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MOVEMENT AND CONTROL OF BRINE RISING FROM THE RETSOF SALT MINE ELEVEN YEARS AFTER THE COLLAPSE

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Abstract

The Retsof Salt Mine became completely filled with saturated brine 21 months after a mining panel collapsed and ground water began to enter on March 12, 1994. Water entered through the collapse zone near the southern, downdip limit of the mine, which consists of rooms and pillars established within the Retsof Salt Bed. The flooded mine occupies approximately 6500 acres at an average depth of 1100 feet beneath Livingston County, New York. The volume of brine in the mine is estimated to be approximately 16.5 billion gallons based on a mining extraction rate of 62.5 percent with an average room height of 12.5 feet.

It is assumed that the Retsof Mine will gradually compress through roof-to-floor closure. This compression will squeeze brine out through the collapse area. It was assumed initially that this brine would enter and be contained within a regional fracture zone at the contact between the Onondaga Formation and Bertie Group above the mine. This fracture zone forms a regional aquifer that is naturally saline and slopes gently southward in the direction of regional dip. It was assumed that dense brine would preferentially enter this aquifer and move downdip by gravity flow to deep portions of the contact zone that are isolated from overlying fresh water aquifer systems. Despite these assumptions, the operator of the Retsof Salt Mine made a legal commitment to the State of New York to monitor the rise of brine within the collapse zone and to protect aquifers within the rock above the Bertie/Onondaga contact and in the overlying glacial deposits. As part of this legal agreement, the salinity in the collapse area has been monitored since 1996.

Saline water was encountered above the Bertie/Onondaga contact zone and at the base of the glacial valley aquifer system in 2003. Subsequent monitoring indicates that this salinity is increasing and that the salinity is directly connected to brine rising upward in the collapse zone from the mine. This brine is being squeezed from the mine at an estimated rate of between 36 and 106 gallons per minute. These findings have triggered the commitment to implement a remedial program. The following remedial options have been considered: no action; continued monitoring with no immediate action; grouting of the collapsed zone; and pumping control with disposal of the brine through various waste handling options. The various brine handling options include discharge to the Genesee River, transport to a commercial brine production facility, transport to a brine waste disposal facility, or the manufacturer of useable products by desalination at the site. Desalination appears to be the most cost effective and practical solution. A desalination plant has been designed and a plan is being developed to test the ability to control the brine by pumping. The primary pumping objective will be to withdraw brine at a rate balanced with the mine closure rate. If a balance can be achieved, then the brine level can be held in the collapse without pulling fresh water down into the salt bearing formations.

Keywords: Retsof Mine Collapse, Salt Contamination, Brine Control, Aquifer Remediation.