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Prud'homme Cavern No. 1 – Remediation & Reactivation of a Natural Gas Storage Cavern

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Abstract

Prud'homme Cavern No. 1 is one of seven natural gas storage caverns located at the TransGas Ltd. facility near Prud'homme, Saskatchewan. In October 2014, a gas release occurred due to an integrity failure of a cemented liner. The gas release lead to a wellhead fire and blow-out at the cavern site, which was ultimately contained. By December 2015, the cavern was fully de-gassed and re-watered allowing further investigation into the cause of the liner integrity failure which was completed in September 2016. Subsequently, the cavern remained suspended in a brine-filled state and, in the spring of 2019, TransGas Ltd. began contemplating if it was possible to bring the cavern back into natural gas storage service. In June 2019, an in-depth investigation into the current status of the well and cavern integrity was initiated ("Phase 1"). Phase 1 included a comprehensive evaluation of the wellbore integrity, mechanical integrity, and cavern geomechanical integrity. The conclusions derived from the Phase 1 activity lead TransGas Ltd. to execute Phase 2 of the project, which was a full remediation of the wellbore and a comprehensive geomechanical study. The well remediation included: the fishing and milling of approximately 965 meters (3,165 feet) of 177.8 mm (7") cemented liner casing; an evaluation of the condition of the 244.5 mm (9 5/8") cemented production casing; a full replacement of the wellhead (including the top joints of 339.7 mm (13 3/8") surface casing and 244.5 mm (9 5/8") production casing); the installation of a new 177.8 mm (7") cemented casing liner to ~1,000 meters (3,280 feet); and completing a nitrogen/brine interface mechanical integrity test ("MIT"). In order to establish safe operating limitations, the geomechanical study included an evaluation of the geomechanical and thermodynamic conditions of the cavern throughout the known operational history, the short-term gas release event, and projected future conditions of the cavern in natural gas storage service.

Key words: Bedded Salt Deposits, Canada, Gas Storage, Remediation, Geophysics, Salt Cavern, Integrity Failure, Prairie Evaporite, Casing Corrosion, Casing Milling, Casing Collapse, Liner, Mechanical Integrity Test, De-Gassing, Re-Watering, Blow Out, Gas Release