DOE–LM/GJ771–2005

Office of Legacy Management

Long-Term Surveillance Plan for the U.S. Department of Energy Lowman, Idaho, (UMTRCA Title I) Disposal Site

January 2005

U.S. Department of Energy

Office of Legacy Management

Work Performed Under DOE Contract No. DE–AC01–02GJ79491
for the U.S. Department of Energy Office of Legacy Management.
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DOE-LM/GJ771-2005
Revision 2

Office of Legacy Management

Long-Term Surveillance Plan

for the

U.S. Department of Energy
Lowman, Idaho
(UMTRCA Title I) Disposal Site

January 2005

(Supercedes DOE/AL/62350-36, Revision 1, April 1994)

Work Performed by S.M. Stoller Corporation under DOE Contract No. DE–AC01–02GJ79491
for the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado

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Acronyms

AEC	U.S. Atomic Energy Commission
BM	boundary monument
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
LM	[U.S. Department of Energy] Office of Legacy Management
LTSP	Long-Term Surveillance Plan
MCL	maximum concentration limit
mg/L	milligram(s) per liter
NRC	U.S. Nuclear Regulatory Commission
$pCi/m^2/sec$	picocuries per square meter per second
QA	quality assurance
SM/BM	combined survey monument and boundary monument
SMK	site marker
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978 (42 USC 7901, *et seq.*)
USFS	U.S. Forest Service

End of current text

1.0 Introduction

1.1 Purpose

This Long-Term Surveillance Plan (LTSP) explains how the U.S. Department of Energy (DOE) Office of Legacy Management (LM) will fulfill general license requirements of Title 10 *Code of Federal Regulations* Part 40.27 (10 CFR 40.27) as the long-term custodian of the radioactive sands disposal site at Lowman, Idaho. The LM Program at the DOE office in Grand Junction, Colorado, is responsible for the revision and implementation of this LTSP (Revision 2), which specifies procedures for inspecting the site; monitoring, maintenance, and annual and other reporting requirements; and maintaining records pertaining to the site.

1.2 Legal and Regulatory Requirements

The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, as amended, provides for the remediation and regulation of uranium mill tailings at uranium mill sites authorized under Title I of the Act. Title I sites are former uranium mill sites unlicensed and essentially abandoned as of January 1, 1978. Federal regulations at 10 CFR 40.27 provide for the licensing, custody, and long-term care of uranium mill tailings disposal sites remediated under Title I of UMTRCA. The Lowman processing site, included under Title I, did not process uranium, but the byproduct of operations contained residual uranium, radium, and thorium in sand.

A general license is issued by the U.S. Nuclear Regulatory Commission (NRC) for the long-term custody and care of UMTRCA Title I sites. Long-term care includes institutional controls, inspection, monitoring, maintenance, and other measures to ensure that the sites continue to protect human health, safety, and the environment after remediation is completed.

The general license becomes effective when a site-specific LTSP receives NRC concurrence. The original LTSP (Revision 1) for the Lowman disposal site (DOE 1994) received NRC concurrence on September 30, 1994 (Appendix A). The NRC acceptance letter for this revision of the LTSP (Revision 2) is included in Appendix A.

Requirements at 10 CFR 40.27 for the LTSP for the Lowman disposal site are listed in Table 1−1.

Table 1–1. General License Requirements for the Long-Term Surveillance and Maintenance of the Lowman, Idaho, Disposal Site

Requirements of LTSP		
No.	*Requirement*	*Location*
1	Description of final site conditions	Section 2.0
2	Legal description of the site	Appendix B
3	Description of the long-term surveillance program	Section 3.0
4	Criteria for follow-up inspections	Section 3.4.1
5	Criteria for maintenance and emergency actions	Sections 3.5 and 3.6
Requirements for the Long-Term Custodian (DOE)		
No.	*Requirement*	*Location*
1	Notification to NRC of changes to the LTSP	Section 3.1
2	NRC permanent right-of-entry	Section 3.1
3	Notification to NRC of significant construction, actions, or repairs at the site.	Sections 3.4.3 and 3.6.2

The plans, procedures, and specifications in this revised LTSP are based on the guidance document, *Guidance for Implementing the Long-Term Surveillance Program for UMTRCA Title I and Title II Disposal Sites* (DOE 2001). Rationale and procedures in the guidance document are considered part of this revised LTSP.

1.3 Role of the U.S. Department of Energy

In 1988, DOE designated the office at Grand Junction, Colorado, to be the program office for the long-term surveillance and maintenance of all DOE remedial action project disposal sites, as well as other sites as assigned, and to be the common office for the surveillance, monitoring, maintenance, and institutional control of these sites. At that time, DOE established the Long-Term Surveillance and Maintenance Program to carry out this responsibility. In December of 2003, all actions and responsibilities under this program were transferred and incorporated into DOE-LM. DOE-LM is responsible for the revision and implementation of this LTSP.

2.0 Final Site Conditions

2.1 Site History

Porter Brothers Corporation, Boise, Idaho, opened the mill at Lowman in 1955. Although the mill was subsequently owned by Michigan Chemical Corporation of Chicago and its successor, Versicol Chemical Corporation, Porter Brothers may have been the only operator of the mill (FBD 1977).

Porter Brothers operated the mill from 1955 until 1960 to recover heavy minerals from sands dredged from placer deposits at Bear Valley, 20 miles north of Lowman. At the Bear Valley dredge site, sands were fed through a jig concentrator to separate the heavier minerals from the lighter fractions. The heavy mineral concentrate was trucked from Bear Valley to the Lowman mill where the sands were further separated by density into several concentrates: columbite-euxenite, monazite, ilmenite, zircon, garnet, and quartz waste.

The radioactivity in these concentrates owed to the presence of uranium and thorium in several of the heavy minerals. For example, uranium is a common impurity in columbite. Uranium and thorium are common in euxenite. Thorium may replace cerium and lanthanum in monazite, and thorium and uranium commonly replace zirconium in zircon. Columbite, euxenite, and zircon are highly resistant oxide or silicate minerals that are very stable under surface weathering conditions. Contaminants do not leach easily from these minerals (DOE 1991a).

While the mill was in operation, approximately 200,000 tons of heavy mineral concentrates were processed at the mill. The final concentrates were shipped to Mallinckrodt Chemical Works in Hematite, Missouri, for recovery of columbium and tantalum pentoxides, uranium oxide, rare-earth elements, titanium, and thorium-iron residues. Some byproduct magnetite and ilmenite were shipped to the U.S. Atomic Energy Commission (AEC) at Las Vegas, Nevada, for stemming material at the Nevada Test Site; and some of the garnet sands were used for sand blasting grit.

Porter Brothers operated the mill under a contract with the General Services Administration for acquisition of columbium-tantalum pentoxides. Porter Brothers also operated under an AEC contract for uranium oxide, although no uranium oxide, or “yellow cake”, was actually produced at the mill. As a result, uranium mill tailings typically associated with Title I sites were not generated. In this respect, the Lowman site is unique among Title I sites. Processing consisted only of mechanical separation of minerals according to their density—no chemical digestion of ores took place. Subsequently, the waste byproduct of the operation was radioactive sand rather than chemically processed mill tailings. This is an important point because it accounts for there being no extensive contamination of soils or ground water at the site. The stability and resulting low leachability characteristics of the uranium and thorium-bearing minerals remaining within the radioactive sand is a further contributing factor to the absence of water and soil contamination at the site.

The mill was closed in 1960 and the site abandoned. Prior to remedial action in 1991, all that remained at the site were concrete foundations, a few small sheds, scattered debris, and just over 90,000 tons of sand concentrates in several discrete piles. Composition of the piles could be determined by color: black (original jig concentrate, primarily magnetite); red (primarily garnet); gray (primarily columbite-euxenite), and white (primarily quartz) (DOE 1991b). All of the sand piles were radioactive to varying degrees.

Remedial action by DOE to encapsulate and isolate the radioactive sands began in 1991 and was completed in 1992. The site was included under the general license by NRC in 1994.

2.2 Area Description

The Lowman disposal site is in Boise County, Idaho, approximately 75 miles northeast of Boise and 0.5 mile east of the unincorporated town of Lowman (Figure 2–1).

The site is in Clear Creek valley on the western side of the Sawtooth Mountains at an elevation of 4,000 feet, and is located on a Pleistocene river terrace about 80 feet above Clear Creek. The area surrounding the site is steeply mountainous and forested by ponderosa pine. Mountains above the site rise to elevations of 6,000 feet. Clear Creek is a tributary to the South Fork of the Payette River, located approximately 0.5 mile south of the site.

Average annual precipitation ranges between 20 and 25 inches, and much of it is from snow that falls in late winter or early spring. Heavy summer rains are infrequent and reportedly occur only once every 10 years or so.

2.3 Site Description

2.3.1 Legal Description

The legal description of the site and a brief history of the acquisition of the site are provided in Appendix B. The site boundary is shown on Figure 2–2.

2.3.2 Location and Access

Directions to the site follow. See also see Figure 2–1.

Begin odometer reading on State Highway 21 at the bridge over the South Fork of the Payette River at Lowman.

Mileage	Route
0.0	From the bridge, proceed east toward Stanley, Idaho.
0.5	Cross a smaller bridge over Clear Creek and immediately turn left (north) onto a one-lane, hard-packed gravel road. The access gate is about 150 feet from the highway along this gravel road. The site boundary is approximately 500 feet further along the gravel road.

2.3.3 Disposal Site Description

Disposal Site—The Lowman disposal site comprises 18.07 acres and is irregular in shape. The site and site features described in this LTSP are shown on Figure 2–2.

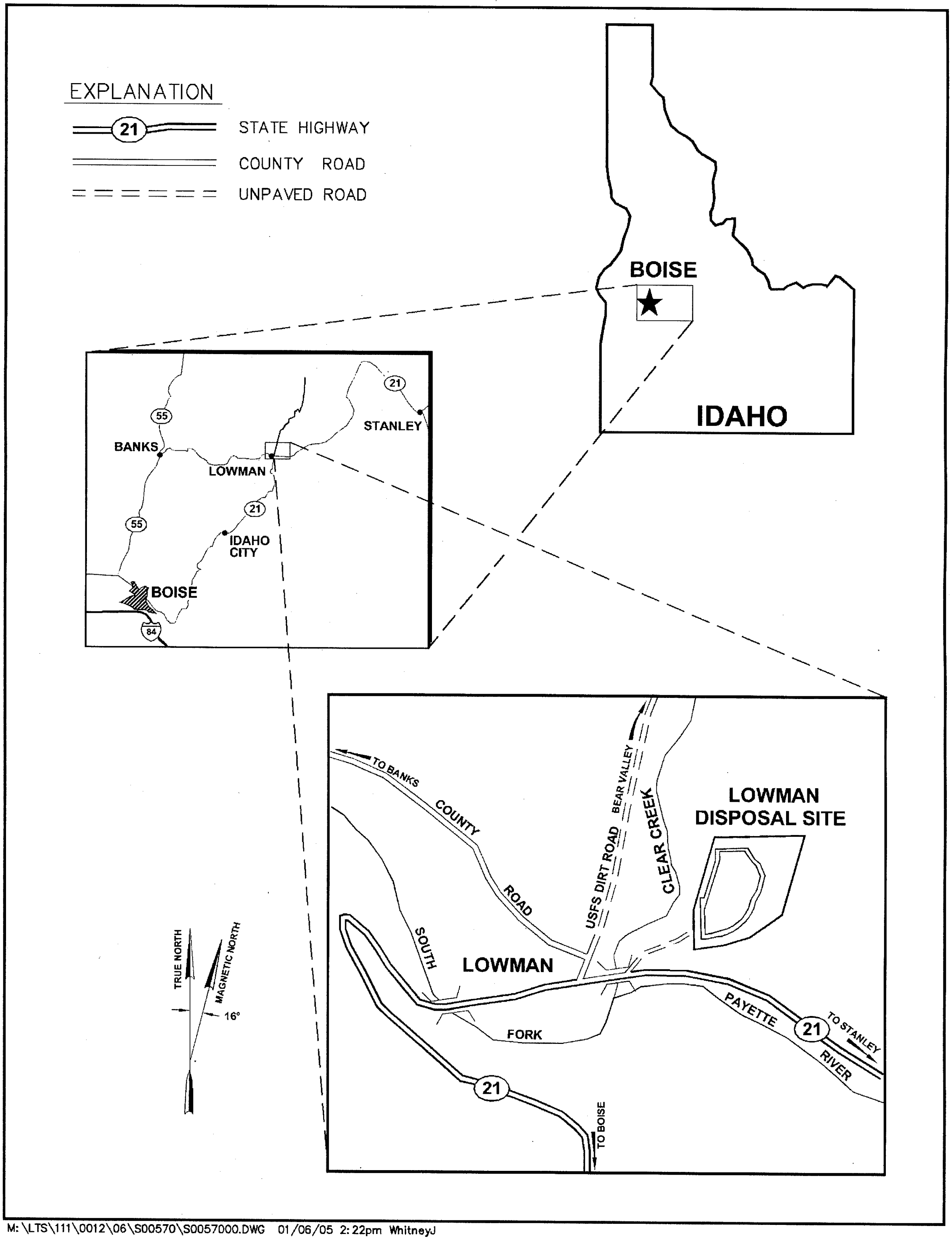


Figure 2–1. Location of Lowman, Idaho, Disposal Site

Disposal Cell—The disposal cell covers 8.29 acres and is irregular in shape. The cell contains 222,230 dry tons of encapsulated materials (radioactive sand residues, contaminated soil, and building debris). Radioactivity within the disposal cell is 12 curies of radium-226.

The disposal cell is a surface impoundment (Figure 2–3). The bottom or "footprint" of the disposal cell is essentially the original surface of the ground prior to remedial action. Radioactive sands and other contaminated materials, as placed, are about 20 feet thick in the center of the disposal cell. There is no liner between the ground and overlying radioactive materials because the sands are not leachable, as explained in Sections 2.4.3 and 3.5.

The radioactive materials are protected by an engineered cover that is 36 inches thick. The cover consists of three layers: a lowermost, relatively impermeable radon barrier constructed of compacted earthen materials (18 inches thick); a coarse-grained, free-draining, sandy bedding layer (6 inches thick); and a surface layer of riprap for erosion protection (12 inches thick). The riprap in the surface layer has a median diameter of 6 inches (DOE 1993).

The cover is sloped to facilitate runoff. On the east, or up-slope side of the disposal cell, the cover is fairly flat with a 10:1 slope. On the west, or down-slope side, the cover is steeper with a 5:1 slope.

The cover is designed to (1) protect the disposal cell from erosion, (2) limit release of radon to the atmosphere (radon flux), and (3) facilitate runoff to minimize infiltration of precipitation.

An apron of coarse riprap surrounds the disposal cell for additional erosion protection. The apron is 3 to 6 feet deep and 30 to 35 feet wide. Riprap in the apron has a median diameter of 24 inches.

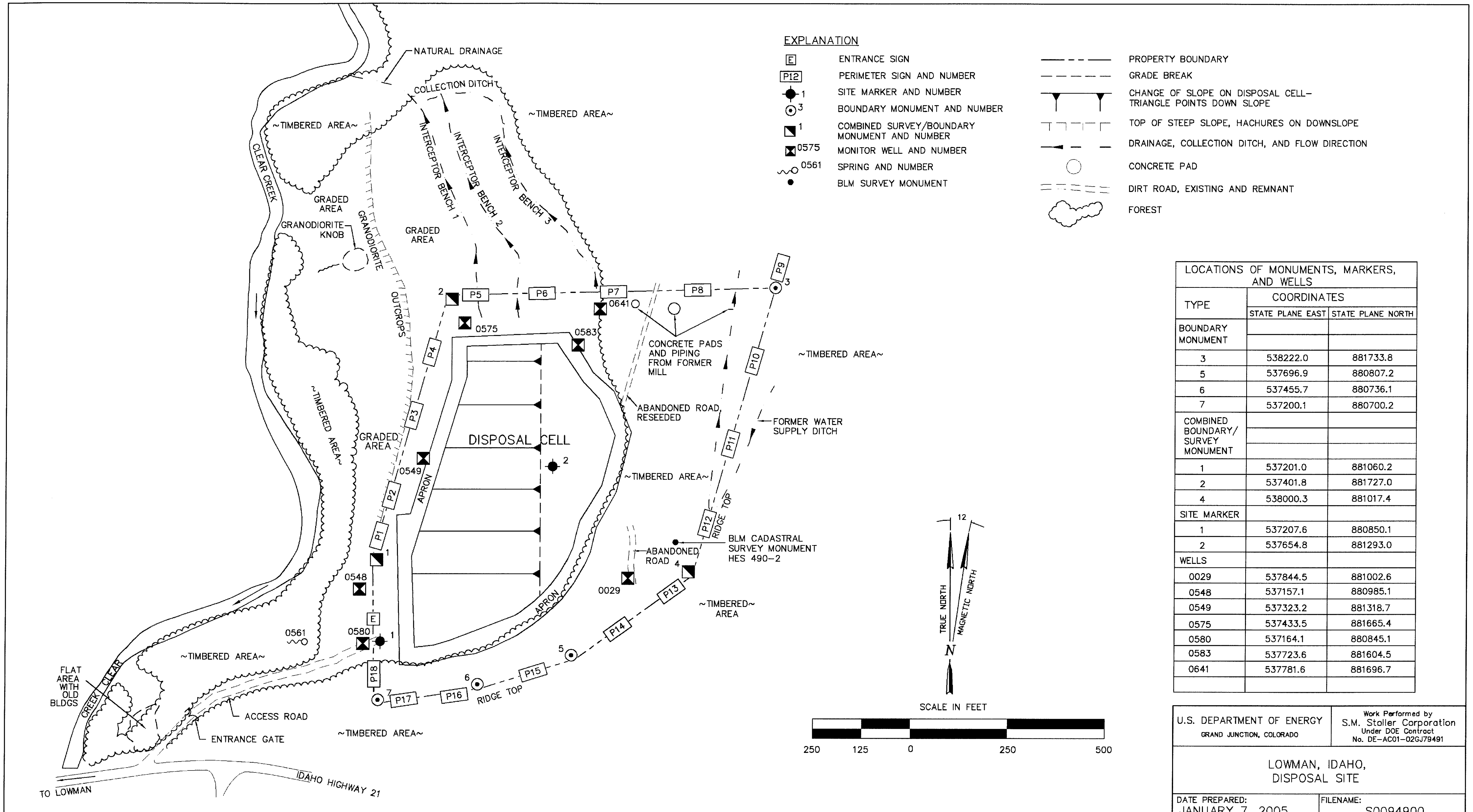
The apron is graded to prevent ponding around the edges of the disposal cell and to divert run-on from the hill slope above the site. In addition, the apron serves to protect the disposal cell from headward erosion that could potentially develop on the steep slope immediately west of the disposal site.

2.3.4 Area Adjacent to the Disposal Site

A steep, forested slope rises above the disposal cell on the east and south. Areas around the disposal cell on the north and west were disturbed during remedial action. These areas were graded and revegetated as part of remedial action. Initial seeding failed and natural vegetation did not establish sufficiently to prevent erosion. In 1997, DOE graded and planted the disturbed areas again. In the process, three large drainage terraces (Interceptor Benches 1, 2, and 3) and a collection ditch were constructed north of the disposal site (Figure 2–2). These benches and ditch intercept runoff and divert it north and away from the disposal site.

2.3.5 Institutional Controls

Institutional controls at the disposal site consists of (1) federal ownership (withdrawal) of the property; (2) warning signs; and (3) the gate across the access road that leads to the site from State Highway 21. There is no security fence at the site because of its remote location and open forest setting. As a result, human intrusion, vandalism, and livestock grazing are not expected to be problems. Inadvertent or casual intrusion by humans or animals is not of great concern.



LOCATIONS OF MONUMENTS, MARKERS, AND WELLS

TYPE	COORDINATES	
	STATE PLANE EAST	STATE PLANE NORTH
BOUNDARY MONUMENT		
3	538222.0	881733.8
5	537696.9	880807.2
6	537455.7	880736.1
7	537200.1	880700.2
COMBINED BOUNDARY/SURVEY MONUMENT		
1	537201.0	881060.2
2	537401.8	881727.0
4	538000.3	881017.4
SITE MARKER		
1	537207.6	880850.1
2	537654.8	881293.0
WELLS		
0029	537844.5	881002.6
0548	537157.1	880985.1
0549	537323.2	881318.7
0575	537433.5	881665.4
0580	537164.1	880845.1
0583	537723.6	881604.5
0641	537781.6	881696.7

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Figure 2–2. Lowman, Idaho, Disposal Site

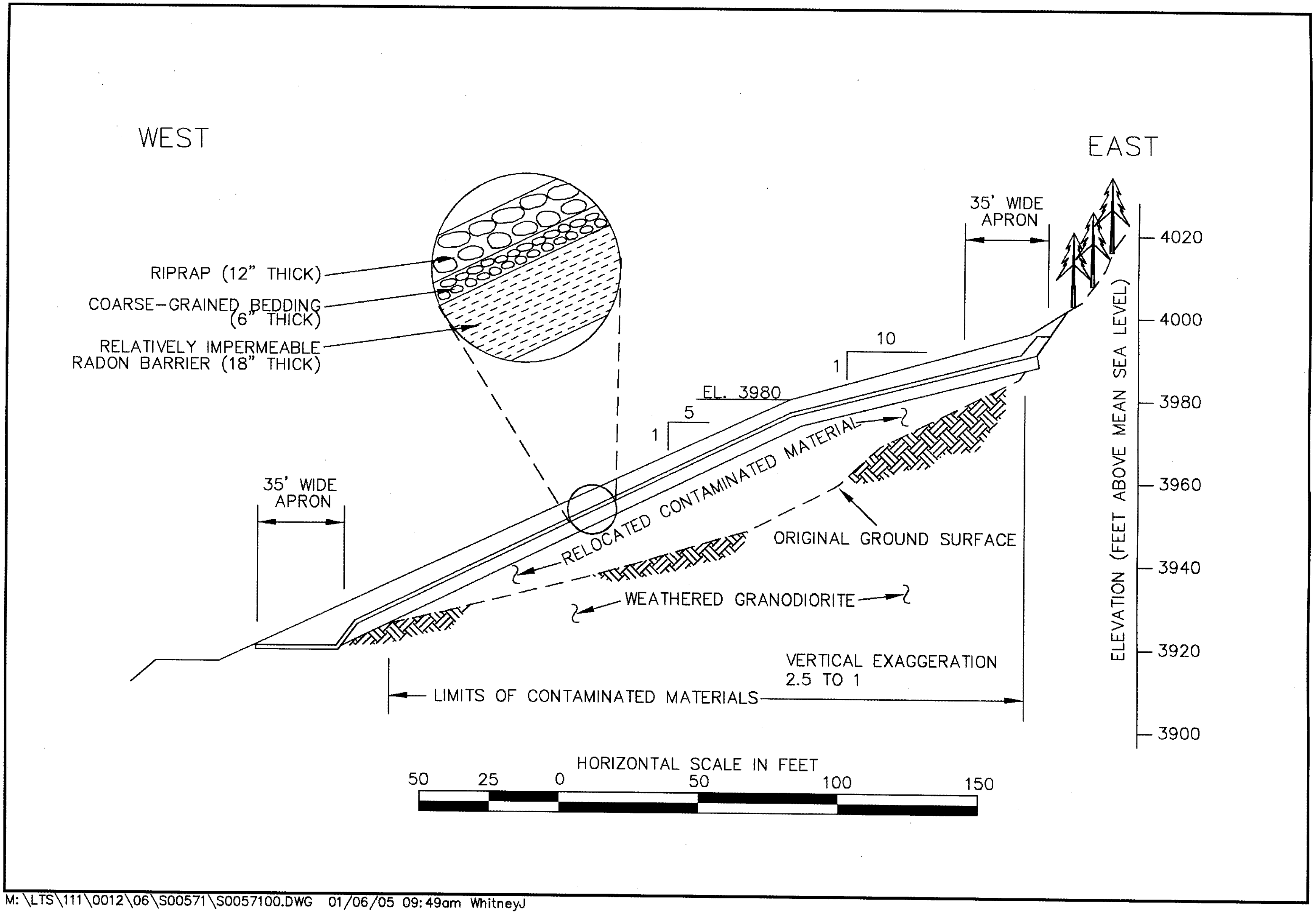

Figure 2–3. Cross Section of the Lowman, Idaho, Disposal Cell

The site is within the Boise National Forest and therefore protected from development or changes in land use. The area immediately north of the site is state-owned, acquired from the U.S. Forest Service (USFS) under Section 104 of UMTRCA for the purpose of remedial action. DOE understands that the state may eventually convey this parcel back to the USFS. There are private inholdings within the national forest on the west side of Clear Creek opposite the disposal site. Some of this land is used for cabins and summer homes. There is no private land on the east side of the creek adjacent to the site.

2.3.6 Specific Site Surveillance Features

Features described in this section are shown on Figure 2–2. Specifications for construction of monuments, markers, and signs are in the *Guidance for Implementing the Long-Term Surveillance Program for UMTRCA Title I and Title II Disposal Sites* (DOE 2001). Coordinates in Figure 2–2 for boundary monuments, survey monuments, site markers, and monitor wells were established to second-order standards and confirmed by global positioning system survey in 1999.

Boundary and Survey Monuments—Four boundary monuments (BMs) and three combined survey-boundary monuments (SM/BMs) mark corners along the site boundary (DOE 1994). These monuments are set back from each corner about 14 feet.

Survey monuments were initially established for location and elevation control during remedial action. Boundary monuments were set once the final site boundary was determined. Boundary monuments and combined survey-boundary monuments differ in their design and construction.

The four boundary monuments (BM−3, BM−5, BM−6, and BM−7) are Berntsen A−1 federal aluminum survey monuments. The bottom of each boundary monument is at a depth of 48 inches to prevent displacement by frost heaving.

Combined survey-boundary monuments (SM/BM−1, SM/BM−2, and SM/BM−4) are Berntsen RT−1 markers set in concrete. The concrete at the bottom of each SM/BM is at a depth of 38 inches.

Ceramic magnets are set in the top and bottom of each boundary monument to facilitate location by metal detector should the monument ever become buried. Magnets in the shaft and metal bars in the concrete along the side of the combined survey-boundary monuments serve a similar purpose.

Site Markers—Site markers (SMK) are unpolished granite monuments set in reinforced concrete. SMK−1 is just inside the site boundary at the southwest corner of the site. SMK−2 is on top of the disposal cell at the center and just east of the break in slope.

The markers are inscribed with a diagram to show the site boundary and location of the disposal cell within that boundary, the date of closure (September 14, 1991), the quantity of contaminated materials (222,230 dry tons), and the level of radioactivity (12 curies of radium-226).

Perimeter Signs—There are 18 perimeter signs and 1 entrance sign located along the site boundary. The signs are aluminum placards, similar to highway signs, and are mounted on steel posts set in concrete.

The perimeter signs identify the site as a uranium mill tailings repository on U.S. Government property with no trespassing allowed. In addition, the signs provide a 24-hour telephone number the public or outside agencies may use for emergency or inquiry (970-248-6070). The international symbol for radioactive materials (trefoil) on the signs warns of the potential hazard, although there is no hazard as long as the engineered cover over the tailings remains undisturbed.

The entrance sign is at the southwest corner of the site just inside the site boundary and a few feet north of site marker SMK−1. The entrance sign identifies the site as the Lowman site and provides the same information as the perimeter signs including the 24-hour telephone number.

Monitor Wells—There are 4 monitor wells (0549, 0575, 0583, and 0641) and 1 wellpoint (0029) onsite, and 2 monitor wells (0548 and 0580) just beyond the site boundary at the southwest corner of the site (Figure 2–2). All but the wellpoint are part of the monitoring network established for initial cell performance and ground water compliance monitoring. Because ground water monitoring is no longer required (see Section 3.7), all wells will eventually be decommissioned in accordance with state ground water protection requirements.

Spring—A small perennial spring (0561) is located southwest of the site (Figure 2–2**)**. Ground water recharged from rain and snowmelt discharges to Clear Creek and this spring.

2.4 Ground Water

2.4.1 Geology

The Lowman disposal site is located in rugged mountainous terrain of the Idaho Batholith. The batholith comprises several Cretaceous granitic intrusions, with biotite granodiorite exposed at the disposal site. Rock exposed near the site is fractured and weathered to varying degrees, and unweathered bedrock crops out down slope from the northwest corner of the site and in adjacent Clear Creek.

Alluvial terraces of probable Pleistocene age occur along the sides of deeply incised V-shaped stream valleys and above the occasional flat, alluviated valley floor. The disposal site lies on such a terrace approximately 80 to 100 feet above Clear Creek. A second younger and narrower alluvial terrace is present below the site approximately 15 feet above Clear Creek. The alluvial terrace beneath the disposal site is mantled with stream deposits (poorly consolidated silty and gravely sands) overlain by thin colluvium derived from hill slopes above the terrace. The stream and colluvial deposits unconformably overlie weathered bedrock. Except on relatively flat, alluviated valleys floors, such as at the Lowman town site, soils in the area are typically thin mountain loams, which are young and poorly developed.

2.4.2 Hydrology

At the site, ground water occurs in the terrace deposits and underlying weathered bedrock, which together constitute the uppermost aquifer. Depth to ground water in the uppermost aquifer beneath the site has historically ranged between 27 and 78 feet (DOE 1994). Ground water is unconfined and generally flows toward the west and southwest (Figure 2–4). Ground water is recharged from rain and snowmelt, and discharges to Clear Creek and a small perennial spring (0561) southwest of the site (DOE 1991b).

Ground water also is present along fractures in the deeper, unweathered bedrock, but yields are insufficient for the unit to qualify as an aquifer as defined in 10 CFR 40, Appendix A.

2.4.3 Ground Water Quality

Ground water quality was extensively studied during remedial action. Studies included characterization of site hydrology and geology; analysis of radioactive sands pore water, soil pore water, and upgradient and downgradient ground water chemistry; and column leach tests on the radioactive sands. Site ground water is not contaminated from uranium milling operations or natural sources.

Contaminants in ground water at designated UMTRCA Title I sites must conform to maximum concentration limits (MCLs) established by the U.S. Environmental Protection Agency (EPA) at 40 CFR Section 192.02 and 192.04, or must not exceed background concentrations.

Background ground water quality was determined at wells upgradient from the site in an area unaffected by processing operations. Ground water at the Lowman site is oxidizing with a neutral pH. No hazardous constituent in background ground water exceeded its respective MCL. In tests performed during remedial action, no potentially hazardous constituent in the radioactive sands pore fluid had a mean concentration in excess of its MCL, and only a few (barium, molybdenum, gross alpha, nitrate, and uranium) exceeded laboratory-method detection limits. Only the sand pore fluid concentration of antimony exceeded the statistical maximum for background ground water (background soil pore fluids had higher concentrations of antimony than the tailings pore fluids). Chromium, lead, and radium-226 plus radium-228 exceeded laboratory detection limits only in neutral pH leach tests conducted on the various radioactive sand products left at the site. Pore fluids in upgradient native soils contain higher concentrations of soluble metals, including antimony, than pore fluids in the radioactive sands (DOE 1991b).

Antimony was designated as the target analyte and the sole hazardous constituent with the potential to affect ground water quality downgradient from the disposal cell. Antimony does not have an MCL under 40 CFR 192, but EPA established a standard of 0.006 milligrams per liter (mg/L) under the Safe Drinking Water Act (40 CFR 141.51). The maximum background ground water concentration for antimony exceeded 0.007 mg/L only two times since 1987. The maximum background concentration prior to completion of the disposal cell was 0.007 mg/L. Therefore, this value (0.007 mg/L) for antimony was adopted as the standard for ground water compliance at the site. Although antimony was the target analyte during monitoring, other constituents in downgradient ground water also had the same median or mean concentrations as background water quality. This suggests that all ground water that was sampled was of the same population with no detectable contribution from the uncontrolled sands or, later, the disposal cell.

Granites typically contain 0.1 to 0.9 parts per million antimony, where it may occur in sulfide minerals or with niobium and tantalum in oxide minerals (Wedepohl 1978). Abundance of antimony in mineralized metamorphic rocks may be an order of magnitude higher. Several minerals in the heavy sand concentrates processed at the Lowman site (monazite, euxenite, samarskite, fergusonite, thorite, xenotime, zircon, and others) may contain antimony together with niobium and tantalum (Fairbridge 1972).

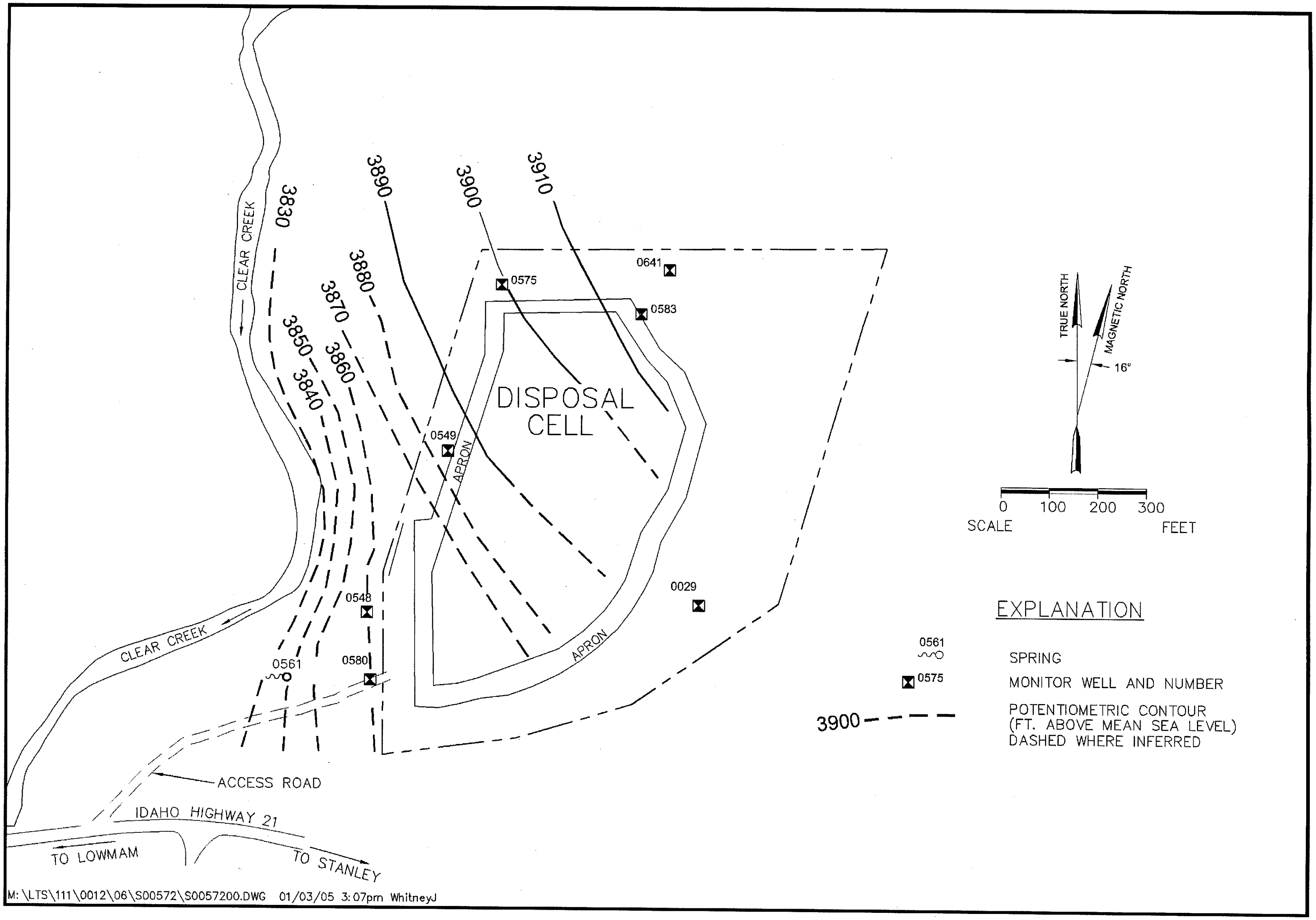

Figure 2–4. Potentiometric Surface at the Lowman, Idaho, Disposal Site

Processing-related contamination is not expected because activities at the Lowman site consisted solely of mechanical separation of minerals according to their respective densities. No chemical digestion of ores took place and no acids or other potentially contaminating chemicals were used.

Leaching and transport of hazardous constituents has not occurred. The radioactive minerals stockpiled on site, chiefly columbite, euxenite, and zircon in the form of dredged placer sands, are highly resistant to further physical and chemical weathering under surface conditions. Contaminants do not easily leach from these minerals. More specifically,

- Sand derived from the weathering of granitic source rocks and transported and deposited by streams does not contain significant amounts of easily soluble minerals. All of the soluble minerals in the stream deposits were likely removed by physical and chemical weathering before the sands were dredged.
- The small quantities of soluble minerals that may have been present in sands stored at the site would not contain significant amounts of radioactive or other contaminants.
- The heavy minerals dredged from Bear Creek and later concentrated at the mill are "resistates" or end-state weathering products, highly resistant to physical and chemical weathering that might contribute to leaching of contaminants.
- Sand piles with very high porosity were exposed at the site for 30 years (before remedial action). Infiltration through the piles did not contaminate site ground water.

DOE proposed to demonstrate ground water compliance by meeting MCLs or the background concentration for antimony, the designated hazardous constituent for the uppermost aquifer, at the downgradient wells and spring. The Remedial Action Plan (DOE 1991b) concluded that the MCLs would be met at downgradient locations because none of the constituents that exceeded laboratory-method detection limits in the tailings pore fluid were above their respective MCL. Antimony, with an adopted compliance standard of 0.007 mg/L, was left as the target analyte for demonstrating initial cell performance and ground water compliance at downgradient locations.

3.0 Long-Term Surveillance Program

3.1 General License for Long-Term Custody

With NRC concurrence in the original LTSP (Appendix A), the site was included under the general license for long-term custody [10 CFR 40.27(b)].

Although sites remediated under UMTRCA are designed and constructed to last "for up to 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years" (40 CFR 192, Subpart A, 192.02), there is no provision for termination of the general license for DOE's long-term custody of these sites (10 CFR 40.27(b)).

When DOE determines that revision of the LTSP is necessary, DOE will notify NRC. Changes to the LTSP may not conflict with the requirements of the general license.

Additionally, DOE must guarantee NRC permanent right-of-entry to the site so that NRC may conduct site inspections. Access to the Lowman site is described in Section 2.3.2.

3.2 Requirements of the General License

Requirements of the general license are at 10 CFR 40.27 and 10 CFR 40, Appendix A, Criterion 12. The requirements of the general license and the sections in this LTSP where each is addressed are listed in Table 3−1.

Table 3–1. Requirements of the General License and DOE Response

Requirement	LTSP Section
Annual site inspection	Section 3.3
Annual inspection report	Section 3.3.5
Follow-up inspections and reports of follow-up inspections	Section 3.4
Site maintenance	Section 3.5
Emergency response	Section 3.6
Environmental monitoring	Section 3.7

3.3 Annual Site Inspections

3.3.1 Frequency of Inspection

At a minimum, sites must be inspected annually to confirm the integrity of visible features at the site and to determine the need, if any, for maintenance, additional inspections, or monitoring (10 CFR 40, Appendix A, Criterion 12).

To meet the inspection requirement, DOE will inspect the Lowman site once each calendar year. DOE will notify NRC of the annual inspection at least 30 days in advance.

3.3.2 Inspection Procedure

To ensure a thorough and uniform inspection, the site is divided into three areas referred to as transects. Transects for the inspection of the Lowman site are listed in Table 3−2 and shown on Figure 3–1.

Table 3–2. Transects Used During Inspection of the Lowman, Idaho, Disposal Site

Inspection Transect	Description
Top and Side Slope of the Disposal cell	Rock-covered top surface of the disposal cell and surrounding side slope apron of riprap.
Area between the disposal cell and site boundary	Graded and revegetated areas immediately north and west of the disposal cell. Natural, undisturbed forest on steep hillsides east and south of the disposal cell.
Outlying Area	The area immediately surrounding the site in all directions up to a distance of a quarter mile.

Each transect is visually inspected during a walk-over. Within each transect, inspectors examine any specific site surveillance features that are present. Specific site surveillance features at the Lowman site include; survey and boundary monuments, entrance and perimeter signs, site markers, monitor wells, a wellpoint, and a spring (Section 2.3.6 and Appendix D). Inspectors also examine each transect for maintenance requirements, success of any previous maintenance performed, and for erosion, settling, slumping, plant or animal encroachment, human intrusion or vandalism, and other activity or phenomenon that might affect the safety, integrity, long-term performance, or institutional control of the site.

Inspectors will note changes within 0.25 mile of the site. Changes that might be significant include signs of human activity such as new development or changes in the current land use, along with any environmental changes such as changes in and along the banks of Clear Creek or the stability of slopes around the site.

Inspectors will use photographs, as necessary, to support or supplement written observations. When photographs are taken, a photograph log will be generated and will include: site name, purpose of visit (i.e., annual inspection), date taken, inspector name, photograph number, electronic photograph file name, orientation (azimuth), and caption.

3.3.3 Inspection Checklist

A pre-inspection briefing is held involving the site inspectors and other DOE and contractor personnel associated with site activities. An inspection checklist and site drawings, addressing all required site surveillance features and other pertinent site issues, are prepared and discussed. The checklist and drawings, updated each year, serve as a guide for conducting a thorough inspection and a means of documenting observations, issues, and recommendations. Minimum information contained in the checklist is provided in Appendix D.

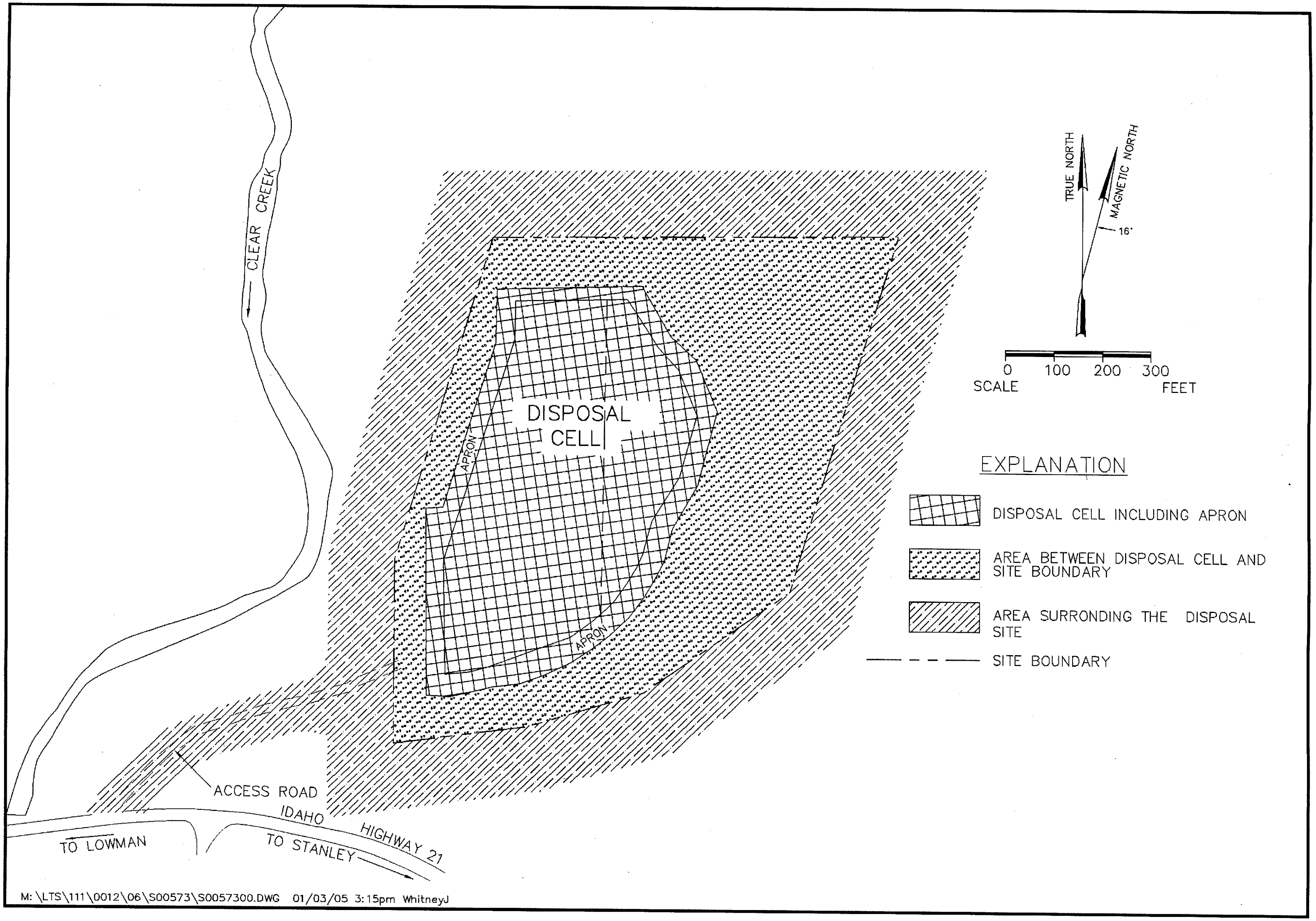

Figure 3–1. Transects Used During Inspection of the Lowman, Idaho, Disposal Site

3.3.4 Personnel

A team of two or more inspectors performs annual inspections. Inspectors are trained and experienced scientists and engineers. Training includes participation in previous site inspections. Engineers will typically be civil, geotechnical, or geological engineers. Scientists will typically be geologists, hydrologists, biologists, or environmental scientists. The inspection team will be selected on the basis of skills and experience appropriate to the issues or concerns at the site. If serious or unique problems develop at the site, additional inspectors, specialized in specific fields, may be assigned to the inspection team.

3.3.5 Annual Compliance Report

An annual regulatory compliance report for all Title I disposal sites, including results of the annual Lowman disposal site inspection, will be submitted to the NRC within 90 days of the last Title I site inspection in the calendar year (10 CFR 40, Appendix A, Criterion 12). In the event that the report cannot be submitted in accordance with 10 CFR 40, DOE will notify the NRC. Annual reports are available to the public and other agencies and include the following:

- Compliance Summary: A brief description of the inspection performed.
- Compliance Requirements: Provides the license requirements governing the site's long-term surveillance and maintenance, the regulations mandating their implementation, and the plan and procedures used to perform them.
- Compliance Review: Describes the inspection, presents findings and observations made for each item, identifies any issue or problem, discusses corrective actions required, repairs needed, and details any follow-up inspections performed.

3.4 Follow-Up Inspections

Follow-up inspections are in response to significantly new or changed conditions at the site.

3.4.1 Criteria for Follow-Up Inspections

The LTSP is required to include criteria for follow-up inspections in accordance with 10 CFR 40.27(b)(4). DOE will conduct a follow-up inspection when:

- A condition is identified during the annual inspection (or other site visit) that requires personnel, perhaps with special expertise, to return to the site to evaluate the condition and whether additional testing is necessary as a result of the condition identified.

- DOE is notified by a citizen or outside agency that conditions at the site are substantially changed.

With respect to citizens and outside agencies, DOE has established lines of communication with local law enforcement, USFS (Lowman District), and emergency response agencies to facilitate notification in the event of significant trespass, vandalism, severe storm, flood, or other natural disaster. These agencies will notify DOE or provide information should a significant event occur that might affect the security or integrity of the site.

DOE may request the assistance of local agencies to confirm the seriousness of a condition before conducting a follow-up inspection or emergency response. The public may use the 24-hour DOE telephone number posted prominently on the entrance sign to request information or to report a problem at the site.

Once a new or changed condition is identified, DOE will evaluate the information and determine whether a follow-up inspection is warranted. Conditions that may require a routine follow-up inspection include changes in vegetation, erosion, storm damage, low-impact human intrusion, minor vandalism, or the need to evaluate, design, or perform certain maintenance projects.

Conditions that threaten the safety of the site or the integrity of the disposal cell may require a more urgent follow-up inspection. Slope failure, disastrous storm, major seismic event, and deliberate human intrusion are among these conditions.

DOE will use a graded approach with respect to follow-up inspections. Urgency will be proportional to the potential seriousness of the condition. For example, a follow-up inspection to investigate or control vegetation may be postponed until a particular time during the growing season. A follow-up inspection to evaluate erosion may be scheduled to avoid snow cover.

In the event of "unusual damage or disruption" (10 CFR 40, Appendix A, Criterion 12), damage that may compromise or threaten the safety, security, or integrity of the site, DOE will

- Notify NRC pursuant to 10 CFR 40, Appendix A, Criterion 12, or 10 CFR 40.60, whichever is determined to apply;
- Begin DOE's internal occurrence notification process (DOE Order 232.1A);
- Respond with an immediate follow-up inspection or emergency response team; and
- Implement emergency measures, as necessary, to prevent or contain exposure to or dispersal of radioactive materials (Section 3.6).

3.4.2 Personnel

DOE will assign inspectors to follow-up inspections on the same basis as the annual site inspection.

3.4.3 Reports

Results of routine follow-up inspections will be in the annual Title I compliance report to NRC. Separate reports will not be issued unless DOE determines that is it advisable to notify NRC and other agencies of a potentially serious problem at the site.

If follow-up inspections are required for more urgent reasons, DOE will submit a preliminary report of the follow-up inspection to NRC within the 60-day period required by 10 CFR 40, Appendix A, Criterion 12.

3.5 Site Maintenance

Sites remediated under UMTRCA are designed and constructed so that "ongoing active maintenance is not necessary to preserve isolation" of radioactive material (10 CFR 40,

Appendix A, Criterion 12). No recurrent or regularly scheduled active maintenance is required at the Lowman disposal site. Maintenance activities, when required, will be described in annual reports to NRC.

Routine Maintenance—Routine maintenance may include: upgrade of the entrance gate; sign replacement; and erosion and vegetation control measures.

Vegetation Control—In 1994, inspectors first observed encroachment of ponderosa pine and other plants on the apron and cover of the disposal cell. It was postulated that plant roots could increase the saturated hydraulic conductivity of the relatively impermeable radon barrier that overlies the contaminated materials. If the saturated hydraulic conductivity were to increase, meteoric water could flow downward through the cover and into the tailings where it might leach contaminants into the uppermost aquifer. However, vegetation establishment has been shown to decrease water flux and may be advantageous in infiltration control (Waugh 2002). At issue was whether to institute a practice of controlling the vegetation by cutting and removal. Plant control would not be necessary if plant encroachment and increased hydraulic conductivity posed no additional risk to human health and the environment.

DOE reviewed the evaluation of the consequences of water infiltration that was prepared in support of the Remedial Action Plan. Program scientists concluded that establishment of the native forest plant community on the disposal cell might increase infiltration, but this would likely not result in leaching of contaminants from the disposal cell (DOE 2002). This conclusion was based on four lines of evidence.

1. The tailings are “resistates” or end-state weathering products, highly resistant to physical and chemical weathering that might contribute to leaching of contaminants.
2. In the tailings pore fluid, concentrations of possible contaminants with MCLs were all below their respective MCL.
3. Results of batch leach tests confirm that leaching of radium and other potential contaminants is limited at pH values expected in pore fluids even with establishment of forest. Over time, development of forest and associated organic soils might decrease pH to a value of 6 in the root zone. But only at pH values lower than would occur naturally would leaching of radium reach significant levels (the 2002 report postulates that acidic solutions with an initial pH of 2 or 3 were used in the acidic batch leaching tests because the final pH of the leach solutions ranged from about 3 to 5 and feldspars would buffer strongly acidic solutions).
4. No ground water contamination occurred at the site during the 30-year period that the radioactive sands were exposed to the environment.

Ground water protection at the site does not depend on controlling infiltration through the contaminated material in the cell. The cover is designed to shed water and thereby reduce infiltration. However, as stated in the “Water Resources Protection Strategy” section of the Remedial Action Plan, although the radon barrier is relatively impermeable, because the cell contents will not leach contaminants to the uppermost aquifer, impermeability to water percolation is not necessary for ground water protection (DOE 1991b). The Remedial Action Plan also states, “Because the radioactive sands are chemically inactive and do not weather and release hazardous constituents, controlling infiltration through the disposal cell is not critical to the design of the disposal cell" (DOE 1991b, Appendix B, Attachment 4).

Based on these observations, active intervention to prevent establishment of forest on the disposal cell is not warranted for the purpose of protecting site ground water. Therefore, DOE will not remove the vegetation encroaching on the cell cover. DOE expects forest duff to accumulate and an organic soil to form on the cover that may eventually fill the interstices in the filter layer and riprap. Along with soil formation will come the progressive establishment of the native plant community on the cover of the cell. DOE will allow this process to occur without intervention.

DOE must preserve the physical integrity of the cell to prevent dispersion of contaminated materials. The possibility of mature trees being blown down and exposing cell contents was evaluated. Ponderosa pine trees, which are beginning to establish on the cell cover, have deep root systems and do not tend to uproot when damaged by wind. Therefore, DOE does not anticipate the need to log the trees, which is an activity that could damage the cell cover. However, DOE will repair any damage that may occur to the riprap cover and underlying cover layers to maintain protection from erosion and possible consequent dispersion of cell contents. This level of maintenance is less than that required if DOE must implement active vegetation control. The need to control trees and plants will be reevaluated if unexpected problems develop.

Radon emanation will not exceed EPA standards if plant roots penetrate the radon barrier. The disposal cell contains 12 curies of radium-226, and the more-contaminated material (e.g., the abandoned stocks of processed and unprocessed sands) is located in the bottom of the cell and covered by less-contaminated material (windblown and vicinity property material). The average radon flux measured after placement of the radon barrier was 0.058 picocuries per square meter per second ($pCi/m^2/sec$); the standard is 20 $pCi/m^2/sec$ (DOE 1993). Soil formation should enhance radon attenuation by interspersing additional material in the path of radon percolating toward the cell surface and by possibly allowing moisture levels to increase in materials that lie in the path of radon beyond moisture contents used to model radon transport.

The effect of soil formation on water infiltration is not important. Soil formation may result in ultimately lowering the hydraulic conductivity of the filter layer and thus reducing the conductivity contrast between the filter layer and the underlying radon barrier. However, the cell was designed to shed water by maintaining sloped surfaces, and the hydraulic conductivity contrast cited by cell designers in the remedial action plan as essential to controlling infiltration will be enhanced by soil formation at the soil/atmosphere interface. Additionally, vegetation establishing on the cell cover will remove water through evapotransporation.

Soil formation should not create a source of sediment transport. Riprap on the cover will control erosion as demonstrated at sites covered with a soil/rock matrix, and the apron will dissipate energy and reduce the load-carrying capacity of runoff. Undisturbed slopes east and south of the site are stable, with no discernable sediment transport.

3.6 Emergency Response

Emergency response is action DOE will take in response to "unusual damage or disruption" that threatens or compromises site safety, security, or integrity (10 CFR 40, Appendix A, Criterion 12).

3.6.1 Criteria for Emergency Response

Short-term catastrophic events (i.e.; earthquakes, floods, forest blow-down) capable of causing significant site damage requiring reconstruction, although possible, are unlikely. Long-term progressive events (i.e.; erosion, settling, riprap degradation) are more likely.

Conceptually, there is a continuum in the progression from small-scale, minor, routine maintenance to large-scale intervention that might include reconstruction of the disposal cell following an unlikely disaster. Although required by 10 CFR 40.27(b)(5), criteria for initiating specific responses to progressively more serious problems are not easily established because the nature of all potential problems is unforeseeable and highly scale-dependent. The information in Table 3−3 is a guide to the actions DOE may take in response to increasingly more serious problems.

Table 3–3. DOE Criteria for Maintenance and Emergency Measures[a]

Priority	Description	Example	Response
1	Breach of disposal cell with dispersal of radioactive material.	Side slope of disposal cell fails and radioactive materials are dispersed.	Notify NRC. Immediate follow-up inspection by DOE emergency response team. Emergency actions to prevent further dispersal, recover radioactive materials, and repair breach.
2	Breach without dispersal of radioactive material.	Partial or threatened exposure of radioactive materials.	Notify NRC. Immediate follow-up inspection by DOE emergency response team. Emergency actions to repair the breach.
3	Erosion or instability of slopes surrounding the site.	Erosion on slopes above the site, possibly after forest fire, or erosion on slopes below the site due to flooding or severe storm.	Assess damage and perform risk assessment if warranted. Stabilize eroded slopes, divert runoff, or take similar actions if integrity or future performance of the disposal cell is threatened.
4	Breach of site security with or without excavation or removal of materials.	Willful human intrusion, significant vandalism.	Repair damage. Evaluate current level of institutional control and increase security if necessary.
5	Minor problems, small scale changes.	Minor erosion, undesirable plant encroachment (noxious weeds), minor vandalism, incidental trespass.	Routine maintenance.

[a]Other changes or conditions will be evaluated and treated similarly on the basis of perceived risk.

The table shows that the difference between routine maintenance and various emergency responses is primarily one of risk or urgency. Priorities are listed in the table in inverse order relative to the probability of occurrence. The highest priority responses are the least likely to be required.

3.6.2 Notification

In accordance with 10 CFR 40.60, DOE will notify

Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety and Security
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission

within 4 hours of discovery of a Priority 1 or 2 event in Table 3−3. The telephone number for the NRC Operations Center is 301-816-5100.

3.6.3 Procedure for Emergency Response

In the event of a Priority 1 or 2 Event, an emergency response team will assess the damage and decide whether evaluation of the problem is required or if immediate intervention (additional remedial action) is essential. This decision will be based on the emergency team's evaluation of the adequacy of the damaged feature to perform its intended function.

To make this decision, the emergency response team will assess and evaluate the following. The evaluation may include risk analysis.

1. Adequacy of the design specification(s) for the damaged feature to control or accommodate the observed problem(s).

2. Extent of the damage, degradation, or departure from the design (or as-built condition) of the damaged feature.

3. Ability of the feature, in its damaged condition, to withstand a design-basis event. DOE will provide NRC with a clear, technical explanation for its decision to study and evaluate or intervene with additional remedial action (DOE 2001).

3.7 Environmental Monitoring

Ground water monitoring was the only environmental monitoring required at the site (DOE 1994). The ground water monitoring network consists of six monitor wells and one spring. Background monitor wells 0583 and 0641 are hydrologically upgradient of the disposal cell. Monitor wells 0548, 0549, 0575, and 0580, and spring 0561 are downgradient of the cell. Antimony was the target analyte for demonstration of both ground water compliance and initial performance of the disposal cell. In addition, TDS, pH, calcium, chloride, iron, magnesium, manganese, potassium, sodium, and sulfate were monitored as indicator parameters to observe potential changes in ground water quality.

Revision 1 of the LTSP (DOE 1994) stated that periodic performance evaluations would be conducted to determine: (1) the effectiveness of the disposal cell ground water compliance strategy, (2) the effectiveness of the ground water monitoring plan, and (3) the need for continued ground water monitoring. As described in Revision 1, it was expected that the design of the disposal cell was sufficient to provide long-term protection against future ground water contamination that might result from infiltration and leaching; and that the proposed concentration limit for antimony, 0.007 mg/L, would be met through attenuation in subsoils beneath the disposal cell and by dilution from ground water underflow (DOE 1991b).

Monitoring results for antimony, total dissolved solids, and pH are shown as time-concentration plots in Appendix C. Ground water monitoring results since completion of the disposal cell in 1992 were evaluated to determine if the performance requirements of Revision 1 of the LTSP have been met.

Cell performance monitoring has not indicated that contaminants have leached from the cell. As explained in Sections 2.4.3 and 3.5, this is probably the result of cell contents having a low potential for leaching. As demonstrated in *Leaching Characteristics of Radioactive Sands, Long-Term Surveillance and Maintenance Program, Lowman, Idaho, Site* (DOE 2002), hazardous constituents are not readily leached from cell contents until pH falls to concentrations more acidic then would be created by passage of water through cover materials. The pH of pore water samples was not low enough to leach radium from contaminated material when compared to laboratory leachability test results. The arithmetic average of antimony in neutral batch leach tests was greater than the detection limit but less than the standard at 40 CFR 141.51.

Concentrations of antimony in ground water from all locations have been less than 0.006 mg/L with the exception of an observation of 0.017 mg/L in background monitor well 0583 in 1994. This elevated measurement was considered to be anomalous and did not indicate a change in background water quality. These results indicate that antimony has not leached from the disposal cell; or, if in the unlikely event that minor leaching has occurred, antimony is being attenuated in soils beneath the disposal cell, or diluted by underflow, as predicted.

Concentrations of other indicator parameters in ground water have generally been consistently low and provide no indication of any anomalous behavior of constituents in the vicinity of the disposal cell. The other constituents in downgradient ground water had the same median or mean concentrations as in background water. This situation was observed also with the unprotected radioactive sand piles that were left at the site and suggests that upgradient and downgradient water chemistry is of the same population with no detectable contribution from the disposal cell or, previously, the uncontrolled sands.

Based on the water quality results and the evaluation of the results, the disposal cell is (1) performing as designed and the site is in compliance with ground water protection standards; and (2) the ground water monitoring program has demonstrated that no site-related contamination exists in ground water near the site. Ground water monitoring results since 1992 have been consistent and indicate no site-related impact on ground water quality near the site, and there is no unacceptable risk to human health and the environment. Consequently, there is no need to continue ground water monitoring at the Lowman disposal site.

Upon regulatory concurrence to discontinue ground water monitoring, the six monitor wells and the small diameter wellpoint remaining at the site will be decommissioned as soon as practicable in accordance with State of Idaho ground water protection requirements.

3.8 Records and Data Management

DOE maintains records at their office in Grand Junction, Colorado, to support post closure maintenance of the closure site. These records are being maintained by DOE because they contain critical information required to protect human health and the environment, manage land and assets, protect legal interests of DOE and the public, and mitigate community impacts resulting from the cleanup of legacy waste. DOE will include records generated during site operations in the LM site collection. Inactive or retired site records will be stored in a federal records center. The records are managed in accordance with the following requirements.

- Title 44, United States Code, Chapter 29, Records Management by the Archivist of the United States and by the Administrator of General Services, Chapter 31, "Records Management by Federal Agencies,"; and Chapter 33, "Disposal of Records"
- Title 36 CFR Chapter XII, Subchapter B, "Records Management"
- DOE G 1324.5B, *Implementation Guide*
- *LM Information and Records Management Transition Guidance*

3.9 Quality Assurance

The long-term care of the Lowman disposal site and all activities related to the annual surveillance, monitoring, and maintenance of the site comply with DOE Order 414.1A, *Quality Assurance (QA)* and ANSI/ASQC E4-1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs* (*American Society for Quality Control 1994*).

QA requirements are transmitted to subcontractors through procurement documents when appropriate.

3.10 Health and Safety

Long-term surveillance and maintenance activities are conducted in accordance with health and safety procedures established for all sites managed by DOE-LM. These procedures are consistent with DOE orders, regulations, codes, and standards.

Health and safety concerns specific to work at the Lowman disposal site are in the *Office of Land and Site Management Project Safety Plan* (DOE 2004). This plan contains a list of emergency telephone numbers and addresses for local fire, hospital, ambulance, and police or sheriff agencies, as well as a map to the nearest emergency medical facility. Personnel are briefed on health and safety requirements during a pre-inspection meeting.

Maintenance subcontractors are advised of health and safety requirements through appropriate procurement documents. Subcontractors must submit health and safety plans for all activities subject to Occupational Safety and Health Administration requirements. Subcontractor health and safety plans are reviewed and approved before contracts are awarded.

End of current text

4.0 References

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Appendix A

Concurrence Documentation

Acceptance of Revision 1 of the LTSP

(Letter dated September 30, 1994)

Acceptance of Revision 2 of the LTSP

(Letter and Technical Evaluation Report dated April 6, 2005,
appended to the Long-Term Surveillance Plan
after concurrence by the
U.S. Nuclear Regulatory Commission)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 30, 1994

Mr. Albert R. Chernoff, Project Manager
Uranium Mill Tailings Remedial Action
Project Office
U. S. Department of Energy
Albuquerque Operations Office
P. O. Box 5400
Albuquerque, New Mexico 87185-5400

SUBJECT: ACCEPTANCE OF THE LONG-TERM SURVEILLANCE PLAN FOR THE LOWMAN, IDAHO SITE

Dear Mr. Chernoff:

The U.S. Nuclear Regulatory Commission staff hereby accepts the U.S. Department of Energy's (DOE's) final Long-Term Surveillance Plan (LTSP) for the Lowman, Idaho, Uranium Mill Tailings Remedial Action Project site. This action establishes the Lowman site under the general license in 10 CFR Part 40.27.

The acceptance of the LTSP is based on the staff's determination that all of the open issues have been adequately addressed in the page changes to the April 1994 final LTSP. These changes were transmitted by DOE's letters dated September 7 and 19, 1994. The LTSP for the Lowman site satisfies the requirements set forth in the Uranium Mill Tailings Radiation Control Act of 1978 for long-term surveillance of a disposal site, and all requirements in 10 CFR Part 40.27 for an LTSP.

In accordance with DOE's guidance document for long-term surveillance, all further NRC/DOE interaction on the long-term care of the Lowman site will be conducted with the DOE's Grand Junction Projects Office. If you have any questions, please contact the NRC Project Manager, Mohammad Haque at (301) 415-6640.

Sincerely,

Joseph J. Holonich

Joseph J. Holonich, Chief
High-Level Waste and Uranium
Recovery Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

cc: C. Smythe, DOE Alb
W. Woodworth, DOE Alb
D. Bierley, TAC Alb
L. Nielson, ID DEQ
K. Feldman, EPA

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 6, 2005

Mr. Thomas C. Pauling, Site Manager
U.S. Department of Energy
Office of Legacy Management
2597 B ¾ Road
Grand Junction, CO 81503

SUBJECT: ACCEPTANCE OF REVISION 2 OF THE LONG-TERM SURVEILLANCE PLAN FOR THE LOWMAN, IDAHO, SITE

Dear Mr. Pauling:

The U.S. Nuclear Regulatory Commission (NRC) accepts Revision 2 of the U.S. Department of Energy's (DOE's) Long-term Surveillance Plan (LTSP) for the Lowman, Idaho, Disposal Site. The Lowman site is a Uranium Mill Tailings Radiation Control Act, Title I site and is covered under the general license in 10 CFR 40.27. The revision to the LTSP was transmitted by your letter of February 23, 2005.

Revision 2 modified the LTSP by eliminating the requirement for ground water monitoring and allowing native vegetation to encroach on the disposal cell. Based on its review and its independent analysis, the staff concludes that the revised LTSP is acceptable. The basis for the staff's approval is documented in a Technical Evaluation Report, provided as Enclosure 1.

Please provide us with a copy of Revision 2 of the LTSP when it is finalized. If you have any questions concerning this letter please contact the NRC project manager for Lowman, Myron Fliegel. Dr. Fliegel can be reached at (301) 415-6629 or via e-mail at mhf1@nrc.gov.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

Gary S. Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No.: WM-43
Enclosure: Technical Evaluation Report

TECHNICAL EVALUATION REPORT
U.S. DEPARTMENT OF ENERGY
REQUEST TO REVISE LOWMAN LONG-TERM SURVEILLANCE PLAN

DATE:	**March 28, 2005**
DOCKET NO.	**WM-43**
LICENSE:	**10 CFR 40.27**
LICENSEE:	**U.S. Department of Energy** **Office of Legacy Management** **2597 B ¾ Road** **Grand Junction, CO 81503**
FACILITY:	**Lowman, Idaho Disposal Site**
PROJECT MANAGER:	**Myron Fliegel**
TECHNICAL REVIEWER:	**Paul Michalak**

SUMMARY AND CONCLUSIONS:

The U.S. Department of Energy (DOE) has proposed a revision to its Long-Term Surveillance Plan (LTSP) for the Lowman, Idaho Disposal Site (Lowman) that would eliminate the requirement for ground water monitoring at the site and allow native vegetation to establish on the Lowman cell cover.

The staff concludes that continued ground water monitoring at the Lowman, Idaho disposal site is no longer necessary. Although several constituents were detected in pore water samples and/or acidic/neutral leaching tests at concentrations either above background ground water levels or above their respective maximum concentration levels (MCLs), ground water monitoring at and down gradient of the sand/ore piles has not detected any constituents over their MCLs or risk-based concentrations either prior to (baseline) or subsequent to site capping. Given the absence of elevated constituents in historical ground water sampling (prior to 1991) and the continued low levels of antimony in more recent sampling results (1994 to 2004), it appears unlikely that any hazardous constituents that may leach from these sand/ores in the future will result in correspondingly high levels in the water table aquifer.

With respect to allowing native vegetation (primarily ponderosa pines) to establish itself on the Lowman cell cover, the staff concludes that it will not have a negative impact on ground water quality at the Lowman site nor on radon emanation from the cell. The expected reduction in cell cover pH from native pine growth may result in some constituent leaching; however, as stated

Enclosure

above, the absence of elevated levels of hazardous constituents in the initial ground water assessment (following approximately 36 years of sand/ore exposure to the elements) indicates that dilution in the relatively neutral ambient surficial ground water is sufficient to reduce leached constituents to levels below applicable MCLs or risk-based concentrations. The measured radon flux from the cell is sufficiently below the emanation standard that root penetration of the cover will not lead to exceeding the standard.

EVALUATION:

Termination of Ground Water Monitoring

DOE has presented three separate analytical data sets in support of its proposal to terminate ground water monitoring at Lowman: pore fluid, batch leach test analysis, and ground water quality.

Pore Fluids Analysis (1987 to 1990)
Analysis of pore fluids collected from 13 lysimeters placed at the base of sand/ore piles indicated that none of the 26 hazardous constituents tested exceeded MCLs. Vanadium was detected sporadically at levels (420 to 580 ug/L) above its 260 ug/L risk-based concentration limit; however, the estimated weighted mean concentration for vanadium in the pore fluids was 149.3 ug/L. In addition, one of the elevated values appears to have been from a background sample.

Antimony was not detected at concentrations above its 150 ug/L risk-based concentration limit; however, it was found to exceed the statistical maximum background ground water value (7 ug/L) in several pore water samples. Pore water analysis of samples from five "Black Sand" locations indicated Radium 226 levels below detection (1 pCi/L).

Batch Leaching Tests (prior to 1991)
Of the eight acidic batch leaching tests (pH ranging from about 3.12 to 4.89) conducted on various sand/ore samples, only Radium 226 and 228 levels (8.1 to 47 pCi/L) were found above the 5 pCi/L MCL limit. No acidic batch leach tests results were presented for antimony or vanadium.

Of the eight neutral batch leach tests analyzed for Radium 226 and 228, only one test indicated a Radium 226 and 228 level (5.5 pCi/L) above its 5 pCi/L concentration limit. Of the eight neutral batch leach tests analyzed for antimony, only two tests indicated concentrations (7 and 9 ug/L) above the 7 ug/L background level. No neutral batch leach tests results were presented for vanadium.

Ground Water Assessment
A ground water quality assessment was conducted at Lowman as part of the Remedial Action Plan and Site Design Stabilization of the Inactive Uranium Mill Tailings Site at Lowman, Idaho (DOE 1991). Analysis of samples of ground water collected at the site (within and down gradient of the sand/ore piles) prior to remediation activities detected no contaminants above MCLs or risked-based concentrations (virtually all constituents were below background levels). Antimony was selected as the sole target hazardous constituent because it was the only constituent that exceeded the statistical maximum background ground water value (7 ug/L) in pore water samples.

Beginning in 1994, antimony, calcium, chloride, iron, magnesium, manganese, potassium, sodium, and sulfate appear to be the only monitored constituents. Between 1994 and 2004, with a single exception, antimony concentrations have been less than or equal to 5 ug/L. During the same period, aquifer pH has been generally neutral, ranging between 6 to 8.

Discussion

Based on the data discussed above, it appears that some constituents (vanadium and antimony in ambient pore water and radium 226 and 228 in acidic leachate) may have the potential to leach from the Lowman sand/ore piles. However, because of the absence of elevated constituents in historical ground water sampling and the continued low levels of antimony in more recent sampling results, it appears unlikely that any hazardous constituents that may leach from these sand/ores in the future will result in correspondingly high levels in the water table aquifer.

Vegetation Growth on Cell Cover

Allowing native vegetation (e.g., ponderosa pines) to establish itself on the Lowman cell cover will likely reduce the cell cover's pH. Typical pine forest soils have a pH range of between 4.5 to 5.5, and it is reasonable to expect that a similar pH reduction will occur on the surficial portion of the Lowman cell cover. Such a pH reduction in the surface material could lead to some constituent leaching. In particular, DOE's acidic batch leaching test results did indicate some radium 226 and 228 leaching. However, Lowman site ground water sampling conducted between 1988 and 2004 generally indicates a relatively neutral pH for the underlying surficial aquifer. The neutral pH, coupled with the absence of elevated levels of radium 226 or 228 in the initial ground water assessment (following approximately 36 years of sand/ore exposure to the elements) indicates that dilution in the relatively neutral ambient ground water is sufficient to keep leached constituents to low levels.

Plant roots could penetrate the radon barrier if native vegetation was allowed to encroach on the cell. However, because the cell contains only 12 curies of radium-226 (with the hotter material near the bottom of the cell) and the radon flux measured after completion of the radon barrier was only 0.058 $pCi/m^2/sec$, the staff concludes that radon emanation will not exceed the standard of 20 $pCi/m^2/sec$.

DOE also evaluated the possibility of mature trees being blown down, exposing cell contents. DOE stated that ponderosa pines have deep root systems that are unlikely to be uprooted. However, DOE committed to repairing any damage that may occur to the cell cover system to maintain protection from erosion.

REFERENCES:

Environmental Sciences Laboratory, *Leaching Characteristics of Radioactive Sands, Long-Term Surveillance and Maintenance Program, Lowman, Idaho, Site*, GJO-2002-332-TAR, ESL-RPT-2002-05, May 2002. ML050690332

Pauling, Thomas C., *Draft Long-Term Surveillance Plan (Revision 2) for the Lowman, Idaho, Disposal Site*, February 23, 2005. ML050690332

U.S. Department of Energy, *Remedial Action Plan and Site Design for Stabilization of the In active Uranium Mill Tailings Site at Lowman, Idaho, Attachment 3, Groundwater Hydrology Report,* Final, UMTRA-DOE/AL 050512, September 1991. 9201060284

U.S. Department of Energy, Office of Legacy Management, *Long-Term Surveillance Plan for the U.S. Department of Energy Lowman, Idaho, (UMTRCA Title I) Disposal Site,* Draft, DOE-LM/GJ771-2005, January 2005. ML050690332

End of current text

Appendix B

Real Estate Documentation

Acquisition

Remedial action for the Lowman disposal site consisted of consolidation and stabilization of the contaminated materials on site. The State of Idaho acquired the designated site property in two portions. The larger portion of the site, comprising 37 acres, was acquired from NWI Land Management Corporation. The smaller portion of the site, comprising 4.32 acres, was acquired from the U.S. Forest Service (USFS). Acquisition of this tract was in fee simple title (DOE 1994).

Upon completion of the remedial action, the State of Idaho conveyed ownership of the disposal site, an area of 18.07 acres, to the federal government under the jurisdictional control of the DOE. DOE understands that the state still holds land north of the disposal site and may eventually re-convey this land to the USFS.

Legal Description

Disposal Site. The Lowman disposal site is located on an 18-acre parcel of land in the Southeast ¼ of Section 27, the Southwest ¼ section of Section 26, and a portion of Homestead Entry Survey No. 490; all in Township 9 North (T9N), Range 7 East (R7E), Boise Meridian, Boise County, Idaho, and is more particularly described as,

> Beginning at a U.S. Forest Service Brass Cap marking the Section Corner common to Sections 26, 27, 34, and 35, T.9 N., R. 7 E., B. M.;
>
> thence, along the section line common to Sections 26 and 27, N. 1°01’36” W. 1342.69 feet to a Bureau of Land Management Brass Cap marking Corner No. 2 of Said H.E.S. No. 490;
>
> thence, leaving said section line, S. 26°46’59” E. 96.16 feet to a point, being the Real Point of Beginning, said point being witnessed by an Aluminum Cap bearing N. 44°48’40” W., 14.16 feet from the true corner;
>
> thence, S. 54°22’20” W. 369.09 feet to a point, said point being witnessed by an Aluminum Cap bearing N. 45°15’04” W. 14.18 feet from the true corner;
>
> thence, S. 72°38’46” W. 251.45 feet to a point, said point being witnessed by an Aluminum Cap bearing N. 45°09’29” W. 14.19 feet from the true corner;
>
> thence, S. 81°43’27” W. 277.89 feet to a point, said point being witnessed by an Aluminum Cap bearing N. 45°21’48” E. 14.27 feet from the true corner;
>
> thence, N. 0°45’14” W. 380.03 feet to a point, said point being witnessed by an Aluminum Cap bearing S. 45°29’56” E. 14.09 feet from the true corner;
>
> thence, N. 15°49’57” E. 696.42 feet to a point, said point being witnessed by an Aluminum Cap bearing S. 45°32’26” E. 14.24 feet from the true corner;
>
> thence, N. 88°38’10” E. 840.24 feet to a point, said point being witnessed by an Aluminum Cap bearing S. 44°29’21” W. 14.20 feet from the true corner;

thence, S. 15°50’35” W. 769.22 feet to the Real Point of Beginning;
said parcel contains 18.08 acres, more or less;

said parcel is subject to any rights-of-ways or easement of record, or in use.

Repository

The deed transferring the Lowman disposal site to the Federal government was recorded as Instrument No. 153307, on September 12, 1994, at Boise, Idaho.

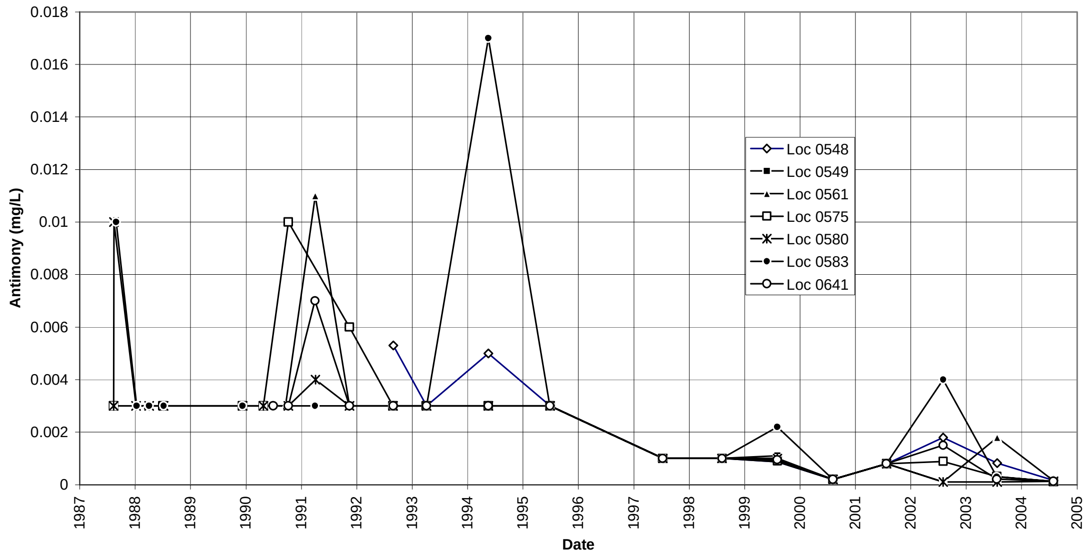
Documentation and correspondence related to property acquisition are on file at the U.S. Department of Energy office in Grand Junction, Colorado (2597 B ¾ Road, Grand Junction, Colorado 81503).

Appendix C

Time-Concentration Plots

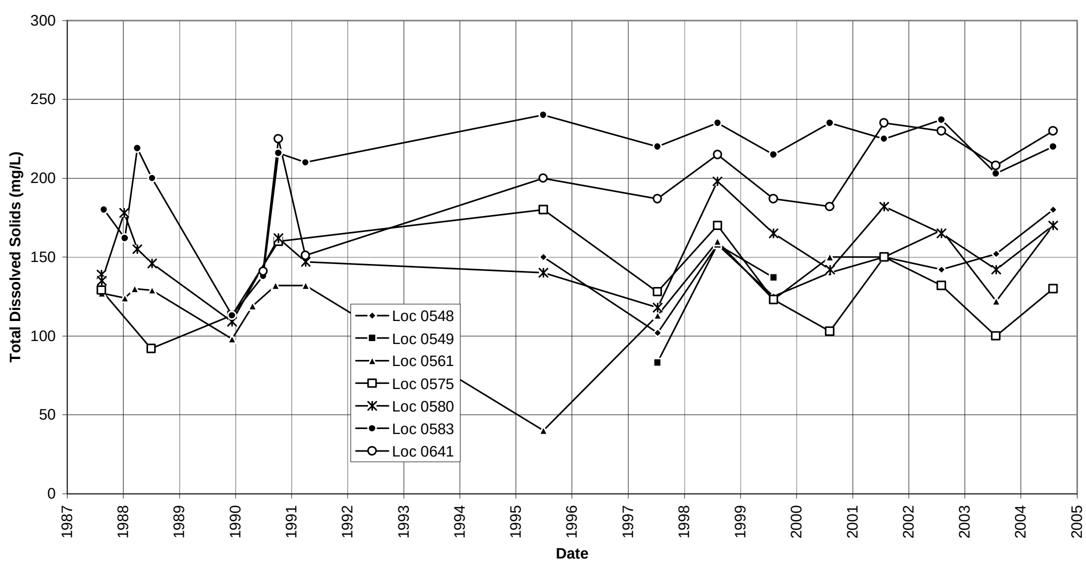
Lowman, Idaho, Disposal Site

Antimony Concentration



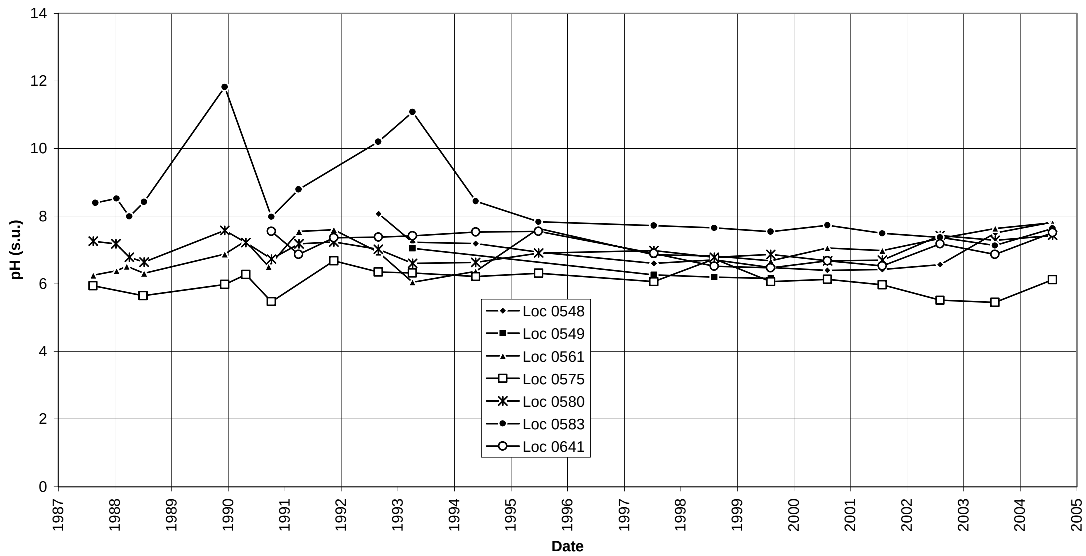
Lowman, Idaho, Disposal Site

Total Dissolved Solids Concentration



Lowman, Idaho, Disposal Site

pH Concentration



Appendix D

Inspection Checklist

Inspection Checklist Items for the Lowman, Idaho, Disposal Site

The inspection will, at a minimum, address the following activities and items.

- Scheduled Date of Inspection
- Scheduled Inspectors
- Protocols: Contact the State of Idaho to inform them of the inspection and to see if a representative will attend the inspection.
- Access: Access is from a public highway and no prior contacts are necessary.
- Safety Briefing: A tailgate safety meeting is required before performing any inspection activities.
- Inspection of the Disposal Cell Top and Side Slopes Transect: Check the condition of the features of this transect pertaining to site integrity and long-term performance. Observations will include evidence of trespassing, settling, slumping, erosion, rock degradation, and vegetation encroachment, including noxious weeds.
- Inspection of the Area Between the Disposal Cell and the Site Boundary Transect: Observations will include evidence of trespassing and erosion, the condition of erosion control features, and the types and extent of noxious weeds.
- Inspection of the Outlying Area Transect: Observations will include evidence of erosion or land use within 0.25 mile of the site that could adversely impact the integrity or security of the site, the condition of erosion control features on the north side of the site, and the types and extent of noxious weeds that could encroach on DOE property.
- Inspection of Specific Site Surveillance Features: Observations will include the condition and security (if applicable) of the following features.
    - Access road: An approximately 650-foot long hard-packed gravel road off of State Highway 21.
    - Access gate: A locked steel gate located approximately 150 feet from State Highway 21.
    - Entrance sign (1): Aluminum sign mounted on a steel post at the southwest corner of the site.
    - Perimeter signs (18): Aluminum signs mounted on steel posts located along the property boundary,
    - Site markers (2): Granite markers SMK–1 at the site entrance and SMK–2 on the cell top.
    - Boundary monuments (4): Aluminum Berntsen A-1 federal survey monuments BM–3 (northeast corner of the site), BM–5 (southeast corner of the site), BM–6 (south end of the site), and BM–7 (southwest corner of the site).
    - Combined boundary/survey monuments (3): Aluminum Berntsen RT-1 markers SM−1/BM–1 (southwest portion of the site against the west boundary), SM−2/BM−2 (northwest corner of the site), and SM−4/BM−4 (southeast portion of the site against the east boundary).
    - Monitor wells (6): 0548 (POC), 0549 (POC), 0575 (POC), 0580 (POC), 0583 (background), and 0641 (background), until they are decommissioned.

End of current text