

Dear DEC Regional Directors Dereth Glance and Timothy Walsh,

This e-mail covers a number of salt-related issues. First among them, congratulations on DEC's [deicing salt survey](#). It is an excellent step in assessing awareness of the growing risks that present day use of deicing salt poses to our water resources.

The salt mines under and near Seneca and Cayuga Lakes, the two largest Finger Lakes, may explain in large part their higher salinity levels. However, Tony Prestigiacoimo has indicated that Canandaigua Lake is almost as saline as Cayuga Lake. This suggests that deicing of roads and other surfaces with salt is emerging as a primary threat to most if not all the Finger Lakes.

Over the summer, CLEAN's Cornell intern reached out to officials within the Keuka, Seneca, and Cayuga lake watersheds to get a better sense of how much road salt has been applied in recent winters, as well as to what extent use of brine is being implemented as an alternative. A transition to the use of brine for deicing is not yet taking place, possibly due to lack of budget for switching to the necessary equipment.

Please consider the idea of having the DEC target these three interconnected watersheds for an innovative high-priority "switching to brine deicing project." According to [Phil Sexton at What It Takes Advisers](#), conversion to brine deicing can enable reductions of winter salt applications by about 30%.

Brine storage in Cayuga Salt Mine

Our technical advisers continue to believe that Cargill's "storage" or de facto disposal of what may now be >500M gallons of brine stored in ponds in the Cayuga Salt Mine poses risks of mine collapse and the risk of long-term salinization of Cayuga Lake.

As Cargill is now thought to have the mine for sale or to otherwise be keen to dispose of this salt mine, it is now especially urgent that DEC require an EIS that will assess the risks associated with brine storage in S3 and elsewhere prior to a) permitting a modification of Cargill's 2021 mining permit to allow brine storage in the S3 portion of Cayuga Salt Mine or b) permitting the mine to be decommissioned with brine storage left in place. The flooding of the S3 portion of the mine with up to 360M gallons of brine is a "material change" that triggers the need for an EIS.

Brine storage in other room-and-pillar salt mines

[According to the Ithaca Times](#) (August 29, 2024) "The DEC said that the storage of water into abandoned portions of mines 'is a common practice in salt mines throughout the world.'" We don't know if the DEC official was quoted accurately, but we would appreciate learning from the DEC what other room-and-pillar salt mines store their shaft leakage waters in the mine rather than pumping them to the surface?

Our consultant, John K. Warren, author of the 1800-page monograph, **Evaporites: A Geological Compendium**, as well as [four reports](#) for CLEAN on Cayuga Salt Mine, describe the most fundamental principle of safe salt mining as "stay in the salt." As shaft leakage waters that are not yet fully saturated will dissolve salt in the mine, the storage/disposal of shaft leakage waters in a salt mine is a fundamental violation of Dr. Warren's mine safety mantra, "stay in the salt." We know that shaft leakage waters have never been stored in either of the two other New York room-and-pillar salt mines, the Hampton Corners Salt Mine and the former Retsof Salt Mine. Shaft leakage waters are pumped to the surface at Detroit Salt Mine.

We think that Cargill pumps shaft leakage waters to the surface at the new Cayuga Salt Mine Shaft 4. Earlier annual reports have described Cargill plans to pump shaft leakage waters to the surface at the Portland Point campus and we wonder why the DEC has required Cargill to follow through on such a commonsense investment in mine safety. We understand that Cargill is using concrete bulwarks to contain water intrusion in certain parts of their Whiskey Island Mine at Cleveland, and that such a risky situation has rendered that mine non-saleable.

On-going risks of brine storage at Cayuga Salt Mine

In 2015, the DEC's then mining consultant, [Dr. Vincent Scovazzo, quoted RESPEC](#), a Cargill consultant, as having warned Cargill in a 2014 report that on-going storage of under-saturated shaft leakage waters in ponds in mined voids on the No. 4 salt level could result in a "major collapse" that "could have a significant effect on Cayuga Lake's shoreline and the mine shafts."(p.12)

Fully saturated brine is about 26.5% salt and yet Cargill is proposing to flood the S3 portion of the mine with brine that would be only 24%-25% salt. In other words, they seem to be intent on repeating the risky practice that RESPEC (2014) warned them not to engage in pertaining to the 4-level mine. Cargill senior mining engineer Zoe Scopa put it this way in a [13 June 2023 document](#), "All water stored in this area will be sufficiently saturated to minimize dissolution of the remaining salt pillars, floor, and roof." (see page 33)

In that [review of Cargill's 2014 Annual Report to DEC](#), the DEC's mining consultant also noted issues with panel U12:

"The U-12 panel is also showing higher than normal closure near the breakthrough with SW2 [the panel leading to S3] and near the U-12A subpanel [which is located mostly under land just north of the Girl Scout Camp]. These areas are being monitored more frequently as we try to understand why the rates are increased. Both of these areas in U-12 were backfilled in the 1990's and both are showing a decreasing rate trend at this time."

Additionally, RESPEC notes "Salt dissolution near the injection point on the 4-Level is visible and the pillars are being undercut" which can possibly result in mine collapse. The review recommended a continuation of dumping "waste salt at the base of the No. 2 Shaft to increase salt saturation before the inflow enters the west pond."

Vortex risks in the event of mine collapse under Cayuga Lake

It is worth noting that neither the DEC nor Cargill has ever--to our knowledge--conducted any study on what sorts of risks mine collapse and a subsequent flooding of the salt mine might pose to Cargill's miners and shoreline residents, as well as long-term water quality in Cayuga Lake. We know that the one instance of a [freshwater lake draining into a salt mine](#) ended badly for Lake Peigneur and its shoreline. Lake Peigneur's water has been too saline to drink ever since the flooding event in 1980 where 65 acres of botanic garden were sucked down into the mine during the vortex event. Later this year CLEAN expects to receive a technical opinion as to whether a mine collapse under Cayuga Lake could result in a similar or even more damaging vortex.

As shown in the Table 1 below Cayuga Lake is much larger than Lake Peigneur.

Table 1. Lake Peigneur and Cayuga Lake Compared				
	Area (acres)	Average depth (ft) (pre-vortex)	Lake Volume (gallons)	Acres of land removed by vortex
Peigneur	1,200	3	3.5B	65
Cayuga	42,500	179	2,483B	????
Factor by which Cayuga is larger:	35	60	709	????

Source: area, average depth, & lake volume from Wikipedia & from other sources.

Deltas protruding into Cayuga Lake including Taughannock Park and Myers Point might each be susceptible to rapid removal by a mine collapse vortex occurring near the delta. The delta portion of Taughannock State Park east of Route 89 is about 45 acres and, like all the deltas protruding into the lake, contains no anchoring bedrock. This delta overlies an area just west of the unstable U40B mining panel and the parkland on this delta is part of the most iconic ecotourism destination in central New York, i.e., it is invaluable.

U40B and U12 are the two mining panels in the entire mine that have had the most chronically-problematic room closure rates, “room closure” referring to the rate at which the panel ceiling and the panel floor approach each other. Now that back-filling in the 1990s has not sufficiently slowed U12 closure rates, Cargill has resorted to the much riskier method of boring up into overhead brine pockets above U12. As former R8 DEC official Steve Army can likely attest, one group of experts authored a year 2000 paper (cited below) making the case that it was a pressurized overhead brine pocket that caused the sudden collapse of the Restof Salt Mine in 1994. The former Restof Salt Mine is located in similar geology just 65 miles NW of Cayuga Salt Mine. In the 54 years of reports during the time that Cayuga Salt Mine has been managed by Cargill, “borehole decompression fluids” have never been reported to be a mine inflow until 2023, the same year that Cargill [reportedly hired Deutsche Bank to help them sell Cayuga Salt Mine](#). It seems odd that Cargill would suddenly put the mine on the market within a few years of spending many tens of millions of dollars to upbore Shaft 4 and to construct a building over their lower bulk salt storage pad at Portland Point.

The DEC has required American Rock Salt to conduct two Environmental Impact Statements at their Hampton Corners Salt Mine in Livingston County during the 23 years the mine has been in operation. Why has the DEC exempted Cargill (the largest private corporation in North America) from conducting a single EIS at Cayuga Salt Mine during the 54 years the company has managed the mine? Why the double standard? Does the DEC really need to wait for an actual mine collapse before deciding that tapping into a brine pocket over U12 is a material change in mining practices, and one that may have established a hydraulic connection to overhead water resources?

In October, Cargill will reportedly [shut down its third shift and reduce employees from 190 to 165](#). American Rock Salt will reportedly be hiring more staff this fall. Cargill may already have

begun the mine closure process now that would-be buyers have decided the mine has failed their due diligence queries.

The need to better define “other inflows”

Returning to the above-cited Ithaca Times article, we learn that:

“The DEC told the Ithaca Times in a statement that the water entering the mine is not a leak, and is not associated with the lake. They say that the source of the water is an accumulation of process water, surface stormwater runoff, and seepage into the shafts, and that it is a common occurrence in underground mines.”

In 2019, Cargill began reporting to the DEC “other inflows” into the mine without defining this term. It’s not clear why the DEC has not had the regulatory curiosity to require Cargill to define “other inflows.” Cargill has continued to use the term “other inflows” in four subsequent annual reports to the DEC. However, in a 2023 document, we learned that one component of other inflows was brine from decompression boreholes that were being drilled up into the roof rock above the U12 mining panel in an attempt to slow room closure rates. This is the first mention of “decompression boreholes” that we know of during the 54 years that Cargill has owned the mine. This fact alone is a material change. There was no mention in [Cargill's 2023 Annual Report to the DEC](#) of either “process water” or stormwater runoff being routed into the mine.

As already mentioned, one theory for the collapse of the Retsof Mine in 1994 is that there was an unknown pressurized brine pocket that triggered the two collapse zones in the mine. Leo van Sambeek, S.W. Gowan and K.A. Payment wrote in [Loss of Retsof Mine: An Engineering Analysis](#) (2000, pp.411-416):

“The separation distance was sufficient to shield the mine from known solution-mined caverns, but a natural ‘brine pocket’ that existed west of the mine also extended over the part of the mine that eventually collapsed. The deliverability of the valley aquifer system exceeded everyone's precollapse expectations, both in rate and total volume. The aquifer deliverability was 50 times greater than had been opined...

“The brine pool above the mine was formed by the dissolution of salt beds in the Syracuse Formation of the Salina Group. ***The salt was dissolved by groundwater that was apparently circulating downward through fractures or faults that are vertically connected to aquifers near the top of the rock and in the overlying glacial sediment*** (Gowan et al., 1999). These overlying aquifers were relatively fresh and sufficiently prolific to sustain the inflow rate.” (emphasis added in second paragraph)

Given these authors’ understanding that a pressurized brine pocket may have caused the collapses at Retsof Mine in 1994 and that there was a hydraulic connection to overlying aquifers, it only makes sense for Cargill to want to drain and depressurize any pockets of pressurized brine located above mining panel U-12, if those brine pockets are not connected to the overlying aquifer. The large size of the planned S3 brine disposal area and the relatively recent decision to

sell the mine suggest that Cargill may have unintentionally bored into a hydraulic situation they are not willing to disclose to the DEC, to prospective buyers, or to the public.

Risks posed by flooding of the S3 Zone

The north end of the proposed S3 flood zone is located about 370 yards south of the U12 mining panel. In projecting the shaft leakage and other flow rates over the next 15 years, it appears that Cargill is factoring the possibility of flow rates that are up to 24% greater than the rate reported in 2023. [In the 2003 annual report](#), the earliest one that we have accessed, total inflow was reported to be 40 gallons per minute, but 21 of those gallons were “stormwater run-off” that was diverted into the mine. In its 2023 Annual Report to DEC, total inflow is reported to be 33 gallons per minute with no storm water run-off and with 2 gpm of “other inflows.” There was no actual mention in the 2023 Annual Report of decompression borehole fluids, but these fluids could have been included within the term “other inflows.”

On page 36 of [this document](#), Cargill has indicated that the S3 flood zone will have a storage capacity of 360 million gallons. Fill time for this flood zone is estimated to be 15 to 18 years “and will fill at a rate of approximately 1.3-1.8 million gallons per month.” Doing the math, 1.3M gallons per month translates to 29.6 gpm, whereas 1.8M gallons translates to 41.0 gpm. 41 gpm is 24% higher than the 2023 storage rate reported to the DEC. The 1.8M gallons of inflow per month would be, in our opinion, a material change in mine operations.

A lot depends on whether a pressurized brine pocket is an isolated entity, possibly a relict pool created within the Syracuse Formation during the last ice age 10,000 years ago or whether rainfall percolating down through the watershed (or from the artesian aquifer discovered in 1995 between the lake and the mine) is now reaching fissures in the Syracuse Formation, and thus creating relatively new pockets of pressurized brine that are causing accelerated room closure in mining panels U12 and/or U40B.

Our earth scientist adviser, Dr. Raymond Vaughan believes that a “leak” cannot be ruled out if the source of these borehole decompression fluids is being actively refilled from an aquifer or other water resource higher in the geologic strata.

Will flooding of the S3 zone pose a risk of mine collapse? We know that Cargill initially hired their long-term mining engineering consultant RESPEC to study this issue. Yet, after learning that RESPEC assumed that flooding would cause the first 15 feet of claystone roof rock over the S3 area to lose 95% of its strength, Cargill hired a new consultant, Agapito Associates, to conduct a new study. [Reportedly, Agapito was not shown the RESPEC report.]

As far as we know, Agapito had no prior experience at Cayuga Salt Mine, and we find no mention of salt mine experience on their [website](#). Perhaps when the largest private corporation in N. America invites a new firm to work for them there is a robust effort to please? In any case, we do find this language from an April 2022 Agapito report to Cargill that is cited by the DEC’s mining consultant:

“The precise behavior of the claystone roof when exposed to water is unknown, but it is hypothesized that the current mining state has caused relaxation of the roof over the entries, meaning that portions of the roof are in tension or relatively low compression

and that these portions of the roof are especially susceptible to deterioration and failure as the panel is flooded.”

On the topic of prior experience with salt mines, we are also concerned that the DEC’s third-party mining adviser, John T. Boyd, Inc. has hired Keith A. Heasley, PhD, PE, who may have had no prior experience with salt mining when Boyd hired him (out of retirement) to advise the DEC on the two room-and-pillar salt mines in New York State. Now that Cargill is “managing” the DEC’s mining consultant, does Cargill prefer a situation in which their own salt mining experience cannot be trumped by a consultant whose prior experience has been focused on coal mining?

OGS lease to Cargill does not permit brine disposal in the mine

Has the DEC conferred with OGS regarding Cargill’s proposed flooding of S3? Redactions notwithstanding, we see no language in [Cargill’s lease with OGS](#) that allows Cargill to dispose of inflow waters in the mine.

Is Cargill complying with 40 CFR §144.24?

We are aware that the injection of concentrated brine into Cargill’s Cayuga Mine via two mine shafts is considered Class V injection activity under 40 CFR §144.6(e). This Class V injection activity is currently authorized by rule pursuant to 40 CFR §144.24, meaning Cargill must comply with all requirements of Part 144 Subpart G and the rest of the Underground Injection Control (UIC) program but does not have to get an individual permit.

Do you know whether EPA Region 2 has visited Cayuga Salt Mine this year and determined that the Class V inventory information for the mine is up-to-date to the extent that EPA is aware of borehole decompression fluids are now part of “other inflows”?

Please keep in mind that once Cayuga Salt Mine is flooded, the highly pressurized brine will need to travel somewhere as room closure proceeds. Movement of this concentrated brine into Cayuga Lake through a fault, fracture or rubble chimney would be [a contamination of USDWs](#). According to the DEC about 100,000 people currently rely on Cayuga Lake for their drinking water. This figure will increase dramatically as sea-level rise begins to push coastal communities inland. We also know that this sort of aquifer contamination occurred following the flooding of the Retsof Mine and therefore feel that a forward-thinking approach to regulation cannot responsibly allow injection of brine into Cayuga Salt Mine whether or not it is fully-saturated.

Conclusion

To fail or not to fail? To risk or not to risk a shoreline-eroding vortex? Why continue risking a lake-salinizing collapse event, or even a planned mine flooding event, prior to an EIS of the mine that carefully addressed a key might closure plan issue: is it acceptable to flood the mine at decommissioning or should Cargill be required to keep it dry for as long as possible?

Recently FOILED documents give us the impression that the DEC is presently poised to approve the modification of the mining permit to allow the flooding of S3 to continue. We share the DEC’s concerns expressed in the January NOIA that there will be no means to assess risks of mine collapse once extensometers in the S3 zone are disabled by rising flood waters. We request

that any decision on the requested permit modification be delayed until after an EIS, and that brine storage in the mine be halted immediately.

We insist that New York State require Cargill to post a \$10B environmental bond until such time as the mining panels have all closed, a process that can take from 20 to 200+ years. Additionally, we would like to meet with you both in person to discuss the need for a 621 or 624 public hearing about the risks posed by the flooding of S3 by tapping into overhead pressurized brine pockets and mining near and under geologic anomalies A through E and the Frontenac Point Anomaly at the northern end of the mine.

We look forward to talking about these issues in person.

Best regards,

John

John V Dennis, PhD
Cayuga Lake Environmental Action Now (CLEAN)
893 Cayuga Heights Road
Ithaca, New York 14850, USA
Cell: 1-607-227-5172
<http://www.CLEANcayugalake.org/>