High Mobility Grouting for Subsidence Mitigation at Glenrock, Wyoming

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Abstract

Through initial reconnaissance work and subsequent geotechnical investigations of a sinkhole event in May 2016, previously unknown mine workings were discovered at very shallow depth underneath primary roadways at the intersection of Millar Lane and the I-25 Bypass (aka Highway 20-26-87 and E. Birch Street) in Glenrock, Wyoming. In several locations mine voids were discovered as shallow as 10 feet below ground surface. As a result of the past history of subsidence events in Glenrock, previous subsidence mitigation efforts had been conducted in the area, in multiple projects and phases, but predominantly east of the area where the sinkhole occurred and new mine workings discovered.

In order to mitigate the subsidence risk to the critical roadways while maintaining use for local traffic, a void-fill grouting program was implemented. The extremely shallow depth to the mine workings encountered at Millar Lane limited grout injection pressures, and required careful grouting and grout monitoring procedures to prevent damage to the roadways. Additionally, the shallow depth to the mine workings required a high degree of void filling to mitigate the subsidence risk. The ability to achieve a high degree of void filling was also complicated by the highly caved and rubblized conditions present, water-filled mine workings, soft sediment infilling, and also by previous grout and sand slurry injection as operations moved eastward. As a result, injection of high-mobility grout with good flow characteristics and penetration capabilities was necessary for the conditions present.

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Verification core drilling conducted during initial stages of pilot grouting and again after all grouting was completed indicate that the high mobility grout was effective at filling both large open voids as well as small cracks and fissures, and that a high degree of void filling was achieved. These results confirmed the effectiveness of the high mobility grouting approach.