

# Verification Monitoring Report for the Riverton, Wyoming, Processing Site

## Update for 2011

April 2012



U.S. DEPARTMENT OF  
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## Abbreviations

AWSS	alternate water supply system
cfs	cubic feet per second
COPC	constituent of potential concern
DOE	U.S. Department of Energy
ft	foot
IC	institutional control
LTMP	<i>Long-Term Management Plan for the Riverton, Wyoming, Processing Site</i>
MCL	maximum concentration limit
mg/L	milligrams per liter
pCi/L	picocuries per liter

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## 1.0 Introduction

The compliance strategy for the Riverton, Wyoming, Processing Site (Riverton site) is natural flushing in conjunction with institutional controls (ICs) and continued monitoring (DOE 1998a). Monitoring during the natural flushing period is referred to as verification monitoring because the purpose of the monitoring is to verify that the natural flushing strategy is progressing as predicted, and to verify that ICs are in place and functioning as intended. Data collected during verification monitoring are reported annually in a Verification Monitoring Report. These reports have been issued annually since 2001 (DOE 2001, 2002, 2003, 2005, 2006, 2007, 2008, 2009a, 2010, 2011). The monitoring program at the Riverton site is specified in the *Long-Term Management Plan for the Riverton, Wyoming, Processing Site* (LTMP) (DOE 2009b).

The purpose of this report is to present data collected during calendar year 2011, to summarize site conditions, to evaluate monitoring data collected to date, and to provide an annual update on the progress of the natural flushing compliance strategy. Data from 2011 were generated from two routine groundwater and surface water sampling events conducted at the Riverton site during June and November.

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## 2.0 Site Conditions

### 2.1 Hydrogeology

The Riverton site is located on an alluvial terrace between the Wind River and the Little Wind River approximately 2.3 miles southwest of the town of Riverton, Wyoming (Figure 1).

Groundwater is in three aquifers beneath the site: (1) a surficial unconfined aquifer (surficial aquifer), (2) a middle semiconfined aquifer, and (3) a deeper confined aquifer (DOE 1998b). The surficial aquifer consists of approximately 15 to 20 feet (ft) of unconsolidated alluvial material; the semiconfined and confined aquifers are composed of shales and sandstones of the upper units of the Eocene Wind River Formation, which is over 500 ft thick in the vicinity of the site. Depth to groundwater in the surficial aquifer is generally less than 10 ft below ground surface. For compliance purposes, the surficial aquifer and semiconfined aquifer comprise the uppermost aquifer, which is the aquifer where compliance with groundwater standards is assessed. Groundwater in the uppermost aquifer flows to the southeast.

### 2.2 Water Quality

Shallow groundwater beneath and downgradient from the site was contaminated as a result of uranium-processing activities from 1958 through 1963 (DOE 1998b). Constituents of potential concern (COPCs) in the groundwater beneath the Riverton site are manganese, molybdenum, sulfate, and uranium. COPCs were selected using a screening process that compared constituent concentrations with the maximum concentration limits (MCLs) in Title 40 *Code of Federal Regulations* Part 192, as appropriate, and evaluated potential human health risks and ecological risks. (Note: The MCLs discussed in this document should not be confused with the maximum contaminant levels that the U.S. Environmental Protection Agency sets as drinking water standards.) The COPC-selection process is detailed in the *Environmental Assessment of Ground Water Compliance at the Riverton, Wyoming, Uranium Mill Tailings Site* (DOE 1998c).

Molybdenum and uranium were selected as indicator constituents for compliance monitoring in the *Final Ground Water Compliance Action Plan for the Riverton, Wyoming, Title I UMTRA Project Site* (DOE 1998a). These constituents were selected as indicator constituents because they are the most widely distributed and because they form significant aqueous plumes in the uppermost aquifer in the vicinity of the site. The MCLs for molybdenum and uranium are 0.10 milligram per liter (mg/L) and 30 picocuries per liter (pCi/L), respectively.

Note: In order to provide a consistent comparison with historical data, uranium concentrations continue to be measured in mg/L; therefore, the uranium standard referenced in this report has been converted from 30 pCi/L to 0.044 mg/L (which assumes secular equilibrium of uranium isotopes) to allow direct comparison of uranium data to the standard.

### 2.3 Surface Remediation Activities

Uranium mill tailings and other contaminated materials were removed from the Riverton site during 1988 and 1989, and encapsulated at the Gas Hills East, Wyoming, Disposal Site (Figure 1.). About 1.8 million cubic yards of tailings and associated materials were removed from the site for disposal (DOE 1998b). Soils at and below the water table with elevated thorium-230 concentrations were left in place on portions of the former millsite by applying supplemental standards. An easement and covenant to restrict land use on the former millsite is in place to prevent exposure to and disturbance of the supplemental-standard areas.

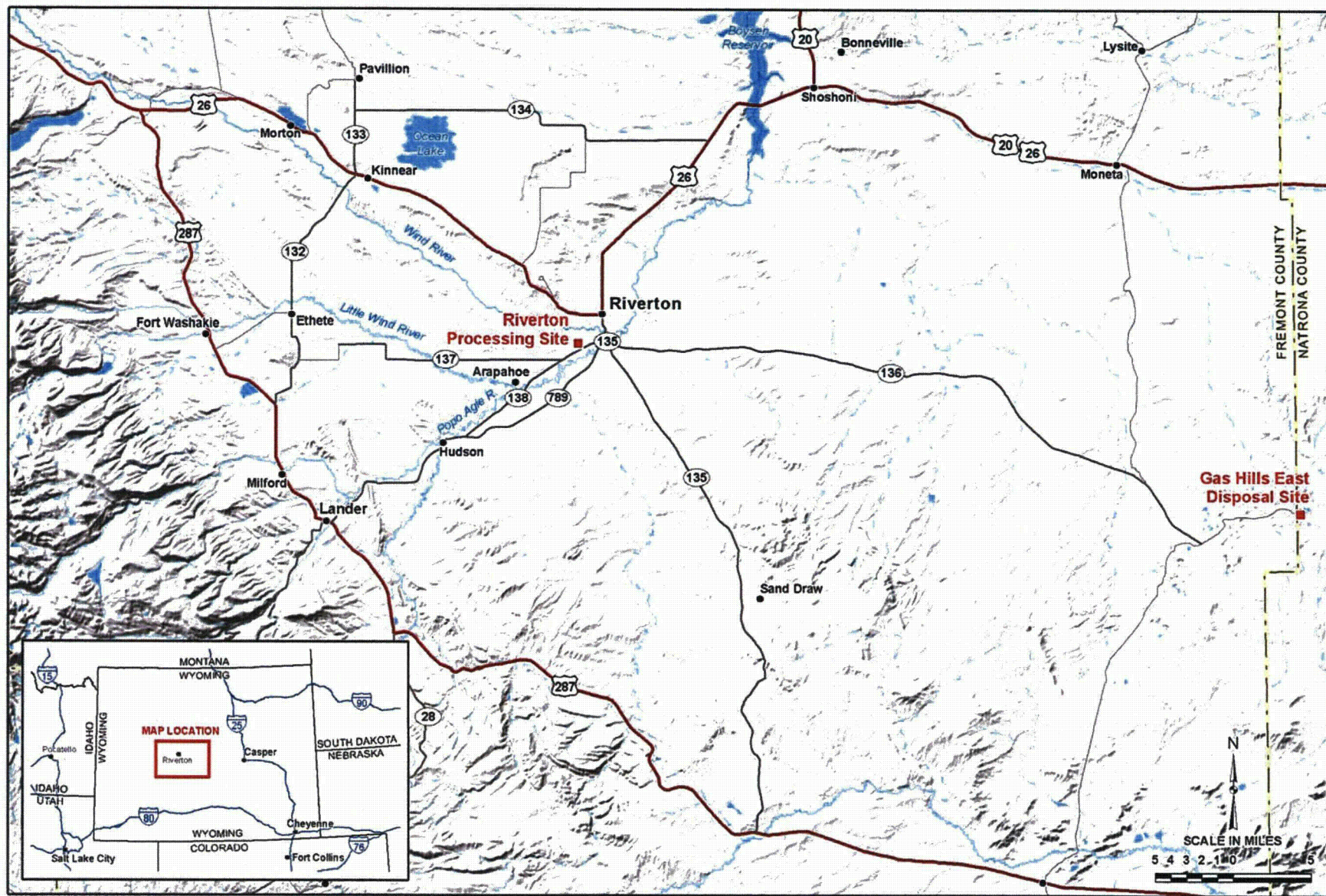


Figure 1. Site Location Map



## 2.4 Institutional Controls

To protect human health and the environment during the natural flushing period, ICs are required to control exposure to contaminated groundwater. An IC boundary has been established at the Riverton site (Figure 2), delineating the area that requires protection. The IC boundary was set to encompass the area of current groundwater contamination and a surrounding buffer zone to account for potential future plume migration.

### 2.4.1 Site Institutional Controls

Although all components have not been finalized, cooperative efforts among the U.S. Department of Energy (DOE), the Northern Arapaho and Eastern Shoshone Tribes, and the State of Wyoming continue in order to obtain viable and enforceable ICs at the Riverton site. ICs in place prior to 2011 include the following components:

- An alternate water supply system (AWSS), funded by DOE and operated by the Northern Arapaho Utility Organization, supplies potable water to residents within the IC boundary to minimize use of groundwater.
- Warning signs installed around the oxbow lake (Figure 2) explain that the contaminated water is not safe for human consumption, with instructions not to drink from, fish in, or swim in the lake.
- A Tribal Ordinance places restrictions on well installation, prohibits surface impoundments, authorizes access to inspect and sample new wells, and provides notification to drilling contractors with tribal permits of the groundwater contamination within the IC boundary. Restrictions on well installation include a minimum depth of 150 ft below ground surface (approximately 50 ft below the top of the confined aquifer) and installation of surface casing through the contaminated upper aquifer.
- DOE notified area drilling contractors of existing groundwater contamination.
- A State of Wyoming Department of Environmental Quality notification of existing groundwater contamination will be provided to persons on privately owned land who apply for a gravel pit permit within the IC boundary.
- A Bureau of Indian Affairs notification of existing groundwater contamination will be provided to persons on tribal land applying for a surface impoundment within and adjacent to the IC boundary.
- The State of Wyoming State Engineer's Office will inform DOE when permit applications are received for wells or surface impoundments within or adjacent to the IC boundary, provide DOE with a copy of the application (so that DOE may comment on it), and incorporate DOE's comments on the permit, if approved.
- An easement and covenant to restrict land use and well drilling on the former millsite property was finalized on June 29, 2009, and the former millsite was purchased by Chemtrade Refinery Services Inc.

Other ICs that are in progress, but not finalized, include the following:

- A Bureau of Indian Affairs–provided notification of existing groundwater contamination will be provided to all residents on tribal land within and adjacent to the IC boundary.
- A notification of existing groundwater contamination will be provided to fee-land property owners within the IC boundary every 5 years.

#### **2.4.2 Institutional Control Monitoring**

The LTMP specifies ongoing IC monitoring to verify that ICs are in place and working, in order to ensure that potential exposure to contaminated groundwater is minimized during the natural flushing period. IC monitoring consists of two components: sampling, and land and water use verification. The sampling component consists of sampling of domestic wells and the AWSS. The land and water use verification consists of periodic inspection of lands within the IC boundary to verify and document that no additional land or water uses expose or involve shallow groundwater, such as new wells, gravel pits, and recreational ponds.

All domestic wells used as a potable water source within the IC boundary were sampled during June and November in 2011, and results are presented in Section 4.2 and Appendix C.

The Northern Arapaho Utility Organization is responsible for ensuring that the quality, safety, and quantity of the water in the AWSS are adequate. The Northern Arapaho Utility Organization is also required to maintain compliance with U.S. Environmental Protection Agency standards that regulate community water systems. To assist in this effort and to maintain the AWSS as a viable IC, a cooperative agreement with the Northern Arapaho Tribe was initiated to ensure cooperative efforts and funding for ongoing maintenance, flushing, sampling, and capital improvements on the AWSS.

Sampling crews inspected areas within the IC boundary during each semiannual sampling event and found no evidence of new land or water use that would expose groundwater. A damaged warning sign around the oxbow lake was noted during the June sampling event and replaced during the November sampling event.



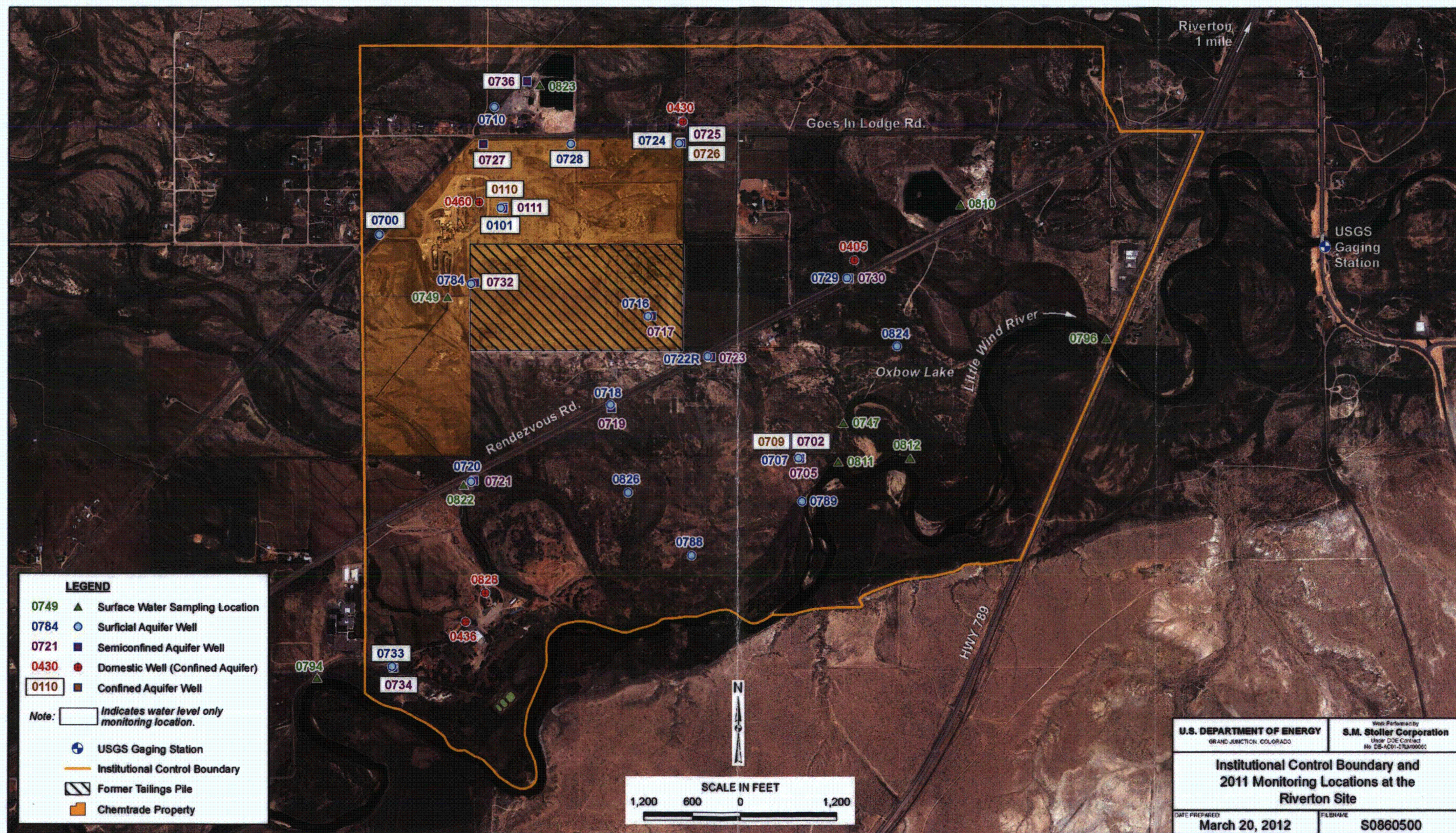


Figure 2. Institutional Control Boundary and 2011 Monitoring Locations at the Riverton Site



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### 3.0 Monitoring Program

The monitoring program for 2011 consisted of 18 monitoring wells, 5 domestic wells, and 9 surface water locations, which are listed in Table 1. and shown in Figure 2. Water levels were measured at 15 additional monitoring wells. Sampling events were conducted in June and November. Samples were analyzed for manganese, molybdenum, sulfate, and uranium, and field measurements of temperature, pH, specific conductance, oxidation-reduction potential, dissolved oxygen, alkalinity, and turbidity were measured at each sampling location.

Table 1. 2011 Sampling Network at the Riverton Site

Location ID	Description	Sampling Event	Rationale
<b>DOE Monitoring Wells</b>			
0705	Semiconfined aquifer	June, November	Monitor semiconfined aquifer
0707	Surficial aquifer	June, November	Monitor centroid of plume
0710	Surficial aquifer	June, November	Background location
0716	Surficial aquifer	June, November	Monitor upgradient portion of plume
0717	Semiconfined aquifer	June, November	Monitor semiconfined aquifer
0718	Surficial aquifer	June, November	Monitor lateral plume movement
0719	Semiconfined aquifer	June, November	Monitor semiconfined aquifer
0720	Surficial aquifer	June, November	Monitor lateral plume movement
0721	Semiconfined aquifer	June, November	Monitor semiconfined aquifer
0722R	Surficial aquifer	June, November	Monitor centroid of plume
0723	Semiconfined aquifer	June, November	Monitor semiconfined aquifer
0729	Surficial aquifer	June, November	Monitor lateral plume movement
0730	Semiconfined aquifer	June, November	Monitor semiconfined aquifer
0784	Surficial aquifer	June, November	Monitor lateral plume movement
0788	Surficial aquifer	June, November	Monitor lateral plume movement
0789	Surficial aquifer	June, November	Monitor centroid of plume
0824	Surficial aquifer	June, November	Monitor lateral plume movement
0826	Surficial aquifer	June, November	Monitor lateral plume movement
<b>Domestic Wells<sup>a</sup></b>			
0405	Private residence	June, November	Potential point of exposure
0430	Private residence	June, November	Potential point of exposure
0436	St Stephens Mission	June, November	Potential point of exposure
0460	Chemtrade Refinery	June, November	Potential point of exposure
0828	St. Stephens Mission	June, November	Potential point of exposure
<b>Surface Water</b>			
0747	Oxbow lake	June, November	Impacted by groundwater discharge
0749	Chemtrade discharge ditch	June, November	Effluent from acid plant
0794	Little Wind River	June, November	Upstream of predicted plume discharge
0796	Little Wind River	June, November	Downstream of predicted plume discharge
0810	Pond—former gravel pit	June, November	Potential for impact—within IC boundary
0811	Little Wind River	June, November	Within area of predicted plume discharge
0812	Little Wind River	June, November	Within area of predicted plume discharge
0822	West side irrigation ditch	June, November	Potential for impact—within IC boundary
0823	Pond—former gravel pit	June, November	Upgradient of plume—within IC area

<sup>a</sup>All domestic wells are completed in the confined aquifer.

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## 4.0 Results of 2011 Monitoring

### 4.1 Groundwater

#### 4.1.1 Groundwater Flow

Water levels were measured at all wells in the monitoring network in June and November in order to verify groundwater flow direction and to assess vertical gradients throughout the IC area. Water level data are included in Appendix A.

Assessment of horizontal groundwater flow direction in the surficial aquifer is required to ensure that the monitoring network is adequate for assessing contaminant plume movement and to ensure that the IC boundary provides a sufficient buffer to prevent access to contaminated groundwater. As shown in Figure 3. and Figure 4, groundwater elevation contours for the surficial aquifer indicate a general flow direction to the southeast, which is consistent with historically measured flow directions and contaminant plume configurations. In addition, groundwater flow direction is consistent for both the June and November monitoring events.

Vertical gradients are used to assess the direction that groundwater will flow vertically. Using the methods that have traditionally been applied to assess vertical flow, a negative gradient indicates potential for upward groundwater flow, and a positive gradient indicates potential for downward groundwater flow. Regardless of the direction indicated by gradient, vertical migration of groundwater is expected to be relatively minor because of the low vertical hydraulic conductivities of the confining layers separating aquifers. Vertical gradients calculated from June and November data are shown in Table 2. General observations from Table 2 include the following:

- Vertical gradients in the confined aquifer are upward at two locations and downward at one location.
- The well cluster adjacent to the sulfuric acid plant (0101, 0111, and 0110) indicates a downward vertical gradient in the confined aquifer, which is likely a reflection of continuous long-term pumping of the confined aquifer from the acid-plant production well.
- Although the well cluster adjacent to the sulfuric acid plant indicates a downward vertical gradient in the confined aquifer, an upward vertical gradient is indicated in the semiconfined aquifer, which confirms that the semiconfined and confined aquifers are hydrologically isolated.
- Vertical gradients in the semiconfined aquifer vary but tend to be downward near surface water features, and upward away from surface water features. Surface water is likely recharging the surficial aquifer, causing a localized increase in heads in the surficial aquifer and a resulting downward vertical gradient.



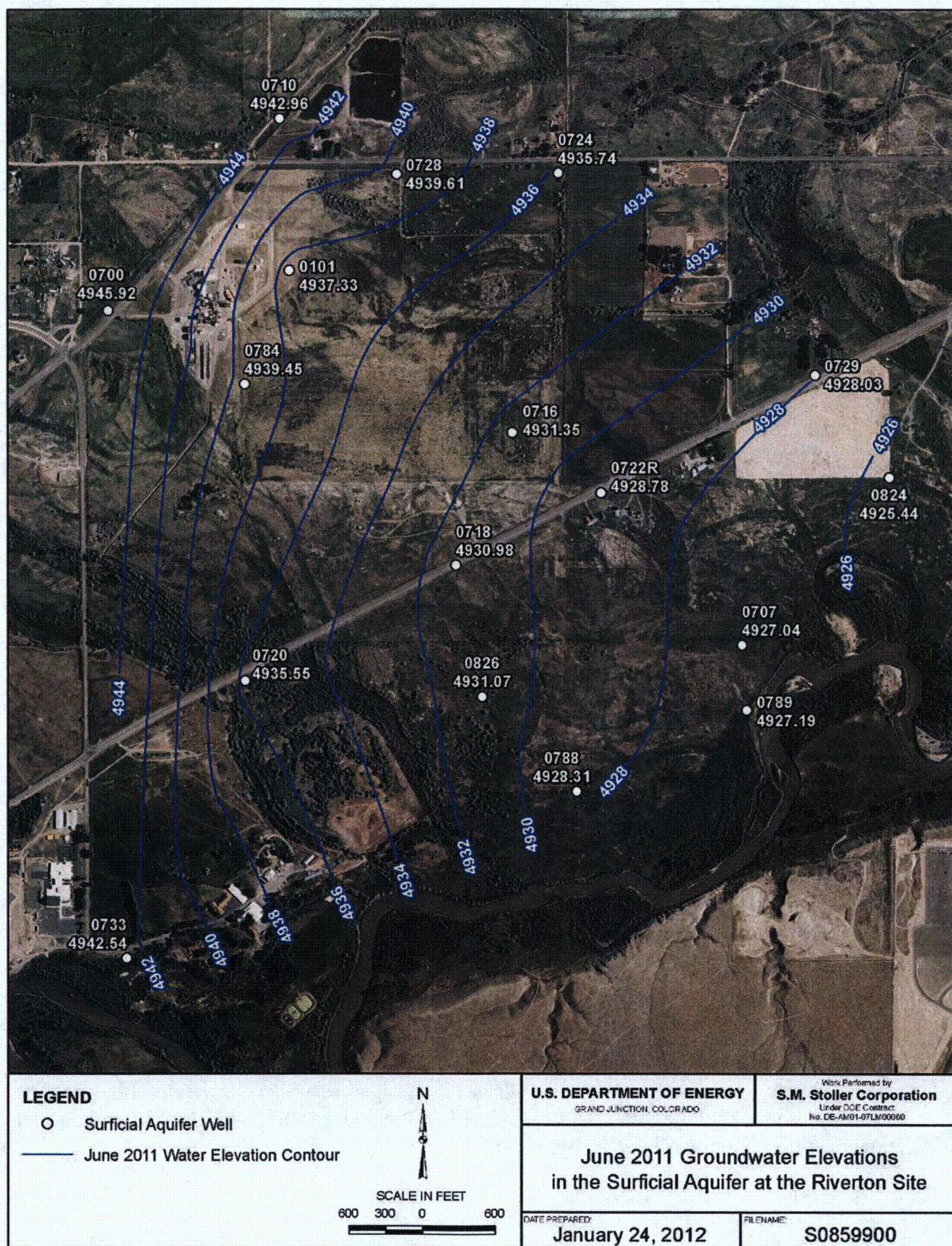


Figure 3. June 2011 Groundwater Elevations in the Surficial Aquifer at the Riverton Site





Figure 4. November 2011 Groundwater Elevations in the Surficial Aquifer at the Riverton Site



Table 2. Riverton Vertical Gradients

Well ID	Aquifer	Water Elevation June 2011	Water Elevation November 2011	Vertical Gradient <sup>a</sup> June 2011	Vertical Gradient November 2011
0724	Surficial	4935.74	4933.7		
0725	Semiconfined	4935.69	4933.66	0.0002	-0.002
0726	Confined	4936.44	4934.81	-0.006	-0.001
0101	Surficial	4937.33	4936.28		
0111	Semiconfined	4938.41	4936.61	-0.040	-0.012
0110	Confined	4935.9	4934.09	0.027	0.042
0784	Surficial	4939.45	4939.00		
0732	Semiconfined	4938.02	4937.25	0.054	0.067
0716	Surficial	4931.35	4930.19		
0717	Semiconfined	4931.29	4930.21	0.002	-0.0005
0707	Surficial	4927.04	4925.52		
0705	Semiconfined	4926.41	4924.32	0.022	0.042
0709	Confined	4927.97	4927.81	-0.012	-0.030
0718	Surficial	4930.98	4929.57		
0719	Semiconfined	4931.25	4929.88	-0.014	-0.016
0722R	Surficial	4928.78	4927.82		
0723	Semiconfined	4928.97	4928.00	-0.006	-0.006
0720	Surficial	4935.55	4935.31		
0721	Semiconfined	4933.84	4932.63	0.048	0.074
0729	Surficial	4928.03	4925.82		
0730	Semiconfined	4927.82	4925.98	0.009	-0.007
0733	Surficial	4942.54	4939		
0734	Semiconfined	4940.16	4937.36	0.104	0.072

<sup>a</sup> The vertical gradient from the semiconfined aquifer is between the semiconfined aquifer and the surficial aquifer, and the vertical gradient from the confined aquifer is between the confined aquifer and the surficial aquifer. A negative value indicates an upward vertical gradient.

#### 4.1.2 Groundwater Quality

Surficial aquifer data from the 2011 sampling events are summarized in the following plots and figures. Time-concentration plots for molybdenum in wells located within contaminant plumes and wells bordering the contaminant plumes in the surficial aquifer are shown in Figure 5 and Figure 6, respectively. The distribution of molybdenum in the surficial aquifer from the June and November 2011 sampling events is shown in Figure 7 and Figure 8, respectively. Time-concentration plots for uranium in wells located within contaminant plumes and wells on the lateral edge of the contaminant plumes in the surficial aquifer are shown in Figure 9 and Figure 10, respectively. The distribution of uranium in the surficial aquifer, based on June and November 2011 sampling results, is shown in Figure 11 and Figure 12, respectively.

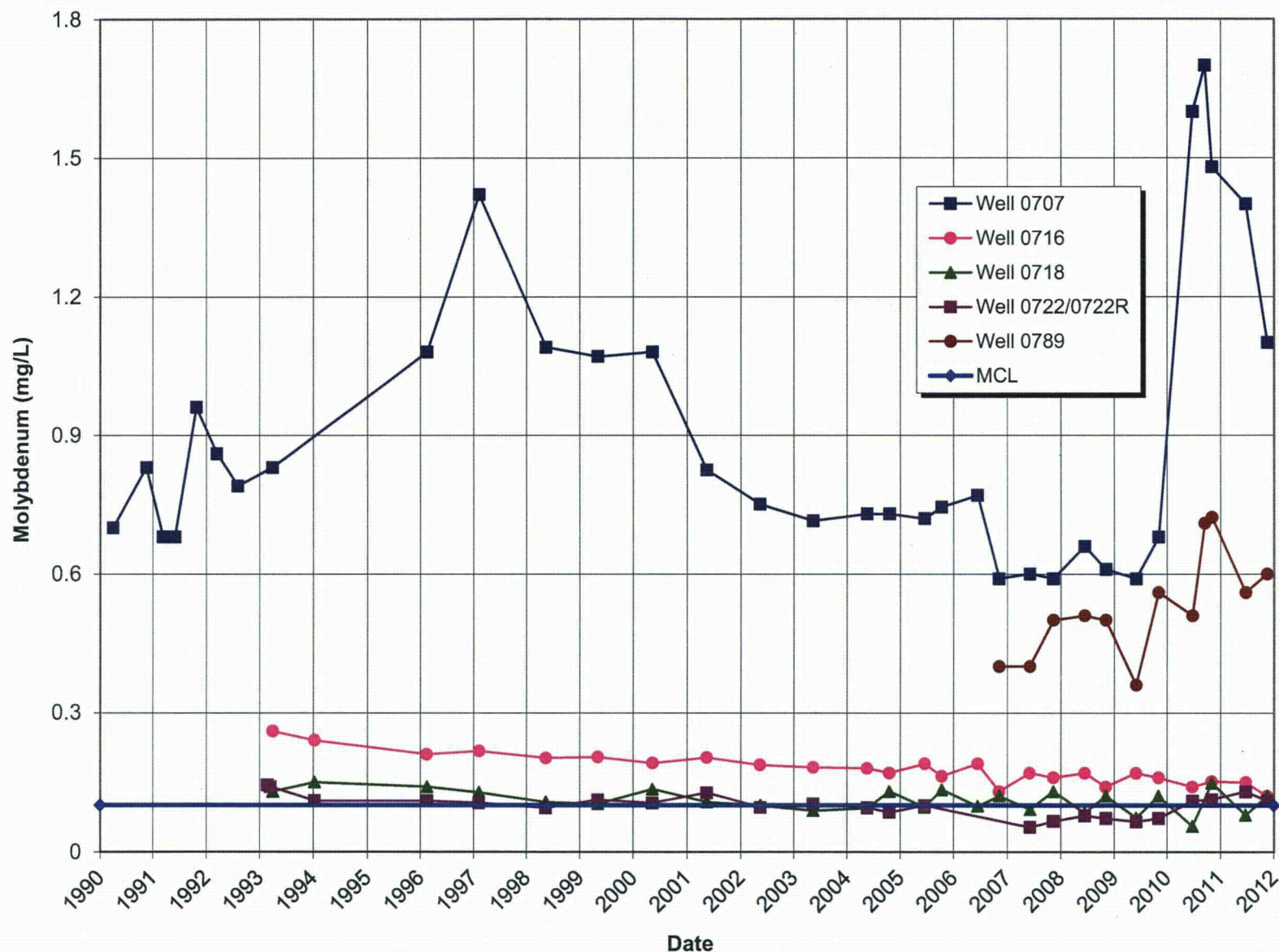
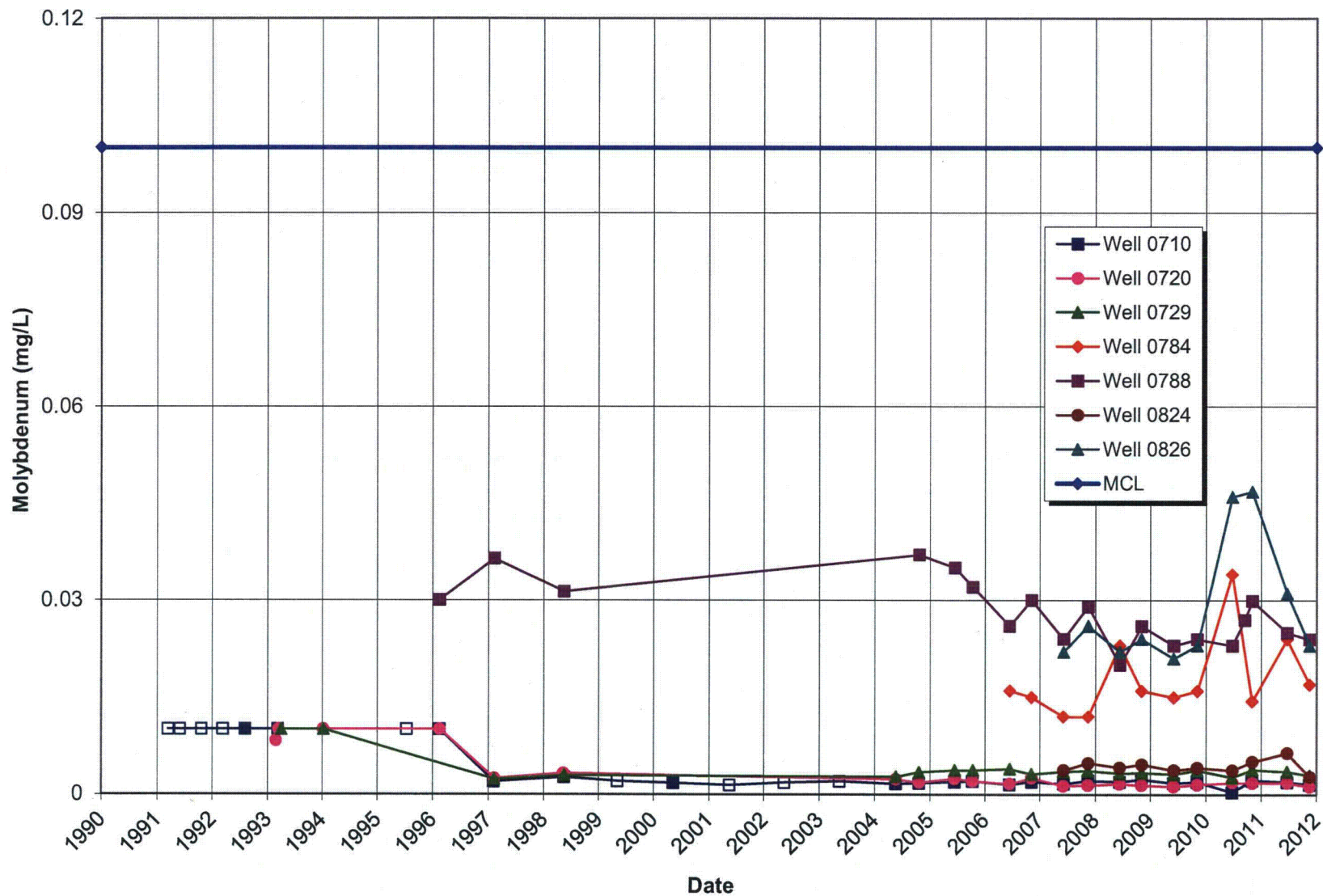


Figure 5. Molybdenum Concentrations in Surficial Aquifer Wells within the Contaminant Plume



Note: A hollow symbol denotes an analytical result below the detection limit.

Figure 6. Molybdenum Concentrations in Surficial Aquifer Wells on the Edge of the Contaminant Plume



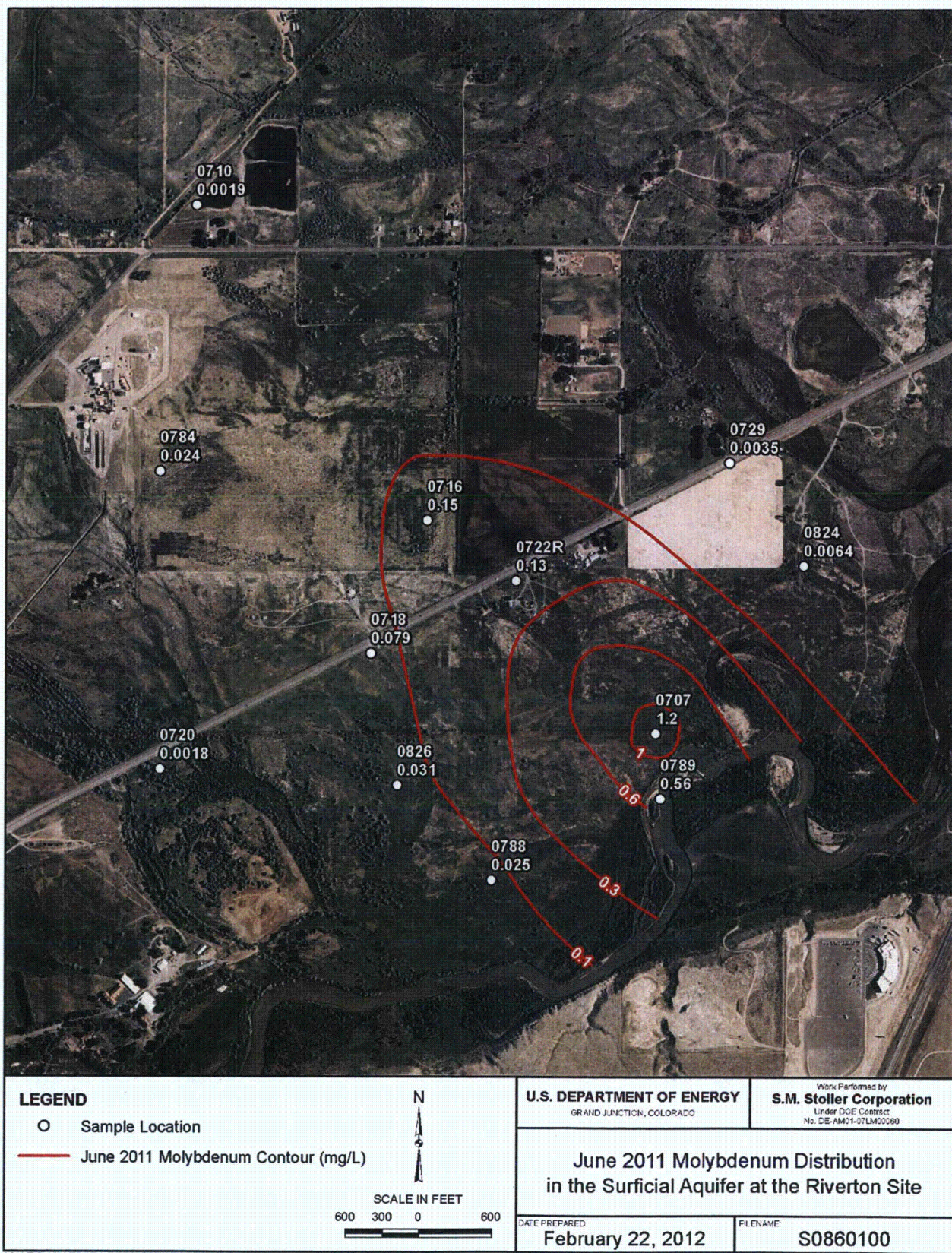


Figure 7. June 2011 Molybdenum Distribution in the Surficial Aquifer at the Riverton Site



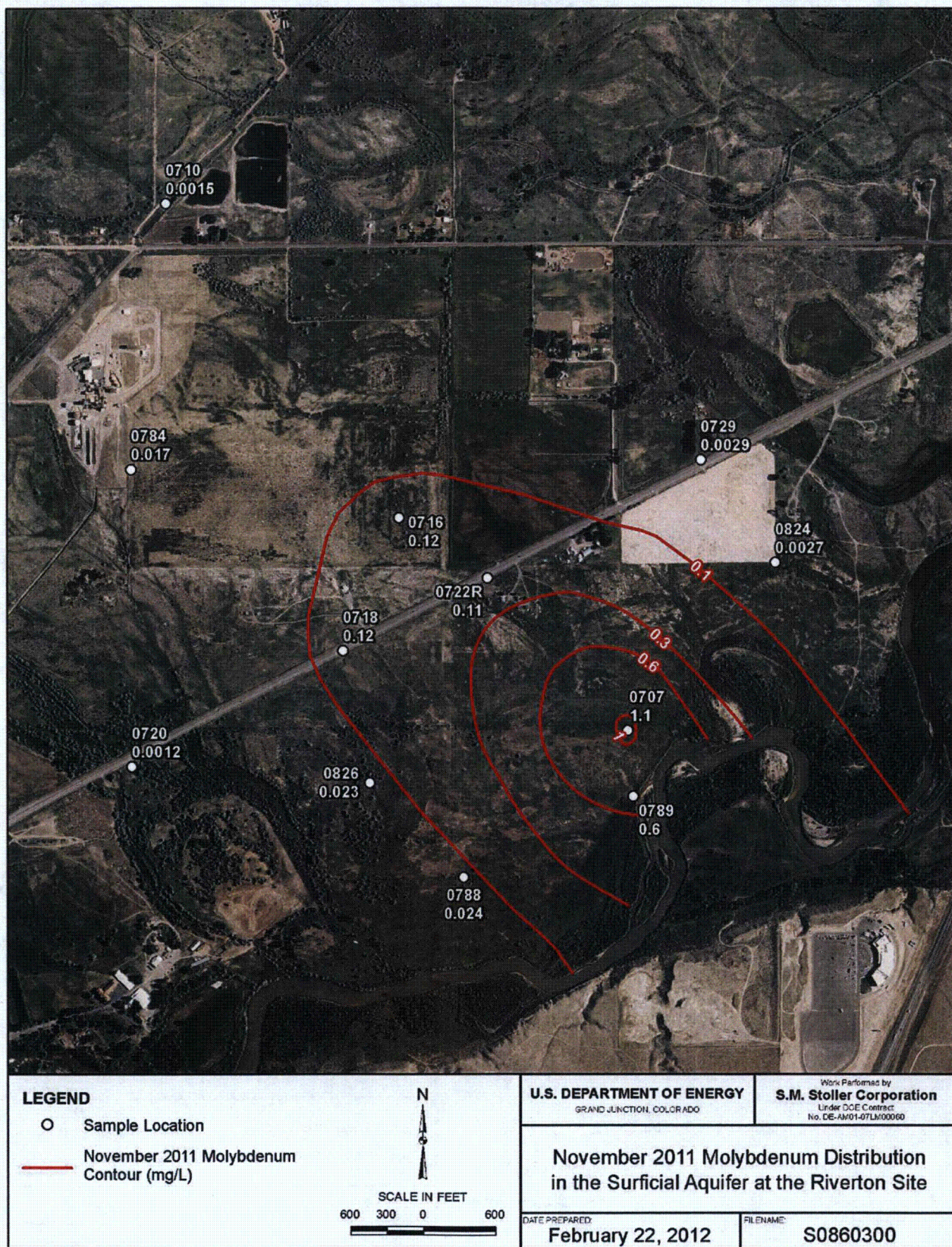


Figure 8. November 2011 Molybdenum Distribution in the Surficial Aquifer at the Riverton Site



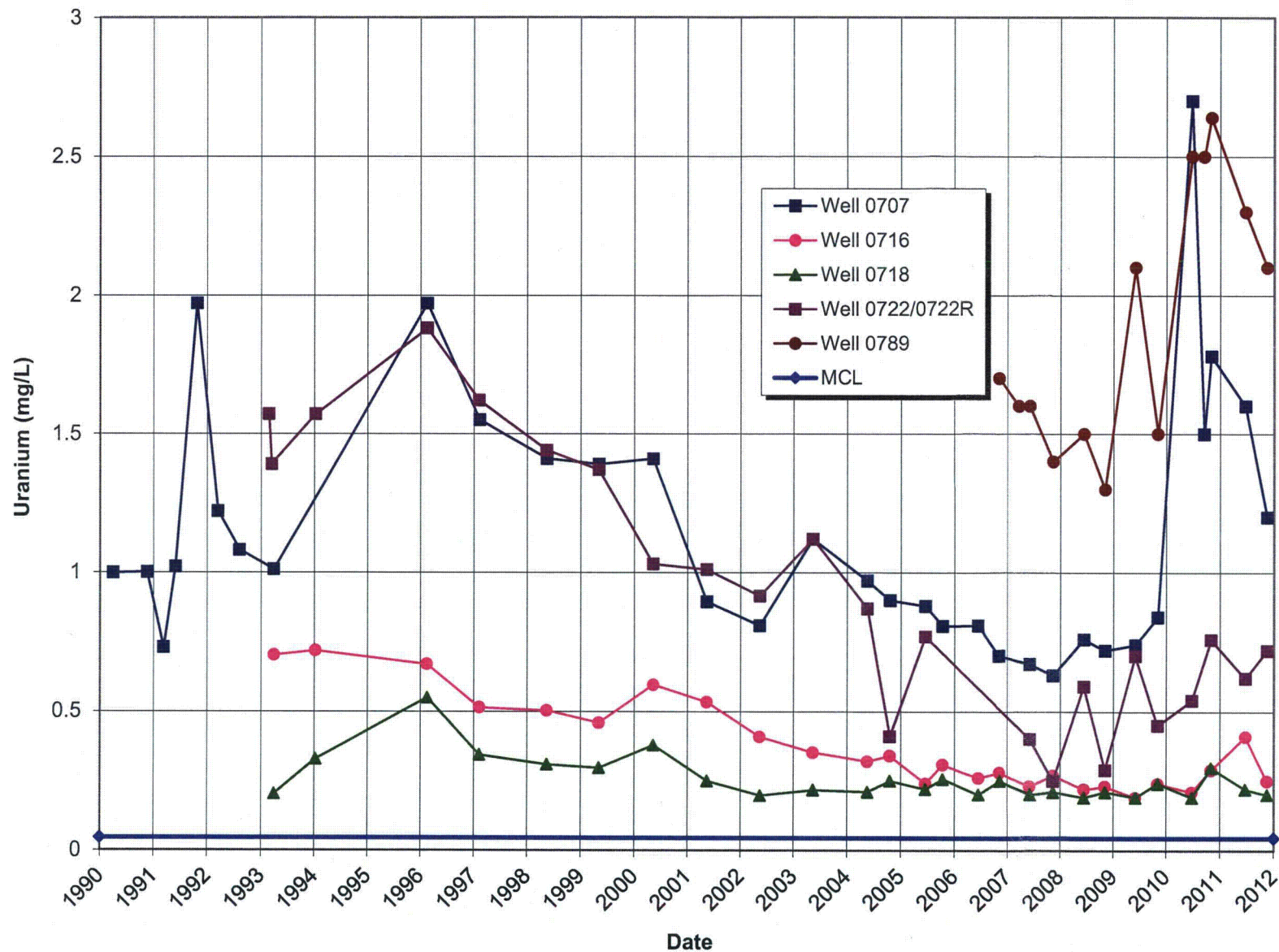


Figure 9. Uranium Concentrations in Surficial Aquifer Wells within the Contaminant Plume

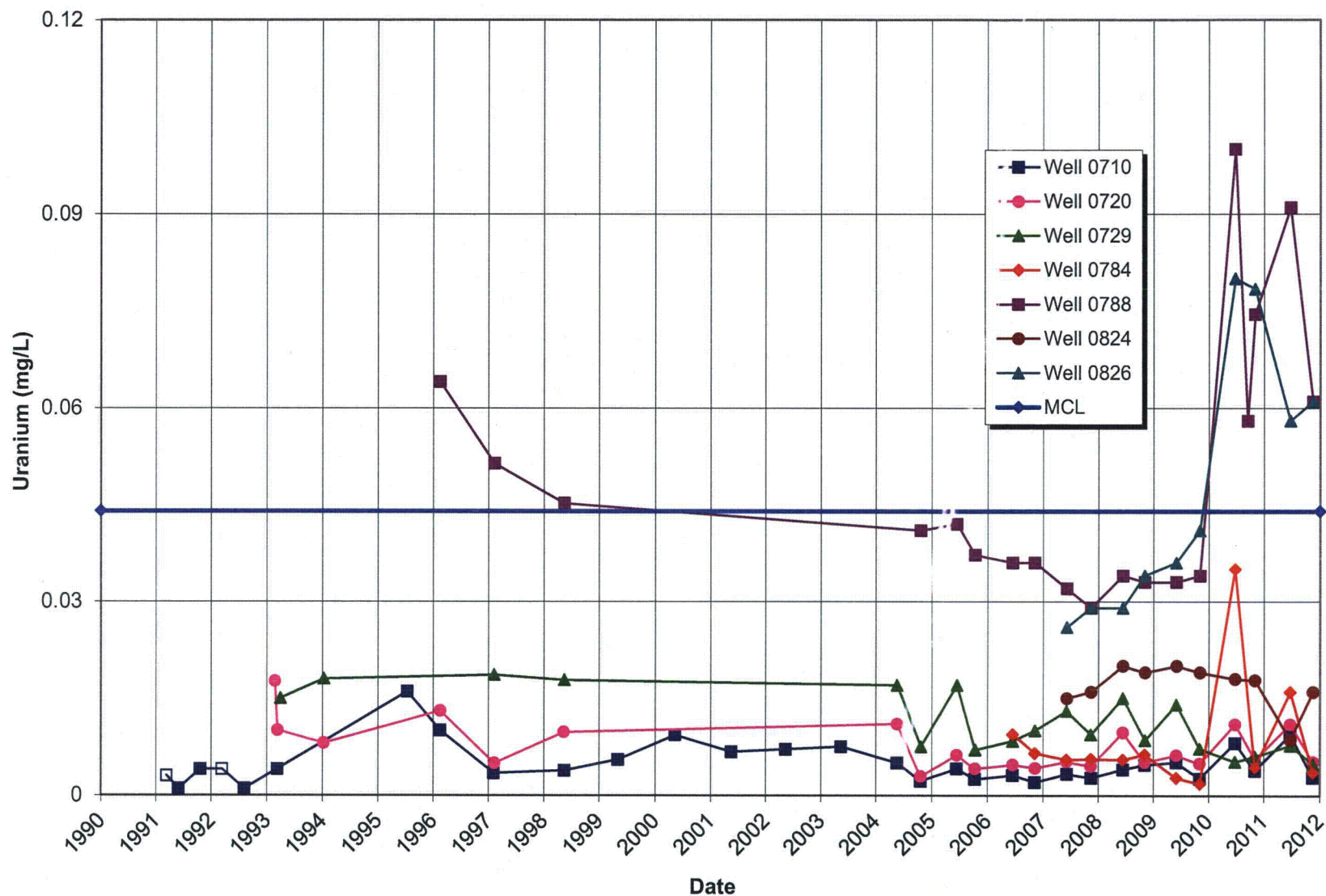


Figure 10. Uranium Concentrations in Surficial Aquifer Wells on the Edge of the Contaminant Plume





Figure 11. June 2011 Uranium Distribution in the Surficial Aquifer at the Riverton Site



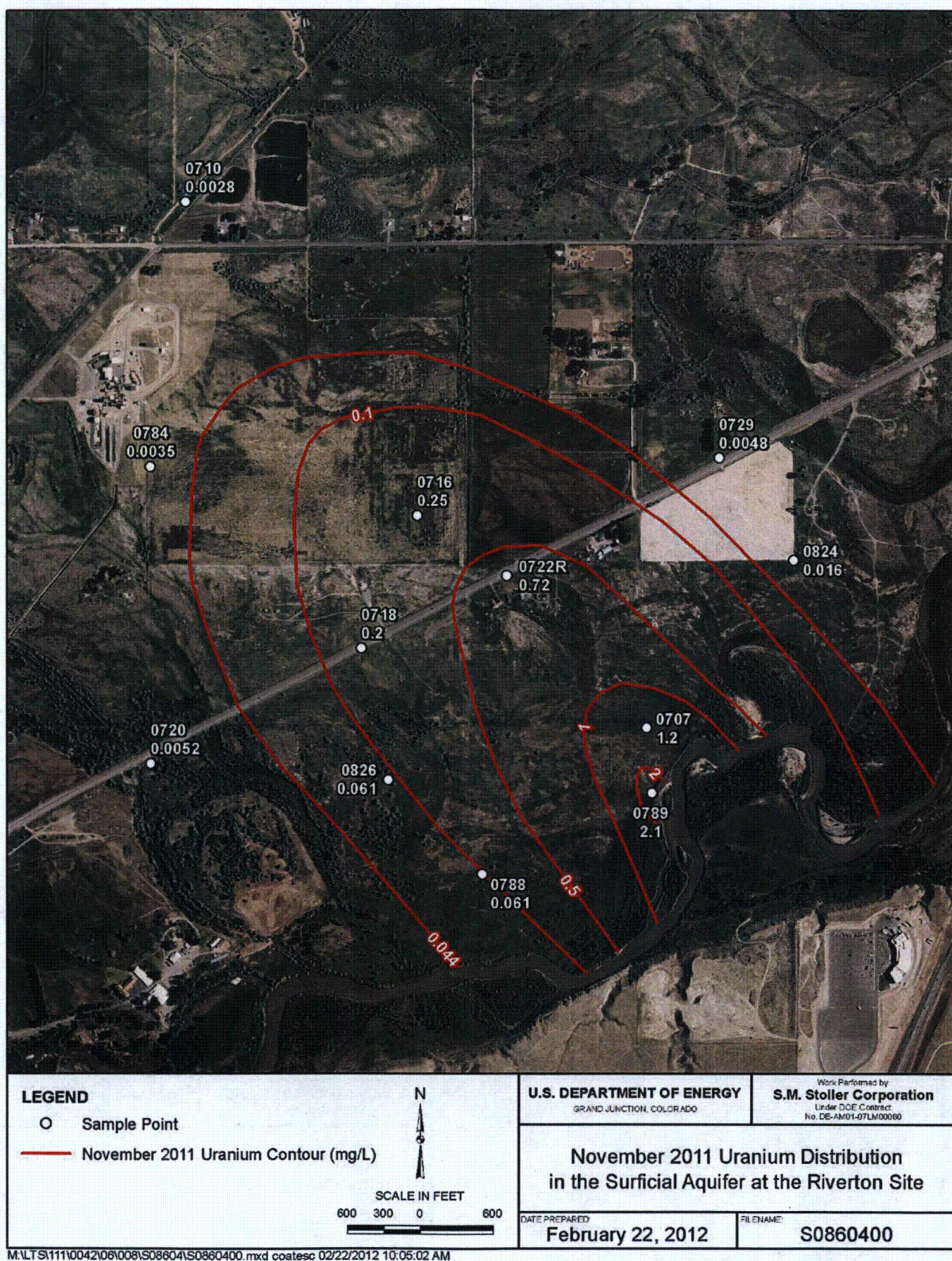


Figure 12. November 2011 Uranium Distribution in the Surficial Aquifer at the Riverton Site



As shown in the plots and figures, concentrations of molybdenum and uranium in groundwater in the surficial aquifer are still above their respective MCLs. In June 2010, a dramatic increase in uranium concentrations was observed in wells 0707, 0788, 0789, and 0826 where flooding of the Little Wind River occurred. These increases in uranium concentrations included wells on the western edge of the plume (0788 and 0826), where sample concentrations exceeded the uranium standard, indicating lateral expansion of the plume. In addition, molybdenum concentrations increased dramatically in well 0707 during the June sampling event (Figure 5). Results from wells not impacted by the flood generally had molybdenum and uranium concentrations that were comparable to levels observed in 2009. In 2011, concentrations of molybdenum and uranium in samples collected from wells that were impacted from the 2010 flood were lower than the 2010 levels but not back to 2009 levels, as shown in Figure 5, Figure 9, and Figure 10.

Concentrations of molybdenum and uranium in groundwater in the semiconfined aquifer are still below corresponding MCLs in areas where the overlying surficial aquifer groundwater is contaminated, which indicates no significant impact from site-related contamination in this unit (Figure 13 and Figure 14).

Groundwater quality data by parameter for locations sampled during 2011 are provided in Appendix B.

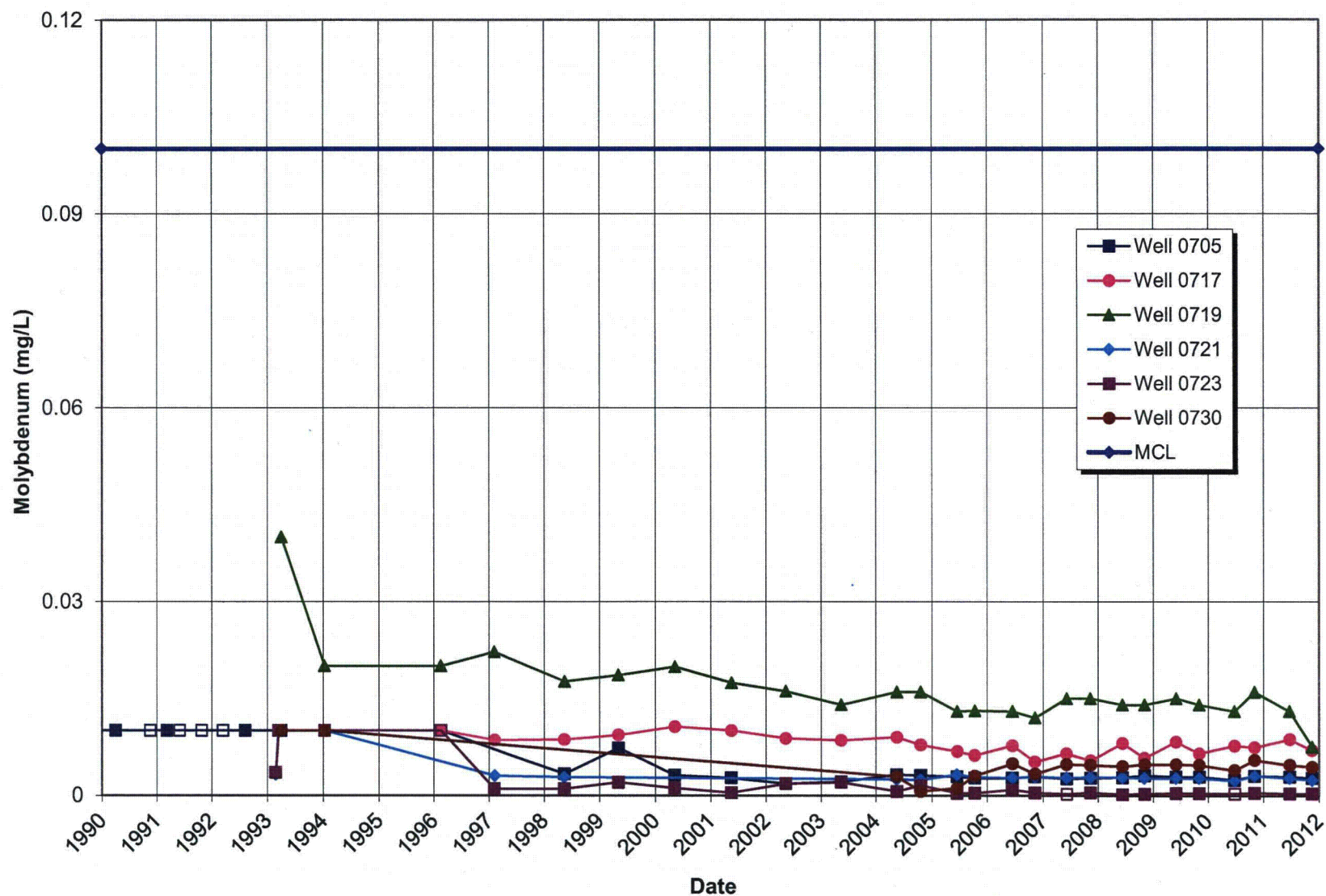
## **4.2 Domestic Wells**

Domestic wells at all residences within the IC boundary used as a potable water source were sampled in 2011; these wells are completed in the confined aquifer. Results from domestic wells did not indicate any impacts from the Riverton site. Concentrations of molybdenum and uranium in samples collected from domestic wells were two to three orders of magnitude below their respective standards. Data obtained from sampling of domestic wells in 2011 are provided in Appendix C. Time-concentration graphs for molybdenum and uranium are shown in Figure 15 and Figure 16, respectively.

## **4.3 Surface Water**

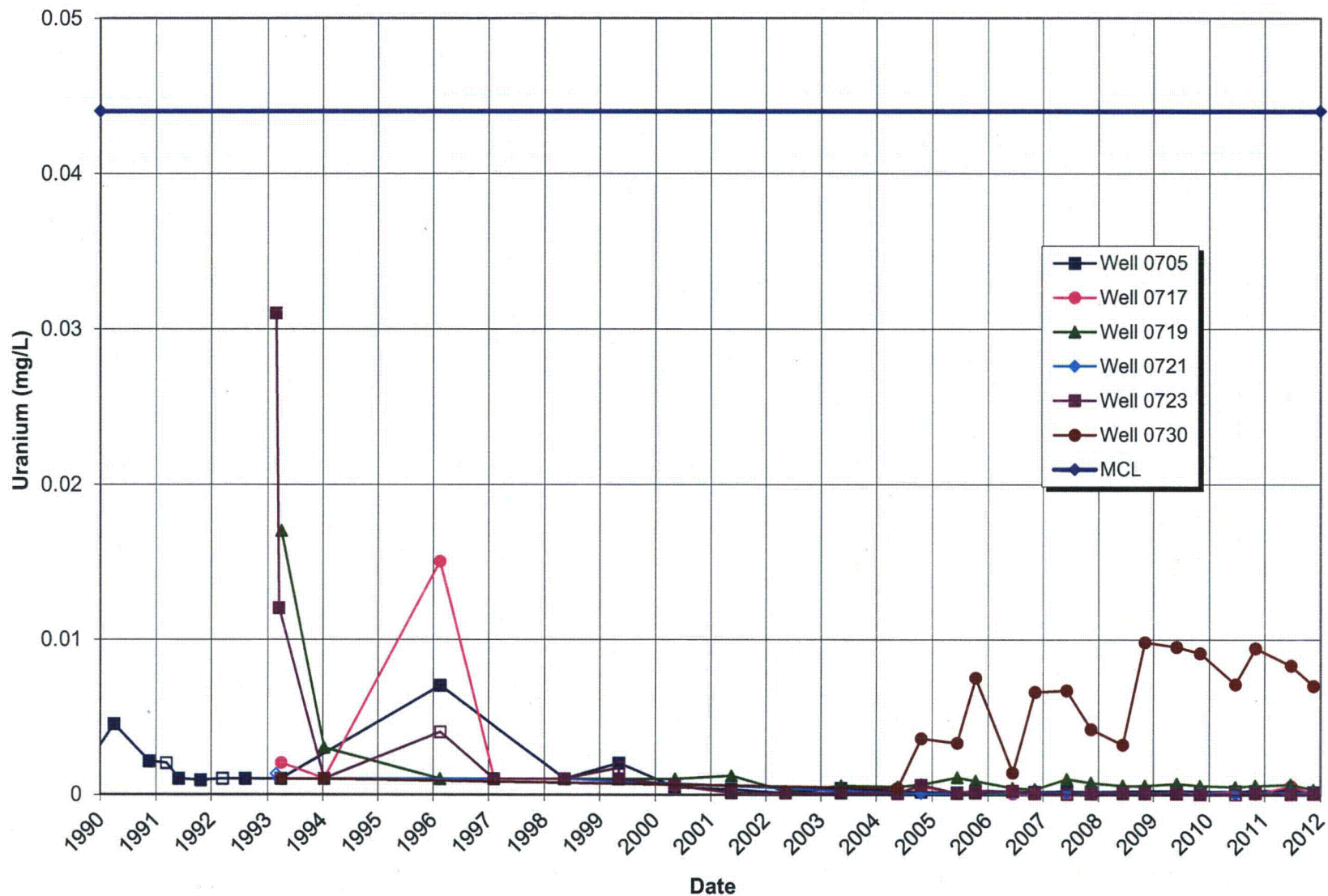
### **4.3.1 Surface Water Flow**

The highest river stage ever recorded (since 1941) in the Little Wind River at the U.S. Geological Survey gaging station just downstream of the site (the gaging station location is shown in Figure 2) was measured on June 9, 2010, at 3.91 feet above flood stage, with a discharge of 13,300 cubic feet per second (cfs) (Figure 17) (USGS 2011). In 2011, the highest discharge for the year was measured on July 2 at 7,210 cfs and at a river stage of 0.93 feet above flood stage. Discharge in the Little Wind River is statistically the highest in June, which reflects spring runoff from the Wind River Range. Most of the recharge of the alluvial aquifer likely occurs during these higher flows in the river. An assessment of June Little Wind River discharge data indicates that spring runoff/flow in the river has been above normal for the last 3 years, as shown in Table 3. Prior to 2009, mean spring runoff/flow in the river had been below normal since 2000.



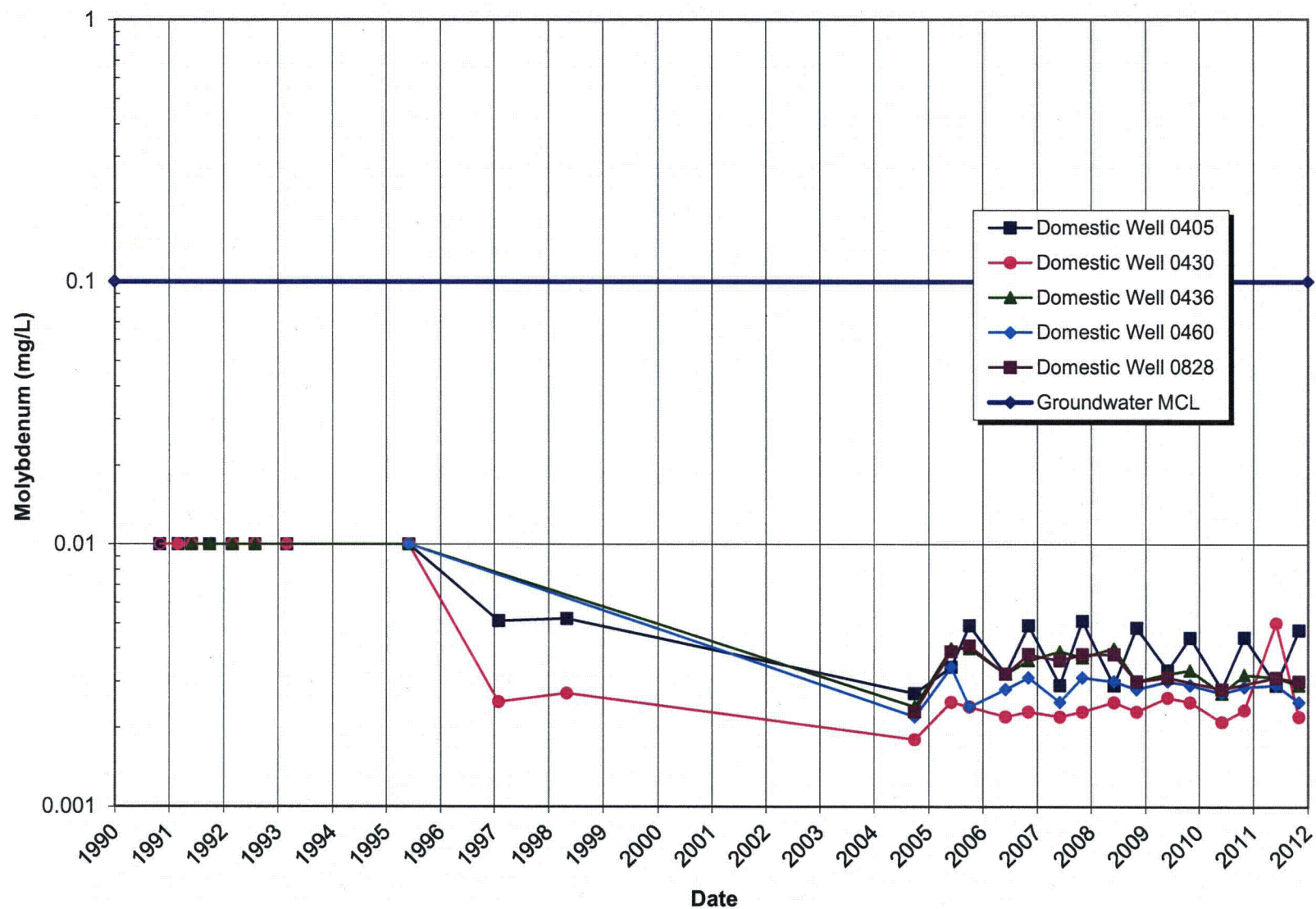
Note: A hollow symbol denotes an analytical result below the detection limit.

Figure 13. Molybdenum Concentrations in Semiconfined Aquifer Wells



Note: A hollow symbol denotes an analytical result below the detection limit.

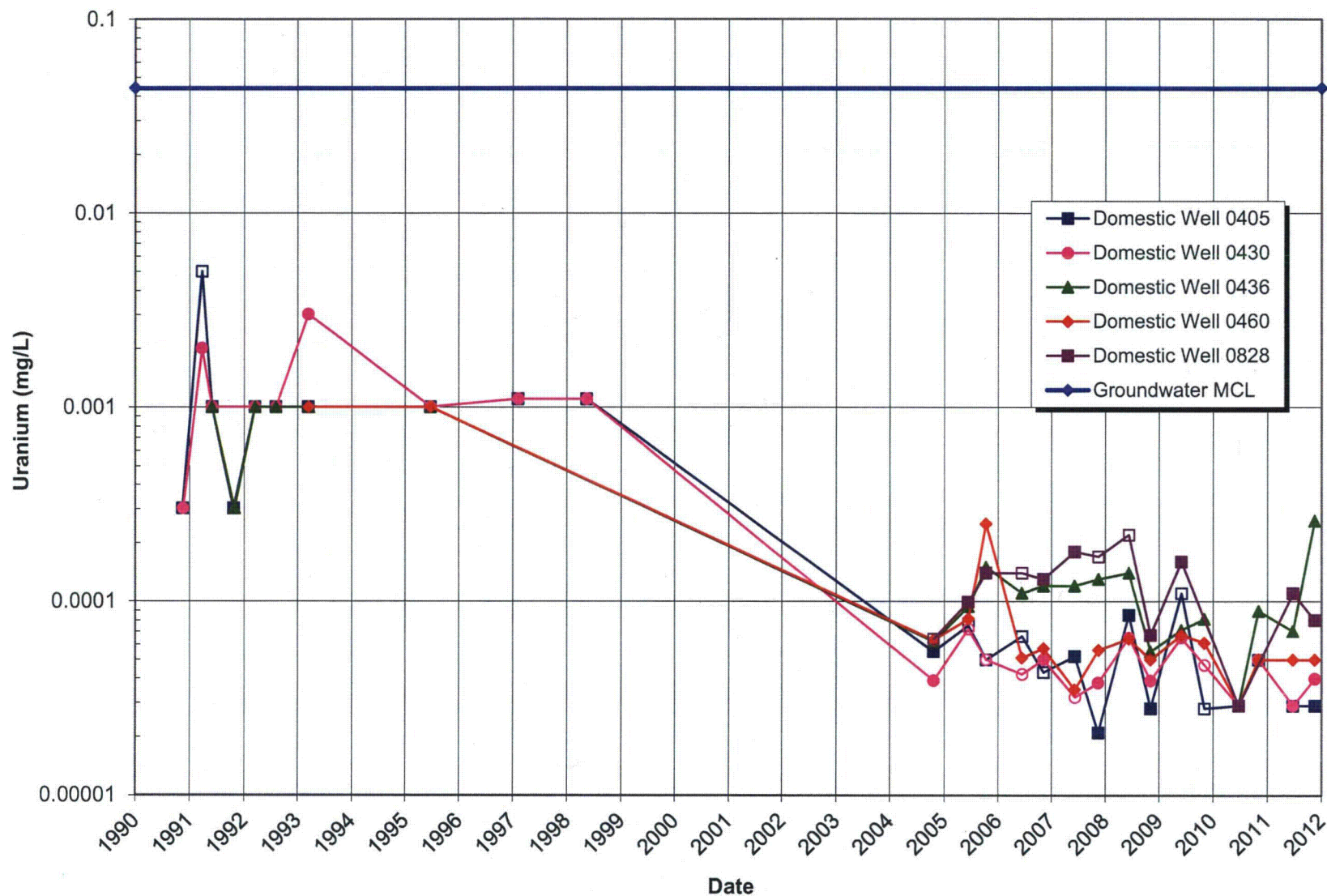
Figure 14. Uranium Concentrations in Semiconfined Aquifer Wells



Note: A hollow symbol denotes an analytical result below the detection limit.

Figure 15. Molybdenum Concentrations in Domestic Wells





Note: A hollow symbol denotes an analytical result below the detection limit.

Figure 16. Uranium Concentrations in Domestic Wells



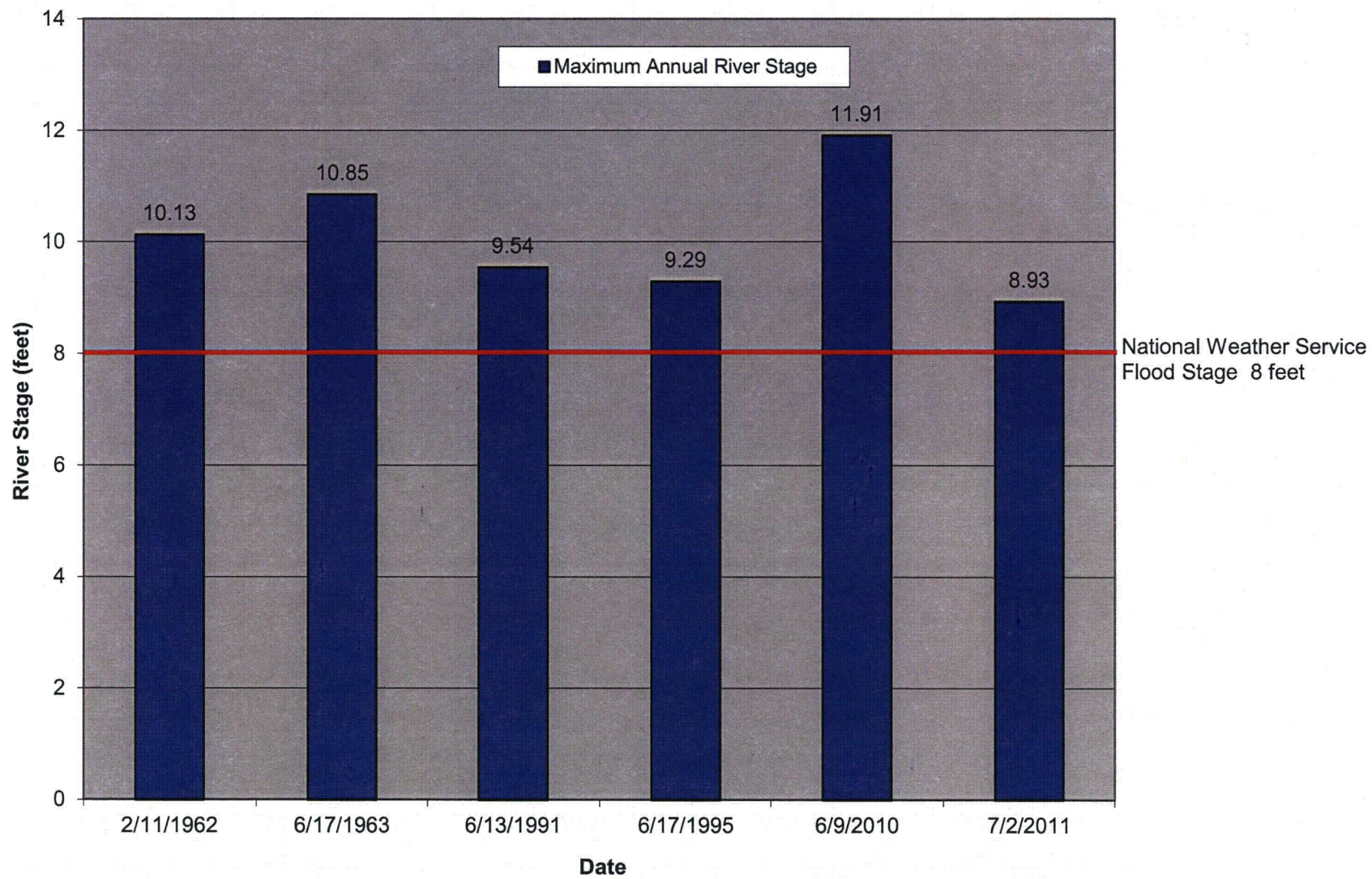


Figure 17. Historical Maximum Stage of the Little Wind River

Table 3. Discharge Statistics<sup>a</sup> from the Little Wind River

Year	Mean June Discharge (cfs)	Deviation from Normal <sup>b</sup> June Discharge (cfs)	Maximum Discharge (cfs)
2000	1,089	-1,251	2,720
2001	233.2	-2,107	2,090
2001	740.6	-1,599	1,930
2003	861.7	-1,478	2,490
2004	1,591	-749	4,120
2005	2,272	-68	4,520
2006	642.4	-1,698	1,710
2007	738.9	-1,601	1,910
2008	2,175	-165	3,730
2009	3,012	672	4,190
2010	5,829	3,489	13,300
2011	2,861	521	7,210

<sup>a</sup> U.S. Geological Survey gaging station statistics.

<sup>b</sup> Based on a mean June discharge of 2,340 cfs since 1941.

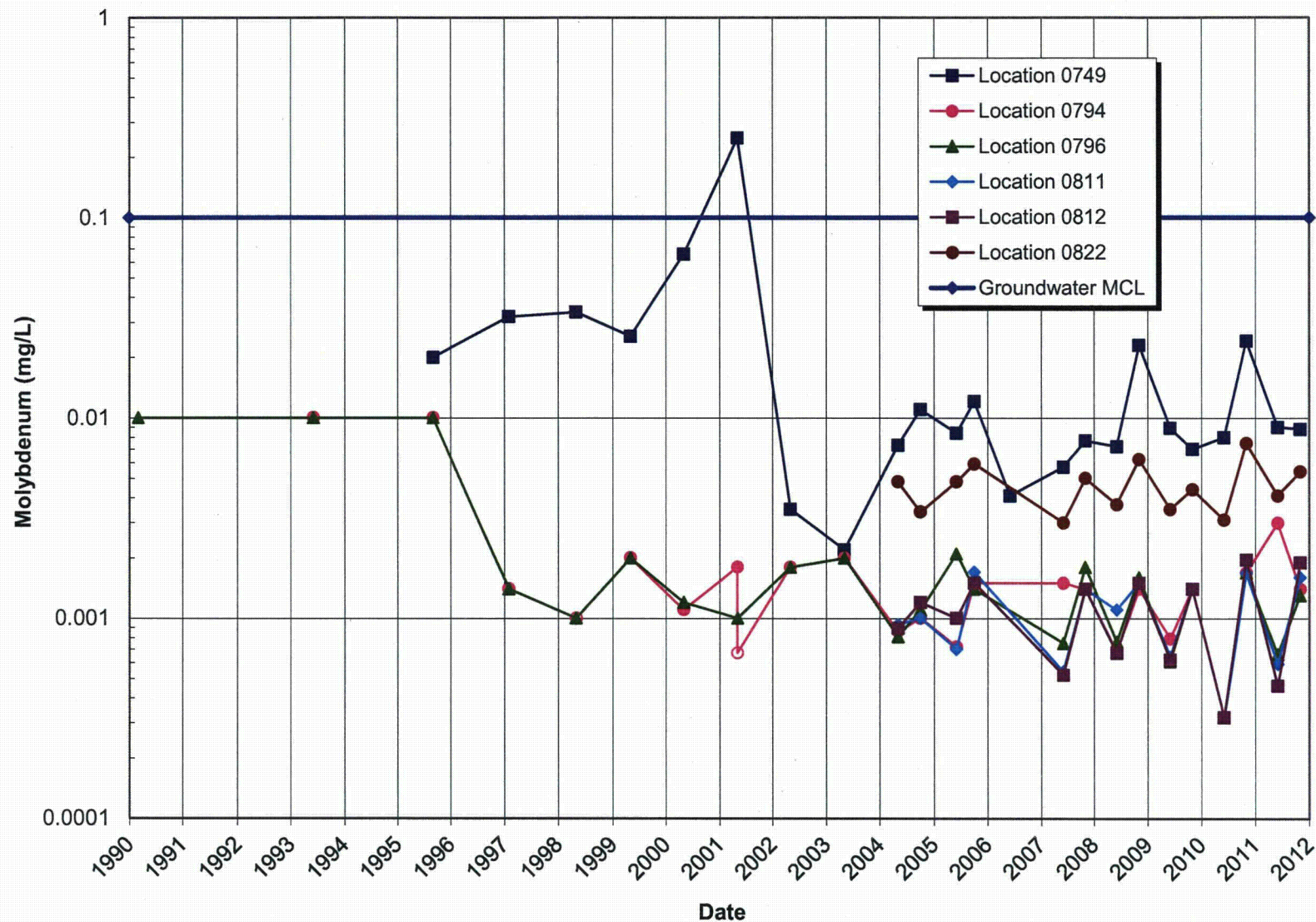
#### 4.3.2 Surface Water Quality

Samples were collected at four locations on the Little Wind River (Figure 2), which flows generally from the southwest to the northeast adjacent to the site. Contaminated groundwater likely discharges to the Little Wind River, but there is no evidence that it impacts surface water quality in the river. Molybdenum and uranium concentrations measured in samples collected from river locations adjacent to and downstream of the groundwater plume (locations 0811, 0812, and 0796) are comparable to concentrations from river samples collected upstream of the groundwater plume (location 0794), as shown in Figure 18 and Figure 19, respectively.

Two ponds (locations 0810 and 0823) formed from groundwater discharge into former gravel pits were sampled as part of the long-term monitoring network. These ponds are primarily used for fishing and swimming. Samples collected from these ponds had concentrations of molybdenum and uranium that were below their respective groundwater MCLs and comparable to background, which indicates no discernible impacts from the site. Molybdenum and uranium concentrations over time in these pond locations are shown in Figure 20 and Figure 21, respectively.

The sample collected at the ditch that carries discharge water from the Chemtrade sulfuric acid refinery (location 0749) had elevated concentrations of sulfate in 2011 (2,000 mg/L in June). Discharge from the ditch is regulated through a National Pollutant Discharge Elimination System permit issued to Chemtrade and administered by the U.S. Environmental Protection Agency. Sulfate concentrations have been in the 1,800 to 3,000 mg/L range since 2004. The elevated sulfate concentrations in the Chemtrade ditch water have affected sulfate concentrations farther downstream in the west side irrigation ditch (980 mg/L at location 0822 in June). Water samples from the west side irrigation ditch also have been analyzed for radium-226 and radium-228 in response to elevated concentrations of these constituents in the sediments within the ditch. Radium concentrations in water samples collected from the ditch were either less than the detections limit (three samples) or near the detection limit (one sample), which indicates minimal impacts to water quality in the ditch from the sediments. Historically, radium concentrations have been low (below or near the detection limit), indicating no impact to water quality in the ditch. Uranium concentrations in samples collected from the west side irrigation ditch have been





Note: A hollow symbol denotes an analytical result below the detection limit.

Figure 18. Molybdenum Concentrations in Creek and River Locations



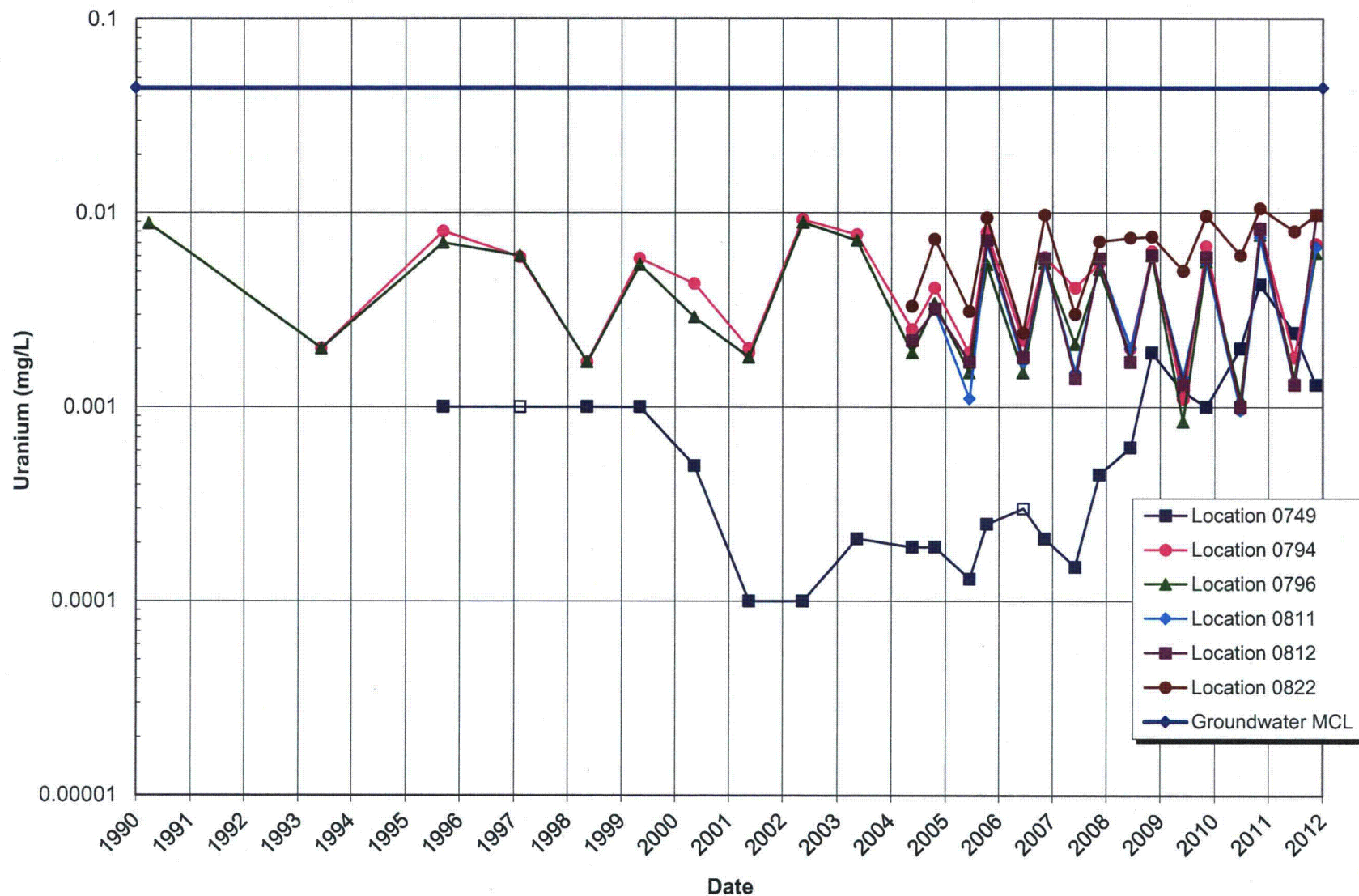
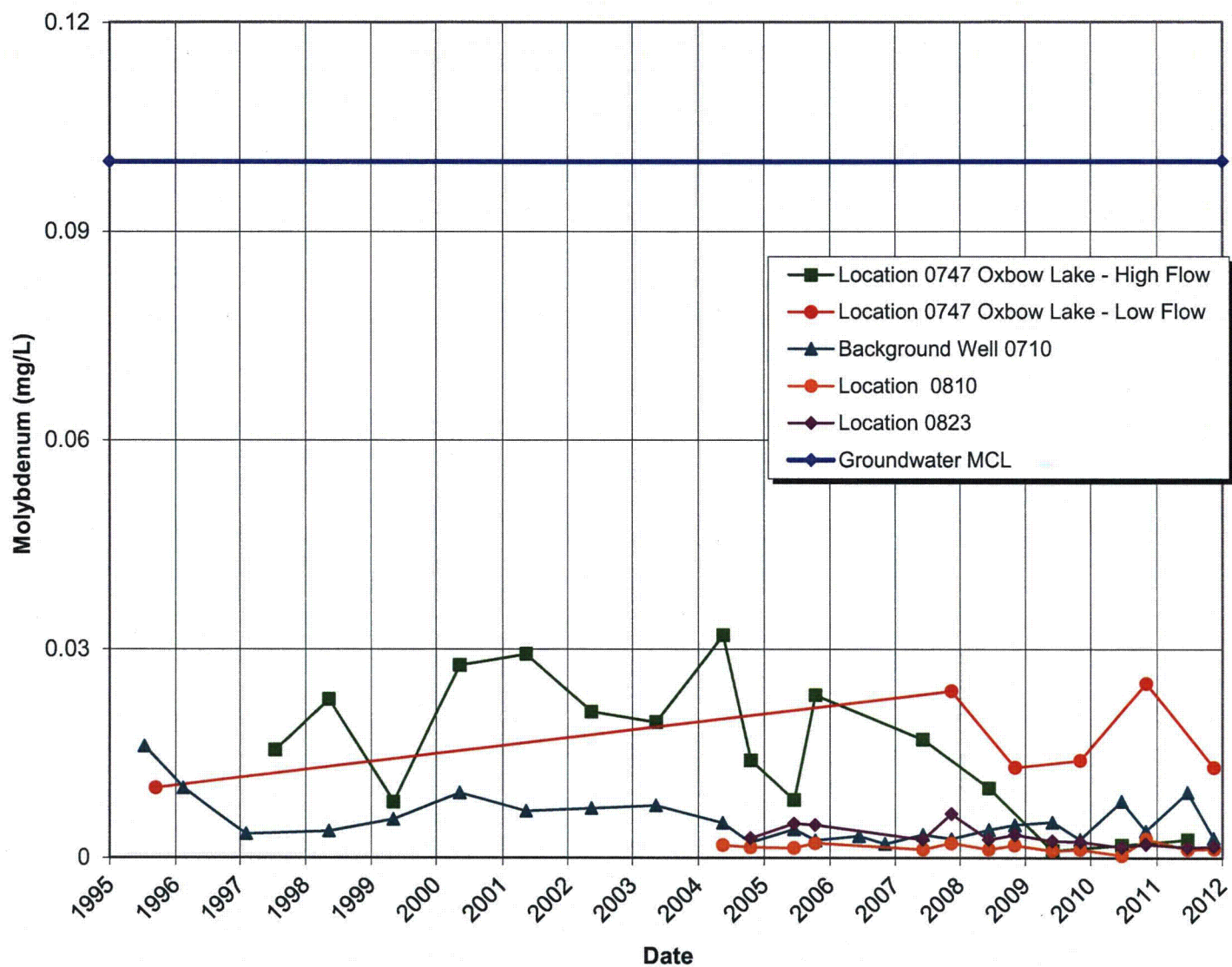


Figure 19. Uranium Concentrations in Creek and River Locations



Note: A hollow symbol denotes an analytical result below the detection limit.

Figure 20. Molybdenum Concentrations in Ponds



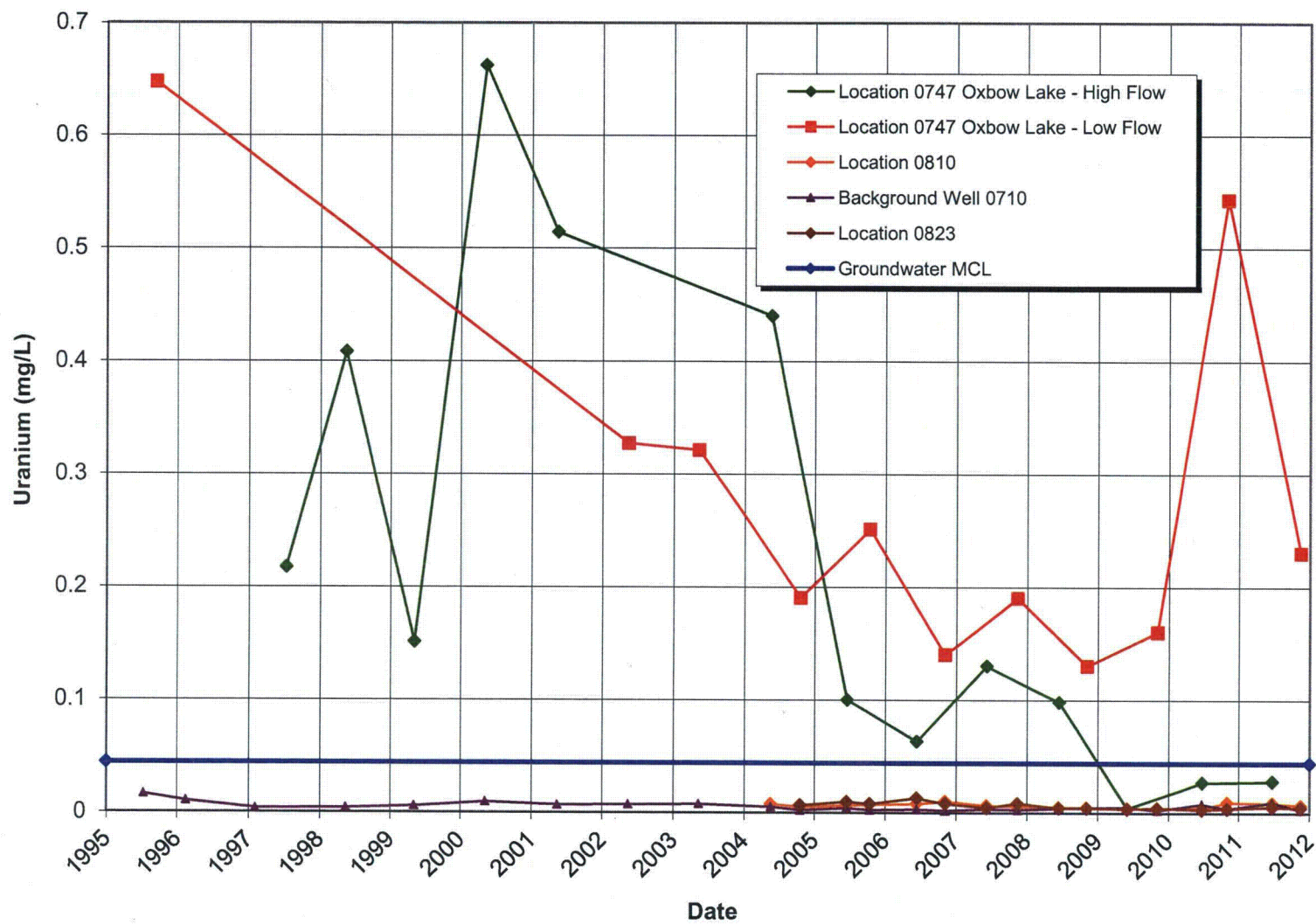


Figure 21. Uranium Concentrations in Ponds

within the range of background uranium concentrations and correlate with uranium concentrations in the river (Figure 19), which indicates minimal site impacts to the water quality in the ditch.

Concentrations of molybdenum and uranium in the oxbow lake (location 0747) have varied over time. This variability is attributed to surface inflow (this does not occur every year; it depends on the river stage) to the lake from the Little Wind River during a high river stage, which causes a dilution of uranium concentrations. Hydraulic and water quality data indicate that the oxbow lake is fed by the discharge of contaminated groundwater; therefore, elevated concentrations are expected.

Figure 20 and Figure 21 split oxbow graphs into high-flow and low-flow events; the high-flow events reflect the potential for river inflow diluting analyte concentrations in the oxbow lake, and the low-flow events reflect a low potential for river inflow diluting analyte concentrations in the oxbow lake. In the June 2011 sampling event, the Little Wind River was flowing through the oxbow lake; therefore, analyte concentrations in the sample collected from the oxbow lake were low and reflected river-water chemistry. Molybdenum and uranium concentrations were elevated in samples collected from the oxbow lake in November because the river was not flowing into the lake at the time of sampling. Surface water quality data by parameter for locations sampled during 2011 are provided in Appendix D.



## 5.0 Natural Flushing Assessment

Groundwater numerical modeling predicted that the alluvial aquifer will naturally flush contaminants to levels below applicable standards within the 100-year regulatory timeframe. This modeling formed the basis for the natural flushing strategy that was approved in the *Final Ground Water Compliance Action Plan for the Riverton, Wyoming, Title I UMTRA Project Site* (DOE 1998a) in 1998. In previous years, the progress of natural flushing was assessed using three tools: comparison to hydrogeologic modeling predictions, trend analysis, and curve matching/interpolation techniques applied to temporal plots of concentrations at individual locations. These techniques were based on a site conceptual model of gradually declining contaminant concentrations after surface remediation of source material on the former millsite. Prior to 2010, these techniques indicated that natural flushing of the surficial aquifer, in total, was progressing.

However, based on observations made in 2010 in context with historical data, the site conceptual model and groundwater computer modeling were too simplistic to account for the spikes in contaminant concentrations in the surficial aquifer groundwater. Spikes in contaminant concentrations are attributed to flooding of the Little Wind River in June 2010, which may have mobilized contaminants in the unsaturated zone of the surficial aquifer. Cross correlation of flood events in the Little Wind River with monitoring data reveal that uranium concentrations spiked in well 0707 in 1991, 1996, and 2010, which followed floods of Little Wind River (Figure 9 and Figure 17). Groundwater numerical modeling did not account for flood events and the subsequent mobilization of contaminants. In 2011, contaminant concentrations have decreased from their 2010 highs, but concentrations are not back to the pre-flood levels, as shown in Table 4, which compares mean contaminant concentrations in the surficial aquifer from 2009, 2010, and 2011. Flooding of the Little Wind River in 2011 may have contributed to the mobilization of contaminants from the unsaturated zone and a continuation of elevated contaminant concentrations relative to pre-flood levels.

Table 4. Mean<sup>a</sup> Analyte Concentrations in the Surficial Aquifer

Analyte	Mean Concentration in Surficial Aquifer (mg/L)		
	2009	2010	2011
Manganese	0.246	0.663	0.52
Molybdenum	0.123	0.282	0.189
Sulfate	1,088	2,573	1,764
Uranium	0.301	0.600	0.416

<sup>a</sup> Calculated using data from all surficial aquifer wells in the monitoring network.

A new approach, therefore, is needed to refine the site conceptual model and to better assess natural flushing processes. To accomplish this, DOE has planned to conduct additional characterization work and reconstruct the groundwater numeric model at the Riverton site in 2012.

Additional characterization work will be accomplished using a Geoprobe to sample soils in the unsaturated zone and shallow groundwater. Goals of the additional characterization work are to:

- Obtain data to determine the source-term that remains in the unsaturated zone.
- Provide better definition of contaminant plumes, including the location of the centroid of the plumes and the extent of groundwater contamination.

- Provide a new baseline to track plume movement and plume size over time.
- Improve the ability to site new wells on the lateral edges of the plume.

Reconstruction of the groundwater numeric model will be accomplished using MODFLOW-SURFACT software, which will account for surface factors such as flood events. Goals of the groundwater modeling are to:

- Account for flood events in the Little Wind River.
- Account for the source-term that remains in the unsaturated zone.
- Assess the completion time for natural flushing and adherence to the 100-year regulatory timeframe.



## 6.0 Conclusions

Uranium and molybdenum are the indicator constituents for compliance monitoring at the Riverton site (DOE 1998a), and concentrations are still above their respective MCLs. Flooding of the Little Wind River in 2010 caused dramatic increases in contaminant concentrations in surficial aquifer monitoring wells located in flooded areas. Concentrations of molybdenum and uranium in samples collected in 2011 from wells affected by the flood are less than 2010 levels but have not returned to pre-flood levels. Concentrations of molybdenum and uranium in samples collected from semiconfined-aquifer monitoring wells, confined-aquifer domestic wells, and surface water locations (except the oxbow lake) continued to indicate no impact from the former milling operation. Surface water in the oxbow lake adjacent to the Little Wind River continues to be impacted because it is recharged by contaminated groundwater from the surficial aquifer.

Because of significant changes in the concentration and distribution of groundwater contaminants in 2010, DOE has planned additional characterization and computer modeling work in 2012 to better assess the extent of contamination and the natural flushing compliance strategy. Verification monitoring of groundwater and surface water from designated locations will continue semiannually until additional characterization and modeling are complete. If warranted, changes to the long-term monitoring program for the site will be initiated and specified in a revised LTMP. Moreover, after the results of the additional characterization and groundwater modeling results are available, it may be appropriate for DOE and the stakeholders to revisit the site groundwater compliance strategy.

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## 7.0 References

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**Appendix A**  
**Water Level Data**

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STATIC WATER LEVELS (USEE700) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:08 am

LOCATION CODE	FLOW CODE	TOP OF CASING ELEVATION (FT)	MEASUREMENT		DEPTH FROM TOP OF CASING (FT)	WATER ELEVATION (FT)	WATER LEVEL FLAG
			DATE	TIME			
0101	O	4946.58	06/22/2011	18:47	9.25	4937.33	
		4946.58	11/16/2011	20:35	10.30	4936.28	
0110	O	4944.35	06/22/2011	18:37	8.45	4935.90	
		4944.35	11/16/2011	20:15	10.26	4934.09	
0111	O	4946.87	06/22/2011	18:49	8.46	4938.41	
		4946.87	11/16/2011	20:38	10.26	4936.61	
0700	U	4951.38	06/22/2011	17:13	5.46	4945.92	
		4951.38	11/16/2011	21:01	5.65	4945.73	
0702	D	4931.00	11/17/2011	20:03	6.32	4924.68	
0705	D	4930.80	06/22/2011	11:30	4.39	4926.41	
		4930.80	11/17/2011	09:00	6.48	4924.32	
0707	D	4931.00	06/22/2011	10:45	3.96	4927.04	
		4931.00	11/17/2011	08:45	5.48	4925.52	
0709	D	4930.70	06/22/2011	11:01	2.73	4927.97	
		4930.70	11/17/2011	20:09	2.89	4927.81	
0710	U	4947.90	06/21/2011	11:20	4.94	4942.96	
		4947.90	11/15/2011	14:00	6.24	4941.66	
0716	O	4939.12	06/22/2011	17:50	7.77	4931.35	
		4939.12	11/15/2011	15:50	8.93	4930.19	
0717	O	4938.80	06/22/2011	18:15	7.51	4931.29	
		4938.80	11/15/2011	16:20	8.59	4930.21	
0718	D	4937.60	06/21/2011	16:10	6.62	4930.98	
		4937.60	11/17/2011	10:00	8.03	4929.57	
0719	D	4937.55	06/21/2011	17:00	6.30	4931.25	
		4937.55	11/17/2011	09:40	7.67	4929.88	
0720	C	4940.46	06/21/2011	14:45	4.91	4935.55	
		4940.46	11/16/2011	11:15	5.15	4935.31	
0721	C	4940.47	06/21/2011	15:30	6.63	4933.84	
		4940.47	11/16/2011	11:00	7.84	4932.63	
0722R		4937.06	06/22/2011	15:15	8.28	4928.78	
		4937.06	11/17/2011	14:50	9.24	4927.82	
0723	D	4936.01	06/22/2011	14:55	7.04	4928.97	
		4936.01	11/17/2011	14:25	8.01	4928.00	

STATIC WATER LEVELS (USEE700) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:08 am

LOCATION CODE	FLOW CODE	TOP OF CASING ELEVATION (FT)	MEASUREMENT		DEPTH FROM TOP OF CASING (FT)	WATER ELEVATION (FT)	WATER LEVEL FLAG
			DATE	TIME			
0724	U	4941.36	06/22/2011	17:29	5.62	4935.74	
		4941.36	11/16/2011	20:13	7.66	4933.70	
0725	U	4941.66	06/22/2011	18:31	5.97	4935.69	
		4941.66	11/16/2011	20:00	8.00	4933.66	
0726	U	4942.00	06/22/2011	18:36	5.56	4936.44	
		4942.00	11/16/2011	20:10	7.19	4934.81	
0727	U	4951.69	06/22/2011	17:15	9.06	4942.63	
		4951.69	11/16/2011	00:01	10.71	4940.98	
0728	U	4946.01	06/22/2011	17:23	6.40	4939.61	
		4946.01	11/16/2011	19:56	9.09	4936.92	
0729	D	4932.75	06/22/2011	08:25	4.72	4928.03	
		4932.75	11/17/2011	15:35	6.93	4925.82	
0730	D	4933.08	06/22/2011	08:40	5.26	4927.82	
		4933.08	11/17/2011	15:10	7.10	4925.98	
0732	U	4945.07	06/21/2011	13:25	7.05	4938.02	
		4945.07	11/16/2011	20:42	7.82	4937.25	
0733	U	4946.76	06/21/2011	09:14	4.22	4942.54	
		4946.76	11/15/2011	21:46	7.76	4939.00	
0734	U	4946.08	06/21/2011	09:10	5.92	4940.16	
		4946.08	11/15/2011	21:52	8.72	4937.36	
0736	U	4946.00	06/21/2011	10:59	6.56	4939.44	
		4946.00	11/15/2011	21:55	7.25	4938.75	
0784	U	4945.45	06/21/2011	13:15	6.00	4939.45	
		4945.45	11/16/2011	09:30	6.45	4939.00	
0788	C	4935.09	06/22/2011	14:10	6.78	4928.31	
		4935.09	11/16/2011	14:10	8.71	4926.38	
0789	D	4933.66	06/22/2011	12:00	6.47	4927.19	
		4933.66	11/16/2011	14:45	8.97	4924.69	
0824		4928.27	06/22/2011	16:55	2.83	4925.44	
		4928.27	11/17/2011	12:40	5.95	4922.32	
0826		4936.98	06/22/2011	13:20	5.91	4931.07	
		4936.98	11/16/2011	13:30	7.43	4929.55	



STATIC WATER LEVELS (USEE700) FOR SITE RVT01, Riverton Processing Site  
REPORT DATE: 4/4/2012 7:08 am

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LOCATION CODE	FLOW CODE	TOP OF CASING ELEVATION (FT)	MEASUREMENT		DEPTH FROM TOP OF CASING (FT)	WATER ELEVATION (FT)	WATER LEVEL FLAG
			DATE	TIME			

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RECORDS: SELECTED FROM USEE700 WHERE site\_code='RVT01' AND LOG\_DATE between #1/1/2011# and #12/31/2011#

FLOW CODES:     C   CROSS GRADIENT     D   DOWN GRADIENT     O   ON-SITE  
                  U   UPGRADIENT

WATER LEVEL FLAGS:

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**Appendix B**  
**Groundwater Quality Data**

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CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN- CERTAINTY
Alkalinity, Total (As CaCO3)	mg/L	0705	WL	06/22/2011	N001	SE	D	66	FQ #	-	-
	mg/L	0705	WL	11/17/2011	N001	SE	D	39	FQ #	-	-
	mg/L	0707	WL	06/22/2011	N001	SF	D	382	F #	-	-
	mg/L	0707	WL	11/17/2011	N001	SF	D	280	F #	-	-
	mg/L	0710	WL	06/21/2011	N001	SF	U	309	F #	-	-
	mg/L	0710	WL	11/15/2011	N001	SF	U	147	F #	-	-
	mg/L	0716	WL	06/22/2011	N001	SF	O	306	F #	-	-
	mg/L	0716	WL	11/15/2011	N001	SF	O	266	F #	-	-
	mg/L	0717	WL	06/22/2011	N001	SE	O	210	F #	-	-
	mg/L	0717	WL	11/15/2011	N001	SE	O	205	F #	-	-
	mg/L	0718	WL	06/21/2011	N001	SF	D	393	F #	-	-
	mg/L	0718	WL	11/17/2011	N001	SF	D	474	F #	-	-
	mg/L	0719	WL	06/21/2011	N001	SE	D	123	FQ #	-	-
	mg/L	0719	WL	11/17/2011	N001	SE	D	90	FQ #	-	-
	mg/L	0720	WL	06/21/2011	N001	SF	C	257	F #	-	-
	mg/L	0720	WL	11/16/2011	N001	SF	C	214	F #	-	-
	mg/L	0721	WL	06/21/2011	N001	SE	C	136	F #	-	-
	mg/L	0721	WL	11/16/2011	N001	SE	C	93	F #	-	-
	mg/L	0722R	WL	06/22/2011	N001	SF		308	F #	-	-
	mg/L	0722R	WL	11/17/2011	N001	SF		310	F #	-	-
	mg/L	0723	WL	06/22/2011	N001	SE	D	306	F #	-	-
	mg/L	0723	WL	11/17/2011	N001	SE	D	355	F #	-	-
	mg/L	0729	WL	06/22/2011	N001	SF	D	272	F #	-	-
	mg/L	0729	WL	11/17/2011	N001	SF	D	302	F #	-	-
	mg/L	0730	WL	06/22/2011	N001	SE	D	345	FQ #	-	-
	mg/L	0730	WL	11/17/2011	N001	SE	D	370	FQ #	-	-



CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN- CERTAINTY
Alkalinity, Total (As CaCO <sub>3</sub> )	mg/L	0784	WL	06/21/2011	N001	SF	U	142	F #	-	-
	mg/L	0784	WL	11/16/2011	N001	SF	U	109	F #	-	-
	mg/L	0788	WL	06/22/2011	N001	SF	C	475	F #	-	-
	mg/L	0788	WL	11/16/2011	N001	SF	C	465	F #	-	-
	mg/L	0789	WL	06/22/2011	N001	SF	D	519	F #	-	-
	mg/L	0789	WL	11/16/2011	N001	SF	D	521	F #	-	-
	mg/L	0824	WL	06/22/2011	N001	SF		207	F #	-	-
	mg/L	0824	WL	11/17/2011	N001	SF		338	F #	-	-
	mg/L	0826	WL	06/22/2011	N001	SF		446	F #	-	-
	mg/L	0826	WL	11/16/2011	N001	SF		434	F #	-	-
Dissolved Oxygen	mg/L	0705	WL	06/22/2011	N001	SE	D	2.68	FQ #	-	-
	mg/L	0705	WL	11/17/2011	N001	SE	D	1.20	FQ #	-	-
	mg/L	0707	WL	06/22/2011	N001	SF	D	2.12	F #	-	-
	mg/L	0707	WL	11/17/2011	N001	SF	D	1.26	F #	-	-
	mg/L	0710	WL	06/21/2011	N001	SF	U	2.31	F #	-	-
	mg/L	0710	WL	11/15/2011	N001	SF	U	0.96	F #	-	-
	mg/L	0716	WL	06/22/2011	N001	SF	O	1.64	F #	-	-
	mg/L	0716	WL	11/15/2011	N001	SF	O	1.26	F #	-	-
	mg/L	0717	WL	06/22/2011	N001	SE	O	1.10	F #	-	-
	mg/L	0717	WL	11/15/2011	N001	SE	O	0.71	F #	-	-
	mg/L	0718	WL	06/21/2011	N001	SF	D	0.90	F #	-	-
	mg/L	0718	WL	11/17/2011	N001	SF	D	2.22	F #	-	-
	mg/L	0719	WL	06/21/2011	N001	SE	D	5.50	FQ #	-	-
	mg/L	0719	WL	11/17/2011	N001	SE	D	1.08	FQ #	-	-
	mg/L	0720	WL	06/21/2011	N001	SF	C	0.14	F #	-	-
	mg/L	0720	WL	11/16/2011	N001	SF	C	1.72	F #	-	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Dissolved Oxygen	mg/L	0721	WL	06/21/2011	N001	SE	C	1.61	F #	-	-
	mg/L	0721	WL	11/16/2011	N001	SE	C	0.36	F #	-	-
	mg/L	0722R	WL	06/22/2011	N001	SF		2.10	F #	-	-
	mg/L	0722R	WL	11/17/2011	N001	SF		1.69	F #	-	-
	mg/L	0723	WL	06/22/2011	N001	SE	D	1.37	F #	-	-
	mg/L	0723	WL	11/17/2011	N001	SE	D	1.52	F #	-	-
	mg/L	0729	WL	06/22/2011	N001	SF	D	4.45	F #	-	-
	mg/L	0729	WL	11/17/2011	N001	SF	D	1.43	F #	-	-
	mg/L	0730	WL	06/22/2011	N001	SE	D	1.84	FQ #	-	-
	mg/L	0730	WL	11/17/2011	N001	SE	D	1.95	FQ #	-	-
	mg/L	0784	WL	06/21/2011	N001	SF	U	0.09	F #	-	-
	mg/L	0784	WL	11/16/2011	N001	SF	U	1.15	F #	-	-
	mg/L	0788	WL	06/22/2011	N001	SF	C	2.17	F #	-	-
	mg/L	0788	WL	11/16/2011	N001	SF	C	1.27	F #	-	-
	mg/L	0789	WL	06/22/2011	N001	SF	D	3.06	F #	-	-
	mg/L	0789	WL	11/16/2011	N001	SF	D	1.92	F #	-	-
	mg/L	0824	WL	06/22/2011	N001	SF		5.57	F #	-	-
	mg/L	0824	WL	11/17/2011	N001	SF		1.32	F #	-	-
	mg/L	0826	WL	06/22/2011	N001	SF		0.83	F #	-	-
	mg/L	0826	WL	11/16/2011	N001	SF		1.21	F #	-	-
Manganese	mg/L	0705	WL	06/22/2011	N001	SE	D	0.063	FQ #	0.00011	-
	mg/L	0705	WL	11/17/2011	N001	SE	D	0.077	FQ #	0.00011	-
	mg/L	0707	WL	06/22/2011	N001	SF	D	1.300	F #	0.00011	-
	mg/L	0707	WL	06/22/2011	N002	SF	D	1.300	F #	0.00011	-
	mg/L	0707	WL	11/17/2011	N001	SF	D	1.300	F #	0.00011	-
	mg/L	0710	WL	06/21/2011	N001	SF	U	0.013	F #	0.00011	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Manganese	mg/L	0710	WL	11/15/2011	N001	SF	U	0.019	F #	0.00011	-
	mg/L	0716	WL	06/22/2011	N001	SF	O	0.230	F #	0.00011	-
	mg/L	0716	WL	11/15/2011	N001	SF	O	0.140	F #	0.00011	-
	mg/L	0716	WL	11/15/2011	N002	SF	O	0.150	F #	0.00011	-
	mg/L	0717	WL	06/22/2011	N001	SE	O	0.280	F #	0.00011	-
	mg/L	0717	WL	11/15/2011	N001	SE	O	0.180	F #	0.00011	-
	mg/L	0718	WL	06/21/2011	N001	SF	D	0.350	F #	0.00011	-
	mg/L	0718	WL	11/17/2011	N001	SF	D	0.470	F #	0.00011	-
	mg/L	0719	WL	06/21/2011	N001	SE	D	0.160	FQ #	0.00011	-
	mg/L	0719	WL	11/17/2011	N001	SE	D	0.110	FQ #	0.00011	-
	mg/L	0720	WL	06/21/2011	N001	SF	C	0.072	F #	0.00011	-
	mg/L	0720	WL	11/16/2011	N001	SF	C	0.0053	F #	0.00011	-
	mg/L	0721	WL	06/21/2011	N001	SE	C	0.0044	B F #	0.00011	-
	mg/L	0721	WL	11/16/2011	N001	SE	C	0.0029	B F #	0.00011	-
	mg/L	0722R	WL	06/22/2011	N001	SF		0.002	B F #	0.00011	-
	mg/L	0722R	WL	11/17/2011	N001	SF		0.015	F #	0.00011	-
	mg/L	0723	WL	06/22/2011	N001	SE	D	0.330	F #	0.00011	-
	mg/L	0723	WL	11/17/2011	N001	SE	D	0.400	F #	0.00011	-
	mg/L	0729	WL	06/22/2011	N001	SF	D	0.067	F #	0.00011	-
	mg/L	0729	WL	11/17/2011	N001	SF	D	0.0049	B F #	0.00011	-
	mg/L	0730	WL	06/22/2011	N001	SE	D	0.180	FQ #	0.00011	-
	mg/L	0730	WL	11/17/2011	N001	SE	D	0.047	FQ #	0.00011	-
	mg/L	0784	WL	06/21/2011	N001	SF	U	0.600	F #	0.00011	-
	mg/L	0784	WL	06/21/2011	N002	SF	U	0.600	F #	0.00011	-
	mg/L	0784	WL	11/16/2011	N001	SF	U	0.660	F #	0.00011	-
	mg/L	0788	WL	06/22/2011	N001	SF	C	0.380	F #	0.00011	-



CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN- CERTAINTY
Manganese	mg/L	0788	WL	11/16/2011	N001	SF	C	0.420	F #	0.00011	-
	mg/L	0789	WL	06/22/2011	N001	SF	D	0.540	F #	0.00011	-
	mg/L	0789	WL	11/16/2011	N001	SF	D	0.690	F #	0.00011	-
	mg/L	0789	WL	11/16/2011	N002	SF	D	0.750	F #	0.00011	-
	mg/L	0824	WL	06/22/2011	N001	SF		0.0083	F #	0.00011	-
	mg/L	0824	WL	11/17/2011	N001	SF		0.002	B F #	0.00011	-
	mg/L	0826	WL	06/22/2011	N001	SF		2.200	F #	0.00011	-
	mg/L	0826	WL	11/16/2011	N001	SF		3.000	F #	0.00011	-
Molybdenum	mg/L	0705	WL	06/22/2011	N001	SE	D	0.0029	FQ #	0.00032	-
	mg/L	0705	WL	11/17/2011	N001	SE	D	0.0027	FQ #	0.00032	-
	mg/L	0707	WL	06/22/2011	N001	SF	D	1.400	F #	0.0016	-
	mg/L	0707	WL	06/22/2011	N002	SF	D	1.200	F #	0.0016	-
	mg/L	0707	WL	11/17/2011	N001	SF	D	1.100	F #	0.0064	-
	mg/L	0710	WL	06/21/2011	N001	SF	U	0.0019	F #	0.00032	-
	mg/L	0710	WL	11/15/2011	N001	SF	U	0.0015	F #	0.00032	-
	mg/L	0716	WL	06/22/2011	N001	SF	O	0.150	F #	0.00032	-
	mg/L	0716	WL	11/15/2011	N001	SF	O	0.120	F #	0.0016	-
	mg/L	0716	WL	11/15/2011	N002	SF	O	0.120	F #	0.0016	-
	mg/L	0717	WL	06/22/2011	N001	SE	O	0.0087	F #	0.00032	-
	mg/L	0717	WL	11/15/2011	N001	SE	O	0.007	F #	0.00032	-
	mg/L	0718	WL	06/21/2011	N001	SF	D	0.079	F #	0.00032	-
	mg/L	0718	WL	11/17/2011	N001	SF	D	0.120	F #	0.0016	-
	mg/L	0719	WL	06/21/2011	N001	SE	D	0.013	FQ #	0.00032	-
	mg/L	0719	WL	11/17/2011	N001	SE	D	0.0075	FQ #	0.00032	-
	mg/L	0720	WL	06/21/2011	N001	SF	C	0.0018	F #	0.00032	-
	mg/L	0720	WL	11/16/2011	N001	SF	C	0.0012	F #	0.00032	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN- CERTAINTY
Molybdenum	mg/L	0721	WL	06/21/2011	N001	SE	C	0.0027	F #	0.00032	-
	mg/L	0721	WL	11/16/2011	N001	SE	C	0.0024	F #	0.00032	-
	mg/L	0722R	WL	06/22/2011	N001	SF		0.130	F #	0.0016	-
	mg/L	0722R	WL	11/17/2011	N001	SF		0.110	F #	0.0016	-
	mg/L	0723	WL	06/22/2011	N001	SE	D	0.00032 U	F #	0.00032	-
	mg/L	0723	WL	11/17/2011	N001	SE	D	0.00032 U	F #	0.00032	-
	mg/L	0729	WL	06/22/2011	N001	SF	D	0.0035	F #	0.00032	-
	mg/L	0729	WL	11/17/2011	N001	SF	D	0.0029	F #	0.00032	-
	mg/L	0730	WL	06/22/2011	N001	SE	D	0.0047	FQ #	0.00032	-
	mg/L	0730	WL	11/17/2011	N001	SE	D	0.0044	FQ #	0.00032	-
	mg/L	0784	WL	06/21/2011	N001	SF	U	0.022	F #	0.00032	-
	mg/L	0784	WL	06/21/2011	N002	SF	U	0.024	F #	0.00032	-
	mg/L	0784	WL	11/16/2011	N001	SF	U	0.017	F #	0.00032	-
	mg/L	0788	WL	06/22/2011	N001	SF	C	0.025	F #	0.00032	-
	mg/L	0788	WL	11/16/2011	N001	SF	C	0.024	F #	0.00032	-
	mg/L	0789	WL	06/22/2011	N001	SF	D	0.560	F #	0.0032	-
	mg/L	0789	WL	11/16/2011	N001	SF	D	0.600	F #	0.0064	-
	mg/L	0789	WL	11/16/2011	N002	SF	D	0.590	F #	0.0064	-
	mg/L	0824	WL	06/22/2011	N001	SF		0.0064	F #	0.00032	-
	mg/L	0824	WL	11/17/2011	N001	SF		0.0027	F #	0.00032	-
	mg/L	0826	WL	06/22/2011	N001	SF		0.031	F #	0.00032	-
	mg/L	0826	WL	11/16/2011	N001	SF		0.023	F #	0.00032	-
Oxidation Reduction Potential	mV	0705	WL	06/22/2011	N001	SE	D	177.7	FQ #	-	-
	mV	0705	WL	11/17/2011	N001	SE	D	-128.7	FQ #	-	-
	mV	0707	WL	06/22/2011	N001	SF	D	214.5	F #	-	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Oxidation Reduction Potential	mV	0707	WL	11/17/2011	N001	SF	D	72.7	F #	-	-
	mV	0710	WL	06/21/2011	N001	SF	U	236.3	F #	-	-
	mV	0710	WL	11/15/2011	N001	SF	U	12.7	F #	-	-
	mV	0716	WL	06/22/2011	N001	SF	O	179.4	F #	-	-
	mV	0716	WL	11/15/2011	N001	SF	O	171.4	F #	-	-
	mV	0717	WL	06/22/2011	N001	SE	O	111.9	F #	-	-
	mV	0717	WL	11/15/2011	N001	SE	O	-77.6	F #	-	-
	mV	0718	WL	06/21/2011	N001	SF	D	213.5	F #	-	-
	mV	0718	WL	11/17/2011	N001	SF	D	-43.5	F #	-	-
	mV	0719	WL	06/21/2011	N001	SE	D	118.9	FQ #	-	-
	mV	0719	WL	11/17/2011	N001	SE	D	-158.2	FQ #	-	-
	mV	0720	WL	06/21/2011	N001	SF	C	185.0	F #	-	-
	mV	0720	WL	11/16/2011	N001	SF	C	47.4	F #	-	-
	mV	0721	WL	06/21/2011	N001	SE	C	184.0	F #	-	-
	mV	0721	WL	11/16/2011	N001	SE	C	-130.0	F #	-	-
	mV	0722R	WL	06/22/2011	N001	SF		139.4	F #	-	-
	mV	0722R	WL	11/17/2011	N001	SF		29.5	F #	-	-
	mV	0723	WL	06/22/2011	N001	SE	D	138.7	F #	-	-
	mV	0723	WL	11/17/2011	N001	SE	D	-99.7	F #	-	-
	mV	0729	WL	06/22/2011	N001	SF	D	198.2	F #	-	-
	mV	0729	WL	11/17/2011	N001	SF	D	28.7	F #	-	-
	mV	0730	WL	06/22/2011	N001	SE	D	164.0	FQ #	-	-
	mV	0730	WL	11/17/2011	N001	SE	D	-50.9	FQ #	-	-
	mV	0784	WL	06/21/2011	N001	SF	U	168.1	F #	-	-
	mV	0784	WL	11/16/2011	N001	SF	U	-70.6	F #	-	-



CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Oxidation Reduction Potential	mV	0788	WL	06/22/2011	N001	SF	C	207.3	F #	-	-
	mV	0788	WL	11/16/2011	N001	SF	C	-21.7	F #	-	-
	mV	0789	WL	06/22/2011	N001	SF	D	217.3	F #	-	-
	mV	0789	WL	11/16/2011	N001	SF	D	-60.5	F #	-	-
	mV	0824	WL	06/22/2011	N001	SF		161.0	F #	-	-
	mV	0824	WL	11/17/2011	N001	SF		51.9	F #	-	-
	mV	0826	WL	06/22/2011	N001	SF		194.1	F #	-	-
	mV	0826	WL	11/16/2011	N001	SF		5.6	F #	-	-
pH	s.u.	0705	WL	06/22/2011	N001	SE	D	8.23	FQ #	-	-
	s.u.	0705	WL	11/17/2011	N001	SE	D	8.53	FQ #	-	-
	s.u.	0707	WL	06/22/2011	N001	SF	D	6.97	F #	-	-
	s.u.	0707	WL	11/17/2011	N001	SF	D	7.19	F #	-	-
	s.u.	0710	WL	06/21/2011	N001	SF	U	7.26	F #	-	-
	s.u.	0710	WL	11/15/2011	N001	SF	U	7.56	F #	-	-
	s.u.	0716	WL	06/22/2011	N001	SF	O	7.06	F #	-	-
	s.u.	0716	WL	11/15/2011	N001	SF	O	7.24	F #	-	-
	s.u.	0717	WL	06/22/2011	N001	SE	O	7.66	F #	-	-
	s.u.	0717	WL	11/15/2011	N001	SE	O	8.02	F #	-	-
	s.u.	0718	WL	06/21/2011	N001	SF	D	7.02	F #	-	-
	s.u.	0718	WL	11/17/2011	N001	SF	D	7.14	F #	-	-
	s.u.	0719	WL	06/21/2011	N001	SE	D	7.61	FQ #	-	-
	s.u.	0719	WL	11/17/2011	N001	SE	D	7.72	FQ #	-	-
	s.u.	0720	WL	06/21/2011	N001	SF	C	7.19	F #	-	-
	s.u.	0720	WL	11/16/2011	N001	SF	C	7.35	F #	-	-
	s.u.	0721	WL	06/21/2011	N001	SE	C	8.77	F #	-	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
pH	s.u.	0721	WL	11/16/2011	N001	SE	C	8.97	F #	-	-
	s.u.	0722R	WL	06/22/2011	N001	SF		6.90	F #	-	-
	s.u.	0722R	WL	11/17/2011	N001	SF		6.95	F #	-	-
	s.u.	0723	WL	06/22/2011	N001	SE	D	7.10	F #	-	-
	s.u.	0723	WL	11/17/2011	N001	SE	D	7.22	F #	-	-
	s.u.	0729	WL	06/22/2011	N001	SF	D	7.17	F #	-	-
	s.u.	0729	WL	11/17/2011	N001	SF	D	7.23	F #	-	-
	s.u.	0730	WL	06/22/2011	N001	SE	D	7.36	FQ #	-	-
	s.u.	0730	WL	11/17/2011	N001	SE	D	7.51	FQ #	-	-
	s.u.	0784	WL	06/21/2011	N001	SF	U	7.45	F #	-	-
	s.u.	0784	WL	11/16/2011	N001	SF	U	7.49	F #	-	-
	s.u.	0788	WL	06/22/2011	N001	SF	C	7.10	F #	-	-
	s.u.	0788	WL	11/16/2011	N001	SF	C	7.26	F #	-	-
	s.u.	0789	WL	06/22/2011	N001	SF	D	7.04	F #	-	-
	s.u.	0789	WL	11/16/2011	N001	SF	D	7.16	F #	-	-
	s.u.	0824	WL	06/22/2011	N001	SF		7.31	F #	-	-
	s.u.	0824	WL	11/17/2011	N001	SF		7.23	F #	-	-
	s.u.	0826	WL	06/22/2011	N001	SF		7.09	F #	-	-
	s.u.	0826	WL	11/16/2011	N001	SF		7.18	F #	-	-
Specific Conductance	umhos/cm	0705	WL	06/22/2011	N001	SE	D	1232	FQ #	-	-
	umhos/cm	0705	WL	11/17/2011	N001	SE	D	1246	FQ #	-	-
	umhos/cm	0707	WL	06/22/2011	N001	SF	D	6593	F #	-	-
	umhos/cm	0707	WL	11/17/2011	N001	SF	D	6458	F #	-	-
	umhos/cm	0710	WL	06/21/2011	N001	SF	U	1188	F #	-	-
	umhos/cm	0710	WL	11/15/2011	N001	SF	U	607	F #	-	-
	umhos/cm	0716	WL	06/22/2011	N001	SF	O	1558	F #	-	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN- CERTAINTY
Specific Conductance	umhos/cm	0716	WL	11/15/2011	N001	SF	O	1481	F #	-	-
	umhos/cm	0717	WL	06/22/2011	N001	SE	O	1894	F #	-	-
	umhos/cm	0717	WL	11/15/2011	N001	SE	O	1939	F #	-	-
	umhos/cm	0718	WL	06/21/2011	N001	SF	D	5155	F #	-	-
	umhos/cm	0718	WL	11/17/2011	N001	SF	D	5580	F #	-	-
	umhos/cm	0719	WL	06/21/2011	N001	SE	D	1210	FQ #	-	-
	umhos/cm	0719	WL	11/17/2011	N001	SE	D	1224	FQ #	-	-
	umhos/cm	0720	WL	06/21/2011	N001	SF	C	1096	F #	-	-
	umhos/cm	0720	WL	11/16/2011	N001	SF	C	791	F #	-	-
	umhos/cm	0721	WL	06/21/2011	N001	SE	C	886	F #	-	-
	umhos/cm	0721	WL	11/16/2011	N001	SE	C	899	F #	-	-
	umhos/cm	0722R	WL	06/22/2011	N001	SF		2057	F #	-	-
	umhos/cm	0722R	WL	11/17/2011	N001	SF		2517	F #	-	-
	umhos/cm	0723	WL	06/22/2011	N001	SE	D	3577	F #	-	-
	umhos/cm	0723	WL	11/17/2011	N001	SE	D	3715	F #	-	-
	umhos/cm	0729	WL	06/22/2011	N001	SF	D	710	F #	-	-
	umhos/cm	0729	WL	11/17/2011	N001	SF	D	820	F #	-	-
	umhos/cm	0730	WL	06/22/2011	N001	SE	D	957	FQ #	-	-
	umhos/cm	0730	WL	11/17/2011	N001	SE	D	1021	FQ #	-	-
	umhos/cm	0784	WL	06/21/2011	N001	SF	U	4157	F #	-	-
	umhos/cm	0784	WL	11/16/2011	N001	SF	U	4039	F #	-	-
	umhos/cm	0788	WL	06/22/2011	N001	SF	C	4797	F #	-	-
	umhos/cm	0788	WL	11/16/2011	N001	SF	C	4164	F #	-	-
	umhos/cm	0789	WL	06/22/2011	N001	SF	D	10763	F #	-	-
	umhos/cm	0789	WL	11/16/2011	N001	SF	D	11113	F #	-	-
	umhos/cm	0824	WL	06/22/2011	N001	SF		568	F #	-	-



CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Specific Conductance	umhos/cm	0824	WL	11/17/2011	N001	SF		1187	F #	-	-
	umhos/cm	0826	WL	06/22/2011	N001	SF		3247	F #	-	-
	umhos/cm	0826	WL	11/16/2011	N001	SF		3836	F #	-	-
Sulfate	mg/L	0705	WL	06/22/2011	N001	SE	D	390	FQ #	10	-
	mg/L	0705	WL	11/17/2011	N001	SE	D	410	FQ #	5	-
	mg/L	0707	WL	06/22/2011	N001	SF	D	3600	F #	50	-
	mg/L	0707	WL	06/22/2011	N002	SF	D	3700	F #	50	-
	mg/L	0707	WL	11/17/2011	N001	SF	D	3500	F #	25	-
	mg/L	0710	WL	06/21/2011	N001	SF	U	370	F #	10	-
	mg/L	0710	WL	11/15/2011	N001	SF	U	130	F #	1	-
	mg/L	0716	WL	06/22/2011	N001	SF	O	480	F #	10	-
	mg/L	0716	WL	11/15/2011	N001	SF	O	440	F #	5	-
	mg/L	0716	WL	11/15/2011	N002	SF	O	440	F #	5	-
	mg/L	0717	WL	06/22/2011	N001	SE	O	710	F #	10	-
	mg/L	0717	WL	11/15/2011	N001	SE	O	690	F #	10	-
	mg/L	0718	WL	06/21/2011	N001	SF	D	2700	F #	25	-
	mg/L	0718	WL	11/17/2011	N001	SF	D	2900	F #	25	-
	mg/L	0719	WL	06/21/2011	N001	SE	D	440	FQ #	10	-
	mg/L	0719	WL	11/17/2011	N001	SE	D	440	FQ #	5	-
	mg/L	0720	WL	06/21/2011	N001	SF	C	320	F #	10	-
	mg/L	0720	WL	11/16/2011	N001	SF	C	180	F #	2.5	-
	mg/L	0721	WL	06/21/2011	N001	SE	C	280	F #	5	-
	mg/L	0721	WL	11/16/2011	N001	SE	C	280	F #	2.5	-
	mg/L	0722R	WL	06/22/2011	N001	SF		860	F #	10	-
	mg/L	0722R	WL	11/17/2011	N001	SF		1200	F #	10	-
	mg/L	0723	WL	06/22/2011	N001	SE	D	1700	F #	25	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Sulfate	mg/L	0723	WL	11/17/2011	N001	SE	D	1700	F #	25	-
	mg/L	0729	WL	06/22/2011	N001	SF	D	100	F #	2.5	-
	mg/L	0729	WL	11/17/2011	N001	SF	D	160	F #	2.5	-
	mg/L	0730	WL	06/22/2011	N001	SE	D	160	FQ #	5	-
	mg/L	0730	WL	11/17/2011	N001	SE	D	150	FQ #	2.5	-
	mg/L	0784	WL	06/21/2011	N001	SF	U	2300	F #	25	-
	mg/L	0784	WL	06/21/2011	N002	SF	U	2300	F #	25	-
	mg/L	0784	WL	11/16/2011	N001	SF	U	2200	F #	25	-
	mg/L	0788	WL	06/22/2011	N001	SF	C	2500	F #	25	-
	mg/L	0788	WL	11/16/2011	N001	SF	C	2000	F #	25	-
	mg/L	0789	WL	06/22/2011	N001	SF	D	6300	F #	50	-
	mg/L	0789	WL	11/16/2011	N001	SF	D	6500	F #	50	-
	mg/L	0789	WL	11/16/2011	N002	SF	D	6600	F #	50	-
	mg/L	0824	WL	06/22/2011	N001	SF		65	F #	2.5	-
	mg/L	0824	WL	11/17/2011	N001	SF		240	F #	5	-
	mg/L	0826	WL	06/22/2011	N001	SF		1400	F #	25	-
	mg/L	0826	WL	11/16/2011	N001	SF		1900	F #	25	-
Temperature	C	0705	WL	06/22/2011	N001	SE	D	10.05	FQ #	-	-
	C	0705	WL	11/17/2011	N001	SE	D	6.95	FQ #	-	-
	C	0707	WL	06/22/2011	N001	SF	D	8.99	F #	-	-
	C	0707	WL	11/17/2011	N001	SF	D	7.44	F #	-	-
	C	0710	WL	06/21/2011	N001	SF	U	8.92	F #	-	-
	C	0710	WL	11/15/2011	N001	SF	U	11.07	F #	-	-
	C	0716	WL	06/22/2011	N001	SF	O	10.73	F #	-	-
	C	0716	WL	11/15/2011	N001	SF	O	11.11	F #	-	-
	C	0717	WL	06/22/2011	N001	SE	O	11.46	F #	-	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Temperature	C	0717	WL	11/15/2011	N001	SE	O	9.08	F #	-	-
	C	0718	WL	06/21/2011	N001	SF	D	11.80	F #	-	-
	C	0718	WL	11/17/2011	N001	SF	D	12.97	F #	-	-
	C	0719	WL	06/21/2011	N001	SE	D	13.29	FQ #	-	-
	C	0719	WL	11/17/2011	N001	SE	D	10.94	FQ #	-	-
	C	0720	WL	06/21/2011	N001	SF	C	9.81	F #	-	-
	C	0720	WL	11/16/2011	N001	SF	C	10.57	F #	-	-
	C	0721	WL	06/21/2011	N001	SE	C	11.91	F #	-	-
	C	0721	WL	11/16/2011	N001	SE	C	10.04	F #	-	-
	C	0722R	WL	06/22/2011	N001	SF		11.84	F #	-	-
	C	0722R	WL	11/17/2011	N001	SF		13.43	F #	-	-
	C	0723	WL	06/22/2011	N001	SE	D	12.10	F #	-	-
	C	0723	WL	11/17/2011	N001	SE	D	12.19	F #	-	-
	C	0729	WL	06/22/2011	N001	SF	D	10.55	F #	-	-
	C	0729	WL	11/17/2011	N001	SF	D	12.57	F #	-	-
	C	0730	WL	06/22/2011	N001	SE	D	11.06	FQ #	-	-
	C	0730	WL	11/17/2011	N001	SE	D	12.94	FQ #	-	-
	C	0784	WL	06/21/2011	N001	SF	U	13.08	F #	-	-
	C	0784	WL	11/16/2011	N001	SF	U	9.60	F #	-	-
	C	0788	WL	06/22/2011	N001	SF	C	9.98	F #	-	-
	C	0788	WL	11/16/2011	N001	SF	C	10.43	F #	-	-
	C	0789	WL	06/22/2011	N001	SF	D	9.38	F #	-	-
	C	0789	WL	11/16/2011	N001	SF	D	9.46	F #	-	-
	C	0824	WL	06/22/2011	N001	SF		13.91	F #	-	-
	C	0824	WL	11/17/2011	N001	SF		11.58	F #	-	-
	C	0826	WL	06/22/2011	N001	SF		9.97	F #	-	-



CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Temperature	C	0826	WL	11/16/2011	N001	SF		9.64	F #	-	-
Turbidity	NTU	0705	WL	06/22/2011	N001	SE	D	4.43	FQ #	-	-
	NTU	0705	WL	11/17/2011	N001	SE	D	4.58	FQ #	-	-
	NTU	0707	WL	06/22/2011	N001	SF	D	3.98	F #	-	-
	NTU	0707	WL	11/17/2011	N001	SF	D	0.59	F #	-	-
	NTU	0710	WL	06/21/2011	N001	SF	U	2.00	F #	-	-
	NTU	0710	WL	11/15/2011	N001	SF	U	1.44	F #	-	-
	NTU	0716	WL	06/22/2011	N001	SF	O	2.10	F #	-	-
	NTU	0716	WL	11/15/2011	N001	SF	O	3.74	F #	-	-
	NTU	0717	WL	06/22/2011	N001	SE	O	4.58	F #	-	-
	NTU	0717	WL	11/15/2011	N001	SE	O	1.30	F #	-	-
	NTU	0718	WL	06/21/2011	N001	SF	D	3.19	F #	-	-
	NTU	0718	WL	11/17/2011	N001	SF	D	1.16	F #	-	-
	NTU	0719	WL	06/21/2011	N001	SE	D	5.66	FQ #	-	-
	NTU	0719	WL	11/17/2011	N001	SE	D	2.98	FQ #	-	-
	NTU	0720	WL	06/21/2011	N001	SF	C	1.68	F #	-	-
	NTU	0720	WL	11/16/2011	N001	SF	C	2.32	F #	-	-
	NTU	0721	WL	06/21/2011	N001	SE	C	1.28	F #	-	-
	NTU	0721	WL	11/16/2011	N001	SE	C	0.39	F #	-	-
	NTU	0722R	WL	06/22/2011	N001	SF		0.93	F #	-	-
	NTU	0722R	WL	11/17/2011	N001	SF		0.35	F #	-	-
	NTU	0723	WL	06/22/2011	N001	SE	D	0.69	F #	-	-
	NTU	0723	WL	11/17/2011	N001	SE	D	2.05	F #	-	-
	NTU	0729	WL	06/22/2011	N001	SF	D	9.89	F #	-	-
	NTU	0729	WL	11/17/2011	N001	SF	D	1.32	F #	-	-
	NTU	0730	WL	06/22/2011	N001	SE	D	4.77	FQ #	-	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Turbidity	NTU	0730	WL	11/17/2011	N001	SE	D	0.60	FQ #	-	-
	NTU	0784	WL	06/21/2011	N001	SF	U	0.85	F #	-	-
	NTU	0784	WL	11/16/2011	N001	SF	U	1.31	F #	-	-
	NTU	0788	WL	06/22/2011	N001	SF	C	3.38	F #	-	-
	NTU	0788	WL	11/16/2011	N001	SF	C	7.13	F #	-	-
	NTU	0789	WL	06/22/2011	N001	SF	D	1.07	F #	-	-
	NTU	0789	WL	11/16/2011	N001	SF	D	9.28	F #	-	-
	NTU	0824	WL	06/22/2011	N001	SF		9.82	F #	-	-
	NTU	0824	WL	11/17/2011	N001	SF		4.54	F #	-	-
	NTU	0826	WL	06/22/2011	N001	SF		4.98	F #	-	-
	NTU	0826	WL	11/16/2011	N001	SF		1.08	F #	-	-
Uranium	mg/L	0705	WL	06/22/2011	N001	SE	D	0.00032	FQ #	2.9E-05	-
	mg/L	0705	WL	11/17/2011	N001	SE	D	0.00017	FQ #	2.9E-05	-
	mg/L	0707	WL	06/22/2011	N001	SF	D	1.600	F #	0.00015	-
	mg/L	0707	WL	06/22/2011	N002	SF	D	1.500	F #	0.00015	-
	mg/L	0707	WL	11/17/2011	N001	SF	D	1.200	F #	0.00058	-
	mg/L	0710	WL	06/21/2011	N001	SF	U	0.0094	F #	2.9E-05	-
	mg/L	0710	WL	11/15/2011	N001	SF	U	0.0028	F #	2.9E-05	-
	mg/L	0716	WL	06/22/2011	N001	SF	O	0.410	F #	2.9E-05	-
	mg/L	0716	WL	11/15/2011	N001	SF	O	0.250	F #	0.00015	-
	mg/L	0716	WL	11/15/2011	N002	SF	O	0.250	F #	0.00015	-
	mg/L	0717	WL	06/22/2011	N001	SE	O	0.00055	F #	2.9E-05	-
	mg/L	0717	WL	11/15/2011	N001	SE	O	0.00006 B	F #	2.9E-05	-
	mg/L	0718	WL	06/21/2011	N001	SF	D	0.220	F #	2.9E-05	-
	mg/L	0718	WL	11/17/2011	N001	SF	D	0.200	F #	0.00015	-
	mg/L	0719	WL	06/21/2011	N001	SE	D	0.00065	FQ #	2.9E-05	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN- CERTAINTY
Uranium	mg/L	0719	WL	11/17/2011	N001	SE	D	0.00032	FQ #	2.9E-05	-
	mg/L	0720	WL	06/21/2011	N001	SF	C	0.011	F #	2.9E-05	-
	mg/L	0720	WL	11/16/2011	N001	SF	C	0.0052	F #	2.9E-05	-
	mg/L	0721	WL	06/21/2011	N001	SE	C	0.00014	F #	2.9E-05	-
	mg/L	0721	WL	11/16/2011	N001	SE	C	0.0001 B	F #	2.9E-05	-
	mg/L	0722R	WL	06/22/2011	N001	SF		0.620	F #	0.00015	-
	mg/L	0722R	WL	11/17/2011	N001	SF		0.720	F #	0.00015	-
	mg/L	0723	WL	06/22/2011	N001	SE	D	0.00004 B	F #	2.9E-05	-
	mg/L	0723	WL	11/17/2011	N001	SE	D	0.00005 B	F #	2.9E-05	-
	mg/L	0729	WL	06/22/2011	N001	SF	D	0.0077	F #	2.9E-05	-
	mg/L	0729	WL	11/17/2011	N001	SF	D	0.0048	F #	2.9E-05	-
	mg/L	0730	WL	06/22/2011	N001	SE	D	0.0083	FQ #	2.9E-05	-
	mg/L	0730	WL	11/17/2011	N001	SE	D	0.007	FQ #	2.9E-05	-
	mg/L	0784	WL	06/21/2011	N001	SF	U	0.016	F #	2.9E-05	-
	mg/L	0784	WL	06/21/2011	N002	SF	U	0.016	F #	2.9E-05	-
	mg/L	0784	WL	11/16/2011	N001	SF	U	0.0035	F #	2.9E-05	-
	mg/L	0788	WL	06/22/2011	N001	SF	C	0.091	F #	2.9E-05	-
	mg/L	0788	WL	11/16/2011	N001	SF	C	0.061	F #	2.9E-05	-
	mg/L	0789	WL	06/22/2011	N001	SF	D	2.300	F #	0.00029	-
	mg/L	0789	WL	11/16/2011	N001	SF	D	2.100	F #	0.00058	-
	mg/L	0789	WL	11/16/2011	N002	SF	D	2.100	F #	0.00058	-
	mg/L	0824	WL	06/22/2011	N001	SF		0.0086	F #	2.9E-05	-
	mg/L	0824	WL	11/17/2011	N001	SF		0.016	F #	2.9E-05	-
	mg/L	0826	WL	06/22/2011	N001	SF		0.058	F #	2.9E-05	-
	mg/L	0826	WL	11/16/2011	N001	SF		0.061	F #	2.9E-05	-



CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:15 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
RECORDS: SELECTED FROM USEE200 WHERE site_code='RVT01' AND location_code in('0705','0707','0710','0716','0717','0718','0719','0720','0721','0722R','0723','0729','0730','0784','0788','0789','0824','0826') AND (data_validation_qualifiers IS NULL OR data_validation_qualifiers NOT LIKE '%R%' AND data_validation_qualifiers NOT LIKE '%X%') AND DATE_SAMPLED between #1/1/2011# and #12/31/2011#											

SAMPLE ID CODES: 000X = Filtered sample. N00X = Unfiltered sample. X = replicate number.

LOCATION TYPES: WL WELL

ZONES OF COMPLETION: a zone of completion with a "-" is cross-screened and, therefore, has two zones of completion (1st zone - 2nd zone).

SE SEMICONFINED SANDSTONE SF SURFICIAL

FLOW CODES: C CROSS GRADIENT D DOWN GRADIENT O ON-SITE U UPGRADIENT

LAB QUALIFIERS:

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

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- R Unusable result.
- G Possible grout contamination, pH > 9.
- N Presumptive evidence that analyte is present. The analyte is "tentatively identified".
- U Parameter analyzed for but was not detected.
- J Estimated value.
- Q Qualitative result due to sampling technique
- X Location is undefined.

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

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**Appendix C**  
**Domestic Well Data**



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CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:12 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Alkalinity, Total (As CaCO3)	mg/L	0405	WL	06/21/2011	N001	NR	N	237	#	-	-
	mg/L	0405	WL	11/17/2011	N001	NR	N	28	#	-	-
	mg/L	0430	WL	06/21/2011	N001	NR	N	79	#	-	-
	mg/L	0430	WL	11/15/2011	N001	NR	N	150	#	-	-
	mg/L	0436	WL	06/21/2011	N001	NR	N	171	#	-	-
	mg/L	0436	WL	11/15/2011	N001	NR	N	140	#	-	-
	mg/L	0460	WL	06/21/2011	N001	NR	N	175	#	-	-
	mg/L	0460	WL	11/15/2011	N001	NR	N	159	#	-	-
	mg/L	0828	WL	06/21/2011	N001		O	182	#	-	-
	mg/L	0828	WL	11/15/2011	N001		O	149	#	-	-
Dissolved Oxygen	mg/L	0405	WL	06/21/2011	N001	NR	N	3.60	#	-	-
	mg/L	0405	WL	11/17/2011	N001	NR	N	5.47	#	-	-
	mg/L	0430	WL	06/21/2011	N001	NR	N	1.17	#	-	-
	mg/L	0430	WL	11/15/2011	N001	NR	N	3.15	#	-	-
	mg/L	0436	WL	06/21/2011	N001	NR	N	4.89	#	-	-
	mg/L	0436	WL	11/15/2011	N001	NR	N	4.39	#	-	-
	mg/L	0460	WL	06/21/2011	N001	NR	N	3.31	#	-	-
	mg/L	0460	WL	11/15/2011	N001	NR	N	4.53	#	-	-
	mg/L	0828	WL	06/21/2011	N001		O	3.63	#	-	-
	mg/L	0828	WL	11/15/2011	N001		O	3.71	#	-	-
Manganese	mg/L	0405	WL	06/21/2011	N001	NR	N	0.0064	#	0.00011	-
	mg/L	0405	WL	11/17/2011	N001	NR	N	0.0022 B	#	0.00011	-
	mg/L	0430	WL	06/21/2011	N001	NR	N	0.0018 B	#	0.00011	-
	mg/L	0430	WL	11/15/2011	N001	NR	N	0.068	#	0.00011	-
	mg/L	0436	WL	06/21/2011	N001	NR	N	0.0018 B	#	0.00011	-
	mg/L	0436	WL	11/15/2011	N001	NR	N	0.0018 B	#	0.00011	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:12 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA			DETECTION LIMIT	UN-CERTAINTY
Manganese	mg/L	0460	WL	06/21/2011	N001	NR	N	0.00094	B	U	#	0.00011	-
	mg/L	0460	WL	11/15/2011	N001	NR	N	0.00048	B	J	#	0.00011	-
	mg/L	0828	WL	06/21/2011	N001		O	0.0013	B	U	#	0.00011	-
	mg/L	0828	WL	11/15/2011	N001		O	0.0022	B		#	0.00011	-
Molybdenum	mg/L	0405	WL	06/21/2011	N001	NR	N	0.0029			#	0.00032	-
	mg/L	0405	WL	11/17/2011	N001	NR	N	0.0047			#	0.00032	-
	mg/L	0430	WL	06/21/2011	N001	NR	N	0.005			#	0.00032	-
	mg/L	0430	WL	11/15/2011	N001	NR	N	0.0022			#	0.00032	-
	mg/L	0436	WL	06/21/2011	N001	NR	N	0.0031			#	0.00032	-
	mg/L	0436	WL	11/15/2011	N001	NR	N	0.0029			#	0.00032	-
	mg/L	0460	WL	06/21/2011	N001	NR	N	0.0029			#	0.00032	-
	mg/L	0460	WL	11/15/2011	N001	NR	N	0.0025			#	0.00032	-
	mg/L	0828	WL	06/21/2011	N001		O	0.0031			#	0.00032	-
	mg/L	0828	WL	11/15/2011	N001		O	0.003			#	0.00032	-
Oxidation Reduction Potential	mV	0405	WL	06/21/2011	N001	NR	N	149.0			#	-	-
	mV	0405	WL	11/17/2011	N001	NR	N	-18.7			#	-	-
	mV	0430	WL	06/21/2011	N001	NR	N	130.1			#	-	-
	mV	0430	WL	11/15/2011	N001	NR	N	158.8			#	-	-
	mV	0436	WL	06/21/2011	N001	NR	N	214.8			#	-	-
	mV	0436	WL	11/15/2011	N001	NR	N	169.0			#	-	-
	mV	0460	WL	06/21/2011	N001	NR	N	203.6			#	-	-
	mV	0460	WL	11/15/2011	N001	NR	N	119.1			#	-	-
	mV	0828	WL	06/21/2011	N001		O	215.8			#	-	-
	mV	0828	WL	11/15/2011	N001		O	167.5			#	-	-
pH	s.u.	0405	WL	06/21/2011	N001	NR	N	8.71			#	-	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:12 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
pH	s.u.	0405	WL	11/17/2011	N001	NR	N	9.37	#	-	-
	s.u.	0430	WL	06/21/2011	N001	NR	N	9.29	#	-	-
	s.u.	0430	WL	11/15/2011	N001	NR	N	8.69	#	-	-
	s.u.	0436	WL	06/21/2011	N001	NR	N	8.76	#	-	-
	s.u.	0436	WL	11/15/2011	N001	NR	N	8.96	#	-	-
	s.u.	0460	WL	06/21/2011	N001	NR	N	8.77	#	-	-
	s.u.	0460	WL	11/15/2011	N001	NR	N	8.95	#	-	-
	s.u.	0828	WL	06/21/2011	N001		O	8.75	#	-	-
	s.u.	0828	WL	11/15/2011	N001		O	9.00	#	-	-
Specific Conductance	umhos/cm	0405	WL	06/21/2011	N001	NR	N	750	#	-	-
	umhos/cm	0405	WL	11/17/2011	N001	NR	N	1017	#	-	-
	umhos/cm	0430	WL	06/21/2011	N001	NR	N	993	#	-	-
	umhos/cm	0430	WL	11/15/2011	N001	NR	N	756	#	-	-
	umhos/cm	0436	WL	06/21/2011	N001	NR	N	776	#	-	-
	umhos/cm	0436	WL	11/15/2011	N001	NR	N	771	#	-	-
	umhos/cm	0460	WL	06/21/2011	N001	NR	N	715	#	-	-
	umhos/cm	0460	WL	11/15/2011	N001	NR	N	725	#	-	-
	umhos/cm	0828	WL	06/21/2011	N001		O	795	#	-	-
	umhos/cm	0828	WL	11/15/2011	N001		O	767	#	-	-
Sulfate	mg/L	0405	WL	06/21/2011	N001	NR	N	190	#	2.5	-
	mg/L	0405	WL	11/17/2011	N001	NR	N	370	#	2.5	-
	mg/L	0430	WL	06/21/2011	N001	NR	N	390	#	5	-
	mg/L	0430	WL	11/15/2011	N001	NR	N	180	#	2.5	-
	mg/L	0436	WL	06/21/2011	N001	NR	N	210	#	2.5	-
	mg/L	0436	WL	11/15/2011	N001	NR	N	190	#	2.5	-
	mg/L	0460	WL	06/21/2011	N001	NR	N	170	#	2.5	-



CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:12 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Sulfate	mg/L	0460	WL	11/15/2011	N001	NR	N	160	#	2.5	-
	mg/L	0828	WL	06/21/2011	N001		O	210	#	5	-
	mg/L	0828	WL	11/15/2011	N001		O	200	#	2.5	-
Temperature	C	0405	WL	06/21/2011	N001	NR	N	13.42	#	-	-
	C	0405	WL	11/17/2011	N001	NR	N	9.31	#	-	-
	C	0430	WL	06/21/2011	N001	NR	N	12.41	#	-	-
	C	0430	WL	11/15/2011	N001	NR	N	9.05	#	-	-
	C	0436	WL	06/21/2011	N001	NR	N	13.94	#	-	-
	C	0436	WL	11/15/2011	N001	NR	N	13.23	#	-	-
	C	0460	WL	06/21/2011	N001	NR	N	18.19	#	-	-
	C	0460	WL	11/15/2011	N001	NR	N	19.83	#	-	-
	C	0828	WL	06/21/2011	N001		O	14.65	#	-	-
	C	0828	WL	11/15/2011	N001		O	10.87	#	-	-
Turbidity	NTU	0405	WL	06/21/2011	N001	NR	N	1.49	#	-	-
	NTU	0405	WL	11/17/2011	N001	NR	N	1.41	#	-	-
	NTU	0430	WL	06/21/2011	N001	NR	N	5.57	#	-	-
	NTU	0430	WL	11/15/2011	N001	NR	N	4.43	#	-	-
	NTU	0436	WL	06/21/2011	N001	NR	N	4.97	#	-	-
	NTU	0436	WL	11/15/2011	N001	NR	N	3.48	#	-	-
	NTU	0460	WL	06/21/2011	N001	NR	N	4.98	#	-	-
	NTU	0460	WL	11/15/2011	N001	NR	N	1.15	#	-	-
	NTU	0828	WL	06/21/2011	N001		O	3.32	#	-	-
	NTU	0828	WL	11/15/2011	N001		O	0.5	#	-	-
Uranium	mg/L	0405	WL	06/21/2011	N001	NR	N	0.00002 U	#	2.9E-05	-
	mg/L	0405	WL	11/17/2011	N001	NR	N	0.00002 U	#	2.9E-05	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:12 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	ZONE COMPL	FLOW REL.	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN- CERTAINTY
Uranium	mg/L	0430	WL	06/21/2011	N001	NR	N	0.00002	U #	2.9E-05	-
	mg/L	0430	WL	11/15/2011	N001	NR	N	0.00004	B #	2.9E-05	-
	mg/L	0436	WL	06/21/2011	N001	NR	N	0.00007	B #	2.9E-05	-
	mg/L	0436	WL	11/15/2011	N001	NR	N	0.00026	#	2.9E-05	-
	mg/L	0460	WL	06/21/2011	N001	NR	N	0.00005	B #	2.9E-05	-
	mg/L	0460	WL	11/15/2011	N001	NR	N	0.00005	B #	2.9E-05	-
	mg/L	0828	WL	06/21/2011	N001		O	0.00011	#	2.9E-05	-
	mg/L	0828	WL	11/15/2011	N001		O	0.00008	B #	2.9E-05	-

CLASSIC GROUNDWATER QUALITY DATA BY PARAMETER WITH ZONE (USEE201) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:12 am

PARAMETER	UNITS	LOCATION CODE	LOCATION TYPE	SAMPLE: DATE	ID	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('0405','0430','0436','0460','0828') AND (data\_validation\_qualifiers IS NULL OR data\_validation\_qualifiers NOT LIKE '%R%' AND data\_validation\_qualifiers NOT LIKE '%X%') AND DATE\_SAMPLED between #1/1/2011# and #12/31/2011#

SAMPLE ID CODES: 000X = Filtered sample. N00X = Unfiltered sample. X = replicate number.

LOCATION TYPES: WL WELL

ZONES OF COMPLETION: a zone of completion with a "-" is cross-screened and, therefore, has two zones of completion (1st zone - 2nd zone).

NR NO RECOVERY OF DATA FOR CLASSIFYING

FLOW CODES: N UNKNOWN O ON-SITE

LAB QUALIFIERS:

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

DATA QUALIFIERS:

- |  |  |  |
|--|--|--|
| F Low flow sampling method used.                     | G Possible grout contamination, pH > 9.  | J Estimated value.                             |
| L Less than 3 bore volumes purged prior to sampling. | N Presumptive evidence that analyte is present. The analyte is "tentatively identified". | Q Qualitative result due to sampling technique |
| R Unusable result.                                   | U Parameter analyzed for but was not detected.   | X Location is undefined.                       |

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

## **Appendix D**

### **Surface Water Quality Data**



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SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:10 am

PARAMETER	UNITS	LOCATION CODE	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Alkalinity, Total (As CaCO3)	mg/L	0747	06/22/2011	0001	126		#	-
	mg/L	0747	11/16/2011	N001	296		#	-
	mg/L	0749	06/21/2011	N001	95		#	-
	mg/L	0749	11/15/2011	0001	21		#	-
	mg/L	0794	06/21/2011	0001	117		#	-
	mg/L	0794	11/15/2011	N001	177		#	-
	mg/L	0796	06/21/2011	0001	98		#	-
	mg/L	0796	11/15/2011	N001	187		#	-
	mg/L	0810	06/21/2011	N001	396		#	-
	mg/L	0810	11/17/2011	N001	461		#	-
	mg/L	0811	06/22/2011	0001	63		#	-
	mg/L	0811	11/16/2011	N001	182		#	-
	mg/L	0812	06/22/2011	0001	65		#	-
	mg/L	0812	11/17/2011	N001	186		#	-
	mg/L	0822	06/21/2011	N001	220		#	-
	mg/L	0822	11/16/2011	0001	204		#	-
	mg/L	0823	06/21/2011	N001	79		#	-
	mg/L	0823	11/15/2011	N001	109		#	-
Dissolved Oxygen	mg/L	0747	06/22/2011	N001	4.59		#	-
	mg/L	0747	11/16/2011	N001	10.21		#	-
	mg/L	0749	06/21/2011	N001	3.31		#	-
	mg/L	0749	11/15/2011	N001	7.68		#	-
	mg/L	0794	06/21/2011	N001	9.40		#	-
	mg/L	0794	11/15/2011	N001	13.58		#	-
	mg/L	0796	06/21/2011	N001	9.93		#	-
	mg/L	0796	11/15/2011	N001	13.47		#	-
	mg/L	0810	06/21/2011	N001	8.68		#	-
	mg/L	0810	11/17/2011	N001	10.93		#	-
	mg/L	0811	06/22/2011	N001	8.94		#	-
	mg/L	0811	11/16/2011	N001	13.89		#	-
	mg/L	0812	06/22/2011	N001	8.56		#	-
	mg/L	0812	11/17/2011	N001	13.90		#	-
	mg/L	0822	06/21/2011	N001	5.16		#	-
	mg/L	0822	11/16/2011	N001	9.46		#	-
	mg/L	0823	06/21/2011	N001	6.86		#	-
	mg/L	0823	11/15/2011	N001	12.83		#	-
Manganese	mg/L	0747	06/22/2011	0001	0.180		#	0.00011

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:10 am

PARAMETER	UNITS	LOCATION CODE	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN- CERTAINTY
Manganese	mg/L	0747	11/16/2011	N001	0.620		# 0.00011	-
	mg/L	0749	06/21/2011	N001	0.050		# 0.00011	-
	mg/L	0749	11/15/2011	0001	0.041		# 0.00011	-
	mg/L	0794	06/21/2011	0001	0.0065		# 0.00011	-
	mg/L	0794	11/15/2011	N001	0.033		# 0.00011	-
	mg/L	0796	06/21/2011	0001	0.0037 B		# 0.00011	-
	mg/L	0796	11/15/2011	N001	0.046		# 0.00011	-
	mg/L	0810	06/21/2011	N001	0.054		# 0.00011	-
	mg/L	0810	11/17/2011	N001	0.340		# 0.00011	-
	mg/L	0811	06/22/2011	0001	0.0051		# 0.00011	-
	mg/L	0811	11/16/2011	N001	0.035		# 0.00011	-
	mg/L	0812	06/22/2011	0001	0.0067		# 0.00011	-
	mg/L	0812	11/17/2011	N001	0.072		# 0.00011	-
	mg/L	0822	06/21/2011	N001	0.0067		# 0.00011	-
	mg/L	0822	11/16/2011	0001	0.099		# 0.00011	-
	mg/L	0823	06/21/2011	N001	0.051		# 0.00011	-
	mg/L	0823	11/15/2011	N001	0.042		# 0.00011	-
Molybdenum	mg/L	0747	06/22/2011	0001	0.0026		# 0.00032	-
	mg/L	0747	11/16/2011	N001	0.013		# 0.0016	-
	mg/L	0749	06/21/2011	N001	0.009		# 0.00032	-
	mg/L	0749	11/15/2011	0001	0.0088		# 0.00032	-
	mg/L	0794	06/21/2011	0001	0.003		# 0.00032	-
	mg/L	0794	11/15/2011	N001	0.0014		# 0.00032	-
	mg/L	0796	06/21/2011	0001	0.0006 B		# 0.00032	-
	mg/L	0796	11/15/2011	N001	0.0013		# 0.00032	-
	mg/L	0810	06/21/2011	N001	0.0012		# 0.00032	-
	mg/L	0810	11/17/2011	N001	0.0013		# 0.00032	-
	mg/L	0811	06/22/2011	0001	0.0005 B		# 0.00032	-
	mg/L	0811	11/16/2011	N001	0.0016		# 0.00032	-
	mg/L	0812	06/22/2011	0001	0.0004 B		# 0.00032	-
	mg/L	0812	11/17/2011	N001	0.0019		# 0.00032	-
	mg/L	0822	06/21/2011	N001	0.0041		# 0.00032	-
	mg/L	0822	11/16/2011	0001	0.0054		# 0.00032	-
	mg/L	0823	06/21/2011	N001	0.0015		# 0.00032	-
	mg/L	0823	11/15/2011	N001	0.0016		# 0.00032	-
Oxidation Reduction Potential	mV	0747	06/22/2011	N001	167.5		# -	-
	mV	0747	11/16/2011	N001	96.6		# -	-

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:10 am

PARAMETER	UNITS	LOCATION CODE	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Oxidation Reduction Potential	mV	0749	06/21/2011	N001	177.2		#	- -
	mV	0749	11/15/2011	N001	27.8		#	- -
	mV	0794	06/21/2011	N001	222.3		#	- -
	mV	0794	11/15/2011	N001	223.1		#	- -
	mV	0796	06/21/2011	N001	206.7		#	- -
	mV	0796	11/15/2011	N001	271.9		#	- -
	mV	0810	06/21/2011	N001	225.8		#	- -
	mV	0810	11/17/2011	N001	-34.9		#	- -
	mV	0811	06/22/2011	N001	160.3		#	- -
	mV	0811	11/16/2011	N001	32.9		#	- -
	mV	0812	06/22/2011	N001	129.9		#	- -
	mV	0812	11/17/2011	N001	31.3		#	- -
	mV	0822	06/21/2011	N001	185.3		#	- -
	mV	0822	11/16/2011	N001	80.9		#	- -
	mV	0823	06/21/2011	N001	231.9		#	- -
	mV	0823	11/15/2011	N001	174.1		#	- -
pH	s.u.	0747	06/22/2011	N001	7.60		#	- -
	s.u.	0747	11/16/2011	N001	7.54		#	- -
	s.u.	0749	06/21/2011	N001	7.46		#	- -
	s.u.	0749	11/15/2011	N001	7.77		#	- -
	s.u.	0794	06/21/2011	N001	8.17		#	- -
	s.u.	0794	11/15/2011	N001	8.33		#	- -
	s.u.	0796	06/21/2011	N001	7.74		#	- -
	s.u.	0796	11/15/2011	N001	6.96		#	- -
	s.u.	0810	06/21/2011	N001	8.82		#	- -
	s.u.	0810	11/17/2011	N001	8.55		#	- -
	s.u.	0811	06/22/2011	N001	7.97		#	- -
	s.u.	0811	11/16/2011	N001	8.58		#	- -
	s.u.	0812	06/22/2011	N001	7.98		#	- -
	s.u.	0812	11/17/2011	N001	8.50		#	- -
	s.u.	0822	06/21/2011	N001	8.44		#	- -
	s.u.	0822	11/16/2011	N001	7.84		#	- -
	s.u.	0823	06/21/2011	N001	8.62		#	- -
	s.u.	0823	11/15/2011	N001	8.26		#	- -
Radium-226	pCi/L	0822	06/21/2011	N001	0.19	U	#	0.19 ± 0.14
	pCi/L	0822	11/16/2011	0001	0.21	U	#	0.21 ± 0.14
Radium-228	pCi/L	0822	06/21/2011	N001	0.42	U	#	0.42 ± 0.25



SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:10 am

PARAMETER	UNITS	LOCATION CODE	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Radium-228	pCi/L	0822	11/16/2011	0001	1.11	J	# 0.46	± 0.46
Specific Conductance	umhos/cm	0747	06/22/2011	N001	430		# -	-
	umhos/cm	0747	11/16/2011	N001	2363		# -	-
	umhos/cm	0749	06/21/2011	N001	3344		# -	-
	umhos/cm	0749	11/15/2011	N001	3267		# -	-
	umhos/cm	0794	06/21/2011	N001	281		# -	-
	umhos/cm	0794	11/15/2011	N001	919		# -	-
	umhos/cm	0796	06/21/2011	N001	251		# -	-
	umhos/cm	0796	11/15/2011	N001	958		# -	-
	umhos/cm	0810	06/21/2011	N001	1308		# -	-
	umhos/cm	0810	11/17/2011	N001	1755		# -	-
	umhos/cm	0811	06/22/2011	N001	266		# -	-
	umhos/cm	0811	11/16/2011	N001	899		# -	-
	umhos/cm	0812	06/22/2011	N001	249		# -	-
	umhos/cm	0812	11/17/2011	N001	947		# -	-
	umhos/cm	0822	06/21/2011	N001	2052		# -	-
	umhos/cm	0822	11/16/2011	N001	1963		# -	-
	umhos/cm	0823	06/21/2011	N001	1819		# -	-
	umhos/cm	0823	11/15/2011	N001	2408		# -	-
Sulfate	mg/L	0747	06/22/2011	0001	98		# 1	-
	mg/L	0747	11/16/2011	N001	1000		# 10	-
	mg/L	0749	06/21/2011	N001	2000		# 25	-
	mg/L	0749	11/15/2011	0001	1800		# 25	-
	mg/L	0794	06/21/2011	0001	62		# 0.5	-
	mg/L	0794	11/15/2011	N001	290		# 2.5	-
	mg/L	0796	06/21/2011	0001	59		# 0.5	-
	mg/L	0796	11/15/2011	N001	290		# 2.5	-
	mg/L	0810	06/21/2011	N001	330		# 10	-
	mg/L	0810	11/17/2011	N001	450		# 5	-
	mg/L	0811	06/22/2011	0001	56		# 0.5	-
	mg/L	0811	11/16/2011	N001	290		# 2.5	-
	mg/L	0812	06/22/2011	0001	49		# 0.5	-
	mg/L	0812	11/17/2011	N001	300		# 2.5	-
	mg/L	0822	06/21/2011	N001	980		# 10	-
	mg/L	0822	11/16/2011	0001	900		# 10	-
	mg/L	0823	06/21/2011	N001	650		# 10	-
	mg/L	0823	11/15/2011	N001	920		# 10	-
Temperature	C	0747	06/22/2011	N001	19.38		# -	-

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE RVT01, Riverton Processing Site  
 REPORT DATE: 4/4/2012 7:10 am

PARAMETER	UNITS	LOCATION CODE	SAMPLE:		RESULT	QUALIFIERS:			DETECTION LIMIT	UN- CERTAINTY
			DATE	ID		LAB	DATA	QA		
Temperature	C	0747	11/16/2011	N001	2.14				#	-
	C	0749	06/21/2011	N001	24.80				#	-
	C	0749	11/15/2011	N001	16.60				#	-
	C	0794	06/21/2011	N001	13.16				#	-
	C	0794	11/15/2011	N001	1.00				#	-
	C	0796	06/21/2011	N001	11.94				#	-
	C	0796	11/15/2011	N001	0.72				#	-
	C	0810	06/21/2011	N001	17.81				#	-
	C	0810	11/17/2011	N001	2.79				#	-
	C	0811	06/22/2011	N001	14.68				#	-
	C	0811	11/16/2011	N001	1.48				#	-
	C	0812	06/22/2011	N001	17.38				#	-
	C	0812	11/17/2011	N001	1.90				#	-
	C	0822	06/21/2011	N001	22.60				#	-
	C	0822	11/16/2011	N001	4.74				#	-
	C	0823	06/21/2011	N001	19.35				#	-
	C	0823	11/15/2011	N001	3.16				#	-
Turbidity	NTU	0747	06/22/2011	N001	36.1				#	-
	NTU	0747	11/16/2011	N001	6.96				#	-
	NTU	0749	06/21/2011	N001	9.29				#	-
	NTU	0749	11/15/2011	N001	12.3				#	-
	NTU	0794	06/21/2011	N001	96.1				#	-
	NTU	0794	11/15/2011	N001	6.44				#	-
	NTU	0796	06/21/2011	N001	129				#	-
	NTU	0796	11/15/2011	N001	9.61				#	-
	NTU	0810	06/21/2011	N001	7.13				#	-
	NTU	0810	11/17/2011	N001	5.39				#	-
	NTU	0811	06/22/2011	N001	78.8				#	-
	NTU	0811	11/16/2011	N001	7.87				#	-
	NTU	0812	06/22/2011	N001	76.0				#	-
	NTU	0812	11/17/2011	N001	7.93				#	-
	NTU	0822	06/21/2011	N001	2.42				#	-
	NTU	0822	11/16/2011	N001	25.9				#	-
	NTU	0823	06/21/2011	N001	1.81				#	-
	NTU	0823	11/15/2011	N001	3.59				#	-
Uranium	mg/L	0747	06/22/2011	0001	0.028				#	2.9E-05
	mg/L	0747	11/16/2011	N001	0.230				#	0.00015
	mg/L	0749	06/21/2011	N001	0.0024				#	2.9E-05

SURFACE WATER QUALITY DATA BY PARAMETER (USEE800) FOR SITE: RVT01, Riverton Processing Site  
REPORT DATE: 4/4/2012 7:10 am

PARAMETER	UNITS	LOCATION CODE	SAMPLE: DATE	ID	RESULT	QUALIFIERS: LAB DATA QA	DETECTION LIMIT	UN-CERTAINTY
Uranium	mg/L	0749	11/15/2011	0001	0.0013		# 2.9E-05	-
	mg/L	0794	06/21/2011	0001	0.0018		# 2.9E-05	-
	mg/L	0794	11/15/2011	N001	0.0069		# 2.9E-05	-
	mg/L	0796	06/21/2011	0001	0.0014		# 2.9E-05	-
	mg/L	0796	11/15/2011	N001	0.0062		# 2.9E-05	-
	mg/L	0810	06/21/2011	N001	0.0088		# 2.9E-05	-
	mg/L	0810	11/17/2011	N001	0.0067		# 2.9E-05	-
	mg/L	0811	06/22/2011	0001	0.0013		# 2.9E-05	-
	mg/L	0811	11/16/2011	N001	0.0066		# 2.9E-05	-
	mg/L	0812	06/22/2011	0001	0.0013		# 2.9E-05	-
	mg/L	0812	11/17/2011	N001	0.0097		# 2.9E-05	-
	mg/L	0822	06/21/2011	N001	0.008		# 2.9E-05	-
	mg/L	0822	11/16/2011	0001	0.0097		# 2.9E-05	-
	mg/L	0823	06/21/2011	N001	0.0054		# 2.9E-05	-
	mg/L	0823	11/15/2011	N001	0.0045		# 2.9E-05	-

RECORDS: SELECTED FROM USEE800 WHERE site\_code='RVT01' AND (data\_validation\_qualifiers IS NULL OR data\_validation\_qualifiers NOT LIKE '%R%' AND data\_validation\_qualifiers NOT LIKE '%X%') AND DATE\_SAMPLED between #1/1/2011# and #12/31/2011#

SAMPLE ID CODES: 000X = Filtered sample. N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

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

DATA QUALIFIERS:

- F Low flow sampling method used.
- J Estimated value.
- N Presumptive evidence that analyte is present. The analyte is "tentatively identified".
- R Unusable result.
- X Location is undefined.
- G Possible grout contamination, pH > 9.
- L Less than 3 bore volumes purged prior to sampling.
- Q Qualitative result due to sampling technique
- U Parameter analyzed for but was not detected.

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

## **Verification Monitoring Report for the Riverton, Wyoming, Processing Site, Update for 2011**

The U.S. Department of Energy (DOE) has prepared a Verification Monitoring Report documenting the evaluation of groundwater and surface water monitoring data generated from the 2011 semiannual sampling events at the Riverton, Wyoming, Processing Site. **At your request, you are receiving a hard copy of the report.**

The report is also available for your review on the Internet at the DOE Office of Legacy Management (LM) website – [www.lm.doe.gov](http://www.lm.doe.gov). From the LM website home page, select the United States map icon titled Legacy Management Sites. Then select the Riverton Site from the drop-down list. The report will be available on the Riverton Processing Site page of the LM website under Site Documents and Links.



U.S. DEPARTMENT OF  
**ENERGY**

Legacy  
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