LMS/GUP/S14690

2016 Verification Monitoring Report for the Gunnison, Colorado, Processing Site

June 2017

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Abbreviations

ACL	alternate concentration limit
CDPHE	Colorado Department of Public Health and Environment
CFR	*Code of Federal Regulations*
COPC	contaminant of potential concern
CSM	conceptual site model
DOE	U.S. Department of Energy
DWEL	drinking water equivalent level
EPA	U.S. Environmental Protection Agency
ft	feet
GCAP	Groundwater Compliance Action Plan
IC	institutional control
LM	Office of Legacy Management
MCL	maximum concentration limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NRC	U.S. Nuclear Regulatory Commission
RRM	residual radioactive material
SOWP	Site Observational Work Plan
VMR	Verification Monitoring Report

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1.0 Overview

The Gunnison, Colorado, Processing Site (Gunnison site) is in Gunnison County, Colorado, approximately 0.5 miles southwest of the City of Gunnison (Figure 1). The Gunnison site includes the area inside the institutional control (IC) boundary, which includes the former mill site and the area downgradient of the former mill site.

The purpose of this Verification Monitoring Report (VMR) is to provide an annual update of the compliance strategy for groundwater cleanup at the Gunnison site, which is natural flushing in conjunction with continued groundwater and surface water monitoring and ICs. In 2015, the U.S. Nuclear Regulatory Commission (NRC) concurred with the Groundwater Compliance Action Plan (GCAP) (DOE 2010a), which documented the selection of the natural flushing compliance strategy. Site characterization details are available in the Final Site Observational Work Plan (SOWP) (DOE 2001).

Uranium and manganese are the two contaminants of potential concern (COPCs) in the alluvial aquifer. Concentrations of uranium in groundwater are assessed against the U.S. Environmental Protection Agency (EPA) Title 40 *Code of Federal Regulations* Part 192 (40 CFR 192) maximum concentration limit (MCL) of 0.044 milligram per liter (mg/L). Because there is no 40 CFR 192 MCL for manganese, the EPA drinking water equivalent level (DWEL) of 1.6 mg/L is used as a benchmark to assess manganese concentrations in groundwater (EPA 2012). DWELs are not legally enforceable and do not carry any legal authority under the Safe Drinking Water Act. The DWEL is a lifetime-exposure concentration protective of adverse, noncancer health effects that assumes all of the exposure to a contaminant is from drinking water. Uranium remained above the MCL, and manganese remained above the DWEL in monitoring wells at the Gunnison site. Concentrations of COPCs in samples collected from domestic wells, which are used as a drinking water source, and from the Gunnison River showed no indication of site impacts.

Detailed information for the Gunnison site and water quality data through 1999 are available in the SOWP. Site information and water quality data from recent years are available in previous VMRs (DOE 2007, DOE 2008, DOE 2009, DOE 2010b, DOE 2011, DOE 2012, DOE 2013, DOE 2014, DOE 2016) on the U.S. Department of Energy (DOE) Office of Legacy Management (LM) website at http://www.lm.doe.gov/Gunnison/Processing/Documents.aspx. Water quality data for 2016 are provided in Appendixes A–C of this report. All water quality data for the Gunnison site are archived in the environmental database at the LM Office in Grand Junction, Colorado. Water quality data are also available for viewing with dynamic mapping via the Geospatial Environmental Mapping System (GEMS) website at http://gems.lm.doe.gov/#.

ICs are measures taken and formalized to control access to contaminated media to ensure protection of human health and the environment. ICs at the Gunnison site include deed restrictions on the original mill site property (specified in a quitclaim deed), a Gunnison County Resolution (Gunnison County 2004) establishing the New Domestic Well Constraint Area, and construction of a domestic water supply system. The quitclaim deed specifies restrictions on excavation, groundwater use, and construction of habitable structures on the former mill site. The quitclaim deed also specifies approval needed from DOE for construction activities.

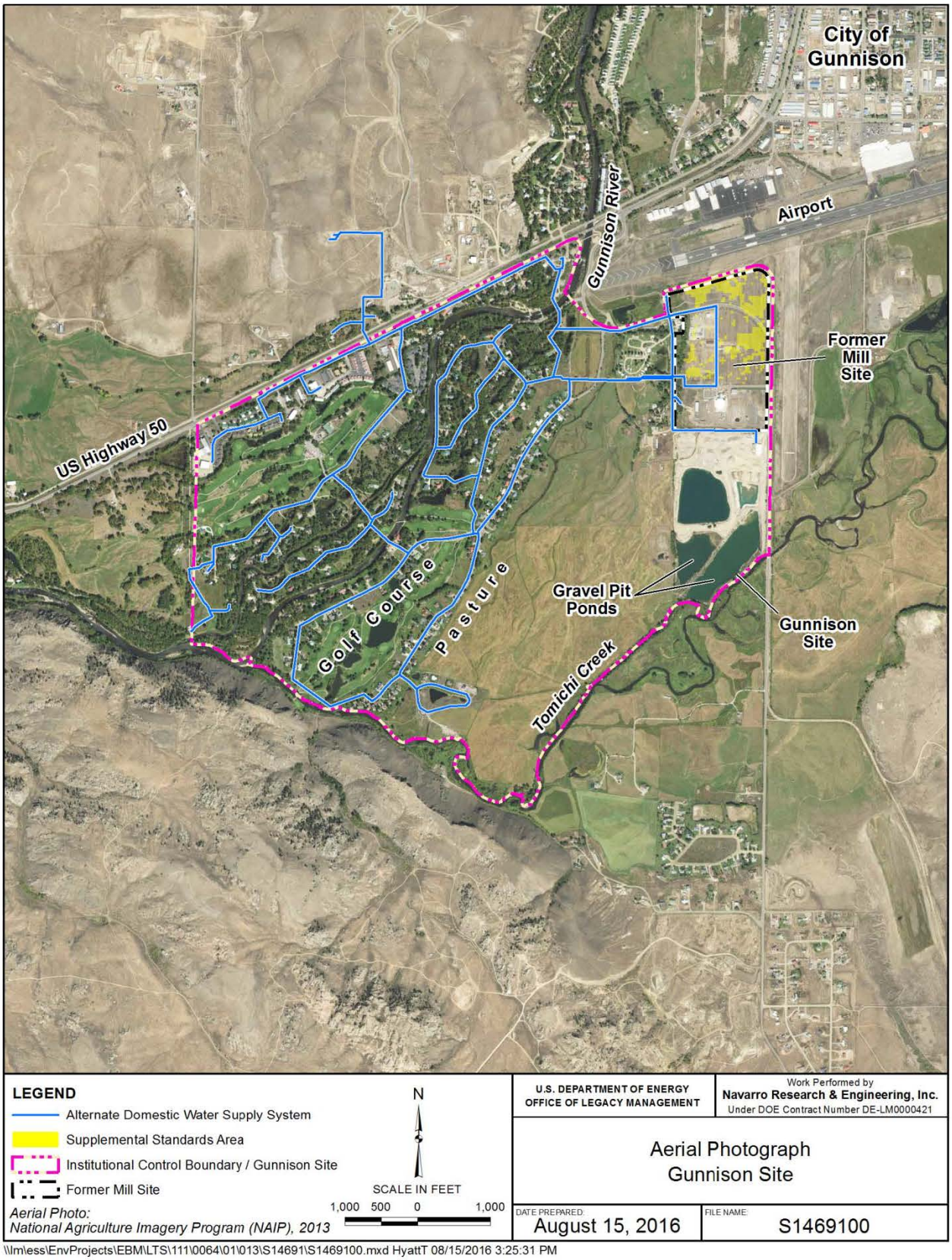

Figure 1. Aerial Photograph of the Gunnison Site

The Colorado Department of Public Health and Environment (CDPHE), DOE, and Gunnison County have developed protocols to streamline the review process, to convey guidance to Gunnison County for planning construction activities at the former mill site, and to clarify the procedures for CDPHE and LM for reviewing proposed construction activities.

Groundwater modeling predicted that natural flushing of the alluvial aquifer beneath and downgradient of the site would be completed within the 100-year time frame specified in Subpart B of 40 CFR 192. Although there is evidence of natural flushing processes occurring in the alluvial aquifer, natural flushing of the alluvial aquifer is not likely to be completed within 100 years based on the more recent monitoring data. Accordingly, DOE is currently updating the GCAP to propose a new compliance strategy for the Gunnison site that involves no remediation and application of alternate concentration limits (ACLs).

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2.0 Site Conditions

This section summarizes conditions at the Gunnison site, including information about surface remediation activities, the conceptual site model (CSM), and ICs.

2.1 Surface Remediation Activities

Uranium mill tailings and other residual radioactive material (RRM) were removed from the former mill site from 1992 through 1995 and stabilized in a disposal cell 6 miles east of the City of Gunnison. RRM beneath the site was removed to just below the water table, with some contaminated material left in place, requiring the application of supplemental standards for thorium-230. The site was backfilled with clean fill and revegetated after RRM removal. An investigation of subpile soils was conducted during field activities associated with the SOWP. Results indicated that uranium contamination remained in soils beneath the former mill site after remediation, with uranium concentrations up to 86.2 milligrams per kilogram (mg/kg); background concentrations were 0.020 and 0.023 mg/kg. Column experiments on that soil suggest that uranium in these soils is contributing to groundwater contamination (DOE 2001).

2.2 Conceptual Site Model

A CSM conveys a conceptual understanding of the hydrogeologic and geochemical framework and processes influencing contaminant migration. The CSM of the Gunnison site was developed primarily through field investigations and groundwater modeling conducted from 1999 to 2001. The CSM was documented in the SOWP and is summarized in this section (DOE 2001).

Groundwater occurs in unconfined conditions in the alluvial aquifer beneath the Gunnison site. Depth to groundwater ranges from 2 to 11 feet (ft), and groundwater elevations generally peak in the spring and summer months and may fluctuate more than 10 ft over the course of a year. The alluvium is composed of poorly sorted sediments ranging from clay-sized material to gravel, with cobbles and a few boulders. It ranges in thickness from 70 to 130 ft. Alluvial groundwater generally flows to the southwest with an average gradient of 0.005 ft/ft. Hydraulic conductivity ranges from 100 to 170 ft per day. On the basis of the gradient and an estimated effective porosity of 0.27, the average linear groundwater velocity ranges from 1.9 to 3.2 ft per day.

Groundwater in the alluvial aquifer system is recharged by regional groundwater flow, adjacent streams, precipitation, flood irrigation of the pasture downgradient of the site, and irrigation of the golf course and residential areas southwest of the site. Groundwater loss is through evapotranspiration and natural discharge to adjacent streams. Groundwater loss is also through dewatering activities at the adjacent sand-and-gravel company located south of the former mill site.

Groundwater in the alluvial aquifer beneath the former mill site was contaminated by uranium-ore processing activities, and natural groundwater flow caused contamination to migrate downgradient through the alluvial aquifer. A variety of tailings-related contaminants in the subsurface and groundwater at the site were evaluated following the cessation of uranium-ore processing, and the potential risks to human health and the environment were assessed in the SOWP. Only uranium and manganese were identified as COPCs because uranium exceeded a groundwater standard and manganese exceeded a risk-based benchmark.

Vertical gradients in the alluvial aquifer are generally downward and are caused by flood irrigation of the pasture just southwest of the former mill site. The vertical gradient causes uranium to migrate downward through the alluvial aquifer as it progresses laterally downgradient. Concentrations of uranium above background, but below the MCL, are found approximately 7000 ft downgradient of the former mill site, indicating that uranium has migrated beneath the Gunnison River.

The Gunnison River and Tomichi Creek influence the alluvial aquifer. There is direct relationship between groundwater elevations and Gunnison River and Tomichi Creek stream flows. As a general rule, wells located adjacent to the Gunnison River respond more quickly to river stage than those farther away (DOE 2001). Pits that remain from gravel-mining operations adjacent to the former mill site filled with groundwater, leaving behind gravel-pit ponds.

As part of the SOWP, groundwater flow and contaminant transport models were developed to evaluate if natural flushing processes would reduce uranium concentrations to below the MCL within 100 years (DOE 2001). Since uranium is the primary indicator of site-related contamination, it was used as the contaminant in the contaminant transport model. Two versions of the groundwater flow model and contaminant transport models were developed. Initial steady-state flow-and-transport models were developed and used as the basis for a stochastic version of the models, which was used to quantify the uncertainty in flow-and- transport parameters.

A multilayer model was used for both the groundwater flow and contaminant transport models; layers corresponded approximately to the zones defined by the shallow, intermediate, and deep monitoring wells. Residual source from subpile soil contamination was simulated in the groundwater models using a recharge concentration from a recharge zone. Sensitivity analysis of the groundwater flow and contaminant transport models indicated that the distribution coefficient was the most sensitive parameter and that pumping and dewatering activities from gravel-mining operations had little effect on the maximum uranium concentration remaining after 100 years. The distribution coefficient used in the Gunnison groundwater models was derived from laboratory testing of samples from the alluvial aquifer.

The steady-state models predicted that the maximum uranium concentration in the alluvial aquifer would decrease to below the MCL within the 100-year time frame. The stochastic models also predicted the maximum uranium concentration would be below the MCL but that there was a moderate probability (41%) that the maximum concentration will be greater than the MCL over a small portion (approximately 40 acres) of the alluvial aquifer after 100 years. The area with the potential to exceed the MCL after 100 years is southwest of the site and east of the Gunnison River (in the vicinity of existing well 0063). The stochastic models were used as the basis for selecting the former natural flushing compliance strategy.

2.3 Institutional Controls

ICs in effect in the vicinity of the Gunnison site were finalized in 2004. They consist of government ownership and deed restrictions on the original mill site property (specified in a quitclaim deed transferring the property from the State of Colorado to Gunnison County), a Gunnison County Resolution (Gunnison County 2004) establishing the New Domestic Well

Constraint Area, and construction of a domestic water supply system. The quitclaim deed specifies restrictions on excavation, groundwater use, and construction of habitable structures, as well as approvals needed from CDPHE and DOE for those activities. If part or all of the mill site property is transferred to another owner, the deed restrictions will remain in effect. It is expected that the site will continue to be developed as a light industrial park by the owner, Gunnison County. Representatives from DOE, CDPHE, and Gunnison County have discussed the need to keep any disturbance of supplemental standards areas, due to excavation and construction, minimized to the maximum extent practicable.

In 2014 and 2015, DOE conducted activities to streamline the process of approving future construction projects on the former mill site. An updated base map of the site was produced in 2015 by overlaying the supplemental standards areas on an aerial survey that was conducted in 2014. The base map will facilitate timely and accurate assessment of impacts to supplemental standards areas when new construction drawings are overlain on the base map. In addition, DOE, CDPHE, and Gunnison County developed a protocol to streamline the review process, to convey guidance to Gunnison County for planning construction activities at the former mill site, and to clarify for CDPHE and LM the procedures for reviewing proposed construction activities.

A Gunnison County resolution established the New Domestic Well Constraint Area, which is delineated by the IC boundary (Figure 1). The Gunnison County resolution specifies that no new domestic wells can be constructed within the constraint area. A domestic water supply system was installed in 1994 to provide safe water to local residents in areas potentially impacted by contaminated groundwater. In 2004, DOE entered into a cooperative agreement with Gunnison County, approved by NRC (DOE 2004), in which DOE (and CDPHE) agreed to fund extensions of the domestic water supply system to accommodate projected future growth within the IC boundary (Figure 1). A major extension was constructed in 2005 and 2006.

Smaller extensions were constructed in 2008 to supply water to the former mill site and several parcels of land south and west of the former mill site. Most domestic wells that are used as a drinking water source within the IC boundary (where the residence is not connected to the water system) are monitored to verify that concentrations of uranium and manganese remain low and below the MCL and DWEL, respectively. One domestic well is not monitored because the owner has not granted permission for sampling.

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3.0 Monitoring Program

NRC in 2015 concurred with the GCAP (DOE 2010a), which specifies the natural flushing compliance strategy, the current monitoring program, and the requirement for this VMR. However, DOE is currently working on a revised GCAP to present a new compliance strategy based on ACLs. The current monitoring program will continue until NRC concurs with the new compliance strategy and DOE receives approval of the revised GCAP.

During 2016, the monitoring network included sampling of 28 DOE monitoring wells, 6 surface water locations, and 5 domestic wells (Figure 2 and Table 1). Two of those domestic wells (0476 and 0477) were not sampled during the April sampling event because the homeowners could not be contacted. These wells were subsequently sampled in June after contact was made with the homeowners. Samples from all monitoring locations were collected and analyzed according to the *Sampling and Analysis Plan for U. S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351). Samples were analyzed for uranium and manganese, and field measurements of oxidation–reduction potential, pH, specific conductance, temperature, and turbidity were made at each location.

Table 1. Groundwater and Surface Water Monitoring at the Gunnison Site

Monitoring Well[a]	Screened Interval (ft)	Rationale (Uranium)
Groundwater		
0002	10–15	Upgradient—background
0102	42–47	Upgradient—background
0005	10–15	Origin of plume
0105	42–47	Origin of plume
0006	10–15	Origin of plume
0106	34–39	Origin of plume
0012R	6–16	Origin of plume
0112	40–45	Monitor plume migration
0013	11–16	Monitor plume migration
0113	41–46	Monitor plume migration
0125	18–23	Monitor plume migration
0126	54–59	Monitor plume migration
0127	94–99	Monitor plume migration
0135	18–23	Monitor plume migration
0136	53–58	Monitor plume migration
0064	87–97	Monitor plume migration
0062	48–58	Monitor plume migration
0063	88–98	Monitor plume migration
0181	18–23	Monitor plume migration
0183	93–98	Monitor plume migration
0065	50–60	Monitor plume migration
0066	40–50	Monitor plume migration
0186	53–58	Monitor plume migration
0187	93–98	Monitor plume migration
0188	53–58	Monitor plume migration
0189	93–98	Monitor plume migration
0160	51–56	Adjacent to IC boundary
0161	93–98	Adjacent to IC boundary
Surface Water		
0248	NA	Downstream of gravel-pit pond
0250	NA	Potential aquifer discharge
0251	NA	Upstream of IC boundary—background
0777	NA	Potential aquifer discharge
0780	NA	Gravel pit—aquifer discharge to pond
0795	NA	Potential aquifer discharge
Domestic Wells		
0476	NA	Verify low COPC concentrations
0477	NA	Verify low COPC concentrations
0478	NA	Verify low COPC concentrations
0667	NA	Verify low COPC concentrations
0683	NA	Verify low COPC concentrations

Note:
[a] Monitoring wells listed in the same table cell are co-located.

Abbreviation:
NA = not applicable

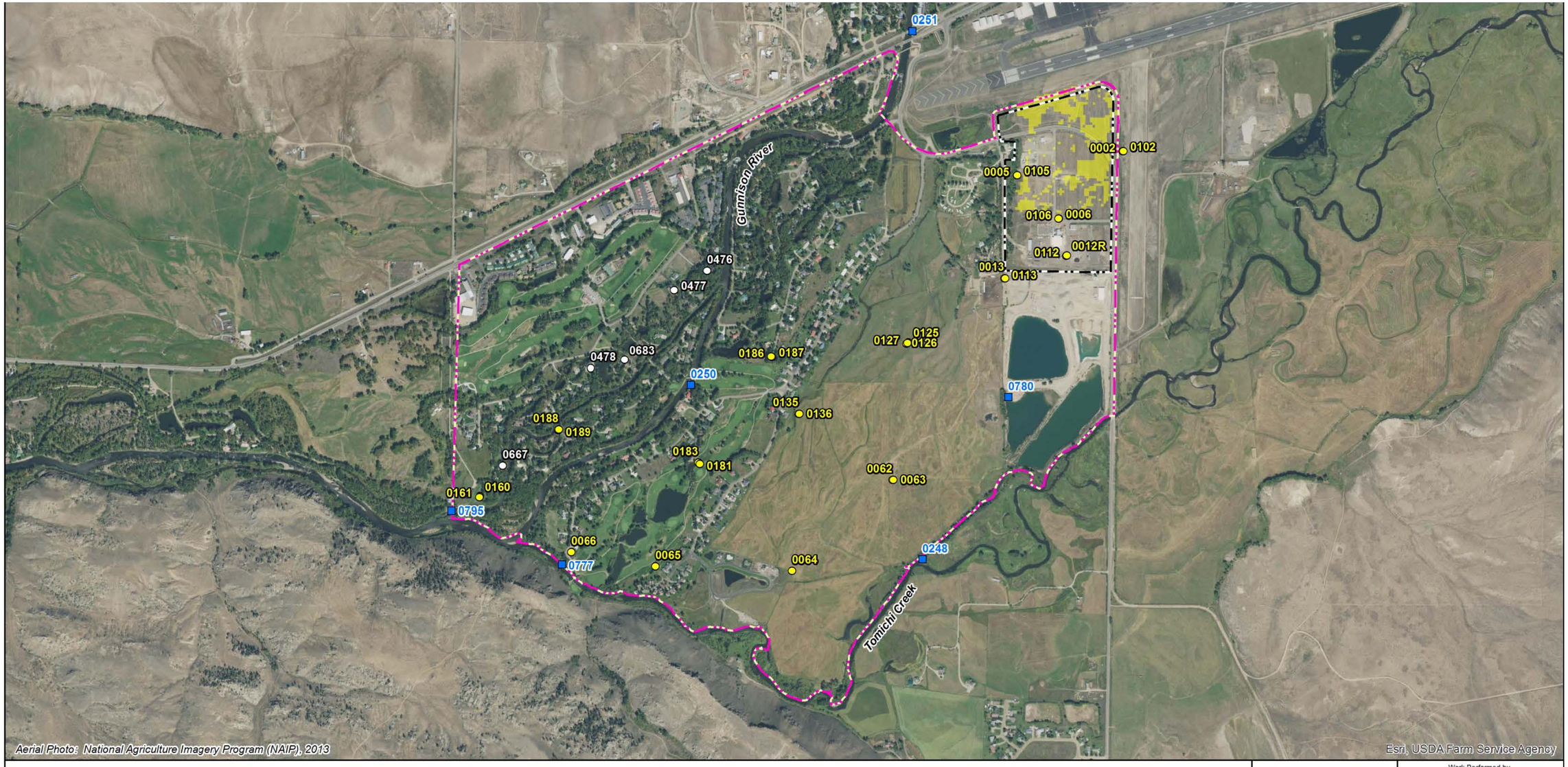

Figure 2. 2016 Monitoring Locations at the Gunnison Site

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4.0 Results of 2016 Monitoring

Monitoring conducted at the Gunnison Site in 2016 included groundwater, domestic well, and surface water monitoring.

4.1 Groundwater

Groundwater monitoring in 2016 consisted of water-level measurements and groundwater sampling of monitoring wells. Water-level measurements provided data for assessment of groundwater flow direction and determination of vertical gradients in Section 4.1.1.Groundwater sampling provided data to assess groundwater quality in Section 4.1.2.

4.1.1 Groundwater Flow

Water levels were measured at all monitoring wells in the monitoring network (Figure 2) in April. Water-level data were used to verify lateral groundwater flow direction and to assess vertical gradients at the Gunnison site. Water level data are included in Appendix D.

Assessment of the lateral groundwater flow direction in the alluvial aquifer is necessary to confirm that flow direction is consistent with historical flow direction and that the current monitoring network and IC boundary are adequate for assessing contaminant plume movement. As shown in Figure 3, groundwater elevation contours for the alluvial aquifer show a hydraulic gradient from the northeast to the southwest, which indicates a general flow direction to the southwest. The hydraulic gradient and flow direction are consistent with historical observation and the CSM.

Vertical gradients are used to assess the direction that groundwater will flow vertically. The methods traditionally applied to assess vertical flow use a negative gradient to indicate potential for upward groundwater flow and a positive gradient to indicate potential for downward groundwater flow. Vertical gradients are calculated from a monitoring well screened in an upper zone of the alluvial aquifer and an adjacent monitoring well screened in a lower zone of the alluvial aquifer using the following formula: (GE1 − GE2)/(SE1 − SE2), where GE = groundwater elevation in the upper zone (GE1) and lower zone (GE2), and SE = screen elevation at the midpoint of the screen. Table 2 shows vertical gradients calculated from grouped monitoring wells. Numerous downward gradients were observed, which is consistent with the CSM.

4.1.2 Groundwater Quality

Analytical data for uranium and manganese, along with field measurements from DOE monitoring wells, domestic wells, and surface water for 2016, are provided in Appendixes A–C. The areal distributions of uranium and manganese in groundwater in the alluvial aquifer, based on the 2016 sampling event, are shown in Figure 4 and Figure 5, respectively. The distributions are displayed in these figures by using the monitoring well with the highest concentration in areas where several monitoring wells are clustered together irrespective of sampling depth. Time-concentration plots for uranium and manganese in DOE monitoring wells, domestic wells, and surface water from 1997 (postremedial action) through 2016 are presented in Figure 6 through Figure 13 at the end of this section.

Uranium is one of the two COPCs in groundwater. Historical concentrations ranged up to 1.5 mg/L beneath the former mill site, which is the main area of groundwater contamination in the shallow groundwater. Currently, uranium concentrations exceed the MCL of 0.044 mg/L for groundwater in several monitoring wells on, and adjacent to, the former mill site and in one monitoring well (0183) further downgradient. Concentrations of uranium that are less than the MCL, but above background, extend to monitoring wells 0160 and 0161. Uranium concentrations in these wells also exhibit upward trends (Table 4 in Section 5.0), indicating that site-related uranium contamination has migrated beneath the Gunnison River just beyond the confluence with Tomichi Creek.

Table 2. Vertical Gradients at the Gunnison Site

Well ID	Zone	Groundwater Elevation (ft msl)	Screen Midpoint Elevation (ft msl)	Vertical Gradient[a]
0002	Shallow	7641.29	7634.43	0.0057
0102	Intermediate	7641.11	7602.75	
0005	Shallow	7638.41	7631.9	0.0188
0105	Intermediate	7637.81	7600.06	
0006	Shallow	7636.05	7632.6	0.0054
0106	Intermediate	7635.92	7608.68	
0012R	Shallow	7634.33	7632.335	0.0307
0112	Intermediate	7633.36	7600.71	
0013	Shallow	7631.67	7628.2	0.0003
0113	Intermediate	7631.66	7598.41	
0062	Intermediate	7623.9	7575.3	0.0339
0063	Deep	7622.55	7535.47	
0125	Shallow	7626.86	7611.05	−0.0218[b]
0126	Intermediate	7627.65	7574.86	0.0340[c]
0127	Deep	7626.29	7534.84	0.0075[d]
0135	Shallow	7622.54	7603.1	−0.0003
0136	Intermediate	7622.55	7567.86	
0160	Intermediate	7599.19	7550.24	0.0059
0161	Deep	7598.94	7508.14	
0181	Shallow	7614.23	7596.36	0.0271
0183	Deep	7612.19	7521.16	
0186	Intermediate	7621.62	7569.84	0.0233
0187	Deep	7620.69	7529.9	
0188	Intermediate	7607.87	7556.11	0.0143
0189	Deep	7607.3	7516.38	

Notes:
[a] A negative value indicates an upward vertical gradient, and a positive value indicates a downward vertical gradient.
[b] Vertical gradient between the shallow and intermediate zone wells.
[c] Vertical gradient between the intermediate and deep zone wells.
[d] Vertical gradient between the shallow and deep zone wells.

Abbreviation:

ft msl = feet above mean sea level

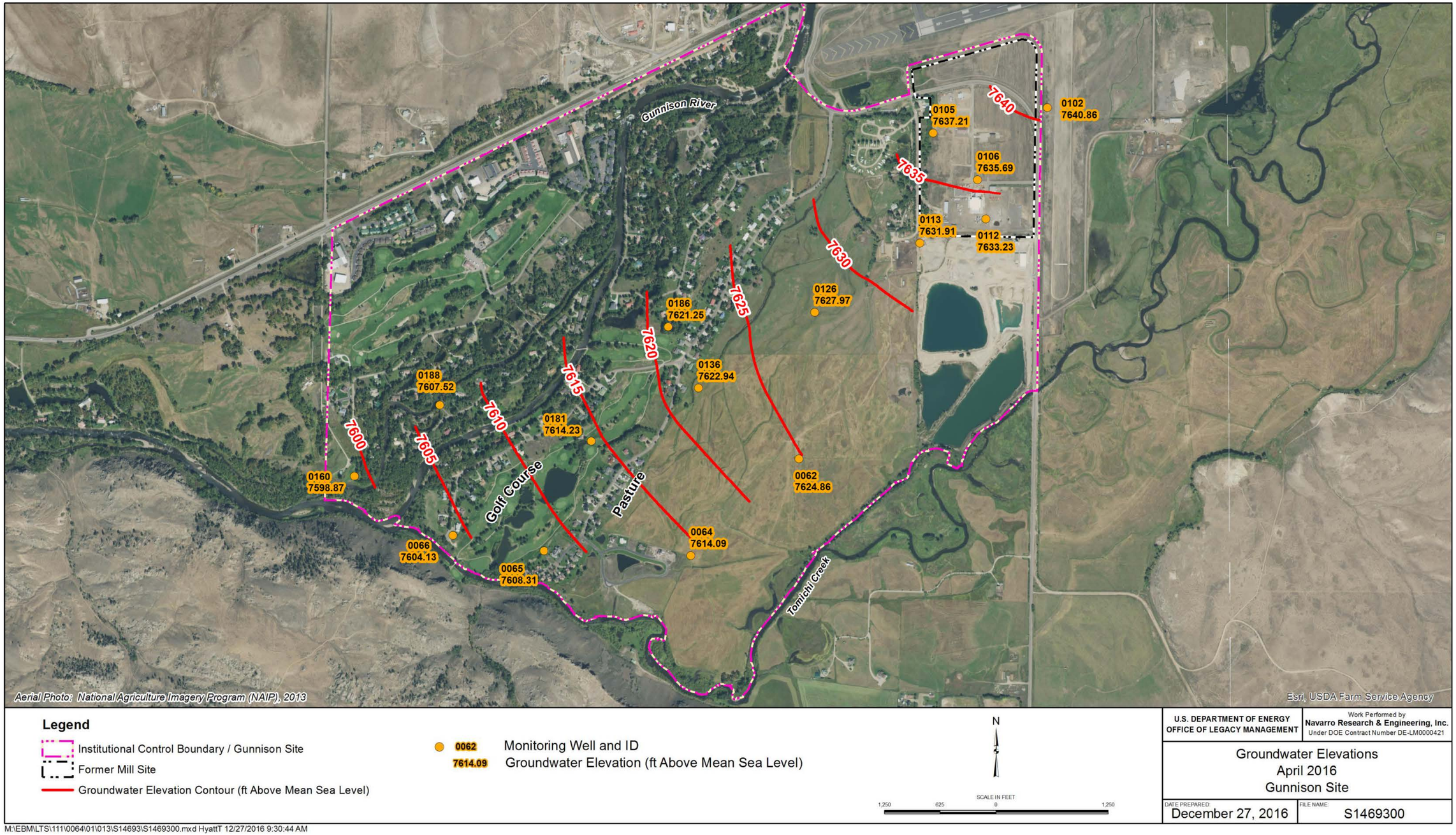

Figure 3. Groundwater Elevations in the Alluvial Aquifer

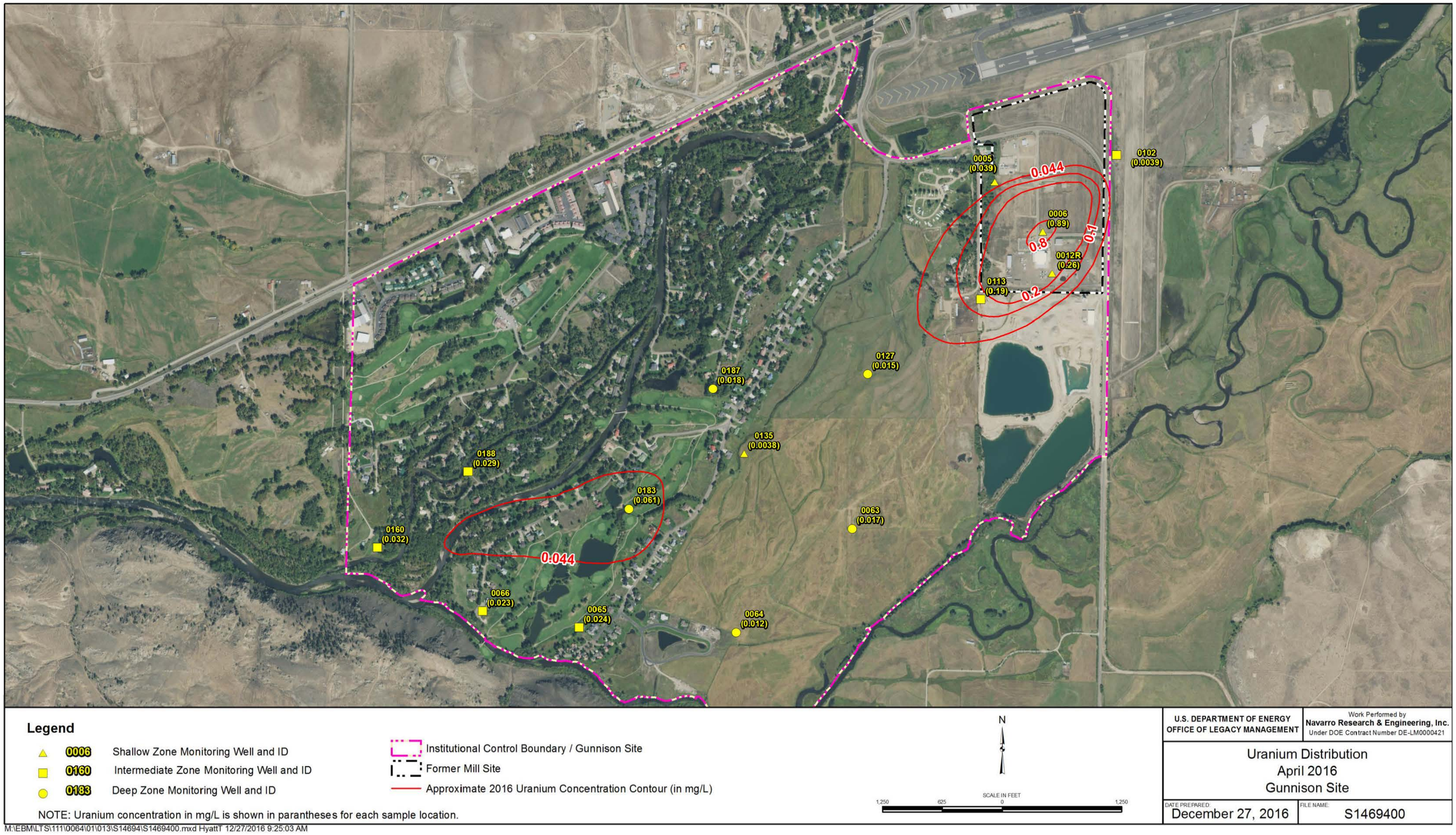

Figure 4. Distribution of Uranium in Groundwater from April 2016 at the Gunnison Site

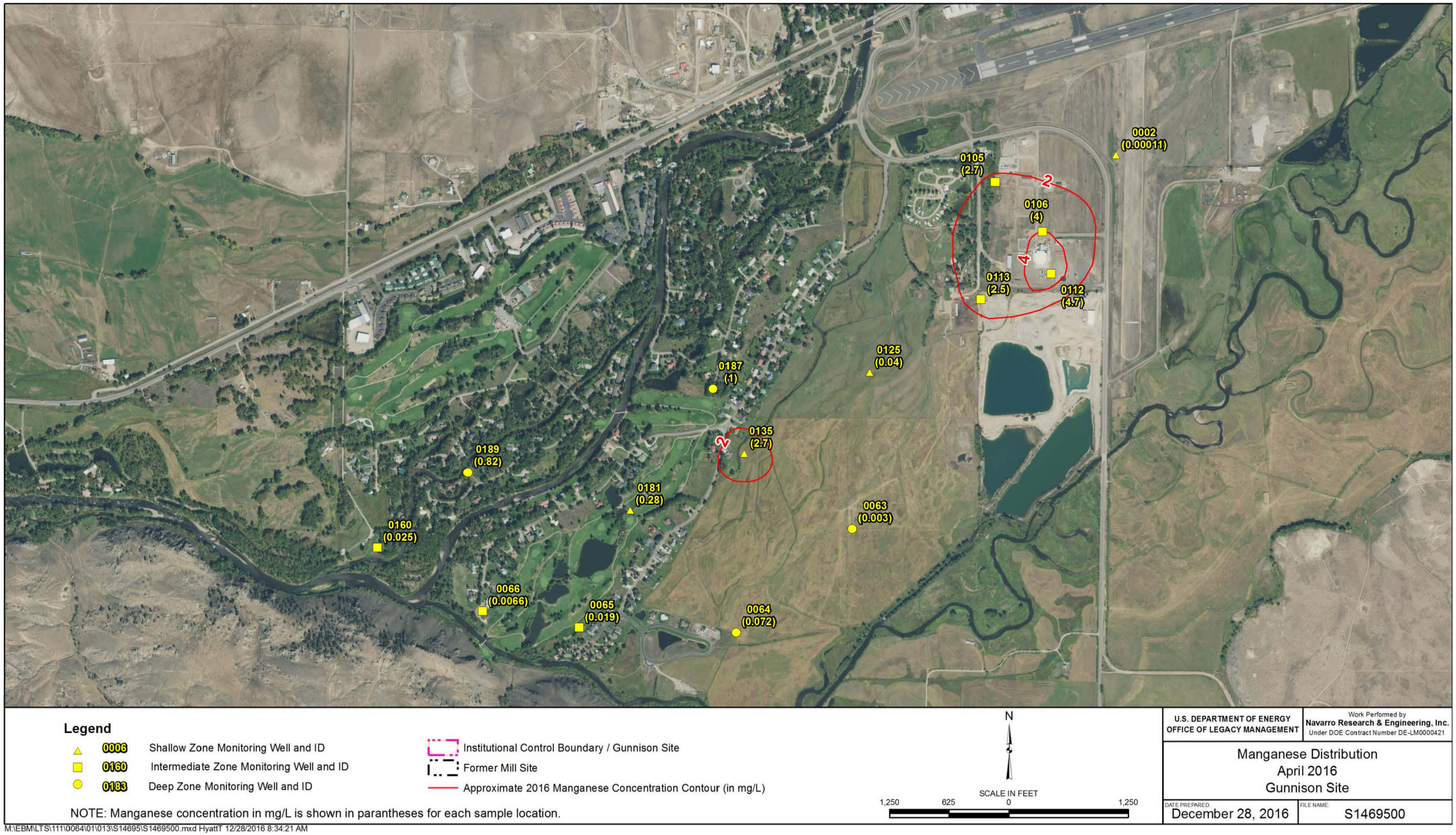

Figure 5. Distribution of Manganese in Groundwater from April 2016 at the Gunnison Site

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Manganese is also a COPC in groundwater, with historical concentrations up to 77 mg/L beneath the former mill site. In 2016, concentrations of manganese remained above the DWEL in the intermediate-zone monitoring wells on the site (0105, 0106, and 0112) and in downgradient monitoring wells 0113, 0135, and 0136. Manganese does not appear to be widespread farther downgradient in the alluvial aquifer (Figure 5).

Though not separated lithologically, the alluvial aquifer (up to 130 ft thick) has been divided into three zones to assist in developing the CSM and to facilitate monitoring (wells are constructed with screens in these zones). These zones include (1) a shallow zone from 6 to 23 ft, (2) an intermediate zone from 34 to 60 ft, and (3) a deep zone from 87 to 98 ft. Time–concentration plots for uranium and manganese in DOE monitoring wells have been grouped by monitoring wells onsite and in three downgradient sectors (pasture, golf course, and west of the Gunnison River) with the zone indicated in the caption of each figure showing the relationship between distance downgradient of the site and depth in the aquifer.

As shown in the time–concentration graphs and in Table 3, results from the 2016 sampling event indicate that uranium in groundwater is migrating deeper in the alluvial aquifer while progressing downgradient from the former mill site, which is consistent with historical data and the CSM. Concentrations of uranium in groundwater in the shallow zone exceeded the MCL of 0.044 mg/L in two of the three wells on the former mill site (Figure 6) and in one well immediately downgradient of the site (0013) (Figure 7). Concentrations exceeded the MCL in two intermediate-zone wells on the former mill site (0106 and 0112) and in one intermediate-zone well (0113) immediately downgradient of the site but did not exceed the MCL in any other intermediate-zone well (Figure 6 and Figure 7). Uranium exceeded the MCL in one deep-zone well (0183) approximately 4400 ft downgradient of the former mill site boundary (Figure 8). In wells farthest downgradient, uranium concentrations exceeded background levels (upper limit of background range is 0.009 mg/L) but did not exceed the MCL (Figure 9). Table 3 also shows this progression: The highest uranium concentrations on the former mill site are in the shallow-zone wells; the highest uranium concentrations in the pasture sector are in the deep zone; the highest uranium concentrations in the golf course sector are in the deep zone where the MCL is exceeded (monitoring well 0183); and uranium concentrations west of the Gunnison River are above background in the intermediate and deep zones, indicating uranium migration.

4.2 Domestic Wells

DOE, in conjunction with CDPHE, has set an action level for uranium (no action level was set for manganese) in domestic wells at the Gunnison site. The area west of the Gunnison River is referred to as the "buffer zone" and has an action level for uranium of 0.02 mg/L for domestic wells located there (DOE 1996). All domestic wells in the monitoring program are west of the Gunnison River in the buffer zone (Figure 2). Results from the 2016 sampling event indicate that uranium concentrations in all domestic wells in the monitoring program are below the Safe Drinking Water Act primary drinking water standard of 0.03 mg/L and below DOE's action level of 0.02 mg/L (Figure 14). Concentrations of manganese in the domestic wells are below the DWEL of 1.6 mg/L (Figure 15). If the uranium action level for uranium or the DWEL for manganese are exceeded, DOE notification to CDPHE is required, and any additional actions will be determined at that time.

Table 3. Summary of 2016 Uranium Distribution in Groundwater at the Gunnison Site

Area	Zone	Wells	Uranium Concentration[a] (mg/L)
Upgradient	Shallow	0002	0.0028
	Intermediate	0102	0.0039
Onsite and just off the former mill site	Shallow	0005, 0006, 0012R, 0013	0.310
	Intermediate	0105, 0106, 0112, 0113	0.078
Downgradient (pasture)	Shallow	0125, 0135	0.008
	Intermediate	0062, 0126, 0136	0.009
	Deep	0063, 0064, 0127	0.015
Downgradient (golf course)	Shallow	0181	0.008
	Intermediate	0065, 0066, 0186	0.022
	Deep	0183, 0187	0.039
Downgradient (west of Gunnison River)	Intermediate	0160, 0188	0.031
	Deep	0161, 0189	0.020

Note:
[a] Where more than one well is listed, the concentration is the 2016 mean value.

4.3 Surface Water

Concentrations of uranium in surface water in the Gunnison River during 2016 ranged from 0.00089 to 0.00096 mg/L and were consistent with historical results (Figure 17). Downstream uranium concentrations (locations 0250 and 0795) were within 0.0007 mg/L of the upstream (location 0251) concentrations, indicating that discharge of alluvial groundwater has no impact on river water quality. The concentration of uranium (0.049 mg/L) in surface water in the gravel-pit pond (0780) continued to be an order of magnitude above background groundwater (0.0026 to 0.0036 mg/L) and two orders of magnitude above Gunnison River surface water (Figure 16). The elevated uranium concentrations in the gravel-pit pond compared to background provides evidence that the gravel-pit pond receives discharge of alluvial groundwater.

Surface water sampling location 0248, approximately 1500 ft downstream of the gravel-pit pond discharge point, is on the abandoned channel of Tomichi Creek. In 2016, the concentration of uranium in the sample collected from location 0248 (0.026 mg/L) was elevated compared to background because it receives some water from the gravel-pit pond (0.049 mg/L at location 0780). The concentration of uranium in the sample collected farther downstream on Tomichi Creek at location 0777 was lower (0.0058 mg/L) because of dilution as the rerouted creek merges back into a single channel. Concentrations of manganese in samples collected from all surface water locations were below the DWEL of 1.6 mg/L (Figure 17).

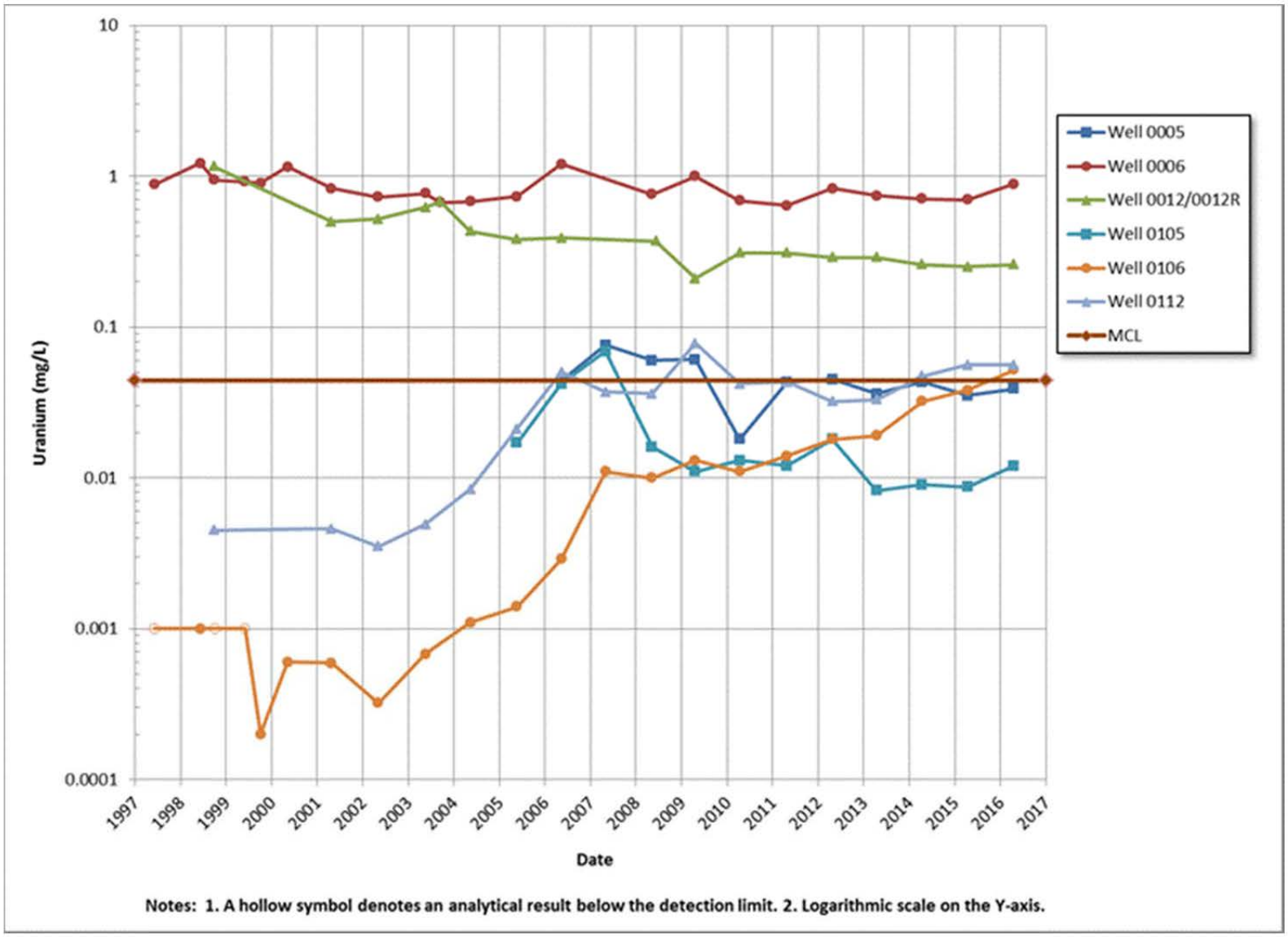

Figure 6. Uranium Concentrations in Groundwater, Onsite DOE Monitoring Wells at the Gunnison Site

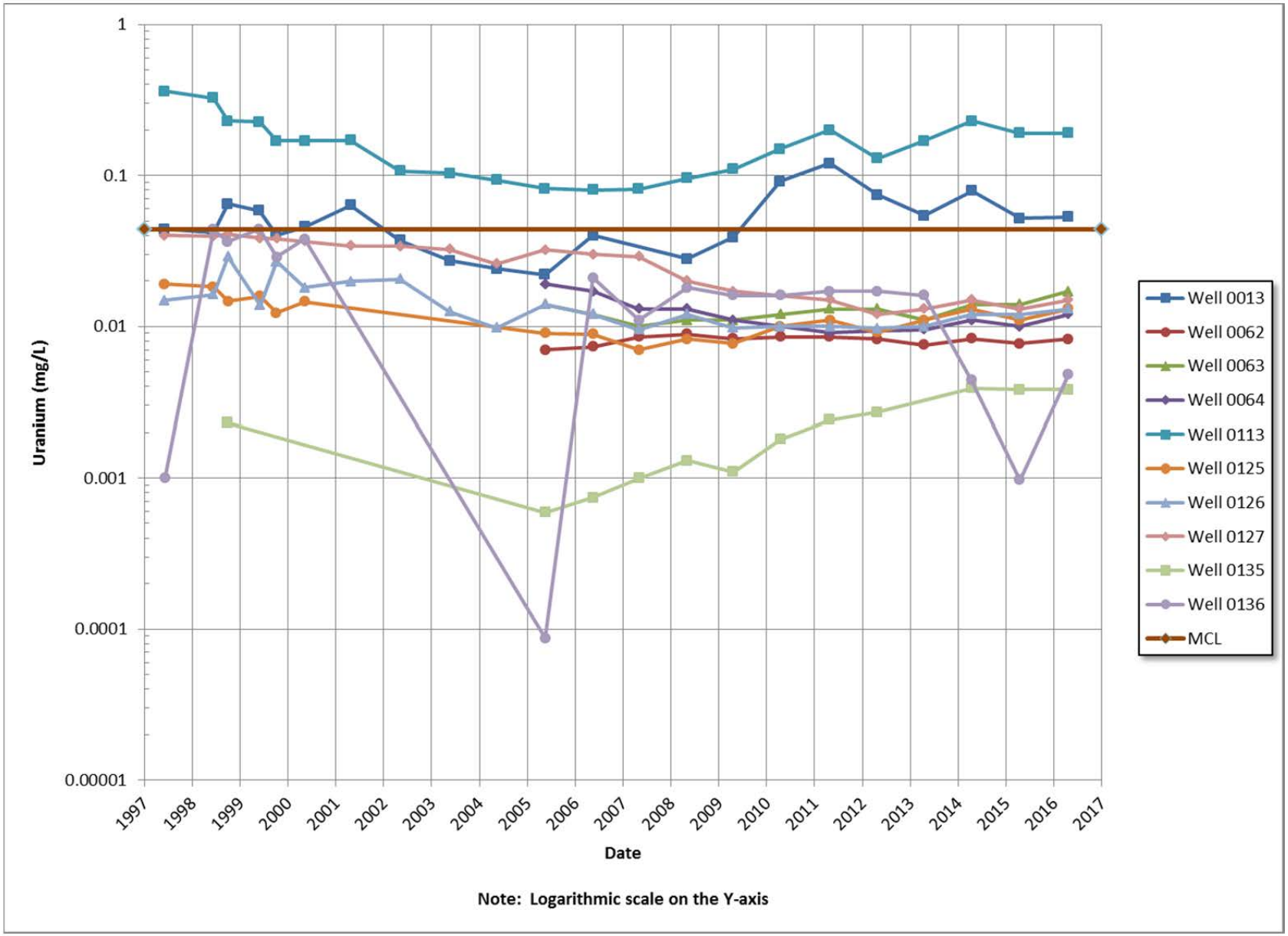

Figure 7. Uranium Concentrations in Groundwater, Downgradient DOE Monitoring Wells—Pasture, near the Gunnison Site

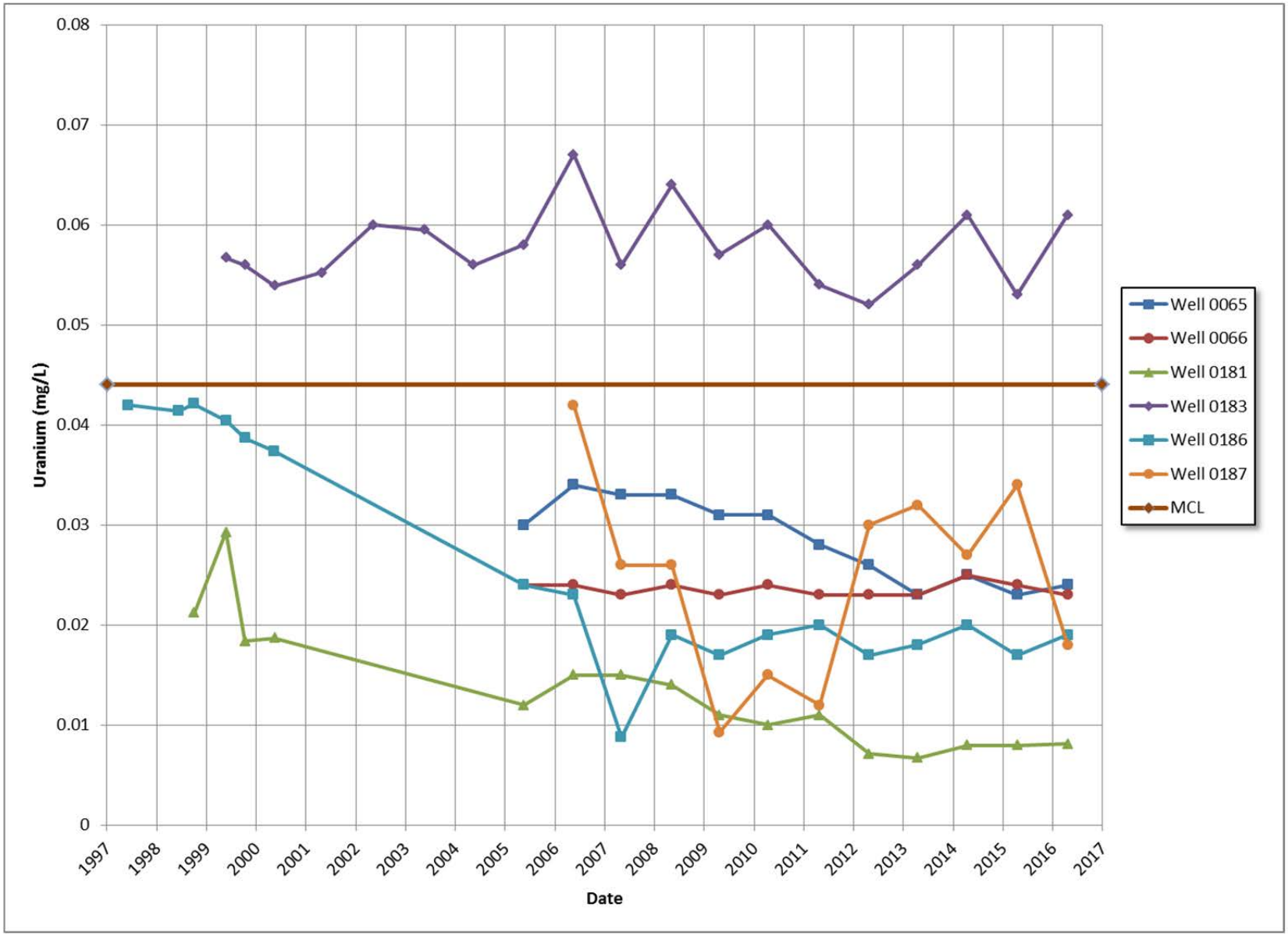

Figure 8. Uranium Concentrations in Groundwater, Downgradient DOE Monitoring Wells—Golf Course and Residential, near the Gunnison Site

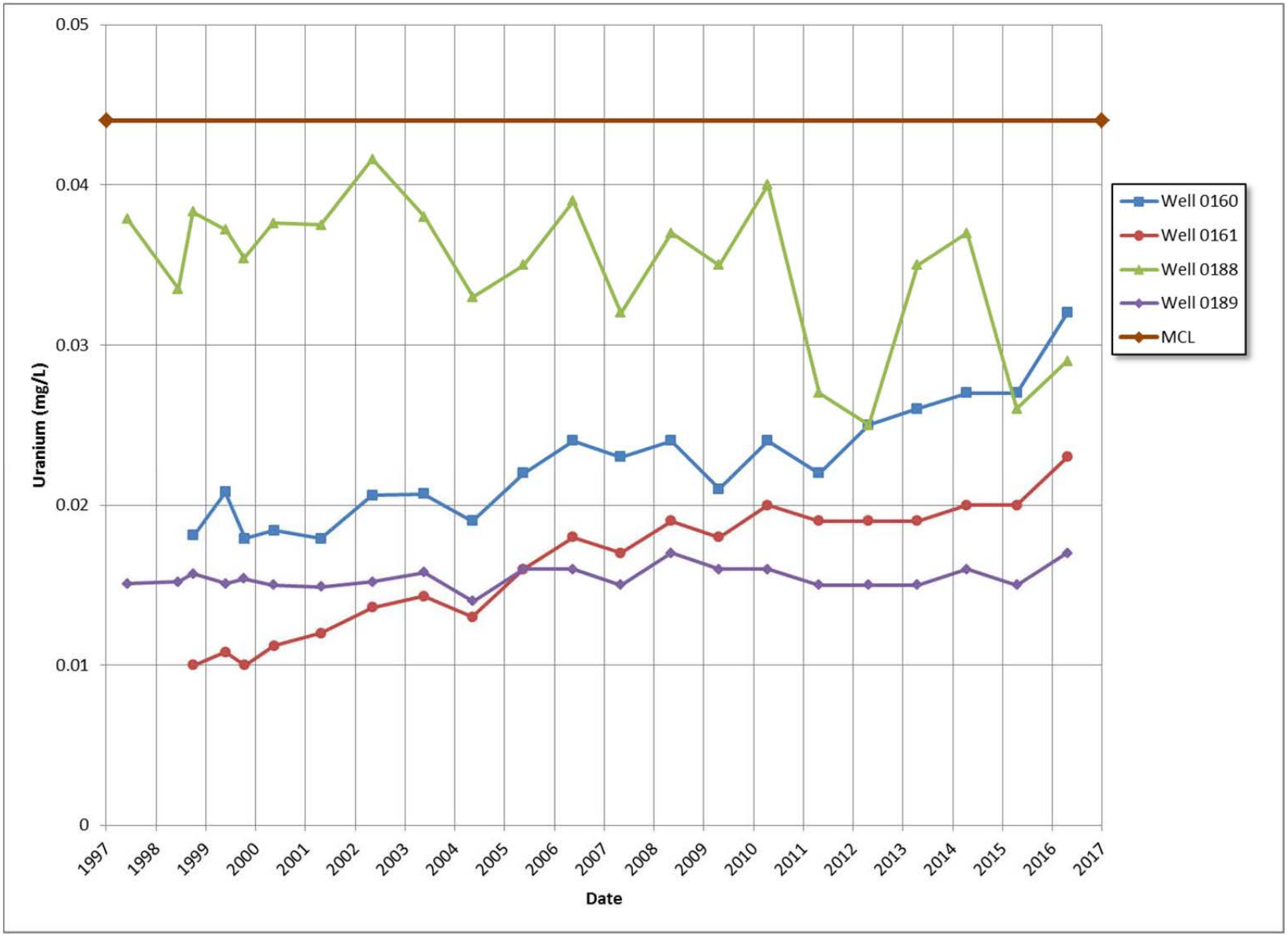

Figure 9. Uranium Concentrations in Groundwater, Downgradient DOE Monitoring Wells—West of the Gunnison River, near the Gunnison Site

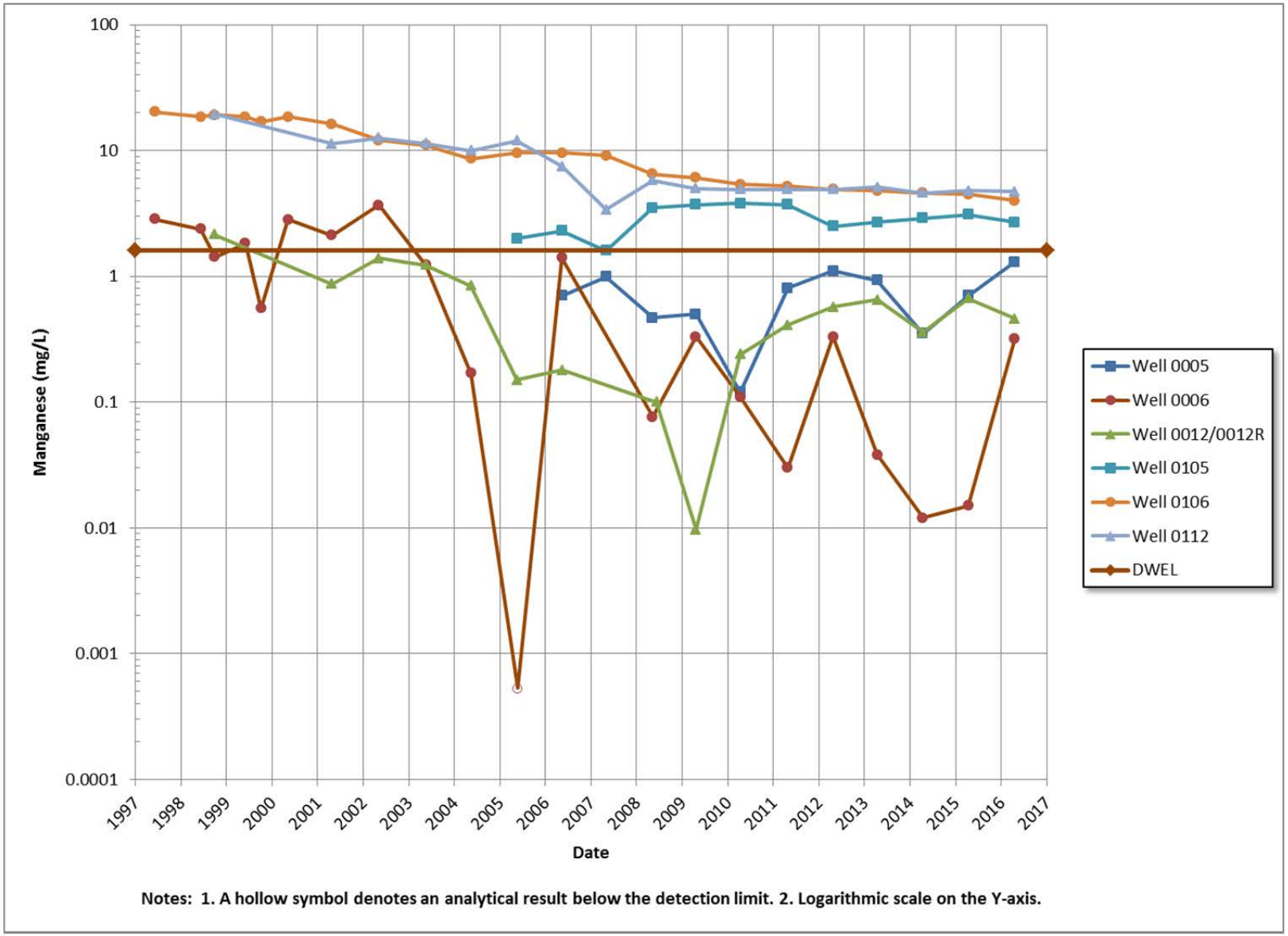

Figure 10. Manganese Concentrations in Groundwater, Onsite DOE Monitoring Wells at the Gunnison Site

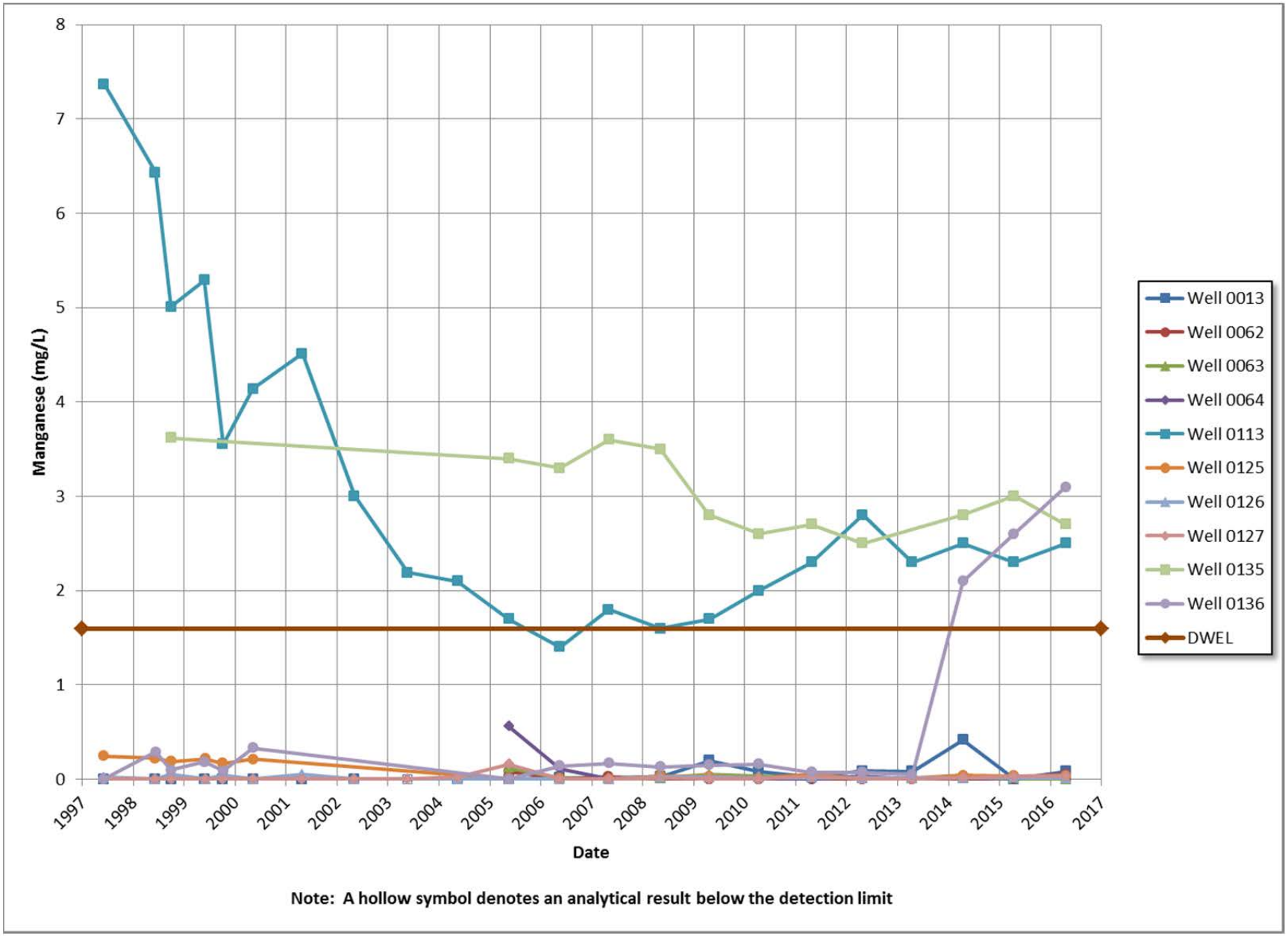

Figure 11. Manganese Concentrations in Groundwater, Downgradient DOE Monitoring Wells—Pasture, near the Gunnison Site

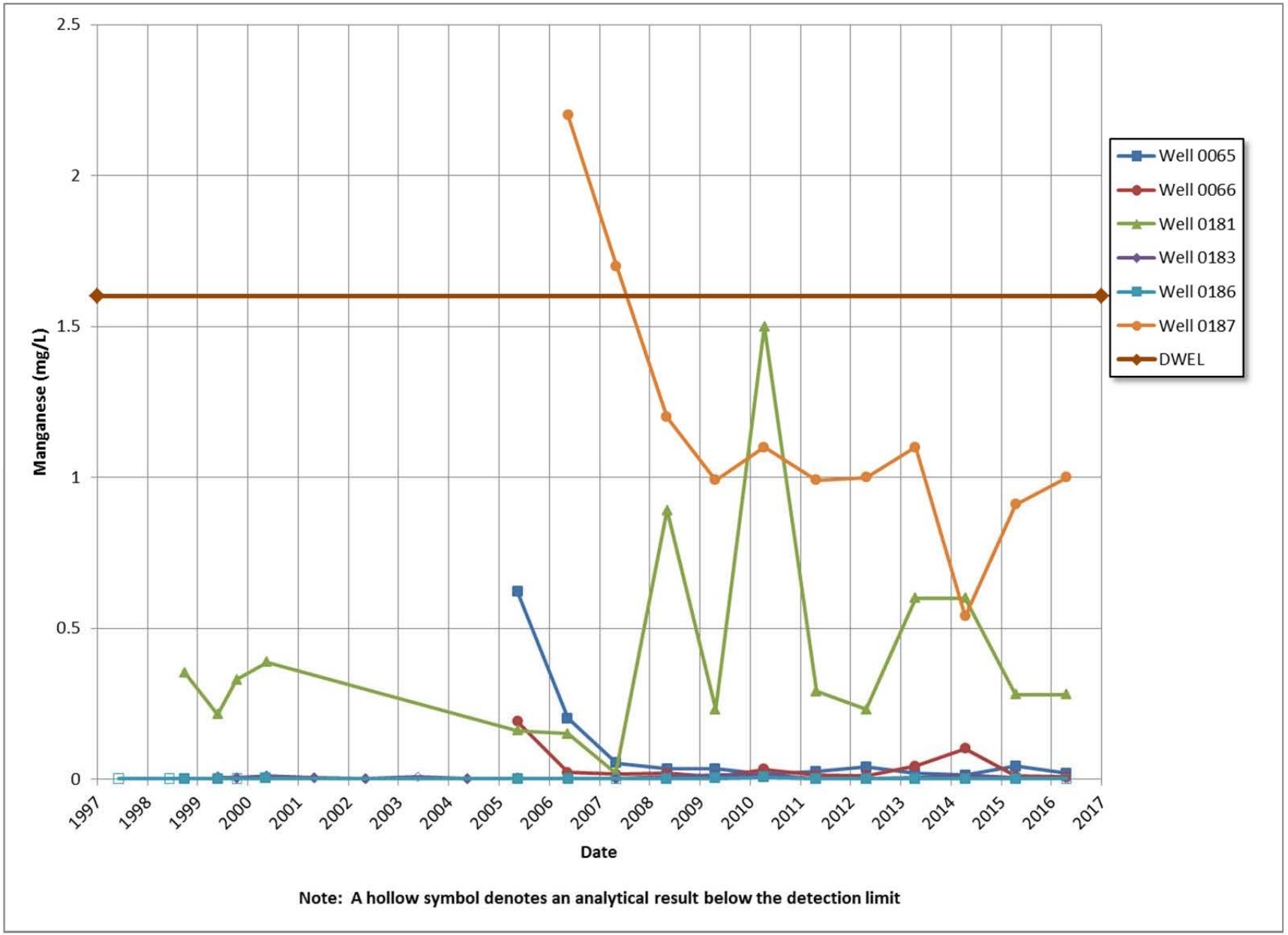

Figure 12. Manganese Concentrations in Groundwater, Downgradient DOE Monitoring Wells—Golf Course and Residential, near the Gunnison Site

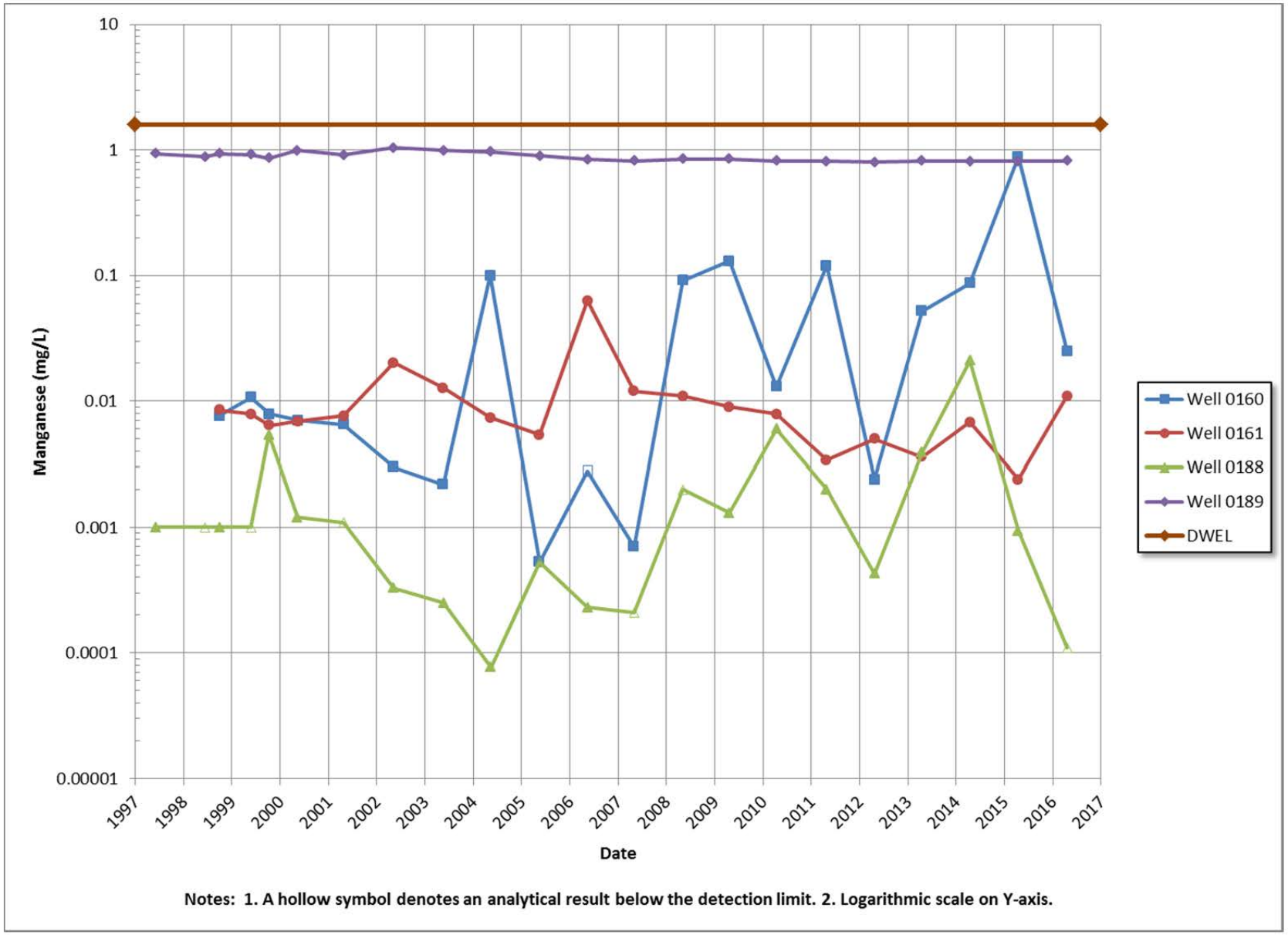

Figure 13. Manganese Concentrations in Groundwater, Downgradient DOE Monitoring Wells—West of the Gunnison River, near the Gunnison Site

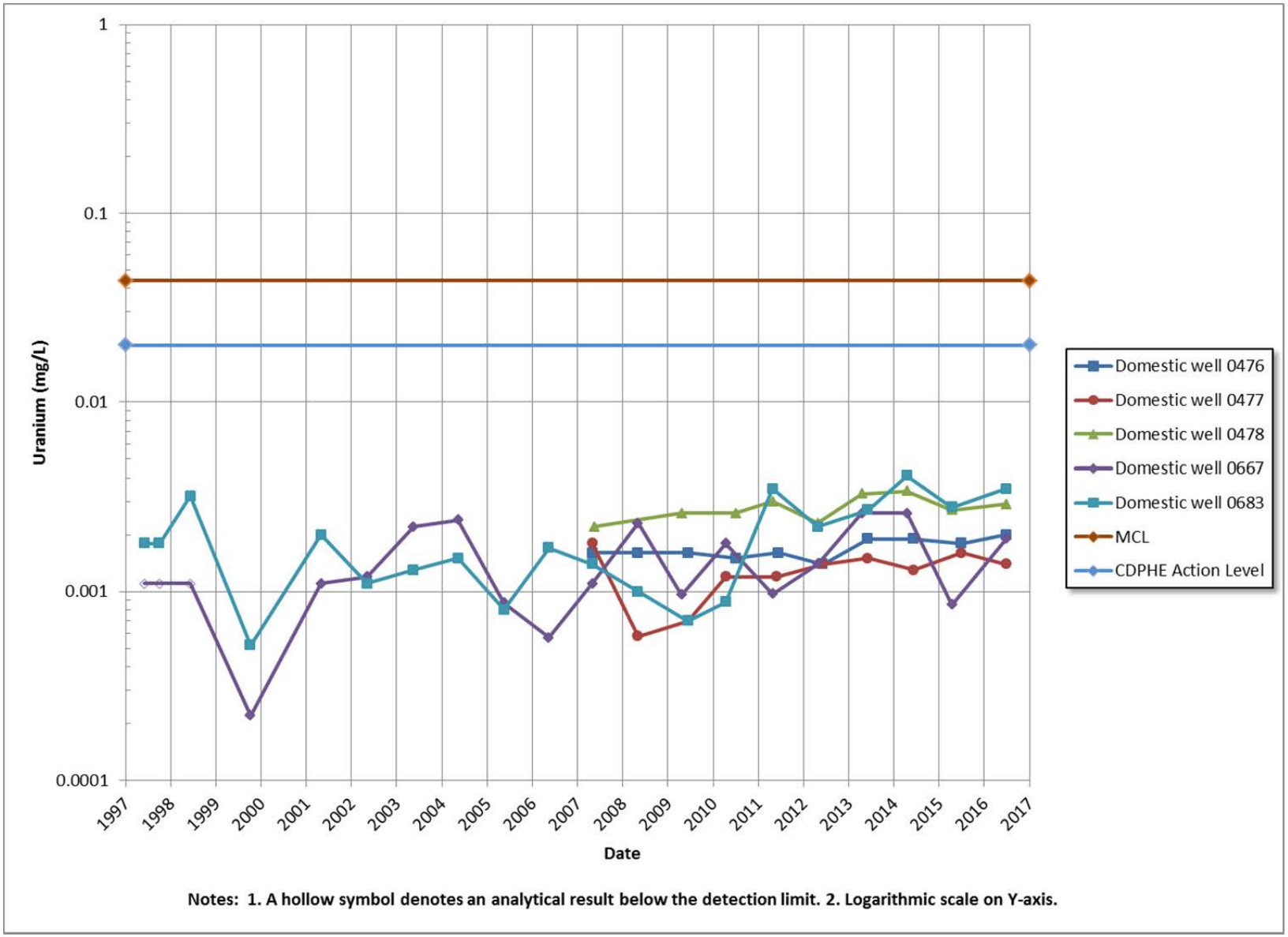

Figure 14. Uranium Concentrations in Groundwater, Domestic Wells Downgradient from the Gunnison Site

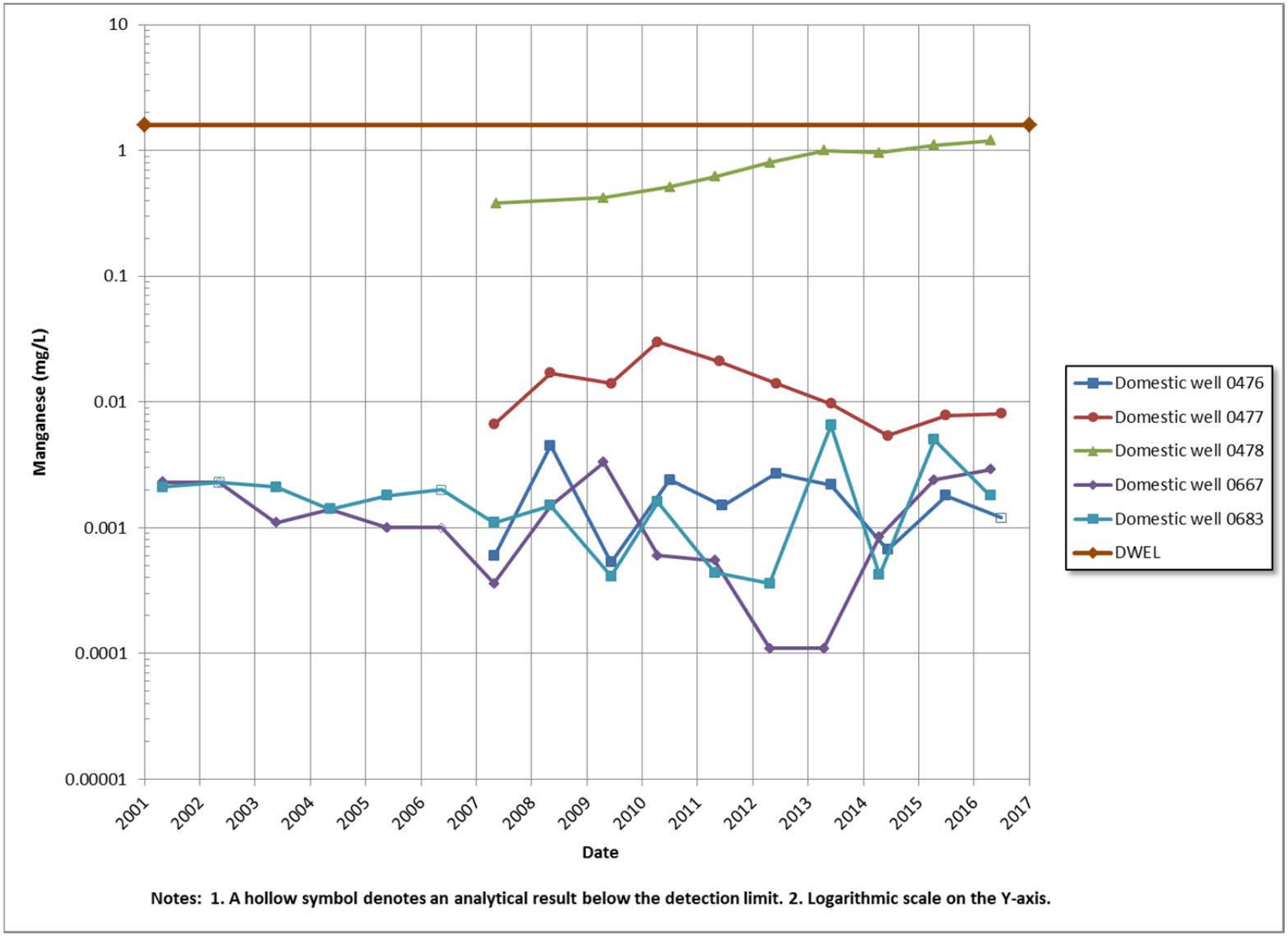

Figure 15. Manganese Concentrations in Groundwater, Domestic Wells Downgradient from the Gunnison Site

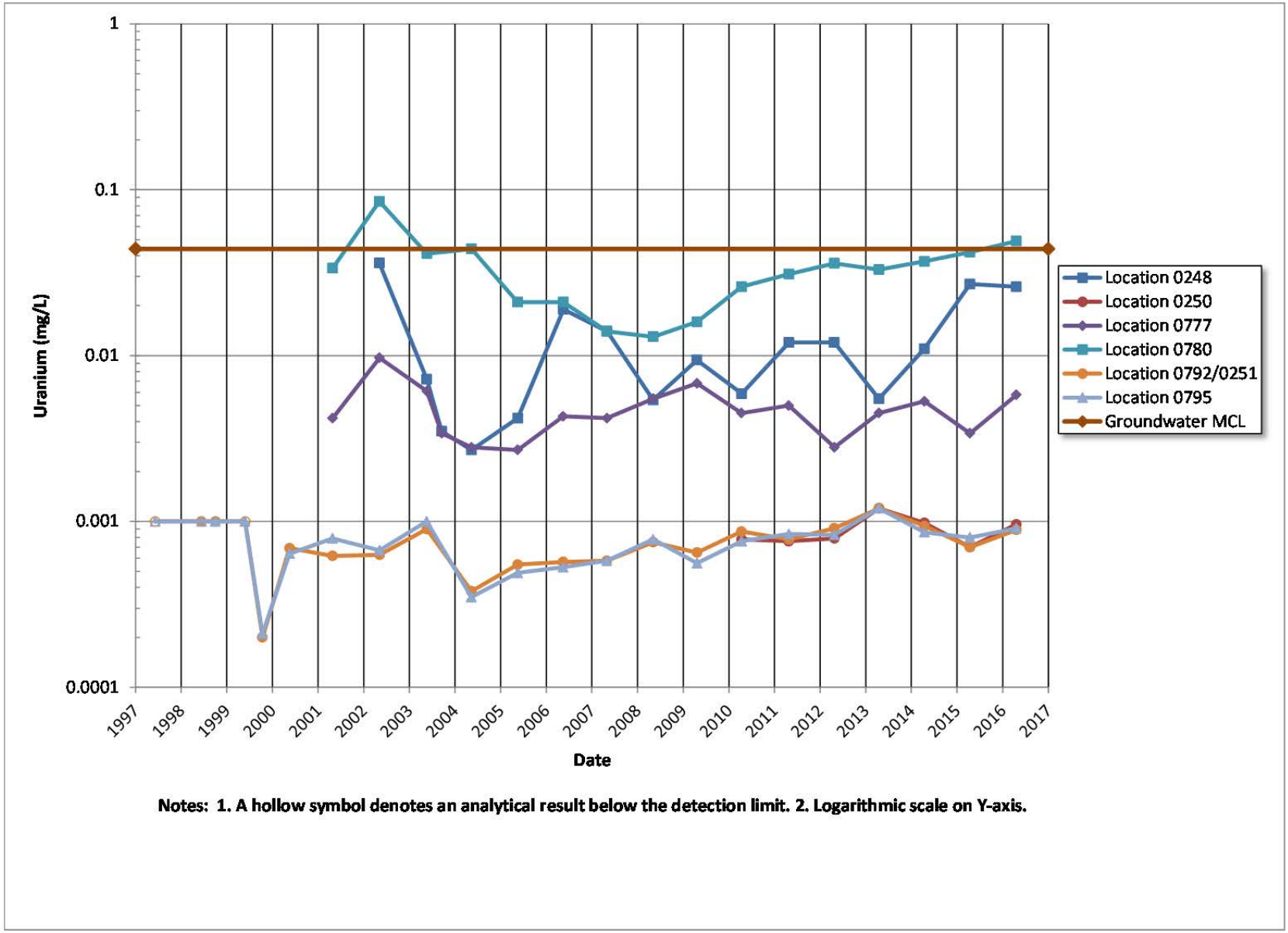

Figure 16. Uranium Concentrations in Surface Water near the Gunnison Site

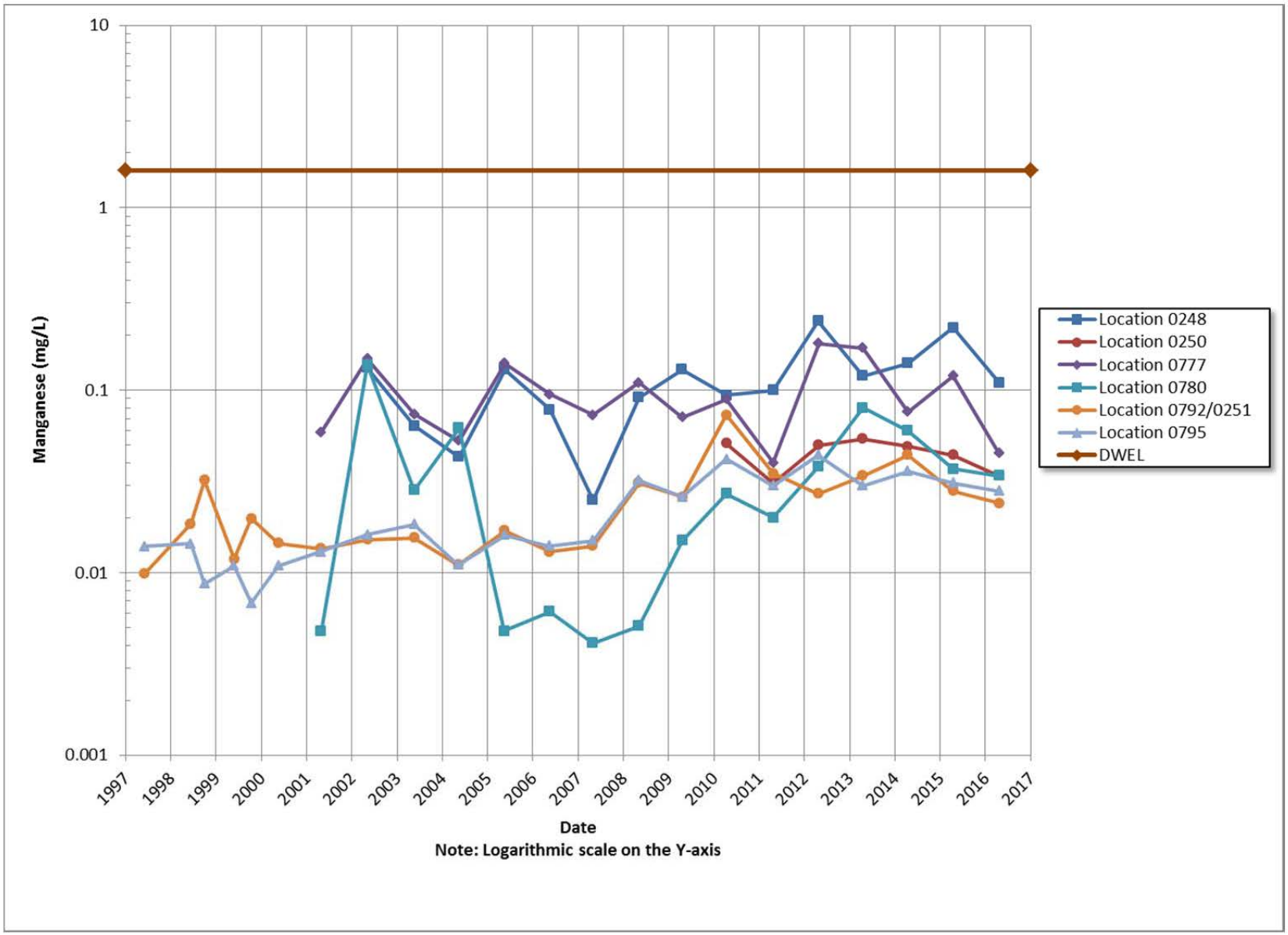

Figure 17. Manganese Concentrations in Surface Water near the Gunnison Site

5.0 Natural Flushing Assessment

Groundwater flow and transport modeling predicted that uranium concentrations in alluvial groundwater will decrease to levels below EPA's 40 CFR 192 groundwater standard within 100 years. To assess the progress of natural flushing, a trend analysis using the Mann-Kendall test (Gilbert 1987) was performed to assess the temporal behavior of uranium concentrations. This test determines if an upward trend, a downward trend, or no trend exists at a specified level of significance. For purposes of evaluating trends at the Gunnison site, a 95% level of significance ($\alpha = 0.05$) was used. Table 4 shows the trend analysis, which includes 1997–2016 uranium sampling data and *p* values denoting the strength (statistical significance) of the trend (generally, the closer to 0, the stronger the trend), and lists 2016 uranium concentrations. Trends from the Mann-Kendall tests in conjunction with current uranium concentrations were used to assess the progress of natural flushing. In Table 4, the last column indicates if natural flushing is progressing, neutral, or regressing based on the following criteria:

- **Progressing:** Current uranium concentrations are below the MCL with a downward or no trend, or uranium concentrations are above the MCL but less than 0.2 mg/L with a downward trend.

- **Neutral:** Current uranium concentrations are greater than 0.2 mg/L with a downward trend, or current uranium concentrations are below the MCL with an upward trend.

- **Regressing:** Current uranium concentrations are above the standard with an upward or no trend.

Another method of assessing the progress of natural flushing is to compare uranium concentrations predicted by groundwater flow and transport modeling to measured uranium concentrations. Figure 18 shows the comparison of predicted concentrations to actual concentrations measured in samples from intermediate-zone monitoring well 0113 (DOE 2001). This intermediate-zone well was selected as an indicator of natural flushing progress because of its depth and location adjacent to, and immediately downgradient of, the mill site, which is in an area of the aquifer that should be the first to flush as the plume migrates off the former mill site. Data from this monitoring well are also used to assess potential aquifer-wide groundwater impacts from the subpile soil contamination remaining on the former mill site. As shown in Figure 18, uranium concentrations tracked closely with concentrations predicted by the groundwater model from 1999 through 2009. Since 2010, uranium concentrations have been deviating from model predictions.

Table 4. Assessment of Uranium Concentration Trends at the Gunnison Site

Location	Number of Samples	Trend[a]	*p* Value	2016 Result (mg/L)	MCL[b] Exceeded in 2016? (Yes/No)	Natural Flushing Progress
0005	11	Downward[c]	0.0362	0.039	No	
0006	22	Downward	0.0149	0.89	Yes	
0012/0012R	17	Downward	0.0000	0.26	Yes	
0013	21	No Trend	0.2342	0.053	Yes	
0062	12	No Trend	0.4447	0.0082	No	
0063	12	Upward	0.0291	0.017	No	
0064	12	Downward	0.0266	0.012	No	
0065	12	Downward	0.0007	0.024	No	
0066	12	No Trend	0.3215	0.023	No	
0105	12	Downward	0.0139	0.012	No	
0106	22	Upward	0.0000	0.052	Yes	
0112	17	Upward	0.0003	0.056	Yes	
0113	22	No Trend	0.1830	0.190	Yes	
0125	18	No Trend	0.0743	0.013	No	
0126	22	Downward	0.0032	0.013	No	
0127	22	Downward	0.0000	0.015	No	
0135	12	Upward	0.0008	0.0038	No	
0136	18	Downward	0.0075	0.0048	No	
0160	20	Upward	0.0000	0.032	No	
0161	20	Upward	0.0000	0.023	No	
0181	16	Downward	0.0000	0.0081	No	
0183	19	No Trend	0.4163	0.061	Yes	
0186	18	Downward	0.0002	0.019	No	
0187	11	No Trend	0.4074	0.018	No	
0188	22	Downward	0.0159	0.029	No	
0189	22	No Trend	0.1942	0.017	No	

Notes:
[a] Data from 1997 to 2016.
[b] The value of 0.044 mg/L is from 40 CFR 192.
[c] **Blue** = downward trend; **red** = upward trend or standard was exceeded in 2016.

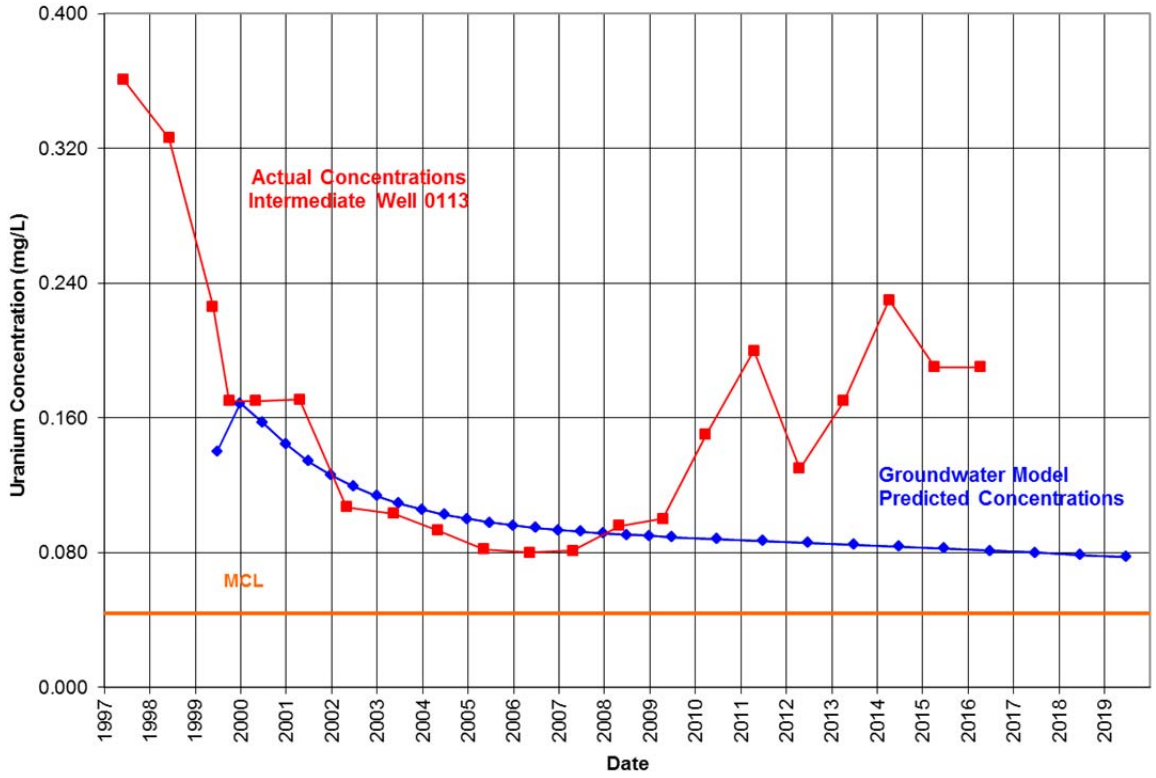

Figure 18. Uranium Concentrations in DOE Monitoring Well 0113 at the Gunnison Site

Construction activities in 2008 on the former mill site may have had an impact on uranium mobility. In 2008, Gunnison County excavated a north-south–trending utility trench approximately 7 ft deep across the site to install sewer and water infrastructure. The excavation removed fine-grained fill and provided a conduit for increased infiltration of precipitation and snowmelt to mobilize uranium in the subpile soils. In 2009, uranium concentrations in monitoring well 0006 increased to 1.0 mg/L, which was an increase from the pretrenching concentration of 0.76 mg/L in 2008. In 2009, concentrations in monitoring wells 0013 and 0113 downgradient of the former mill site started to increase (Figure 2 and Figure 7). Long-term monitoring of well 0113 will determine if recent increases in uranium concentrations are temporary due to construction activities at the former mill site or are more permanent due to the influence of RRM in subpile soils. In either case, recent uranium concentrations vary considerably from model predictions, and the viability of the natural flushing compliance strategy is in question.

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6.0 Conclusions

Concentrations of uranium in the alluvial groundwater beneath the former mill site remained above the MCL in 2016. The highest uranium concentration in 2016 (0.89 mg/L) was measured in monitoring well 0006, which is on the former mill site and completed in the shallow zone. Continued elevated uranium concentrations in this monitoring well indicate that residual soil contamination has a localized effect. Uranium concentrations in monitoring well 0113, which is immediately downgradient of the former mill site, continue to be higher than groundwater model predictions (Figure 18). Uranium trends in the alluvial groundwater farther downgradient of the former mill site are variable with a mix of decreasing, increasing, and no trends (Table 4). Concentrations of uranium in groundwater farthest downgradient of the site and deeper in the alluvial aquifer are elevated and increasing, as expected, as the plume migrates downgradient. Contaminant distribution continues to confirm the CSM of uranium migrating deeper in the alluvial aquifer with distance from the mill site.

Geochemical conditions in the alluvial aquifer tend to minimize concentrations and limit the mobility of manganese (DOE 2001). Samples from six monitoring wells in the monitoring network exceed the DWEL, and maximum concentrations were less than 5 mg/L. DOE will continue to monitor the concentrations and mobility of manganese in the alluvial aquifer.

Uranium concentrations in the domestic wells sampled at the Gunnison site were all below the MCL and the CDPHE action level. Manganese concentrations in these wells were all below the DWEL.

The uranium concentrations in the Gunnison River locations indicate that discharge of alluvial groundwater is being diluted by river water and has no measurable impact on river water quality. The uranium concentration at the gravel-pit pond (0780) is elevated compared to background concentrations in groundwater and surface water, which indicates that the gravel-pit pond is an expression of contaminated alluvial groundwater.

Achieving compliance using the natural flushing compliance strategy requires designation of all monitoring wells in the monitoring network (excluding background wells) as point-of-compliance wells; this is because compliance with the uranium MCL must be achieved at every point in the alluvial aquifer. The assessment of natural flushing based on current uranium concentrations and trends at each monitoring well in the monitoring network is presented in Table 4. This table shows that 11 of the 26 wells in the monitoring network indicate that natural flushing is either not progressing (4) or is regressing (7). On the basis of this assessment, the 99-year natural flushing time predicted by groundwater modeling and compliance with the 100-year regulatory time frame for natural flushing are unlikely. Accordingly, DOE is currently pursuing a new compliance strategy based on ACLs for the Gunnison site and is updating the GCAP, which will be submitted for NRC concurrence in 2017.

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7.0 References

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Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites, LMS/PRO/S04351, continually updated, prepared by Navarro Research and Engineering, Inc., for the U.S. Department of Energy Office of Legacy Management.

Appendix A

Groundwater Quality Data by Parameter for DOE Monitoring Wells

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Ground Water Quality Data by Parameter with Zone (EQuIS201) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:01 PM

Parameter	Units	Location Code	Loc Type	Sample Date	Type	Geol. Units	Flow Rel.	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detect Limit	Uncert
Manganese	mg/L	0002	WL	04/20/2016	(F)F	AL	U	1.1e-04	U	F	Y	0.00011	
	mg/L	0005	WL	04/20/2016	(F)F	AL	O	1.30		F	Y	0.00011	
	mg/L	0006	WL	04/20/2016	(F)F	AL	O	0.32		F	Y	0.00011	
	mg/L	0012R	WL	04/19/2016	(F)F	AL	O	0.46		F	Y	0.00011	
	mg/L	0013	WL	04/20/2016	(F)F	AL	D	0.082		F	Y	0.00011	
	mg/L	0062	WL	04/19/2016	(F)F	AL	O	4.0e-03	J	F	Y	0.00011	
	mg/L	0063	WL	04/19/2016	(F)F	AL	O	3.0e-03	J	F	Y	0.00011	
	mg/L	0064	WL	04/19/2016	(F)F	AL	O	0.072		F	Y	0.00011	
	mg/L	0065	WL	04/20/2016	(F)F	AL	O	0.019		F	Y	0.00011	
	mg/L	0066	WL	04/20/2016	(F)F	AL	O	6.6e-03		F	Y	0.00011	
	mg/L	0102	WL	04/20/2016	(F)F	AL	U	1.1e-04	U	F	Y	0.00011	
	mg/L	0105	WL	04/20/2016	(F)F	AL	O	2.70		F	Y	0.00011	
	mg/L	0106	WL	04/20/2016	(F)F	AL	O	4.00		F	Y	0.00011	
	mg/L	0112	WL	04/19/2016	(F)F	AL	O	4.70		F	Y	0.00011	
	mg/L	0113	WL	04/20/2016	(F)F	AL	D	2.50		F	Y	0.00011	
	mg/L	0125	WL	04/19/2016	(F)F	AL	D	0.04		F	Y	0.00011	
	mg/L	0126	WL	04/19/2016	(F)F	AL	D	0.012		F	Y	0.00011	
	mg/L	0127	WL	04/19/2016	(F)F	AL	D	0.029		F	Y	0.00011	
	mg/L	0135	WL	04/19/2016	(F)F	AL	D	2.70		F	Y	0.00011	
	mg/L	0136	WL	04/19/2016	(F)F	AL	D	3.10		F	Y	0.00011	
	mg/L	0160	WL	04/21/2016	(F)F	AL	D	0.025		F	Y	0.00011	
	mg/L	0161	WL	04/21/2016	(F)F	AL	D	0.011		F	Y	0.00011	
	mg/L	0181	WL	04/20/2016	(F)F	AL	D	0.28		F	Y	0.00011	
	mg/L	0183	WL	04/20/2016	(F)F	AL	D	1.1e-04	U	F	Y	0.00011	
	mg/L	0186	WL	04/21/2016	(F)F	AL	D	1.1e-04	U	F	Y	0.00011	
	mg/L	0187	WL	04/21/2016	(F)F	AL	D	1.00		F	Y	0.00011	
	mg/L	0188	WL	04/21/2016	(F)F	AL	D	1.1e-04	U	F	Y	0.00011	
	mg/L	0189	WL	04/21/2016	(F)F	AL	D	0.82		F	Y	0.00011	
Oxidation	mV	0002	WL	04/20/2016	(F)F	AL	U	126.1		F	Y		
Reduction Potential	mV	0005	WL	04/20/2016	(F)F	AL	O	13.6		F	Y		

Ground Water Quality Data by Parameter with Zone (EQuIS201) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:01 PM

Parameter	Units	Location Code	Loc Type	Sample Date	Type	Geol. Units	Flow Rel.	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detect Limit	Uncert
Oxidation Reduction Potential	mV	0006	WL	04/20/2016	(F)F	AL	O	180.2		F	Y		
	mV	0012R	WL	04/19/2016	(F)F	AL	O	199.8		F	Y		
	mV	0013	WL	04/20/2016	(F)F	AL	D	105.5		F	Y		
	mV	0062	WL	04/19/2016	(F)F	AL	O	148.6		F	Y		
	mV	0063	WL	04/19/2016	(F)F	AL	O	148.0		F	Y		
	mV	0064	WL	04/19/2016	(F)F	AL	O	116.7		F	Y		
	mV	0065	WL	04/20/2016	(F)F	AL	O	76.3		F	Y		
	mV	0066	WL	04/20/2016	(F)F	AL	O	102.6		F	Y		
	mV	0102	WL	04/20/2016	(F)F	AL	U	120.4		F	Y		
	mV	0105	WL	04/20/2016	(F)F	AL	O	-23.3		F	Y		
	mV	0106	WL	04/20/2016	(F)F	AL	O	130.1		F	Y		
	mV	0112	WL	04/19/2016	(F)F	AL	O	-39.8		F	Y		
	mV	0113	WL	04/20/2016	(F)F	AL	D	9.1		F	Y		
	mV	0125	WL	04/19/2016	(F)F	AL	D	71.3		F	Y		
	mV	0126	WL	04/19/2016	(F)F	AL	D	29.4		F	Y		
	mV	0127	WL	04/19/2016	(F)F	AL	D	-7.8		F	Y		
	mV	0135	WL	04/19/2016	(F)F	AL	D	30.2		F	Y		
	mV	0136	WL	04/19/2016	(F)F	AL	D	-1.0		F	Y		
	mV	0160	WL	04/21/2016	(F)F	AL	D	174.6		F	Y		
	mV	0161	WL	04/21/2016	(F)F	AL	D	167.9		F	Y		
	mV	0181	WL	04/20/2016	(F)F	AL	D	103.7		F	Y		
	mV	0183	WL	04/20/2016	(F)F	AL	D	72.1		F	Y		
	mV	0186	WL	04/21/2016	(F)F	AL	D	74.9		F	Y		
	mV	0187	WL	04/21/2016	(F)F	AL	D	20.2		F	Y		
	mV	0188	WL	04/21/2016	(F)F	AL	D	28.6		F	Y		
	mV	0189	WL	04/21/2016	(F)F	AL	D	-9.4		F	Y		
pH	s.u.	0002	WL	04/20/2016	(F)F	AL	U	7.37		F	Y		
	s.u.	0005	WL	04/20/2016	(F)F	AL	O	7.06		F	Y		
	s.u.	0006	WL	04/20/2016	(F)F	AL	O	6.89		F	Y		
	s.u.	0012R	WL	04/19/2016	(F)F	AL	O	6.96		F	Y		

Ground Water Quality Data by Parameter with Zone (EQuIS201) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:01 PM

Parameter	Units	Location Code	Loc Type	Sample Date	Type	Geol. Units	Flow Rel.	Result	Qualifiers Lab	Data	QA	Detect Limit	Uncert
pH	s.u.	0013	WL	04/20/2016	(F)F	AL	D	7.28		F	Y		
	s.u.	0062	WL	04/19/2016	(F)F	AL	O	7.60		F	Y		
	s.u.	0063	WL	04/19/2016	(F)F	AL	O	7.57		F	Y		
	s.u.	0064	WL	04/19/2016	(F)F	AL	O	7.32		F	Y		
	s.u.	0065	WL	04/20/2016	(F)F	AL	O	7.40		F	Y		
	s.u.	0066	WL	04/20/2016	(F)F	AL	O	7.31		F	Y		
	s.u.	0102	WL	04/20/2016	(F)F	AL	U	7.45		F	Y		
	s.u.	0105	WL	04/20/2016	(F)F	AL	O	6.53		F	Y		
	s.u.	0106	WL	04/20/2016	(F)F	AL	O	6.03		F	Y		
	s.u.	0112	WL	04/19/2016	(F)F	AL	O	6.32		F	Y		
	s.u.	0113	WL	04/20/2016	(F)F	AL	D	7.00		F	Y		
	s.u.	0125	WL	04/19/2016	(F)F	AL	D	7.26		F	Y		
	s.u.	0126	WL	04/19/2016	(F)F	AL	D	7.27		F	Y		
	s.u.	0127	WL	04/19/2016	(F)F	AL	D	7.42		F	Y		
	s.u.	0135	WL	04/19/2016	(F)F	AL	D	6.78		F	Y		
	s.u.	0136	WL	04/19/2016	(F)F	AL	D	6.77		F	Y		
	s.u.	0160	WL	04/21/2016	(F)F	AL	D	6.57		F	Y		
	s.u.	0161	WL	04/21/2016	(F)F	AL	D	6.66		F	Y		
	s.u.	0181	WL	04/20/2016	(F)F	AL	D	6.86		F	Y		
	s.u.	0183	WL	04/20/2016	(F)F	AL	D	6.68		F	Y		
	s.u.	0186	WL	04/21/2016	(F)F	AL	D	7.59		F	Y		
	s.u.	0187	WL	04/21/2016	(F)F	AL	D	6.48		F	Y		
	s.u.	0188	WL	04/21/2016	(F)F	AL	D	7.23		F	Y		
	s.u.	0189	WL	04/21/2016	(F)F	AL	D	6.38		F	Y		
Specific Conductance	uS/cm	0002	WL	04/20/2016	(F)F	AL	U	549		F	Y		
	uS/cm	0005	WL	04/20/2016	(F)F	AL	O	518		F	Y		
	uS/cm	0006	WL	04/20/2016	(F)F	AL	O	2228		F	Y		

Parameter	Units	Location Code	Loc Type	Sample Date	Type	Geol. Units	Flow Rel.	Result	Qualifiers Lab	Data	QA	Detect Limit	Uncert
Specific Conductance	umhos/cm	0012R	WL	04/19/2016	(F)F	AL	O	1003		F	Y		
	uS/cm	0013	WL	04/20/2016	(F)F	AL	D	681		F	Y		
	uS/cm	0062	WL	04/19/2016	(F)F	AL	O	524		F	Y		
	uS/cm	0063	WL	04/19/2016	(F)F	AL	O	571		F	Y		
	uS/cm	0064	WL	04/19/2016	(F)F	AL	O	508		F	Y		
	uS/cm	0065	WL	04/20/2016	(F)F	AL	O	670		F	Y		
	uS/cm	0066	WL	04/20/2016	(F)F	AL	O	675		F	Y		
	uS/cm	0102	WL	04/20/2016	(F)F	AL	U	545		F	Y		
	uS/cm	0105	WL	04/20/2016	(F)F	AL	O	508		F	Y		
	uS/cm	0106	WL	04/20/2016	(F)F	AL	O	1802		F	Y		
	uS/cm	0112	WL	04/19/2016	(F)F	AL	O	959		F	Y		
	uS/cm	0113	WL	04/20/2016	(F)F	AL	D	824		F	Y		
	uS/cm	0125	WL	04/19/2016	(F)F	AL	D	551		F	Y		
	uS/cm	0126	WL	04/19/2016	(F)F	AL	D	721		F	Y		
	uS/cm	0127	WL	04/19/2016	(F)F	AL	D	747		F	Y		
	uS/cm	0135	WL	04/19/2016	(F)F	AL	D	498		F	Y		
	uS/cm	0136	WL	04/19/2016	(F)F	AL	D	519		F	Y		
	uS/cm	0160	WL	04/21/2016	(F)F	AL	D	911		F	Y		

Ground Water Quality Data by Parameter with Zone (EQuIS201) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:01 PM

Parameter	Units	Location Code	Loc Type	Sample Date	Sample Type	Geol. Units	Flow Rel.	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detect Limit	Uncert
Specific Conductance	uS/cm	0161	WL	04/21/2016	(F)F	AL	D	917		F	Y		
	uS/cm	0181	WL	04/20/2016	(F)F	AL	D	512		F	Y		
	uS/cm	0183	WL	04/20/2016	(F)F	AL	D	1160		F	Y		
	uS/cm	0186	WL	04/21/2016	(F)F	AL	D	712		F	Y		
	uS/cm	0187	WL	04/21/2016	(F)F	AL	D	1148		F	Y		
	uS/cm	0188	WL	04/21/2016	(F)F	AL	D	717		F	Y		
	uS/cm	0189	WL	04/21/2016	(F)F	AL	D	2186		F	Y		
Temperature	deg C	0002	WL	04/20/2016	(F)F	AL	U	8.70		F	Y		
	deg C	0005	WL	04/20/2016	(F)F	AL	O	6.63		F	Y		
	deg C	0006	WL	04/20/2016	(F)F	AL	O	7.07		F	Y		
	deg C	0012R	WL	04/19/2016	(F)F	AL	O	6.87		F	Y		
	deg C	0013	WL	04/20/2016	(F)F	AL	D	7.63		F	Y		
	deg C	0062	WL	04/19/2016	(F)F	AL	O	7.69		F	Y		
	deg C	0063	WL	04/19/2016	(F)F	AL	O	7.83		F	Y		
	deg C	0064	WL	04/19/2016	(F)F	AL	O	7.02		F	Y		
	deg C	0065	WL	04/20/2016	(F)F	AL	O	7.23		F	Y		
	deg C	0066	WL	04/20/2016	(F)F	AL	O	6.94		F	Y		
	deg C	0102	WL	04/20/2016	(F)F	AL	U	10.21		F	Y		
	deg C	0105	WL	04/20/2016	(F)F	AL	O	8.97		F	Y		

Parameter	Units	Location Code	Loc Type	Sample Date	Type	Geol. Units	Flow Rel.	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detect Limit	Uncert
Temperature	deg C	0106	WL	04/20/2016	(F)F	AL	O	9.46		F	Y		
	deg C	0112	WL	04/19/2016	(F)F	AL	O	9.13		F	Y		
	deg C	0113	WL	04/20/2016	(F)F	AL	D	9.88		F	Y		
	deg C	0125	WL	04/19/2016	(F)F	AL	D	7.31		F	Y		
	deg C	0126	WL	04/19/2016	(F)F	AL	D	8.06		F	Y		
	deg C	0127	WL	04/19/2016	(F)F	AL	D	8.13		F	Y		
	deg C	0135	WL	04/19/2016	(F)F	AL	D	5.37		F	Y		
	deg C	0136	WL	04/19/2016	(F)F	AL	D	5.73		F	Y		
	deg C	0160	WL	04/21/2016	(F)F	AL	D	6.50		F	Y		
	deg C	0161	WL	04/21/2016	(F)F	AL	D	6.61		F	Y		
	deg C	0181	WL	04/20/2016	(F)F	AL	D	5.74		F	Y		
	deg C	0183	WL	04/20/2016	(F)F	AL	D	7.24		F	Y		
	deg C	0186	WL	04/21/2016	(F)F	AL	D	7.72		F	Y		
	deg C	0187	WL	04/21/2016	(F)F	AL	D	7.81		F	Y		
	deg C	0188	WL	04/21/2016	(F)F	AL	D	6.92		F	Y		
	deg C	0189	WL	04/21/2016	(F)F	AL	D	6.07		F	Y		
Turbidity	NTU	0002	WL	04/20/2016	(F)F	AL	U	4.68		F	Y		
	NTU	0005	WL	04/20/2016	(F)F	AL	O	8.22		F	Y		
	NTU	0006	WL	04/20/2016	(F)F	AL	O	3.44		F	Y		
	NTU	0012R	WL	04/19/2016	(F)F	AL	O	8.05		F	Y		
	NTU	0013	WL	04/20/2016	(F)F	AL	D	3.74		F	Y		

Ground Water Quality Data by Parameter with Zone (EQuIS201) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:01 PM

Parameter	Units	Location Code	Loc Type	Sample Date	Sample Type	Geol. Units	Flow Rel.	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detect Limit	Uncert
Turbidity	NTU	0062	WL	04/19/2016	(F)F	AL	O	4.92		F	Y		
	NTU	0063	WL	04/19/2016	(F)F	AL	O	1.64		F	Y		
	NTU	0064	WL	04/19/2016	(F)F	AL	O	9.80		F	Y		
	NTU	0065	WL	04/20/2016	(F)F	AL	O	8.51		F	Y		
	NTU	0066	WL	04/20/2016	(F)F	AL	O	.93		F	Y		
	NTU	0102	WL	04/20/2016	(F)F	AL	U	1.17		F	Y		
	NTU	0105	WL	04/20/2016	(F)F	AL	O	2.35		F	Y		
	NTU	0106	WL	04/20/2016	(F)F	AL	O	2.21		F	Y		
	NTU	0112	WL	04/19/2016	(F)F	AL	O	8.85		F	Y		
	NTU	0113	WL	04/20/2016	(F)F	AL	D	1.91		F	Y		
	NTU	0125	WL	04/19/2016	(F)F	AL	D	2.12		F	Y		
	NTU	0126	WL	04/19/2016	(F)F	AL	D	3.38		F	Y		
	NTU	0127	WL	04/19/2016	(F)F	AL	D	3.19		F	Y		
	NTU	0135	WL	04/19/2016	(F)F	AL	D	8.52		F	Y		
	NTU	0136	WL	04/19/2016	(F)F	AL	D	4.03		F	Y		
	NTU	0160	WL	04/21/2016	(F)F	AL	D	0.81		F	Y		
	NTU	0161	WL	04/21/2016	(F)F	AL	D	4.63		F	Y		
	NTU	0181	WL	04/20/2016	(F)F	AL	D	1.62		F	Y		
	NTU	0183	WL	04/20/2016	(F)F	AL	D	2.89		F	Y		
	NTU	0186	WL	04/21/2016	(F)F	AL	D	1.85		F	Y		
	NTU	0187	WL	04/21/2016	(F)F	AL	D	4.75		F	Y		
	NTU	0188	WL	04/21/2016	(F)F	AL	D	1.69		F	Y		
	NTU	0189	WL	04/21/2016	(F)F	AL	D	6.85		F	Y		
Uranium	mg/L	0002	WL	04/20/2016	(F)F	AL	U	2.8e-03		FJ	Y	0.000012	
	mg/L	0005	WL	04/20/2016	(F)F	AL	O	0.039		F	Y	0.000012	
	mg/L	0006	WL	04/20/2016	(F)F	AL	O	0.89		F	Y	0.000012	
	mg/L	0012R	WL	04/19/2016	(F)F	AL	O	0.26		F	Y	0.000012	
	mg/L	0013	WL	04/20/2016	(F)F	AL	D	0.053		F	Y	0.000012	
	mg/L	0062	WL	04/19/2016	(F)F	AL	O	8.2e-03		F	Y	0.000012	
	mg/L	0063	WL	04/19/2016	(F)F	AL	O	0.017		F	Y	0.000012	

Ground Water Quality Data by Parameter with Zone (EQuIS201) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:01 PM

Parameter	Units	Location Code	Loc Type	Sample Date	Sample Type	Geol. Units	Flow Rel.	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detect Limit	Uncert
Uranium	mg/L	0064	WL	04/19/2016	(F)F	AL	O	0.012		F	Y	0.000012	
	mg/L	0065	WL	04/20/2016	(F)F	AL	O	0.024		F	Y	0.000012	
	mg/L	0066	WL	04/20/2016	(F)F	AL	O	0.023		F	Y	0.000012	
	mg/L	0102	WL	04/20/2016	(F)F	AL	U	3.9e-03		F	Y	0.000012	
	mg/L	0105	WL	04/20/2016	(F)F	AL	O	0.012		F	Y	0.000012	
	mg/L	0106	WL	04/20/2016	(F)F	AL	O	0.052		F	Y	0.000012	
	mg/L	0112	WL	04/19/2016	(F)F	AL	O	0.056		F	Y	0.000012	
	mg/L	0113	WL	04/20/2016	(F)F	AL	D	0.19		F	Y	0.000012	
	mg/L	0125	WL	04/19/2016	(F)F	AL	D	0.013		F	Y	0.000012	
	mg/L	0126	WL	04/19/2016	(F)F	AL	D	0.013		F	Y	0.000012	
	mg/L	0127	WL	04/19/2016	(F)F	AL	D	0.015		F	Y	0.000012	
	mg/L	0135	WL	04/19/2016	(F)F	AL	D	3.8e-03		F	Y	0.000012	
	mg/L	0136	WL	04/19/2016	(F)F	AL	D	4.8e-03		F	Y	0.000012	
	mg/L	0160	WL	04/21/2016	(F)F	AL	D	0.032		FJ	Y	0.000012	
	mg/L	0161	WL	04/21/2016	(F)F	AL	D	0.023		F	Y	0.000012	
	mg/L	0181	WL	04/20/2016	(F)F	AL	D	8.1e-03		F	Y	0.000012	
	mg/L	0183	WL	04/20/2016	(F)F	AL	D	0.061		F	Y	0.000012	
	mg/L	0186	WL	04/21/2016	(F)F	AL	D	0.019		F	Y	0.000012	
	mg/L	0187	WL	04/21/2016	(F)F	AL	D	0.018		F	Y	0.000012	
	mg/L	0188	WL	04/21/2016	(F)F	AL	D	0.029		F	Y	0.000012	
	mg/L	0189	WL	04/21/2016	(F)F	AL	D	0.017		F	Y	0.000012	

Sample Types:
(F) Filtered Sample
(N) Nonfiltered Sample

Type Codes: F-Field Sample D-Duplicate R-Replicate N-Not Known FR-Field Sample with Replicates S-Split Sample

Geologic Unit

AL ALLUVIUM

Location Types

WL WELL

DATA

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	Tentatively identified compund (TIC).
Q	Qualitative result due to sampling technique
R	Unusable result.
U	Parameter analyzed for but was not detected.
X	Location is undefined.

LAB

*	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 Value.
M	GFAA duplicate injection precision not met.
N	Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
P	> 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
S	Result determined by method of standard addition (MSA).
U	Parameter analyzed for but was not detected.
W	Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X	Laboratory defined qualifier, see case narrative.
Y	Laboratory defined qualifier, see case narrative.
Z	Laboratory defined qualifier, see case narrative.

Flow Codes:

B BACKGROUND	C CROSS GRADIENT	D DOWN GRADIENT
F OFF-SITE	N UNKNOWN	O ON-SITE
U UPGRADIENT		

Appendix B

Groundwater Quality Data by Parameter for Domestic Wells

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Ground Water Quality Data by Parameter with Zone (EQuIS201) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 02:36 PM

Parameter	Units	Location Code	Loc Type	Sample Date	Sample Type	Geol. Units	Flow Rel.	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detect Limit	Uncert
Manganese	mg/L	0476	WL	06/27/2016	(N)F			0.0012	J	U	Y	0.00024	
	mg/L	0477	WL	06/27/2016	(N)F			0.0081			Y	0.00024	
	mg/L	0478	WL	04/20/2016	(F)F			1.10			Y	0.00011	
	mg/L	0478	WL	04/21/2016	(F)F			1.20			Y	0.00011	
	mg/L	0667	WL	04/21/2016	(F)F	AL	N	2.9e-03	J		Y	0.00011	
	mg/L	0683	WL	04/20/2016	(F)F	AL	N	1.8e-03	J		Y	0.00011	
Oxidation Reduction Potential	mV	0476	WL	06/27/2016	(N)F			189			Y		
	mV	0477	WL	06/27/2016	(N)F			47			Y		
	mV	0478	WL	04/20/2016	(F)F			145.5			Y		
	mV	0478	WL	04/21/2016	(F)F			4.1			Y		
	mV	0667	WL	04/21/2016	(F)F	AL	N	112.3			Y		
	mV	0683	WL	04/20/2016	(F)F	AL	N	228.4			Y		
pH	s.u.	0476	WL	06/27/2016	(N)F			6.65			Y		
	s.u.	0477	WL	06/27/2016	(N)F			7.30			Y		
	s.u.	0478	WL	04/20/2016	(F)F			7.57			Y		
	s.u.	0478	WL	04/21/2016	(F)F			7.58			Y		
	s.u.	0667	WL	04/21/2016	(F)F	AL	N	7.60			Y		
	s.u.	0683	WL	04/20/2016	(F)F	AL	N	8.19			Y		
Specific Conductance	umhos/cm	0476	WL	06/27/2016	(N)F			251			Y		
	umhos/cm	0477	WL	06/27/2016	(N)F			232			Y		
	uS/cm	0478	WL	04/20/2016	(F)F			301			Y		
	uS/cm	0478	WL	04/21/2016	(F)F			294			Y		
	uS/cm	0667	WL	04/21/2016	(F)F	AL	N	237			Y		
	uS/cm	0683	WL	04/20/2016	(F)F	AL	N	317			Y		

Ground Water Quality Data by Parameter with Zone (EQuIS201) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 02:36 PM

Parameter	Units	Location Code	Loc Type	Sample Date	Sample Type	Geol. Units	Flow Rel.	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detect Limit	Uncert
Temperature	deg C	0476	WL	06/27/2016	(N)F			15.96			Y		
	deg C	0477	WL	06/27/2016	(N)F			11.14			Y		
	deg C	0478	WL	04/20/2016	(F)F			19.71			Y		
	deg C	0478	WL	04/21/2016	(F)F			10.62			Y		
	deg C	0667	WL	04/21/2016	(F)F	AL	N	6.18			Y		
	deg C	0683	WL	04/20/2016	(F)F	AL	N	13.90			Y		
Turbidity	NTU	0476	WL	06/27/2016	(N)F			0.92			Y		
	NTU	0477	WL	06/27/2016	(N)F			6.18			Y		
	NTU	0478	WL	04/20/2016	(F)F			.90			Y		
	NTU	0478	WL	04/21/2016	(F)F			1.90			Y		
	NTU	0667	WL	04/21/2016	(F)F	AL	N	3.95			Y		
Uranium	mg/L	0476	WL	06/27/2016	(N)F			0.002			Y	0.000012	
	mg/L	0477	WL	06/27/2016	(N)F			0.0014			Y	0.000012	
	mg/L	0478	WL	04/20/2016	(F)F			2.9e-03			Y	0.000012	
	mg/L	0478	WL	04/21/2016	(F)F			2.9e-03			Y	0.000012	
	mg/L	0667	WL	04/21/2016	(F)F	AL	N	1.9e-03			Y	0.000012	
	mg/L	0683	WL	04/20/2016	(F)F	AL	N	3.5e-03			Y	0.000012	

Sample Types:
(F) Filtered Sample
(N) Nonfiltered Sample

Type Codes: F-Field Sample R-Replicate FR-Field Sample with Replicates
D-Duplicate N-Not Known S-Split Sample

Geologic Unit

AL ALLUVIUM

Location Types

WL WELL

DATA

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	Tentatively identified compund (TIC).
Q	Qualitative result due to sampling technique
R	Unusable result.
U	Parameter analyzed for but was not detected.
X	Location is undefined.

LAB

*	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 Value.
M	GFAA duplicate injection precision not met.
N	Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
P	> 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
S	Result determined by method of standard addition (MSA).
U	Parameter analyzed for but was not detected.
W	Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X	Laboratory defined qualifier, see case narrative.
Y	Laboratory defined qualifier, see case narrative.
Z	Laboratory defined qualifier, see case narrative.

Flow Codes:

B BACKGROUND	C CROSS GRADIENT	D DOWN GRADIENT
F OFF-SITE	N UNKNOWN	O ON-SITE
U UPGRADIENT		

Appendix C

Surface Water Quality Data by Parameter

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Surface Water Quality Data by Parameter (EQuIS800) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:13 PM

Parameter	Units	Location Code	Sample: Date	Type	Result	Qualifiers: Lab	Data	Detection Limit	Uncertainty
Manganese	mg/L	0248	04/19/2016	(F)F	0.11			0.00011	
	mg/L	0250	04/20/2016	(F)F	0.034			0.00011	
	mg/L	0251	04/20/2016	(F)F	0.024			0.00011	
	mg/L	0777	04/20/2016	(F)F	0.045			0.00011	
	mg/L	0780	04/20/2016	(F)F	0.034			0.00011	
	mg/L	0795	04/21/2016	(F)F	0.028			0.00011	
Oxidation Reduction Potential	mV	0248	04/19/2016	(F)F	184.5				
	mV	0250	04/20/2016	(F)F	138.8				
	mV	0251	04/20/2016	(F)F	75,7				
	mV	0777	04/20/2016	(F)F	113.8				
	mV	0780	04/20/2016	(F)F	94.3				
	mV	0795	04/21/2016	(F)F	126.8				

Surface Water Quality Data by Parameter (EQuIS800) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:13 PM

Parameter	Units	Location Code	Sample: Date	Type	Result	Qualifiers: Lab	Data	Detection Limit	Un-certainty
pH	s.u.	0248	04/19/2016	(F)F	7.89				
	s.u.	0250	04/20/2016	(F)F	7.64				
	s.u.	0251	04/20/2016	(F)F	8.25				
	s.u.	0777	04/20/2016	(F)F	7.96				
	s.u.	0780	04/20/2016	(F)F	7.94				
	s.u.	0795	04/21/2016	(F)F	7.87				
Specific Conductance	uS/cm	0248	04/19/2016	(F)F	484				
	uS/cm	0250	04/20/2016	(F)F	226				
	uS/cm	0251	04/20/2016	(F)F	224				
	uS/cm	0777	04/20/2016	(F)F	249				
	uS/cm	0780	04/20/2016	(F)F	606				
	uS/cm	0795	04/21/2016	(F)F	224				

Surface Water Quality Data by Parameter (EQuIS800) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:13 PM

Parameter	Units	Location Code	Sample: Date	Type	Result	Qualifiers: Lab	Data	Detection Limit	Un-certainty
Temperature	deg C	0248	04/19/2016	(F)F	7.74				
	deg C	0250	04/20/2016	(F)F	4.04				
	deg C	0251	04/20/2016	(F)F	8.23				
	deg C	0777	04/20/2016	(F)F	5.32				
	deg C	0780	04/20/2016	(F)F	9.14				
	deg C	0795	04/21/2016	(F)F	4.84				
Turbidity	NTU	0248	04/19/2016	(F)F	2.37				
	NTU	0250	04/20/2016	(F)F	7.72				
	NTU	0251	04/20/2016	(F)F	3.86				
	NTU	0777	04/20/2016	(F)F	13.4				
	NTU	0780	04/20/2016	(F)F	5.81				
	NTU	0795	04/21/2016	(F)F	5.54				

Parameter	Units	Location Code	Sample: Date	Type	Result	Qualifiers: Lab	Data	Detection Limit	Un-certainty
Uranium	mg/L	0248	04/19/2016	(F)F	0.026			0.000012	
	mg/L	0250	04/20/2016	(F)F	9.6e-04			0.000012	
	mg/L	0251	04/20/2016	(F)F	8.9e-04			0.000012	
	mg/L	0777	04/20/2016	(F)F	5.8e-03			0.000012	
	mg/L	0780	04/20/2016	(F)F	0.049			0.000012	
	mg/L	0795	04/21/2016	(F)F	9.1e-04			0.000012	

DATA

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	Tentatively identified compund (TIC).
Q	Qualitative result due to sampling technique
R	Unusable result.
U	Parameter analyzed for but was not detected.
X	Location is undefined.

LAB

*	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 Value.
M	GFAA duplicate injection precision not met.
N	Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compund (TIC).
P	> 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
S	Result determined by method of standard addition (MSA).
U	Parameter analyzed for but was not detected.
W	Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X	Laboratory defined qualifier, see case narrative.
Y	Laboratory defined qualifier, see case narrative.
Z	Laboratory defined qualifier, see case narrative.

Sample Types:
(F) Filtered Sample
(N) Nonfiltered Sample

Type Codes: F-Field Sample R-Replicate FR-Field Sample with Replicates
D-Duplicate N-Not Known S-Split Sample

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Appendix D

Water Level Data

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Static Water Levels (EQuIS 700) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:51 PM

Location	Flow Relationship	TOC Elevation	Log Date Time	Water Level Depth	Water Level Elev	Water Level Flag
0002	U	7646.75	4/20/2016 3:03:00 PM	5.82	7640.93	
0005	O	7644.66	4/20/2016 5:28:00 PM	6.35	7638.31	
0006	O	7647.23	4/20/2016 4:45:00 PM	11.36	7635.87	
0012R	O	7645.95	4/19/2016 8:23:00 AM	12.12	7633.83	
0013	D	7643.75	4/20/2016 1:11:00 PM	11.8	7631.95	
0062	O	7630.61	4/19/2016 5:58:00 PM	5.75	7624.86	
0063	O	7630.34	4/19/2016 5:38:00 PM	7.11	7623.23	
0064	O	7620.76	4/19/2016 4:36:00 PM	6.67	7614.09	
0065	O	7610.27	4/20/2016 9:55:00 AM	1.96	7608.31	
0066	O	7606.22	4/20/2016 10:45:00 AM	2.09	7604.13	
0102	U	7647.3	4/20/2016 3:19:00 PM	6.44	7640.86	
0105	O	7646.11	4/20/2016 5:52:00 PM	8.9	7637.21	
0106	O	7647.22	4/20/2016 1:11:00 PM	11.53	7635.69	
0112	O	7645.74	4/19/2016 8:43:00 AM	12.51	7633.23	
0113	D	7643.83	4/20/2016 1:11:00 PM	11.92	7631.91	
0125	D	7633.52	4/19/2016 3:33:00 PM	6.3	7627.22	
0126	D	7634.14	4/19/2016 3:15:00 PM	6.17	7627.97	
0127	D	7634.64	4/19/2016 2:52:00 PM	8.06	7626.58	
0135	D	7627.03	4/19/2016 2:04:00 PM	4.15	7622.88	
0136	D	7626.24	4/19/2016 2:21:00 PM	3.3	7622.94	

Static Water Levels (EQuIS 700) for Site GUN01 Gunnison Processing Site
Report Date: 08/10/2016 03:51 PM

Location	Flow Relationship	TOC Elevation	Log Date Time	Water Level Depth	Water Level Elev	Water Level Flag
0160	D	7604.39	4/21/2016 7:58:00 AM	5.52	7598.87	
0161	D	7605.63	4/21/2016 8:25:00 AM	6.94	7598.69	
0181	D	7616.38	4/20/2016 9:00:00 AM	2.15	7614.23	
0183	D	7616.27	4/20/2016 9:00:00 AM	4.03	7612.24	
0186	D	7627.21	4/21/2016 11:15:00 AM	5.96	7621.25	
0187	D	7625.91	4/21/2016 11:50:00 AM	5.25	7620.66	
0188	D	7613.65	4/21/2016 10:40:00 AM	6.13	7607.52	
0189	D	7613.56	4/21/2016 9:42:00 AM	6.49	7607.07	

Flow Codes: B BACKGROUND C CROSS GRADIENT D DOWN GRADIENT
F OFF-SITE N UNKNOWN O ON-SITE
U UPGRADIENT

Water Level Flags: B Water level is below the top of the pump
D Dry
E Water elevation may not be comparable to other water elevations at this site
F Flowing
I Inaccessible