19.0 Tuba City, Arizona, Disposal Site

19.1 Compliance Summary

The Tuba City, Arizona, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site was inspected on May 17, 2022. No significant changes were observed on the disposal cell or in the associated drainage features. Inspectors identified maintenance needs but found no cause for a follow-up inspection.

The U.S. Department of Energy (DOE) Office of Legacy Management (LM) conducts semiannual groundwater monitoring at the site to compare current conditions to baseline postconstruction groundwater quality. Evaluative groundwater monitoring is performed in lieu of normal point of compliance (POC) monitoring, as preexisting milling-related groundwater contamination may mask contamination leaching from the disposal cell. The most recent semiannual sampling events occurred in February and August 2022. The corresponding results are presented in Section 19.7.

19.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the site are specified in the site-specific Long-Term Surveillance Plan (DOE 1996) (LTSP) in accordance with procedures established to comply with the requirements of the U.S. Nuclear Regulatory Commission (NRC) general license at Title 10 *Code of Federal Regulations* Section 40.27 (10 CFR 40.27). Table 19-1 lists these requirements.

Table 19-1. License Requirements for the Tuba City, Arizona, Disposal Site

Requirement	LTSP	This Report	10 CFR 40.27
Annual Inspection and Report	Section 6.0	Section 19.4	(b)(3)
Follow-Up Inspections	Section 7.0	Section 19.5	(b)(4)
Maintenance and Repairs	Section 8.0	Section 19.6	(b)(5)
Environmental Monitoring	Section 5.2	Section 19.7	(b)(2)
Corrective Action	Section 9.0	Section 19.8	—

19.3 Institutional Controls

The 145-acre site, identified by the property boundary shown in Figure 19-1, is held in trust by the U.S. Bureau of Indian Affairs. The Navajo Nation retains title to the land. UMTRCA authorized DOE to enter into a Cooperative Agreement (DE-FC04-85AL26731) with the Navajo Nation to perform remedial actions at the former uranium processing sites (DOE 1984). DOE and the Navajo Nation executed a Custodial Access Agreement that conveys to the federal government title to the residual radioactive materials stabilized at the site and ensures that DOE has perpetual access to the site.

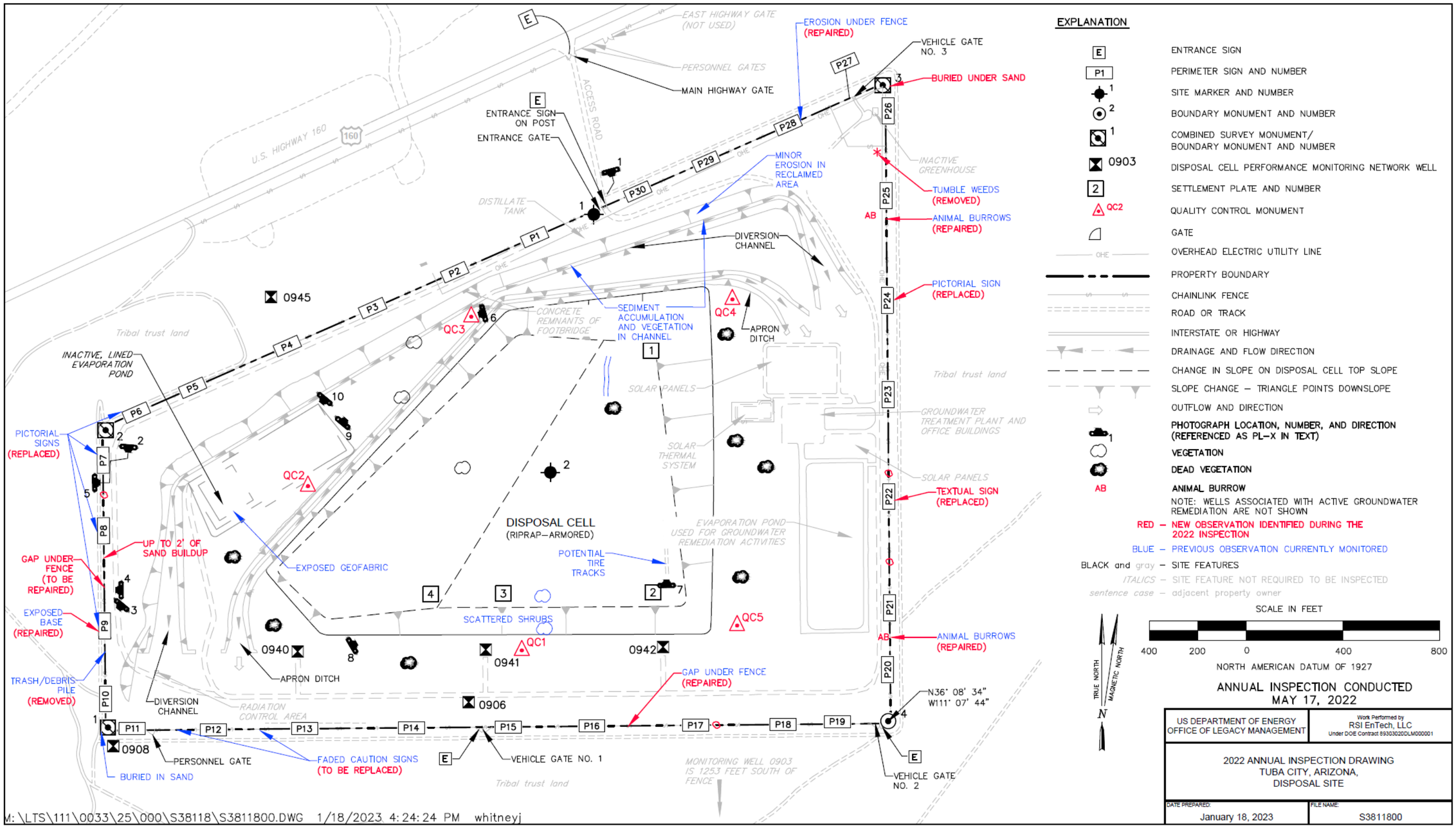


Figure 19-1. 2022 Annual Inspection Drawing for the Tuba City, Arizona, Disposal Site

The site was accepted under the NRC general license in 1996. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, LM is responsible for the custody and long-term care of the site. Institutional controls (ICs) at the site include federal custody of the disposal cell and its engineered features, administrative controls, and the following physical ICs that are inspected annually: the disposal cell and associated drainage features, entrance gate and sign, perimeter fence and signs, site markers, survey and boundary monuments, and wellhead protectors.

19.4 Inspection Results

The site, 6 miles northeast of Tuba City, Arizona, was inspected on May 17, 2022. The inspection was conducted by L. Sheader and A. Smith of the Legacy Management Support contractor. J. Tallbull and G. Dayzie (both of Navajo Nation Abandoned Mine Lands/Uranium Mill Tailings Remedial Action) and N. Honie (Hopi Tribe Department of Natural Resources, Office of Mining and Mineral Resources) also attended and participated in the inspection. The purposes of the inspection were to confirm the integrity of visible features at the site, identify changes in conditions that might affect conformance with the LTSP, and evaluate whether maintenance or follow-up inspection and monitoring are needed.

19.4.1 Site Surveillance Features

Figure 19-1 shows the locations of site features, including site surveillance features and inspection areas, in black and gray font. Some site features that are present but not required to be inspected are shown in italic font. Observations from previous inspections that are currently monitored are shown in blue, and new observations identified during the 2022 annual inspection are shown in red. Inspection results and recommended maintenance activities associated with site surveillance features are described in the following subsections. Photographs to support specific observations are noted in the text and in Figure 19-1 by photograph location (PL) numbers. The photographs and photograph log are presented in Section 19.10.

19.4.1.1 Access Road, Entrance Gates, and Entrance Signs

Access to the site is from U.S. Highway 160. Perpetual access to the site is granted by the Custodial Access Agreement. A gate in a chainlink fence on the main highway right-of-way (Figure 19-1) allows access to the site via a gravel road. The entrance gate is in the inner chainlink perimeter fence between perimeter signs P1 and P30. Both gates were operational at the time of the inspection. Vehicle gates are also present in the northeast corner of the site and along the southern fence line to facilitate access for offsite activities. All gates were secured and functional.

Entrance signs are posted on the main highway gate, near the entrance gate, and on two vehicle gates (No. 1 and No. 2). Vehicle Gate No. 3, in the northeast corner of the site, purposefully does not have a sign. An informational sign exists on the main entrance gate (PL-1). No maintenance needs were identified.

19.4.1.2 Perimeter Fence and Signs

A chainlink perimeter fence encloses the site. Windblown sand and tumbleweeds regularly accumulate along the perimeter fence line and road (PL-2 and PL-3) resulting in several gaps under the fence (PL-4). These areas will be repaired before the next inspection. Trash and debris have accumulated around perimeter sign P9 and were removed following the inspection.

Thirty pairs of perimeter signs, designated P1 through P30, are attached to steel posts set in concrete directly inside and along the perimeter fence. One of the sign pairs is textual, and the other is pictorial. Pictorial signs P6, P7 (PL-5), P8, P9, and P24 and textual sign P22 were damaged and were replaced following the inspection. In previous years, perimeter sign P9 was reported to be undercut by wind erosion and was repaired following the inspection. Two faded signs warning of high voltage near perimeter sign P12 need to be replaced. No other maintenance needs were identified.

19.4.1.3 Site Markers

The site has two granite site markers. Site marker SMK-1 is just inside the entrance gate, and site marker SMK-2 is on the top slope of the disposal cell. No maintenance needs were identified.

19.4.1.4 Survey and Boundary Monuments

One boundary monument and three combined survey and boundary monuments delineate the corners of the site. Combined survey and boundary monuments SM/BM-1 and SM/BM-3 tend to get covered with windblown sand and are marked with steel T-posts. All other survey and boundary monuments were located and in good condition. No maintenance needs were identified.

19.4.1.5 Aerial Survey Quality Control Monuments

Five aerial survey quality control (QC) monuments were installed before the 2022 inspection as identified in Figure 19-1. All were located and in good condition (PL-6). No maintenance needs were identified.

19.4.1.6 Monitoring Wells

Seven monitoring wells (0903, 0906, 0908, 0940, 0941, 0942, and 0945) constitute the disposal cell performance monitoring network. Monitoring wells 0906, 0908, 0940, 0941, and 0942 are inside or immediately outside the perimeter fence. Inspectors checked the wellhead protectors (with the exception of wells 0903 and 0945, which are offsite). All were found to be undamaged and locked except well 0941, which was unlocked. No other maintenance needs were identified.

19.4.2 Inspection Areas

In accordance with the LTSP, the site is divided into three inspection areas (referred to as "transects" in the LTSP) to ensure a thorough and efficient inspection. The inspection areas are (1) the disposal cell, (2) the area between the disposal cell and the site boundary, and (3) the outlying area. Inspectors examined specific site surveillance features within each area and looked

for evidence of erosion, settling, slumping, or other modifying processes that might affect the site's conformance with LTSP requirements.

19.4.2.1 Disposal Cell

The disposal cell, completed in 1989, occupies 50 acres. The disposal cell is armored with riprap to control erosion and deter animal and human intrusion. Inspectors confirmed parallel tracks on the top slope of the disposal cell (PL-7) reported in previous annual reports. This area will continue to be monitored. There was no evidence of erosion, settling, slumping, or other modifying processes on the disposal cell.

In accordance with the LTSP, deep-rooted vegetation is controlled to prevent potential penetration of the radon barrier. Windblown sediments continue to accumulate on the rock-covered surfaces, providing a favorable environment for plant growth. Periodic spot-application of herbicide has been effective in controlling deep-rooted vegetation growth on the disposal cell cover. No deep-rooted shrubs were observed on top of the disposal cell, but some shrubs have become established on the side slopes (PL-8). This area will continue to be monitored. No other maintenance needs were identified.

19.4.2.2 Area Between the Disposal Cell and the Site Boundary

The disposal cell is protected from stormwater runoff by a disposal cell apron ditch and a diversion channel, both of which are armored with riprap and located along the north and northwest sides of the disposal cell. Windblown sand and vegetation accumulate in the apron ditch and the diversion channel along the north and northwest sides of the disposal cell. The sand deposition and associated vegetation establishment have not adversely affected the performance of these structures. No evidence of recent or past water flows was observed in the apron ditch or the diversion channel.

The north slope above the diversion channel consists of noncohesive sandy soil and is subject to erosion from stormwater runoff. Erosion repair conducted in this area in 2013 reduced the rate of erosion and subsequent soil deposition in the channel. Some erosion and deposition continue near the northeast corner of the diversion channel, however, and erosion control repairs are performed as needed.

Inspectors noted that much of the woody vegetation, in reclaimed areas around the disposal cell, was dead. These areas were of concern to tribal officials (Mr. Honie) as they could present a potential fire hazard. Inspectors will evaluate multiple habitat enhancements to address the dead vegetation and reduce potential fire hazards at the site.

Two of the three evaporation ponds near the northwest side of the disposal cell were removed in 2007. The area was reclaimed and seeded with a native seed mix in 2007 and again in 2013. Perennial vegetation is establishing in these areas (PL-9).

The remaining historical evaporation pond, containing windblown sand and evaporites (PL-10), is retained as a backup for the main evaporation pond on the east side of the site. The steel cable and caution signs surrounding the pond and the high-density polyethylene liner were intact. The plastic geofabric that stabilizes the south-facing slope of the pond remains exposed. No repairs of

the geofabric are needed at this time, as it remains mostly buried and continues to stabilize the slope. Inspectors will continue to monitor this area. No other maintenance needs were identified.

There are many structures and features associated with the former groundwater treatment system. Beginning in 2002, contaminated groundwater was extracted and treated through ion exchange and distillation processes, then returned to the aquifer through an infiltration trench upgradient of the disposal cell. Operation of the groundwater treatment plant (GWTP) was suspended in September 2014 due to hydrologic constraints on extraction and GWTP maintenance challenges. The structures associated with the GWTP remain onsite and include a control building; a shop and laboratory building; an ion exchange building, external tanks, and distillation skid; a solar water-heating system; two photovoltaic panel arrays for utility power generation; evaporation ponds; a network of extraction, injection, and monitoring wells; and a treated water infiltration trench.

19.4.2.3 Outlying Area

The area beyond the site boundary for a distance of 0.25 mile was visually observed for erosion, changes in land use, or other phenomena that might affect the long-term integrity of the site. No evidence of changed land use or maintenance needs were identified.

19.5 Follow-Up Inspections

LM 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) LM 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.

19.6 Maintenance and Repairs

Several maintenance items identified in the 2020 and 2021 inspections and reported previously were completed this year. These items include:

- Removal of tumbleweeds along the fence near perimeter sign P26.
- Repair of the gap beneath the fence near perimeter signs P16 and P28.
- Repair of the eroding base and removal of trash and debris at perimeter sign P9.
- Repair of animal burrows under the fence line near perimeter signs P20 and P25.
- Replacement of the P6, P7, P8, P9, and P24 pictorial perimeter signs and P22 textual sign.
- Treatment of vegetation growing on the side slopes of the disposal cell.

Five aerial survey quality control monuments were installed before the 2022 inspection. Inspectors noted the following maintenance items that will be completed before the next inspection:

- Treatment of the vegetation on the side slopes of the disposal cell
- Replacement of two caution signs near perimeter sign P12
- Repair of the gap in the fence near perimeter sign P9
- Implementation of habitat enhancements to reduce potential fire hazards at the site

19.7 Environmental Monitoring

In accordance with the LTSP, semiannual groundwater monitoring is conducted at the locations shown in Figure 19-2 to compare current conditions at the site to baseline postconstruction groundwater quality. Groundwater quality beneath and downgradient of the disposal cell has been degraded by contamination from former uranium-processing activities. This preexisting milling-related contamination might mask contamination leaching from the disposal cell, which limits the effectiveness of normal POC groundwater monitoring as a reliable indicator of disposal cell performance (40 CFR 192 Subpart A).

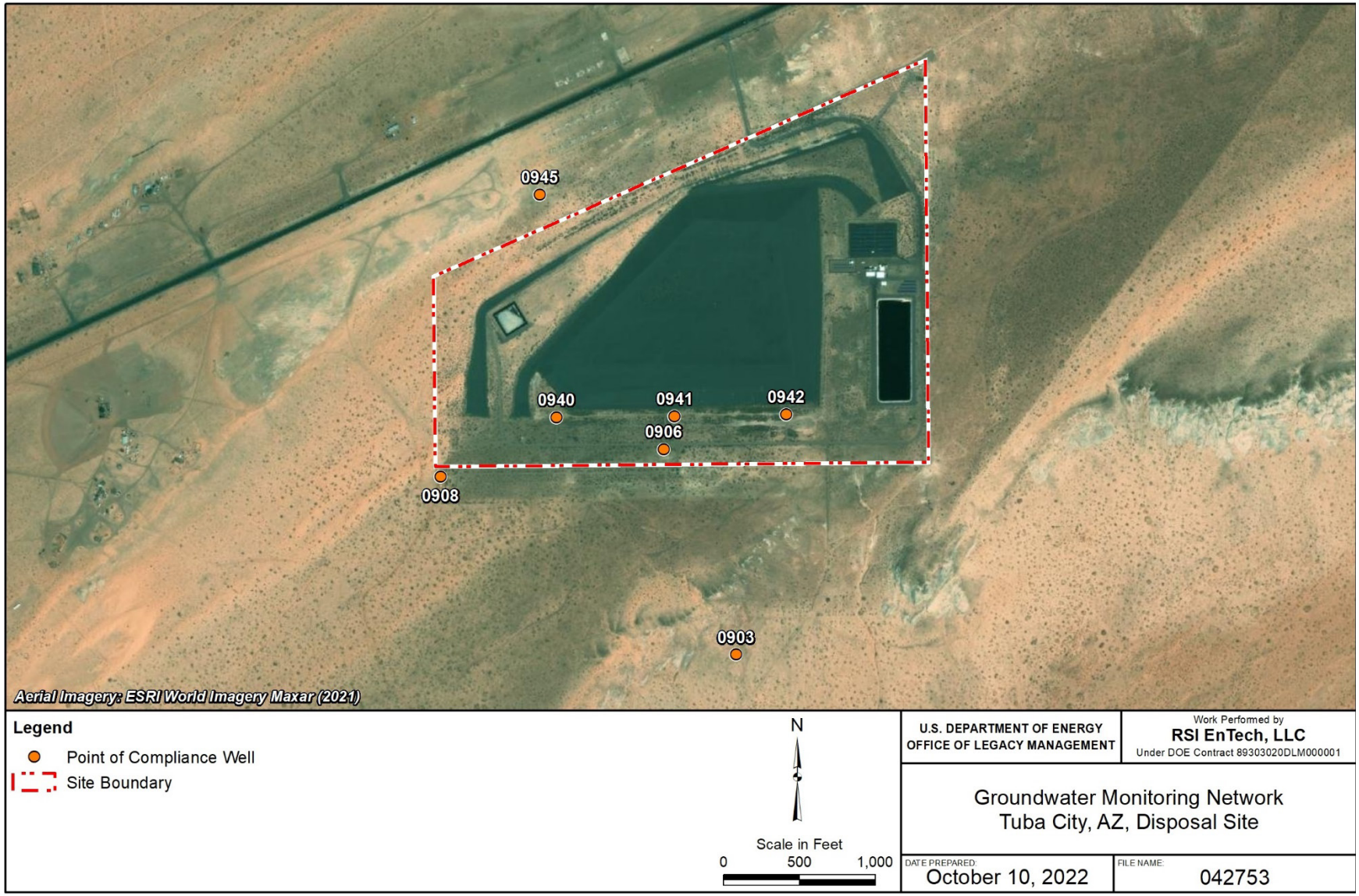
19.7.1 Groundwater Monitoring Program

In lieu of POC monitoring, groundwater monitoring is performed in accordance with Section 5.2.2 of the LTSP and is defined as evaluative monitoring. Evaluative monitoring is performed to "(1) evaluate trends in ground water quality, (2) monitor the downgradient extent of contamination in ground water, (3) analyze the impacts of transient drainage and surface runoff, and (4) assess the effects of ground water restoration measures associated with containing the contamination related to uranium processing activities" (DOE 1996). Evaluative groundwater monitoring was conducted in February and August 2022.

The progress of groundwater remediation is evaluated and reported annually, separate from this compliance reporting. Groundwater remediation is being conducted by an active treatment system that includes the operation of extraction wells and the transport of extracted (contaminated) groundwater to the onsite evaporation pond. Extraction wells are installed in areas and depths of greatest contamination in order to maximize source mass removal. Annual extraction volume is constrained to 5 million gallons due to evaporation pond capacity and the average annual evaporation rate of the pond. The contaminant plume is monitored, and additional mitigative actions will be defined and implemented if monitoring reveals unacceptable migration of the plume.

Pumping tests were performed in 2017 to determine groundwater drawdown and recovery rates and to characterize variations in hydraulic conductivity. Results were reported in the *Interim Treatment System Evaluation Report, Tuba City, Arizona, Disposal Site* (DOE 2018). Since 2018, the remediation system has operated in 4-month-long high-volume intensity, short-duration campaigns that begin in July and end in October.

Seven wells (Figure 19-2 and Table 19-2) identified in the LTSP are monitored for four hazardous constituents: molybdenum, nitrate, selenium, and uranium (Table 19-2) (DOE 1996). As a baseline for cell performance evaluation, provisional upper baseline limits (UBLs) for the four constituents were calculated in accordance with the U.S. Environmental Protection Agency's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities–Interim Final Guidance* (EPA 1989) and documented in the LTSP (DOE 1996). The UBLs are listed in Table 19-3.



Note: Well 0942 was converted from a monitoring well to an extraction well in 2015.

Figure 19-2. Groundwater Monitoring Network at the Tuba City, Arizona, Disposal Site

Table 19-2. LTSP Groundwater Monitoring Network at the Tuba City, Arizona, Disposal Site

Monitoring Well	Hydrologic Relationship	Monitoring Frequency
0903	Downgradient (offsite)	Annually
0906	Downgradient	Semiannually
0908	Downgradient	Semiannually
0940[a]	Downgradient	Semiannually
0941	Downgradient	Semiannually
0942[b]	Downgradient	Semiannually
0945	Upgradient (background)	Annually

Notes:
[a] Between August 2004 and February 2010, samples from well 0940 could not be obtained because of an insufficient volume of water. This explains the data gaps in Figure 19-3 through Figure 19-6.
[b] Well 0942 was converted from a monitoring well to an extraction well in 2015 and, therefore, has not been sampled since then.

Table 19-3. Provisional Upper Baseline Limits for Groundwater at the Tuba City, Arizona, Disposal Site

Constituent	Provisional UBL (mg/L)[a]	MCL (mg/L)[b]
Molybdenum	0.14	0.10
Nitrate (as nitrogen)	311[c]	10
Selenium	0.05	0.01
Uranium	1.17	0.044

Notes:
[a] As documented in the LTSP (DOE 1996).
[b] MCLs as listed in 40 CFR 192 Subpart A.
[c] UBL for nitrate as nitrogen converted from original UBL cited in the LTSP.

Abbreviations:
MCL = maximum concentration limit
mg/L = milligrams per liter

UBLs were described in the LTSP as provisional because "baseline conditions were established for locations other than the disposal cell monitor wells." Establishing baseline conditions at wells 0906 and 0908 were conducted to determine "transient excursions from baseline conditions, potential chemical gradients between baseline and disposal cell locations, and stabilization of postclosure disposal cell hydrology" (DOE 1996). UBLs are concentrations that, with 95% confidence, would be exceeded less than 5% of the time during long-term monitoring if groundwater conditions near the monitoring well did not change.

Because the four constituents are present in tailings material, relatively mobile in groundwater, and found in low concentrations in background groundwater quality, exceedance of UBLs in more than 5% of sampling events over the long term could indicate that the disposal cell is not performing to design standards. However, the LTSP also notes that elevated concentrations could result from transient drainage of tailings fluid into the subsurface (directly beneath the cell) or from rainfall infiltrating through contamination in the unsaturated zone in the mill ponds area not

covered by the disposal cell. Elevated concentrations attributed to transient drainage or infiltration would not be indicative of substandard performance for the cell.

Active groundwater remediation was anticipated when the LTSP was prepared in 1996, and it was expected that deviations from anticipated disposal cell performance could be detected even with ongoing groundwater remediation. However, the LTSP also noted that (1) POC sampling and analysis protocol to monitor cell performance could not be established until groundwater restoration was complete and (2) the LTSP would be revised at that time.

As noted in the LTSP, the UBL value should not be exceeded more than 5% of the time as long as conditions near the monitoring well do not change. Due to implementation of active remediation (2002–2014) and interim treatment (2015 to present), the conditions near the LTSP cell performance wells have constantly been affected, and exceedance of UBLs cannot be attributed to disposal cell performance. Recent operation of the interim treatment system, which potentially affects concentrations of target analytes in the LTSP-specified evaluative monitoring wells, is described in the following paragraphs.

From September 2014 to April 2018, contaminated groundwater was pumped from one to three extraction wells in the higher-concentration portions of the plume. Since June 2018, the remediation system has operated in high-volume, short-duration campaigns during periods of highest potential for evaporative flux that generally begin in July and end in October. As many as 11 extraction wells are operating during this period to expand the capture zone area to capture more of the contaminant plume footprint, relative to the capture zone resulting from approximately three wells operating continuously between 2014 and 2018 (DOE 2020).

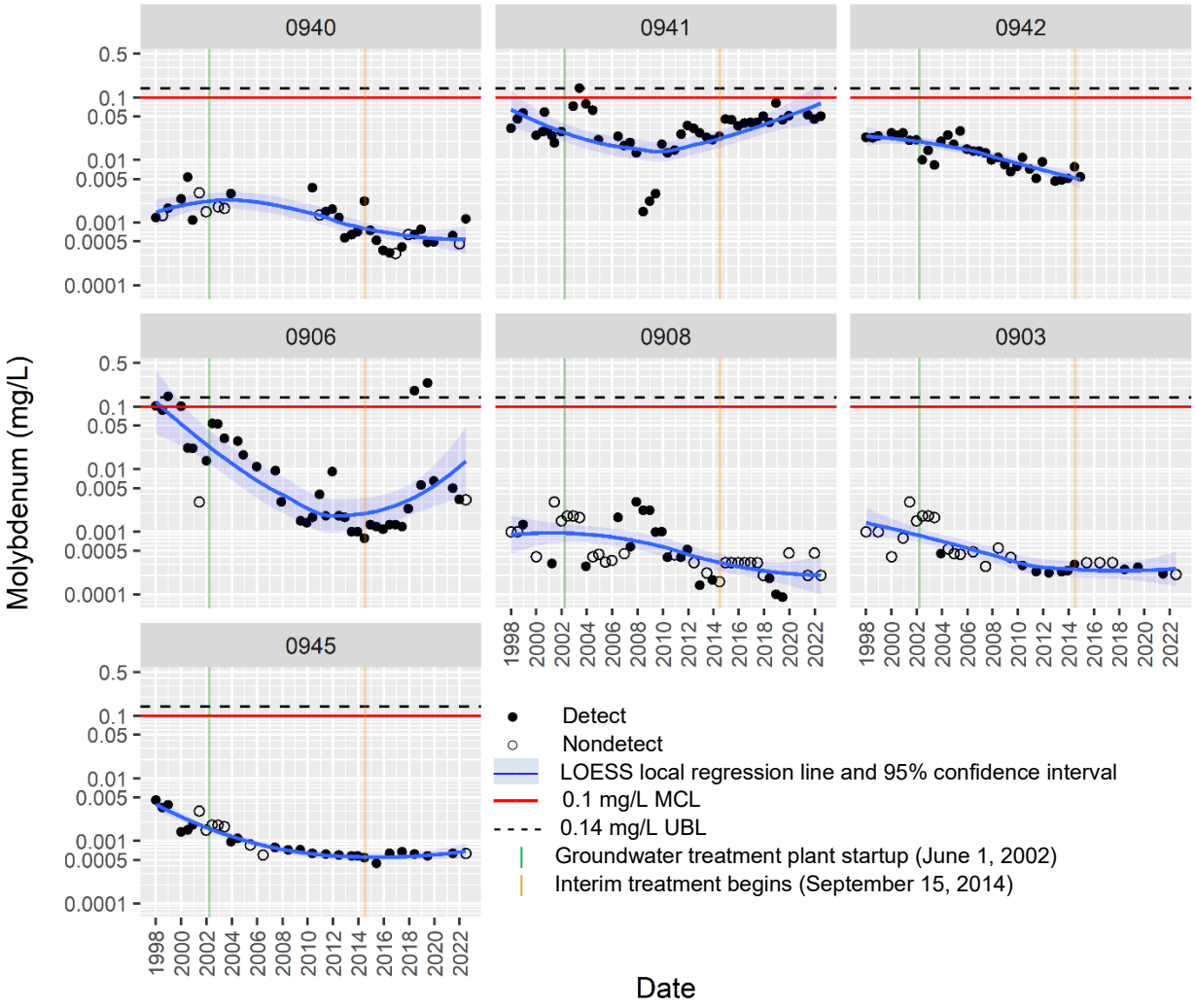
19.7.2 Groundwater Monitoring Results

Figure 19-3 through Figure 19-6 show time-concentration plots for the four target analytes, along with corresponding UBLs and MCLs. In these figures, data are plotted from 1998 to the present, consistent with the time frame evaluated in previous annual reports (DOE 2022a). Although data are plotted for the entire evaluative monitoring network, because well 0942 was converted from a monitoring well to an extraction well in 2015 (precluding sampling), corresponding trends are no longer discussed. All groundwater monitoring results for the site are reported and published on the LM Geospatial Environmental Mapping System (GEMS) website (https://gems.lm.doe.gov/#site=TUB).[1] In this section, MCLs shown are presented for informational purposes only. The LTSP requirement related to disposal cell performance is for evaluative monitoring over time, in comparison with the UBLs listed in Table 19-3.

Since 2004, molybdenum concentrations have been below both the 0.10 milligram per liter (mg/L) MCL and the 0.14 mg/L UBL in all LTSP evaluative monitoring wells except well 0906 in August 2019 (Figure 19-3). Overall, molybdenum concentrations have been highest in well 0941, averaging about 0.04 mg/L. Concentrations in this well have increased since 2015 but are still below the UBL (most recent result of 0.05 mg/L). Molybdenum concentrations in wells 0940, 0908, and 0903 have been comparable to concentrations in background well 0945. In August 2019, the molybdenum concentration in well 0906 (0.18 mg/L) exceeded the UBL for the

[1] The August 2020 and February 2021 semiannual sampling events were cancelled due to travel restrictions imposed in response to the coronavirus disease 2019 pandemic, thus the data gap for this period in the time-concentration plots.

first time since 1999. Concentrations declined the following February but then exceeded the UBL again in August 2019 (0.24 mg/L). Both UBL exceedances coincided with the pumping campaigns. Molybdenum concentrations in well 0906 have since declined to levels well below both the MCL and the UBL (≤0.007 mg/L). The most recent (August 2022) was below the detection limit value (<0.003 mg/L).



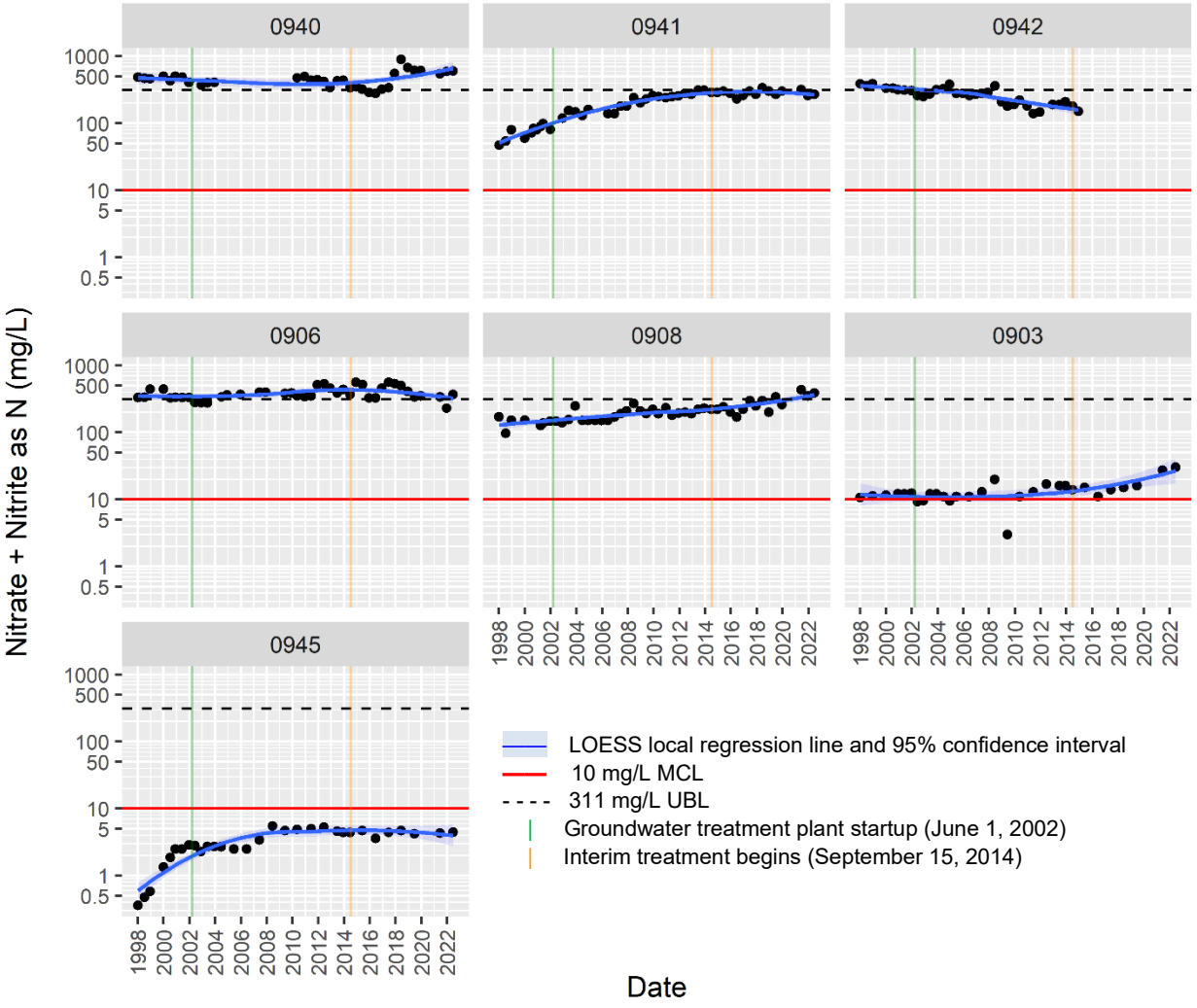
Note: Downgradient wells (from Table 19-2) are ordered in general direction of groundwater flow or distance from the disposal cell (Figure 19-2). Data for the upgradient background well are plotted last.
Abbreviation: LOESS = locally estimated scatterplot smoothing

Figure 19-3. Time-Concentration Plots of Molybdenum in Groundwater at the Tuba City, Arizona, Disposal Site

Nitrate (+ nitrite as nitrogen [N]) concentrations have historically exceeded the 10 mg/L MCL in all LTSP evaluative wells except background well 0945 (Figure 19-4). The 311 mg/L UBL has been exceeded in all downgradient evaluative monitoring wells except southernmost well 0903, approximately 1250 feet south of the site perimeter. The UBL has been exceeded consistently in wells 0940 and 0906, but only recently (in the last several years) in wells 0941 and 0908. Nitrate

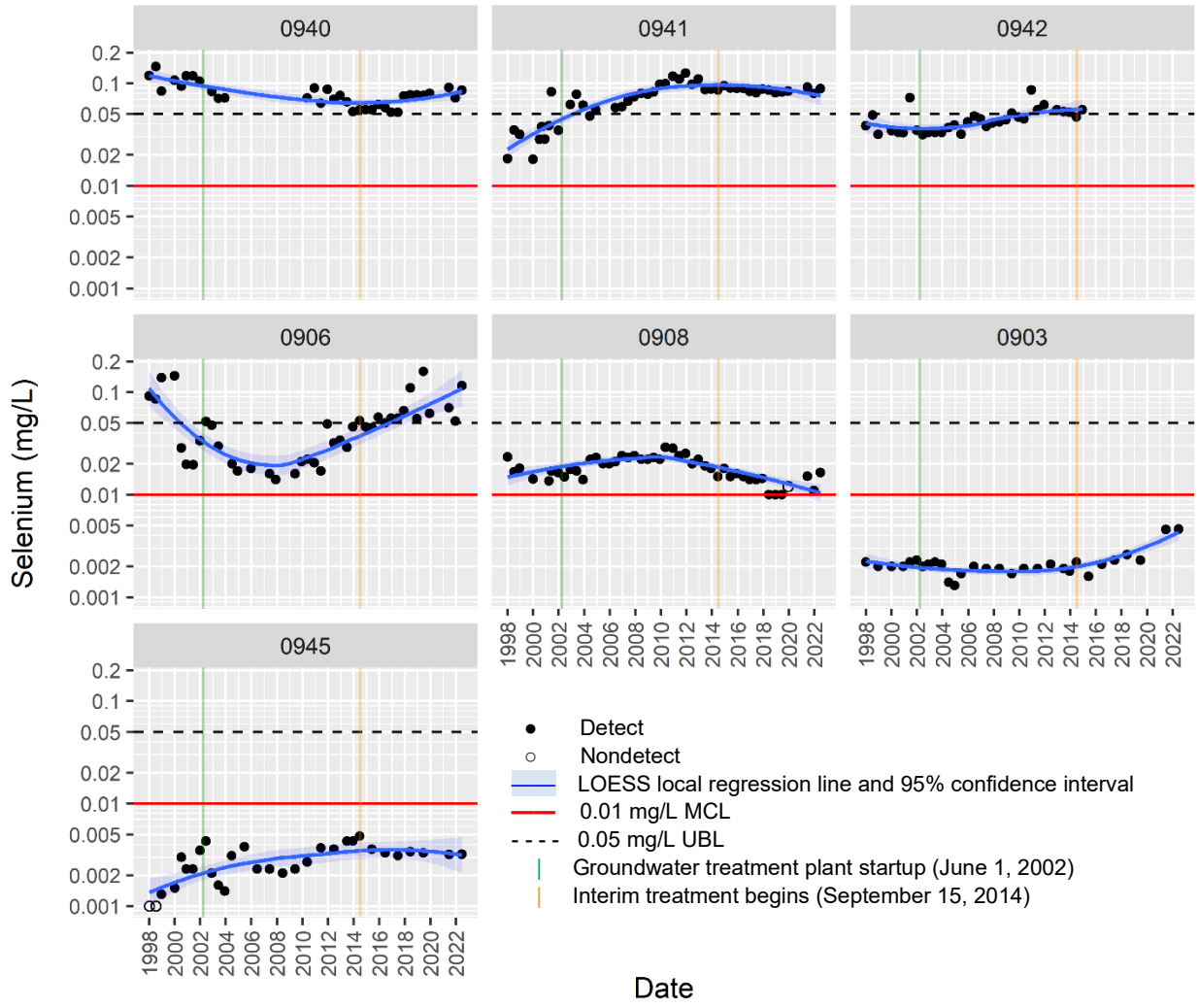
concentrations in well 0941 exceeded the UBL twice, first in August 2018 (340 mg/L) and again (slightly) in August 2021 (318 mg/L); the most recent (August 2022) result was 270 mg/L.

In westernmost well 0908, nitrate exceeded the 311 mg/L UBL for the first time in August 2019. Levels have remained elevated since August 2021, when the maximum concentration of 434 mg/L was detected. Nitrate concentrations in southernmost downgradient well 0903, although regularly exceeding the MCL since 2004, have remained below the UBL. However, results have slightly increased since about 2014, with the maximum result (30.1 mg/L) detected in August 2022. In summary, in 2022, the UBL was exceeded in three compliance monitoring wells: 0940 (590–605 mg/L), 0906 (370 mg/L), and 0908 (350–391 mg/L).



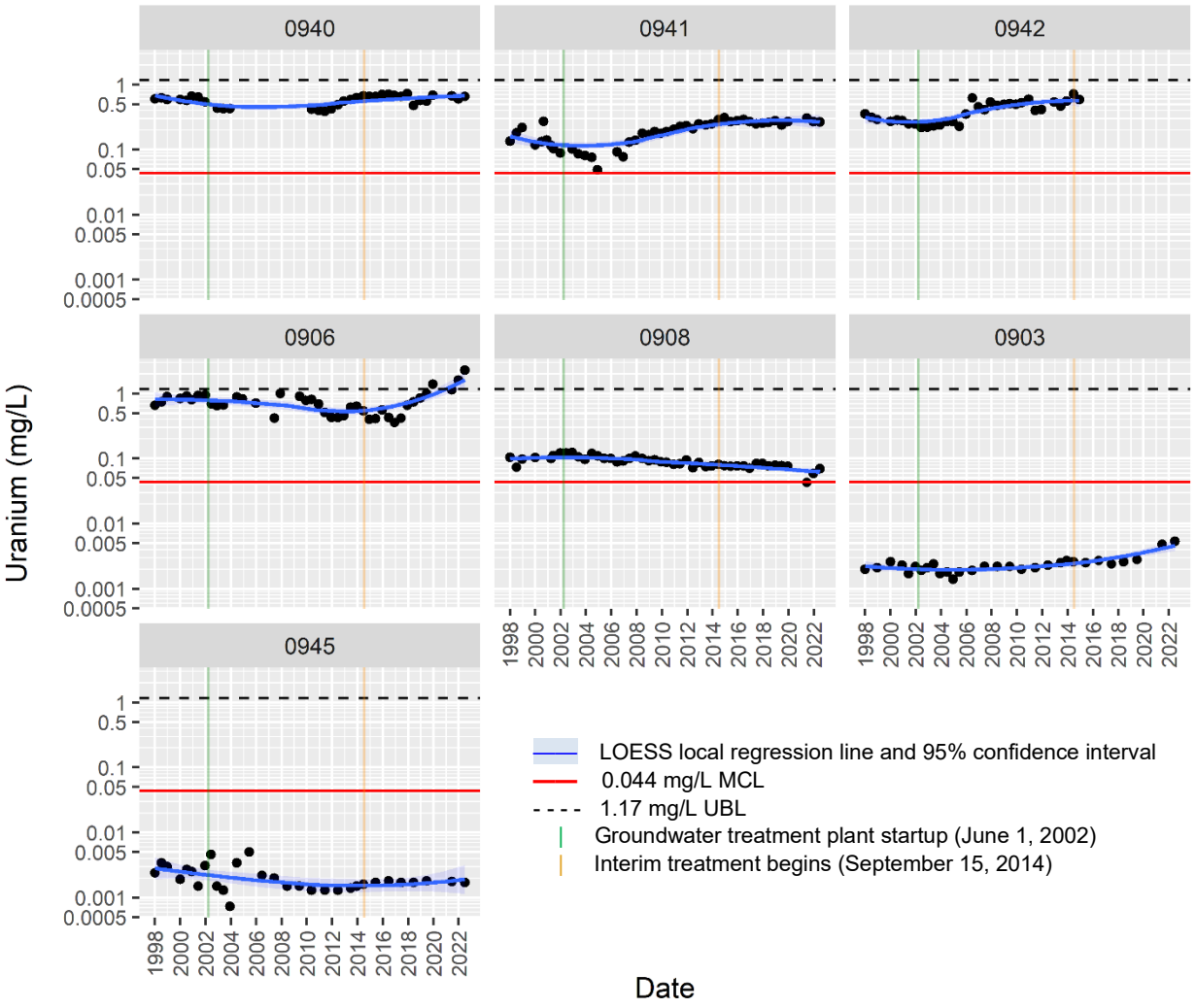
Note: Downgradient wells (from Table 19-2) are ordered in general direction of groundwater flow or distance from the disposal cell (Figure 19-2). Data for the upgradient background well are plotted last.
Abbreviation: LOESS = locally estimated scatterplot smoothing

Figure 19-4. Time-Concentration Plots of Nitrate in Groundwater at the Tuba City, Arizona, Disposal Site



Note: Downgradient wells (from Table 19-2) are ordered in general direction of groundwater flow or distance from the disposal cell (Figure 19-2). Data for the upgradient background well are plotted last.
Abbreviation: LOESS = locally estimated scatterplot smoothing

Figure 19-5. Time-Concentration Plots of Selenium in Groundwater at the Tuba City, Arizona, Disposal Site



Note: Downgradient wells (from Table 19-2) are ordered in general direction of groundwater flow or distance from the disposal cell (Figure 19-2). Data for the upgradient background well are plotted last.
Abbreviation: LOESS = locally estimated scatterplot smoothing

Figure 19-6. Time-Concentration Plots of Uranium in Groundwater at the Tuba City, Arizona, Disposal Site

Selenium concentrations have historically exceeded the 0.01 mg/L MCL in all LTSP evaluative wells except background well 0945 and distal well 0903 (Figure 19-5). The 0.05 mg/L UBL has been exceeded consistently in wells 0940 and 0941, immediately downgradient of the disposal cell, since 1998 and 2005, respectively. Selenium concentrations in both wells have been stable, however, averaging about 0.07 mg/L and 0.09 mg/L (respectively) since 2010; the most recent results were 0.085 and 0.089 mg/L. Since 2018, the highest selenium concentrations have been measured in well 0906. After declining from 0.15 mg/L in 2000 to 0.014 mg/L in 2008, concentrations have since increased; the most recent result was 0.12 mg/L (Figure 19-5). The increase in selenium concentrations in well 0906 since 2009 correlates with the time that average annual cumulative extraction rates dropped from 80 to 35 gallons per minute (gpm) due to intermittent shutdowns of the groundwater treatment plant for maintenance (DOE 2020).

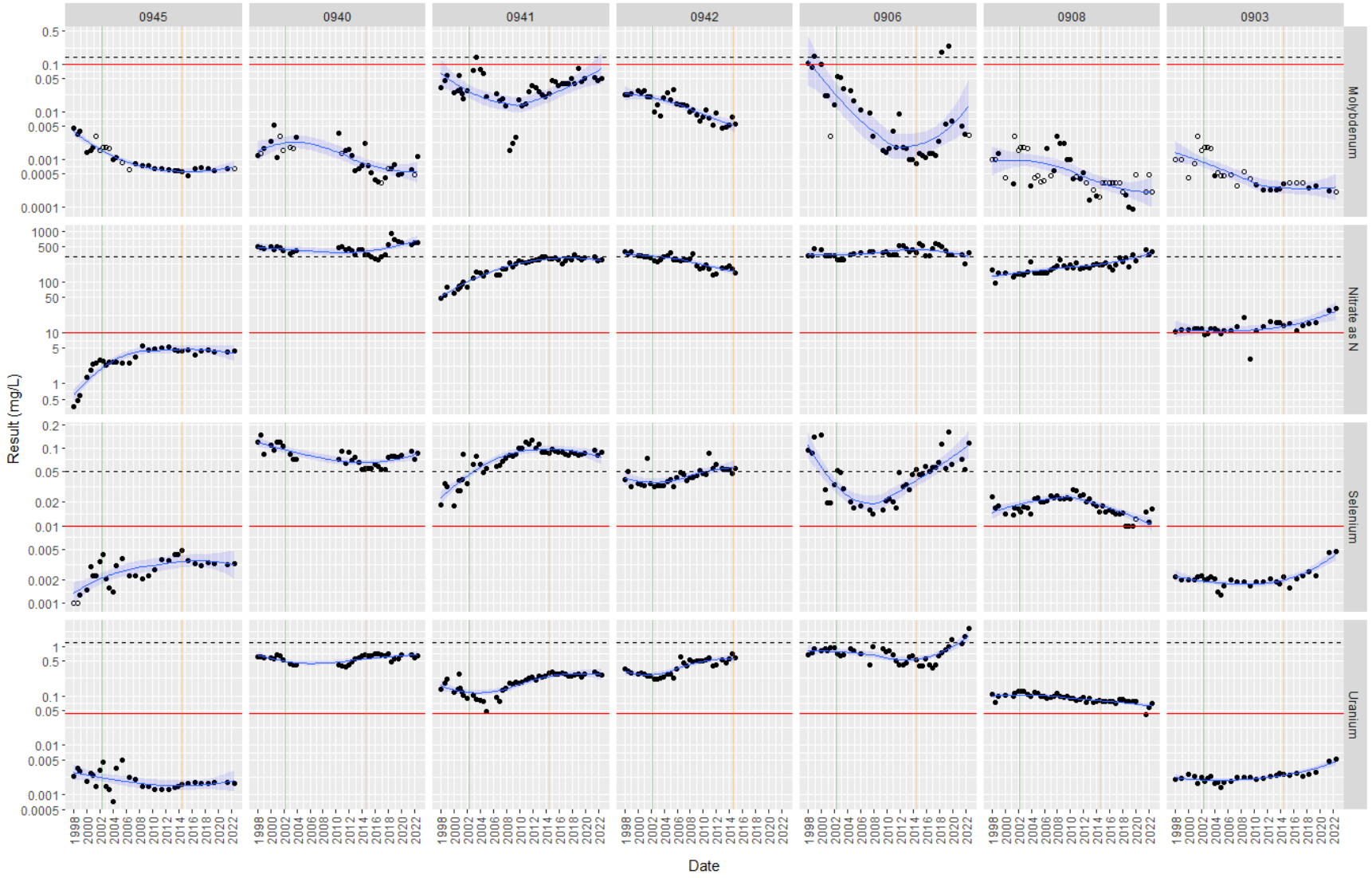
Selenium concentrations in well 0908 have been consistently at or above the 0.01 mg/L MCL but remain below the 0.05 mg/L UBL since 1998 (the most recent result was 0.017 mg/L). Selenium concentrations in southernmost downgradient well 0903 have consistently been below both the UBL and the MCL. Concentrations have increased slightly in recent years, however, from 0.0016 mg/L in 2015 to 0.0046 mg/L in August of 2021 and 2022.

Uranium concentrations have historically exceeded the 0.044 mg/L MCL in all downgradient compliance wells except for distal downgradient well 0903 and a single (August 2021) measurement in well 0908 (Figure 19-6). The 1.17 mg/L UBL has not been exceeded except for recent measurements in well 0906. Uranium concentrations in this well increased from 0.36 mg/L in February 2017 to 1.4 mg/L in February 2020. Following a slight decline in August 2021, concentrations increased again, to 1.6 mg/L in February 2022 and (a historical maximum) 2.3 mg/L in August 2022. Uranium concentrations in well 0908 exhibit a slight decreasing trend, with the most recent results (0.07–0.08 mg/L) just slightly exceeding the 0.044 mg/L MCL. In contrast, increasing uranium concentration trends are apparent in wells 0906 and 0903 (refer to DOE 2022b for a detailed evaluation). Although below both the MCL and the UBL, the most recent uranium concentration in well 0903 is the highest result on record for this well at 0.0054 mg/L.

In summary, analytical results from the 2022 evaluative monitoring effort indicate that groundwater quality in downgradient wells is still degraded relative to background concentrations in upgradient well 0945 (Figure 19-7). The only exceptions to the latter are molybdenum concentrations in wells 0908 and 0903, that are comparable to background. Apart from a few historical results for well 0906, molybdenum concentrations in all downgradient wells have been below the corresponding MCL of 0.1 mg/L. Nitrate concentrations have recently increased in several site wells, with the 311 mg/L UBL currently exceeded in wells 0940, 0906, and 0908. Selenium concentrations currently exceed the 0.05 mg/L UBL in wells 0940, 0941, and 0906 and have increased significantly in well 0906 since 2008. Except for recent measurements in well 0906, uranium concentrations have been below the 1.17 mg/L UBL in all evaluative monitoring wells. Increases in uranium and molybdenum concentrations in well 0906 starting around 2014 correlate with the timing of the groundwater treatment plant shutdown, after which, the site began operating under interim treatment with an average annual cumulative extraction rate of 7 gpm. Analysis of water quality trending and progress of the groundwater remedy are reported in the site-specific remedy performance reports for the Tuba City site (DOE 2020; DOE 2022b).

19.8 Corrective Action

Corrective action is taken to correct out-of-compliance or hazardous conditions that create a potential health and safety problem or that may affect the integrity of the disposal cell or compliance with 40 CFR 192. No need for corrective action was identified.



● Detect ○ Nondetect LOESS local regression line and 95% confidence interval
Limits from Table 19-3: —— = MCL; - - - = UBL
| Groundwater treatment plant startup (June 1, 2002); | Interim treatment begins (September 15, 2014)
Note: Wells are ordered in general direction of groundwater flow or distance from the disposal cell (Figure 19-2); data for upgradient well 0945 are plotted first.
Abbreviation: LOESS = locally estimated scatterplot smoothing, N = nitrogen

Figure 19-7. Summary of Historical Evaluative Monitoring Results at the Tuba City, Arizona, Disposal Site (1998–2022)

19.9 References

10 CFR 40.27. U.S. Nuclear Regulatory Commission, "General License for Custody and Long-Term Care of Residual Radioactive Material Disposal Sites," *Code of Federal Regulations*.

40 CFR 192. U.S. Environmental Protection Agency, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," *Code of Federal Regulations*.

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19.10 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	165	Entrance Sign
PL-2	185	West Perimeter Fence with Sand Deposition
PL-3	220	Vegetation and Debris on Fence near Perimeter Sign P9
PL-4	270	Gap Under Perimeter Fence near Perimeter Sign P9
PL-5	90	Perimeter Sign P7; Pictorial Sign Damaged
PL-6	—	Quality Control Monument QC-3
PL-7	0	Parallel Tracks Visible on Top of Disposal Cell
PL-8	60	Vegetation on South Slope of Disposal Cell
PL-9	40	Revegetated Area of Former Evaporation Ponds
PL-10	220	Inactive Evaporation Pond

Note:
— = Photograph taken vertically from above.

PL-1. Entrance Sign

PL-2. West Perimeter Fence with Sand Deposition

PL-3. Vegetation and Debris on Fence near Perimeter Sign P9

PL-4. Gap Under Perimeter Fence near Perimeter Sign P9

PL-5. Perimeter Sign P7; Pictorial Sign Damaged

PL-6. Quality Control Monument QC-3

PL-7. Parallel Tracks Visible on Top of Disposal Cell

PL-8. Vegetation on South Slope of Disposal Cell

PL-9. Revegetated Area of Former Evaporation Ponds

PL-10. Inactive Evaporation Pond