5.0 Falls City, Texas, Disposal Site

5.1 Compliance Summary

The Falls City, Texas, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title I Disposal Site, was inspected on January 15, 2008. The disposal cell and all associated surface water diversion and drainage structures were in excellent condition and functioning as designed. Control of deep-rooted woody vegetation on the top and side slopes of the disposal cell continues. Grass continues to be cut and baled on site, including on the disposal cell cover. Minor fence repair were performed and one missing perimeter sign was replaced. Groundwater monitoring was performed; generally, historical trends continue, although the uranium concentration in well MW–0880 decreased significantly. NRC concurrence in the revised LTSP was received after the annual inspection was conducted; however, changes to the monitoring program were implemented. No maintenance needs or cause for a follow-up or contingency inspection was identified.

5.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Falls City Disposal Site are specified in the *Long-Term Surveillance Plan* [LTSP] *for the Falls City Disposal Site, Falls City, Texas* (DOE/AL/62350–187, Rev. 3, DOE, Albuquerque Operations Office, July 1997) and in procedures established by DOE to comply with general license requirements at Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27).

5A In March 2008, NRC concurred in the revised LTSP (Long-Term Surveillance Plan for the U.S. Department of Energy Falls City Uranium Mill Tailings, Disposal Site, Falls City, Texas, DOE–LM/1602–2008, March 2008). The annual inspection was performed before the revised LTSP was acceptance. However, groundwater monitoring conducted in April was in accordance with the revised LTSP and the Ground Water Compliance Action Plan (GCAP) (DOE, Grand Junction, Colorado, March 1998). General license requirements are listed in Table 5–1.

Table 5–1. License Requirements for the Falls City Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Section 6.0 and 10.0	Section 5.3.1
Follow-Up or Contingency Inspections	Section 7.0	Section 5.3.2
Routine Maintenance and Repairs	Section 8.0	Section 5.3.3
Groundwater Monitoring	Section 3.7 (in the revised LTSP)	Section 5.3.4
Corrective Action	Sections 3.6	Section 5.3.5

Institutional Controls—Institutional controls at the disposal site, as defined by DOE Order 454.1, consist of federal ownership of the property, a site perimeter fence, warning/no-trespassing signs placed along the property boundary, and locked gates in the perimeter fence.

The 231-acre disposal site is owned by the United States of America and was accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.27) in 1998. DOE is the licensee and, in accordance with the requirements for UMTRCA Title I sites, is responsible for the custody and long-term care of the site.

Inspectors found no evidence that these institutional controls were ineffective or violated.

5.3 Compliance Review

5.3.1 Annual Inspection and Report

The site, located east of Falls City, Texas, was inspected on January 15, 2008. Results of the inspection are described below. Features and photograph locations (PLs) mentioned in this report are shown on Figure 5–1. Numbers in the left margin of this report refer to items summarized in the "Executive Summary" table.

5.3.1.1 Specific Site-Surveillance Features

Access Road, Entrance Gate, Fence, and Signs—Access to the site is through a vehicle gate directly off of a public right-of-way (Farm-to-Market Road 1344). The main entrance gate and the vehicle gate at the north corner of the site were locked and functional.

The five-strand barbed-wire perimeter fence that surrounds the site property boundary was in good condition, although minor maintenance was performed. In the west corner of the site (near perimeter sign P33), the fence was re-secured to a post, and a bent fence post next to perimeter sign P59 was straightened.

The entrance sign located next to the main entrance gate was in good condition. Perimeter sign
5B P2 was replaced. Minor maintenance issues were noted at eight other perimeter signs.

Site Markers and Monuments—The two site markers, SMK–1 at the entrance gate and SMK–2 on top of the disposal cell, were in excellent condition.

Three survey monuments and two boundary monuments situated at the corners of the site were undisturbed and in excellent condition.

Monitor Wells—There are seven monitor wells in the cell performance network and five wells in the groundwater compliance network. All monitor wells were inspected when they were sampled in April and May 2008 and were secure and in excellent condition.

5.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into three transects: (1) the top and side slopes of the disposal cell, (2) the site perimeter, and (3) the outlying area.

The area inside each transect was inspected by walking a series of traverses. Within each transect, inspectors examined specific site-surveillance features, drainage structures, vegetation, and other features. Inspectors also looked for evidence of settlement, erosion, or other modifying processes.

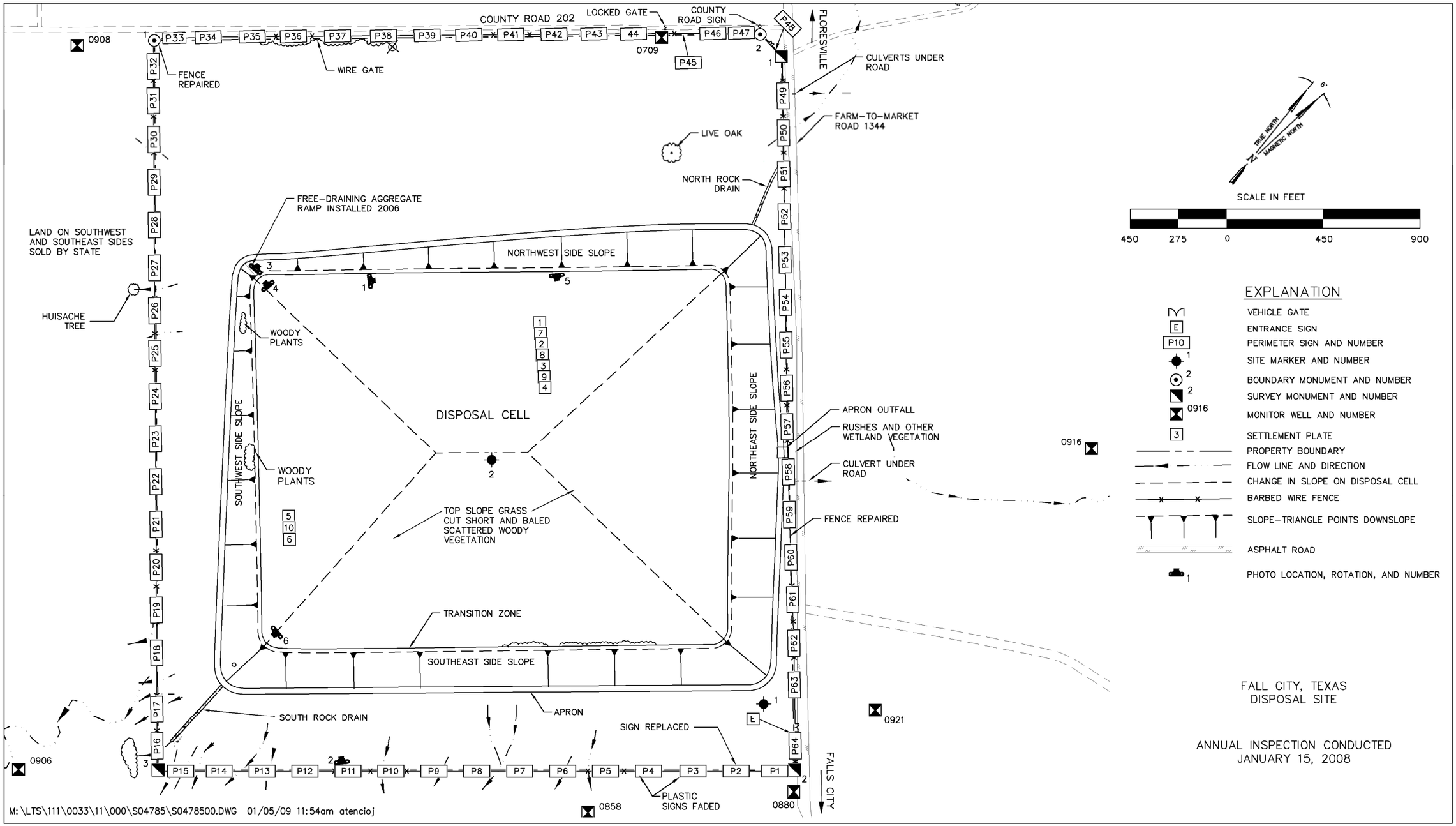

Figure 5–1. 2008 Annual Compliance Drawing for the Falls City Disposal Site

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Top and Side Slopes of the Disposal Cell—The top of the disposal cell is covered with well-established grass and was in good condition; there was no indication of settlement, rock degradation, erosion, or other sign of instability. A local rancher cuts and bales hay each year from the disposal site, including the top of the cell (PL–1). The grass on the cell top had been cut short to control the risk of fire. Deep-rooted vegetation that encroaches on the disposal cell is controlled in accordance with the LTSP. Deep-rooted vegetation is of concern because it can penetrate the radon barrier. There was a minor amount of deep-rooted vegetation found on top of the disposal cell at the time of the inspection.

5C

The side slopes are covered with riprap and are in good condition (PL–2). As noted during previous inspections, minor amounts of fractured riprap were observed along the side slopes. The fractured riprap apparently is an artifact of the quarrying and placement of the rock. Monitoring locations were established with T-posts, and reference photos will be taken during inspections (PL–3). This monitoring is not a requirement of the LTSP, but it is being conducted to demonstrate that the riprap is not deteriorating. During the 2008 inspection, no evidence was found to suggest that the riprap is degrading.

A slight low spot in the riprap at the toe of the southwest corner of the side slope may be present. Although this is likely an artifact of construction, particular attention will be paid to this area during future inspections to determine if any movement or subsidence is occurring. Three T-posts were installed in a line running through the suspected low area to assist in observing if movement is occurring.

An access ramp was installed at the west corner of the side slope. No changes in the access ramp or the side slope were observed (PL–4).

Vegetation management on the top of the cell (PL–5) and side slopes (PL–2) was excellent. Much of the vegetation seen on the side slopes was dead or dormant grass. DOE anticipates that the control of undesirable vegetation on the side slopes will be ongoing.

Site Perimeter—The area between the perimeter fence and the toe of the disposal cell is covered with well-established grass. The grass-covered areas between the disposal cell and the property line were cut short to reduce the risk of fire (PL–2).

Wild hog burrows are present under the fence line on the west side of the property. These burrows will be filled in and monitored for future activity on the site, particularly for biointrusion on the disposal cell.

No water was observed flowing in the north or south rock drains, and the drains appeared to be functioning as designed (PL–6). Grass growing in both drains (as noted in previous inspections) is not sufficient to impede the flow of water draining from the cell apron. The apron outfall, midway along the northeast side slope, is not yet affected by grass encroachment. Grass in the rock drains may actually assist in dissipating the energy of site runoff, and may, therefore, be a desirable feature. No willows were noted this year in the drainage ditch running from the south corner of the disposal cell (PL–6). Vegetation needs to be removed from the culvert northeast of perimeter sign P50.

No active erosion was noted in 2008.

Outlying Area—The area outward from the disposal site for a distance of 0.25 mile was visually inspected. No development or disturbance that could affect site integrity was observed.

5.3.2 Follow-Up or Contingency 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 follow-up or contingency inspections were required in 2008.

5.3.3 Routine Maintenance and Repairs

In 2008, DOE made minor repairs to the perimeter fence, replaced perimeter sign P2, controlled deep-rooted vegetation on the disposal cell, and cut and baled the grass on the disposal cell cover.

5.3.4 Groundwater Monitoring

5D There are two components of the groundwater monitoring program at the Falls City Disposal Site. DOE monitors groundwater at the site as a best management practice to (1) demonstrate the initial performance of the disposal cell (40 CFR 192, Subpart A) and (2) ensure that potential users of groundwater downgradient from the site are not exposed to former-processing-site-related contamination (40 CFR 192, Subpart B). Because narrative supplemental standards apply to the uppermost aquifer at this site, no concentration limits or point of compliance (POC) have been established. Groundwater in the uppermost aquifer beneath the site is designated as limited use (Class III) because it is not currently or potentially a source of drinking water due to widespread ambient contamination that cannot be cleaned up using methods reasonably employed by public water supply systems. Background groundwater quality varies by orders of magnitude in the area because the uppermost aquifer is in an area of naturally occurring redistribution of uranium mineralization. For these reasons, groundwater monitoring at the site is not a requirement of the NRC general license.

Two aquifers of interest underlie the site: the shallow Deweesville/Conquista aquifer and the deeper Dilworth aquifer. Because the two aquifers are hydraulically connected, they constitute the uppermost aquifer for regulatory purposes. The Dilworth aquifer is underlain by the Manning Clay, a 300-foot-thick aquitard that isolates the uppermost aquifer from better-quality groundwater in deeper aquifers. Groundwater monitoring samples at the site are collected from both the Deweesville/Conquista aquifer and from the underlying Dilworth aquifer.

The disposal cell performance monitoring network consists of five monitor wells (MW−0709, MW−0858, MW−0880, MW−0906, and MW−0921) that are completed in the uppermost aquifer and sampled as specified in the revised LTSP (March 2008). Two additional cell performance wells (MW–0908 and MW–0916), also completed in the uppermost aquifer, are designated for water-level measurements only.

The groundwater compliance monitoring network consists of five monitor wells (MW−0862, MW−0886, MW−0891, MW−0924, and MW−0963) that are completed in the uppermost aquifer and sampled annually as specified in the GCAP and the revised LTSP. The monitor well networks are shown on Figure 5–2.

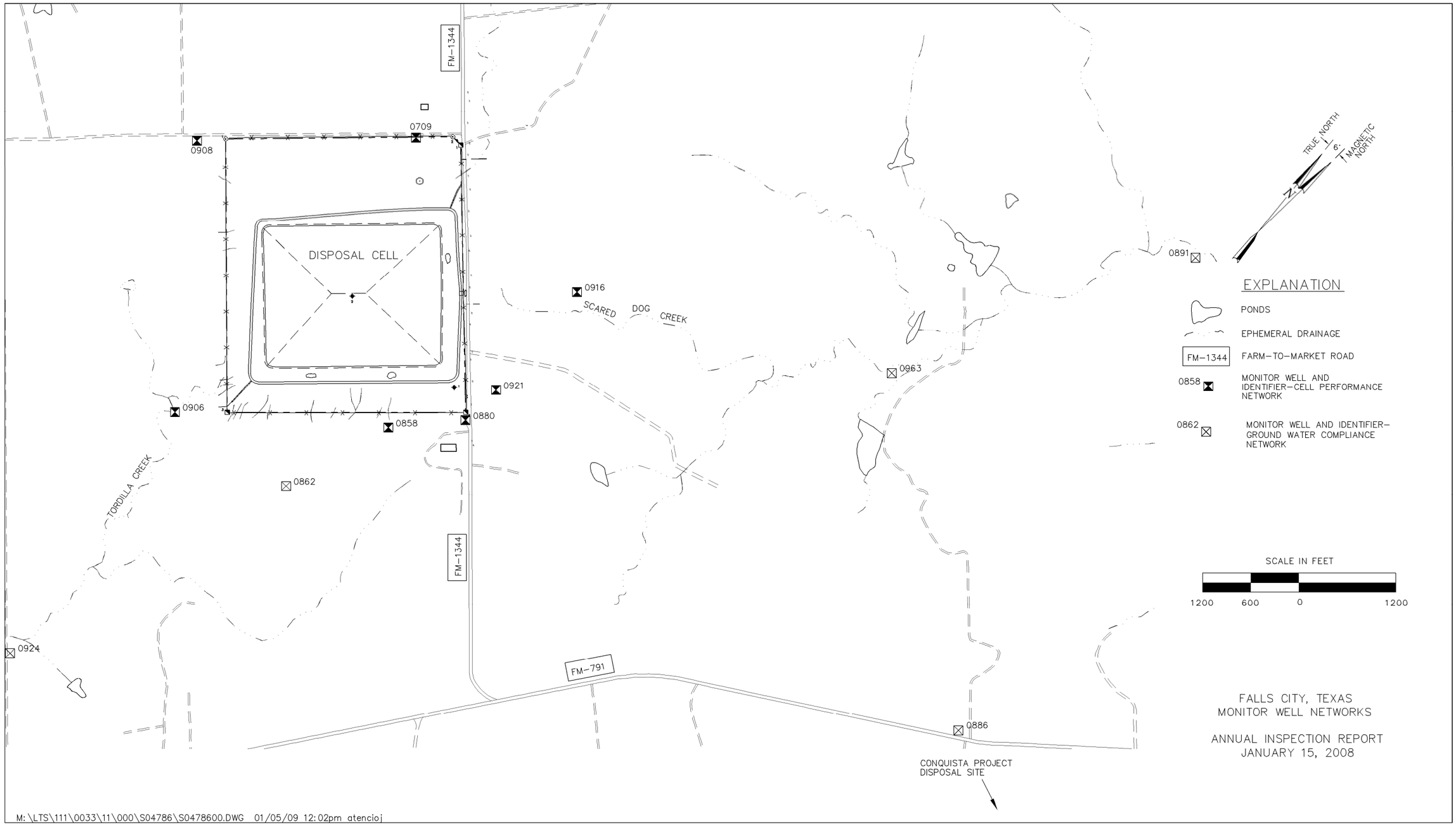

Figure 5–2. Combined Monitor Well Network at the Falls City Disposal Site

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The revised LTSP modifies the environmental monitoring program for the Falls City Disposal Site to continue monitoring the current network of wells annually for the next 5 years as a best management practice and reduce the analyte list to total uranium and field measurements of temperature, pH, conductivity, turbidity, alkalinity, dissolved oxygen, and oxidation-reduction potential.

The revised LTSP (March 2008) identifies pH levels in groundwater as a sensitive indicator parameter of changes in geochemical conditions because pH exerts a major control of contaminant transport (e.g., contaminant mobility generally increases as pH decreases). Changes in the baseline geochemical conditions may also indicate disposal cell performance on the basis of tailings pore-fluid chemistry. Tailings pore fluids were generally lower in pH than background groundwater. However, because pH levels and other signature contaminants in tailings pore fluids are essentially indistinguishable from processing-related contamination, it is difficult to distinguish the possible contribution of contamination from the disposal cell from that which resulted from legacy processing-site activities. Nevertheless, it was anticipated that changes in pH could be used to predict changes in uranium concentrations. Statistical analysis has since indicated that only a moderate correlation exists between pH and uranium concentrations in the affected portions of the uppermost aquifer beneath the site. Time-concentration plots for pH and uranium from 1996 through May 2008 are included as Figures 5–3 through 5–6.

Groundwater Quality Monitoring Results—Groundwater monitoring results from the October 2007 and April 2008 sampling events are presented in this report. Validated results from the October 2007 sampling event were not available in time to meet the 2007 annual report submittal and are therefore being presented in this report.

At the cell performance wells, pH levels have historically been within approximately 1 to 2 standard units of measurement, with no significant upward or downward trends evident. In 2008, the pH levels for the cell performance wells remained within the historical range (Figure 5–3), although a slight long-term decline may be occurring.

At the compliance monitoring wells, pH levels have historically been within approximately 2 to 3 standard units of measurement, with no significant upward or downward trends evident. In 2008, the pH levels for the compliance monitoring wells all were stable and within the historical range (Figure 5–4).

The uranium concentrations in the cell performance network remained stable and within the historical range, approximately 1.0 milligrams per liter (mg/L), or less, with one exception. At well MW–0880, uranium has varied from which rose to a high concentration of 14 mg/L in 2004 and to a low of 1.38 mg/L in 2008 (Figure 5–5). Historically, the concentration of uranium in this well has been variable and, until 2008, substantially greater than the uranium concentrations reported historically in the other site wells. In 2008, the uranium concentration in well MW–0880 decreased significantly and was comparable with the other wells in the cell performance network. Because pH at this location has not fallen significantly, the uranium concentrations reported historically are most likely the result of the natural redistribution of uranium mineralization. However, although the pH at this location has not fallen significantly, it has been lower than at other nearby wells, which may indicate that legacy, contamination persists at well MW–0880.

The explanation for the previously higher concentrations of uranium displayed in this well is not entirely clear, but it may be a result of (1) transient drainage from the disposal cell (i.e., tailings pore water), (2) residual processing-site-related contamination (i.e., historical), or as mentioned above (3) the natural redistribution of uranium mineralization Additionally, the reason for the variation and the relatively higher concentration of uranium in well MW–0880, as compared with concentrations in other wells, is ambiguous and difficult to explain is because tailings pore water is very similar chemically to the processing-site-related contamination, and groundwater at other monitor wells nearby does not show this historical variability or similarly elevated concentrations of uranium.

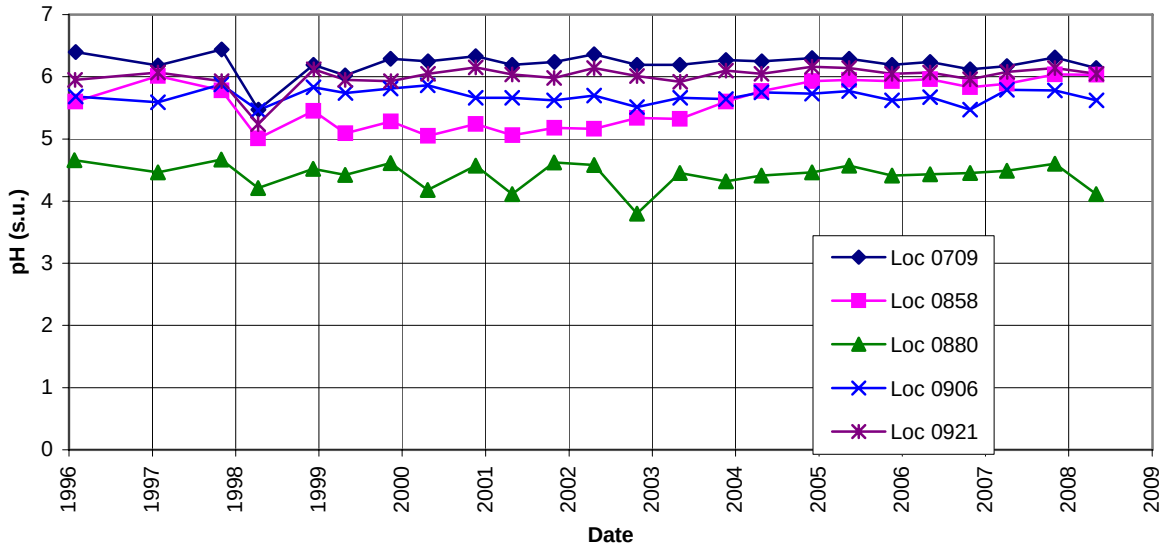

Figure 5–3. pH in Groundwater at Cell Performance Monitoring Locations at the Falls City Disposal Site

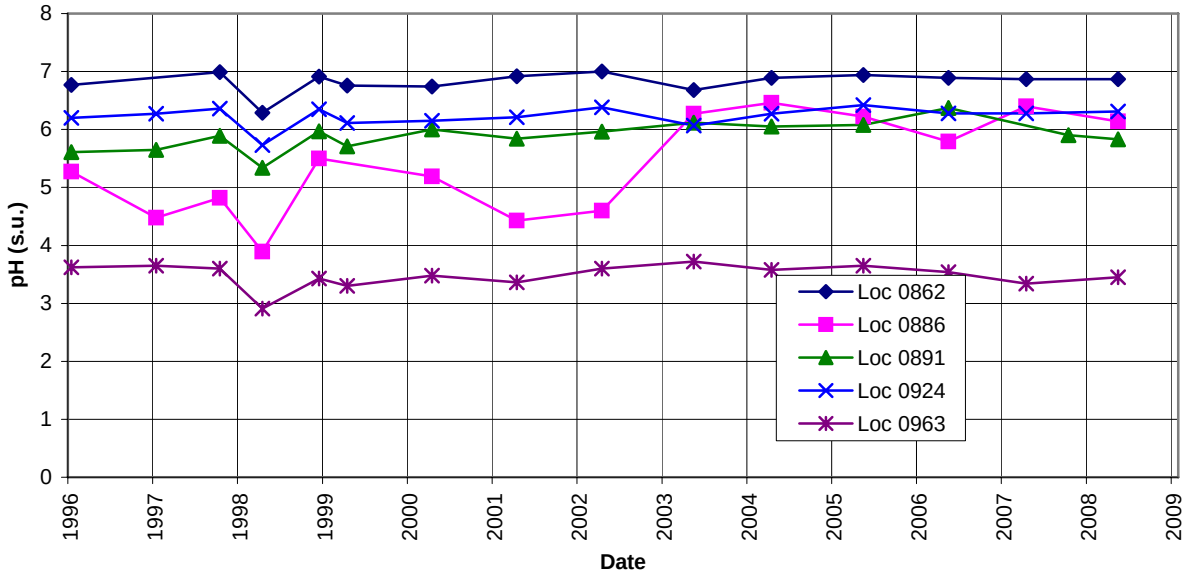

Figure 5–4. pH in Groundwater at Compliance Monitoring Locations at the Falls City Disposal Site

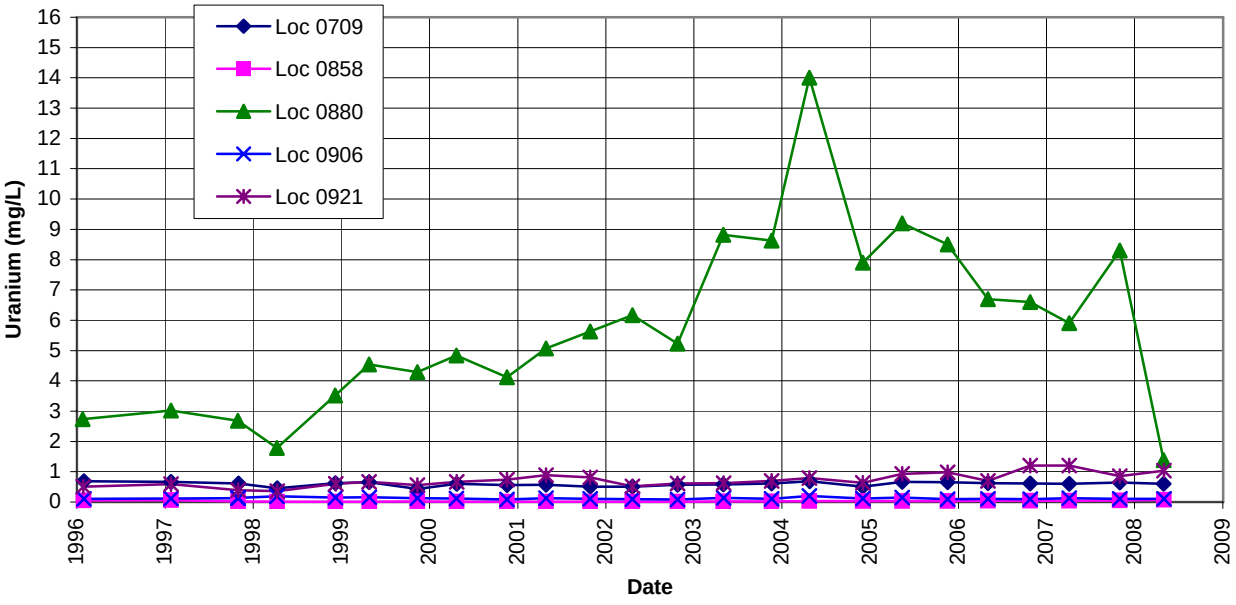

Figure 5–5. Uranium in Groundwater at Cell Performance Monitoring Locations at the Falls City Disposal Site

The concentration of uranium in groundwater within the compliance monitoring network displays three distinct trends: stable (wells MW–0862, MW–0886, and MW–0963), variable

(well MW–0891), and upward (well MW–0924) (Figure 5–6). Well MW–0924 continues to have the highest concentration of uranium in the compliance monitoring network. The concentrations at MW–0891 continue to fluctuate with no discernable trend; however, after reaching a historical high in 2006 (0.45 mg/L), the concentration declined to 0.033 mg/L in 2007 and 0.058 mg/L in 2008. In 2007 and 2008, the uranium concentrations reported in the remaining three compliance monitoring network wells were all within the historical range (less than 0.15 mg/L), with no significant trends evident.

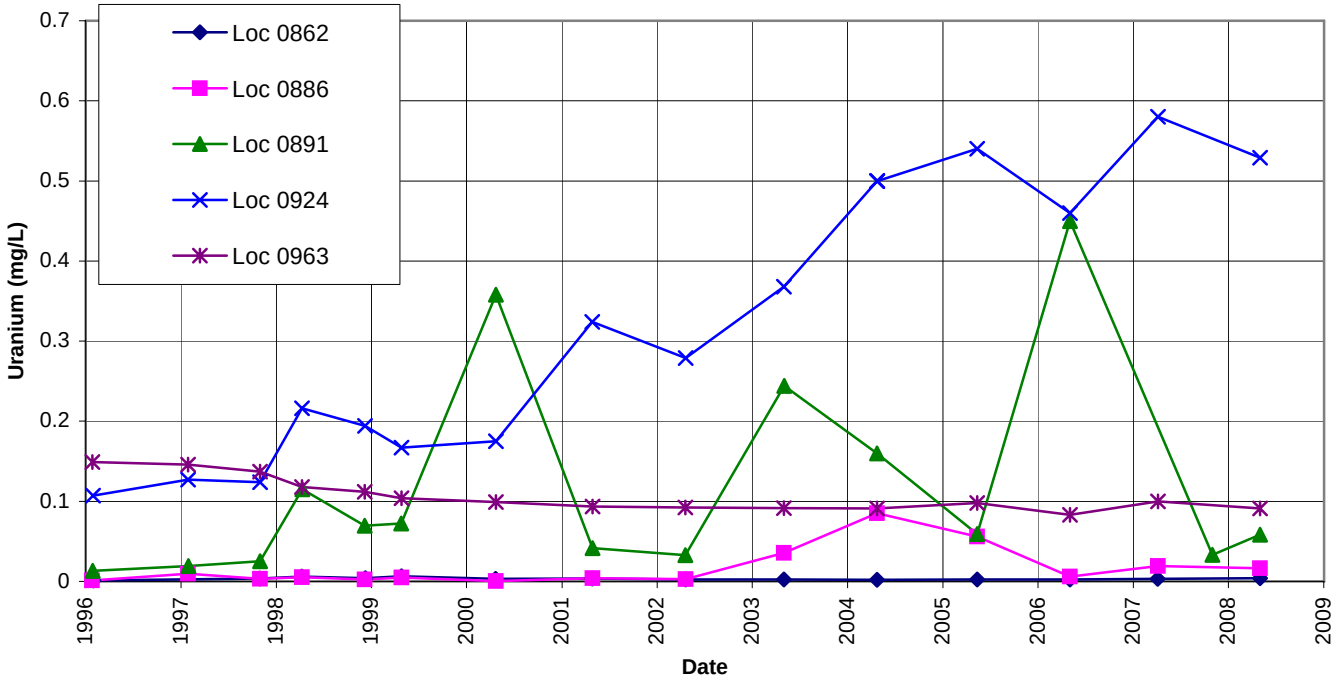

Figure 5–6. Uranium in Groundwater at Compliance Monitoring Locations at the Falls City Disposal Site

Groundwater Level Monitoring Results—Groundwater levels in the disposal cell performance network wells displayed a decreasing trend with one exception: well MW–0906, which (although variable) showed an overall increasing trend. The fluctuation does not appear to be seasonal, nor does the water level track with the other wells in the network. The 2007–2008 levels were within the historical values and appear to be stabilizing (Figure 5–7). Monitor well MW–0906 is located directly down slope of the disposal cell, and the historical fluctuation may be the result of the infiltration of water shed by and conveyed away from the disposal cell, reflecting variations in annual precipitation. Other contributors that may influence local groundwater levels include (1) dissipation of the processing-site-related groundwater mound beneath the disposal cell, and (2) dissipation of transient drainage from the disposal cell.

Two cell performance monitor wells, MW–0908 and MW–0916, are not shown on Figure 5–7. These wells, designated for groundwater level monitoring only, are completed in the unsaturated zone of the Conquista Sandstone and have been dry since 1996.

In contrast, water levels in the groundwater compliance monitoring network wells have all steadily increased several feet since monitoring began in 1996, indicating a regional effect (Figure 5–8). Water levels in 2007 and 2008 continue trending upward, although the increase has been gradual, only a few feet over more than 20 years.

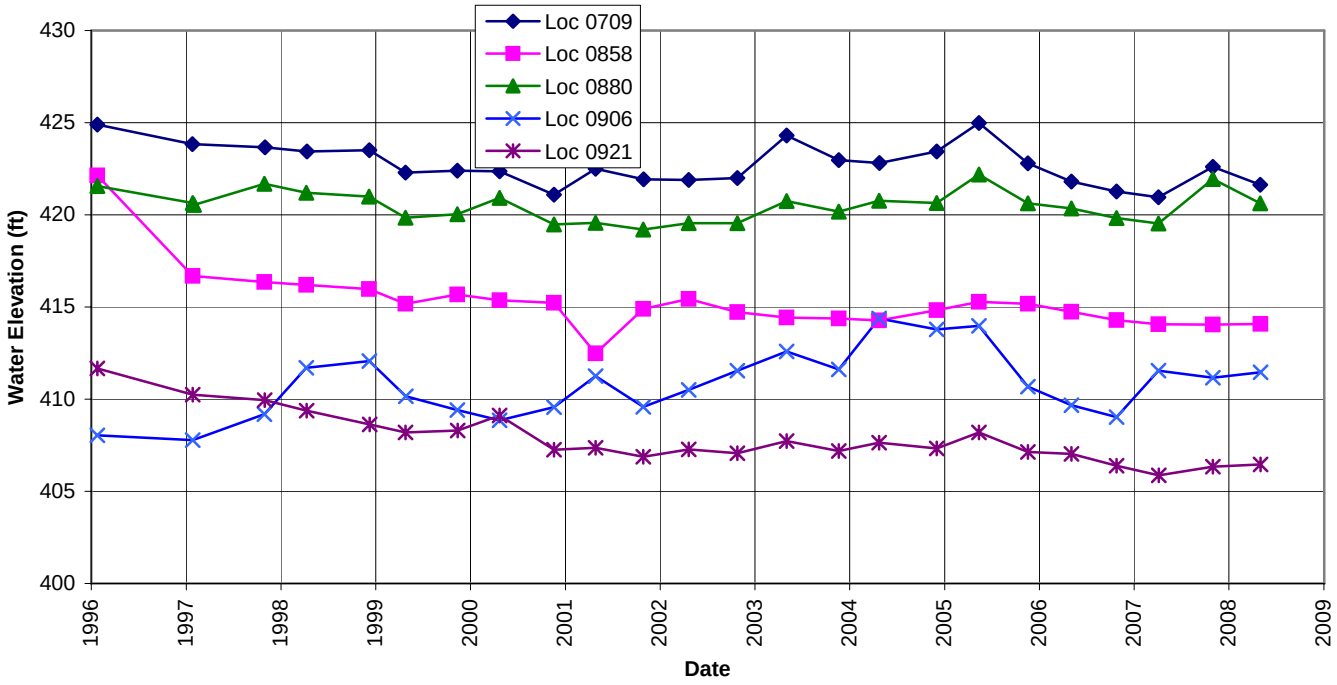

Figure 5–7. Water-Level Measurements at Cell Performance Monitoring Locations at the Falls City Disposal Site

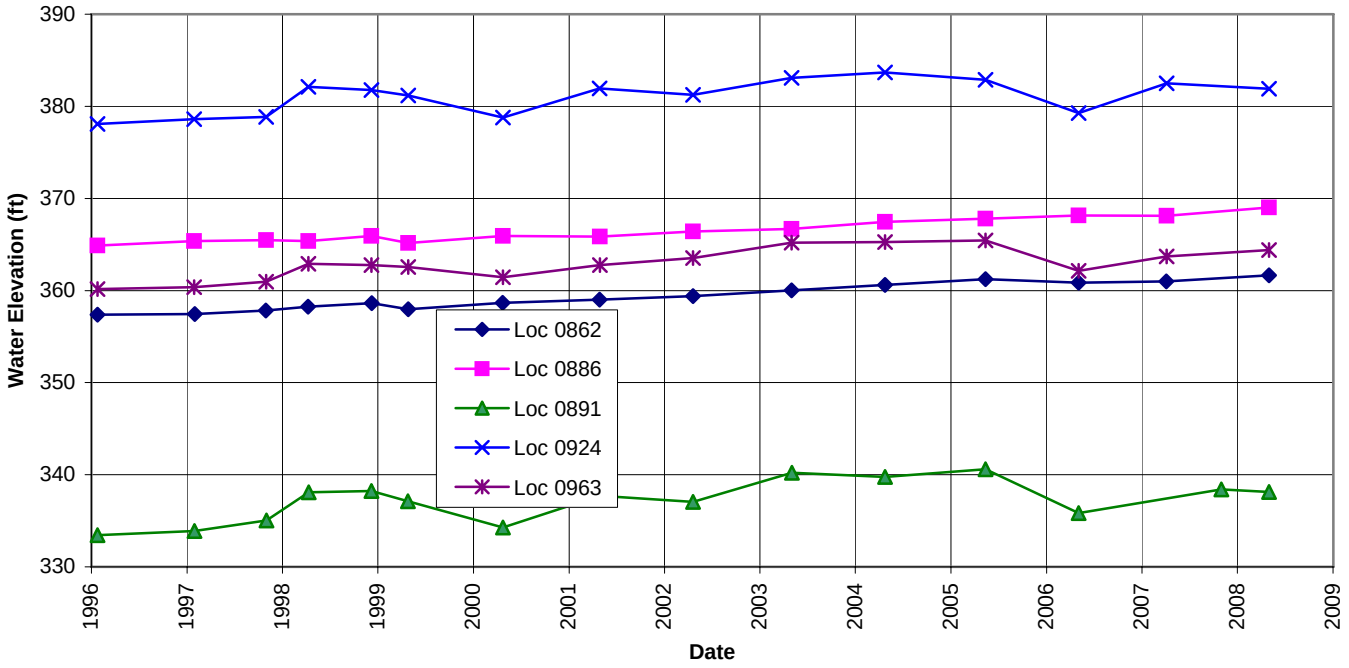

Figure 5–8. Water-Level Measurements at Compliance Monitoring Locations at the Falls City Disposal Site

Evaluation of Groundwater Monitoring—In 2006, DOE evaluated the groundwater monitoring program at the site as required every 5 years by the LTSP (July 1997) to determine the effectiveness of the program. The evaluation considered whether protectiveness could be demonstrated with reduced monitoring requirements, such as sampling fewer wells, analyzing fewer constituents, or reducing the sampling frequency.

The evaluation concluded that monitoring for the designated suite of analytes in groundwater does not appear to be an effective means to assess the performance of the disposal cell because the area is affected by widespread ambient contamination (naturally occurring uranium mineralization), uranium exploration and mining, and former uranium-processing activities. Groundwater in the uppermost aquifer at the site is in contact with the naturally occurring uranium deposits and associated minerals. Water that might leach from the disposal cell, either through transient drainage or from infiltration of precipitation through the cover, will be chemically similar and perhaps indistinguishable from ambient conditions.

Currently, there is no risk from site-related contamination because there is no local use of the groundwater, and the groundwater in the uppermost aquifer beneath the site is designated as limited use (Class III). Potable (domestic) water is produced locally from the Carrizo Sandstone that lies 2,000 feet below the surface in the vicinity of the disposal site.

Based on the 2006 evaluation, and NRC's concurrence in its recommendations, DOE revised the LTSP to continue monitoring the current network of wells annually for the next 5 years as a best management practice, reducing the analyte list to total uranium only, and to continue performing field measurements, consisting of temperature, pH, conductivity, turbidity, alkalinity, dissolved oxygen, and oxidation-reduction potential. After the 5 years of reduced monitoring, the monitoring program will be reevaluated. In March 2008, NRC concurred in the revised LTSP
5E and the changes incorporated into the monitoring program. Monitoring in April 2008 was performed in accordance with the revised LTSP (March 2008).

5.3.5 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 corrective action was required in 2008.

5.3.6 Photographs

Table 5–2. Photographs Taken at the Falls City Disposal Site

Photograph Location Number	Azimuth	Photograph Description
PL–1	45	Northwest side slope of the disposal cell; hay bales on cell top.
PL–2	315	Southeast side slope of the disposal cell.
PL–3	N/A	Reference photo of riprap adjacent to disposal cell access ramp.
PL–4	280	Aggregate ramp on the west corner of the disposal cell.
PL–5	135	Vegetation management on the disposal cell top.
PL–6	190	South side slope of the disposal cell; south rock drain in the background.

FCT 1/2008. PL–1. Northwest side slope of the disposal cell; hay bales on cell top.

FCT 1/2008. PL–2. Southeast side slope of the disposal cell.

FCT 1/2008. PL–3. Reference photo of riprap adjacent to disposal cell access ramp.

FCT 1/2008. PL–4. Aggregate ramp on the west corner of the disposal cell.

FCT 1/2008. PL–5. Vegetation management on the disposal cell top.

FCT 1/2008. PL–6. South side slope of the disposal cell; south rock drain in the background.

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