THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Natural Resources
DIVISION OF MINING, LAND & WATER
Mining Section

550 West 7th Avenue, Suite 900B
Anchorage, Alaska 99501-3577
Minerals Property Management Main: 907.269.8642
Fax: 907.269.8649
Coal Regulatory/Abandoned Mine Lands Main: 907.269.8631
Fax: 907.269.8930
TDD: 907.269.8411

RED DOG MINE INSPECTION REPORT

Inspection Date:	July 25 through July 27, 2016
Weather:	July 25: Sunny-overcast, **69** °F; July 26: sunny, overcast **66** °F; July 27: rain, wind **53** °F
Time of Inspection:	July 25 1:30PM to July 27 noon
Operator Contact:	Chris Eckert (Teck Alaska Incorporated)
Agency Personnel:	ADNR – Carolyn Curley
Inspection Objectives:	General Site Inspection and observation of construction activities.
Documentation:	Photos and field book notes may be reviewed at the Northern Regional Office of ADNR

This report contains photographs and observations from the field inspection of Red Dog Mine. Agency personnel were greeted at the building entrance by Chris Eckert.
The inspection began with a brief review of site facilities and location of those facilities on a site map.

Red Dog Mine Tailings Main Dam (AK00201): Construction activities observed on the Red Dog Mine Main Tailings Dam were associated with the liner installation. Figure 1 shows the work in progress west of the pipeline crossing. Figures 2 through 17 show different aspects of the liner installation process. New piezometers, SS-05-16 and SS-10-16, were installed (Figures 18 and 19). Figures 20 through 25 show facilities on the downstream side of the Red Dog Mine Tailings Main Dam to include the seepage pumpback system and typical monitoring site set-ups.

Figure 1: View of liner installation progress on upstream face of main dam, looking west from pipe crossing.

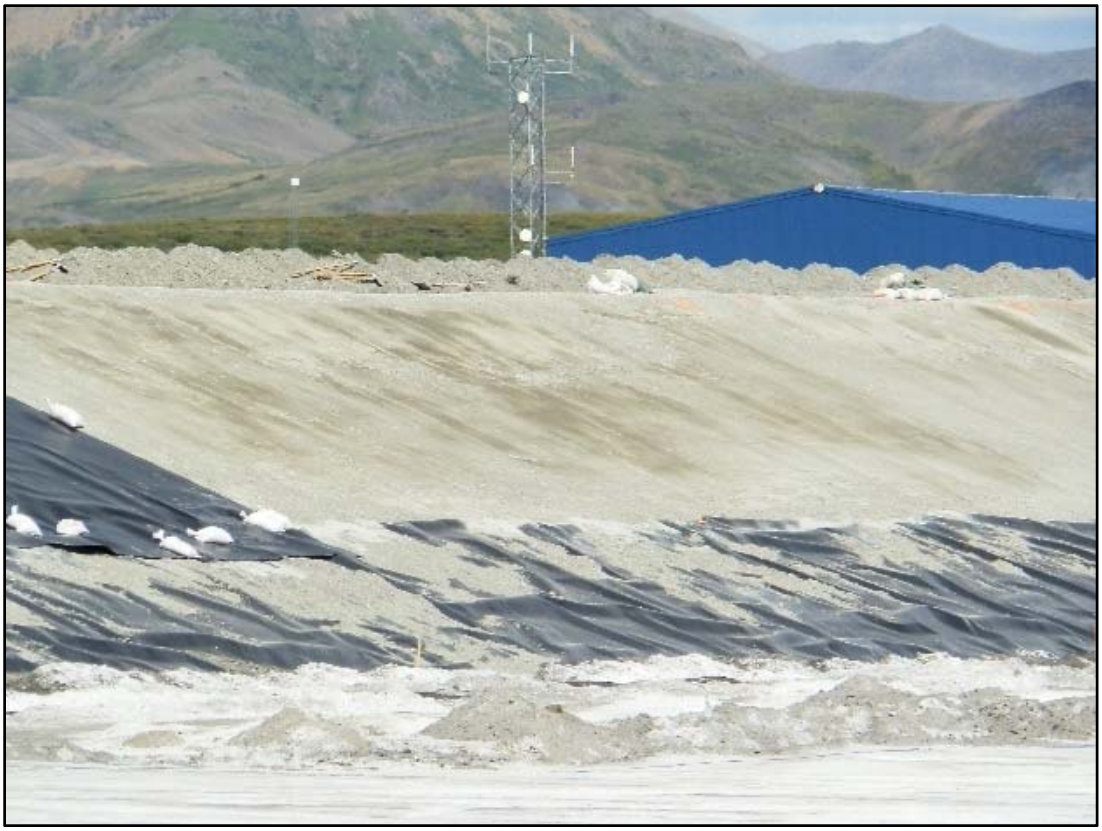

Figure 2: Upstream face of Red Dog Mine Tailings Main Dam showing compacted material before liner placement.

Figure 3: Crest of Red Dog Mine Tailings Main Dam looking down the upstream face.

Figure 4: Markings for anchor trench on Red Dog Mine Tailings Main Dam crest. View is looking west.

Figure 5: Crew prepares anchor trench for installation of a liner panel.

Figure 6: Crew placing liner panel.

Figure 7: Placement of the liner panel end in the anchor trench.

Figure 8: Crew placing liner panel on upstream face of Red Dog Mine Tailings Main Dam.

Figure 9: View of panels 139 to 143 in place on upstream face of Red Dog Mine Tailings Main Dam.

Figure 10: View of panels 119 to 122 on upstream face of Red Dog Mine Tailings Main Dam after seam fusion welding.

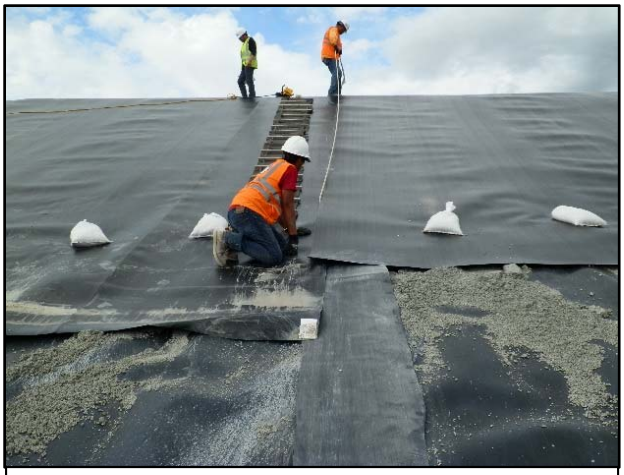

Figure 11: Crew preparing panels 149 and 150 for the seam fusion weld.

Figure 12: Close-up photo of seam fusion welder.

Figure 13: Completed seam fusion weld of panels 149 and 150.

Figure 14: Panel 127 trimmed in preparation for extrusion weld.

Figure 15: Crew extrusion welding at panels 128 and 129.

Figure 16: Patch at intersection of existing liner, panel 104 and panel 103.

Figure 17: Looking east along the upstream face of the Red Dog Mine Tailings Main Dam.

Figure 18: Piezometers SS-5-16 (Left) and SS-10-16 (Right) installed in Tailings Storage Facility.

Figure 19: Piezometer SS-10-16 installed. Equipment to be hooked up to power supply.

Figure 20: Seepage pumpback system and pond downstream from Red Dog Mine Tailings Main Dam.

Figure 21: No visible seepage on the Red Dog Mine Tailings Main Dam downstream face behind seepage pumpback system building.

Figure 22: Red Dog Mine Tailings Main Dam, west side downstream face.

Figure 23: Monitoring station on Red Dog Mine Tailings Main Dam downstream face looking to the west.

Figure 24: Close-up view of monitoring station set-up.

Figure 25: Monitoring stations downstream face of Red Dog Mine Tailings Main Dam, looking east.

Main Waste Dump Cover Test:
Initial cover test on southwest corner of the Main Waste Dump was abandoned. Location of new cover test will be to the north of the abandoned cover test, near Material Site 15 (MS-15).

Figure 26: View of Main Waste Dump, southwest corner. Approximate location for new cover test is shown.

Figure 27: Abandoned cover test southwest corner of main waste dump.

Figure 28: Flags set for new cover test by MS 15.

Figure 29: survey flags extend height of waste rock dump for new cover test.

Red Dog Tailings Back Dam (AK00303):

Work was progressing on the east abutment of the back dam. Figure 30 shows an overview of the Red Dog Tailings Back Dam. Observations are noted in the following Figures 33 through 36 showing work progressing on the east abutment.

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Figure 30: Back Dam viewed from Qanaiyaq Dump.

Figure 31: View of east abutment from Qanaiyaq Dump.

Figure 32: View of the north side of the east abutment from the haul road.

Figure 33.Location of work on the east abutment Red Dog Tailings Back Dam.

Figure 34: Cement was protected with plastic while curing.

Figure 35: Insulation waiting to be placed.

Figure 36 Insulation placed. Frost cap installation in process.

Figure 37: Northeast side of Red Dog Tailings Back Dam with area of fill circled.

Figure 38: View from east end of Red Dog Tailings Back Dam looking west along the north side.

Figure 39: View from center of Red Dog Tailings Back Dam looking east along the north side. Note the elevation change of the road along the north face of the Back Dam.

Figure 40: Center of Red Dog Tailings Back Dam as viewed from the Main Waste Dump. Note elevation change of road on north side of the dam. The Overburden Dump is visible in the background.

Figure 41: View of the north side Red Dog Tailings Back Dam from frost cap. View is looking toward the west.

Figure 42: North side of the Red Dog Tailings Dam looking west from approximate center.

Figure 43: West end of the Red Dog Tailings Back Dam as viewed from the Qanaiyaq Dump.

Figure 44: View of the northwest end of the Red Dog Tailings Back Dam

Figure 45: Red Dog Tailings Back Dam viewed looking east along the south side.

Figure 46: Example of surface crack in the frost cap associated with culvert.

Figure 47: Example of typical instrument casing on Red Dog Tailings Back Dam.

Figure 48: Subsidence at instrument near west end on the back dam. This was noted in previous inspections by Dam Safety.

DD2 Quarry:
Minor activity was observed at the DD2 Quarry on the upper level. Equipment was idle on the floor of the quarry. Figures 49 through 53 note conditions of DD2 Quarry during the site inspection.

Figure 49: DD2 Quarry viewed from haul road across the Tailings Storage Facility.

Figure 50: Equipment on the floor of DD2 Quarry.

Figure 51: Looking south into the active working of DD2 Quarry.

Figure 52: South face in fault zone of DD2 Quarry. Material did not meet specifications for use in projects on site.

Figure 53: West face of DD2 Quarry with competent material.

Gradation Testing Area:

The stockpile samples and equipment for the gradation test are located south of the Red Dog Tailings Back Dam, east of the Overburden Stockpile. Figures 54 through 57 show typical set-up for sample segregation. Figures 58 through 61 show the equipment on site. Gradation testing had not yet begun. Figure 62 show wildlife on site interested in the area.

Figure 55: Sample collection in progress for gradation test.

Figure 56: Samples for gradation testing are separated, covered, and labeled.

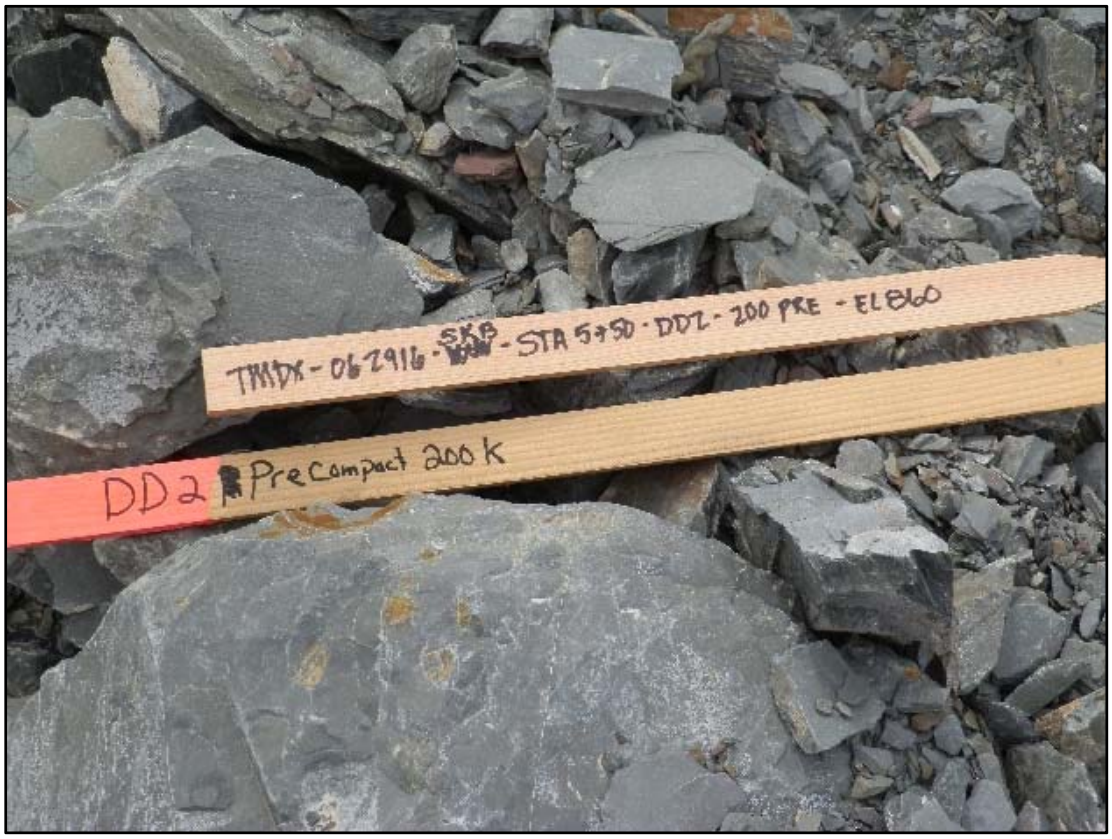

Figure 57: Example of labeling for the gradation test stockpiles.

Figure 58: Side view of the equipment on site for the gradation test.

Figure 59: Custom-built equipment on site for the gradation tests of DD2 Quarry material.

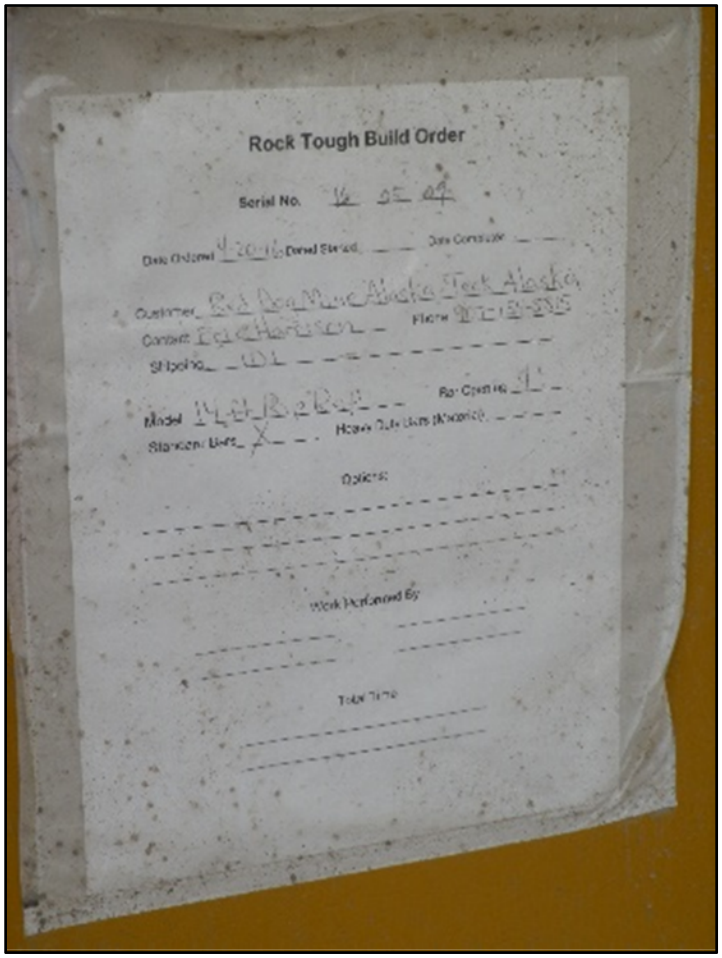

Figure 60: Specification sheet for equipment noting 14-foot model with 4 inch spacing of standard bars.

Figure 61: Marking inside the equipment for the gradation tests.

Figure 62: Red fox investigating stockpiles.

Slurry Wall:

The extension of the slurry wing wall was in process. The crew had begun the first section to tie into the existing wingwall of the Red Dog Mine Tailings Main Dam. Figures 63 through 69 show construction on the wingwall.

Figure 63: Side view of excavator bucket for wing wall construction.

Figure 64: Front view of the excavator bucket for wing wall construction.

Figure 65: Tie-in to existing wing wall.

Figure 66: Beginning trench for slurry wing wall construction.

Figure 67: Excavator digging the trench for the wing wall.

Figure 68: Set-up for material; deposition for the slurry wing wall construction.

Figure 69: Excavator bucket removing material from trench.

Geotechnical Drill:

The hole observed for the geotechnical drill program was located south of the power plant near the haul road.

Figure 70: Drill rig set to begin geotechnical drill hole.

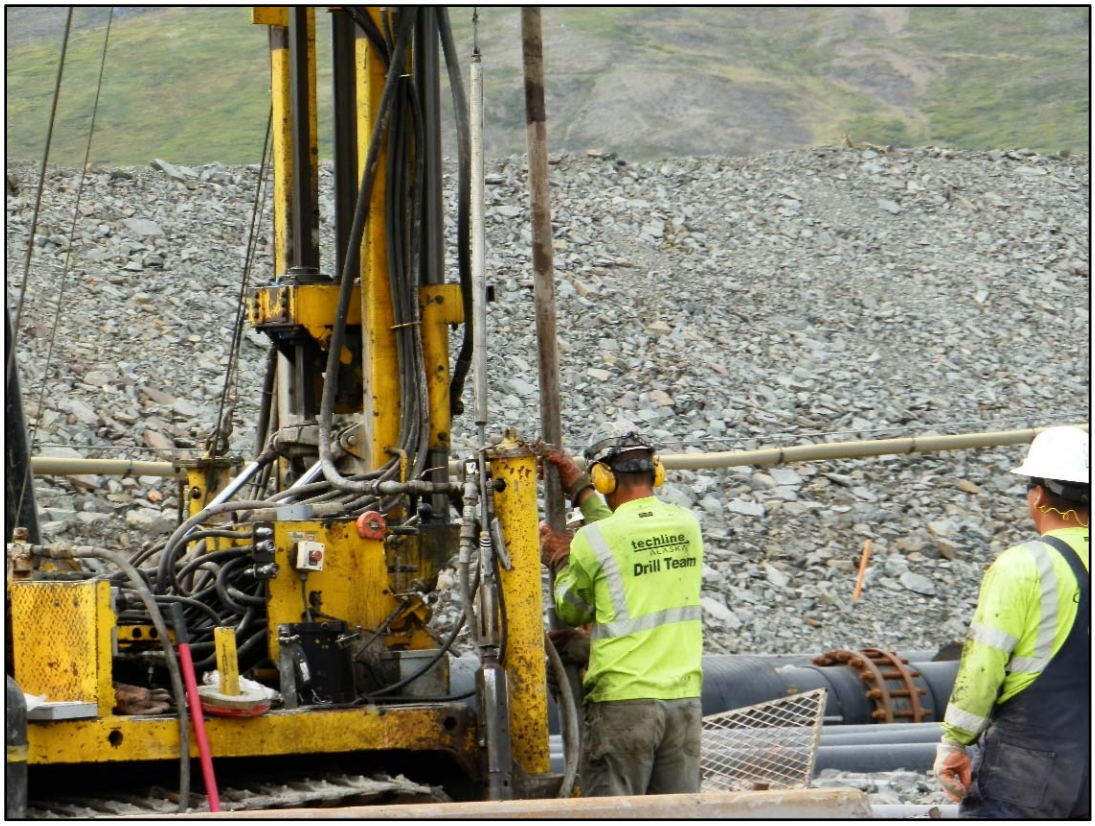

Figure 71: Packer test was observed.

Figure 72: Core samples were removed and logged.

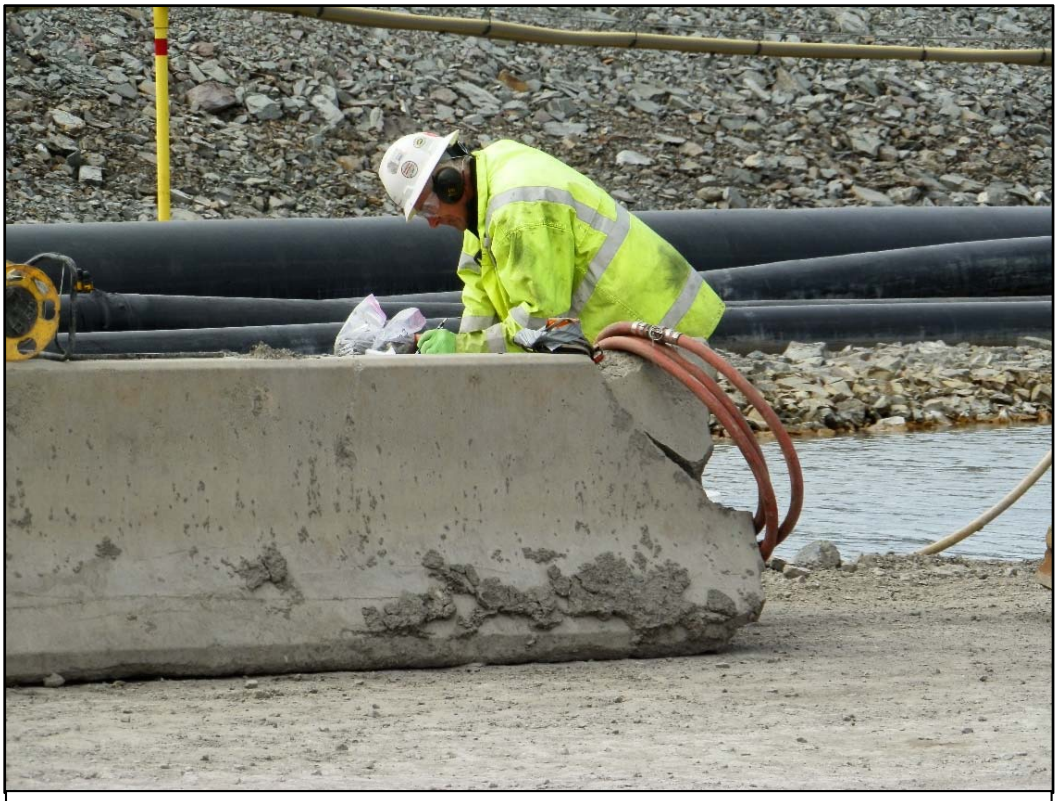

Figure 73: Notes and measurements taken in the field by crew.

Pits:

Aqqaluk Pit and main pit were viewed from the Boulder Overlook. Qanaiyaq Pit and Qanaiyaq Dump were visited. Material from Qanaiyaq Pit was dumped into the Main Pit.

Figure 74: Aqqaluk Pit and Main Pit Dump viewed from the Boulder Overlook.

Figure 75: View of Main Pit as seen looking east from the Boulder Overlook.

Figure 76: Qanaiyaq Pit working face.

Figure 77: Qanaiyaq Pit floor looking north east

Stockpiles:

The Qanaiyaq Dump is located on top of the southeast portion of the Main Waste Dump.

Figure 78: The Qanaiyaq Dump as seen heading south on the haul road on the Oxide Dump.

Figure 79: The Qanaiyaq Dump located on the Main Waste Dump.

Summary of Key Observations: The summary is based upon my inspection on July 25 through July 27, 2016.

- Work is progressing on the liner installation of Red Dog Mine Tailings Main Dam.
- Insulation has been placed on the Red Dog Tailings Back Dam and will be covered with frost cap material. The alignment of the haul road will be adjusted after the work is completed on the Red Dog Tailings Back Dam.
- The slurry wall construction on the wing wall is progressing.
- The geotechnical drilling program will continue pending appropriate weather for that crew to continue working.
- Equipment is on site for the bulk gradation testing.
- Qanaiyaq pit has begun to be developed.
- Backfilling of Main Pit is in process.
- Location has been selected for cover test on the Main Waste Dump.

Conclusion:

- Continue monitoring progress of the new geotechnical cover test on the Main Waste Dump.
- Construction on the Main Dam, Back Dam, and Wing Wall Dam are on track for completion.
- Final construction reports should be submitted to ADNR Dam Safety when projects are completed.

Sincerely,
Carolyn Curley
Geologist III