1.0 Bluewater, New Mexico, Disposal Site

1.1 Compliance Summary

The Bluewater, New Mexico, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II Disposal Site was inspected on August 19 and 20, 2015. A significant pond was present on the top slope of the main tailings disposal cell cover in an area where shallow depressions are present; disposal cell performance is being evaluated to determine if additional monitoring or cover enhancement is necessary. Several Siberian elm saplings present on the main tailings disposal cell and tamarisk shrubs scattered across the site will be cut and treated with herbicide in 2016. Inspectors identified no other maintenance needs or cause for a follow-up inspection.

Groundwater monitoring in 2015 indicated that no alternate concentration limits (ACLs) were exceeded, but that groundwater leaving the site has uranium concentrations exceeding the UMTRCA maximum concentration limit (MCL) and the State of New Mexico drinking water standard. Downgradient sampling indicates that drinking-water wells in the vicinity of the site have uranium concentrations below the drinking water standard, and the groundwater conceptual model indicates that uranium contamination from the Bluewater site is not expected to impact the local municipal water supplies.

1.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the *Long-Term Surveillance Plan for the DOE Bluewater (UMTRCA Title II) Disposal Site Near Grants, New Mexico* (LTSM003407, July 1997) and in procedures the U.S. Department of Energy (DOE) established to comply with requirements of Title 10 *Code of Federal Regulations* Section 40.28 (10 CFR 40.28). Table 1-1 lists these requirements.

Table 1-1. License Requirements for the Bluewater, New Mexico, Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.3 and 3.4	Section 1.4
Follow-up Inspections	Section 3.5	Section 1.5
Routine Maintenance and Emergency Measures	Section 3.6	Section 1.6
Environmental Monitoring	Section 3.7	Section 1.7

1.3 Institutional Controls

The approximately 3,300-acre site (Figures 1-1 and 1-2) is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.28) in 1997. DOE is the licensee and, in accordance with the requirements for UMTRCA Title II sites, is responsible for the custody and long-term care of the site. Institutional controls at the site include federal ownership of the property and the following features that are inspected annually: a site marker, boundary monuments, and warning/no-trespassing signs.

1.4 Inspection Results

The site, located approximately 9 miles northwest of Grants, New Mexico, was inspected on August 19 and 20, 2015. The inspection was conducted by R. Johnson and M. Widdop of the DOE Legacy Management Support contractor. D. Barr (DOE Site Manager), J. Parrott (NRC Site Manager), and A. Ortelli (New Mexico Environment Department, or NMED) attended the inspection.

The purposes of the inspection were to confirm the integrity of the visible features at the site, to identify changes in conditions that might affect site integrity, and to determine the need, if any, for maintenance or additional inspection and monitoring. Numbers in the left margin of this report refer to items summarized in Table ES-1 of the "Executive Summary."

1.4.1 Site Surveillance Features

The locations of site surveillance features are shown on Figure 1-1 (south area) and Figure 1-2 (north area). Inspection results and recommended maintenance activities associated with site surveillance features are included in the following subsections. Photographs to support specific observations are identified in the text and on the figures by photograph location (PL) numbers.

1.4.1.1 Site Access and Interior Roads

Access to the site is directly off gravel-surfaced Cibola County Road 63; no private property is crossed to gain site access. The entrance gate is a tubular steel, double-swing gate. The gate is secured by a chain and locks belonging to DOE and the various utility companies that have rights-of-way across the site. The gate was locked and in good condition.

The site access road is surfaced with crushed basalt and extends northward along a narrow strip of DOE property for approximately 1,700 feet from the entrance gate to another gate. The access road was in good condition.

Interior tertiary roads used to access DOE assets consist of dirt tracks covered at places with crushed basalt. The roads are susceptible to erosion, and are repaired when they become impassable. All roads were passable, and interior-road locations repaired in September 2014 were in good condition despite above-normal rainfall during the summer.

1.4.1.2 Perimeter Signs and Boundary Monuments

Fifty-five warning signs, referred to as perimeter signs, are mounted on steel posts along the site boundary and around the main and carbonate tailings disposal cells. Perimeter signs P3 and P10 had gunshot damage but were still legible. All other observed signs were in good condition.

Twenty-four boundary monuments define the site boundary. These monuments are typically inside the perimeter fence and several feet inside the true corner or boundary line. The boundary monuments observed during the inspection were in good condition. Some monuments tend to get covered by drifting sand, and metal t-posts have been driven at those locations to help inspectors find them (PL-1).

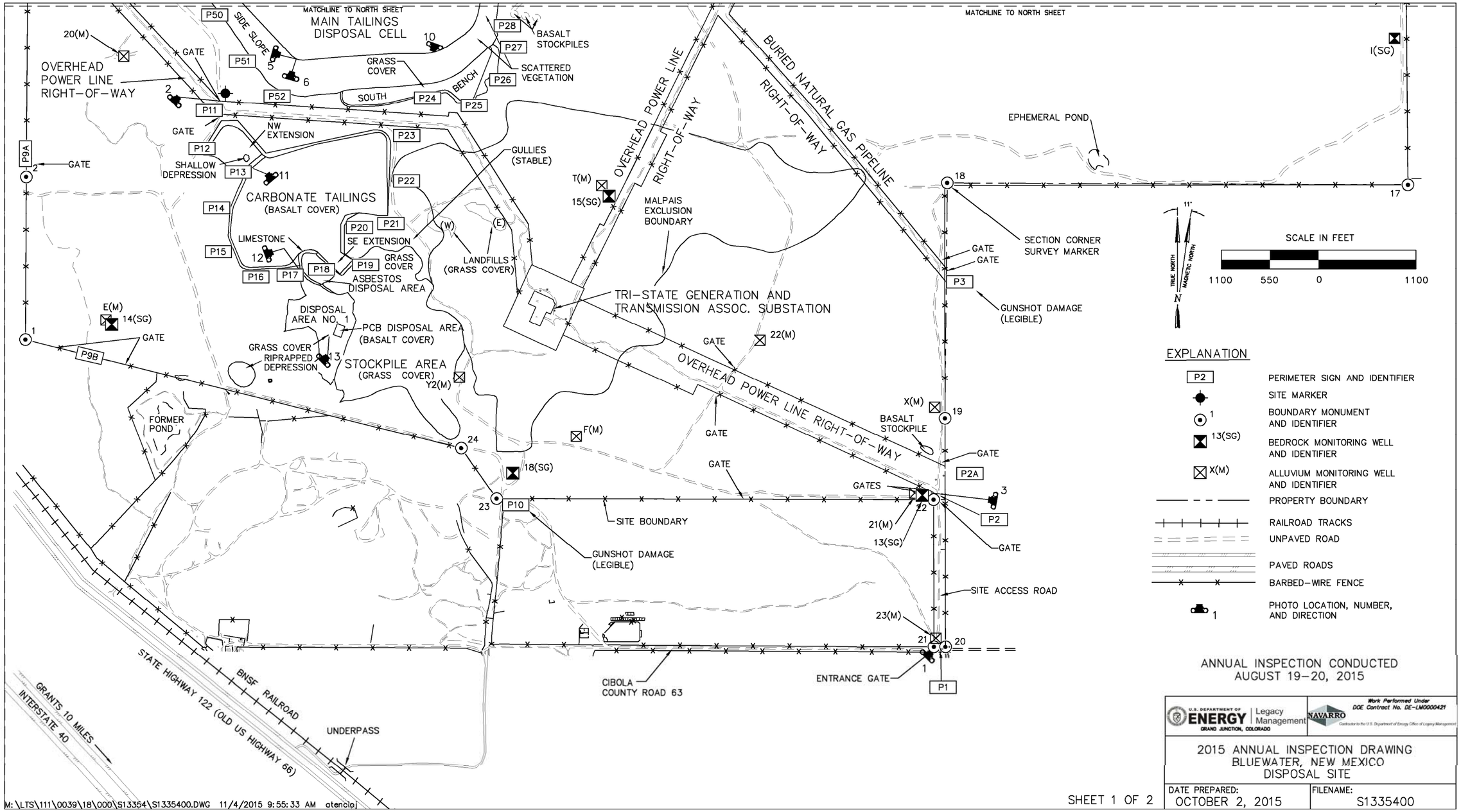


Figure 1-1. 2015 Annual Inspection Drawing for the Bluewater, New Mexico, Disposal Site (South Area)

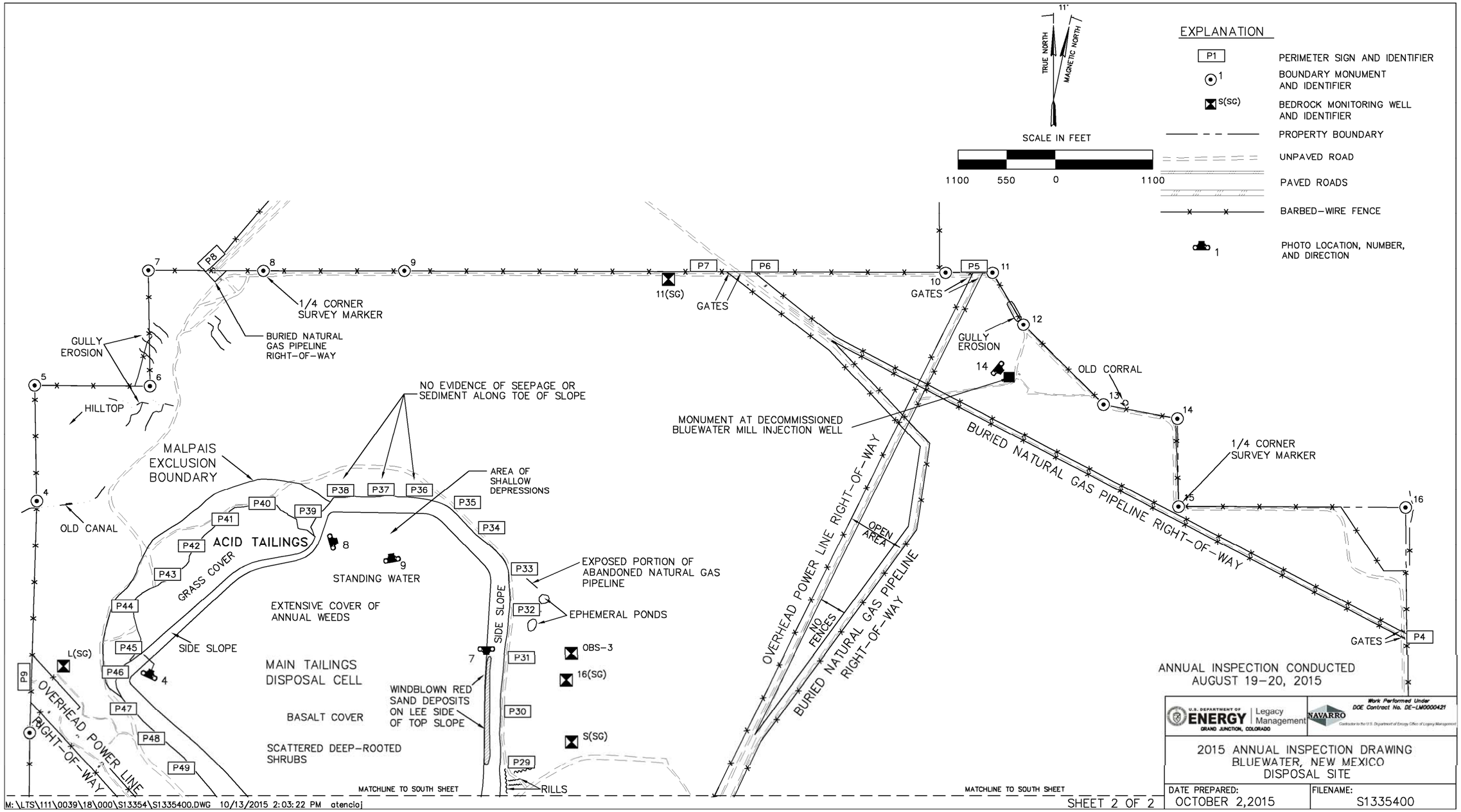


Figure 1-2. 2015 Annual Inspection Drawing for the Bluewater, New Mexico, Disposal Site (North Area)

1.4.1.3 Perimeter Fence

A four-strand barbed-wire fence encompasses the site to facilitate land management by DOE. A local subcontractor has been retained to periodically check the site perimeter fence and to remove trespassing cattle. Minor fence repairs are conducted as needed. The fence was in good condition.

1.4.1.4 Site Marker

A granite site marker is between the southwest corner of the main tailings disposal cell and the northwest corner of the carbonate tailings disposal cell. The site marker was in excellent condition (PL-2).

1.4.1.5 Monitoring Wells

The groundwater monitoring network consisted of nine wells when the site was transferred to DOE. Two additional wells were installed in summer 2011, and eight more wells were installed in summer 2012 in response to elevated uranium concentrations in the two aquifers at the site. The onsite groundwater-monitoring network now consists of 19 monitoring wells.

Nine wells are screened in Rio San Jose alluvium underlying basalt lava flows and are identified as E(M), F(M), T(M), X(M), Y2(M), 20(M), 21(M), 22(M), and 23(M). The other 10 wells are completed in the San Andres Limestone and Glorieta Sandstone hydrogeologic unit, known as the San Andres aquifer, which is the uppermost bedrock aquifer at the site. The bedrock wells are I(SG), L(SG), OBS-3, S(SG), 11(SG), 13(SG), 14(SG), 15(SG), 16(SG), and 18(SG). Several wells have transducers to obtain continuous water level measurements, and the data are transmitted to the DOE office in Grand Junction, Colorado. The wells and their associated telemetry towers were secure and in excellent condition (PL-3).

1.4.2 Inspection Areas

In accordance with the Long-Term Surveillance Plan (LTSP), the site is divided into four inspection areas (referred to as “transects” in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are: (1) the main tailings disposal cell, including the acid tailings disposal area and the south bench disposal area; (2) the carbonate tailings disposal cell, including the asbestos disposal area, the polychlorinated biphenyl (PCB) disposal area, and associated landfills; (3) the region between the disposal structures and the site perimeter; and (4) the site perimeter and outlying area.

Within each area, inspectors examined the specific site surveillance features. Inspectors also looked for evidence of erosion, settling, slumping, or other disturbances that might affect the site’s integrity, protectiveness, or long-term performance.

1.4.2.1 Main Tailings Disposal Cell, the Acid Tailings Disposal Area, and the South Bench Disposal Area

The main tailings disposal cell and the acid tailings and south bench disposal areas are contiguous, and together they constitute one large disposal area of approximately 354 acres. The main tailings disposal cell is covered with basalt riprap and slopes northward. The top slope

grade is 3 to 4 percent at the south end and decreases to less than 0.5 percent at the north end. The top slopes of the acid tailings (PL-4) and the south bench (PL-5) disposal areas are essentially flat and covered by healthy grass. Basalt riprap protects the side slopes of the three disposal structures. The riprap was in excellent condition.

Plant encroachment (annual weeds, perennial grasses and forbs, and scattered perennial shrubs) continues on the cell cover (PL-6) and side slopes (PL-7). Saplings of Siberian elm have been present on the disposal cell covers and are managed to prevent the establishment of trees that could damage the cell covers; several saplings were observed during the inspection. The elm saplings will be cut and treated with herbicide in 2016.

Several shallow depressions have formed on the relatively flat north end of the top slope of the main tailings disposal cell and along the east and northwest edges of the cover. Ponds often develop in the depressions after rainfall events, and occasionally coalesce into a one large pond after a series of rainfall events. The summer of 2015 was wetter than normal and a large pond was present at the time of the inspection (PL-8). When measured on September 3, 2015, the pond covered approximately 10.1 acres, and held approximately 2.2 million gallons of runoff water. The presence of ponded water is monitored continuously using a remotely operated camera system (PL-9).

NRC requested DOE to evaluate the performance of the low-permeability radon barrier to determine if the ponded water was degrading disposal cell performance through (1) release of radon to the atmosphere or (2) infiltration of water through the cover and into the encapsulated tailings.

DOE measured radon flux on top of the radon barrier in the area of the depressions in July 2013. All radon measurements were less than the detection limit. On the basis of the radon monitoring results, there do not seem to be gross defects in the low-permeability radon barrier that would result in elevated radon flux, indicating that the radon barrier in that portion of the disposal cell was performing as designed.

DOE noted that ponded water accumulates after precipitation events and does not dissipate rapidly, and that evaporation far exceeds precipitation in the Bluewater region. Water levels in point-of-compliance (POC) wells have been dropping steadily since 1995, when the cell was covered, which suggest insignificant seepage from the tailings. Based on the integrity of the radon barrier, the persistence of ponded water, and lack of evidence of seepage, dissipation of the ponded water is most likely due to evaporation rather than infiltration.

The Bluewater site is part of an NRC-funded radon study investigating the effects of soil-forming processes on the engineering properties of disposal cell cover materials. Investigations will include determining if soil structures that might increase permeability are forming within the compacted soil layers in the cell cover system. Results of the DOE investigations will be used to determine, in consultation with NRC, if additional monitoring, methods to drain the ponded water, or cover enhancements are necessary.

1.4.2.2 Carbonate Tailings Disposal Cell, Asbestos and PCB Disposal Areas, and Landfills

The 54-acre carbonate tailings disposal cell is south of the main tailings disposal cell (PL-10). Basalt riprap covers the top and side slopes of the disposal cell. The top, for the most part, slopes gently eastward. The cell includes extensions to the northwest and southeast. A very shallow depression exists on the northwest extension, and rainfall runoff occasionally ponds at this location; the depression was dry at the time of the inspection (PL-11). Annual weeds, perennial grasses, and scattered woody shrubs were present on the cell and its extensions. Saplings of Siberian elm have been present on the cell cover and are periodically cut, and their stumps are treated with herbicide; no saplings were observed during the inspection.

The 2-acre asbestos disposal area is a bowl-like feature just south of the carbonate tailings disposal cell (PL-12). The north, west, and south side slopes of this feature are covered by limestone riprap; the bottom of the bowl (the asbestos cell cover) is grass-covered. The asbestos disposal area was in excellent condition.

The 11-acre grass-covered Disposal Area Number 1 south of the asbestos disposal area was in excellent condition, as was the small riprap-covered PCB cell located within that disposal area (PL-13). The two grass-covered landfills east of the carbonate tailings disposal cell, totaling about 2 acres, were not checked during this inspection.

1.4.2.3 Area Between the Disposal Cells and the Site Perimeter

Other areas inside the site were inspected by driving the site perimeter road and other roads and tracks. Much of the southern and western portions of the site are inaccessible by vehicle because they are covered by basalt flows.

Small ponds often form in an area along the east side of the disposal cell and in other low spots following storm events and were present at the time of the inspection. The areas of ponding are far enough from the cell to not impact it.

A monument consisting of a steel well casing set in concrete is located at the decommissioned mill process fluid injection well near the northeast corner of the site (PL-14). Information pertaining to the well is welded onto the monument.

Several utility company rights-of-way cross the site. These rights-of-way are bordered by stock fences with locked gates where the rights-of-way cross the site boundary. Roads along the rights-of-way typically are covered with crushed basalt to provide the utility companies with all-weather access. DOE is not responsible for maintaining the right-of-way roads, fences, or associated gates.

An electric power substation, enclosed by a security fence, is located near the center of the site. Utility company personnel visit the substation frequently. DOE is not responsible for maintaining the substation or its security fence and access road.

1.4.2.4 Site Perimeter and Outlying Area

Surrounding land is used for livestock grazing and wildlife habitat. The area outside the site boundary for 0.25 mile was visually inspected for erosion, development, changes in land use, or

other phenomena that might affect the long-term integrity of the site. No such impacts were observed.

1.5 Follow-up Inspections

DOE will conduct follow-up inspections if (1) a condition is identified during the annual inspection or other site visit that requires a return to the site to evaluate the condition, or (2) DOE is notified by a citizen or outside agency that conditions at the site are substantially changed. No need for a follow-up inspection was identified during the inspection.

1.6 Routine Maintenance and Emergency Measures

Elm saplings on the main tailings disposal cell cover will be cut and treated with herbicide in 2016. No other maintenance needs were identified.

Emergency measures are corrective actions that DOE will take in response to unusual damage or disruption that threatens or compromises site safety and health, security, integrity, or compliance with 40 CFR 192. No emergency measures were identified.

1.7 Environmental Monitoring

1.7.1 Groundwater Monitoring

1A Groundwater monitoring is required at the Bluewater site. The well network acquired by DOE at the time of site transition and included in the LTSP consisted of wells E(M), F(M), T(M), Y2(M), X(M), L(SG), OBS-3, S(SG), and I(SG). The LTSP requires annual sampling for PCBs and triennial sampling for molybdenum, selenium, and uranium in the alluvial aquifer background and POC wells. The LTSP also requires triennial sampling of the San Andres (bedrock) aquifer background and POC wells for selenium and uranium. Alluvial aquifer well X(M) and bedrock aquifer well I(SG)—point-of-exposure (POE) wells located along the east property boundary—are to be sampled only if specified ACLs are exceeded at POC wells. The monitoring network, including new wells installed in 2011 and 2012, is described in Table 1-2. ACLs are listed in Table 1-3.

NMED requested DOE's assistance in investigating and evaluating regional groundwater contamination associated with the former Grants Mineral Belt uranium mining industry. NMED suspected that contaminants from the Bluewater site were migrating offsite and contaminating the regional groundwater. In response to NMED's concerns, DOE reinitiated annual sampling at all of the site wells in fall 2008, including the POE wells. Semiannual sampling was initiated in 2011 in response to an ACL exceedance. DOE also began evaluating the hydrogeology and groundwater quality at the site in 2009, and started analyzing a larger suite of constituents than what is required by the LTSP to characterize the site aquifers and to support NMED's regional groundwater investigation. In consultation with NRC, DOE installed additional monitoring wells in 2011 and 2012, evaluated disposal cell performance, and has developed a groundwater conceptual model to address uranium contamination issues. NRC is reviewing the model.

Table 1-2. Groundwater Monitoring Network at the Bluewater, New Mexico, Disposal Site

Monitoring Well	Network Application
E(M)	Alluvium background well
F(M)	Alluvium POC well
T(M)	Alluvium POC well
X(M)	Alluvium POE well
Y2(M)	Alluvium POC well
20(M)	Alluvium upgradient well
21(M)	Alluvium downgradient well
22(M)	Alluvium downgradient well
23(M)	Alluvium downgradient well
I(SG)	Bedrock POE well
L(SG)	Bedrock background well
OBS-3	Bedrock POC well
S(SG)	Bedrock POC well
11(SG)	Bedrock crossgradient well
13(SG)	Bedrock downgradient well
14(SG)	Bedrock crossgradient well
15(SG)	Bedrock downgradient well
16(SG)	Bedrock replacement POC well
18(SG)	Bedrock downgradient well

Key: POC = point of compliance; POE = point of exposure

Table 1-3. Groundwater Alternate Concentration Limits for the Bluewater, New Mexico, Disposal Site

POC Well	Analyte	ACL (mg/L)
Alluvial Aquifer Wells F(M) and T(M)	Molybdenum Selenium Uranium	0.10 0.05 0.44
Bedrock Aquifer Wells OBS-3 and S(SG)	Selenium Uranium	0.05 2.15

Key: ACL = alternate concentration limit; mg/L = milligrams per liter; POC = point of compliance

1.7.2 Alluvial Aquifer

Water-bearing alluvium underlies the southern portion of the Bluewater site. The alluvium, along the course of the ancestral Rio San Jose, is covered by basalt lava flows. The alluvium consists of coarse sands and gravels in the main channel and finer-grained floodplain deposits outside the channel. Groundwater in the alluvium is in hydraulic communication with the deeper bedrock aquifer along fault lines and where the alluvium overlies bedrock.

Groundwater in the alluvial aquifer is contaminated with uranium as it passes beneath the southeast portion of the main disposal cell and comes in contact with a mineralized zone that formed beneath the tailings impoundments. Calculations performed by the former licensee indicate that as much as 2.7 billion gallons of seepage seeped from the tailings ponds before excess water was decanted and disposed of in a deep injection well starting in 1960, and a total of 5.7 billion gallons of tailings fluids seeped from the impoundments before the cells were

closed in 1995. The mineralized zone is the result of the acidic seepage water from the impoundments becoming neutralized as it contacted formation materials and dissolved constituents precipitated out of solution. Groundwater in the aquifer is oxidized and adsorption of dissolved uranium does not occur. However, uranium concentrations reduce with distance from the Bluewater site due to dispersion.

Alluvial aquifer analytical results from sampling events in November 2014 and in May–June 2015 are provided in Table 1-4. Alluvial aquifer POC well T(M) was not sampled because it remains dry. The uranium concentration in well T(M) trended upward since DOE began monitoring the well in 1999, and the November 2010 concentration of 0.557 milligram per liter (mg/L) exceeded the ACL of 0.44 mg/L (Figure 1-3). DOE notified NRC of the exceedance upon receiving the results from the laboratory. Uranium concentrations in the well continued to exceed the ACL and remained steady in four subsequent samples until the well dried up after the May 2012 sampling event. Concentrations for the other analytes in all of the wells remain less than their respective ACLs. PCBs have never been detected in the wells at the site.

Table 1-4. Alluvial Aquifer Monitoring Results in November 2014 and in May–June 2015 at the Bluewater, New Mexico, Disposal Site

Well	Molybdenum (mg/L) ACL = 0.10 mg/L	Selenium (mg/L) ACL = 0.05 mg/L	Uranium (mg/L) ACL = 0.44 mg/L
E(M)	ND, 0.0007	ND, 0.0004	0.000067, 0.00003
F(M)	0.000974, 0.0010	ND, 0.0011	0.00757, 0.0077
T(M)	NS	NS	NS
X(M)	ND, 0.0008	0.00745, 0.0071	0.122, 0.1070
Y2(M)	0.00168, 0.0014	ND, 0.0013	0.00494, 0.0061
20(M)	0.00192, 0.0019	0.00442, 0.0040	0.0129, 0.0130
21(M)	0.00119, 0.0010	0.0109, 0.0115	0.129, 0.1210
22(M)	0.00106, 0.0012	0.00391, 0.0032	0.388, 0.3220
23(M)	0.0064, 0.0055	0.00199, 0.0011	0.025, 0.0240

November 2014 results are first and May–June 2015 results are second in each pair of results.
Key: ND = not detected (below method detection limit); NS = not sampled

Alluvium well 21(M), installed in 2011, is adjacent to the southern site boundary, where the estimated deepest part of the ancestral Rio San Jose channel coursed prior to being buried by basalt lava flows. Alluvium well 22(M), also installed in 2011, is approximately halfway between POC well T(M) and well 21(M). The uranium concentrations in these two newer wells are less than the ACL (Table 1-4). However, the uranium concentrations in both wells, shown on Figure 1-3, continue to exceed the UMTRCA MCL of 0.044 mg/L (40 CFR 192, Table 1) and the State of New Mexico drinking water standard of 0.03 mg/L. The elevated uranium
1B concentrations in well 21(M) and POE well X(M) indicate that alluvial groundwater with elevated uranium is leaving the site.

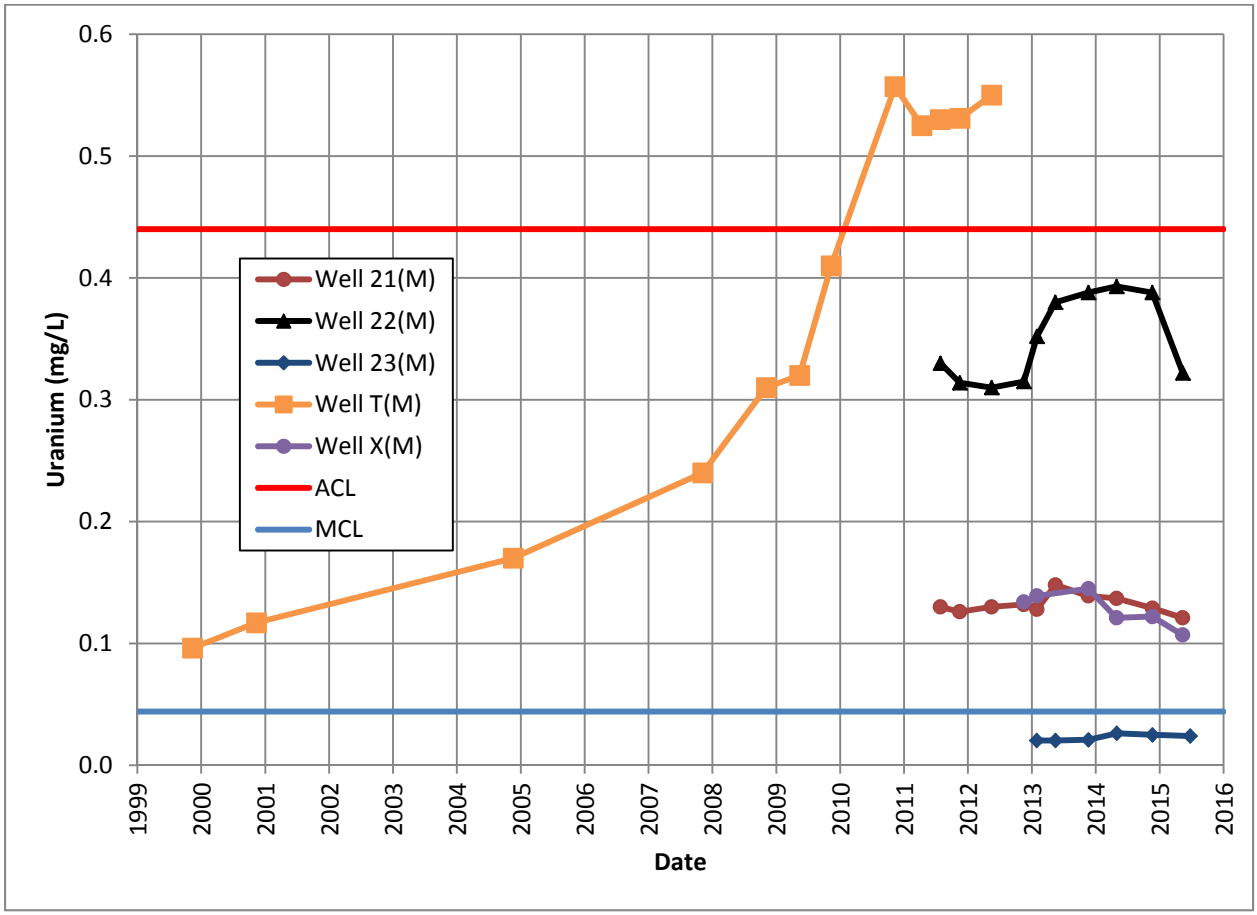


Figure 1-3. Uranium Concentrations in Alluvial Aquifer POC Well T(M) and Downgradient Wells at the Bluewater, New Mexico, Disposal Site

NRC requested DOE to evaluate the performance of the main tailings disposal cell to see if there is a correlation between cell performance and the elevated uranium concentrations in POC well T(M) (see Figure 1-3). A cell cover and water balance evaluation of the disposal cell (including the radon study referred to in Section 1.4.2.1) concluded that the increase in uranium concentrations in well T(M) cannot be attributed to a reduction in disposal cell performance—no surge of tailings fluids from the cell has occurred since it was closed. The increase in uranium concentration is apparently related to the declining water level at the well location and the influence of groundwater from contaminated weathered Chinle Formation material at the bottom of the well screen.

The extent of contamination in the alluvial aquifer has been evaluated as part of the groundwater conceptual model. Approximately 1 mile downgradient of the Bluewater site the alluvial groundwater flow from the site merges with contaminated alluvial groundwater flow from the Homestake mill site. The combined alluvial groundwater flows southeast toward the Village of Milan. Although some alluvial aquifer monitoring wells downgradient of the Bluewater site have uranium concentrations exceeding the New Mexico drinking water standard, samples from the nearest downgradient drinking water well had uranium concentrations less than the drinking water standard.

1.7.3 Bedrock Aquifer

Bedrock wells 11(SG), 13(SG), 14(SG), 15(SG), 16(SG), and 18(SG) were installed in summer 2012 to gain a better understanding of the hydrogeological characteristics of the San Andres aquifer at the site, and because a nearby offsite private well (HMC-951) completed in the same aquifer had elevated uranium concentrations. There were no bedrock wells in the south portion of the site prior to this well construction project. Wells 11(SG) and 14(SG) are crossgradient of the groundwater flowing beneath the disposal cells, and all of the other new wells are downgradient of the cells. Well 16(SG) was installed between POC wells OBS-3 and S(SG) because their well screens are highly corroded and their uranium concentrations seemed to be anomalously low. Because of the poor well conditions, sample results from wells OBS-3 and S(SG) are not considered to be representative of aquifer conditions, but they continue to be sampled in accordance with the LTSP.

Bedrock wells I(SG) and L(SG) were completed with open-borehole construction through the entire thickness of the San Andres Limestone and Glorieta Sandstone formations, which comprise the San Andres aquifer. All of the new San Andres aquifer wells, except well 16(SG), are screened in the upper 50 feet of the San Andres Limestone as are most San Andres aquifer wells in the region because this is the most productive zone of the aquifer. Well 16(SG) is screened in the Glorieta Sandstone because the San Andres Limestone is dry at that location.

In response to NMED questions about the possibility of stratification of contamination within the aquifer, downhole conductivity was measured in wells I(SG) and L(SG) in spring 2013. No change in conductivity with depth was observed in background well L(SG). However, three zones of different conductivities were noted in POE well I(SG)—conductivity was lowest in the water within the well casing, higher in the upper portion of the open borehole, and highest in the lower portion of the open borehole. In 2013, low-flow samples collected in each zone in well I(SG) demonstrated that uranium concentrations increased with conductivity: 0.005 mg/L within the well casing, 0.15 mg/L in the upper portion of the open borehole, and 0.34 mg/L in the lower portion of the open borehole. Well L(SG) was also sampled at three depths for comparison purposes and all results were 0.003 mg/L.

Analytical results for the required constituents in bedrock wells are provided in Table 1-5. A low-flow sample was collected in the lower portion of the open borehole in well I(SG) to represent the highest uranium concentration. The selenium and uranium concentrations did not exceed ACLs in the POC wells. However, the uranium concentrations in downgradient wells
1C 13(SG), 18(SG), and I(SG), located along the site boundary, exceed the UMTRCA MCL of 0.044 mg/L and the New Mexico drinking water standard. This indicates that San Andres aquifer groundwater with elevated uranium is leaving the site. The uranium concentration in private well HMC-951, used for monitoring purposes only, exceeded the New Mexico drinking water standard.

Uranium concentrations in the San Andres aquifer are shown on Figure 1-4. Uranium concentrations in well I(SG) prior to 2013 were erroneously low because of an incorrect sampling depth in the well. Uranium concentrations at POC wells OBS-3 and S(SG) are not shown in Figure 1-4 because the well screens are encrusted with iron scale that has resulted in erroneously low uranium concentrations.

Table 1-5. Bedrock Aquifer Monitoring Results for November 2014 and May–June 2015 at the Bluewater, New Mexico, Disposal Site

Well	Selenium (mg/L) ACL = 0.05 mg/L	Uranium (mg/L) ACL = 2.15 mg/L
11(SG)	ND, 0.0015	0.0127, 0.011
13(SG)	0.00621, 0.0058	0.102, 0.098
14(SG)	ND, ND	0.0593, 0.057
15(SG)	ND, 0.0003	0.102, 0.088
16(SG)	0.017, 0.0200	1.29, 0.800
18(SG)	0.00532, 0.0070	0.195, 0.220
I(SG)[a]	0.0081, 0.0091	0.306, 0.303
L(SG)	ND, 0.0015	0.003, 0.003
OBS-3	ND, 0.0004	0.00363, 0.009
S(SG)	0.0116, 0.0077	0.552, 0.480
HMC-951	0.00592, 0.0060	0.0332, 0.032

November 2014 results are first and May–June 2015 results are second in each pair of results.
[a] Sample collected at 265 feet below the top of the casing at the depth of highest conductivity.
Key: ACL = alternate concentration limit; mg/L = milligrams per liter; ND = not detected (below method detection limit)

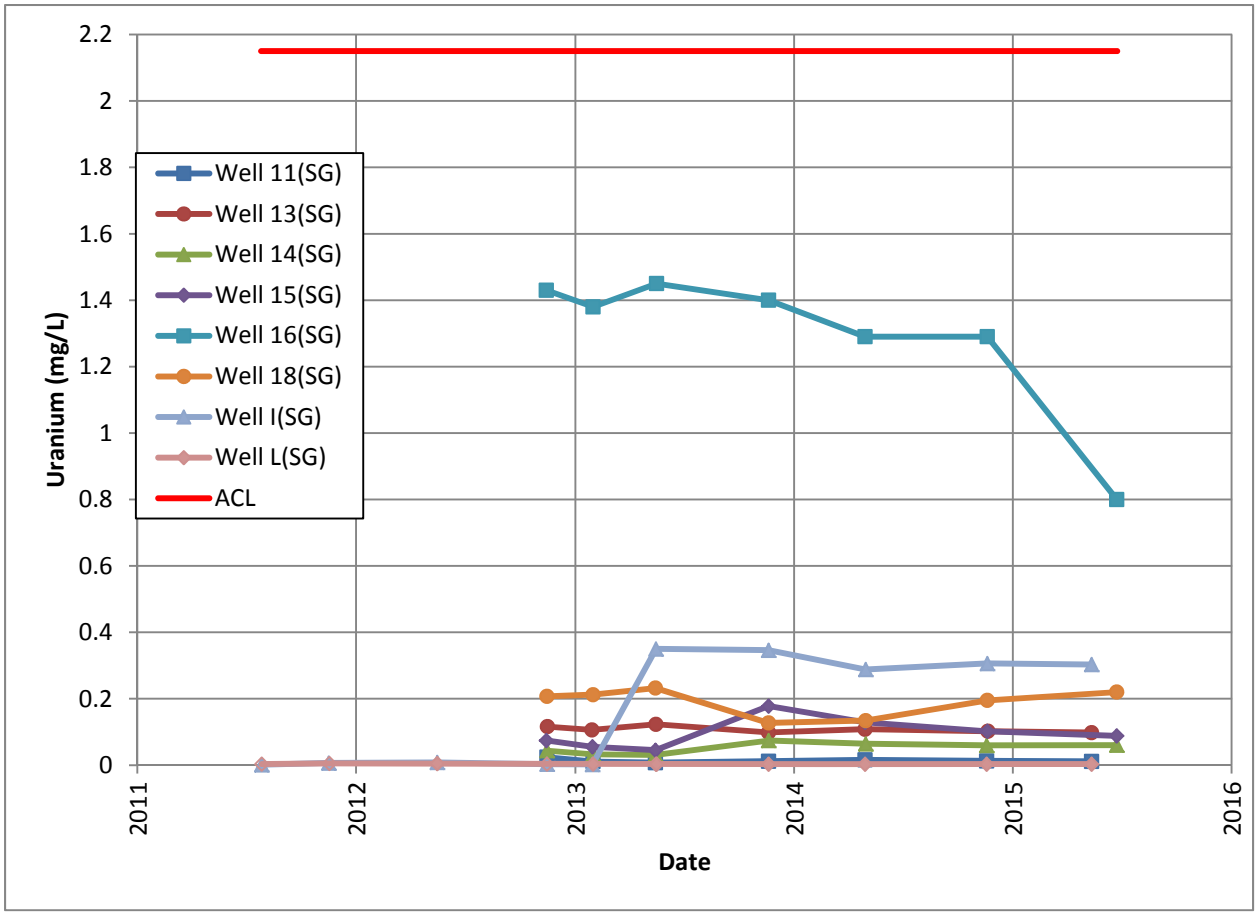


Figure 1-4. Uranium Concentrations in the San Andres Aquifer at the Bluewater, New Mexico, Disposal Site

To evaluate the extent of contamination, DOE sampled private wells near the Bluewater site in 2013. Most of the private wells near the site are completed in the San Andres aquifer because of the limited extent of the alluvial aquifer near the site. A stock well near the south boundary of the site, which had been a production well for the Bluewater mill, had a uranium concentration above the drinking water standard but below limits considered safe for livestock consumption. All other private San Andres wells sampled by DOE, whether permitted for drinking water or agricultural use, had uranium concentrations below the drinking water standard. The nearest downgradient municipal wells, operated by Milan, produce from the San Andres aquifer and do not have elevated uranium concentrations or show upward trends.

The extent of uranium contamination in the San Andres aquifer and the potential risk to downgradient groundwater users was evaluated in DOE's groundwater conceptual model. Evaluation of previous groundwater studies in the region and available groundwater data indicated that the flow path of the aquifer from the Bluewater site is in the east-southeast direction. The groundwater from the site passes under the Homestake mill site and continues through an area north of the community of Grants. The flow path from the Bluewater site is substantially north of the Milan and Grants municipal wells (Figure 1-5).

The uranium plume follows the groundwater flow path, and the leading portion is in the vicinity of the Homestake site. Groundwater monitoring results obtained by various entities over the last several decades indicate that uranium contamination from Bluewater mill operations reached the Homestake site by 1980 and that the plume has essentially stabilized. Uranium concentrations attenuate with distance from the Bluewater site primarily through dispersion. No known drinking water wells are completed within the uranium plume, and Bluewater site-derived uranium contamination in the San Andres aquifer is not expected to impact the Milan or Grants municipal water supplies.

1D

1.8 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	45	Boundary monument BM-21.
PL-2	45	Site marker.
PL-3	280	Monitoring wells 13(SG) and 21(M).
PL-4	25	Acid tailings bench of main tailings disposal cell.
PL-5	105	South bench of main tailings disposal cell.
PL-6	15	Vegetation on main tailings disposal cell top slope.
PL-7	180	Vegetation on east side slope of main tailings disposal cell.
PL-8	75	Ponded water on north end of main tailings disposal cell top slope.
PL-9	350	Camera tower on north end of main tailings disposal cell top slope.
PL-10	200	Carbonate tailings disposal cell viewed from main tailings disposal cell.
PL-11	320	Shallow depression on northwest extension of carbonate tailings disposal cell (dry).
PL-12	70	Asbestos disposal area.
PL-13	45	PCB disposal area.
PL-14	130	Monument at decommissioned injection well.

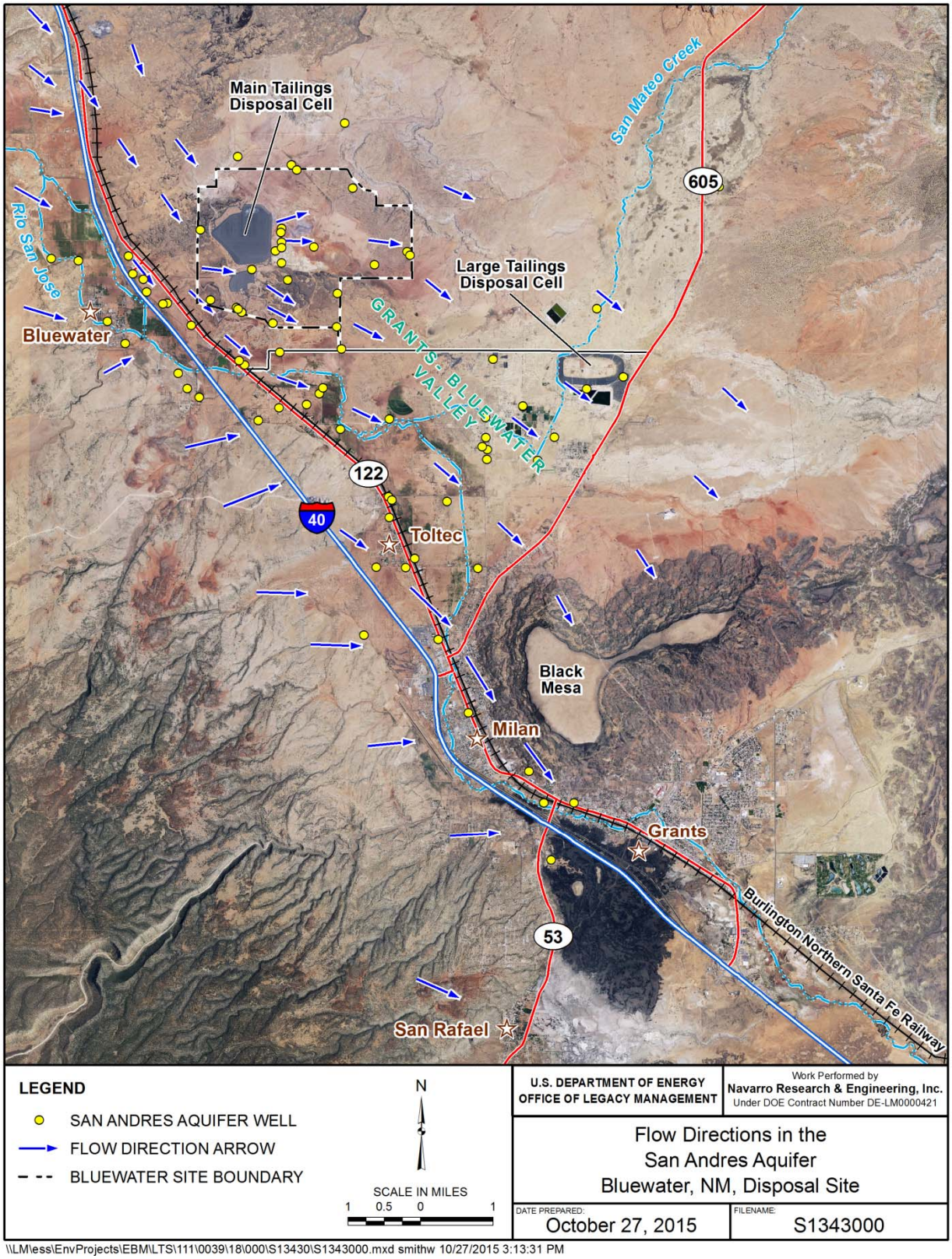


Figure 1-5. Groundwater Flow Directions in the San Andres Aquifer at the Bluewater, New Mexico, Disposal Site.

BLU 8/2015. PL-1. Boundary monument BM-21.

BLU 8/2015. PL-2. Site marker.

BLU 8/2015. PL-3. Monitoring wells 13(SG) and 21(M).

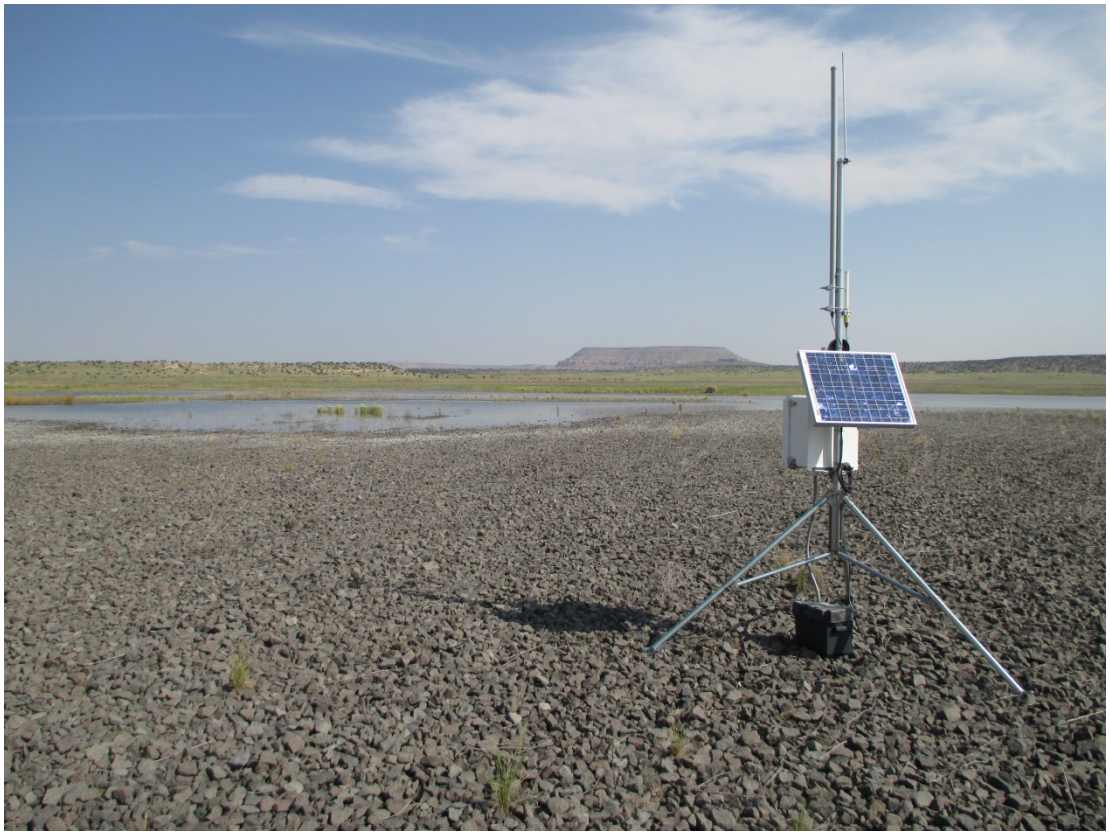
BLU 8/2015. PL-4. Acid tailings bench of main tailings disposal cell.

BLU 8/2015. PL-5. South bench of main tailings disposal cell.

BLU 8/2015. PL-6. Vegetation on main tailings disposal cell top slope.

BLU 8/2015. PL-7. Vegetation on east side slope of main tailings disposal cell.

BLU 8/2015. PL-8. Ponded water on north end of main tailings disposal cell top slope.



BLU 8/2015. PL-9. Camera tower on north end of main tailings disposal cell top slope.

BLU 8/2015. PL-10. Carbonate tailings disposal cell viewed from main tailings disposal cell.

BLU 8/2015. PL-11. Shallow depression on northwest extension of carbonate tailings disposal cell (dry).

BLU 8/2015. PL-12. Asbestos disposal area.

BLU 8/2015. PL-13. PCB disposal area.

BLU 8/2015. PL-14. Monument at decommissioned injection well.