Mining in Rock with a Soft-ground TBM, Birmingham, Alabama

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Abstract

Jefferson County, which includes the city of Birmingham, Alabama and its surrounding communities is undertaking a series of projects designed to improve the quality of its sewage collection and treatment capability. Much of this program has involved the installation of pipelines, some of which have been sited in tunnel. These tunnels have been located in rock, soil and mixed ground. Excavated diameters have been around 102" with pipe diameters up to 54".

The W.L. Hailey Company of Nashville, Tennessee, in partnership with Rast Construction of Birmingham, has constructed a number of the tunnels in a variety of ground types. Two of the tunnels involved predominantly softer materials but with sections of harder ground.

On the Shades Valley Transfer Sewer, Section 10, in Birmingham, the main tunnel was 7,600 ft in length. The tunneling medium was anticipated to be primarily shale with some sandstone. The Hailey/Rast joint venture elected to use a Lovat soft ground tunnel boring machine for the whole tunnel in the expectation that the Lovat would cope with the harder ground, albeit it at a reduced level of production. In fact some sections of the sandstone ultimately proved too hard for the Lovat to cut economically and it became necessary to introduce a Jarva rock TBM to complete the tunnel.

This experience forced a change of approach on a subsequent project in the community of Trussville, some 20 miles to the north-east of Birmingham.

The Trussville Industrial Park Trunk Sewer included 1,600 ft of tunnel. Site investigation had indicated that approximately 1,000 ft of the tunnel would be in soil with the balance being in either a mixture of soil and limestone or wholly in limestone. The Hailey/Rast joint venture submitted the successful bid for the project by planning to use the same Lovat TBM but with the head modified to accept disc cutters to cut rock.

This paper describes the excavation phase of both the Shades Valley and Trussville projects with reference to progress rates and cutter usage and explores the practicality of developing a TBM capable of coping with a variety of different ground conditions on smaller projects.

Keywords: Shades Valley Transfer Sewer; Parkwood Formation; thinly-bedded shale with feldspathic siltstone and sandstone interbeds; Trussville Industrial Park Trunk Sewer and Pump Station; mixed materials of silts, sands and clays; soft-ground Lovat TBM; limestone encountered.

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