

## **Durita, Colorado, Disposal Site Inspection Report, May 22, 2008**

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### **Introduction**

Colorado Department of Public Health and Environment (CDPHE) scheduled the site visit for May 22, 2008, to conduct an annual inspection in accordance with the Hecla Mining Company (Hecla) radioactive materials license. The U.S. Department of Energy (DOE) was invited to visit the site at the same time to meet the licensee and regulator, and to assess site conditions in advance of Hecla license termination and site transition to DOE for long-term surveillance and maintenance.

### **Findings and Discussion**

Engineered disposal structures at the Durita site consist of three leach tanks and a closure cell.

**Leach Tanks**—The leach tanks were shaped to a shallow (approximately 0.5 percent) top slope and 5:1 side slopes. When operations ceased, the tailings in the tanks were covered with an interim cover consisting of 2 to 2.5 feet of compacted soil. The reclamation plan indicates that an additional 2.8 feet of compacted clayey soil was added to the top slopes to control radon emanation.

The top slopes are vegetated with a mixture of native and non-native grasses and shrubs. The revegetation was mostly successful, as evidenced by healthy grasses and shrubs that are established in drill rows. Plant abundance on the cover was comparable to that of nearby undisturbed areas. There was no evidence of concentrated storm water flow or soil erosion on the top slopes of the reclaimed leach tanks. Grades are designed to limit storm water run off velocities from a Probable Maximum Precipitation (PMP) event to less than velocities that exceed the soil shear strength, so erosion damage should be investigated to determine if the as-built condition differs from the design.

A portion of the cover on the southeast corner of tank LT-201 has no seeded species. Sparse kochia and annual mustard are growing in the area. The last seeding occurred in 1999, so the likelihood of desired vegetation establishing in this area is low. If the design takes credit for erosion resistance from the vegetation, the area should be reseeded and established sufficiently to provide the specified erosion resistance. Stoller personnel delineated the barren area with a GPS unit. The licensee and the DOE team discussed the need for reseeding the area. Dave Holland will respond to DOE.

The flat top slopes are susceptible to ponding if any subsidence or consolidation occurs. No evidence of these effects was found. DOE may wish to direct Stoller to evaluate the water balance of the leach tanks because the bottom liners will collect infiltration.

Deep-rooted shrubs, which were included in the seed mix sown on the off-tank portions of the site, are invading the top slopes. Species include big sagebrush (*Artemisia tridentata*),

rabbitbrush (*Ericameria nauseosa*), four-wing saltbush (*Atriplex canescens*), and shadscale (*Atriplex confertifolia*). Deep-rooted tamarisk (*Tamarix ramosissima*) shrubs also have invaded areas of the leach tank covers. Hecla has been controlling these species with cutting and spot spraying. The DOE project team will determine if ongoing control is required.

Animal burrowing was noted on the site. This will be added to the inspection checklist.

Side slopes are covered with riprap. The riprap consists of resistant, mechanically weathered (rounded) screened rock. The rock showed very little degradation, as would be expected because the source was alluvial deposits near Naturita, and the rock already had been transported by running water to its place of deposition. There was no evidence of slumping or displacement. The design did not include a filter layer beneath the rock. The side slopes overlie the leach tank berms. These were constructed of uncontaminated material and originally had 2:1 side slopes and 20-foot-wide crests. During construction the slopes were flattened to 5:1 by cutting a portion of the crest and filling the toe. Some contaminated soil and debris was placed at the toe of leach tanks LT-201 and LT-203. The location of the contaminated fill will be documented and the need for control of deep-rooted plants on the side slopes will be evaluated.

**Closure Cell**—This structure contains the solidified pond material from the former evaporation ponds (referred to as SPM in site documentation). The closure cell is constructed on a clay liner; the footprint covers the center portion of four of the six former east-west trending ponds. Evaporation pond berms were removed from within the cell footprint, and berms of uncontaminated material were constructed around the cell perimeter. The areas within the perimeter berms that did not previously have a clay liner were covered with compacted clay, including the inside surfaces of the perimeter berms. According to the reclamation plan, the perimeter berms appear to be constructed on clean material. This must be confirmed.

The closure cell cover has a slope of 0.5 percent on the top slopes and 5:1 on the upper portions of the side slopes. Above the toe of the side slopes the grade increases to 3:1 because of topographical site constraints that prevented constructing the cell with the footprint area that would be required to maintain the 5:1 slope. The top and side slopes are covered with a 6-inch-thick layer of screened rock having a median diameter ( $D_{50}$ ) of 2 inches. At the toe of the side slopes, Hecla placed scour protection, consisting of a 12-inch-thick layer of screened rock with a  $D_{50}$  of 6 inches. The scour protection extends below grade approximately 3 to 5 feet.

As with the leach tank side slopes, the rock on the closure cell has only minor deterioration (less than 0.5 per cent), consisting of occasional pieces of shale or softer sandstone. There are no indications of settlement, slumping, or other modifying processes. Vegetation encroachment will result in an on-going maintenance requirement if control of deep-rooted plants is required.

**Storm Water Control Structures**—Two major diversion channels (Central and East) cross the site to direct storm water away from the engineered containment structures. The structures are sized to convey the water from a PMP event, which was calculated to be 8.15 inches of precipitation within a 1-hour period. This flow will be contained within a “floodplain” bounded by berms that are armored with riprap scour protection in vulnerable places. The scour protection consists of riprap with a  $D_{50}$  of 12 inches extending below grade. Normal flows are conveyed in discrete channels excavated into the flow line along the flood plains. Ancillary diversion channels convey water into the primary channels from around the leach tanks and closure cell.

All diversion channels generally appeared to be functioning as designed with regard to containing storm water and conveying it past the disposal structures. The Central Diversion Channel is eroded at the south (upslope) end but the erosion is contained within the lateral limits of the floodplain. The slope of the floodplain appears steeper here, and storm water has incised several minor channels less than 2 feet deep from tributary sources into the normal flow channel, which also is incised. Nearby, a tributary channel from the upslope undisturbed area has been armored with large riprap that is dropping into a head cut, as designed. This area should be allowed to equilibrate, and no intervention is deemed necessary.



*South end of Central Diversion Channel looking east, showing minor incising along flow line, self-armoring tributary entering from right (south), and leach tank LT-203 in background.*



*Self-armoring tributary to north end of Central Diversion Channel. Incised flow channel, scour protection, and Leach Tank LT-202 in background.*

**Fencing**—Most of the fence surrounding the site is chain-link topped with three strands of barbed wire on angle brackets. Fence posts consist of 8-foot-long steel t-posts driven into the ground or steel tubing set in concrete. Portions of the fence were replaced in 1999 when construction was completed; these portions are in good condition. The remainder of the chain link fencing is in fair to poor condition but remains generally serviceable (i.e., it seems to keep livestock off the site). The fencing along the north half of the west side and the entire north side are the most deteriorated. Within this portion, many angle brackets are broken. The barbed wire is unattached or broken at many locations. Along the west side, the fabric is below the top rail and attached to the top rail with soft mechanic's wire, which rusts and breaks in only a few years. The fence is leaning at several locations.





*Chain link fence deterioration between southwest corner and Site B.*

The remainder of the site perimeter is fenced with barbed wire. This is generally in good condition. The barbed-wire fence is unstable along the right-of-way on the south half of the east boundary. Fence posts are driven into soft soil at the slope break, with the steeper slope on the inside of the fence. Rill formation is occurring, and the surface will erode back and further loosen the fence posts. The licensee should be asked to move the wire fence away from the slope break.

Fencing is required at the Durita site to keep livestock off the vegetated top slopes of the leach tanks. Intrusion should not be an issue, so the barbed wire at the top of the chain link fencing can be removed rather than repaired. The deteriorated portions of the chain link fence should be repaired; ideally, those portions would remain serviceable for as long as the newer sections.

The entrance gate is in good condition.

Fencing has been installed outside the site boundary on the west and north sides of the site. At the northwest corner, the encroachment appears to be 17 feet onto the private property to the west and 36 feet onto BLM property to the north, based on the location of the survey monument. The licensee must resolve this issue before transition.



*Northwest corner of site showing fence encroachment; looking east, visitor standing at boundary monument.*

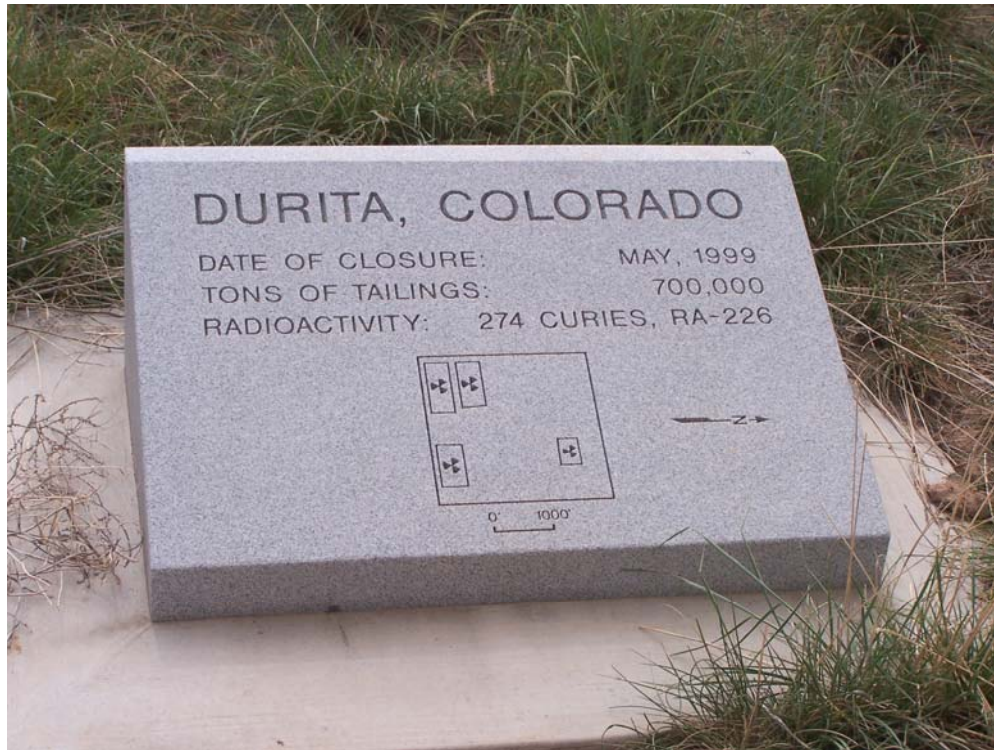
Debris, mostly tumbleweeds, accumulates against the fence in places. Removal may be necessary if the debris interferes with drainage and this item will be added to the inspection checklist.

Woody vegetation growing near the fence has damaged the fence fabric in places. The vegetation should be removed to prevent damage to the fence and this item will be added to the inspection checklist.

No interior fences remain. The location of the fence is discussed further under “Site Perimeter” below.

**Site Surveillance Features**—Site surveillance features at the Durita site consist of the granite site marker, six monuments that define the site boundary, and warning signs. The site marker, located inside the entrance gate, is in excellent condition. The DOE team found four of the six monuments. The located monuments consist of approximately 3-inch-diameter aluminum caps set above ground on what are probably standard monument structures. The monument midway down the east side was not located, nor was the monument at the northeast corner. Two different monuments were found at the northeast corner, consisting of approximately 1.5-inch-diameter aluminum caps. One is stamped as the  $\frac{1}{4}$  corner and the other appears to have been used for site survey control. DOE should confirm whether a monument was installed at the northeast corner that meets specifications established in *Guidance for Implementing the Long-Term Surveillance Program for UMTRCA Title I and Title II Disposal Sites* (see [http://www.lm.doe.gov/documents/3\\_pro\\_doc/guidance/guide\\_doc/s0033600.pdf](http://www.lm.doe.gov/documents/3_pro_doc/guidance/guide_doc/s0033600.pdf)). DOE should determine if a monument was installed on the east side of the site.

The licensee has not yet installed warning signs. DOE should discuss specifications and placement with the licensee.



*Site marker.*

**Site Perimeter**—Engineered waste containment structures extend beyond the boundary of the property owned in fee by Hecla on the southeast, south, and southwest sides of the site. These areas are addressed in a transferable right-of-way (ROW) permit that Hecla obtained from BLM. The ROW allows use of 4 areas (designated Sites A through D) and the access route from the entrance gate to the county road. DOE found that portions of the fence were located on the ROW boundary in Sites A, B, and C. The fence appears to be outside the ROW at Sites B and D.





*Northeast corner boundary monument.*

The ROW boundaries do not provide sufficient access and buffer for several of the engineered structures. DOE found that the withdrawal area encompassing Site A should be extended north to the section line and 50 feet west of the described Site A boundary. Sites B and C allow adequate access. The withdrawal area encompassing Site D should be extended approximately 30 feet east and 250 feet north.

The ROW areas should be permanently withdrawn. If this action is pursued, an area extending 400 feet south, 50 feet east, and 150 feet west of the Hecla property should be withdrawn, along with parcels measuring 150 feet by approximately 1250 feet, and 50 feet by 700 feet, encompassing Sites A and D, respectively (see drawing). The additional land will encompass the fence encroachments in Sites A and D.

The ROW areas are owned by the federal government, so conditions for including the site under the DOE general NRC license are met.

The access route was mapped with a global positioning system (GPS) and aligns well with the mapping data provided by Hecla. DOE should confirm the county road is dedicated and open to unrestricted public access. The access route between the county road and the entrance gate is unimproved and may be impassable in wet weather. Old furniture and other household goods have been dumped along the access route. The access route should not be improved because this might encourage increased dumping, and the site can be reached from the county road on foot if the road becomes impassable by vehicle. DOE will include the access road ROW in the permanent withdrawal.

A telephone-line pedestal was found on the west property boundary. The licensee should determine if there is a utility easement associated with the pedestal.



**Regraded Areas within the Site Perimeter**—These areas are generally in good condition. Vegetation abundance is similar to that in undisturbed areas but the plant community is in an immature stage of succession, and there are fewer trees and shrubs.

An area of concentrated storm water flow and head cutting was found against the fence near the southwest corner of leach tank LT-203. Because this slope was engineered for sheet flow, the licensee will fix the erosion by placing rock and straw wattles.

Another erosion feature was found near the north end of the Central Diversion Channel. A deep (4 to 5-foot-deep) channel is eroding back toward the Closure Cell Diversion Channel. The head cutting is a long way from critical structures; however, the depth of cut and amount of material removed since final grading was completed in 1999 suggests there is sufficient gradient and storm water for the erosion to continue. It appears that the storm water has left the bounds of the diversion channel. An engineer should evaluate this erosion to determine if engineered structures are threatened and if corrective action is required to arrest the erosion, adjust the grade, or harden features upslope of the area.

Debris was found inside the southwest corner of the site, which the licensee should remove.



*Head cutting at south end of Central Drainage Channel.*

**Undisturbed Areas within the Site Perimeter**—The natural drainages were checked below the diversion channels.

The East Diversion Channel transitions into the natural drainage near the east property boundary. No erosion or other signs of instability were found.

The Central Diversion Channel drains toward a natural drainage to the north. Below the bottom of the channel, the watercourse is deeply incised and the channel walls are vertical with an abrupt brink at the top of the walls. The channel has cut as much as 15 feet deep through a weathered shale knob with lenses of gravel. This incising is recent. Further down the drainage the walls are weathered to more mature and stable slopes.

The design flattened the gradient of the storm water diversion channels, more so over the reaches near the engineered structures. This would have created a hydraulic jump at the transition to the undisturbed drainage, and increased velocities would result in incising. Alternatively, the pre-existing drainage flow may have been diverted to accommodate tank construction and the drainage has incised a new channel. The profile for the Central Drainage Channel is not in the DOE records collection but should be acquired and reviewed.



*Southwest boundary monument, debris, and toe of leach tank LT-202 extending into Site A.*

The floor of the incised portion of the drainage has a uniform gradient with only minor local changes and no head cutting. Therefore, it appears that the down cutting has reached equilibrium under “normal” conditions. If this incising occurred because of construction completed in the late 1990s, more severe storm events will result in additional erosion, and the likelihood of a storm causing significant erosion is enhanced in this young channel. Downstream, the drainage continues across BLM rangeland.

Much additional material will be transported downstream as the vertical walls slump, the channel meanders, and the walls erode back to stable slopes. Topographical data preceding site construction should be compared to the present topography. A 1964 USGS 7.5-minute quadrangle map was found but lacks sufficient detail to compare the present and past drainage locations.



DOE will evaluate the process that resulted in the incised drainage ditch below the Central Diversion Channel. DOE will request preconstruction topographical information and look for evidence of an abandoned drainage where the incised drainage rejoins the pre-existing watercourse. The goal of this effort is to determine if the process presents a threat to site integrity or may result in property damage or regulatory noncompliance.



*View upstream of incised drainage below the Central Diversion Channel, showing broad meander and topographic high through which the drainage has eroded.*

Some debris and old livestock fencing remain in the undisturbed areas in the northeast portion of the site. None of the material warrants removal.

**Noxious Weeds**—DOE project staff noted that a number of areas were infested with weed species that are considered noxious by the State of Colorado. The following noxious weed species were observed: Canada thistle (*Cirsium arvense*), halogeton (*Halogeton glomeratus*), Russian knapweed (*Centaurea repens*), leafy spurge (*Euphorbia esula*), and hoary cress (*Cardaria draba*). Mapping of infested areas is proposed for the week of June 18, and the data will be provided to Mr. Reams. Hecla will spray noxious weeds this summer.





*Floor of incised drainage showing active lateral movement of meander, uniform gradient and armoring of floor, and steep, unstable walls.*



*Unstable walls of incised channel will result in additional sediment transport.*

## Recommendations

1. DOE will ask the licensee to reseed the barren area on the southeast corner of leach tank LT-201.
2. DOE should discuss whether the water balance of the leach tank covers may allow infiltrating water to accumulate on bottom liners.
3. DOE will determine if ongoing control of deep-rooted shrubs is required in the leach tank and closure cell top and side slopes.
4. Animal burrowing was noted on the site. DOE will add this to the inspection checklist.
5. DOE should obtain documentation of the locations where contaminated material was placed at the toe of the side slopes at leach tanks LT-201 and LT-203.
6. DOE will confirm that Closure Cell berms were constructed on clean material.
7. DOE will ask the licensee to repair or alter the deteriorated portions of the chain-link fence and move the wire fence away from the slope break in Site D.
8. The licensee must resolve the issue of fence encroachment.
9. Debris, mostly tumbleweeds, accumulates against the fence in places. Removal may be necessary if the debris interferes with drainage and this item will be added to the inspection checklist.
10. Woody vegetation is growing near the fence and has damaged the fence fabric in places. The vegetation should be removed to prevent damage to the fence and this item will be added to the inspection checklist.
11. DOE should confirm whether standard monuments were installed at the northeast corner and east side of the site.
12. DOE and the licensee should discuss installing the warning signs.
13. DOE will withdraw the ROW areas. The withdrawn area should extend 400 feet south of the south side of the Hecla property, 50 feet east and 150 feet west of the Hecla property, along with parcels measuring 150 feet by approximately 1250 feet, and 50 feet by 700 feet, corresponding to Areas A and D, respectively.
14. DOE should confirm the county road is dedicated and open to unrestricted public access.
15. DOE will permanently withdraw the access road ROW.
16. The licensee's title work should reveal if there is a utility easement associated with the telephone-line pedestal found on the west property boundary.
17. The licensee will fix the erosion near the southwest corner of leach tank LT-203 by placing rock and straw wattles.

18. The licensee should evaluate the erosion and head cutting at the north end of the Central Diversion Channel to determine if engineered structures are threatened, and if corrective action is required to adjust the grade or harden features upslope of the area.
19. DOE will ask the licensee to remove debris inside the southwest corner of the site.
20. DOE will request the profile of the Central Diversion Channel. DOE will evaluate the process that resulted in the incised drainage ditch below the Central Diversion Channel. DOE will request preconstruction topographical information and look for evidence of an abandoned drainage where the incised drainage rejoins the pre-existing watercourse. DOE will determine if the process presents a threat to site integrity or may result in property damage or regulatory noncompliance.
21. Work with Hecla to understand the noxious weed control program that has been practiced at the site and develop specifications for the program after transition.
22. Add actions to site transition punch list.



