Getting at the potash: geological and hydrogeological considerations in shaft sinking

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Deep underground mining typically requires two shafts from surface to the orebody, for hoisting of ore, services, and mine ventilation. Currently two 5.5 m diameter concrete lined shafts are being constructed to a depth of almost 1 km at the Picadilly potash property, east of Sussex. These shafts, capable of hoisting 7 MM t of potash ore and 1 MM t of rock salt per year, were located relatively close to the existing Penobsquis mine so that existing mill facilities could be incorporated economically into the new development.

Geologically, the rock units through which the shafts are being sunk are comprised of a thick sequence of Mabou Group siltstones and sandstones, divided into two units: (1) an upper, fractured, water-bearing unit; and (2) a lower, non-water-bearing, generally finer grained unit in which fractures are gypsum-filled. The unconformable (?) contact between these units represents a regional, seismically distinctive, horizon and is known from drilling to be a water-bearing vuggy siltstone and poorly consolidated sandstone. This contact represents a significant challenge to shaft sinking, as the final concrete lined shaft must be essentially dry before it enters the evaporites below.

When sinking through the Windsor Group evaporites, the geomechanical properties of various geological members are the most important consideration. Closure rates of the salts vary, depending on geology, and the presence of hydroscopic salts adds further challenges to the construction of these shafts that must be designed and built to maintain their liner integrity for the life of the mine.

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