

4.0 Sherwood, Washington, Disposal Site

4.1 Compliance Summary

The Sherwood, Washington, Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II Disposal Site was inspected on July 9, 2008. The tailings impoundment, dam, and diversion channel were in good condition. The dam inspection and associated piezometer water level measurements verified that the tailings embankment is functioning as designed. Vegetation monitoring continues in an effort to evaluate the effectiveness of biological control of noxious weeds at the site. Two species of noxious weeds resistant to biocontrol were identified and treated with herbicide. Groundwater monitoring, performed as a best management practice, showed constituent concentrations were significantly less than State of Washington water quality criteria. No cause for a follow-up inspection was identified.

4.2 Compliance Requirements

Requirements for the long-term surveillance and maintenance of the Sherwood, Washington, Disposal Site are specified in the *Long-Term Surveillance Plan [LTSP] for the DOE Sherwood Project (UMTRCA Title II) Reclamation Cell, Wellpinit, Washington* (U.S. Department of Energy [DOE], Grand Junction, Colorado, February 2001) and in procedures established by DOE to comply with requirements of Title 10 *Code of Federal Regulations* Part 40.28 (10 CFR 40.28). License requirements for this site are listed in Table 4–1.

Table 4–1. License Requirements for the Sherwood, Washington, Disposal Site

Requirement	Long-Term Surveillance Plan	This Report
Annual Inspection and Report	Sections 3.3 and 3.4	Section 4.3.1
Follow-up Inspections	Section 3.5	Section 4.3.2
Routine Maintenance and Emergency Measures	Section 3.6	Section 4.3.3
Environmental Monitoring	Section 3.7	Section 4.3.4

Institutional Controls—The United States of America, in trust for the Spokane Tribe of Indians, owns the 380-acre disposal site. The site was accepted under the U.S. Nuclear Regulatory Commission (NRC) general license (10 CFR 40.28) in 2001. Because the site is located on the Spokane Indian Reservation, no agreement of transfer was necessary for conveying the property rights to DOE. However, an agreement for long-term surveillance, maintenance, and permanent right of access, which allows DOE to fulfill its custodial responsibilities required for UMTRCA Title II sites, was executed between the tribe and DOE. The agreement does not prohibit the future use of the site for activities related to uranium mining and milling.

Institutional controls at the disposal site, as defined by DOE Policy 454.1, consist of federal ownership of the property and warning/no trespassing signs placed along the property boundary; the site is not fenced. Verification of these institutional controls is part of the annual inspection.

4.3 Compliance Review

4.3.1 Annual Inspection and Report

The site, located near Wellpinit, Washington, was inspected on July 9, 2008. Features and photograph locations (PLs) mentioned in this report are shown on Figure 4–1. Results of the inspection are described below. Numbers in the left margin of this report refer to items summarized in the Executive Summary table.

4.3.1.1 Specific Site Surveillance Features

Access, Gates, and Signs—The disposal site and adjacent lands are part of the Spokane Indian Reservation. The U.S. Bureau of Indian Affairs (BIA) maintains the all-weather site road over which DOE has permanent right-of-access. A double-swing steel gate across the road controls access to the Sherwood mine area and tribe-owned facilities near the disposal site. A chain with several locks (both DOE and BIA) secures the gate. As in the past several site visits, the gate was open at the time of the inspection, apparently to accommodate activities by the tribe in the vicinity of the disposal site.

Six perimeter signs, designated P1 through P6, are placed at likely access points around the site property. The signs are attached at a height of about 5 feet above ground to steel posts set in concrete. Perimeter sign P4 is on a fence line north of the actual site boundary on an old two-track road that is used by groundwater samplers to access the site. Perimeter sign P6 has several bullet holes but remains legible; otherwise, the signs are in excellent condition.

Site Markers and Monuments—One inscribed granite site marker is present on the southwest side of the site where the access road lies closest to the site boundary (PL–1). The marker was in excellent condition.

Six boundary monuments, designated BM–1, BM–2, BM–3, BM–3A, BM–4, and BM–5 define the site boundary. Boundary monument BM–3A is bent but does not require any repairs; all other monuments were in excellent condition. Because surrounding vegetation had made it difficult to locate some of the monuments, metal t-posts have been installed at each monument location.

Monitor Wells—Three monitor wells are located on the Sherwood site and are designated MW–2B, MW–4, and MW–10. The wells were secure and in good condition.

Four piezometers, designated PZ–1 through PZ–4, were installed in November 2000 along the crest of the tailings dam to a depth equivalent with the base of the dam, as part of the dam safety inspection program. All piezometers were secure and in good condition.

4.3.1.2 Transects

To ensure a thorough and efficient inspection, the site was divided into three areas referred to as transects: (1) the cover of the tailings impoundment; (2) the diversion channel and impoundment dam face; and (3) the area between diversion channel and site boundary, and the outlying area.

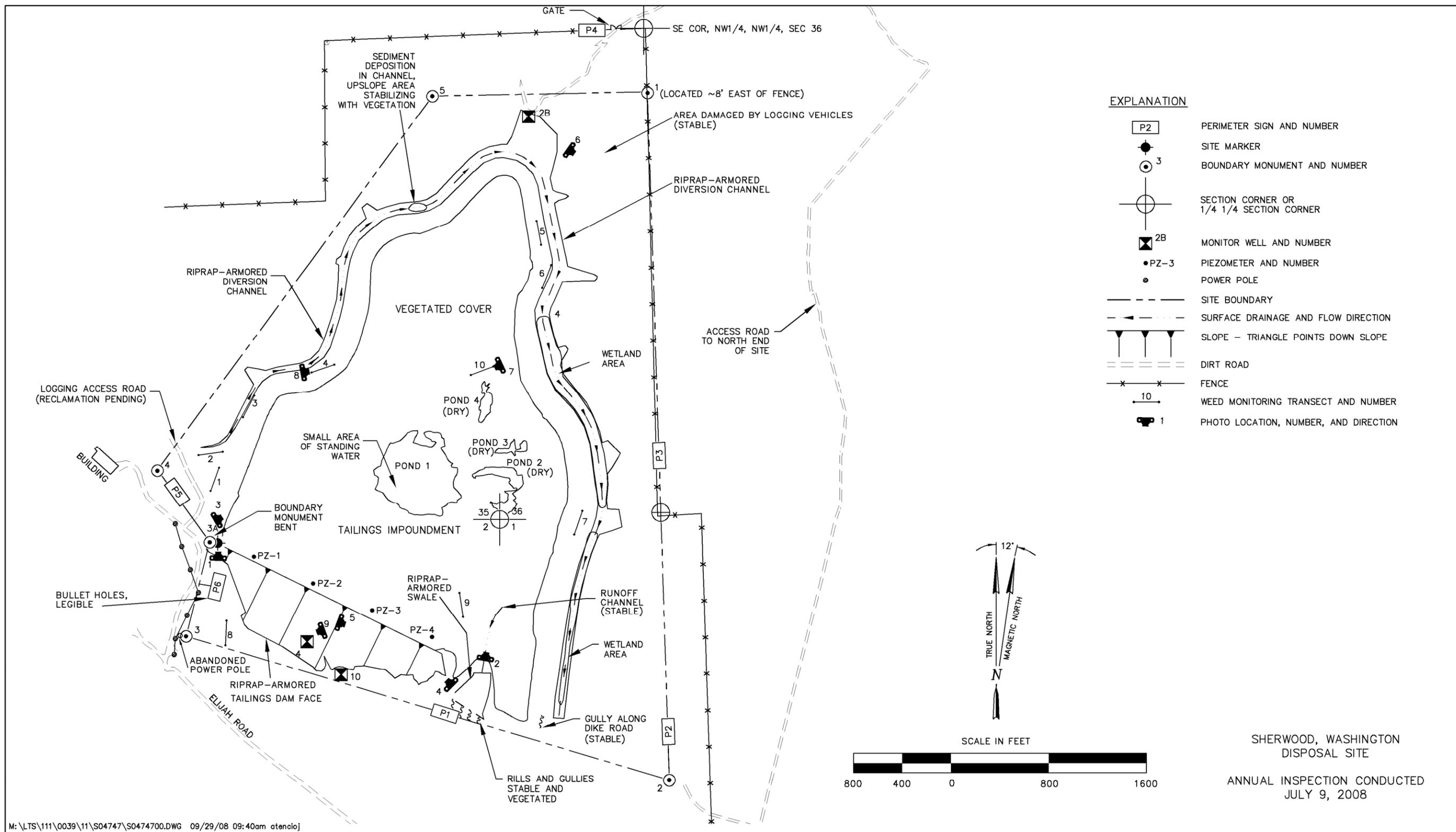


Figure 4-1. 2008 Annual Compliance Drawing for the Sherwood, Washington, Disposal Site

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Within each transect, inspectors examined specific site surveillance features, such as monitor wells, boundary monuments, and signs. Inspectors examined each transect for evidence of erosion, settling, slumping, or other disturbance that might affect site integrity or the long-term performance of the site.

Tailings Impoundment Cover—The cover of the 100-acre tailings impoundment, completed in 1996, consists of 12 to 20 feet of uncompacted soils. During site reclamation, surface soils were seeded and planted with native shrubs, forbs, grasses, and trees. A healthy vegetative cover is needed to provide necessary protection and evapotranspiration of the cover in order to limit infiltration of meteoric water into the impoundment. Reclamation has been successful, as a healthy stand of vegetation is now established. A small, shallow channel developed by runoff from the cell top is present near the southeast corner of the cell (PL-2). The channel discharges into a riprap-armored swale located east of the tailings dam. The channel is not over an area containing tailings and is stable (it has scoured down to quartz monzonite bedrock).

Designers of the cell predicted that some settlement would continue to occur after placement of the uncompacted cover and that it would be self-healing with regard to impacts from freeze-thaw, biointrusion, and settlement (LTSP, page 2–14). The largest area of settlement is now referred to as Pond 1. Some standing water was present in Pond 1 at the time of the inspection, and the plant species present indicate there is year-round moisture below the surface throughout the approximately 7.7-acre pond area. Other minor depressions designated as Ponds 2, 3, and 4, with a total area of approximately 2 acres, did not contain standing water. The shallow ponds are considered to be favorable features on the cell top, but DOE will continue to monitor the cover surface for unusual settlement features such as sinkholes or differential displacement to verify cell cover integrity and ensure that the impoundment is performing as designed.

Vegetation in the area of Pond 1 is composed primarily of native wetland species; the other pond areas contain primarily riparian vegetation. The ponds provide habitat for small mammals, birds, amphibians, and reptiles and provide an important water source for larger mammals such as wild horses, deer, elk, bears, coyotes, and buffalo. Buffalo were on the disposal cell during the time of the inspection (PL-3).

Diversion Channel and Impoundment Dam Face—Inspectors walked the length of the riprap-armored diversion channel. Volunteer plant intrusion within the diversion channel, including trees, is evident in most areas of the channel. The channel was designed to allow trees to grow and stabilize the surfaces, and their presence in the channel is not expected to impact the function of the channel in conveying designed flows. The condition of the riprap cover is good and is the same as that observed during earlier inspections. Sediment deposition is evident in places on the west side of the diversion channel, but does not interfere with the channel's design function; upslope areas that have contributed to the sedimentation are becoming stabilized with vegetation. Two permanent wetland areas have formed along the bottom of the east side of the channel. They provide habitat for a variety of small mammals and birds. In previous years, several pools of standing water have been observed throughout the wetland areas. During the 2008 inspection, only one pool of surface water was present. The lack of visible surface water may be indicative of the recently dry weather in this area.

Adjacent to the eastern end of the dam face is a steep slope that is underlain by rock and covered with soil. Rills and gullies noted during previous annual inspections were inspected on this slope

at the base of the riprap-armored swale. No new rills were identified at this location, and the existing rills and gullies are stable. A new small gully was noted adjacent to the dike access road near the outlet of the diversion channel. This gully will be monitored to ensure that sediment does not run off the site.

- 4A The tailings embankment on this site is classified as a dam because of the saturated condition of the impoundment, so an annual dam safety inspection is required by the LTSP to ensure continued compliance with the Federal Dam Safety Act. The impoundment dam face was inspected in accordance with the attached Dam Inspection Checklist. No evidence of seepage, slumping, erosion, or instability was observed. The rock cover, consisting primarily of highly durable quartz monzonite, is in excellent condition and is effectively preventing erosion of the dam face until vegetation is well established.

Water level measurements in the four piezometers were taken at the time of the annual groundwater sampling. These annual measurements, collected since the piezometers were installed in 2000, provide a direct means of determining moisture conditions in the dam. Significant increases would trigger an investigation of the performance of the dam. Standing water levels in 2008 were consistent with previous years, with no water in piezometers PZ-1, PZ-3, and PZ-4, and 1.61 feet of water in PZ-2. The results verify that moisture conditions in the dam remain constant and that the dam is performing as designed.

The tailings dam face was designed to allow a vegetative cover, including mature trees, to establish and stabilize the surface and prevent erosion. Consequently, the presence of this vegetation does not negatively affect the function of the dam, and the dam will not be compromised if the rock cover eventually degrades. To out-compete undesirable weeds that were establishing on the face of the dam, seeding with desirable species occurred in fall 2004. Extensive vegetative cover, including Ponderosa pine trees ranging in size from seedlings to 15 feet tall, was observed on the dam face (PL-4 and PL-5). Many seeded species also were observed.

Area Between Diversion Channel and Site Boundary, and Outlying Area—Ponderosa pine forest comprises most of the area outside of the diversion channel. The surrounding lands are part of the Spokane Indian Reservation and are used for timber harvesting and wildlife habitat. No residences are located within 0.25 mile of the site boundary.

During the summer of 2005, the BIA proposed to construct a portion of an access road across the southwest corner of the property. The road would follow a reclaimed mining road and not encroach upon the tailings impoundment, and would be used only for logging operations planned for fall 2005. DOE agreed with the proposal and stipulated requirements to reclaim the road and any other areas on the site damaged by logging operations. Logging operations apparently were completed at the time of the 2006 inspection, but no reclamation activities had occurred. DOE subsequently sent a letter to BIA clarifying the need for site reclamation.

Additional logging activities occurred along the site perimeter in 2007. Some slash piles had been removed but road and damaged surface reclamation on the site had not occurred by the time of the 2008 inspection. A berm had been placed across the diversion channel road on the west side of the site to deter trespassing, but high-clearance vehicles can cross it; however, there was

no evidence of trespassing on the site. A damaged area in the northeast corner of the site has not been reclaimed but the vehicle ruts are stabilizing with vegetation (PL-6).

4.3.1.3 Noxious Weeds

4B Several small infestations of Canada thistle, a Washington State noxious weed, have been found in the diversion channel and on the dam face during previous inspections. They have been treated with herbicide each year in September. During the 2008 inspection, the infested areas were revisited, and most Canada thistle plants had been successfully eradicated. However, several new infestations of Canada thistle were discovered in the diversion channel and on the dam face. Additionally, a small infestation of another noxious weed, leafy spurge, was discovered on the dam face. A commercial applicator treated these areas in September 2008.

Significant populations of two noxious weed species, diffuse knapweed and Dalmatian toadflax, occur throughout and around the Sherwood site. DOE initiated a biological control program in spring 2003 to attempt to control the widespread infestations of these weeds. Three insect species targeting Dalmatian toadflax and three species targeting diffuse knapweed were released. In 2004, DOE and Stevens County weed control personnel released additional quantities of insects. The insects attack the target plants in a number of ways, through external feeding of foliage, internal feeding of seed-producing organs by adults and larvae, and internal feeding of central taproots.

4C To monitor the success of the biological weed control efforts, ten permanent weed monitoring (WM) transects were established during the 2004 inspection. Eight of the transects (WM-1 through WM-8) were established in weed-infested areas, and two (WM-9 and WM-10) were established in non-weedy areas. The *Methodology for Conducting Annual Monitoring of Noxious Weeds at the Sherwood, Washington, Disposal Site* (January 2004) describes the sampling methodology. For each of the ten transects, inspectors stretch a rope between two metal fence posts placed 200 feet apart (PL-7). One inspector, a weed specialist, using a 1-foot ruler (and placing 1/2 foot on either side of the rope) walks the rope length and identifies all noxious weed plants that fall within the 1-foot-wide path (PL-8). If any portion of a live weed plant at any stage of maturity occurs within this path, the plant is counted.

The 2008 monitoring data indicate that the total number of noxious weeds in the 10 transects has decreased by approximately 30 percent from that in 2004. Most dramatic has been the decrease in the number of diffuse knapweed plants, which has decreased by approximately 70 percent since 2004. The released insects apparently are responsible for the dramatic change in diffuse knapweed populations, as numerous weevils have been observed on these plants for the last 4 years.

In contrast, the number of Dalmatian toadflax plants along the transects steadily increased from 2004 through 2006 and then began to decrease in 2007 and 2008. In 2007, most Dalmatian toadflax plants were visibly stressed, as indicated by the yellow color of the plants' leaves and stalks. In 2008, only one of the thousands of toadflax plants occurring on the site had flowered. From 90 to 100 percent of the toadflax plants along the monitoring transects appeared to be first-year seedlings, and none of them had flowered. A period of 5 to 7 years is typically needed before significant changes in Dalmatian toadflax populations occur.

4.3.2 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 follow-up inspections were required in 2008.

4.3.3 Routine Maintenance and Emergency Measures

Infestations of Canada thistle and leafy spurge were sprayed with herbicide in 2008. No other maintenance or repairs were required.

Emergency measures are corrective actions that DOE will take in response to unusual damage or disruption that threaten or compromise site health and safety, security, integrity, or compliance with 40 CFR 192. No emergency measures were required in 2008.

4.3.4 Environmental Monitoring

4D Groundwater compliance monitoring is not required at the Sherwood site. However, as a best management practice stipulated in the LTSP, DOE conducts limited groundwater monitoring for designated indicator parameters. Samples are collected annually from one background well, identified as MW-2B, and two downgradient wells, identified as MW-4 and MW-10. Samples are analyzed for sulfate, chloride, and total dissolved solids. Sulfate and chloride are the primary indicator parameters.

Monitoring results will be evaluated for evidence of groundwater impact from the reclamation cell. Should the concentration of sulfate or chloride exceed the State of Washington water quality criteria values of 250 milligrams per liter (mg/L) for either parameter, DOE will conduct confirmatory sampling of the downgradient wells. If the confirmatory sampling verifies the exceedance, DOE will develop an evaluative monitoring work plan, in consultation with the tribe and BIA, and submit that plan to NRC for review prior to initiating the evaluative monitoring program. Results of an evaluative monitoring program would be used to determine if corrective action is necessary.

Groundwater sampling was conducted on the same day as the inspection (PL-9), and the results are presented in Table 4-2. Groundwater constituent concentrations were consistent with previous years and continue to be significantly less than the action levels for confirmatory sampling.

Table 4-2. 2008 Groundwater Quality Summary for the Sherwood, Washington, Disposal Site

Constituent	Water Quality Criterion	Background Well MW-2B	Downgradient Well MW-4	Downgradient Well MW-10
Chloride, mg/L	250	2.1	2.1	2.7
Sulfate, mg/L	250	2.6	19	30
TDS, mg/L	N/A	170	510	650

Key: mg/L = milligrams per liter; TDS = total dissolved solids

Note: State of Washington water quality criteria used as action levels.

4.3.5 Photographs

Photograph Location Number	Azimuth	Description
PL-1	0	Site marker.
PL-2	10	Stable runoff channel east of the tailings dam.
PL-3	60	Buffalo on the disposal cell.
PL-4	315	Vegetation on the tailings dam face.
PL-5	110	View east of vegetation on the tailings dam face.
PL-6	125	Damage by logging equipment on a steep hillside.
PL-7	245	Weed monitoring transect WM-10.
PL-8	80	Counting weeds at weed monitoring transect WM-4.
PL-9	250	Sampling activity at monitor well MW-4.



SHE 7/2008. PL-1. Site marker.



SHE 7/2008. PL-2. Stable runoff channel east of the tailings dam.



SHE 7/2008. PL-3. Buffalo on the disposal cell.



SHE 7/2008. PL-4. Vegetation on the tailings dam face.



SHE 7/2008. PL-5. View east of vegetation on the tailings dam face.



SHE 7/2008. PL-6. Damage by logging equipment on a steep hillside.



SHE 7/2008. PL-7. Weed monitoring transect WM-10.



SHE 7/2008. PL-8. Counting weeds at weed monitoring transect WM-4.



SHE 7/2008. PL-9. Sampling activity at monitor well MW-4.

Dam Inspection Checklist
Sherwood, Washington, UMTRCA Title II Disposal Site

Date of Inspection: July 9, 2008

<u>Inspector</u>	<u>Organization</u>
R. K. Johnson	S.M. Stoller Corp.

Piezometer PZ-1 current year water depth: Dry
(Previous year depth: dry)

Piezometer PZ-2 current year water depth: 1.61 feet
(Previous year depth: 3.05 feet)

Piezometer PZ-3 current year water depth: Dry
(Previous year depth: dry)

Piezometer PZ-4 current year water depth: Dry
(Previous year depth: dry)

Was evidence of significant seepage observed on the dam face?
If yes discuss in report. No

Was evidence of significant slumping observed on the dam?
If yes discuss in report. No

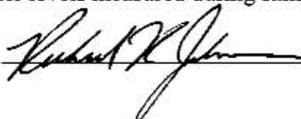
Was evidence of significant erosion observed on the dam?
If yes discuss in report. No

Was vegetative growth that could compromise dam stability observed?
If yes discuss in report. No

Was any condition that presents an imminent hazard to human health and safety or to the environment observed?
If yes immediately contact the following: No

DOE Project Manager (970) 248-6073
NRC Operations Center (301) 951-0550
Spokane Tribal Police/Sheriff (509) 258-4400
State Department of Ecology—Dam Safety (360) 407-6625

Note: Piezometer water levels measured during sampling trip on July 9, 2008.

Inspector Signature:  Date: 7/29/08

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