NYS DOH-certified laboratory. Sodium levels in Crestwood's creeks greatly exceed the EPA drinking water advisory for sodium of between 30 and 60 mg/L, the EPA chloride standard for aquatic life of 230 mg/L, and NYS DOH maximum contaminant level determination for chloride in drinking water of 250 mg/L, as described above. (See Tables 1 - 3 and Figures 1 - 5 in Appendix 1.)

As can be seen in Figure 2 below, this base-water flow survey indicates that stream waters flowing near Crestwood's operations were highly contaminated with salt brine when compared to sampling points further inland, further to the north and in the lake. Sources of this contamination remain unknown but potentially could include:

- previously reported brine leakage to the surface during hydraulic fracturing to create paired brine well connections;
- leakage from above-ground brine pipelines that carry brine from wellheads and the brine pond to the US Salt factory;
- leakage from the brine pond and/or from wellhead activities such as drilling and maintenance;
- brine leaks from well bores due to poor cement bonding to rock/casing; and/or to corroded casing; and
- seepage of salinized groundwater into streams.
We emphasize that this small survey has not yet been replicated and was done during a period of low flow. The volume of water contributed to Seneca Lake by the highly salinated streams flowing through Crestwood’s property is not nearly sufficient, by itself, to explain the elevated salt levels in the lake. The possibility that concerns us is that the lake and the streams are both being contaminated by the same unknown source. More research is needed.

3) Violations of the Clean Water Act continue.

Data available at echo.epa.gov indicate that Crestwood subsidiary US Salt has been in violation of the Clean Water Act (CWA) for 8 out of 12 recent quarters; four of those violations were classified as Significant Non-Compliance (SNC). During this period, US Salt has been fined $30,500 for non-compliance.
During this same period, Cargill Salt, a nearby solution salt mining facility on the south bank of Seneca Lake that does not store gas in salt caverns, has had no violations of the Clean Water Act.

If increased gas storage on Crestwood subsidiary properties increases the amount of brine in need of disposal, US Salt may become even less able to comply with the CWA. We do not know how US Salt has been releasing the bleed brine byproduct that is not suitable for commercial use. We do know that on March 27, 2014, an employee of US Salt made a call to the DEC spill hotline at 11:41am. Seven minutes later, a deliberate release of salt brine into Seneca Lake was initiated. In the record under “amount spilled” is the word, “unknown.” The above-documented stream flows to Seneca Lake may constitute additional violations.

4. Past and recently released evidence both indicate that the salt caverns have been mined in such a way that ceilings or floors of some caverns are now “out of salt,” that is, protruding into non-salt strata. This feature, combined with complicated geology, makes the caverns potentially leaky. Evidence for past and ongoing integrity problems has recently come to light.

4.1 A 2002 assessment of gas storage options in New York State took a dim view of the state’s solution-mined salt caverns, noting that they are hybrid structures made of both salt and rock:

“In the opinion of P. Briggs of the Division of Mineral Resources, NYSDEC, most of the old salt mines and solution cavities in New York State, even though some of which contain thick sections of bedded salt, would be unfit for gas-storage mainly because these cavities probably do not have the required geologic containment capabilities. Also, most of the old salt wells have been improperly plugged and may be flooded with water.”

4.2 FERC relied for its approval on finding no physical reason to conclude that the bedded salt caverns of Gallery 2 lack comprehensive integrity. And yet, other qualified experts have documented concerns about cavern integrity great enough to cancel a similar project in the same group of caverns. In 2011, seeking a storage space for a compressed air energy storage project, the New York State Electric and Gas Corporation (NYSEG) rejected bedded salt caverns on what is now Crestwood’s property on the grounds that...

“...most if not all of the existing salt caverns at the site had been mined in a fashion in which the salt on the roofs of the caverns had largely been mined out leaving a bare rock face on the ceiling. The absence of a substantial layer of salt on the roofs of these caverns, combined with the potential for cavern to cavern leakage made the potential re-use of...”

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19 http://www.dec.ny.gov/cfmx/extapps/derextemaVindex.cfm?pageid=2
existing caverns for the storage of high pressure air problematic."\textsuperscript{21}

The caverns evaluated by the NYSEG team are located near those now selected to serve as NG storage for Crestwood's Arlington NG Storage Project.

4.3 FERC repeatedly stated in its approval that these and adjacent caverns were used previously for storage of LPG (from 1964-1984), without commenting on any difficulties encountered. It has now come to light that more than 400,000 barrels of LPG stored in an adjacent cavern became entrapped because of adverse geometry, requiring recovery techniques unusual enough that the event was described at an international symposium.\textsuperscript{22}

Geophysicist H.C. Clark's new January 2015 cavern integrity report describes this complex geometry as an underlying vulnerability that interacts with the vulnerabilities created by solution mining itself. The combination is dangerous, contends Clark, and was overlooked by FERC.

"The geology where these caverns have been dissolved has been folded, thrust faulted, and cut by vertical faults, leaving a complex geology that has controlled the development of the Watkins Glen Brine Field. The development, shape, and behavior of the caverns are, in large part, a product of that geology."

Clark 2015 notes that this complexity is dynamic, with caverns growing outward and upward over time and intersecting with other caverns or fault lines. Upward growth, in particular, can lead to rock falls and partial roof collapses, as is evident from the rubble piles in the bottom of the caverns.\textsuperscript{23}

4.4 A February 2015 scoping paper by geologist and highly published expert on solution salt mining, John K. Warren, raised further questions about suitability of the Arlington caverns for pressurized gas storage and expressed concerns about cavern perimeters that extend outside of salt formations. Warren singles out worrisome evidence for potential leakage pathways of brine.\textsuperscript{24}

4.5 In early February 2015, the New York State Museum released 80 gamma ray log files for Salt Point Brine Field wells. Because shales typically emit more gamma rays than other sedimentary rocks, gamma ray logging is a standard method of characterizing the amount of shale and overall stratigraphy in boreholes.

Of the released files, 27 describe wells that access, or did access, caverns that are currently used for methane storage or that have been targeted by Crestwood for possible future gas storage. (Seven of the files describe wells located on land owned by Arlington Storage LLC, namely, wells 27, 28, 30, 45, and 46. Files were not obtained for Arlington Wells 30A, 31, 31A, and 59. However, the stratigraphy for Wells 30 and 30A should be virtually identical.) J.K. Warren is expected to complete analysis of these files by late April 2015. The results will reveal how much exposed shale exists inside the boreholes and, perhaps, depending on how the surveys were done, inside the caverns themselves. We believe that these data are vital to the decision-making process and assessment of risk.

All together, these reports raise troubling questions for us about the safety of converting Seneca Lake brine caverns to gas storage.

A more comprehensive summation of the new and/or newly released information on cavern integrity, not considered by FERC, is contained in Appendix 2.

5. Salt cavern leaks, collapses, fires, or catastrophic explosions on the steeply sloped banks of this lake could also threaten drinking water.

Rob Mackenzie, MD, FACHE—retired CEO of Cayuga Medical Center with extensive risk analysis experience—evaluated the major public safety risks associated with the NG storage proposal. In an independent, high-level quantitative assessment (QRA) released in early February 2015, Mackenzie estimated the probability of a serious or extremely serious salt cavern accident at greater than 40 percent over a 25-year period, including both baseline and incremental risks. The possibility of major salt infiltration into Seneca Lake added to this risk, as did the location of the caverns in bedded salt strata rather than salt domes (as is more typical in Gulf Coast gas storage areas).

In a review of the literature on catastrophic accidents involving gas storage in salt caverns, Mackenzie noted that LPG and NG storage in salt caverns is rare—accounting for less than 10 percent of all underground storage in the U.S., with an average of only 30 such facilities operating at any given time over the past two decades. Nevertheless, salt cavern storage is responsible for a disproportionate number of accidents. Despite supervision and monitoring by both state and federal agencies, at least 20 serious or extremely serious incidents in salt caverns used for gas storage have occurred since 1972. Ten involved large fires or explosions. Six involved loss of life or serious injury. Eight necessitated evacuations of residents.25

Mackenzie recommended denial of plans to store additional NG in Schuyler County with strong consideration given to safer forms of gas storage. We further note that a catastrophic accident in a salt cavern on a steeply sloped bank beside a lake that serves as a source of public drinking water could create far-reaching, long-lasting public health consequences.

6. Although they all draw on the same body of water, Seneca Lake’s various public drinking water systems are not collectively protected as a Level 2 National Infrastructure Protection Plan asset, as would be appropriate, given known vulnerabilities and consequences.

The Department of Homeland Security’s National Infrastructure Protection Plan (NIPP) includes a Critical Infrastructure Prioritization Program that identifies nationally significant critical assets and systems needing higher levels of protection. Under the Water Sector-Specific Plan of the NIPP, assets designated as Level 1 and Level 2, if destroyed or disrupted, could cause some combination of significant casualties, major economic losses, or widespread and long-term disruption to national or regional well-being and governance capacity.26

The threshold population for designation of Level 2 NIPP assets is 25,000. The public drinking water systems in Geneva, Watkins Glen, and Waterloo alone provide water to 32,000 residents. (Seneca Lake is a leading tourist destination, with, for example, more than one million annual visitors to Watkins Glen State Park.) Until now, however, each primary water system along both banks of the 40-mile-long lake has been designated its own Level 3 or 4 asset. This segmentation reduces the availability of planning and preparation resources, thus making difficult, if not impossible, any meaningful response to any lake-wide catastrophe. By contrast, Seneca Lake public water systems, taken as a whole, would constitute a Level 2 NIPP asset. From a public health point of view, we believe Seneca Lake water systems merit a Level 2 designation.

Were Seneca Lake rendered non-potable, all public water systems relying on the lake would be affected, and the economic losses and the disruption of regional well-being could be major, widespread, and long-term.

Request for EPA To Take Actions Within its Statutory Purview

We believe that the information provided above should be examined under the Safe Drinking Water Act and Clean Water Act.

We know of no other example of underground storage of NG in interbedded salt caverns that is also located on the shore of a lake that serves as an important drinking water source. Containing 4.2 trillion gallons of water, Seneca Lake is the largest body of fresh water wholly contained within the state of New York. The residence time of water in Seneca Lake is approximately 18 years. A contamination event in this contained body of water could impact the quality of drinking water for generations to come.

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We are mindful that even small upticks of salinity in this lake, which is already high in salt, may have public health consequences. A study showed, for example, that infants fed formula made with high sodium tap water (196 mg/l) had increased blood pressure.\textsuperscript{27}

Again, please review this information and let us know if the materials we have brought to light have bearing on the water quality of Seneca Lake. We ask for a suspension of the permitting process at both the state and federal level until EPA can suitably evaluate the water quality issues raised in this letter and determine if expansion of the NG storage project at Seneca Lake is a threat to the safety of drinking water.

Further, we ask that the EPA request that the Agency for Toxic Substances and Disease Registry and the U.S. Geological Survey closely examine the independent science surrounding the proposed NG project and the combined impact of both the NG and the LPG projects.

We further recommend that the public water systems using Seneca Lake as source water together be designated a Level 2 National Infrastructure Protection Plan asset.

Finally, we believe that, in light of this new information, a formal Environmental Impact Statement—rather than an Environmental Assessment—be required as a pre-condition before permitting the NG gas storage expansion project to proceed.

Please do not hesitate to ask us further questions.

Respectfully yours,

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Concerned Health Professionals of New York

Physicians for Social Responsibility, New York Chapter

cc: Chairman Cheryl LaFleur, Federal Energy Regulatory Commission  
Senator Kirsten Gillibrand  
Senator Charles E. Schumer
### Appendix 1: Stream Sampling Results

#### Appendix Table 1. Locations and parameter values for water samples collected on October 24, 2014 at sites in the Town of Reading, NY.

<table>
<thead>
<tr>
<th>Date</th>
<th>Wssport</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Location</th>
<th>Type</th>
<th>Sodium [mg/L]</th>
<th>Chloride [mg/L]</th>
<th>Conductivity [µS/cm]</th>
</tr>
</thead>
<tbody>
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<td>10/24/2014</td>
<td>37.42429</td>
<td>42° 15' 13&quot;</td>
<td>76° 12' 34&quot;</td>
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<td>undisturbed</td>
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<td>disturbed</td>
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<td>lakeshore</td>
<td>target</td>
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<td>26.4</td>
<td>612</td>
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#### Appendix Table 2. Statistical results comparing concentrations of sodium, chloride, and conductivity among site categories.

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<thead>
<tr>
<th>Parameter</th>
<th>Site Comparison</th>
<th>t-value</th>
<th>p-value</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Sodium (mg/L)</td>
<td>Undisturbed: Seneca Lake</td>
<td>0.223</td>
<td>0.825</td>
<td>n/s</td>
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<tr>
<td></td>
<td>Disturbed: Undisturbed</td>
<td>-3.470</td>
<td>0.002</td>
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</tr>
<tr>
<td></td>
<td>Disturbed: Seneca Lake</td>
<td>-4.460</td>
<td>&lt;0.001</td>
<td>***</td>
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<tr>
<td>Chloride (mg/L)</td>
<td>Undisturbed: Seneca Lake</td>
<td>0.232</td>
<td>0.818</td>
<td>n/s</td>
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<td></td>
<td>Disturbed: Undisturbed</td>
<td>-3.427</td>
<td>0.002</td>
<td>**</td>
</tr>
<tr>
<td></td>
<td>Disturbed: Seneca Lake</td>
<td>-4.387</td>
<td>&lt;0.001</td>
<td>***</td>
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<tr>
<td>Conductivity (µS/cm)</td>
<td>Undisturbed: Seneca Lake</td>
<td>-0.120</td>
<td>0.905</td>
<td>n/s</td>
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<tr>
<td></td>
<td>Disturbed: Undisturbed</td>
<td>-3.460</td>
<td>0.002</td>
<td>**</td>
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<td>Disturbed: Seneca Lake</td>
<td>-4.844</td>
<td>&lt;0.001</td>
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</table>

#### Appendix Table 3. General Water Quality Standards for Surface Waters in New York State
((Environmental Conservation Law, §§ 3-0301[2][c][l], 15-0313, 17-0301, 17-0803))

<table>
<thead>
<tr>
<th>Substance</th>
<th>Water Class</th>
<th>Standard (mg/L)</th>
<th>Type</th>
<th>Basis Code</th>
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<td>H(WS)</td>
<td>H</td>
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<tr>
<td></td>
<td>S, AA- AA-S</td>
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<td>H(WS)</td>
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<tr>
<td>Sodium</td>
<td>GA</td>
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<td>H</td>
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<tr>
<td></td>
<td>GA</td>
<td>20</td>
<td>H(WS)</td>
<td>H</td>
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</table>

1: [http://www.dec.ny.gov/regs/4592.html](http://www.dec.ny.gov/regs/4592.html)
Appendix Figure 1. General sampling area outlined in yellow, located in the Town of Reading, Schuyler County, New York.

Appendix Figure 2. Town of Reading tax map showing parcel ownership (2011) along northern edge of the area of concern.
Appendix Figure 3. Town of Reading tax map showing parcel ownership (2011) along the southern edge of the area of concern.
Appendix Figure 4. Google Earth aerial imagery depicting waypoint locations (Table 1) of sampling sites in the Town of Reading, New York. Yellow pins represent sampling locations on stream segments flowing through non-active sites, blue pins represent sampling locations on stream segments flowing through active sites, and red pins represent sampling locations of paired inland and lakeshore sites on the same stream.
Appendix Figure 5. Two-point comparisons of Sodium, Chloride, and Conductivity values on three streams flowing into Seneca Lake in the Town of Reading, NY. Upstream samples were collected upstream of NYS Rte. 14, downstream samples were collected at the high-water mark entering Seneca Lake. The control stream is located approximately 0.5-mile north of properties containing US Salt operations. The target streams flow through a northern and southern portion of properties containing US Salt operations.
Appendix 2: Summation of New and/or Newly Released Geological Information on Cavern Integrity

FERC concluded in May of 2014 that NG storage in these caverns would be safe, based on available information. Since that time, the following new and/or newly-released information has become available to the public:

1. FERC relied for its approval of this project on company diagrams, one of which has now been released to the public. This company diagram markedly deviates from previously published literature in purporting to show:
   a. A depth for Seneca Lake half the documented depth
   b. A depth for the glacial till bed of Seneca Lake half the documented depth
   c. Absence of documented geologic faults
   d. Inter-cavern pillar width wider than documented
   e. Intra-cavern shale layers thinner and straighter than documented
   f. Absence of documented major rubble piles
   g. Cavern shape and location different than documented
   h. Absence of documented major roof collapse in Cavern 30/31
   i. Omission of 1964 sonar record for Cavern 30/30, stating instead that “1967” is first sonar record

2. FERC relied for its approval on the assertion that it was “unaware of any relation between cavern age and cavern integrity,” a concern raised by opponents of the project. Evidence of such a relationship was documented in 1978 and has recently again come to attention.

3. FERC relied for its approval on finding “no physical reason to conclude that the bedded salt caverns of Gallery 2 lack comprehensive integrity.” Evidence that other qualified experts have documented concerns about cavern integrity, great enough to cancel a similar project in the same group of caverns, has recently come to light.

4. FERC repeatedly stated in its approval that these and adjacent caverns were used previously for storage of LPG (from 1964-1984), without commenting on any difficulties encountered. It has now come to light that more than 400,000 barrels of LPG stored in an adjacent cavern became entrapped because of adverse

29 FERC Order Issuing Certificate dated May 15, 2014 in Docket No. CP13-83
31 Request for rehearing 20141031-5011, 10/30/2014, Docket CP13-83
32 FERC order Issuing Certificate dated May 15, 2014 in Docket No. CP13-83
34 FERC Order Issuing Certificate dated May 15, 2014 in Docket No. CP13-83