**Department of Energy**
**Office of Legacy Management**

AUG 2 5 2010

ATTN: Document Control Desk
Deputy Director
U.S. Nuclear Regulatory Commission
Mail Stop T8 F5
Washington, DC 20555-0001

Subject: Summary of Results for Geotechnical Hole Investigation at the Lakeview, Oregon, Uranium Mill Tailings Radiation Control Act (UMTRCA), Title I, Disposal Site

To Whom It May Concern:

An investigation was conducted by the U.S. Department of Energy at the Lakeview, Oregon, UMTRCA, Title I, disposal site on May 12-14, 2010, to assess saturated conditions within the cell and to determine the need for a special follow-up inspection. The geotechnical hole investigation followed the *Geotechnical Hole Field Plan*, which the U.S. Nuclear Regulatory Commission concurred with on April 20, 2010. Information obtained during the field activities and determinations made as a result of the investigation are summarized in the enclosure to this letter.

Wide-spread saturated conditions did not exist within the cell. A special follow-up inspection does not appear to be warranted at this time with respect to slope stability.

Please contact me at (970) 248-6016 if you have questions.

Sincerely,

Jalena Dayvault
Site Manager

Enclosure

cc w/enclosure:
P. Brandt, NRC
R. Chang, NRC
G. Smith, Geo-Smith Engineering
R. Bush, DOE
T. Pauling, DOE

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| | | |
|---|---|---|
| 2597 B 3/4 Road, Grand Junction, CO 81503 | ☐ | 99 Research Park Road, Morgantown, WV 26505 |
| 1000 Independence Ave., S.W., Washington, DC 20585 | ☐ | 11025 Dover St., Suite 1000, Westminster, CO 80021 |
| 10995 Hamilton-Cleves Highway, Harrison, OH 45030 | ☐ | 955 Mound Road, Miamisburg, OH 45342 |
| 232 Energy Way, N. Las Vegas, NV 89030 | ☐ | |
| REPLY TO: Grand Junction Office | | |

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cc w/enclosure con't:
D. Engstrom, DOE-OR
T. Stoops, DOE-OR
T. Bartlett, Stoller (e)
S. Campbell, Stoller (e)
C. Carpenter, Stoller (e)
A. Houska, Stoller (e)
J. Waugh, Stoller (e)
File: LKD 100.02 (rc-grand junction)

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# Geotechnical Investigation Field Activities and Determinations Summary

An investigation was conducted by the U.S. Department of Energy (DOE) at the Lakeview, Oregon, UMTRCA, Title I, Disposal Site on May 12-14, 2010, to assess saturated conditions within the cell and to determine the need for a special follow-up inspection. Information obtained during the field activities and determinations made as a result of the investigation are summarized below.

## Summary of Field Activities

*Geotechnical Holes:*

Ten geotechnical holes were advanced into the cell using direct-push technology at predetermined locations and depths using a Geoprobe with 2.25-inch outside diameter rod. Two of these holes (DCGH-5A and DCGH-5B) were unplanned and were included because the initial hole did not achieve planned depth and could not be completed; the hole at DCGH-5C was successfully completed to the approximate planned depth. Additionally, the planned location of hole DCGH-1 was moved in the field to the south side of DCGH-2, and holes DCGH-5 through 8 were relocated to the north side of the side slope water content reflectometer. Figure 1 shows the actual hole locations. The geotechnical hole information is summarized in Table 1.

*Water Level Measurement:*

After the Geoprobe rod was pushed to the planned depth, the rod was retracted 6 inches. The temporary steel drive point was left in the hole. Water level measurements were made after at least 18 minutes had elapsed. Saturated water conditions are summarized in Table 1.

At the first location, DCGH-5C, the Geoprobe rod was left in place overnight to ensure there was adequate time for water to enter the hole. After sitting overnight (with no water entering the hole), the rod was removed, and the hole stayed open for approximately 2 hours and 15 minutes with the hole remaining unsaturated.

At location DCGH-2, the rod was left in place overnight to allow the water level to stabilize before the hole was sampled. Prior to sampling, the depth to water (from ground surface) was 15.97 feet (ft), and the water column was 7.23 ft in length.

At DCGH-3, water began to accumulate in the bottom of the hole only after the rod had been removed on May 13, 2010. The last water measurement taken in DCGH-3 on May 13, 2010, indicated that the depth to water (from ground surface) was 22.65 ft, and the water column was 0.45 ft thick, but that it had not stabilized. Prior to leaving the site on May 13 it was noted that the hole had collapsed from 25 ft to 23.1 feet below ground surface (ft bgs). On the morning of May 14, 2010, the hole had collapsed to 4.5 ft below ground surface at which time the depth to water was 1.9 ft below ground surface. The water column was 2.4 ft in length. The accumulated water was measured for standard field parameters. Table 2 presents the field parameter measurements from the investigation. The relatively low result for specific conductance (two orders of magnitude lower than DCGH-2) indicated that the water in DCGH-3 was likely surficial water seeping into the hole. Water from this hole appeared to be relatively transparent. No water sample was collected for laboratory analysis from this hole. At all other locations, no water accumulated in the hole after at least 23 minutes had elapsed.

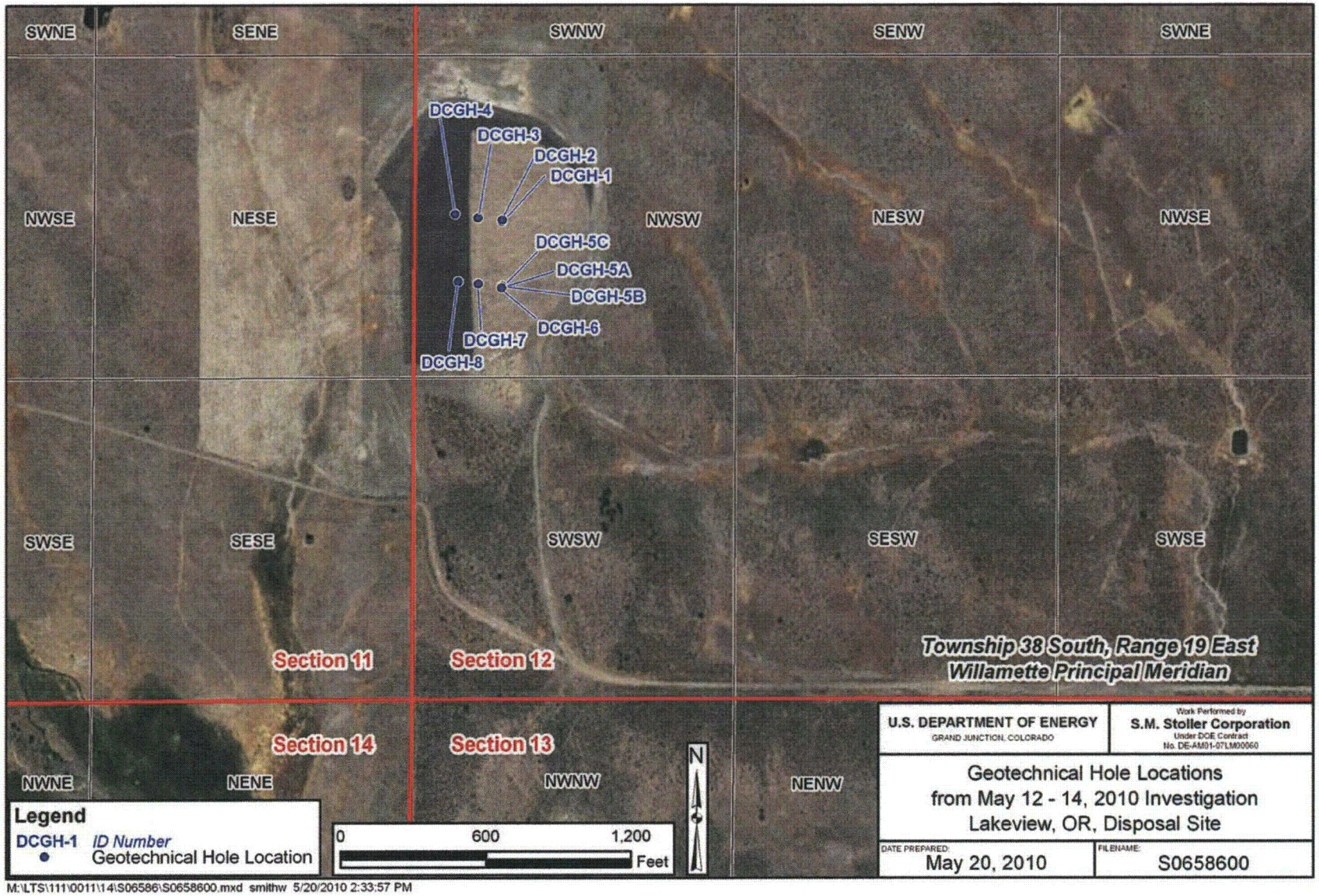


*Figure 1. Geotechnical Hole Locations*

*Table 1. Geotechnical Hole Information*

| Hole ID | Date Hole Pushed | Total Depth (feet bgs[a]) | Saturated Water Conditions Encountered (Yes/No) | Cell Water Sampled (Yes/No) | Date/Time Abandoned | Collapse Depth/ Bentonite Depth (feet bgs[a]) | Bentonite Volume (cu ft) | Bentonite Weight (lbs) | Sodium Bentonite Type |
|---|---|---|---|---|---|---|---|---|---|
| DCGH-1 | 5-13-2010 | 54.5 | No | No | 5-13-2010/ 1417 | 16.5 | 0.4554 | 30.7 | Enviroplug # 16 Granular |
| DCGH-2 | 5-13-2010 | 25 | Yes | Yes | 5-14-2010/ 1055 | 1 | 0.0276 | 1.9 | Enviroplug # 16 Granular |
| DCGH-3 | 5-13-2010 | 25.1 | No, but surficial water entered the hole after rod removal. | No, field parameters measured only. | 5-14-2010/ 1058 | 4.3 | 0.11868 | 8.0 | Enviroplug # 16 Granular |
| DCGH-4 | 5-13-2010 | 10.05 | No | No | 5-13-2010/ 1914 | 6.5 | 0.1794 | 12.1 | Enviroplug # 16 Granular |
| DCGH-5A | 5-12-2010 | 39.5 | No | No | 5-13-2010/ 1250 | 6.7 | 0.18492 | 12.2 | Redmond Swell Plug Coarse |
| DCGH-5B | 5-12-2010 | 9.5 | No | No | 5-13-2010/ 1240 | 1.2 | 0.03312 | 2.2 | Redmond Swell Plug Coarse |
| DCGH-5C | 5-12-2010 | 54.5 | No | No | 5-13-2010/ 1300 | 3 | 0.0828 | 5.4 | Redmond Swell Plug Coarse |
| DCGH-6 | 5-13-2010 | 25 | No | No | 5-13-2010/ 1338 | 24.8 | 0.68448 | 46.2 | Enviroplug # 16 Granular |
| DCGH-7 | 5-13-2010 | 25 | No | No | 5-13-2010/ 1440 | 19.7 | 0.54372 | 36.7 | Enviroplug # 16 Granular |
| DCGH-8 | 5-14-2010 | 9.85 | No | No | 5-14-2010/ 1104 | 7.2 | 0.19872 | 13.4 | Enviroplug # 16 Granular |

[a] Below ground surface

*Table 2. Field Parameter Measurements*

| Location | Temperature (°C) | Specific Conductance (µS/cm) | Dissolved Oxygen (mg/L) | pH (s.u.) | Oxidation-Reduction Potential (mV) | Turbidity (NTU) | Comment |
|---|---|---|---|---|---|---|---|
| DCGH-2 | 13.93 | 12999 | 2.54 | 6.64 | -81.2 | >1000 | Water sample collected for laboratory analyses |
| DCGH-3 | 10.89 | 510 | 9.70 | 6.72 | 110 | Very turbid – no measure-ment recorded | No water sample collected for laboratory analyses. |
| Surface Water Near Toe Drain | 10.28 | 280 | 11.07 | 7.97 | 62 | --- | Very clear water; looks like run-off from land surface from storm event. No water sample collected for laboratory analyses. |

°C = degrees Celsius
µS/cm = microseimens per centimeter
mg/L = milligrams per liter
s.u. = standard units
mV = millivolts
NTU = nepholometric turbidity units

*Sampling:*

After standard field parameters were measured, a cell water sample was collected for anions (chloride and sulfate), metals (arsenic, cadmium, calcium, iron, potassium, magnesium, manganese, silica, sodium, and uranium), and isotopic uranium from one location (DCGH-2) for laboratory analysis. Water from this hole appeared to be dark gray. Because the water in the Geoprobe rods represented new (not stagnant) water from the depth interval desired; purging (or parameter stabilization) was not conducted prior to sampling. The sample was collected with a peristaltic pump with tubing placed at the top of the water column. All samples were filtered to remove particulates that could have biased the water sample analysis, and preservatives were used according to standard practices. A duplicate sample could not be obtained because of inadequate water volume. The sample was shipped from Grand Junction, Colorado, to ALS Laboratory Group on May 17, 2010. The analytical results will be provided to NRC once the data validation process is completed.

Additionally, standard field parameters were measured in surface water present down-gradient of the toe drains. (A significant precipitation event (rain and snow fall) occurred the day before the investigation started.) Table 2 presents the field parameter measurements from the investigation.

*Hole Abandonment:*

Consistent with the regulatory requirements, all holes were abandoned within 72 hours of creation. The abandonment activities were conducted as outlined in the field plan. Specific geotechnical hole abandonment information is summarized in Table 1.

*Surveying:*

All hole locations were surveyed on May 14, 2010, at the completion of the hole abandonment activities. Horizontal coordinates were collected with a Global Positioning Satellite (GPS) device, and vertical elevations were measured with a rod and level using monitoring well 0607 as a reference elevation. Elevations are included in Table 3.

*Table 3. Ground Surface Elevations*

| Hole ID | Ground Surface Elevation (feet)[a] |
|---|---|
| DCGH-1 | 4957.35 |
| DCGH-2 | 4957.45 |
| DCGH-3 | 4954.42 |
| DCGH-4 | 4940.31 |
| DCGH-5A | 4957.42 |

*Radiological Control:*

All work was conducted and controlled under the supervision of a radiological control technician and in accordance with the radiological work permit. The radiologically contaminated investigative-derived waste was taken to the UMTRCA Title I disposal cell in Grand Junction, Colorado for disposal.

## Determinations

The following determinations are summarized as a result of this investigation:

- Wide-spread saturated conditions did not exist within the cell.
    - Saturated conditions were encountered in only one hole, DCGH-2, which was completed at 25 ft bgs. Prior to sampling, the depth to water was 16 ft bgs, and the water column was about 7 ft in length. (Some hole-collapse occurred prior to sampling.) Saturated conditions were not encountered in DCGH-1, which was located adjacent to DCGH-2, and completed at 54.5 ft bgs. Although the vertical interval between 25 and 55 ft was not specifically assessed, it can be inferred that the saturated zone was perched.
    - The lateral extent of the saturated zone was not delineated during the investigation but saturated conditions were not present in the areas where the other holes of similar depths were placed, and thus it can be concluded that the one area of saturation is of relatively limited lateral extent. The saturation could be attributed to the accumulation (perching) of original water drainage within the cell on debris or less permeable material, or localized infiltration of meteoric water, which could be indicative of some heterogeneity in the cell cover.
- Because saturated conditions were limited within the cell during this investigation, wide-scale cell slope instability under seismic loading conditions is less of a concern.

- The cell is completed at a maximum depth of 65 ft bgs. The cell area between 55 and 65 ft was not assessed during this investigation. Because this area is located below the top of the side slope embankment, any potential saturation between 55 and 65 ft bgs would not result in slope instability under seismic loading conditions.

- Insufficient data exists to make a water-balance determination of moisture within the cell because the investigation was not designed for that purpose.

A special follow-up inspection does not appear to be warranted at this time with respect to slope stability.