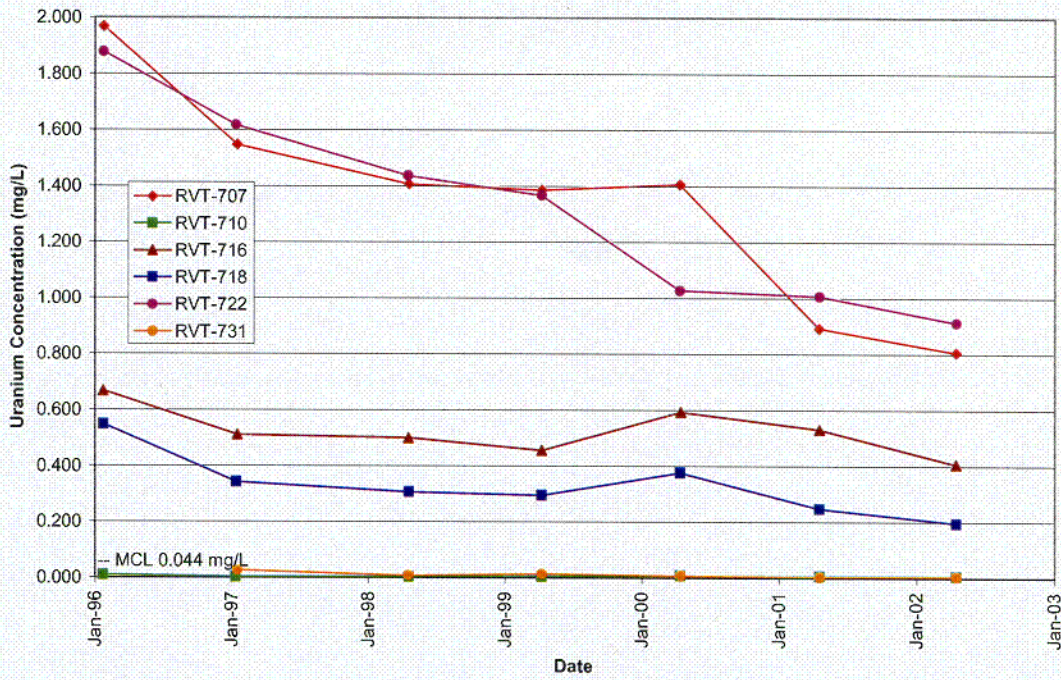


Figure 2. Ground Water Elevations and Streamflow at the Riverton Site

C02



**Uranium Concentrations in Ground Water  
in the Unconfined Aquifer at the Riverton Site**



**Uranium Concentrations in Ground Water  
in the Semiconfined Aquifer at the Riverton Site**

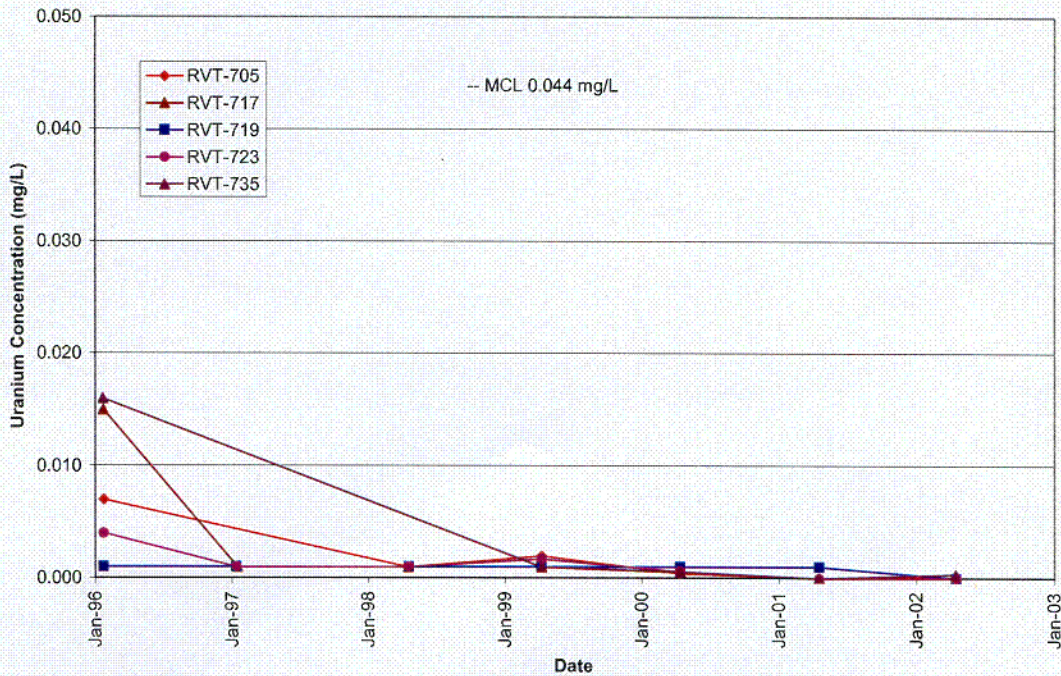
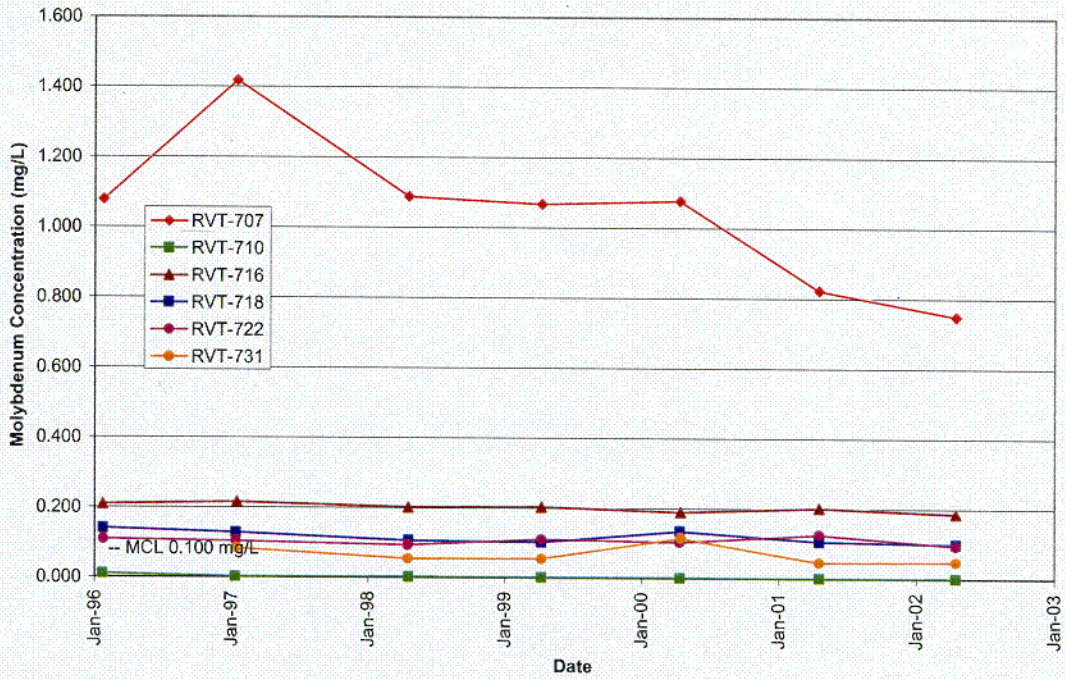


Figure 3. Uranium Concentrations in Ground Water at the Riverton Site

C03



Molybdenum Concentrations in Ground Water  
in the Unconfined Aquifer at the Riverton Site



Molybdenum Concentrations in Ground Water  
in the Semiconfined Aquifer at the Riverton Site

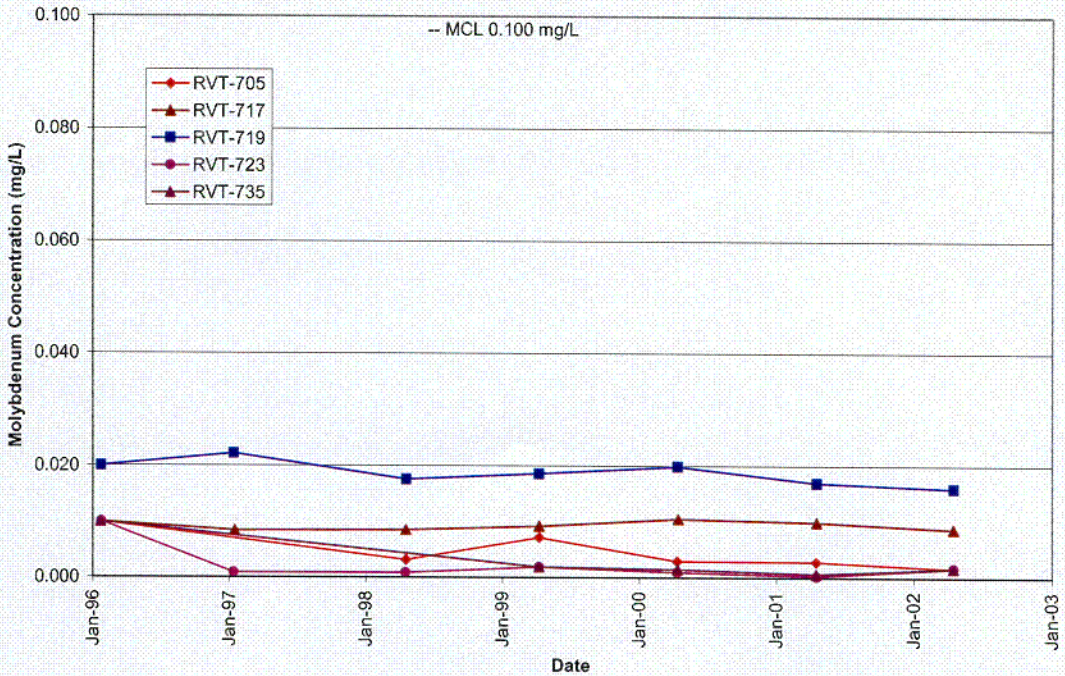


Figure 4. Molybdenum Concentrations in Ground Water at the Riverton Site

CO4



**Uranium Concentrations in Surface Water near the Riverton Site**

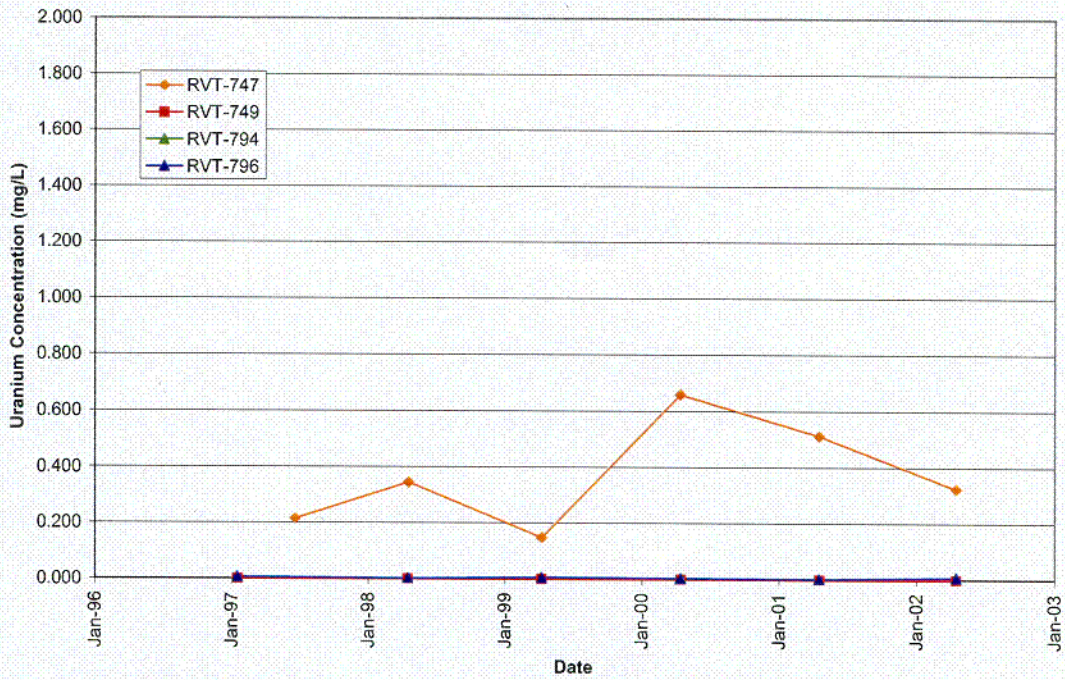


Figure 5. Uranium Concentrations in Surface Water Near the Riverton Site

**Molybdenum Concentrations in Surface Water near the Riverton Site**

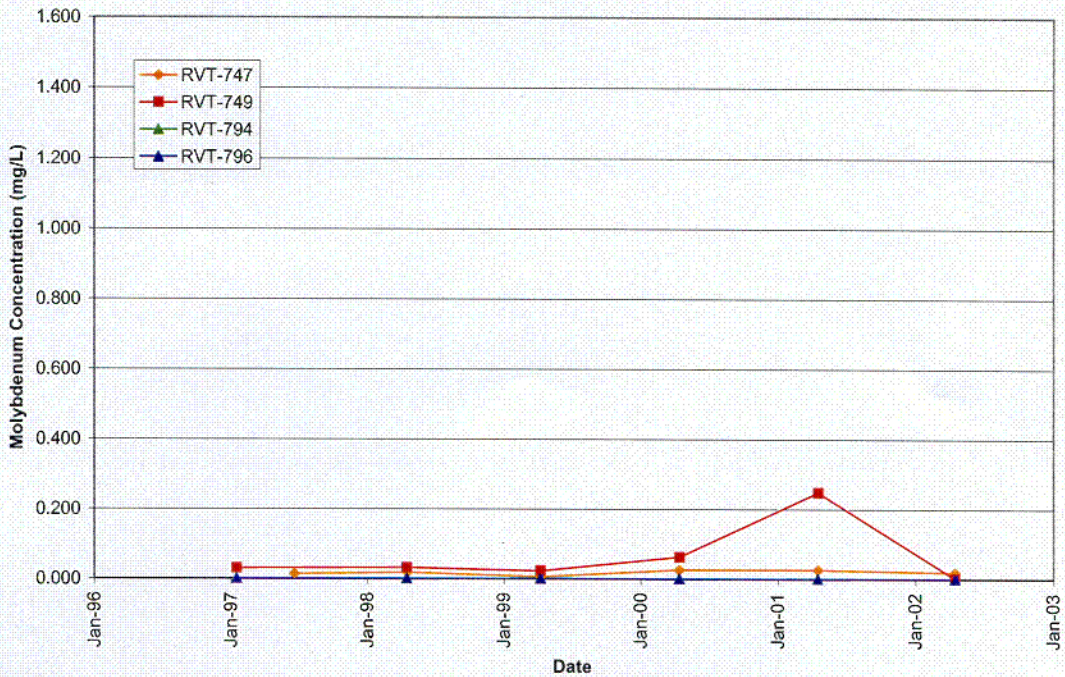


Figure 6. Molybdenum Concentrations in Surface Water Near the Riverton Site

C05



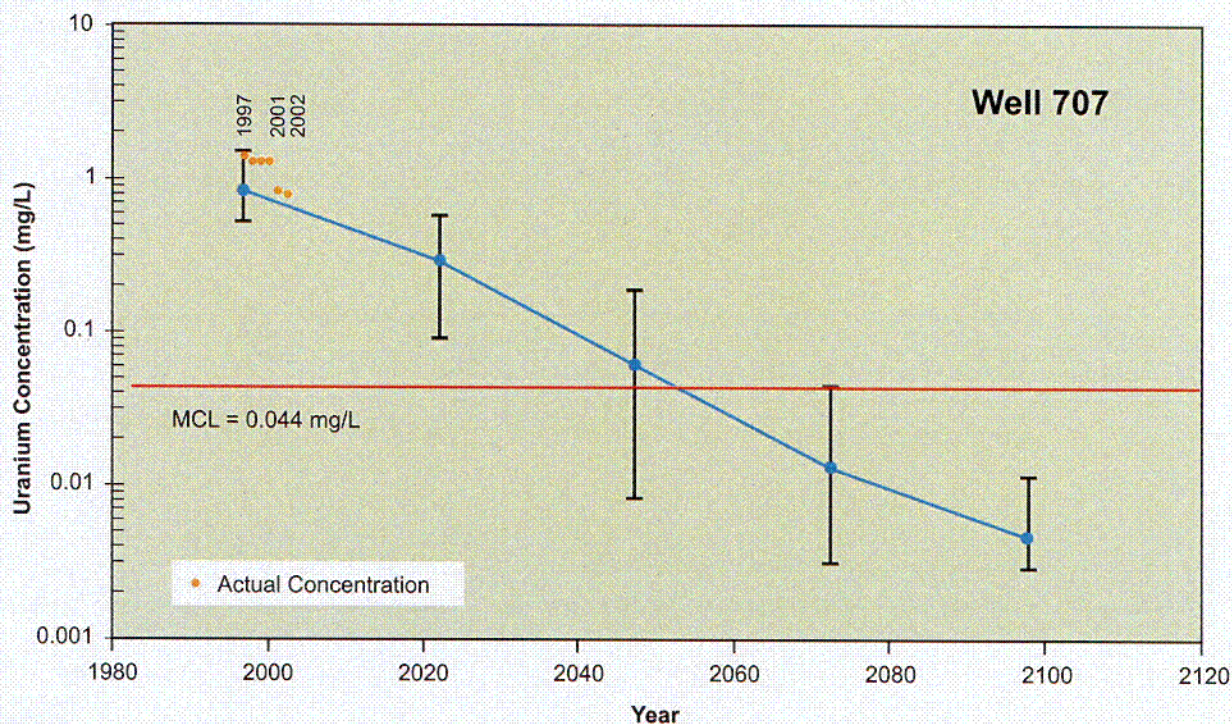


Figure 7. Predicted versus Actual Uranium Concentrations in Ground Water at the Riverton Site

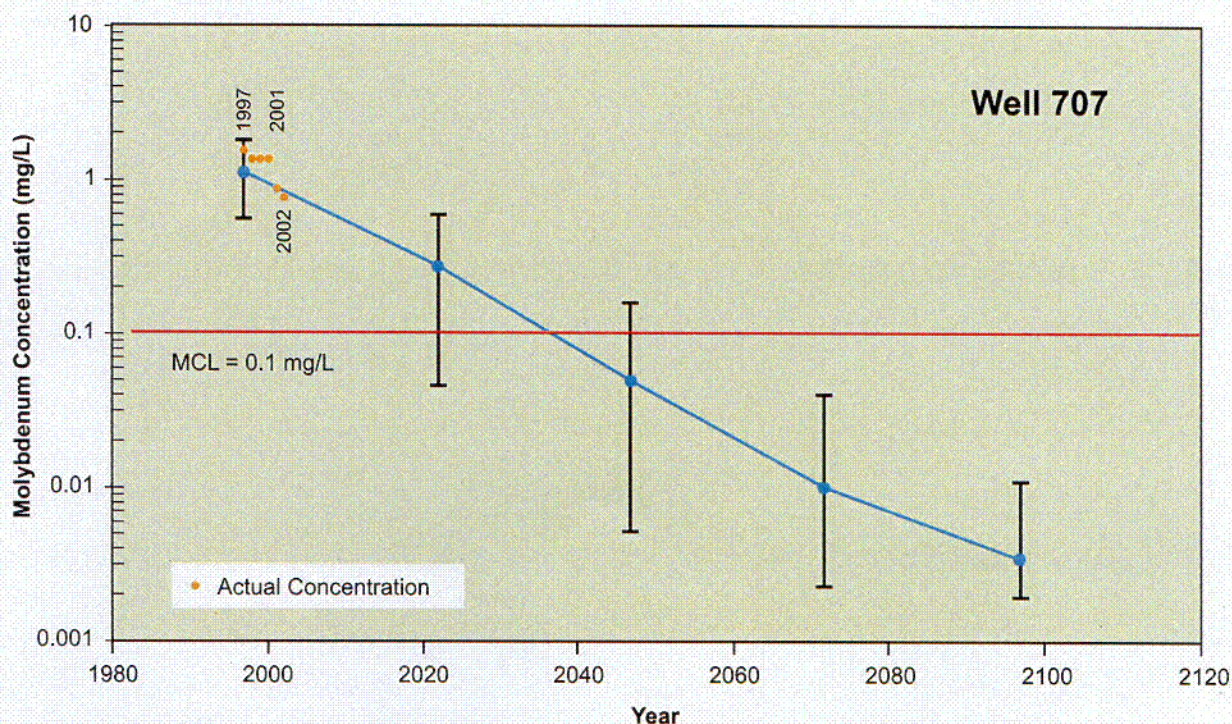


Figure 8. Predicted versus Actual Molybdenum Concentrations in Ground Water at the Riverton Site

CO6



**Appendix A**

**Ground Water Quality Data by Parameter**

GROUND WATER QUALITY DATA BY PARAMETER (USEE200) FOR SITE RVT01, RIVERTON  
 REPORT DATE: 6/25/2002 12:42

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Arsenic	mg/L	0705	05/14/2002	0001	SE	D	0.00014	B	0.0001	-
	mg/L	0707	05/14/2002	0001	SF	D	0.0012	B	0.0001	-
	mg/L	0710	05/14/2002	0001	SF	U	0.0018	B	0.0001	-
	mg/L	0716	05/14/2002	0001	SF	O	0.00054	B	0.0001	-
	mg/L	0717	05/14/2002	0001	SE	O	0.0012	B	0.0001	-
	mg/L	0718	05/15/2002	0001	SF	D	0.00062	B	0.0001	-
	mg/L	0719	05/15/2002	0001	SE	D	0.0017	B	0.0001	-
	mg/L	0722	05/15/2002	0001	SF	D	0.0001	U	0.0001	-
	mg/L	0723	05/15/2002	0001	SE	D	0.00066	B	0.0001	-
	mg/L	0731	05/15/2002	0001	SF	U	0.0158		0.0001	-
	mg/L	0731	05/15/2002	0002	SF	U	0.0169		0.0001	-
	mg/L	0735	05/14/2002	0001	SE	D	0.00066	B	0.0001	-
	Manganese	mg/L	0705	05/14/2002	0001	SE	D	0.0018	B	0.0001
mg/L		0707	05/14/2002	0001	SF	D	1.900		0.0001	-
mg/L		0710	05/14/2002	0001	SF	U	0.00023	B	0.0001	-
mg/L		0716	05/14/2002	0001	SF	O	0.577		0.0001	-
mg/L		0717	05/14/2002	0001	SE	O	0.202		0.0001	-
mg/L		0718	05/15/2002	0001	SF	D	1.620		0.0001	-
mg/L		0719	05/15/2002	0001	SE	D	0.0655		0.0001	-
mg/L		0722	05/15/2002	0001	SF	D	0.708		0.0001	-
mg/L		0723	05/15/2002	0001	SE	D	0.691		0.0001	-
mg/L		0731	05/15/2002	0001	SF	U	0.0028	B	0.0001	-
mg/L		0731	05/15/2002	0002	SF	U	0.0029	B	0.0001	-
mg/L		0735	05/14/2002	0001	SE	D	0.0267		0.0001	-
Molybdenum		mg/L	0705	05/14/2002	0001	SE	D	0.0018	U	0.0018
	mg/L	0707	05/14/2002	0001	SF	D	0.751		0.0018	-
	mg/L	0710	05/14/2002	0001	SF	U	0.0018	U	0.0018	-



GROUND WATER QUALITY DATA BY PARAMETER (USEE200) FOR SITE RVT01, RIVERTON  
 REPORT DATE: 6/25/2002 12 42

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Molybdenum	mg/L	0716	05/14/2002	0001	SF	O	0.187		0.0018	-
	mg/L	0717	05/14/2002	0001	SE	O	0.0088	B	0.0018	-
	mg/L	0718	05/15/2002	0001	SF	D	0.0998		0.0018	-
	mg/L	0719	05/15/2002	0001	SE	D	0.0161		0.0018	-
	mg/L	0722	05/15/2002	0001	SF	D	0.0955		0.0018	-
	mg/L	0723	05/15/2002	0001	SE	D	0.0018	U	0.0018	-
	mg/L	0731	05/15/2002	0001	SF	U	0.0499		0.0018	-
	mg/L	0731	05/15/2002	0002	SF	U	0.0517		0.0018	-
	mg/L	0735	05/14/2002	0001	SE	D	0.0018	U	0.0018	-
Nickel	mg/L	0705	05/14/2002	0001	SE	D	0.0017	B	0.0008	-
	mg/L	0707	05/14/2002	0001	SF	D	0.039	B	0.0008	-
	mg/L	0710	05/14/2002	0001	SF	U	0.0008	U	0.0008	-
	mg/L	0716	05/14/2002	0001	SF	O	0.007	B	0.0008	-
	mg/L	0717	05/14/2002	0001	SE	O	0.0008	U	0.0008	-
	mg/L	0718	05/15/2002	0001	SF	D	0.0254	B	0.0008	-
	mg/L	0719	05/15/2002	0001	SE	D	0.0008	U	0.0008	-
	mg/L	0722	05/15/2002	0001	SF	D	0.0082	B	0.0008	-
	mg/L	0723	05/15/2002	0001	SE	D	0.0008	U	0.0008	-
	mg/L	0731	05/15/2002	0001	SF	U	0.0063	B	0.0008	-
	mg/L	0731	05/15/2002	0002	SF	U	0.0073	B	0.0008	-
	mg/L	0735	05/14/2002	0001	SE	D	0.0008	U	0.0008	-
Sulfate	mg/L	0705	05/14/2002	0001	SE	D	435.000		0.394	-
	mg/L	0707	05/14/2002	0001	SF	D	2560.000		1.97	-
	mg/L	0710	05/14/2002	0001	SF	U	199.000		0.197	-
	mg/L	0716	05/14/2002	0001	SF	O	685.000		0.394	-
	mg/L	0717	05/14/2002	0001	SE	O	742.000		0.788	-
	mg/L	0718	05/15/2002	0001	SF	D	2140.000		1.97	-

GROUND WATER QUALITY DATA BY PARAMETER (USEE200) FOR SITE RVT01, RIVERTON  
 REPORT DATE: 6/25/2002 12 42

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Sulfate	mg/L	0719	05/15/2002	0001	SE	D	412.000		0.394	-
	mg/L	0722	05/15/2002	0001	SF	D	1220.000		0.788	-
	mg/L	0723	05/15/2002	0001	SE	D	1910.000		0.788	-
	mg/L	0731	05/15/2002	0001	SF	U	1260.000		0.788	-
	mg/L	0731	05/15/2002	0002	SF	U	1280.000		1.97	-
	mg/L	0735	05/14/2002	0001	SE	D	552.000		0.394	-
Uranium	mg/L	0705	05/14/2002	0001	SE	D	0.0001	U	0.0001	-
	mg/L	0707	05/14/2002	0001	SF	D	0.809		0.0001	-
	mg/L	0710	05/14/2002	0001	SF	U	0.0071	B	0.0001	-
	mg/L	0716	05/14/2002	0001	SF	O	0.408		0.0001	-
	mg/L	0717	05/14/2002	0001	SE	O	0.0001	U	0.0001	-
	mg/L	0718	05/15/2002	0001	SF	D	0.197		0.0001	-
	mg/L	0719	05/15/2002	0001	SE	D	0.0002	B	0.0001	-
	mg/L	0722	05/15/2002	0001	SF	D	0.915		0.0001	-
	mg/L	0723	05/15/2002	0001	SE	D	0.0001	U	0.0001	-
	mg/L	0731	05/15/2002	0001	SF	U	0.0061	B	0.0001	-
	mg/L	0731	05/15/2002	0002	SF	U	0.0062	B	0.0001	-
	mg/L	0735	05/14/2002	0001	SE	D	0.00038	B	0.0001	-

GROUND WATER QUALITY DATA BY PARAMETER (USEE200) FOR SITE RVT01, RIVERTON  
 REPORT DATE: 6/25/2002 12.42

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
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RECORDS: SELECTED FROM USEE200 WHERE site\_code='RVT01' AND location\_code in('0705','0707','0710','0716','0717','0718','0719','0722','0723','0731','0735') AND (NOT (data\_validation\_qualifiers LIKE "R" OR data\_validation\_qualifiers LIKE "X" ) OR IsNull(data\_validation\_qualifiers)) AND cas in('07440-38-2','PB-210','07439-96-5','07439-98-7','07440-02-0','PO-210','SULFATE','TH-230','07440-61-1','07440-62-2') AND DATE\_SAMPLED between #1/1/2002# and #12/31/2002#

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

- \* Replicate analysis not within control limits.
- + Correlation coefficient for MSA < 0.995
- A TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- H Holding time expired, value suspect
- I Increased detection limit due to required dilution.
- C Pesticide result confirmed by GC-MS.
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- D Analyte determined in diluted sample
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative.
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative
- > Result above upper detection limit.
- J Estimated

DATA QUALIFIERS:

- J Estimated value.
- L Less than 3 bore volumes purged prior to sampling
- U Parameter analyzed for but was not detected.
- F Low flow sampling method used
- R Unusable result.
- G Possible grout contamination, pH > 9.
- X Location is undefined.

QA QUALIFIER: # = validated according to Quality Assurance guidelines.



**Appendix B**

**Surface Water Quality Data by Parameter**

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE RVT01, RIVERTON  
 REPORT DATE: 6/25/2002 1:17 pm

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	ID	RESULT	QUALIFIERS LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Arsenic	mg/L	0747	05/14/2002	0001	0.0008	B	0.0001	-
	mg/L	0749	05/15/2002	0001	0.0018	B	0.0001	-
	mg/L	0794	05/14/2002	0001	0.0008	B	0.0001	-
	mg/L	0796	05/15/2002	0001	0.0007	B	0.0001	-
	mg/L	0796	05/15/2002	0002	0.0007	B	0.0001	-
Manganese	mg/L	0747	05/14/2002	0001	0.411		0.0001	-
	mg/L	0749	05/15/2002	0001	0.0326		0.0001	-
	mg/L	0794	05/14/2002	0001	0.0394		0.0001	-
	mg/L	0796	05/15/2002	0001	0.0392		0.0001	-
	mg/L	0796	05/15/2002	0002	0.039		0.0001	-
Molybdenum	mg/L	0747	05/14/2002	0001	0.021		0.0018	-
	mg/L	0749	05/15/2002	0001	0.0035	B	0.0018	-
	mg/L	0794	05/14/2002	0001	0.0018	U	0.0018	-
	mg/L	0796	05/15/2002	0001	0.0018	U	0.0018	-
	mg/L	0796	05/15/2002	0002	0.0018	U	0.0018	-
Nickel	mg/L	0747	05/14/2002	0001	0.0036	B	0.0008	-
	mg/L	0749	05/15/2002	0001	0.0091	B	0.0008	-
	mg/L	0794	05/14/2002	0001	0.0008	U	0.0008	-
	mg/L	0796	05/15/2002	0001	0.0008	B	0.0008	-
	mg/L	0796	05/15/2002	0002	0.0019	B	0.0008	-
Sulfate	mg/L	0747	05/14/2002	0001	664.000		0.394	-
	mg/L	0749	05/15/2002	0001	1670.000		1.97	-
	mg/L	0794	05/14/2002	0001	468.000		0.394	-
	mg/L	0796	05/15/2002	0001	420.000		0.394	-
	mg/L	0796	05/15/2002	0002	421.000		0.394	-
Uranium	mg/L	0747	05/14/2002	0001	0.327		0.0001	-
	mg/L	0749	05/15/2002	0001	0.0001	U	0.0001	-
	mg/L	0794	05/14/2002	0001	0.0092	B	0.0001	-
	mg/L	0796	05/15/2002	0001	0.0088	B	0.0001	-
	mg/L	0796	05/15/2002	0002	0.0089	B	0.0001	-

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE RVT01, RIVERTON  
 REPORT DATE: 6/25/2002 1.17 pm

PARAMETER	UNITS	LOCATION ID	SAMPLE: DATE	DATE	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
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RECORDS. SELECTED FROM USEE800 WHERE site\_code='RVT01' AND location\_code in('0747','0749','0794','0796') AND (NOT (data\_validation\_qualifiers LIKE 'R' OR data\_validation\_qualifiers LIKE 'X') OR IsNull(data\_validation\_qualifiers)) AND cas in('07440-38-2','PB-210','07439-96-5','07439-98-7','07440-02-0','PO-210','SULFATE','TH-230','07440-61-1','07440-62-2') AND DATE\_SAMPLED between #1/1/2002# and #12/31/2002#

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample X = replicate number

LAB QUALIFIERS

- \* Replicate analysis not within control limits
- + Correlation coefficient for MSA < 0.995
- A TIC is a suspected aldol-condensation product
- B Inorganic: Result is between the IDL and CRDL Organic: Analyte also found in method blank.
- E Inorganic: Estimate value because of interference, see case narrative Organic Analyte exceeded calibration range of the GC-MS.
- Z Laboratory defined (USEPA CLP organic) qualifier, see case narrative
- H Holding time expired, value suspect
- I Increased detection limit due to required dilution
- C Pesticide result confirmed by GC-MS
- M GFAA duplicate injection precision not met.
- N Inorganic or radiochemical Spike sample recovery not within control limits Organic: Tentatively identified compound (TIC)
- S Result determined by method of standard addition (MSA).
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance
- D Analyte determined in diluted sample
- P > 25% difference in detected pesticide or Arochlor concentrations between 2 columns.
- X Laboratory defined (USEPA CLP organic) qualifier, see case narrative
- Y Laboratory defined (USEPA CLP organic) qualifier, see case narrative
- > Result above upper detection limit
- J Estimated

DATA QUALIFIERS

- J Estimated value
- G Possible grout contamination, pH > 9
- R Unusable result
- U Parameter analyzed for but was not detected.
- F Low flow sampling method used
- L Less than 3 bore volumes purged prior to sampling
- X Location is undefined

QA QUALIFIER. # = validated according to Quality Assurance guidelines