

2023 Garrison Phase 6 AML Project Summary

Drilling and Grouting Contractor: Earth Energy & Water Systems, Inc.

Drilling and Grouting Project Cost: \$1,056,105

Drilling and Grouting Contract Number: AM-876-23

Material Testing Contractor: Geoserv, Inc.

Material Testing Contract Cost: \$32,706

Material Testing Contract Number: AM-877-23

Total Project Costs: \$1,056,105+ \$32,706 = **\$1,088,811**

Location: Along McLean County Highway 15 and other infrastructure located less than one mile south of Garrison. Legal Description: W½ of Sec 17 and the E½ of Section 18, T148N, R84W

2023 eAMLIS Project Information							
Project	Problem Area Number & Name	Project Start Date	Project End Date	Working Days	Project Cost	Estimated Population Impacted:	Estimated Acres Reclaimed
2023 Garrison Phase 6 AML Project	ND000019 Garrison	5/24/2023	6/30/2023	26	\$1,088,811	4,250 (McLean County Hwy 15 traffic count)	1.05 Acres

Background

The Public Service Commission (PSC) administers the Abandoned Mine Lands (AML) Program on behalf of the State of North Dakota. The State AML Program was approved by the U.S. Department of the Interior in 1981 under the authority of the Surface Mining Control and Reclamation Act of 1977 (P.L. 95-87, Title IV). Program funding comes from a federal reclamation fee on coal that has been mined in the United States since the late 1970's. These fees are placed into the AML fund and the money that North Dakota receives from this fund is used to eliminate existing and potential public hazards resulting from abandoned surface and underground coal mines.

Garrison

There are several known abandoned mines near Garrison including the Stevens Brothers Mine, Rupp Mine, Quality Coal Company Mine, Kunkel Mine, and the Garrison Power and Light Mine. PSC records indicate the underground mining activity in the work area occurred primarily in the 1910-1920s, but it may have continued beyond.

The first AML project near Garrison was a sinkhole filling project in 1983. In 1997 an exploratory drilling project located abandoned underground mine voids. This was followed by four drilling and grouting projects, three exploratory drilling projects, along with intermittent sinkhole filling projects. A few

cased mine voids remained from the 2005 project and numerous cased holes from the 2021 and 2022 Exploratory Drilling Projects.

AML Drilling and Grouting Projects near Garrison

Project Type	Year	Feet Drilled	Total Cubic Yards of Grout Pumped	Total Cost
Exploratory Drilling	1997	11,371		\$24,426.80
Drilling and Grouting	2002	22,062	1,055	\$120,939.76
Exploratory Drilling	2003	20,100		\$55,000.00
Drilling and Grouting	2004	14,585	1,720	\$217,069.70
Drilling and Grouting	2005	17,985	2,024	\$304,223.50
Exploratory Drilling	2021	7,239		\$130,938.00
Exploratory Drilling	2022	20,072		\$260,726.06
Drilling and Grouting	2022	4,889	2,139	\$721,511.00
Drilling and Grouting	2023	4,060	3,491	\$1,088,811
Total		122,363	10,429	\$2,923,645.82

Reclamation Procedures

In North Dakota, the preferred method to stabilize abandoned underground coal mines near public infrastructure is remote backfilling by pumping pressurized grout into the mine voids. Backfilling begins with drilling injection holes about every 10 linear feet. The relatively close spacing of drill holes is essential to target the mine workings. Haul tunnels were usually 10 feet wide. Angle or directional drilling may be used to drill under buildings, utilities, or roads. Drilled holes that intercept mine workings are cased from the ground surface to within five feet of the mine voids with 3" diameter Schedule 40 PVC pipe. Casing the holes allows for mine inspection with a borehole camera and conduit for pumping the grout to fill the mine voids. The grout strength is designed to mimic the strength of the coal that has been removed and prevent collapse.

Project Narrative

The competitive bidding process for this project was completed in March of 2023, and the Garrison Phase 6 AML Project was awarded to Earth Energy & Water Systems, Inc. of New Salem, ND. The material testing contract was awarded to GEOSERV, Inc. of Bismarck, ND.

The bid quantities for this project included 3,500 cubic yards of grout injection, 5,000 feet of drilling, 1,000 feet of casing, and 50 feet of coring. Grout was pumped in the ditches of McLean County Highway 15 and near parcels with residential homes. During the project, grout was tested by the material testing contractor every 50 cubic yards to ensure it met contract requirements for flowability and strength (**Figure 1**). A total of 4,060 feet were drilled (**Figure 2**) and 3,491 cubic yards of grout was pumped (**Figure 3**) at the locations shown on the map (**Figure 4**).

Five core samples were taken including two in the west ditch and one in the east ditch of McLean County Highway 15. Two cores were also taken near a residential parcel where a haul tunnel had recently been filled with grout. The cores showed a strong, continuous grout sample and confirmed the pumping was effective.

2023 Garrison Phase 6 Project Statistics:

Total holes drilled: 84
Total feet drilled: 4,060 feet
Average depth drilled: 48.33 feet
Total holes cased: 12
Total casing installed: 306 feet
Total grout pumped: 3,491 cubic yards
Average grout pumped per hole: 218.19 cubic yards
Total holes pumped: 16
Holes filled by adjacent pumping: 38
Estimated area reclaimed: 1.05 acres



Figure 1: The material testing contractor is performing a grout slump test.



Figure 2: Drilling Operations



Figure 3: Grout is being pumped in the ditch of McLean County Highway 15.



Figure 4: The project map shows the drilling and grouting conducted in the project.