DOE/AL/62350-247
REV. 2

LONG-TERM SURVEILLANCE PLAN FOR THE MAYBELL, COLORADO DISPOSAL SITE

JULY 1999

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Prepared for
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Environmental Restoration Division
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LIST OF ACRONYMS

Acronym	Definition
BMP	best management practice
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
LTSP	long-term surveillance plan
MCL	maximum concentration limit
NRC	U.S. Nuclear Regulatory Commission
POC	point of compliance
QA	quality assurance
RAP	remedial action plan
TAC	Technical Assistance Contractor
UMTRA	Uranium Mill Tailings Remedial Action

CHANGE HISTORY

Document version	Date	Pages/comments
Rev. 0	September 1997	Initial version prepared for DOE and NRC review.
Rev. 0, Ver. 2	December 1997	Response to DOE review comments.
Rev 1, Ver 0	July 1998	Response to NRC review comments
Rev 1, Ver 1	December 1998	Response to DOE review comments
Rev 1, Ver 2	February 1999	

1.0 PURPOSE AND SCOPE

This long-term surveillance plan (LTSP) describes the U.S. Department of Energy's (DOE) long-term care program for the Uranium Mill Tailings Remedial Action (UMTRA) Project Maybell disposal site in Moffat County, Colorado.

The U.S. Nuclear Regulatory Commission (NRC) has developed regulations for the issuance of a general license for the custody and long-term care of UMTRA Project disposal sites in 10 CFR Part 40. The purpose of this general license is to ensure that the UMTRA Project disposal sites are cared for in a manner that protects the public health and safety and the environment. Before each disposal site is licensed, the NRC requires the DOE to submit a site-specific LTSP. The DOE prepared this LTSP to meet this requirement for the Maybell disposal site. The general license becomes effective when the NRC concurs with the DOE's determination that remedial action is complete for the Maybell site and the NRC formally accepts this LTSP.

This document describes the long-term surveillance program the DOE will implement to ensure the Maybell disposal site performs as designed. The program is based on site inspections to identify threats to disposal cell integrity. The LTSP is based on the UMTRA Project long-term surveillance program guidance document (DOE, 1996a) and meets the requirements of 10 CFR §40.27(b) and 40 CFR §192.03.

2.0 FINAL SITE CONDITIONS

2.1. SITE HISTORY

The Maybell site was established by the Trace Element Corporation in 1955. After Umetco assumed control of the site, milling operations began in 1957 using uranium ore from nearby open pit mines. During the 7 years of operation by Umetco, the mill processed approximately 2.6 million tons of ore. After the mill shut down in November 1964, Umetco dismantled it and began stabilizing the tailings in 1971 in accordance with Colorado regulations.

The DOE began constructing the disposal cell in 1995. The existing tailings were left in place, but reshaped. Windblown contaminated material and other residual radioactive materials (such as contaminated demolition debris, soil, and vicinity property materials) were placed on top of the existing tailings. Cell construction was completed in 1998 with the placement of a radon/infiltration barrier and frost and erosion protection layers.

2.2 GENERAL DESCRIPTION OF THE SITE VICINITY

The Maybell site is approximately 25 miles (mi) (40 kilometers [km]) west of Craig, Colorado, in Moffat County (Figure 2.1). The site is 5 mi (8 km) north of the Yampa River. Running east-west, U.S. Highway 40 is approximately 2 mi (3 km) south of the site (Figure 2.2). The small town of Maybell is about 5-road mi (8 km) southwest of the site. The nearest residence is 2.9 mi (4.7 km) southwest of the site. The area is relatively flat with some low, flat-topped mesas.

The UMTRA Maybell disposal cell is located in a mining district, which contains numerous abandoned uranium mines. Rob Pit is approximately 2000 feet (ft) (610 meters [m]) west of the Maybell disposal cell. Rob Pit is currently a large open hole with standing water at the bottom. Johnson Pit is approximately 1000 ft (305 m) south of the Maybell cell. Johnson Pit has been partially backfilled with mine overburden soil and rock. Several reclaimed and unreclaimed overburden piles are located in the area of the Maybell site. A heap leach pile is located approximately 0.75 mi (1.2 km) to the west.

The climate in the vicinity of the Maybell disposal cell is semiarid. The average annual precipitation in the town of Maybell is 11.7 inches (29.7 centimeters [cm]) and is distributed relatively uniformly throughout the year. The snowfall accumulation is approximately 67 inches (170 cm) per year and generally does not result in rapid runoff. Data from the airport in Craig, Colorado show the prevailing winds are from the west-southwest, and to a lesser degree from the east-northeast. The prevailing wind at the tailings pile is easterly (URS Company, 1976).

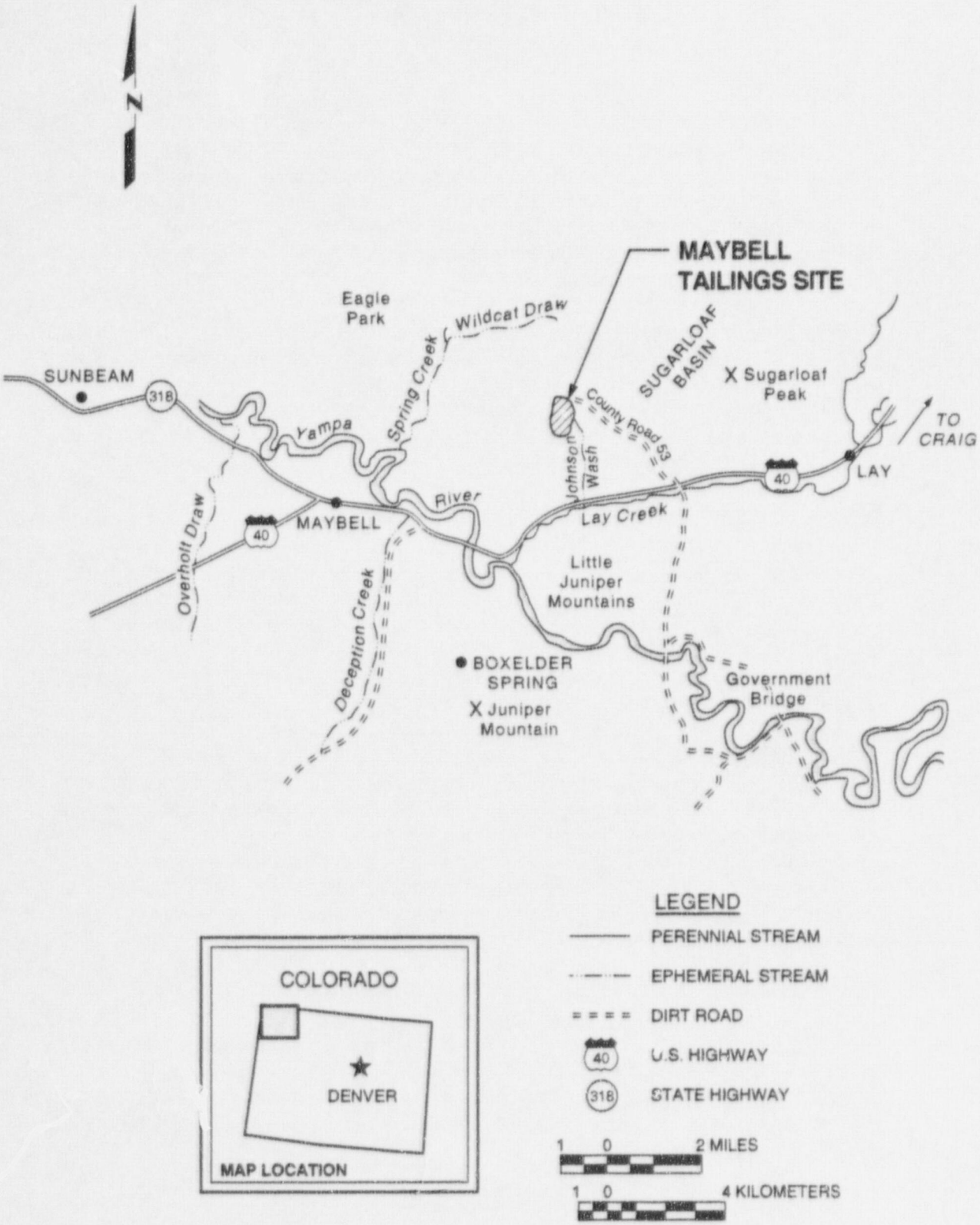


FIGURE 2.1
DISPOSAL SITE LOCATION
MAYBELL, COLORADO, SITE

MAC: SITE/MAY/LTSP/MAY-SITELOC

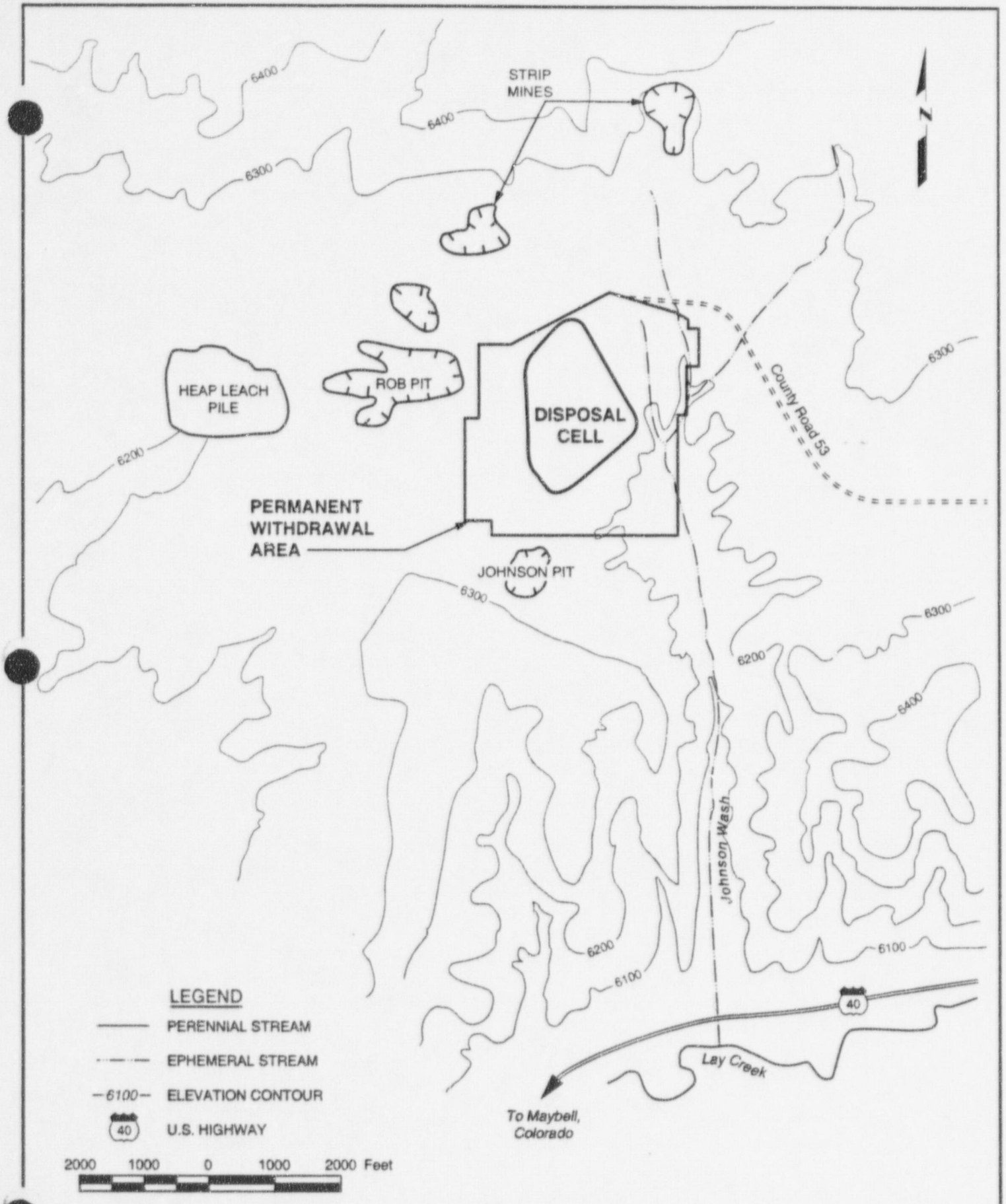


FIGURE 2.2
DISPOSAL CELL LOCATION
MAYBELL, COLORADO, SITE

MAC: SITE/MAY/LTSP/FLDPLNBOUN

2.3 DISPOSAL SITE DESCRIPTION

2.3.1 Site ownership and legal description

Remedial action at the Maybell, Colorado, UMTRA site consisted of onsite consolidation and stabilization of the contaminated materials. Under the requirements of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (42 USC §7901 *et seq.*), as amended, the state of Colorado acquired a portion (two properties) of the designated site property.

These properties comprise the southwest portion of the designated site. They are referred to as the Howsam and Gordon properties. The state acquired them in fee simple from the private owners. These properties were subsequently transferred to the federal government. The two properties comprise approximately 110 acres (ac) (45 hectares [ha]). Attachment 1 provides the legal description for these two properties.

2.3.2 Directions to the disposal site

Follow these directions to the disposal site:

- Begin at the intersection of State Highway 13 and U.S. Highway 40 (on the west side of Craig, Colorado).
- Drive west on Highway 40 20 mi (32 km) to a gravel road on the left (south) with a sign to Juniper Springs.
- Go 0.2 mi (0.3 km) further to an unmarked (from the highway) gravel road on the right (north).
- Turn right onto the gravel road and go over the cattle guard.
- Follow the road sign (County Road 53) 3 mi (5-km) to the site.

2.3.3 Description of surface conditions

The Maybell disposal site is located on approximately 265 ac (107 ha) of land (Plate 1). The disposal cell itself covers approximately 66 ac (27 ha). The completion report contains a detailed description of the final site conditions including the results of the final site topographic survey (MK-F, 1999). The site is enclosed with a 4-strand wire fence (except on the east side), and the perimeter is marked with warning signs, boundary markers, and survey monuments. The tailings and other contaminated materials are contained in a rock-covered disposal cell in the center of the site.

The disposal cell is in a small valley approximately 2.4 mi (3.8 km) long (east to west) and 2 mi (3.2 km) wide (north to south). The center of the valley where the disposal site is located is at an elevation of about 6200 ft (1900 m) mean sea level. The dominant surface feature on the Maybell site is Johnson Wash, which drains to the south into Lay Creek at a point just south of US 40. The main channel of

Johnson Wash is just east of the disposal cell. Original surface topography on the site reflects drainage to the south and east into Johnson Wash. Several small tributary branches of Johnson Wash begin south of the disposal cell and drain toward the east-southeast. Erosion protection rock has been installed in four of these drainages, designated as gullies 1 through 4 on the design drawings (see drawing MAY-PS-10-0211).

During final site grading, all areas were contoured to promote drainage away from the disposal cell. The DOE used a mix of grasses indigenous to the area to revegetate all disturbed areas of the disposal site not covered by riprap.

At the completion of remedial action, the DOE documented final disposal site conditions with site maps, as-built drawings, and ground and aerial photographs (MK-F, 1999). These documents illustrate baseline conditions for comparison to future disposal site conditions. Lithologic logs and construction data for monitor wells drilled on and around the disposal site provide detailed information on site hydrogeology. All original drawings, site maps, well logs, and photographs are part of the Maybell permanent site file.

2.3.4 Permanent site-surveillance features

Survey and boundary monuments, site markers, and warning signs are the permanent, long-term surveillance features of the Maybell disposal cell. Plate 1 shows the locations of these features. Table 2.1 provides their survey grid coordinates. Typical construction and installation specifications for these features are shown in the long-term surveillance guidance (DOE, 1996a) and described in the completion report (MK-F, 1999).

Table 2.1 Locations of permanent surveillance features,

Feature	Location coordinates
Site markers	
SMK-1	N 59.655.83, E 60,227.19
SMK-2	N 57.996.71, E 59.800.20
Permanent survey monuments	
MKE-PM07	N 57.999.74, E 60.999.93
MKE-PM08	N 56.499.94, E 59.350.04
Boundary monuments	
BM-1	N 58.931.06, E 58.248.97
BM-2	N 56.181.36, E 58.066.68
BM-3	N 56.019.53, E 60.650.95
BM-4	N 59.309.67, E 61.536.62

From MK-F, 1999.

Two survey monuments establish permanent horizontal control based on the Colorado State Plane Coordinate System (Central Zone) and are referenced to the Project Survey Control Point. The two permanent survey monuments are Berntsen

RT-1 markers set in concrete with the monument approximately 4 inches (in) (centimeters [cm]) above ground level. Magnets in the markers will permit easier detection if they become buried over time. The survey monument identification number is stamped on the top of the metal cap.

Four boundary monuments lie along the final site boundary. These monuments are Berntsen Model A-1 survey monuments set in concrete with the monument approximately 1 inch (25 millimeter [mm]) above ground level. Magnets in the A-1 monuments will allow easier detection if they become buried. The boundary monument identification number is stamped on the top of the metal cap.

Two unpolished granite markers with an incised message identify the Maybell disposal cell. The message includes a drawing showing the general location of the stabilized disposal cell within the site boundaries, the date of closure, the weight of tailings (4,291,928 dry tons), and the amount of radioactivity (455 curies of radium-226). Site marker SMK-1 is set in reinforced concrete that extends 3 ft (0.9 m) below the ground surface. Site marker SMK-2, at the crest of the disposal cell, is set in reinforced concrete that extends to the top of the frost-protection barrier.

The DOE-posted perimeter warning signs (18 x 24 inches [610 x 460 mm]) indicate property use around the disposal site perimeter. The perimeter warning signs are located at approximately 200-ft (60-m) intervals. The site entrance sign displaying the DOE 24-hour telephone number is at the north access gate near site marker SMK-1.

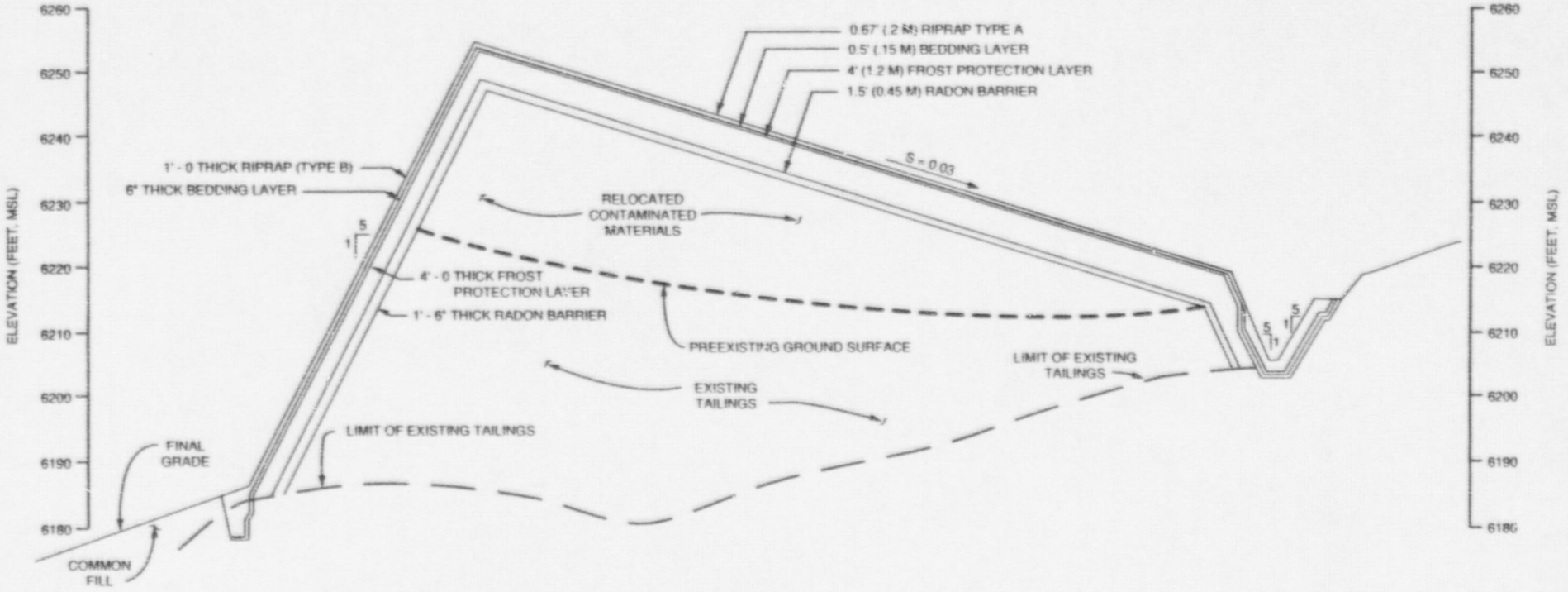
2.4 DISPOSAL CELL DESIGN

The disposal cell area is not subject to any significant hazard from slope failure processes such as landslides, debris flows, mudflows, and rock falls. The geomorphic processes posing a potential hazard to the stabilized disposal cell are ephemeral drainage channel changes, low-gradient slope erosion, and wind erosion. However, these processes are not reasonably expected to affect the cell within the next 1000 years or in any case for at least 200 years.

- The disposal cell is above grade and is approximately 30 ft (9 m) above the surrounding terrain. The disposal cell contains approximately 3,500,000 cubic yards (y^3) (2,676,000 cubic m [m^3]) of stabilized-in-place and relocated tailings and other residual radioactive materials, primarily contaminated soil and demolition debris. The disposal cell is capped with an approximate 7-ft (2.13-m)-thick multiple-component cover.

Figure 2.3 shows a typical cross section of the disposal cell and cover. The cover consists of the following layers, starting at the bottom of the cover:

- A 1.5-ft (0.45-m)-thick radon/infiltration barrier, comprised of bentonite-amended clayey soil placed on top of the contaminated materials.



NOTE: ELEVATIONS ARE GIVEN IN FEET.
TO CONVERT FROM FEET TO METERS,
MULTIPLY FEET BY 0.3048.

FIGURE 2.3
TYPICAL CROSS SECTION
MAYBELL, COLORADO, DISPOSAL CELL

- A 4-ft (1.2-m)-thick layer of compacted soil to prevent the radon/infiltration barrier from the adverse effects of freeze-thaw cycles.

- A 0.5-ft (0.15-m)-thick layer of coarse-grained bedding material to act as a capillary break and filter, and to promote drainage of infiltrating water away from the radon/infiltration barrier.

- An 8- to 12- inch (20- to 30-cm)-thick layer of riprap (rock) to prevent wind and water erosion of the underlying materials.

The topslope of the cell slopes to the west at a grade of 3 percent. Runoff from the topslope enters a rock-lined ditch adjacent to the cell. The sideslopes of the disposal cell are at a 20 percent grade and are protected by riprap aprons on the south and east sides. On the north and west sides of the cell, the sideslopes are part of the main ditch that will carry surface runoff from the cell and adjacent off-cell areas. All upland flow will be intercepted and routed around the disposal cell by these ditches. Detailed engineering drawings of the disposal cell are in the site completion report (MK-F, 1999).

2.5 GROUND WATER CHARACTERIZATION

The DOE has characterized the hydrogeology, aquifer properties, geochemical conditions, water quality, and water resources at the Maybell disposal site. This information is summarized below, with details provided in Attachments 3 and 4 of the RAP (DOE, 1994b).

2.5.1 Hydrogeologic setting

The disposal site is underlain by the Tertiary Browns Park Formation of Miocene age, which unconformably overlies truncated rocks of the Cretaceous Mancos Shale. The Browns Park Formation consists of poorly cemented fluviolacustrine and eolian sandstones. These sandstones contain small lenses of siltstone, claystone, and some well-cemented intervals of calcite. The underlying Mancos Shale consists of relatively impermeable dark gray marine shale, with lenticular sandstone beds near the top and base.

The uppermost aquifer is the upper sandstone unit of the Browns Park Formation. The top of the unconfined ground water table occurs at depths ranging from 35-ft (11 m) to greater than 300 ft (91 m) beneath the ground surface. The average hydraulic conductivity is 1.7 ft per day (ft/day) ($6x10^{-4}$ centimeters per second [cm/s]) and the average linear ground water velocity is 0.17 ft/day ($6x10^{-5}$ cm/s).

The Maybell site is in a recharge area with a limited upslope catchment basin. Recharge to the Browns Park Formation aquifer principally is from rain or snow infiltration. Ground water from the Browns Park Formation discharges to the Yampa River alluvial aquifer system. The potentiometric surface indicates ground water is flowing southwest away from the disposal site.

2.5.2 Background ground water quality

Background ground water quality up-gradient and down-gradient from the Maybell tailings area is variable because it has been naturally affected by extensive low-grade uranium mineralization in the Browns Park Formation. Uranium exploration and open pit mining operations also have affected ground water quality. Up-gradient background ground water in the Browns Park Formation has maximum observed concentrations of arsenic, cadmium, lead, molybdenum, selenium, and uranium, and activities of radium-226 and -228 that exceed the U.S. Environmental Protection Agency (EPA) maximum concentration limit (MCL) (40 CFR Part 192). Down-gradient background ground water in the Browns Park Formation has maximum observed concentrations of arsenic, cadmium, lead, molybdenum, nitrate, selenium, and uranium that exceed the EPA MCLs. The integration of data from both up-gradient and uncontaminated down-gradient monitor wells yields a more complete picture of the variable (and often poor) quality of the ground water present in the Browns Park Formation.

2.5.3 Ground water levels

Analysis of the ground water conditions at the site showed that the uranium milling/processing operations impacted ground water levels in the vicinity of the disposal cell and that construction-related drainage from the cell also would impact the water levels. Residual radioactive materials at the Maybell processing site were stabilized in place. There appears to be a residual ground water mound as a result of the seven years of leakage from the tailings pond to the ground water during the milling operations. The mound is still dissipating 30 years after the mill closed. Current ground water levels beneath the tailings pile are estimated to be 80 to 90 ft (24 to 27 m) above levels that existed prior to mill operation. Mounding of the ground water table presently appears to extend several thousand feet in all directions from the existing tailings pile. It is anticipated that this mound will take several hundred years to completely dissipate.

During and after remedial action construction, as the tailings consolidate under the load from the relocated tailings and the cover, water will be released that will impact water levels below the disposal cell. This transient drainage from construction of the disposal cell will be superimposed on the milling-related ground water mound.

2.6 GROUND WATER PROTECTION

2.6.1 Surface remediation (Subpart A)

Ground water monitoring for compliance

Evaluating site characterization data shows that a program to monitor ground water for demonstration of disposal cell performance based on a set of concentration limits and a point of compliance (POC) is not appropriate because ground water in the uppermost aquifer is of limited use, and a narrative supplemental standard has been applied to the site (40 CFR §192.21(g)). The limited use designation is based on the fact that ground water in the uppermost aquifer is not a current or potential source of drinking water in the area because it contains widespread ambient contamination (related to mineralization in the area and associated exploration and mining activities) that cannot be cleaned up using methods reasonably employed by public water supply systems (40 CFR §192.11(e)). Defining concentration limits and a POC would not provide further protection to human health and the environment. Therefore, ground water monitoring will not be required to demonstrate compliance with the ground water protection standards.

Post-closure ground water monitoring

The DOE plans to perform post-closure ground water level monitoring down-gradient from the disposal cell as a "best management practice" (BMP). The purpose of this BMP monitoring is to measure changes in ground water levels in the down-gradient monitor well 695 that may be related to transient drainage caused by disposal cell construction (Plate 1).

Computer modeling to simulate existing ground water conditions at the Maybell site and predict the effects of transient drainage resulting from remedial action construction has been performed (Calculation No. MAY-03-96-12-05-00) (DOE, 1996b). The modeling has provided a better understanding of site ground water conditions, the rate of dissipation of the ground water mound beneath the site, and the potential water level impacts of transient drainage.

Based on this understanding, evaluation of transient drainage by monitoring ground water levels down-gradient from the site may not be definitive because the potential water level increase resulting from transient drainage would be masked by the predicted water level decrease due to dissipation of the ground water mound. That in turn would be affected by the natural fluctuation of ground water levels in the area and the natural infiltration flux through the cover of the disposal cell.

Consequently, an increase in water level in monitor well 695 would be dependent on several variables, which may or may not be directly related to transient drainage, and may not have any direct correlation to disposal cell performance.

In an attempt to evaluate this phenomenon, dataloggers have been installed in several monitor wells in the vicinity of the disposal cell. Monitor well 695 is just down-gradient from the disposal cell and is the control well for monitoring and model correlation. Ground water levels have been continuously measured in monitor well 695 since November 1995 (Figure 2.4). A datalogger has recently been installed in monitor well 696, just southwest of monitor well 695, and will act as a backup for monitor well 695. A datalogger has also been operating in monitor well 676, cross-gradient from the disposal cell, since November 1995 to provide backup data. A datalogger in monitor well 601, approximately one mile northeast (up-gradient) of the disposal cell, measures background levels which will be used to determine regional fluctuations and trends in the ground water flow pattern in the area. Data from this well are sporadic due to past equipment problems.

Evaluation of results of datalogger information from monitor wells 695, 601, and 676 during the period from November 1995 through May 1999 shows a slight increasing trend of ground water levels in mid-1997 (Figure 2.4. Available data from up-gradient background monitor well 601 also reflects this increase and this indicates the response in monitor well 695 is likely from regional causes rather than being directly related to disposal cell phenomena. On-going monitoring data from monitor well 601 should verify the regional ground water level patterns. Results of ground water level monitoring will be in DOE annual report to NRC.

The decision to discontinue water level monitoring and decommission the monitor wells in the vicinity of the Maybell site will be based on evaluation of datalogger information downloaded on a quarterly schedule for a five year period (until 2004). This evaluation will take into account the variables involved and the uncertainties of the predicted and natural trends of the data.

Key factors in the decision to terminate monitoring will be whether: (1) water levels in the down- and cross-gradient wells continue to vary with water levels in the distant up-gradient well, (2) it is possible to identify the contribution to water level from transient drainage in the noise created by atmospheric (barometric) effects, and (3) the transient water contribution can be separated from decrease of approximately two feet in water level due to dissipation of the ground water mound (See Section 3.5.4). If any of these conditions exist, it can be assumed that the contribution from transient drainage is small or measurement of transient water is not feasible using water level measurements.

BMP monitoring described above is not required under the regulations for the purpose of demonstrating compliance with the EPA ground water protection standards (40 CFR §192.02) and will not trigger corrective action (40 CFR §192.04).

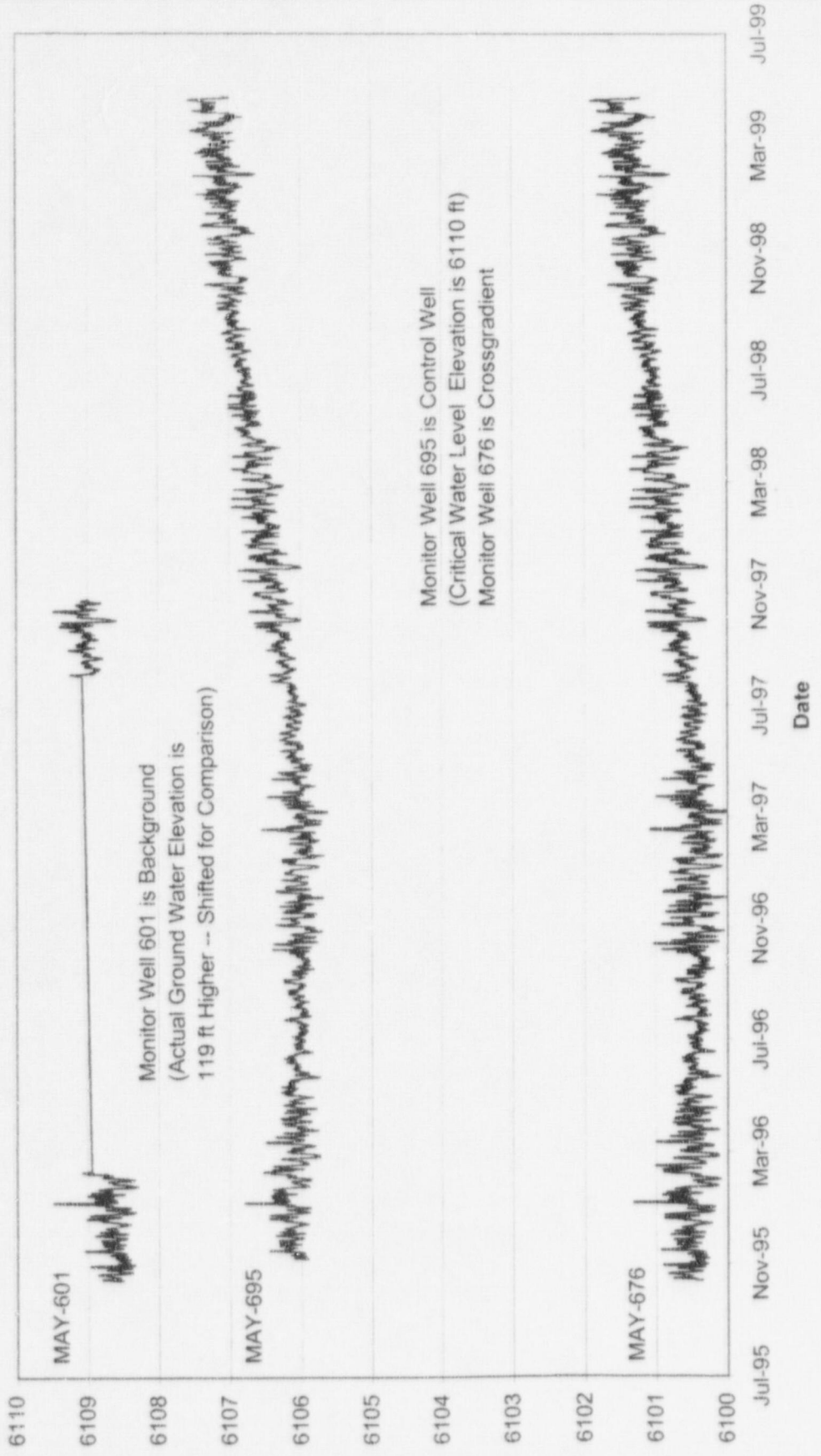
2.6.2 Ground water cleanup (Subpart B)

The ground water compliance strategy for Subpart B is no remediation. This strategy is based on ground water in the uppermost aquifer being classified as limited use, thus providing the basis for the application of supplemental standards (40 CFR §192.21(g) and §192.11(e)). Ground water in the uppermost aquifer is not

a current or potential source of drinking water in the area because it contains widespread ambient contamination caused by naturally occurring uranium mineralization and from the effects of broad-scale human activity unrelated to uranium-milling operations at the site (uranium exploration and mining activities). This ground water cannot be cleaned up using treatment methods reasonably employed in public water supply systems.

Since ground water remediation is not planned for the Maybell processing site, ground water monitoring will not be required for demonstration of compliance with the ground water protection standards. Also, there is no risk to human health and the environment because there are no known exposure pathways for ground water from the uppermost aquifer to a receptor.

Figure 2.4
Datalogger Ground Water Elevations,
Maybell, Colorado Site



3.0 SITE INSPECTIONS

The DOE will inspect the Maybell disposal site to detect progressive change caused by slow-acting natural processes and to identify potential problems before the need for extensive maintenance, repairs, or corrective action. Inspections also may be conducted to follow up on events or conditions that have affected the disposal site (Attachment 2). The DOE will compare the findings from these inspections to initial baseline conditions to identify changes over time and to provide a basis for future inspections, repairs, and corrective actions. This process is shown in Figure 3.1. Custodial maintenance and repair are described in Section 4.0. Corrective action is detailed in Section 5.0.

3.1 INSPECTION FREQUENCY

The DOE will inspect the Maybell disposal site annually. The DOE may schedule more frequent inspections, if necessary. The DOE will notify the NRC and state of the inspection schedule.

3.2 INSPECTION TEAM

The inspection team will consist of a minimum of two inspectors qualified to inspect disposal cell integrity and make preliminary assessments of modifying processes that could adversely affect the disposal cell.

If problems are observed that require more investigation, follow-up inspections will be performed and teams will include one or more technical specialists in appropriate disciplines to assess the problems under investigation. For example, a follow-up inspection by a plant specialist may be required to evaluate reports of significant plant growth on the rock cover or a soils scientist or geomorphologist may be needed to evaluate erosion processes.

3.3 SITE INSPECTION PROCEDURES

Before inspections, inspectors will conduct a preinspection briefing. The long-term surveillance program guidance document contains information useful in preparing for inspections (DOE, 1996a).

Site inspections will cover the disposal cell, the area immediately surrounding the disposal site, and the immediate offsite areas. Site inspections will be thorough enough to identify significant changes or active modifying processes that potentially could adversely impact the disposal cell. Surveillance should be performed to identify unanticipated effects of modifying processes such as gully formation, slope erosion, changes to the rock cover, ephemeral drainage channel changes, and significant modifications by humans, animals, or plants.

Inspectors will evaluate the integrity of the disposal cell by walking a series of transects around the perimeter and over the rock cover. Sufficient transects, at

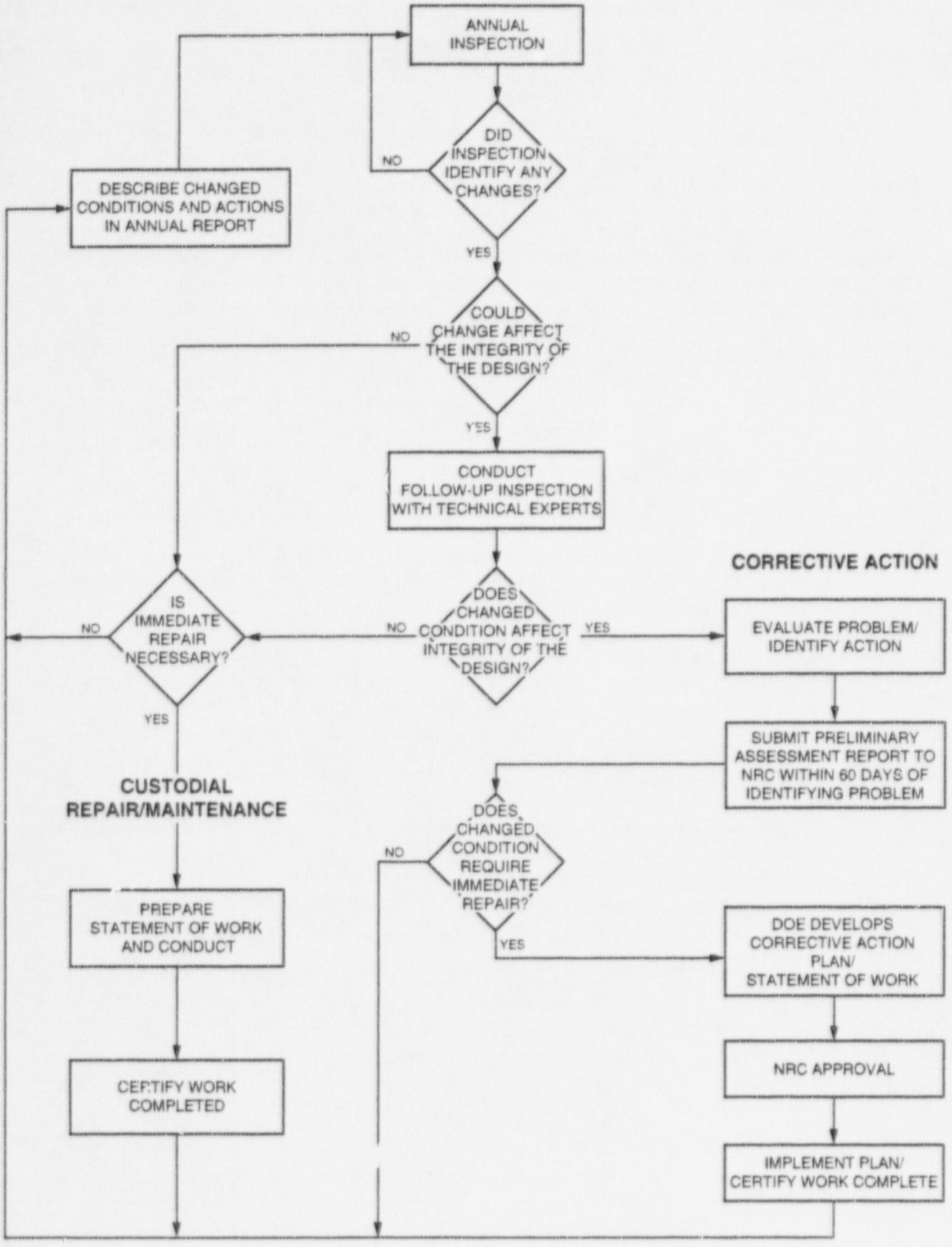


FIGURE 3.1
STEPS FOR FOLLOW-UP INSPECTIONS, CUSTODIAL MAINTENANCE, AND CORRECTIVE ACTION MAYBELL, COLORADO, DISPOSAL SITE

approximately 150-ft (46-m) intervals will be walked to ensure the disposal cell is thoroughly inspected. Diagonal transects of the topslopes will be made and the crest line will be walked. Additional transects will be walked along the sideslopes and rock apron. Transects along the entire length of the drainage ditch will be made to determine whether it is functioning as designed and can be expected to continue to function properly. Inspectors will vary the path of transects from one inspection to the next to ensure small anomalies are not overlooked. The sample inspection checklist lists items that should be examined during inspections (DOE, 1996a).

Vegetation is not planned for the disposal cell cover. However, remedial action of the areas surrounding the disposal cell included revegetation with grasses indigenous to the area. The area surrounding the disposal cell will be monitored to determine the success of the revegetation efforts. Inspectors also will inspect this area for evidence of erosion caused by wind, sheet wash, or changes in drainage patterns including the swales adjacent to but just off-site.

Site inspectors also will monitor damage to or disturbance of permanent site-surveillance features, fencing, gates, and locks.

From inside the disposal site, inspectors will visually survey the area approximately 0.25 mi (0.40 km) outside the disposal site boundary for evidence of land-use changes that indicate increased human activity such as land development, new roads, and paths. Inspectors will note the condition of and changes to site access roads, surrounding vegetation, and relevant geomorphic features like gullies or ephemeral drainage channels; potential impacts to the site will be noted.

3.4 QUALITY ASSURANCE

The DOE has developed and implemented a quality assurance (QA) plan (DOE, 1996c) for the site inspection program that meets the requirements of DOE Order 5700.6C. Site inspections will be conducted in accordance with this plan.

3.5 SITE-SPECIFIC CONCERNS

Four site-specific concerns require special attention during annual inspections: erosion by gullies 1 through 4, postconstruction settlement, the potential for seeps during transient drainage, and monitoring of transient drainage at monitor wells 695 and 696. These four concerns are discussed in detail below.

3.5.1 Erosion near gullies 1 through 4

Available information indicates surface runoff erosion occurred on the property prior to milling operations on the site. Several erosion gullies formed, which drain toward Johnson's Wash to the east-southeast. Erosion protection measures were installed at the outlets of these gullies during construction. Above the erosion protection rock, all four gullies were filled with compacted common fill to the toe of the disposal cell (see sections B and J on construction drawings MAY-PS-10-0214 and MAY-PS-10-0223). The upper end of gully 2 extended beneath the tailings pile.

To monitor potential erosion damage, the inspectors will check for erosion and any changes in headcutting or sedimentation in and around gullies 1 through 4, between these gullies, and the toe of the disposal cell (Plate 1). Careful attention will be taken when traversing these gullies so as not to damage the placed erosion protection.

3.5.2 Postconstruction settlement

Characterization of the Maybell tailings pile indicated a rather thick deposit of slimes exists beneath the south central portion of the pile. To promote settlement of these slimes before construction of the radon barrier, a preload fill was constructed. The Maybell Completion Report (MK-F, 1999) shows the location of these slimes.

During construction, nine settlement plates, numbered 1 through 9, (see Plate 1) were installed for long-term monitoring (MK-F, 1999). Calculations indicate that significant settlements of the Maybell pile should occur during the first 5 years after placement of the frost protection layer. DOE will re-survey the elevations of the settlements of plates 1 through 9 for a period of five years (through 2003) following placement of the radon barrier. DOE will terminate the surveys after the fifth year unless settlement remains significant. Results of the surveys will be included in the annual reports to the NRC. (Reference the Final Completion Report, Volume 4, Appendix B, Design Calculation 14-392-01-01, Embankment Design-Settlement Analysis, MK-F, 1999).

3.5.3 Potential for transient drainage seeps

During disposal cell construction, the slopes on the east side of the pile were cut back to form the final slope configuration. Although not confirmed directly by characterization data, extrapolation of those data indicates the cut slope near the east corner of the cell may be near buried slime layers. If transient drainage from the slimes formed a surface expression on the Maybell cell, it would be located on the east or southeast slopes toward the east corner of the cell.

While walking routine transects over the east and southeast slopes of the cell, inspectors will check for evidence of potential seeps. Potential seeps will not form after transient drainage is complete.

3.5.4 Monitoring transient drainage

During remedial action design and planning, NRC representatives expressed concern that transient drainage from the disposal cell could be observed in nearby monitor wells as a temporary rise in the ground water level, and might mistakenly be interpreted as a cell performance problem or even cell failure. Misidentification of the cause of a water level rise could falsely trigger an investigation of cell cover integrity, needlessly consuming resources and funds.

Computer modeling was performed to predict an "upper bound" curve of water level versus time for monitor well 695. Complete documentation of this modeling is included in the Technical Assistance Contractor Calculation MAY-03-96-12-05-00. The monitoring and closure plan for monitor wells 601, 676, 695 and 696 are included in Section 2.6.1

Several factors need to be considered in this evaluation. In essence, the potential predicted increase of three feet in water level due to transient drainage would be masked by the predicted decrease of two feet in water level due to dissipation of the ground water mound. These predicted water levels would also be affected by the natural regional variability of ground water level of up to two feet and the natural infiltration flux through the cover of the disposal cell. Consequently, an increase in water level in monitor well 695 would be dependent on several variables, which may not be directly related to transient drainage, and may not have any direct correlation to disposal cell performance. Monitoring of water levels in monitor well 695 may not be definitive and should be used with caution.

3.5.5 Elevated Thorium Supplemental Standard Area

Supplemental Standards have been applied to areas with elevated Th-230 that are adjacent to the disposal cell within the permanent withdrawal boundary. (Reference the Final Completion Report, Volume 3, Appendix K, Maybell Site Supplemental Standards, Section A, MK-F, 1999). Site Inspectors will need to pay particular attention for evidence of erosion across these areas.

4.0 CUSTODIAL MAINTENANCE OR REPAIR

The DOE does not plan to conduct routine maintenance at the Maybell disposal site. However, the DOE will perform needed custodial maintenance or repair as determined by site inspections.

Unscheduled custodial maintenance or repair at the Maybell disposal site may be identified during an annual inspection. These activities may include the following:

- Repairing or replacing deteriorated or vandalized warning signs, fencing, gates, locks, and monitor well caps.

- Removing deep-rooted plants determined to be a threat to the integrity of the cover.

For a period up to five (5) years after completion of the disposal cell, a plant specialist or other qualified person will periodically participate in site inspections. If the inspection does not coincide with the general growing season, the individual may conduct a separate inspection at a more favorable time. Conditions such as drought during the five-year period immediately following cell completion may cause the revegetation to die.

The Department of Energy is required to reseed those portions of the temporary withdrawal area that have not sustained a satisfactory growth of vegetation after the second and fourth growing season (2000 and 2002). In either eventuality, seeding must be completed after 1 September and prior to the onset of prolonged ground frost.

Reseeding will be performed per subcontract document specifications Section 02935, Part 2 (DOE, 1994).

After the work is completed and before contractors are released, the DOE will verify that work was performed according to specifications.

The annual report to the NRC will document any repair that is performed. Copies of records, reports, and certifications will be included in the permanent site file.

5.0 CORRECTIVE ACTION

Corrective actions are repairs needed to address problems that affect the integrity of the disposal cell or compliance with 40 CFR Part 192. The NRC must approve the recommended action in advance. Site inspections are designed to identify problems at the developmental stage. Conditions that might trigger corrective action are:

- Surface rupture or subsidence of the disposal cell.
- Development of rills, gullies, or slope instability on the disposal cell.
- Deterioration of the erosion protection rock on the disposal cell.
- Tailings fluid originating from the disposal cell.
- Gully development on or immediately adjacent to disposal site property that could affect the integrity of the disposal cell.
- Damage to the cell cover or disposal site property from natural catastrophic events or vandalism.
- Damage to the disposal cell cover from deep-rooted plant growth.

The DOE will evaluate the factors that caused the problem and identify actions to mitigate the impact and prevent recurrence. An onsite inspection or preliminary assessment will include but is not limited to:

- Identifying the nature and extent of the problem.
- Reevaluating germane engineering design parameters.

For conditions that warrant follow-up inspections, the DOE will submit a preliminary assessment or status report to the NRC within 60 days of the inspection. The preliminary assessment report will evaluate the problem and recommend the next step (e.g., immediate action or continued evaluation). If the problem requires immediate repair, the DOE will develop a corrective action plan for NRC approval. Once the NRC approves the corrective action, the DOE will implement the plan. In some cases, corrective action could include temporary emergency measures taken prior to the completion of the normal approval process. If a problem does not require immediate repair, the problem will be documented in the annual report and assessed at the next annual inspection.

NRC regulations do not stipulate a time frame for implementing corrective action except the finding of an exceedance in established ground water concentration limits, which does not apply at this site. The DOE does not consider assessing the extent of a problem and developing a corrective action plan to be initiation of the corrective action program.

In addition to the preliminary assessment report, the DOE may, as appropriate, prepare progress reports on each corrective action while it is under way or under evaluation.

After corrective action is complete, the DOE will certify the work and submit a certification statement with supporting documentation to the NRC for review and concurrence. A copy of the certification statement will become part of the permanent site file as will reports, data, and documentation generated during the corrective action.

6.0 RECORD KEEPING AND REPORTING

6.1 PERMANENT SITE FILE

The DOE will maintain a permanent site file containing site inspection reports and other supporting documentation of long-term surveillance program activities. The information placed in the site file will include:

- Documentation of disposal site performance.
- Demonstration that licensing provisions were met.
- Information needed to forecast future site surveillance and monitoring needs.
- Reports to stakeholders regarding disposal cell integrity.

After the site is brought under the general license, the DOE will compile copies of site documentation required by the long-term surveillance program guidance document (DOE, 1996a). These copies will become part of the Maybell disposal site permanent site file. Copies of deeds, custody agreements, and other property documents also will be kept in the site file.

The DOE will maintain the surveillance and maintenance documentation identified in other sections of this LTSP and it will become part of the permanent site file. The DOE will update the site file as necessary after disposal site inspections, maintenance activities, or corrective actions are complete. These records will be handled in accordance with DOE directives to ensure their proper handling, maintenance, and disposition. The archival procedures set forth in 41 CFR Part 101 and 36 CFR Parts 1220-1238, Subchapter B, will be followed. The permanent site file will be available for NRC and public review.

6.2 INSPECTION REPORTS/ANNUAL REPORTS

During site inspections, activities and observations will be recorded and described using site inspection checklists, maps, photographs and photo logs, and field notes. Documentary evidence of anomalous, new, or unexpected conditions or situations will describe developing trends and enable the DOE to make decisions concerning follow-up inspections, custodial maintenance, and corrective action. This information will be contained in the permanent site file at the DOE Grand Junction Office. The DOE will prepare a site inspection report documenting the findings and recommendations from field inspections.

Site inspection reports will be submitted to the NRC within 90 days of the annual site inspection. Inspection reports will summarize the results of follow-up inspections and maintenance completed since the previous annual inspection.

If unusual damage or disruption is discovered at the Maybell disposal site during an inspection, a preliminary report assessing the impact will be submitted to the NRC within 60 days. If maintenance, repair, or corrective action is warranted, the DOE will notify the NRC. The NRC will receive a copy of corrective action plans and each corrective action progress report, or the reports will be attached to the annual report.

The DOE will provide copies of inspection reports and other reports generated under the long-term surveillance program to the state of Colorado as required in its cooperative agreement.

7.0 REFERENCES

DOE (U.S. Department of Energy), 1996a. *Guidance for Implementing the Long-Term Surveillance Program for UMTRA Project Title I Disposal Sites*, DOE/AL-62350-189, Rev. 0, prepared for the U.S. Department of Energy, Environmental Restoration Division, UMTRA Project Team, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1996b. Calculation Set, Evaluation of Transient Drainage, Maybell, Colorado. Prepared for the U.S. Department of Energy, Environmental Restoration Division, UMTRA Project Team, Albuquerque, New Mexico

DOE (U.S. Department of Energy), 1996c. *Long-Term Surveillance and Maintenance Program, Quality Assurance Program Plan*, MAC-2152, Rev. 0, prepared by MACTEC Environmental Restoration Services for the U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado.

DOE (U.S. Department of Energy), 1994. *Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site, Maybell, Colorado*, December, DOE/AL/62350-24F, Rev. 1, prepared for the U.S. Department of Energy, Environmental Restoration Division, UMTRA Project Team, Albuquerque, New Mexico.

MK-F (Morrison Knudsen-Ferguson), 1999. *Maybell, Colorado, Completion Report*, prepared by MK-F for the U.S. Department of Energy, Environmental Restoration Division, UMTRA Project Team, Albuquerque, New Mexico.

URS Company, 1976. "Meteorology Affecting Uranium Tailings Near Maybell, Colorado," unpublished report prepared for Ford, Bacon & Davis Utah, Inc., Salt Lake City, Utah.

CODE OF FEDERAL REGULATIONS

10 CFR Part 40, *Domestic Licensing of Source Material*, U.S. Nuclear Regulatory Commission.

36 CFR Parts 1220-1238, *National Archives and Records, Subchapter B- Records Management*, National Archives and Records Administration.

40 CFR Part 192, *Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings*, U.S. Environmental Protection Agency.

41 CFR Part 101, *Federal Property Management Regulations*, General Services Administration.

DOE ORDERS

Order 5700.6C, *Quality Assurance*, 21 August 1991, U.S. Department of Energy, Washington, D.C.

UNITED STATES CODE

42 USC §7901 *et seq.*, *Uranium Mill Tailings Radiation Control Act*, 8 November 1978.

ATTACHMENT 1

SITE REAL ESTATE INFORMATION

REAL ESTATE DOCUMENTATION

GENERAL

Remedial action at the Maybell, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site consisted of onsite consolidation and stabilization of the contaminated materials. The site comprises approximately 251 acres of land. The site was acquired in two portions.

The larger portion of the disposal site is on land formerly administered by the U.S. Department of the Interior's (DOI) Bureau of Land Management (BLM). Under the requirements of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, as amended, the DOE acquired this portion of the disposal site land via Public Land Order (PLO).

The second portion, acquired by the state of Colorado, comprises two properties referred to as the Howsam and Gordon properties. The state acquired the properties in fee simple from the private owners. The 2 properties comprise approximately 110 acres.

TRANSFER OF BLM LANDS

The PLO permanently transferred 141 acres from the public domain to the DOE. As a result of the transfer, the land is no longer subject to the operation of the general land laws, including the mining and mineral leasing laws. The transfer of the land to the DOE vested in the DOE the full management, jurisdiction, responsibility, and liability for the land. However, the BLM retained the authority to administer any claims, rights, and interests in the land established before the effective date of the transfer.

Legal Description

A tract of land located in Township 7 North, Range 43 East, Sixth Principal Meridian, described by the following government land survey. Section 19, lots, 10. 12, 14, and 16. W1/2 E1/2 SW1/4 NE1/4, W1/2 E1/2 NE1/4 SW1/4 NE1/4, W1/2 SW1/4 NE1/4, SE1/4 NW1/4, W1/2 W1/2 NE1/4 NW1/4 SE1/4, and W1/2 NW1/4 SE1/4. The area described contains 140.49 acres of public land in Moffat County, Colorado.

Recorded

The PLO was published in the *Federal Register,* Volume 60, No. 71, page 18778, dated 13 April 1995. The *Federal Register* document is listed as 95-9048 filed 12 April 1995 as 43 CFR Public Land Order 7137. The effective date of the transfer is 13 April 1995.

TRANSFER OF PRIVATE LANDS

Legal Descriptions

Howsam tract

A parcel of land situated in the SW1/4 of Section 19, T.7 N., R. 94 W., 6th Principal Meridian, being more particularly described as follows:

Considering the East line of the Northeast of said Section 19 to bear S00°00'00"E and all bearings contained herein to be relative thereto; Beginning at the Center 1/4 corner of said Section 19; thence S. 00°00'11"E 1,813.80 ft the Southwest corner of the N3/4 NW1/4 SW1/4 SE1/4 of Section 19; thence N89°58'15 "W 2103.37 ft to the Southwest corner of the N1/2 S1/2 NE1/4 of Government Lot 8 of said Section 19, thence N00°01'20"E 164.88 ft to the Southeast corner of the NE1/4 NW1/4 of Government Lot 8 of said Section 19; thence N89°58'16"W 391.26 ft to the Southwest corner of the NE1/4 NW1/4 of Government Lot 8 of said Section 19; thence N00°02'01"E 1648.81 ft to the Northwest corner of the E1/2 W1/2 of Government Lot 7 of said Section 19; thence S89°58'24"E 2493.50 ft to the Point of Beginning, containing 102.37 acres, as described,

with all its appurtenances subject to existing easements for public roads and highways, public utilities, railroads, pipelines and reservations or exceptions of record. The land herein conveyed to the United States of America by and through the Department of Energy.

Entry Number: 1997L 3688, Recordation Number: R-360704, Moffat County, Colorado.

Gordon tract

A parcel of land situated in the SE1/4 of Section 19, T.7 N., R. 94 W., 6th Principal Meridian, being more particularly described as follows:

Considering the East line of the Northeast of said Section 19 to bear S00°00'00"E and all bearings contained herein to be relative thereto; Beginning at the Northwest corner of N3/4 NW1/4 SW1/4 SE1/4 (the South 1/16 Corner of Section 19); thence S89°58'17"E 660.48 ft to the Northeast corner of the N3/4 NW1/4 SW1/4 SE1/4 of said Section 19, thence S00°00'00"E 494.68 ft to the Southeast corner of the N3/4 NW1/4 SW1/4 SE1/4 of said Section 19; thence N89°58'15"W 660.46 ft to the Southwest corner of the N3/4 NW1/4 SW1/4 SE1/4 of said Section 19; thence N 00°00'11"W 494.67 ft to the Point of Beginning, containing 7.50 acres, as described,

with all its appurtenances subject to existing easements for public roads and highways, public utilities, railroads, pipelines and reservations or exceptions of record. The land herein conveyed to the United States of America by and through the Department of Energy.

Entry Number: 1997L 3688, Recordation Number: R-361363, Moffat County, Colorado.

REPOSITORY

Real estate correspondence and related documents are filed and maintained by the Department of Energy's Property and Administrative Services Division, C/O Chief, Property Management Branch, Albuquerque Operations Office, P. O. Box 5400, Albuquerque, NM 87115, (505) 845-6450.

ATTACHMENT 2

AGENCY NOTIFICATION AGREEMENTS

IN UPDC

National Earthquake Information Center
World Data Center A for Seismology

Director
(303) 236-1510
Research
(303) 236-1506

U.S. Geological Survey
Box 25046, DFC, MS-967
Denver, Colorado 80225 USA
Telex: (WUTCO) 8106014123ESL UD

Operations
(303) 236-1500
QED
(800) 358-2663

Clinton C. Smythe
Engineering and Construction Group Leader
Uranium Mill Tailings Remedial Action
Project Office
2155 Louisiana NE, Suite 4,000
Albuquerque, NM 87110

Dear Mr. Smythe:

This letter is to confirm that the DOE Grand Junction Projects Office (24-hour phone line, (303) 248-6070 has been added to our notification list for the occurrence of earthquakes near the following locations:

Disposal Site	Latitude	Longitude
COLORADO		
Durango (Bodo Canyon)	N37.15	W107.90
Grand Junction	N38.91	W108.32
Gunnison (Landfill)	N38.51	W106.85
Maybell	N40.55	W107.99
Naturita (Dry Flats)	N38.21	W108.60
Rifle (Estes Gulch)	N39.60	W107.82
Slick Rock (Burro Canyon)	N38.05	W108.87
IDAHO		
Lowman	N44.16	W115.61
NEW MEXICO		
Ambrosia Lake	N35.41	W107.80
NORTH DAKOTA		
Bowman	N46.23	W103.55
OREGON		
Lakeview (Collins Ranch)	N42.2	W120.3
PENNSYLVANIA		
Canonsburg	N40.26	W80.25
Burrell VP	N40.62	W79.65
TEXAS		
Falls City	N28.91	W98.13
UTAH		
Mexican Hat	N37.10	W109.85
Salt Lake City (Clive)	N40.69	W113.11

National Earthquake Information Center
World Data Center A for Seismology

Director
(303) 236-1510
Research
(303) 236-1506

U.S. Geological Survey
Box 25046, DFC, MS-967
Denver, Colorado 80225 USA
Telex: (WUTCO) 8106014123ESL UD

Operations
(303) 236-1500
QED
(800) 358-2663

We have entered the following selection criteria into our notification program:

1. Any earthquake of magnitude 3.0 or greater, within 0.3 degrees (about 20 miles) of any site shown above, or

2. Any earthquake of magnitude 5.0 or greater, within 1.0 degrees (about 70 miles) of any site shown above.

Sincerely,

Bruce W. Presgrave

Bruce Presgrave
U.S. Geological Survey
National Earthquake Information Center
P.O. Box 25046
Mail Stop 967
Denver Federal Center
Denver, Colorado 80225

Please address future correspondence to Stuart Koyanagi at the above address. I have moved to a different project.

Thank you + best regards,

Bruce Presgrave

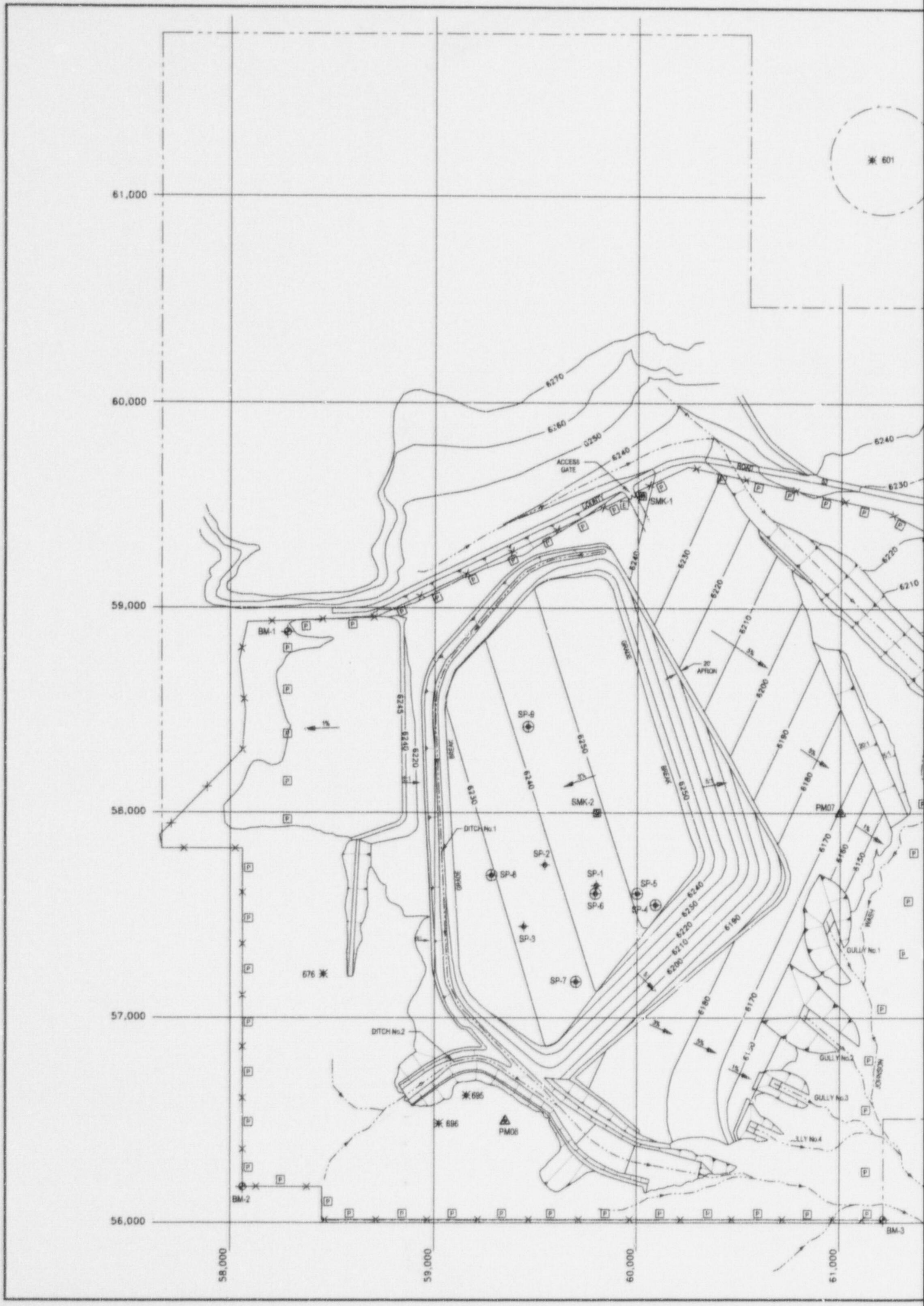
L. A. Woodworth
Maybell Site Manager
Uranium Mill Tailings Remedial
Action Team
Environmental Restoration Division
U. S. Department of Energy
P.O. Box 5400
Albuquerque, NM 87185-5400

Dear Mr. Woodworth:

This letter is to concur with the U.S. Department of Energy (DOE) request for notification as set forth in the DOE letter dated September 28, 1998. As requested in your letter, this office will contact the Grand Junction Office at (970) 248-6070 if any unusual event or anomaly is observed or reported at the Maybell, Colorado, disposal site.

Sincerely

Jeff Corriveau
Moffat County Sheriff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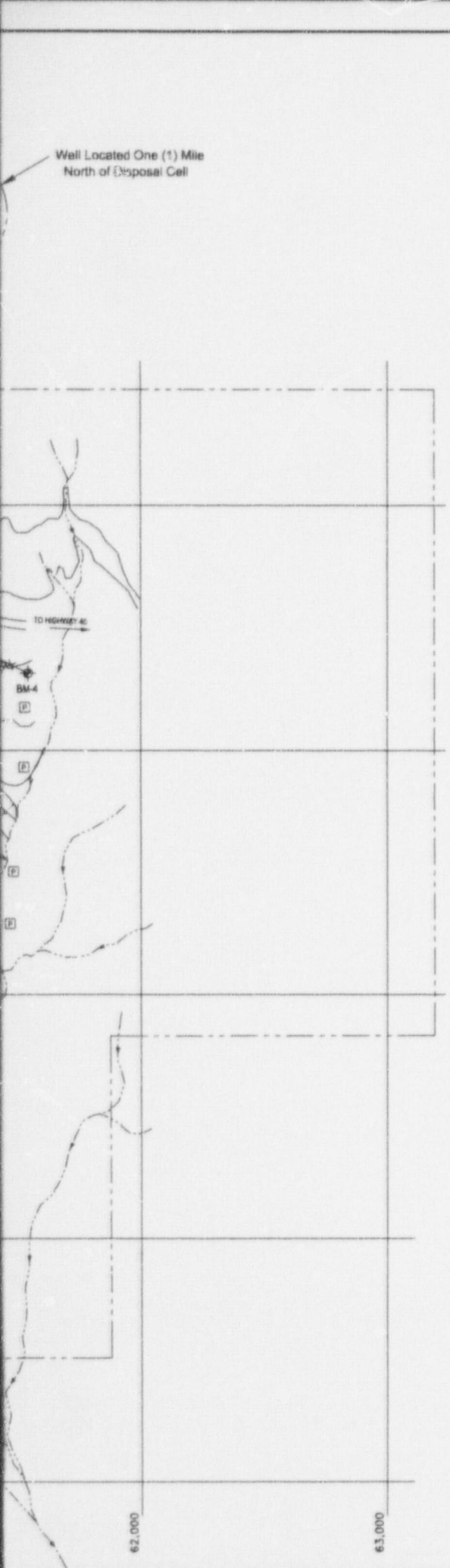
ACCESS GATE
COUNTY
ROAD
SMK-1
SMK-2
BM-1
BM-2
BM-3
SP-1
SP-2
SP-3
SP-4
SP-5
SP-6
SP-7
SP-8
SP-9
PM07
PM08
676
695
696
DITCH No.1
DITCH No.2
GULLY No.1
GULLY No.2
GULLY No.3
20' APRON
1%
2%
3%



LEGEND:

- ENTRANCE SIGN
- PERIMETER SIGN
- PM07 — PERMANENT SURVEY MONUMENT
- BM-4 — PERMANENT BOUNDARY MONUMENT
- SMK-2 — GRANITE SITE MARKER
- 686 — MONITORING WELL
- FENCE LINE
- TAILINGS EMBANKMENT (GRADE BREAK)
- 56,000 — CONSTRUCTION GRID COORDINATES
- 6220 — ELEVATION CONTOURS (10 FT. INTERVAL)
- FLOW LINE
- TEMPORARY WITHDRAWAL AREA BOUNDARY

TABLE 1

MONUMENT NO.	NORTHING	EASTING
SP-1 (SM-1)	N 57645	E 59800
SP-2 (SM-2)	N 57745	E 59545
SP-3 (SM-3)	N 57445	E 59440
SP-4	N 57550	E 60090
SP-5	N 57605	E 60000
SP-6	N 57605	E 59795
SP-7	N 57175	E 59700
SP-8	N 57700	E 59280
SP-9	N 58420	E 59460

SP-2 TYPE I - SETTLEMENT PLATES (DISPLACEMENT MONUMENT) INSTALLED ON EXISTING TAILINGS PRIOR TO PLACEMENT OF CONTAMINATED MATERIAL FILL.

SP-7 TYPE II - SETTLEMENT PLATES (DISPLACEMENT MONUMENT) INSTALLED AT BOTTOM OF RADON BARRIER.

9908270136-01

N

300 150 0 300 600

SCALE: 1" = 300'

U. S. DEPARTMENT OF ENERGY
ALBUQUERQUE, NEW MEXICO

DRAWN BY	DATE
L. Abdy	09/16/97
CHECKED BY	DATE
John McBee	09/16/97
APPROVED BY	DATE
Steve Cox	07/30/99

PLATE 1
SITE PLAN
MAYBELL SITE
MAYBELL, COLORADO

DISPOSAL SITE MAP

JACOBS ENGINEERING GROUP
ALBUQUERQUE OPERATIONS

UMTRA PROJECT
2155 LOUISIANA BLVD NE, ALBUQUERQUE, NM 87110

DRAWING NO.
PLATE1.DWG