NYSDEC OHMS Document No. 201166576-00037

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
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In the Matter of the Application for an Underground Gas Storage Permit Pursuant to Environmental Conservation Law (ECL) Article 23, Title 13, by

DEC Appl. No. 8-4432-00085

FINGER LAKES LPG STORAGE, LLC

Applicant.

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DEPARTMENT OF ENVIRONMENTAL CONSERVATION STAFF INITIAL POST-ISSUES CONFERENCE BRIEF

Dated: April 17, 2015

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PRELIMINARY STATEMENT

The staff of the Department of Environmental Conservation ("DEC" or "Department") respectfully submit this initial post-issues conference brief in the above captioned proceeding. Petitions for full party status were received by the Seneca Lake Pure Waters Association ("SLPWA"), a collective of county and local governments who identify themselves as the "Seneca Lake Communities" ("SLC"), and Gas Free Seneca ("GFS"). Petitions for *amicus* status were received by the Finger Lakes Wine Business Coalition ("FLWBC"), the National Propane Gas Association, the Propane Gas Association of New England, the United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial and Service Workers International Union, AFL-CIO and Schuyler County legislators, Van A. Harp and Michael L. Lausell ("Harp and Lausell").

Petitioners seeking adjudication of an issue in a DEC administrative hearing bear the burden of persuasion to demonstrate that a substantive and significant issue exists. 6 NYCRR 624.4(a) (c) (4). As explained fully below, a review of the petitions for party status in this proceeding and the transcript of the issues conference, will find that petitioners failed to meet their burden. Most of the issues proposed for adjudication, including those related to cavern integrity, water quality, public safety, noise and cumulative impacts are rebutted by information contained in the Draft Underground Storage Permit, the Draft Supplemental Environmental Impact Statement ("DSEIS"), the application materials submitted by Finger Lakes LPG Storage, LLC ("Finger Lakes" or "FLLPG") and Department staff's analysis. On the facts presented here, the project is consistent with existing community character. Staff took a hard look at the potential adverse environmental impacts of the proposed facility, and all material mitigation measures are already included in the Draft Underground Storage Permit.

Two of the petitions for *amicus* status also fail to meet the requirements for an *amicus* petition provided in 6 NYCRR 624.4(b)(1) and (3), in that they failed to identify the legal or policy issues sought to be briefed, and failed to identify why the amicus petitioners are in a unique position to comment on such issues. With few exceptions, the petitions for *amicus* status filed by FLWBC and the Legislators Harp and Lausell raised factual questions, rather than legal or policy issues, and duplicated issues raised by other petitioners. Petitioners also raise issues about the safety of rail transport and the emergency preparedness of the Schuyler County government, neither of which are properly addressed in this proceeding.

I. THE SUBSTANTIVE AND SIGNIFICANT STANDARD

The standard by which to judge offers of proof in DEC administrative proceedings is well established. The Department's hearing regulations prescribe that to be adjudicable, an issue raised by a potential party must be both substantive and significant. 6 NYCRR 624.4(c) (1) (iii). Substantive issues, as defined by 6 NYCRR 624.4(c) (2), are those issues which raise "sufficient doubt about the applicant's ability to meet statutory or regulatory criteria applicable to the project, such that a reasonable person would require further inquiry. *Id.* To be significant, a proposed issue must meet a threshold level of importance; not every substantive issue is automatically significant. Only those issues which "have the potential to result in the denial of a permit, a major modification to the proposed project or the imposition of significant permit conditions in addition to those proposed in the draft permit" are considered significant. 6 NYCRR 624.4(c) (3).

As the Commissioner set out in *Jointa Galusha*, "Judgments about the strength of the offer of proof must be made in the context of the application materials, the analysis by Staff,

draft permits and the issues conference record. Offers of proof submitted by a prospective intervenor may be completely rebutted by reference to any of the above, alone or in combination." *Matter of Jointa Galusha, LLC*, Interim Decision of the Commissioner, 2002 N.Y. ENV LEXIS 27, at 3, May 7, 2002.[1] "While the intervenor's offer of proof at the issues conference need not be so convincing as to prevail on the merits, its offer must amount to more than mere assertions or conclusions." Id., *citing, Matter of Citizens for Clean Air v. NYS Dept. Env. Conserv.*, 135 A.D.2d 256, 261 (3rd Dept. 1988). An offer of proof consisting purely of assertions or conclusions, and which lack a factual foundation, cannot serve as a basis to move forward with litigation. *See*, *Matter of Halfmoon Water Improvement Area No. 1*, 1982 WL 25856, April 2, 1982.

As detailed by Department staff at the issues conference, and explained more fully below, the petitions for party status provide speculative conclusions or unsupported technical opinions, not adjudicable issues. Concerns about community character, noise, alternatives, and salinity levels in Seneca Lake, cumulative impacts, public safety and cavern integrity were not backed up by fact-based offers of proof. Indeed, each of the proposed issues is rebutted by the record available in this proceeding, the draft permit conditions or Department staff's own analysis of the project. Also, rather than demonstrate how FLLPG would be unable to meet applicable statutory and regulatory standards, petitioners referenced many facts and scientific principles that are either unproven or bear no relevancy to the proposed project, all in an attempt to cast doubt on the soundness of the project and DEC staff's review of the project. Petitioners in all respects failed to make an offer of proof sufficient to demonstrate that a substantive and significant issue exists and their requests for an adjudicatory hearing should be denied.

[1] Pinpoint page references are to the Lexis pagination of the case.

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II. THE PETITIONS FOR FULL PARTY STATUS FAIL TO RAISE ANY DOUBT ABOUT THE APPLICANT'S ABILITY TO MEET STATUTORY OR REGULATORY CRITERIA

A. PETITIONERS GFS, SLC, AND AMICUS PETITIONER FLWBC[2] HAVE NOT ESTABLISHED THAT ANY SEQR RELATED ISSUES SHOULD BE ADJUDICATED

Where the Department is lead agency and has prepared a DEIS for an action, the standard for adjudication of SEQR related issues under 6 NYCRR 624.4 (c) (6) (b) is as follows:

> … (b) Whenever the department, as lead agency, has required the preparation of a DEIS, the determination to adjudicate issues concerning the sufficiency of the DEIS or the ability of the department to make the findings required pursuant to section 617.9 of this Title will be made according to the standards set forth in paragraph (1) of this subdivision."

See also, Matter of Crossroads Ventures, Interim Decision of the Deputy Commissioner, 2006 N.Y. ENV LEXIS 88 at 12-13, December 29, 2006 ("[w]here, as here, the Department as lead agency has required the preparation of a DEIS, the determination to adjudicate issues concerning the sufficiency of the DEIS or the ability of the Department to make findings required pursuant to SEQRA will be made in accordance with the same standards that apply to the identification of issues generally…"). "SEQRA, however, does not require the Department to use the adjudicatory forum to resolve all comments on the DEIS.…Where a participant in the Part 624 hearing process seeks simply to add to

[2] Collectively, the petitioners for party status, GFS and SLC, and the amicus petitioners, FLWBC, are referred to herein as "petitioners." Where appropriate, staff refer herein to these entities individually.

information on a topic for which the DEIS contains sufficient information, no adjudicable issue is raised. However, such SEQRA-related information would be considered in the ongoing SEQRA process, including but not limited to the preparation of a responsiveness summary as part of the final environmental impact statement." *Id*. The Commissioner may treat the record of the issues conference, or relevant portions of it, as the case may be, as commentary on the DSEIS which would be responded to in the FEIS. *See Matter of Buffalo Crushed Stone*, Decision of the Commissioner, 2008 N.Y. ENV LEXIS 27, November 27, 2008.[3]

1. Petitioners Failed To Present Facts Sufficient To Show Impacts To Existing Community Character Should Be Adjudicated; Rather, Such Impacts, If Any, As Described In The Petitions Of GFS And SLC For Party Status And FLWBC For Amicus Standing, May Be Treated As Comments On The DSEIS And Specifically Addressed In The Response To Comments And Findings

GFS and SLC[4] propose impacts to community character as an issue for adjudication. GFS Petition for Full Party Status ("GFS Petition") at p. 6, pp. 16 – 18; exhibits 5 and 6.[5]

GFS contends that the DSEIS is deficient because it contains no analysis of the potential impacts of the project on community character and that such impacts would be potentially

[3] Section 624.13. Final decision…
(c) Actions involving a DEIS. Where a DEIS has been the subject of the hearing, the hearing report together with the DEIS will constitute the FEIS." In *Matter of Buffalo Crushed Stone, supra*, staff agreed to treat various pieces of the record of the issues conference as comments on the DEIS. In that proceeding, the Commissioner held that there were no issues for adjudication.

[4] SLC has interposed the affidavits of several Finger Lakes planners. Seneca Lake Communities Petition for Full Party Status, pp. 4, 8-12 and affidavits of Sage Gerling, Director of Neighborhood Initiatives for the City of Geneva, sworn to on January 15, 2015 (Gerling Affidavit) and Mark A Venuti, Supervisor of the City of Geneva, sworn to on January 15, 2015 (Venuti Affidavit) These are attachments "E" and "F" to the Petition of Seneca Lake Communities, respectively.

[5] Exhibits 5 and 6 are respectively the Community Character Report by Harvey K. Flad, PhD ("Flad Report") and Economic Development Report by Susan M. Christopherson, PhD ("Christopherson Report").

significant. They contend that the gas storage facility would cause "disruptions" to scenic vistas as well as increased noise and traffic. GFS also argues that the project will cause socio-economic impacts to the region's wineries and tourist-related businesses and that the project is at odds with, and will harm, to paraphrase GFS's petition, the "emergent development strategy" of Seneca Lake centered on the wine industry and tourism. *See* GFS Petition at 16-18.

SLC makes the same arguments and relies on GFS' offer of proof, namely the Flad and Christopherson reports (exhibits 5 and 6 to the GFS petition) as well as their own offer of proof (namely attachments E and F to the SLC petition). SLC further argues that the discussion of "setting"[6] in the DSEIS is insufficient as it is only includes the setting of the Town of Reading; they argue that the DSEIS should have contained a description of the setting of "likely affected" neighboring communities along Seneca Lake. Finally, SLC argues that the DSEIS ignores the project's potential for a catastrophic event and the impact that such an event would have on the perception of Seneca Lake and its emerging land use patterns tied to wineries and tourism. SLC's Petition at pp. 11-12. In their amicus petition, FLWBC makes the same arguments as does GFS and SLC and relies on GFS's offer of proof.

SEQR defines "Environment" to mean the "physical conditions which will be affected by a proposed action, including ... existing community or neighborhood character." ECL 8-0105(6) and 6 NYCRR 617.2(l). An EIS may be required if a project may result in the impairment of the character or quality of important historical, archeological, architectural, or aesthetic resources, or of existing community or neighborhood character. In *Chinese Staff & Workers Assn v. City of*

[6] According to the SEQR Handbook, "[t]he environmental setting of an action includes the existing environment, any existing uses of the project site, and a general characterization of adjoining areas…The components of the environmental setting that relate to potential relevant impacts should receive most attention in the description." DEC's *SEQR Handbook*, http://www.dec.ny.gov/permits/55215.html, Q & A #19, last visited on April 2, 2015.

New York, the Court of Appeals stated as follows: "[T]he impact that a project may have on population patterns or existing community character, with or without a separate impact on the physical environment, is a relevant concern in an environmental analysis since the statute [SEQR] includes these concerns as elements of the environment." 68 NY2d 359, 366 (1986).

The Department's historical and present policy on addressing impacts to existing community character (see 6 NYCRR 617.7 [c] [[1] [vii]) in its Part 624 hearings process, as discussed more fully below, is to consider it after the record is developed on particular environmental issues such as noise, truck traffic and aesthetics which are aspects of the overall community character. Unlike noise, aesthetics and traffic, community character does not lend itself to adjudication and, generally speaking, it is a land use issue squarely within the jurisdiction of municipal governments to decide.

In *Village of Chestnut Ridge v. Town of Ramapo*, 45 AD3d 74 (2d Dept. 2007), a leading case on community character, the Second Department observed that "[t]he power to define the community character is a unique prerogative of a municipality acting in its governmental capacity, and, that, generally, through the exercise of their zoning and planning powers, municipalities are given the job of defining their own character." *Id* at 94. The fundamental instrument through which municipalities exercise their planning and zoning powers is the comprehensive plan (*see Udell v. Hass*, 21 N.Y.2d 463 [1968]).[7] It is through the comprehensive plan that municipalities, generally speaking, define their character.[8] Relatedly, Commissioner

[7] In this connection, the Court of Appeals in *Udell v. Hass, supra*, 21 N.Y.2d at 469, stated as follows: "[T]he comprehensive plan is the essence of zoning. Without it, there can be no rational allocation of land use. It is the insurance that the public welfare is being served and that zoning does not become nothing more than just a Gallup poll. "

[8] A municipal comprehensive plan, which is authorized in General City Law §28-a, Town Law §272-a, and Village Law §7-722, is the single most important statement from which staff can identify local expressions of character. Through the comprehensive plan, cities, towns and villages document their

The footnote is continued on the next page.

Flacke stated in *Matter of Pyramid Crossgates Company*, Final Decision of the Commissioner, 1981 N.Y. ENV LEXIS 32 at 16 (June 25, 1981) that "the Department does "not intrude its judgment in matters …which have properly been the subject of definitive local governmental determinations of patterns of land use." *See also, Matter of Miracle Mile Associates*, Final Decision of the Commissioner, 1979 N.Y. ENV LEXIS 28 at *5 (December 6, 1979).[9] In *Matter of St. Lawrence Cement*, Second Interim Decision of the Commissioner, 2004 N.Y. ENV LEXIS 60 at *137, September 8, 2004, Commissioner Crotty stated as follows: "The Department, to a large extent, relies on local land use plans as the standard for community character. Adopted local plans are afforded deference in ascertaining whether a project is consistent with community character [citations omitted]." More recently, in *Matter of Red Wing Properties, Inc*., Interim Decision of the Commissioner, 2010 N.Y. ENV LEXIS 31, 16, May 19, 2010, the Commissioner, citing past decisions, stated as follows:

> … [W]here impacts on community character are intertwined with other discrete impacts, the record on community character can be further developed through an adjudicatory hearing on those other impacts. *See Matter of Crossroads Ventures, LLC*, Interim Decision of the Deputy Commissioner, 2006 NY ENV LEXIS 88, 78 at 78, Dec. 29, 2006 ("community character is not readily susceptible to adjudication as a separate issue but rather is considered after the record is developed on particular environmental issues which are aspects of the overall community character"), *citing Matter of Lane Construction Co*., Interim Issues Rulings of the ALJs, 1996 WL 33140733, Feb. 22, 1996; *see also Matter of St. Lawrence Cement Co., LLC*, Second Interim Decision of the Commissioner, 2004 NY ENV LEXIS 58, 138-139, Sept. 8, 2004 (focusing adjudication on discrete environmental issues rather than a general issue of community character).

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existing community character, set out their vision for the future, and configure a road map for achieving that by guiding land use patterns and development. Comprehensive plans are often implemented through zoning and other land use laws. The above-cited statutes define the municipal comprehensive plan as "the materials, written and/or graphic, including but not limited to maps, charts, studies, resolutions, reports and other descriptive material that identify the goals, objectives, principles, guidelines, policies, standards, devices and instruments for the immediate and long-range protection, enhancement, growth and development" of the municipality.

[9] Commissioner Flacke's statement fits with the general rule that SEQR "does not change the jurisdiction of agencies or the jurisdiction between or among state and local agencies." 6 NYCRR 617.3(b).

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Commissioner Crotty in *Matter of St. Lawrence Cement*, Second Interim Decision of the Commissioner, 2004 N.Y. ENV LEXIS 60 at 135-145, *supra*, rejected issues for adjudication that are substantially the same as the issues now raised by petitioners, concerning the need to adjudicate the impact of Finger Lakes on tourism and wineries. Commissioner Crotty stated as follows:

> …HVPC [Hudson Valley Preservation Coalition] seeks to develop the record concerning the Hudson Valley Region's trend away from industrial uses, and towards greater reliance on recreation, tourism, historic resources, and second-home ownership (see id.). The DEIS recognizes and considers the factual background that HVPC seeks to develop concerning the characteristics of the community. For example, the DEIS notes that the "historic character of the regional landscape has spurred a trend for local municipalities . . . to market themselves as tourist and second-home destinations," a trend which "appears to be a lasting one" (DEIS, at 2-20). The DEIS also references the development of antique, craft and art gallery trades, as well as the growth of tourism, in this area (see id.).
>
> HVPC also seeks to develop the record concerning the proposed project's consistency with trends in the community. Neither applicant nor any other party disputes that local trends may potentially change the mix of industrial, commercial, agricultural and residential sectors in this part of the Hudson Valley. To the extent that there may be differing perspectives on these trends, these viewpoints have been expressed in the legislative hearing and in the public comments on the DEIS, which the Department must consider in the preparation of the FEIS and in its SEQRA findings.
>
> Thus, HVPC fails to join an adjudicable issue concerning the factual sufficiency of the DEIS or the Department's ability to make SEQRA findings (see 6 NYCRR 624.4[c] [6] [i] [b]). Any further development of the factual record on these matters would not materially aid the SEQRA decision making process and would constitute an unnecessary academic exercise.
>
> The parties' positions amount to differences of opinion about which particular community values and trends deserve protection. The DEIS, together with the public comment process, provide sufficient information to allow the decision maker to evaluate these trends and the project's consistency with them, and reach the determinations necessary to make SEQRA findings [citation omitted].”

Petitioners' proposed issues with respect to socio-economic impacts to the region's wineries and tourist-related businesses and on neighboring communities (or land use trends, as they describe them) are the same issues rejected by the Commissioner in *Matter of St. Lawrence Cement*, Second Interim Decision, *supra*. As in *Matter of St. Lawrence Cement*, petitioners have asked the Commissioner to adjudicate land use issues, namely whether an industrial use should be allowed on the western shore of Seneca Lake in the Town of Reading notwithstanding whether the underground LPG storage facility would have a significant adverse impact on aesthetics, noise levels, or truck traffic. Petitioners fail to provide facts necessary to support their request.

The effect of adjudicating petitioners' socio-economic issues would be to adjudge the Town's zoning, which the Town of Reading has decided legislatively. In the words of Commissioner Flacke, "it would amount to an intrusion into an area that has already been the subject of definitive local government determination on patterns of land use." *Matter of Pyramid Crossgates Company*, Final Decision of the Commissioner, *supra*.

Under the Town's zoning law, the gas storage project is allowed by special use permit. *See* Commissioners Lead Agency Determination, *Town of Reading Planning Board v. the New York State Department of Environmental Conservation through its Region 8 Office*, http://www.dec.ny.gov/permits/65814.html, last visited on April 7, 2015; Town of Reading Local Law No. 1 of 2005 with amendments from the year 2009, http://www.schuylercounty.us/DocumentCenter/View/1381, last visited April 7, 2015; and DSEIS, Appendix A. A special use permit, which also goes by the name of "special exception" "…gives permission to use property in a way that is consistent with the zoning ordinance, although not necessarily allowed as of right. The significance of this distinction is that the

inclusion of the permitted use in the ordinance is tantamount to a legislative finding that the permitted use is in harmony with the general zoning plan and will not adversely affect the neighborhood." *Retail Prop. Trust v. Bd. of Zoning Appeals of Town of Hempstead*, 98 N.Y.2d 190, 195 (2002), *citing Matter of North Shore Steak House v. Board of Appeals of Inc. Vil. of Thomaston*, 30 N.Y.2d 238, 243 (1972).[10]

In *Matter of St. Lawrence Cement*, *supra,* the draft environmental impact statement addressed the impact of the proposed cement plant on the community character of nearby communities and historic sites.[11] The Commissioner held that discussion together with public comment was sufficient for the Commissioner to make findings on the impact of the project on community and regional character. Here, the DSEIS assesses noise, visual and traffic (DSEIS, 4.3 through 4.5), which constitute the suite of impacts that would affect character. *See Matter of Palumbo*, Interim Decision of the Commissioner, 2001 N.Y. ENV LEXIS 57, June 4, 2001.

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[10] At the same time, SLC cannot decide the Town of Reading's zoning or land use patterns. "It is axiomatic that a municipality may not impose its zoning regulations upon lands outside its territorial limits." *Action Redi-Mix Corp. v. Davison*, 292 A.D.2d 448, 459 (2d Dept. 2002), *citing Matter of Kennedy v Zoning Bd. of Appeals of Vil. of Dobbs Ferry*, 145 AD2d 487, 489 (2d Dept. 1988) and Matter of *Siegel v Tange*, 61 AD2d 57, 59 (2d Dept. 1978). For SLC to say that that Reading should not permit a use because it is industrial would impose the land use preferences of the various municipal entities that make up SLC on the Town of Reading. See also, *Mamaroneck Beach and Yacht Club, Inc. v. Planning Board of the Village of Mamaroneck*, Index No. 24348/07 (Westchester Co. 2010) (attached in Appendix "A" to this brief) (The Village was not permitted to use its environmental review powers to accomplish a rezoning).

[11] In *Matter of St. Lawrence Cement*, Second Interim Decision of the Commissioner, *supra*, at 134-142, the Commissioner affirmed the ALJs ruling that issues concerning the project's impacts on community character and historic resources will be adjudicated in the context of visual impacts and air pollution impacts. The ALJs also ruled that consideration of the project's impacts on community character should not include an assessment of those impacts on the region as a whole (*i.e.*, the Hudson Valley). The inquiry should be confined to the effects on the Town [of Greenport], the City [of Hudson], and the Village of Athens. Thus, the St. Lawrence decision followed prior decisions of the Commissioner on community character in choosing to adjudicate community character through the set of impacts that would likely affect the character of nearby communities and as limited by the communities that could possibly be effected by such impacts.

Here, just as the Commissioner or the Department will be called up to make findings on community character based on the record so will the Town of Reading Planning Board, which is an involved agency. Community character is squarely with that Town's jurisdiction. "SEQR does not change the existing jurisdiction of agencies nor the jurisdiction between or among state and local agencies." 6 NYCRR 617.3 (b).

Petitioners attack the sufficiency of the DSEIS on community character because the DSEIS does not address it as a discrete issue — either in terms of the Town of Reading or on the neighboring communities and the wine industry on Seneca Lake. As a starting point, the DSEIS is unquestionably sufficient in terms of visual impacts, noise and traffic analyses. *See* DSEIS, sections 4.3 through 4.5 and appendices "I," "J," and "K."; Visual Impact Analysis dated November 20, 2014 (East Brine Pond, LPG Transfer Facility, and West Brine Pond); and the attached affidavit of Scott Sheeley, Regional Permit Administrator. Petitioners' only offer of proof is on noise, which is rebutted by the affidavit of Scott Sheeley. Petitioners have not raised an adjudicable issue simply by proposing additions to the record on these subjects. *Matter of Crossroads Ventures*, Interim Decision of the Deputy Commissioner, 2006 N.Y. ENV LEXIS 88 (December 29, 1996) ("…Where a participant in the Part 624 hearing process seeks simply to add to information on a topic for which the DEIS contains sufficient information, no adjudicable issue is raised…").

As to the sufficiency of the DSEIS and relevant to the discussion of sufficiency, the DSEIS was subject to a scoping process under 6 NYCRR 617.8 (*see* DSEIS at p. 4 and Appendix B). The purpose of scoping is to identify the significant environmental conditions and resources which may be affected by the project; focus the EIS on the relevant environmental impacts to those environmental conditions and resources, thus providing the preparers with the specific

issues to be addressed in the EIS; and eliminate irrelevant and non-significant impacts or issues. See 6 NYCRR 617.8 and 617.2 (af).[12]

In *Save the Pine Bush, Inc. v. Common Council of the City of Albany*, the New York, 13 N.Y.3d 297 (2009), the Court of Appeals rejected the notion that every environmental concern brought to the attention of a lead agency required study in a draft environmental impact statement, stating: "An agency complying with SEQRA need not investigate every conceivable environmental problem; it may, within reasonable limits, use its discretion in electing which ones are relevant [citation omitted]." The court further stated, "[w]hile it is essential that public agencies comply with their duties under SEQRA, some common sense in determining the extent of those duties is essential too. … A "rule of reason" … is applicable not only to an agency's judgments about the environmental concerns it investigates, but to its decisions about which matters require investigation." *Id*. at 307-308.

Here, staff did not include impacts to community or regional character (separate and apart from visual impacts, noise and truck traffic) in the final scope for the DSEIS. While such potential impacts were raised in the comments on the draft scope, staff did not believe that such impacts would be significant since the property where the proposed surface facility and wells are to be located is an existing industrial facility and the brine ponds would be located nearby or adjacent to that facility. The project is in keeping with the existing character of properties surrounding the project that include a rail line, salt manufacturing operations, gas storage

[12] The Department's Part 617 regulations defines "scoping" to mean "…the process by which the lead agency identifies the potentially significant adverse impacts related to the proposed action that are to be addressed in the draft EIS including the content and level of detail of the analysis, the range of alternatives, the mitigation measures needed and the identification of non-relevant issues. Scoping provides a project sponsor with guidance on matters which must be considered and provides an opportunity for early participation by involved agencies and the public in the review of the proposal.

facilities, a trucking company, solid waste transfer station, state highway, and highway department garage, as indicated on the land use map attached to the affidavit of Eric Rodriguez.

Moreover, petitioners fail to account for the fact that tourism and the local wineries have co-existed for many decades with the salt plants on Seneca Lake, associated rail lines, solution salt mining well fields and the underground gas storage facilities that formerly or currently exist in Schuyler County. Natural gas and LPG storage currently exists or formerly existed on lands adjacent to the project site and at the TEPPCO facility west of the Project site. From about 1964 until 1984, TEPPCO stored over 4 million barrels of LPG beneath US Salt property in salt caverns adjacent to the project site and which now are used or proposed for natural gas storage as part of the Seneca Lake Storage Facility. Since about the mid 1980's, TEPPCO (and now Enterprise Operating Products, LLC) has stored LPG in hard rock caverns west of the US Salt property. NYSEG (and now Arlington Storage Company, LLC) has stored natural gas in salt caverns near the proposed LPG storage facility since 1996. Nevertheless, as evidenced in comment letters, tourism and the wine industry have both continued to thrive during past decades along with the storage of both natural gas and LPG in the Watkins Glen area.

Additionally, as pointed out above, staff's judgment to exclude community character as a distinct topic in the DSEIS was also reasonable in light of the fact that the project is a special permitted use under the Town of Reading's zoning law, which carries the presumption that the use is compatible with its surroundings (*Retail Prop. Trust*, *supra*, 98 N.Y.2d at 195 and *North Shore Steak House*, 30 N.Y.2d at 243).[13] "The Department, to a large extent, relies on local land

[13] On its website, quoting the 2000 US Census, the Town of Reading describes itself as follows: The Town of Reading can be best described as a small rural town with a balance of agriculture and industry. Agriculture includes: dairy and grain farms as well as grape vineyards. Industry includes: natural gas storage and transmission, a salt evaporation plant, and a metal fabrication/machining company.
The footnote is continued on the next page.

use plans as the standard for community character. Adopted local plans are afforded deference in ascertaining whether a project is consistent with community character…" *Matter of St. Lawrence Cement, Second Interim Decision of the Commissioner,* 2004 N.Y. ENV LEXIS 60 at *137, *supra*, *citing Matter of Lane Constr. Co*., Interim Issues Rulings, February 22, 1996, at 16 [local zoning ordinance as ²the expression of the community's vision of itself²]; *Matter of William E. Dailey, Inc*., Interim Decision of the Commissioner, June 20, 1995, at 8 [²If a zoning ordinance or other local land use plan exists, it would be evidence of the community's desires for the area and should be consulted when evaluating the issue of community character as impacted by a project²]; *Matter of Miracle Mile Assocs*., Decision of the Commissioner, December 6, 1979, at 3 [²the Department will not intrude its judgment . . . in matters which have properly been the subject of definitive local governmental determinations of patterns of land use²]). Staff was, therefore, acting reasonably in concluding that the LPG storage facility would have no significant impact on community character.

To the extent GFS's, SLC's and FLWBC's claim that the DSEIS is insufficient because there is no assessment of impacts on community character as a discrete topic separate and apart from visual, traffic and noise impacts, it is important to keep in mind that the DSEIS went through a scoping process.

On the other hand, SEQR is an iterative process. *See, e.g*., 6 NYCRR 617.8 (h); *Matter of Buffalo Crushed Stone*, Decision of the Commissioner, *supra*. Deficiencies in a draft environmental impact statement, depending on their nature, can be made up through the public

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Attractions in the town include: 2 golf courses, numerous bed and breakfast inns, various motels, restaurants, and a handful of fine wineries. See Town of Reading website, https://sites.google.com/site/townofreadingschuylercountyny/about, last visited April 8, 2015 and County-wide Comprehensive Plan for Schuyler County, http://www.schuylercounty.us/index.aspx?NID=566, pages 68-71, last visited on April 9, 2015.

comment and response process that follows the issuance of a draft EIS. *See Webster Assocs. v. Webster*, 59 N.Y.2d 220, 228 (1983). In *Webster*, for example, the Court of Appeals held that the omission of an alternative from a draft EIS was made up by the fact that the alternative was widely known and considered in the public debate on the project. Here, staff's omission of a discussion of impacts to community character (assuming arguendo that the issue should have been included in the DSEIS) can be cured by treating the issues conference record as comments on the DSEIS. Staff would, therefore, have no objection if OHMS were to supplement the DSEIS with petitioners' offers of proof on community character as well as the applicant's responses. As supplemented, the record would be sufficient for the Commissioner to make findings on community character. *Matter of Buffalo Crushed Stone*, Commissioner's Decision, *supra*, 2008 N.Y. ENV LEXIS 27. These would include the following:

1. Community Character Report of Harvey K. Flad (Exhibit 5 to the Petition of GFS)
2. Economic Development Report of Susan M. Christopherson (Exhibit 6 to the Petition of GFS)
3. The following affidavits, sworn to on January 15, 2015, attached to the petition of SLC: affidavit of Timothy Jensen, affidavit of Sage Gerling, and the affidavit of Scott Gibson.
4. Economic and Fiscal Impact of the Finger Lakes LPG Storage Project, FINAL REPORT, dated February 9, 2015, Prepared for: Finger Lakes LPG Storage, LLC.

In supplementing the DSEIS, staff also ask that the OHMS take judicial notice of the following town and county laws and plans:

1. Town of Reading Land Use Law, Local Law No. 1 of the Year 1995, as amended in 2009 and the Comprehensive Plan of the Town of Reading, both of which are available on-line at the following address:

2. http://www.schuylercounty.us/index.aspx?NID=508, last visited on April 9, 2015.
3. Schuyler County Comprehensive Plan, http://www.schuylercounty.us/index.aspx?NID=566 (discussion of the Town of Reading begins on page 68), last visited April 9, 2015.

While staff question the some of the relevance of the reports prepared by Flad and Christopherson, they should nonetheless be used to supplement the DSEIS on community character. The reports deserve to be addressed and fully evaluated in the response to comments and findings. See *Matter of Buffalo Crushed Stone*, Commissioner's Decision, *supra*, 2008 N.Y. ENV LEXIS 27.

Professor Flad devotes approximately 33 pages of his 40 page report to a discussion of community character and land use trends in the Finger Lakes and Seneca Lake generally. Absent from his discussion of local planning is any mention of the Town of Reading, which is host to the proposed LPG storage area. Reading does not appear to be exhibiting the same land use trends as indicated by the land use map attached to the affidavit of Eric Rodriquez. GFS makes no mention of the fact that the LPG storage facility is a special permitted use in the Town of Reading or the Town's comprehensive plan. Similarly, no mention is made of the County's comprehensive plan or its discussion of the Town of Reading. Professor Flad spends a great deal of time discussing the plans of the City of Geneva, which is situated approximately 36 miles north of the proposed facility and 45 minutes driving time away.[14] Professor Flad's comments

[14] The City of Geneva, however, has no land use authority over the Town of Reading. "A municipality may not impose its zoning regulations upon lands outside its territorial limits." Action Redi-Mix Corp. v. Davison, supra, 292 A.D.2d at 459. *See also, Mamaroneck Beach and Yacht Club, Inc. v. Planning Board of the Village of Mamaroneck, supra*, Index No. 24348/07 (Westchester Co. 2010) (attached in Appendix "A") (The Village was not permitted to use its environmental review powers to accomplish a rezoning).

concerning "industrialization," "planning," "recreation," and "wineries" are relevant as comments on the DSEIS but are not adjudicable. *See St. Lawrence Cement, supra*, at *135-145 [15]

While Professor Flad opines on visual, noise and traffic impacts from pages 34-36 of his report, he does not appear to have any qualifications in these area. On noise (page 36), Professor Flad relies on the Sandstone Report, which Regional Permit Administrator Sheeley shows in his affidavit to be highly flawed. On visual and traffic issues, no offer of proof is made.

Professor Flad's discussion of visual impacts (page 34) is contrary to the visual analyses. A Visual Impact Assessment, conducted by C.T. Male Associates, P.C. is included in the DSEIS (Appendix K). Section 4.5 of the DSEIS also includes a description of potential visual impacts. C.T. Male's assessment includes sight profiles from both a central and northern portion of NYS Route 414 and concluded that the proposed truck transfer facility would not be visible from NYS Route 414. While the Original Pond itself would not be visible from NYS Route 414 from either profile, as with the original pond, it is possible that the proposed East brine pond cleared site and potentially the top of the reduced embankment may be visible from NYS Route 414. Once the East brine pond is constructed and the side slopes of the embankment are vegetated, the view from NYS Route 414 is anticipated to be similar to the current view of a vegetated hillside. In any event, given the much smaller size of the East brine pond than the original pond, any potential perceived visual impacts would be substantially reduced. Like the East brine pond, the

[15] Professor Flad's comments concerning economic impacts, as discussed below in connection with the Economic Development Report by Susan M. Christopherson Report (Exhbiit 6 to GSA's petition), are not adjudicable. *See Matter of Hyland Facility Assocs*., Interim Decision of the Commissioner, 1992 N.Y. ENV LEXIS 52 at 9-10, August 20, 1992, at 5 [potential loss of revenue derived from tourism an economic issue, not an issue of community character]. The Commissioner stated in St. Lawrence Cement, supra, 2004 N.Y. ENV LEXIS 60 at *142, stated, "[m]oreover, to the extent that HVPC seeks to raise various other economics-related matters as an element of community character, such as the project's potential impact on the property market for historic structures, on local property values, and on certain economic sectors (tourism, second home ownership and antique businesses), these matters fail to present an adjudicable issue."

proposed West brine pond embankment will be vegetated upon completion with grasses and other herbaceous species. As a result, to the extent it could be visible from any identified receptor location, the West brine pond embankment will not result in a substantial visible contrast to the vegetated hillside that currently exists at the proposed West brine pond site.

The Visual Impact Assessment evaluated potential visual impacts in accordance with NYSDEC Program Policy DEP-00-2. The locations for the sight receptors were chosen as the locations with the greatest potential for visual impacts. The Visual Impact Assessment evaluates (and proposes) mitigation measures that would be undertaken to limit the visual impact of the project. This was done in accordance with NYSDEC Program Policy DEP-00-2, which provides that mitigation measures for visual impacts may be evaluated during site design.

As noted in the Visual Impact Assessment (Appendix K of the DSEIS), no visual impacts will be noticed from the receptors chosen for the report. The receptors chosen are located on the east side of Seneca Lake at the closest points to the project site (approximately 2 miles away). As one travels north from that location, the road rises higher in elevation and the distance from the project site increases, greatly diminishing one's ability to discern such objects embedded into the hill side with the naked eye. In response as to why no receptor was chosen from Route 79 in Burdett as suggested, that particular location is approximately 139 feet higher in elevation; however, it is also approximately 4,500 feet further from the site making it approximately 3 miles away. From that point, at the angle at which a viewer would be looking at the site, only the top approximately 3 feet of the plastic liner would be exposed and not the entire 14 acres as suggested. While higher in elevation, the distance of 3 miles away and the angle of the view make the site indiscernible to the naked eye.

The Visual Impact Assessment shows that, at most, the grass covered embankment of the East brine pond would be visible from the Lake and from NYS Route 414 on the east side of the Lake. Again, the US Salt plant, in existence for over 100 years and part of the established visual landscape, is in the foreground.

Finger Lakes proposed mitigation measures that will either completely screen the project from visibility or will limit the visibility of the Project. Further, the Visual Impact Assessment contained in the DSEIS showed that, at most, the grass covered embankment of the Original Pond would have been visible from the Lake and from NYS Route 414 on the east side of the Lake. The significantly reduced East brine pond would be even less visible from NYS Route 414 and from the Lake. Like the East brine pond, the proposed West brine pond embankment will be vegetated upon completion with grasses and other herbaceous species. As a result, to the extent it would be visible from any identified receptor location, the West brine pond embankment will not result in a substantial visible contrast to the vegetated hillside that currently exists at the proposed West brine pond site. Petitioners overlook the fact that the US Salt plant, in existence for over 100 years and part of the established visual landscape, will be in the foreground.

Professor Flad's discussion of the gas flare ignores the fact that Finger Lakes has agreed to install a shield around the flare so the flame is not visible from the lake or road. The proposed flare stack would not have a visual impact.[16]

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[16] The lack of a visual impact caused by the flare is best explained by describing how the flare works. When LPG is injected into the storage caverns, the brine is displaced up the brine tubing from the bottom of the well. When the brine reaches the surface, it goes through the wellhead piping then through the safety control valve and finally up to the pond site where the flare tower is located. The main brine line which is a welded 10" pipe connects the storage caverns to the pond. The flare tower is a vertical pipe which extends above the top of the pond dike and the main brine line is connected to it. The main line from a well is connected to the flare tower pipe at a location below the top of the flare tower pipe, but The footnote is continued on the next page.

Professor Christopherson's Economic Development Report concerns the growth of the winery and tourism industries along with regional branding. She then concludes that "[b]ased on my experience conducting economic development research in New York, it is my opinion that construction and operation of an LPG storage facility on Seneca Lake will have significant unmitigated adverse impacts on the region's economic success." Professor Christopherson does not point to research that would support her opinion. Additionally, the impact on branding and tourism does not raise an adjudicable issue. See *Matter of Hyland Facility Assocs*., Interim Decision of the Commissioner, 1992 N.Y. ENV LEXIS 52 at 9-10, August 20, 1992, "[potential loss of revenue derived from tourism an economic issue, not an issue of community character]. The Commissioner stated in *St. Lawrence Cement, supra*, 2004 N.Y. ENV LEXIS 60 at 142, stated , "[m]oreover, to the extent that HVPC seeks to raise various other economics-related matters as an element of community character, such as the project's potential impact on the property market for historic structures, on local property values, and on certain economic sectors (tourism, second home ownership and antique businesses), these matters fail to present an adjudicable issue." Staff have no objection, as in *St. Lawrence Cement*, supra, to accepting

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above the top of the pond dike. The line from the bottom of the flare tower goes to the top of the pond dike and into the pond. The way this is designed, it keeps a brine level in the flare tower pipe so the brine coming from a storage well free falls to the level in the pipe. When the brine free falls, any entrained LPG in the brine would break out and rise to the top of the flare tower where there is a pilot burning, which will ignite the gas and flare it off. However, there is typically no LPG in the brine when it comes out of the wells due to the fact that the LPG-brine interface in each cavern is maintained above the level of the safety weep holes in the brine strings, and mixing of brine and LPG does not readily occur due to the basic chemistries, including specific gravities, of the materials involved. Consequently, LPG does not typically enter the brine string and rise to the surface during routine storage operations and in turn does not typically reach the flare stack. If entrained LPG does reach the flare stack, there would not be a continuous flame shooting out of the flare pipe several feet into the air, as some believe, and it would not be visible from nearly any point in the southern 1/3 of the lake and surrounding area. The size of this flare tower piper would be less than 2 feet in diameter and very difficult to see with the naked eye from across the lake.

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Professor Christopherson's report as comment on the DSEIS and addressing it in response to comments and findings.

B. NOISE IS NOT A SUBSTANTIVE AND SIGNIFICANT ISSUE

GFS's petition, as supplemented by a report by Dr. A. Brook Crosson of Sandstone Environmental Associates ("Sandstone Report"), asserts that the project raises substantive and significant issues for adjudication related to noise impacts. GFS asserts that the project's "region of influence" was too narrowly defined, that impacts to the east shore of Seneca Lake were not sufficiently evaluated, that baseline noise levels were not properly monitored and reported, and an analysis of effective mitigation measures was omitted.

In DEC staff review of the DSEIS and additional noise evaluation documents, DEC staff found that the noise evaluation is consistent with the DEC Program Policy on Assessing and Mitigating Noise Impacts (DEP-00-1) ("DEC Noise Policy"), and that no substantive and significant issues related to noise impacts exist for adjudication. Specifically, as outlined in the attached affidavit of Regional Permit Administrator Scott E. Sheeley, the noise evaluation conducted for this project adequately established baseline ambient noise levels, properly identified the area of impact and potential noise receptors, properly characterized project noise sources, properly estimated changes in projected noise levels, and properly incorporated necessary measures to mitigate noise impacts. Also, as detailed in the attached Sheeley affidavit, projected noise levels will not result in significant adverse impacts. Further, no assertions made in the Sandstone Report substantiate the claims raised in the GFS petition with respect to noise impacts, or raise any further questions of fact concerning the applicant's evaluation of noise impacts pursuant to the DEC Noise Policy.

C. TRUCK TRAFFIC IS NOT A SUBSTANTIVE AND SIGNIFICANT ISSUE

Either as a stand-alone issue, or as part of a larger community character issue, in this matter truck traffic is not substantive and significant, nor as a result, adjudicable. Even in evaluating the worst-case scenario for truck traffic, by its letter dated January 11, 2012, the New York State Department of Transportation ("NYS DOT"), the agency with jurisdiction over state roads, concluded that, "traffic impacts associated with the proposed action do not represent a proposed substantial increase to the existing traffic volumes, nor do they present a need for mitigation to the highway." *See* OHMS Document Number ("Doc. No.") 201166576-00003, Document List ("Doc") I.B.4 and I.B.6, Attachment 9. The State Environmental Quality Review Act does not change the jurisdiction of agencies, nor the jurisdiction between or among state and local agencies. *See* 6 NYCRR 617.3[b]. In this case, the NYS DOT retains the jurisdiction to evaluate the impact of traffic volumes and the need to require additional mitigation to reduce or eliminate project impacts to New York State roadways.

A review of the potential traffic (rail and truck) impacts associated with the proposed Finger Lakes LPG Facility was conducted for Finger Lakes and is discussed in DSEIS Section 4.4, Transportation and Transportation Impacts, Appendix J, Traffic Operations Assessment (*See* OHMS Document Number 201166576-00006, Document List IV.A.3, Appendix J) and in a Supplemental Report by GTS Consulting. *See* OHMS Document Number 201166576-00003, Document List I.B.6, Attachment 8). The primary focus of the analysis was the impact from truck and rail traffic from the loading facility proposed adjacent to State Route 14A. The rail/truck loading facility is accessed by NYS Routes 14 and 14A. On December 2, 2014, Finger Lakes provided a revised Product Transportation Allocation that indicated that the proposed

facility would transport product (butane and propane) into and out of the facility by rail and pipeline, not using trucks for any product transport for the immediate future. *See* OHMS Doc. No. 201166576-00003, Doc. I.B.6, Attachment 10. Department staff continues to include truck traffic in its analysis because Finger Lakes has not formally removed the potential use from the project design. Inclusion of the truck data provides the worst case analysis of potential traffic impacts.

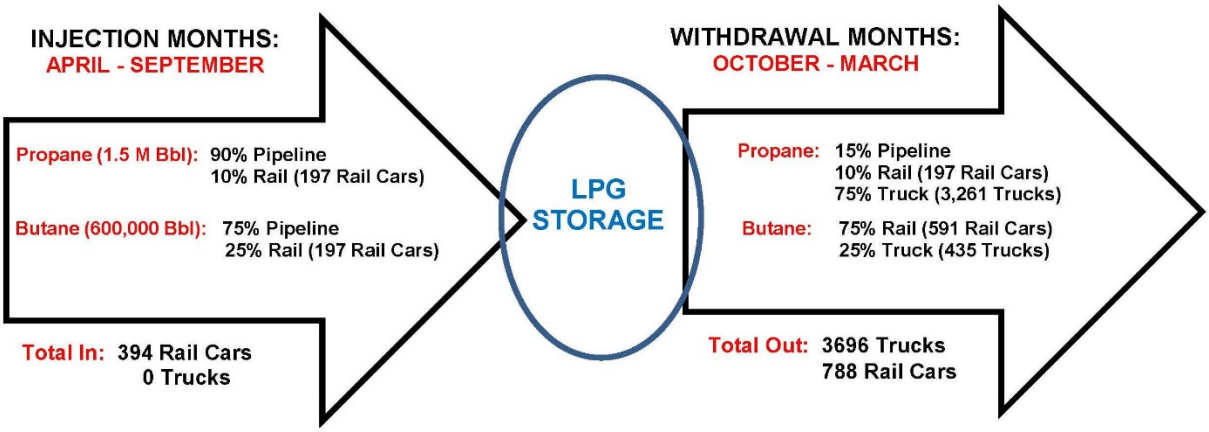
Concerning truck loading operations, during a typical 8-hour work day, the loading capacity of the facility (two loading bays) would be approximately 30-32 large trucks based on an average load time of approximately 30 minutes per truck. A complete description of the rail/truck loading facility and its operation is provided in Section 2.2, and 4.4 of the DSEIS. *See* OHMS Doc. No. 201166576-00006, Document List IV.A.1.

The additional truck traffic generated by the proposed storage facility truck loading facility will not be a significant addition to either State Route 14A or State Route 14. Note again, as stated above, that NYS DOT, following their review of the Traffic Operations Assessment, concluded that the "traffic impacts associated with the proposed action do not represent a substantial increase to the existing traffic volumes, nor do they present a need for mitigation to the highway". *See* OHMS Doc. No. 201166576-00003, Doc. I.B.4 and I.B.6, Attachment 9.

There will also be construction-related truck traffic across the site, but this will only last for a single construction season while the Facility is being built. *See*, OHMS Doc. No. 201166576-00003, Doc. I.B.24, Stormwater Pollution Prevention Plan, Revision 4, September 2012, Section 6, "Construction Sequence."

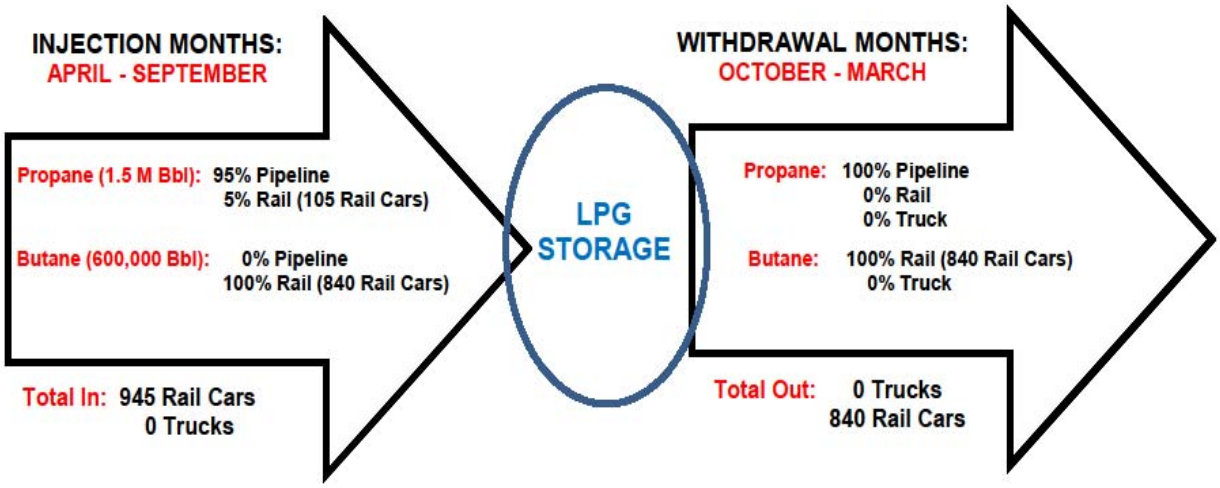
Both truck and rail transportation impacts will be closely related to the seasonal nature of facility operations; the injection of propane and butane will typically occur during the months of April through September and withdrawal activities will typically occur during the heating season from October to March. A diagram that summarizes those activities and the methods of transportation that each entails is provided below.

Figure 1. Facility operations, including trucks. (See OHMS Doc. No. 201166576-00003, Document List I.B.6, Exhibit 10)



In light of the December 2, 2014 Revised Transportation Allocation, the below Figure 2 indicates that under the new proposal, no trucks would be used to transport product in or out of the facility. 95% of propane will come into the facility by pipeline, 5% by rail. 100 % of the propane will leave by pipeline. All of the butane coming into or leaving the facility will be by rail. Under the new Product Transportation Allocation, the average number of rail cars in or out of the facility per day is 6.8 cars (assuming 261 work days in a year). The maximum the facility can manage is 32 cars per day. This new proposal would eliminate truck traffic related to LPG transport and the minimal increase in local traffic that truck transport would entail.

Figure 2. Facility operations, not including trucks. *See* OHMS Doc. No. 201166576-00003, Document List I.B. 36.



Finally, the entire offer of proof of GFS, to support its assertions concerning traffic in relation to community character is one paragraph at page 35 of the Community Character Report of Harvey K. , Ph.D. ("Flad Report"). *See* OHMS Document Numbers 201166576-00020 and 00026. The Flad Report argues there that "the worst-case scenario should be assumed for environmental review purposes" – and it has been, in the DSEIS, as well as in this brief. The remainder of the Flad Report paragraph offers the unsupported statement that "any increase" in truck traffic will have "an impact" on visitor experience. Moreover, no further characterization of that "impact" is identified. In other words, the Flad Report provides no reason to consider truck traffic, alone or as part of community character, to be a substantive and significant issue for this project. For the same reason, GFS also has made no showing that it should be granted party status in relation to this issue. See attached as Appendix "I", *Matter of Orange County Water Authority*, Interim Decision, pages 1-2, February 24, 1992 ["The Town maintains that it should be granted party status even in the absence of a showing that it could offer evidence that would substantively contribute to the record. The Department has stated in numerous prior decisions

that the test established by the regulations require a showing of both environmental interest and the ability to assist in the development of the record…. The Town has not made an adequate showing on this latter point and no matter how strong its environmental interest, party status cannot be granted."]

D. PETITIONERS FAILD TO RAISE AN ADJUDICALBE ISSUE CONCERNING CAVERN INTEGRITY

1. DEC STAFF TOOK A HARD LOOK AT THE ADAPTABILITY OF THE SOLUTION-MINED CAVERNS FOR LPG STORAGE

ECL Article 23, Title 13, provides the prerequisites for an operator to conduct an underground gas storage project in the State. An operator must: a) submit "a map showing the location and boundaries of the proposed underground storage reservoir" (ECL 23-1301 (1) (a)); b) submit to the Department, "a report containing sufficient data to show that the reservoir is adaptable for storage purposes," (ECL 23-1301 (1) (b)); c) provide an affidavit showing the operator has sufficient control over the mineral rights affected by the storage project (ECL 23-1301 (1) (c)); and d) any other information requested by the Department (ECL 23-1301 (1) (d)). Additionally, the Department must receive approval on the adaptability of the reservoir from the State Geologist prior to underground storage permit issuance.

Based on their experience in evaluating and regulating gas storage projects, Department staff developed a detailed list of items that must be included in the report required by ECL 23-1301(1) (b). DEC requires all storage permit applicants to prepare a Reservoir Suitability Report ("RSR") that documents the adaptability of the reservoir for storage purposes. The report must include, at a minimum, geologic cross-sections of the project showing the depth of existing and planned wells, a cavern development plan and geo-mechanical study including computer

modeling, a description of the proposed operating parameters, a discussion of any core test results, and an evaluation of previous sonar reports and surveys. *See* OHMS Doc. No. 00003, Doc. I (A) (1). The RSR must also describe proposed safety and emergency shut-down systems planned for the facility. In addition to the RSR, applicants must also provide the Department with a subsidence monitoring plan, a mechanical integrity testing plan and a well status and condition report as well as organizational and financial information. Each of these pieces of information is thoroughly vetted by Department staff and until Department staff is satisfied, an application is considered incomplete.

Finger Lakes' application dated, October 9, 2009, was received by the Department on October 13, 2009, and the first Notice of Incomplete Application ("NOIA") specific to the storage permit was issued on January 11, 2010. *See*, OHMS Doc. No. 00003, Doc. I (A)(4). A review of the NOIAs issued for the project illustrates the level of attention and detail taken by Department staff to ensure the application materials met the statutory requirements of ECL 23, Title 13. *See,* Attached Affidavit of Peter S. Briggs ("Briggs Aff."). Department staff's review found that the application materials demonstrated the adaptability of the solution-mined caverns to contain liquefied petroleum gas ("LPG") for the projected life of the facility. Staff issued a total of three NOIAs for the project, each followed by responses from the applicant. The end result of Department staff's review and the applicant's compliance with the issued NOIAs is a comprehensive analysis of the proposed project.

The record includes a thorough evaluation of: existing geological conditions including known faults; proof of the competency of the overlying caprock; well status and condition; cavern geometry and integrity including analysis of nearby caverns and storage operations; results of pressure testing; planned operating conditions; subsidence monitoring and future

cavern development. The DSEIS, the underground storage permit application and the subsequent technical submittals included with the responses made by the applicant to the three NOIAs, as fully explained below, together provide a complete record of the hard look taken by Department staff of cavern and well integrity, and their adaptability for storage purposes. Moreover, the draft permit conditions prepared by Department staff address every aspect of the construction and operation of the proposed project including future monitoring and underscore the close examination that Department staff have taken to ensure the applicant would mitigate any significant adverse potential environmental and public safety impacts. *See*, Briggs Aff, Attachment 1.

In the petitions for party status, some of the proposed parties took issue with some of the data provided by FLLPG and relied on by Department staff. For instance, GFS criticized how the geologic cross-sections were presented and SLPWA believes that FLLPG did not pay full homage to the fault documented by Charles Jacoby and L.H. Dellwig in papers released between 1962 and 1974. While their criticisms are not valid, it is important to note that Department staff relies on the application, including the responses to the NOIAs, as a whole to ascertain completeness of the information submitted and determine adaptability of the reservoir for storage purposes. Further, Department staff relies on several types of tests and monitoring requirements to verify the ability of the caverns to contain fluids, including LPG, under pressure. As such, the Department does not rely on any one set of data to verify integrity, but rather a synergy of data.

For this project, the following information contributed to Department staff's finding that FLLPG demonstrated cavern integrity:

- The applicant provided re-entry pressures (also known as drill-in pressure) from plugged wells in each gallery which were drilled out and reentered for testing and cavern sonar

surveys. After a salt cavern is closed and abandoned by the plugging of the well(s) that access it, cavern pressure will build up as the salt creeps. The re-entry pressures measured by FLLPG demonstrate that the caverns successfully contained fluid at pressures ranging from a gradient of 0.66 psi/ft to 0.67 psi/ft at Gallery 1 (based on re-entry pressures at Wells 33 and 34, after approximately 5 years of the caverns' wells being plugged) and 0.81 psi/ft at Gallery 2 (based on reentry pressure at Well 58, after approximately 6 years of the cavern's well being plugged). *See* Briggs Aff. at ¶19. This demonstrates that the galleries were able to contain fluid over an extended period of time at pressures greater than those that would be encountered during FLLPG's proposed storage operation.[17]

- After re-entry of the plugged wells in each gallery, the applicant completed a long-term brine pressure test on each proposed storage gallery as part of its application by subjecting each gallery to induced pressure through the use of mechanical pumps. Each test reached a maximum pressure gradient of 0.80 psi/ft (measured at Well 33 for Gallery 1 and Well 58 for Gallery 2), which is greater than anticipated LPG operating pressures, and the maximum allowable operating pressure gradient of 0.75 psi/ft in the Draft Underground Storage Permit. It is also significantly less than the fracture pressures

[17]The Draft Underground Storage Permit specifies a maximum pressure gradient for Gallery 1, not to exceed 0.75 psi/ft. FLLPG correspondence to the Department indicates the pressure gradient in Gallery 1 will be slightly less than 0.62 psi/ft which is less than the re-entry pressure of 0.66 psi/ft described above. *See*, OHMS Doc. No. 00003, Doc. I.A.34. The Draft Underground Storage Permit also states that the pressure gradient of Gallery 2 is limited to 0.62 psi/ft. This maximum pressure gradient is less than the re-entry pressure of 0.81 psi/ft described above. Consequently, the recorded drill-in pressures which are greater than the proposed LPG storage pressures can be considered a naturally occurring extended pressure test of FLLPG's proposed storage galleries, and thus demonstrate cavern integrity and adaptability of the caverns for storage purposes.

recorded within the salt interval at the site (1.36 to 1.70 psi/ft). *See* OHMS Doc. No. 00012; Doc. No. 00032, Fig. 3; Briggs Aff. at ¶20.

- Halite (i.e., salt) at depth is inherently well-suited for underground gas storage.
- The literature documents that former fracture connections that are unsupported will close and heal, and that healed fractures are substantially stronger in tension than the original primary salt. Therefore, any fractured connections previously made are not a concern to cavern integrity. *See*, Appendix B, Jacoby, 1969. The healing nature of fracture connections in salt is further supported by the fact that after Well 29 was hydraulically fractured to Well 32, the two wells were abandoned as a fracture-connected gallery, and each well was subsequently operated as a single well. *See* Appendix C, Jacoby, 1965.
- FLLPG provided a Finite Element Analysis ("FEA"), which is a structural analysis of the caverns that models how the proposed storage galleries and salt pillars between the caverns behave under different operating pressures over time. FLLPG's FEA predicts that the caverns will be stable under anticipated operating conditions and pressures for expected life of the facility.

While the application materials demonstrated cavern integrity, successful operation of the proposed project would be monitored, verified, and enforced by the Department through imposition of the permit conditions contained in the Draft Underground Storage Permit and exercise of the Department's enforcement authority. For instance:

- Draft Permit Condition 1 requires the applicant to operate the field in accordance with its application, which requires daily pressure readings at all storage wells. Daily monitoring will verify integrity on a daily basis.

- Draft Permit Condition 1(b) requires that product displacement fluid is limited to brine from the base of the brine ponds, which ensures that the most saturated brine available is used to displace product. Monitoring and record keeping of the salt saturation level of the displacement fluid must be performed at least daily during product displacement, and made available to the Department upon request.
- Draft Permit Conditions 1(i) and 2 require the applicant to conduct sonar surveys at specified periods such as when a well is re-entered or drilled, at intervals not to exceed 10 years, or when the gallery reaches its permitted maximum storage capacity or span. A report summarizing the sonar survey results is due to the Department within 90 days of completion of such survey. The report must compare the survey results to the cavern growth model, and discuss the effects, if any, on the conclusions reached in the FEA. Any deviation and/or any unexpected cavern growth must be included in the report, as well as any proposed corrective actions as needed. The Department may require additional analysis or corrective action based on its review of the report.
- Draft Permit Condition 3 requires the applicant to complete mechanical integrity tests ("MIT") at a pressure equivalent to at least 0.75 psi/ft (maximum allowable storage pressure) and less than 0.80 psi/ft prior to initiation of storage operations and every 5 years thereafter. The MITs verify the integrity of the wells and caverns at or above the maximum operating pressure, but are still significantly less than the fracture pressures recorded at the site (1.36 to 1.70 psi/ft);
- Draft Permit Condition 4 requires routine subsidence surveys to monitor the elevation of the ground surface above the caverns. Subsidence of the ground surface in appreciable amounts could be indicative of a failure in cavern integrity. As such, monitoring of the

ground surface is another method of evaluating cavern integrity. Surveys are required every 2 years. All wells, including future and plugged wells within Galleries 1 and 2 must be included in each survey.

- Draft Permit Condition 5 requires production casing evaluations and inspections for all storage and monitoring wells in the storage galleries. These must include, at a minimum, a cement bond log, gamma ray-neutron log, magnetic flux log, and electromagnetic thickness log, or other equivalent logs approved by the Department. These logs evaluate the quality and bonding of the cement seal between the casing and formation and the thickness and integrity of the production casing. Containment of LPG and brine within the storage galleries is ensured by verification of the condition of wells accessing the caverns in each gallery.
- Draft Permit Condition 6 allows the Department, for reasonable cause, to require performance of additional sonar surveys, well and/or cavern MITs, subsidence surveys, casing evaluations and inspection logs or any other tests or procedures and require reporting and analysis to verify compliance with permit conditions in the draft permit or any New York State statute, rule, regulation and/or order. The above-outlined conditions are sufficient to monitor routine operations and verify compliance, but this particular permit condition gives the Department wide latitude to require additional testing and related reporting and analysis, or completion of tests or procedures not outlined in the draft permit, if it is deemed necessary and appropriate to verify compliance. This ensures that the draft permit has sufficient flexibility to accommodate changes in recommended testing technology and/or testing frequency based on industry standards or scientific

study and that the draft permit can respond to non-routine events that might give cause to require additional testing.

- Draft Permit Condition 8 requires reporting of any non-routine incident. The incident must be reported orally within 2 hours of discovery, in writing within 24 hours of discovery, and as required by all applicable statutes and regulations. Non-routine incidents include, but are not limited to, i) any indication of the abnormal presence of storage gas and/or product displacement fluid outside the storage reservoir (i.e., storage galleries) authorized by the draft permit and/or the wells accessing the storage galleries, and ii) casing failures, cement failures, wellhead failures, fires, blowouts and spills. Non-routine incident reporting requires prompt reporting of incidents that may impact the public and/or environment, and requires that the action causing or suspected of causing the incident be ceased immediately upon discovery and that initial remedial actions be commenced. Further, for reasonable cause, the Department may require cessation and/or suspension of storage operations, or partial or complete removal of LPG from the caverns.

FLLPG satisfied all of the prerequisites specified in Article 23, Title 13, to receive an underground gas storage permit. The applicant submitted the required RSR, reservoir map and storage affidavit, the latter of which demonstrated adequate control over the storage rights in the subject reservoir. The RSR, showing the adaptability of the storage reservoir for LPG storage along with the balance of their underground gas storage application, was determined by Department staff to be complete on August 17, 2011 and the project received approval from the State Geologist on March 15, 2013. *See* ECL 23-1301(1).

In all, Department staff conducted a detailed analysis of FLLPG's proposed project from site characterization through planned operating and monitoring conditions. Department staff's evaluation included a comprehensive evaluation of the caverns themselves as well as the wells that access the storage galleries. DEC staff's review considered the potential impacts to cavern integrity from nearby galleries proposed and currently used for natural gas storage by Arlington Storage Company, LLC ("Arlington") as well as all previously drilled wells and solution-mined caverns in the area surrounding the Finger Lakes project. In Department staff's view, the applicant adequately demonstrated that the caverns proposed for LPG storage are not only adaptable for this purpose but will be suitable for LPG storage for the projected life of the facility.

2. Issues Raised By Potential Parties Are Neither Substantive Nor Significant; Offers Of Proof Were Often Conflicting Or Unsupported By Factual Or Technical Basis.

Two potential parties raised cavern integrity as an issue in their petition for party status: SLPWA and GFS. SLPWA's offer of proof related to cavern integrity raised four different issues consisting of 55 separate paragraphs, though not every paragraph raised a distinct issue. Among other things, SLPWA argues that faulting in the area of the proposed project poses a risk to cavern integrity and that horizontal stresses are not well understood. SLPWA Petition, p. 9, ¶1. They also contend that ongoing solutioning of the existing caverns poses an unacceptable risk and that abandoned salt caverns are not adequately characterized. *Id.*, p.20-21. In support of these issues SLPWA provided several generic statements about geological conditions that weren't factually or technically connected to aspects of the proposed project. SLPWA's experts also offered contradicting views to each other of the type of fault they believe to exist east of the proposed storage galleries. Likewise, GFS argues that the cross-sections and maps prepared by

the applicant are not to their expert's liking and that there is missing information about the geologic setting of the project. *See* GFS Petition, p.8.

GFS, through their expert, also proposed a number of other permit conditions that should be imposed on FLLPG, though they didn't adequately demonstrate that the proposed impacts purportedly addressed by their additional permit conditions would be present in FLLPG's project. Neither SLPWA nor GFS discussed any of the Department's draft permit conditions in their petitions for party status or at the issues conference and therefore neglected to consider how the draft permit conditions would address potential impacts identified throughout the Department's evaluation of the project. *See Matter of Jointa Galusha*, *supra*. As a consequence, they failed to raise any substantive and significant issues.

a. The geologic setting of the proposed project is well understood.

SLPWA's first proposed issue for adjudication, which consists of 33 numbered paragraphs, begins with their assertion that faults in the project area were not properly characterized. Specifically, SLPWA's paragraphs 1-6, 8, 9, and 27 relate to their concern that FLLPG has not sufficiently addressed known faults documented by Charles Jacoby and L. F. Dellwig. Tr. P. 212:10-14. In a similar fashion, GFS's first of three issues related to cavern integrity concerns their belief that faulting wasn't given due respect and that the cross-sections prepared by FLLPG did not satisfy their expert, Dr. Clark. *See* GFS Petition at 8-9.

The record clearly indicates that known faults were properly identified, as required by the Department for all underground storage permit applicants. *See*, OHMS Doc. No. 00003, Doc. I.A.4, ¶6(b). The underground storage permit application and the RSR address the potential for faulting and the extent to which it extends into the overlying caprock. *See*, October 9, 2009 application, RSR, pgs. 6-9; May 14, 2010 RSR, pgs. 9-12. This analysis was supplemented by

the January 19, 2012 memorandum by Leonard Dionisio and John Istvan, which was prepared in response to public comments made on the DSEIS. *See* OHMS Doc. No. 00003, Doc. I (B) (5). In DEC staff's view of the record, including the January 19, 2012 memorandum, the applicant satisfactorily evaluated site-specific and regional geologic data, including the presence of a strike-slip fault east of the proposed galleries.

The, January 19, 2012, memorandum and staff's own evaluation confirmed that the north-south strike-slip fault referenced in the 1979 Stone & Webster report is the same fault referenced in the 1974 Jacoby & Dellwig paper, and the applicant satisfactorily demonstrated that the fault, to the extent it runs along Seneca Lake, would not intersect the proposed galleries, compromise the caprock or otherwise pose a risk to cavern integrity. *See*, Briggs Aff. ¶22. The geology of the region is well studied and FLLPG thoroughly investigated and evaluated site conditions by reviewing available literature, conducting rock core analysis, and reviewing geophysical logs to map geologic units.

As to GFS's claim that FLLPG did not prepare cross-sections that met with their expert's approval, the level of specificity in the geological cross-sections was dictated by Department staff and the final version of the cross-sections and gallery map satisfied the Department's requirements. It is worth noting that it is not the Department's expectation to have all geologic data displayed on a single set of maps. The SEQR record, which includes each Notice of Incomplete Application (dated 1/11/2010, 8/12/2010, and 3/28/2011) sent to FLLPG by the Department, demonstrates this, as does the Department's Notice of Complete Application dated August 17, 2011.

Rather, FLLPG has provided the required geologic information in a series of submittals which include the geologic cross-sections and gallery map, sonar survey reports for the caverns

for multiple years (the surveys were used to show the caverns on the cross sections, but the actual sonar survey reports provide 360 degree views of the caverns as opposed to the few transects displayed on the cross-sections), geophysical logs showing lithology, structural cross-sections developed using geophysical logs, and isopach and structure contour maps for the caprock. FLLPG also provided well status and condition reports that show original well depth and current top of rubble, geo-mechanical study results which included core logs from the site area and quantitative analysis of physical rock properties for the storage formation and caprock, and a literature review which included papers by Jacoby and his related geologic work that included mapping of salt beds and faults for the brine field that underlies the proposed project site. As such, FLLPG's application is comprehensive and has provided all information that was required by ECL 23-1301(1) and the Department. In the end, petitioners are essentially arguing that a hearing is necessary to determine just how much information is enough to make decisions about the facility but applicable case law indicates this is not an appropriate basis to proceed to adjudication. *See Matter of Akzo Nobel Salt, Inc.*, 1996 N.Y. Env. Lexis 4, 22, Interim Decision of the Commissioner, January 31, 1996, ("A hearing on the issues identified would not resolve disputed facts with evidence, but rather would become a debate among geological and mining engineers over the quantity and quality of information appropriate to make judgments. . .")

The Federal Energy Regulatory Commission's ("FERC") experts also evaluated the presence of faulting in the area and the potential for faults to intersect the galleries proposed for use by Arlington at the nearby Seneca Lake Storage Facility. *See Arlington Storage Co., LLC*, 2014 FERC LEXIS 768, *Order Issuing Certificate and Reaffirming Market-Based Rates*, FERC Docket No. CP 13-83-000, (May 15, 2014), also available at: www.ferc.gov/whats-new/comm-meet/2014/051514/C-1.pdf. In that proceeding, GFS also raised the Jacoby-Dellwig fault as an

issue for FERC's consideration and FERC concluded, as Department staff does, that the fault's location does not intersect the proposed storage galleries and that successful pressure tests demonstrate there is no evidence of leakage from the caverns. *Id* at ¶26, Briggs Aff. ¶23. Consistent with FERC's findings, Department staff agreed with FLLPG that any faulting is limited to the salt layer and does not extend into the caprock or the formation underlying the storage formation. *Id.*

In their petition and during the issues conference, SLPWA claimed that the fault was omitted from the finite element analysis ("FEA") conducted by FLLPG's expert, Prof. Kittitep Fuenkajorn. SLPWA Petition, ¶21. In fact, SLWPA said the fault was "improperly omitted" from the FEA. Tr. 212:8-15. SLWPA's expert, Dr. Raymond Vaughn, went so far as to say that FLLPG ". . . misled this expert by not informing him of the proximity of the north-south strike-slip fault. . . or at least it is not evident from the Thai expert's test and cited sources that he was aware of the fault." Report of Raymond Vaughn at ¶31. Putting aside for the moment Dr. Vaughn's references to Professor Fuenkajorn as "the Thai" expert and Vaughn's accusation about FLLPG, it's worth nothing that neither SLPWA nor Dr. Vaughn specifically identify why the location of the fault hundreds of feet away from proposed storage Gallery 1 and solely contained within the salt interval would have any impact on the outcome of the FEA. SLWPA did not cite to any geomechanical studies, engineering texts or industry standards to demonstrate that a fault, located some distance away from proposed storage caverns should be included in an FEA modeling exercise.

Likewise, they do not point to any statutory or regulatory standard that FLLPG will be unable to satisfy if the FEA is not redone nor are they even able to point to any place in the FEA as proof that the inputs in the modeling or any of the engineering assumptions used by Prof.

Funkajorn were improper. In reality, what SLWPA provided in their petition for party status cannot be described as an offer of proof on this subject. What they provided was a generic, conclusory statement that lacked any factual or technical foundation. *See* Matter of Citizens for Clean Air at 3-4 (". . . petitioners utterly failed in their burden. . . to provide a clear explanation of the issues sought to be adjudicated and not merely make obscure references [] to matters which should be considered and then seek to set aside a determination on the ground that there was a failure to consider those matters.")

Moreover, nothing in Dr. Vaughn's resume suggests he has any experience in FEA modeling or is at least familiar enough with the modeling program and engineering analysis used by Prof. Funkajorn, to serve as credible critic of whether the FEA was conducted correctly. *See, generally*, Matter of Gernatt Asphalt Products, Inc., Commissioner's Decision, May 25, 1995, (where an expert who did not do any study or analysis of his own and was not qualified to do the type of analysis at issue was discredited). Dr. Vaughn's entire critique of the FEA consists of three paragraphs where he offers the unsupported opinion that the FEA does not incorporate the north-south fault and did not model the southern part of Gallery 1. Dr. Vaughn is actually mistaken about the southern part of Gallery 1. FLLPG's FEA, contained in their September 28, 2010 Response to the Second NOIA discusses and displays the modeling. *See* OHMS Doc. No. 00003, Doc. I.A.8. Nevertheless, it is not enough to point out what Dr. Vaughn perceives as missing. SLWPA should be prepared to identify that the omission is both substantive, as defined in 6 NYCRR 624.4(c)(2), and has the potential to result in either denial of the permit or the imposition of significant permit conditions, as specified by 6 NYCRR 624.4(c)(3). SLPWA's petition, however, didn't offer any further elaboration on Dr. Vaughn' statements. By definition,

this is not a substantive and significant issue. *See*, *Matter of Bonded Concrete, Inc.*, Interim Decision of the Commissioner, June 4, 1990.

SLPWA's contention that known faults were not evaluated by FLLPG is rebutted by evidence in the record as well as DEC staff's own analysis. *See*, *Matter of Jointa Galusha*, supra. Department staff's opinion is consistent with FERC's evaluation of faulting in the area and that it has no impact on the integrity of the proposed and existing natural gas storage galleries operated by Arlington; a conclusion made more relevant by the fact that the Jacoby-Dellwig fault is closer to the existing natural gas storage gallery successfully used for 20 years than the galleries proposed for use by FLLPG. Since SLPWA has not identified any defect in the application or the Department's analysis, this proposed issue is neither substantive nor significant.

Department staff is also unpersuaded by SLPWA's and Vaughn's collective call for seismic testing, additional core samples, horizontal drilling or "massive excavation" to verify the location of the Jacoby-Dellwig fault. *See*, Tr. P. 220:14-17; Vaughn Report, ¶14, 30, 36 and 43; SLPWA Petition, ¶22, 23. In light of the information available from Jacoby & Dellwig and Stone & Webster, further testing is not necessary. To that point, Dr. Vaughn drew the location of the fault on a map of the well field and – assuming for argument sake that his illustration of the Jacoby-Dellwig fault is correct – his own analysis is that the fault lies to the east of Well 29, and therefore lies a significant distance from the proposed storage galleries. *See*, Vaughn Report, Ex. 3 & 4. As a consequence, Dr. Vaughn's own illustration demonstrates that the Jacoby-Dellwig fault would not intersect the proposed storage galleries and pose any risk to cavern integrity. As such, there is no dispute of material fact worthy of adjudication.

b. Small-scale faulting in the salt layer does not extend into the caprock.

SLPWA also takes issue with FLLPG's conclusion that small scale faulting in the salt layer is confined to the salt and does not extend upward into the Camillus Shale. *See*, SLPWA petition, ¶7, 10, 13, 14, 25. SLWPA also raises the specter that an expression of brine discussed by Charles Jacoby in 1974 is evidence that faulting extends into the caprock and up to the surface. Id., ¶7. These are not substantive and significant issues. Both Department staff and FERC reviewed isopach and structure contour maps which depict the stratigraphy of the area and those contour maps, as FERC indicated, "gives no indications of faults breaking into the overlying sediments." FERC Order, ¶26; Briggs Aff. ¶22. Department staff agrees with FERC's conclusion regarding caprock integrity. These isopach and contour structure maps are developed by analyzing geophysical logs which are obtained from drilled wells.

There are approximately 58 geophysical logs available from the 86 wells drilled, plugged or re-entered in the area of the proposed facility, all of which are available to the public. The reports provided by the petitioners rely mainly on the published works of Jacoby and Dellwig, and the limited descriptions of events and portions of well logs that Jacoby and Dellwig chose to highlight. There is no evidence in their reports that Dr. Vaughn, Nieto or Clark reviewed any complete copies of the geophysical logs themselves. Instead, what petitioners and their experts have done is taken selected passages from Jacoby and Dellwig's work and reinterpreted or reformulated those passages to fit their own narrative. However, there is nothing in Jacoby and Dellwig's published works - - which incidentally were not written to answer questions about future cavern integrity - - that contradicts or undermines the balance of information available today which does establish cavern integrity.

Dr. Vaughn makes the statement that "[g]eological and engineering studies and the results of sonars, hydrotests, vertilogs, various other logs are useful. . ." but instead advocates

that seismic surveys be performed. Vaughn Report, ¶30. However, geophysical well logs obtained from drilled wells are more than useful, they are definitive.[18] Geophysical logging, including gamma ray and neutron logging, is a well-established and accepted method of documenting formation type and depth and have been around since at least the 1940s. *See*, Well Surveys, Inc. v. McCullough Tool Company, 199 F. Supp. 374 (N.D. Okl.) (1961). Based in part on an analysis of well logs, FERC concluded that "there is no faulting in the Camillus Shale caprock above the storage galleries." FERC Order, ¶30. Department staff agrees.

Citing to Jacoby, FERC went on to conclude that "the geologic literature states that structure contour and isopach maps reveal that both the upper and lower surfaces of the salt are relatively uniform, that the top and bottom of the salt are horizontal in parallel planes, and the faulting occurred within the salt mass between these over and underlying bedrock units." *Id.*, *citing* Jacoby (1969); *see also,* FERC Order, ¶85-87.

Jacoby reiterated this finding in 1973 in *Recovery of Entrapped Hydrocarbons* where he states:

> Tectonically, the Salina has been disturbed by several thrusting actions of the Appalachian uplift. This diastrophism has given rise to a series of low angle thrust, tear and slip faults. In order to correlate beds of salt across these fault zones, all beds were defined by previously established nomenclature from geophysical logs (Fig. 3). Confusion arises from the fact that despite the thousands of feet of horizontal displacement that have occurred within the evaporites, the upper contact of the topmost salt bed and the lower contact of the bottom salt bed can be said to be parallel." Appendix D, Jacoby (1973).

[18] In a 2012 Solution Mining Research Institute research report on common practices for the underground storage industry, it states that well control, not seismic, is the most common and precise method of mapping the salt structures and that it "…is accomplished by accumulating the well drilling records and geophysical logs within the area of interest, and then mapping the depth to the top of the caprock and to the top of the salt," and creating isopach and other maps that show the structure including the caprock (Pereira, 2012). This is exactly what FLLPG did when it relied, throughout its application and responses to the three NOIAs, on the results of drilled and logged wells in the project area, and created an isopach and structure map of the Camillus caprock.

In short, the literature supports the conclusion that the Camillus Shale is an effective part of the storage container and small-scale thrusting is confined to the salt interval.

Dr. Vaughn includes extensive quotes from Jacoby and Dellwig's 1974 paper in his report to SLPWA, and then tries to reinterpret those quotes to suggest there is evidence that the faulting observed by Jacoby and Dellwig extends above the salt layer. *See*, Vaughn report, ¶9-13. Of course, the first six words in the long citation included by Dr. Vaughn are "In the Watkins Glen Brine Field." ¶10. Every part of the discussion that follows Dr. Vaughn's quotes from Jacoby and Dellwig is a discussion of their observations *within* the salt layers and nowhere else.

In fact, the cross-sections included in Jacoby's 1969 paper shows the tear fault and it clearly shows that the fault doesn't extend higher than the "C" salt. *See* Appendix B, Figures 1-3. Petitioners rely heavily on Jacoby's interpretation of geophysical well logs to establish the presence of the north-south strike-slip fault. If that's the case, they should also rely on his interpretation of the extent of the faults and lack of faulting above the salt interval.

During the issues conference SLPWA questioned FLLPG's conclusion that any localized faults in the salt layer could heal, noting their opinion that there is a lack of proof that salt has the plasticity needed to heal faults. Tr. 215: 16-24; Tr. 216:13 to 217:5; SLPWA petition, ¶60-61. However, it is appropriate to note that halite (i.e., salt) at depth is inherently well-suited for underground gas storage due to its ability to close unsupported fractures or openings within the salt bed itself. SLPWA relies heavily on Jacoby's work, and it was Jacoby that wrote:

> As the salt and rock close in on the opening, a crystalline halite begins to grow in the crevice until the void is completely filled. This crystal halite is substantially stronger in tension than the original primary salt, thus resisting refracturing. Thus in refracturing a well at the same point as that at which it was initially fractured, after collapse of the bed has occurred, the fracturing fluid will take a direction of secondary preference avoiding the target well. Advantage can be taken of this healing effect in refracturing at the point of the original fracture where the fluid in the original fracture has taken an undesired direction. <u>It is this healing effect that</u>

> allows fractured cavities in faulted salt beds such as those in New York, Ohio and Pennsylvania to be used for the storage of hydrocarbons." Jacoby (1969), (emphasis added).

While no hydraulic fracturing is proposed by Finger Lakes, the above passage from Jacoby demonstrates a well-known characteristic of halite at depth which contributes to ensuring containment of any stored hydrocarbon.

As to the flow of brine to the surface briefly described by Jacoby and Dellwig in 1974, very little information is available for this event. SLPWA states that Jacoby himself witnessed the event at the surface of Well 29, however, the exact quote from Jacoby's paper is "Well 29. During fracturing, a flow of brine at the surface 0.5 mi. to the north must certainly be interpreted as the result of brine from the well along the tear fault." See, Tr. P. 216:2-3; Ex. XXX, Jacoby (1974). The quote from Jacoby's paper noted that some kind of flow occurred but it doesn't say that Jacoby witnessed it himself and that it was at Well 29. Notably, the flow is first mentioned in Jacoby and Dellwig's 1974 paper and consists of one sentence, quoted above, and it is never mentioned again (except for being referenced in subsequent papers by other authors). *See*, Appendix E. Further, the well was fractured in 1958, but the flow to the surface was never mentioned in any of the numerous papers by Jacoby until 1974.

In *Effect of Geology on the Hydraulic Fracturing of Salt*, Jacoby described the hydraulic fracturing of Well 29 and its connection to Well 32. He noted that "… a high pressure connection between the two wells was established quickly" but he failed to make any mention of a surface flow. *See*¸ Appendix C, Jacoby (1965) at 318. Due to the lack of data on the reported surface flow associated with the hydraulic fracturing of Well 29, there are no records available to verify and/or quantify the volume, origin, location or composition of the purported flow. There is just the anecdotal reference in the 1974 paper. There is likewise no way to know if during

hydraulic fracturing brine flowed up the annular space of Well 29 before traveling through some other formation or whether the flow was noted from a wellbore to the north or observed on the ground.

Furthermore, Jacoby and Dellwig state that the reported flow of brine to the surface occurred during fracturing of Well 29, which, as a matter of fact, does not access either of the proposed storage galleries. *See*, Jacoby and Dellwig (1974); *see*, Vaughn report, Ex. 3, 4, 5 & 6. Nevertheless, it bears noting that typical pressures required for fracture connections within the salt beds at the site ranged from 1.36 to 1.70 psi/ft, which are far above the maximum pressure gradient of 0.75 psi/ft allowed for the storage operations. *See*, FERC Order, supra, at ¶92; OHMS Doc. No. 00012, condition 1(g); Briggs Aff. ¶20. As such, the maximum pressures allowed in the draft permit conditions for storage operations will never approach those required to fracture the storage formation. The maximum pressure allowed during storage operations would be controlled by Permit Condition 1(g), which states both the minimum and maximum pressure gradient allowed in each well. In addition, the maximum allowable storage pressure is only 55% of the minimum pressure observed for fracturing, which provides a significant margin of safety (i.e., 0.75 psi/ft is 55% of 1.36 psi/ft).

FERC was also presented with the same evidence that there was a surface flow of brine during a hydraulic fracturing event in 1958 and likewise, FERC concluded that successful pressure tests and successful storage operations for 20 years in Arlington's existing Gallery 1 demonstrate integrity. *See* FERC Order, supra, at ¶26. Department staff agrees with FERC that any fracture created within the salt interval would have long since healed and that successful pressure tests, coupled with ongoing monitoring of cavern operations and growth, will ensure long-term integrity of the caverns. *Id.*

c. There is no technical support for an interpretation of the Jacoby-Dellwig fault as a thrust fault.

In direct contrast to the opinion of their own expert, Dr. Vaughn, SLPWA offers the opinion of Dr. Alberto Nieto, who hypothesizes that the north-south strike-slip fault documented by Jacoby and Dellwig in 1974 is not a strike-slip fault but a thrust fault towards the east that may provide a direct link between the project site and the bed of Seneca Lake. *See*, SLPWA Petition, ¶27-33. Dr. Nieto's hypothesis, however, does not agree with available literature and site-specific data.

Published literature by Jacoby (1969), Jacoby & Dellwig (1974), and Stone & Webster (1978-79) show that the fault at the project site is a north-south strike slip fault, with associated thrusting towards the north that is confined to the Syracuse formation. In fact, as stated above, Figure 1 in Jacoby's 1969 paper shows that the beds in the upper half of the Syracuse Formation are relatively consistent in their thickness and elevation, showing the absence of any type of thrust faulting described by Dr. Nieto. *See*, Appendix B, Figure 1. This evidence, based on Jacoby's analysis of rock core logs and geophysical logs collected from wells at the site, along with Department staff's own evaluation of approximately 58 geophysical logs, clearly refutes Dr. Nieto's hypothesis. Further, beds in the lower half of the formation show tear faults confined to the Syracuse that are oriented north-south, with associated thrusting towards the north. *Id.* Based on the above, there is no evidence to support the hypothesis of an eastward thrusting fault below the site, and as such, any contribution to horizontal stress/movement from such hypothesized fault is absent. *Id;* Briggs Aff. ¶25.

SLPWA argues that FLLPG's failure to identify the alleged thrust fault hypothesized by Dr. Nieto speaks to the quality of their application. Tr. P. 220:8-12. However, it is the petitioner for party status who has the burden of establishing that there is a question of fact that meets the

regulatory definition of a substantive and significant issue. While SLWPA calls for additional seismic testing to confirm the presence of their hypothesized fault, it is SLPWA who must provide a sufficient offer of proof that the "re-formulated" fault exists. Since the orientation of the fault was determined by Jacoby through a detailed analysis of geophysical logs, and Dr. Nieto's theory is not supported by such an analysis, there is nothing to adjudicate.

d. In-situ stresses were identified and fully evaluated.

In their second proposed issue for adjudication, SLPWA comments that regional and local horizontal stresses have not been adequately evaluated and may affect cavern integrity. SLPWA states summarily that "for the most part, the Applicant does not evaluate the impact of these stresses. . ." SLPWA ¶35. Their second issue can be broken down into two sub-issues: valley stress relief (¶34-38) and tectonic stresses (¶39-46). Their offer of proof to support paragraphs 34 to 38 of their petition, consists of paragraphs 17 and 18 in Dr. Vaughn's report where he states generally that the regional tectonic stress field and the local stress field "in and around" bedrock valleys should be considered. Vaughn report, ¶17. Dr. Vaughn cites to three articles about horizontal stresses but all three relate to horizontal stresses in traditional underground mine workings such as coal mines and except for standing for the general proposition that it's a good idea to understand in-situ stress, their relevancy is questionable. *Id.*, ¶41, fn 41.

Nevertheless, in support of their sub-issue on valley stress relief, SLPWA offers that FLLPG used the wrong depth for the lake bottom in their cross-sections because they showed the depth of the valley as the top of unconsolidated materials in the lake rather than the top of bedrock. SLPWA Petition, ¶37. SLPWA never actually said this was a substantive or significant

concern, or offered any argument suggesting that this difference would override the balance of data that established cavern integrity. *See*, *Matter of Jay Giardinia, supra, at* 4. They do say that valley stress is an "uncertain" and "poorly bounded" risk, though they, again, didn't explain why this uncertainty is both substantive and significant. SLPWA Petition, ¶38.

FLLPG's expert, Dr. Samuel Gowan was correct to quickly dismiss Dr. Vaughn's generalized concern by saying "There is no evidence of valley stress relief related structures at the site." *See Finger Lakes LPG Storage, LLC's Response to Party Status Petitions, February 9, 2015*, Gowan Report at 39. Department staff agrees this is not a valid technical concern and does not rise to either a substantive or significant issue. For one, FLLPG states that in order to be a concern elevation changes between valley and hill need to be over 1,000 feet to have any significant stress effect induced by topographic variation. FLLPG considers the lake bottom as the valley bottom, which results in ~700 ft relief and is less than 1,000 ft. Petitioners did not disagree with the 1,000 ft threshold either in their petitions or at the issues conference, although their preference to show the lake bottom as the top of bedrock results in approximately 1,250 feet of relief.

Second, as the January 6, 2014 memorandum from Leonard Dionisio and John Istvan points out, "[S]ince the caverns are under the slope of the valley (and not the valley itself), the lateral stresses on the cavern field will be greater than what was used in the FEA model. However, this has no adverse effect. ln fact, the additional lateral stress should increase the cavern roof stability during the withdrawal period." OHMS Doc. No. 00003; Doc. I.A.30. There is also approximately 4,000 feet between the proposed storage Gallery 1 caverns and the centerline of Seneca Lake. Proposed storage Gallery 2 is located an additional 1,000 feet further away for a total distance of approximately 5,000 feet, so while SLPWA speaks to valley stress,

there is considerable distance between the proposed galleries and the deepest part of the valley, which attenuates their concerns.

Third, petitioner SLPWA does not discuss how the approximately 550 feet of unconsolidated overburden (i.e., sediment) above the valley bedrock may affect horizontal stresses on the proposed storage caverns and reduce valley stress relief. Briggs Aff. ¶26. Instead they simply state a preference to measure the elevation change to the top of bedrock, without citing any technical authority to support their offer of proof. Dr. Nieto included a figure demonstrating the principle of valley stress relief. *See* Nieto report, Figure 6. However, his figure appears to show a relatively shallow open valley with limited sediment and a small river or stream. In contrast, Seneca Lake is deep, and has approximately 450 feet of open water and several hundred feet of saturated sediment, both of which would have significant hydrostatic pressure on the bedrock floor that would resist the type of uplift alluded to in Dr. Nieto's figure 6.

Finally, on the issue of valley stress relief, it also bears noting that there is a 40-year history of storing LPG and natural gas in adjacent galleries that have not shown any issues related to cavern integrity from horizontal stresses. In sum, there is no question of fact related to valley stress relief, and no data on which to question the applicant's FEA. SLPWA bears the burden of proof to demonstrate that the elevation of the lake bottom is substantive, and in light of the fact that the storage galleries are not actually located under the lake and that FLLPG's FEA and subsequent analysis demonstrates the caverns are adaptable for storage purposes, it's not possible for them to meet that burden.

As to SLPWA's second sub-issue, concerning tectonic stress, there is no reasonable threat to cavern integrity from seismicity, and there is no evidence of horizontal stresses

adversely affecting the 40-year operating history of storage of LPG and natural gas in caverns adjacent to the project site. The DSEIS and the underground storage permit application demonstrates that a hard look was taken at the potential for seismic activity to pose a risk to cavern integrity. The DSEIS, in Section 4.1.3.1., indicates that the region is characterized as a low seismicity area. This conclusion is based on a review of data collected from the USGS and the National Geophysical Data Center. Department staff agrees with this conclusion. Nothing in the available literature indicates that seismic activity poses a concern to cavern integrity. FERC also evaluated the potential for seismic activity to impact integrity at the adjacent Seneca Lake Storage Facility and concluded that there was low-seismic risk to Arlington Storage Company's natural gas expansion project. *See*, FERC Order, ¶ 80-82.

SLPWPA offers to have Dr. Nieto testify that there is proof of modern tectonic stresses and thereby proof of his re-formulated fault. SLPWA Petition, ¶39-46. This proof, according to SLPWA, is: a) log-correlation work done by Jacoby and Dellwig; b) sediments in Seneca Lake that show compressional features; c) core disking from a sample taken at NYSEG's Well 59 and, d) roof instability in Well 58.

Dr. Nieto's January 15, 2015 report, however, does not suffice as an offer of proof of their purported facts. It is contradicted at every turn by data available in the record in this proceeding or in published literature, and it offers generalized conclusory statements that are not specific to this project. *See Jointa Galusha.* Specifically, SLPWA states in their petition that log-correlation work and subsurface geological work by Jacoby and Dellwig shows a north-south band of wells and this is somehow evidence of Dr. Nieto's re-formulated fault. SLPWA Petition, ¶40. Dr. Nieto, in his report, draws a picture of his hypothesized fault and makes the same statement repeated by SLPWA, that Jacoby and Dellwig's log-correlation work served, in part,

as the basis of his opinion. *See*, Nieto Report, ¶4(a); Nieto Report, Figure 1. However, neither SLPWA's petition nor Dr. Nieto's report explain how the detailed and exhaustive review of logs done by Jacoby and Dellwig supports an interpretation as an east-west thrust fault when every other person who reviews the same work, including Jacoby and Dellwig themselves, characterizes the fault a north-south strike-slip fault with associated thrusting to the north. Dr. Nieto adds in his report that his drawing of the re-interpreted fault is also based on his knowledge of neo-tectonics, and his knowledge of other horizontal stresses documented on the World Stress Map Project. Nieto report, p. 2. However, these general statements do not shed any additional light on his opinion.

SLPWA's and Dr. Nieto's discussion of dam sites is also not helpful, as it simply states that valley anticlines, pervasive shear zones along bedding, and fractured zones at the bottom of valleys have been previously observed at dam sites. SLPWA petition, ¶41; Nieto report, ¶5. However, this has no bearing on the proposed Finger Lakes Project because the geology and structure beneath the site has already been evaluated by the applicant and proven to be adaptable for storage.

Data available on the cores taken from Well 59 also contradicts Dr. Nieto's speculation that core disking is both present and indicative of faulting. In support of this claim, SLPWA cites to the January 1996 report from RE/SPEC Inc. and claims, without support, that the preparer of the report observed "core disking" and that such disking is evidence of high horizontal stress. SLPWA Petition, ¶43. Petitioner doesn't point to any specific location of the report or even provide an example of their claim. Laying aside the fact that the words "core disking" don't actually appear in the 1996 report, Department staff reviewed the core descriptions and if one runs down the tables included the report, specifically the column labeled

"Nature of Break at Base of Piece," it becomes readily apparent that all the breaks in the cores were either drilling induced or handling induced. OHMS Doc. No. 00003; Document I.A.6, RSR, Exhibit 18 of RSR. Considering the length of the cores involved, and the discussion up front in Section 2.3 of the report that safe core handling requires that cores be broken into smaller section, it is entirely expected that the cores taken at the site should show man-made handling breaks. *Id.* Petitioner SLPWA and Dr. Nieto summarily state breaks in the cores is evidence of "core disking" but the only report they rely on in support of this theory does not support them at all. There is no dispute of law or fact on this point, as there is absolutely no factual support in the RE/SPEC report for SLPWA's argument. As such, their claim that core disking is present and indicative of horizontal stress is both insignificant and non-substantive.

The final claim made by SLPWA in support of their theory that high horizontal stresses pose a risk to cavern integrity is their belief that Well 58 has an instable roof. SLPWA Petition, ¶46. Their claim is based on paragraph 10 of Dr. Nieto's report, in which Dr. Nieto explains that he learned from GFS's proposed expert, Dr. Clark, that Well 58 "showed signs of roof instability." Nieto report, ¶10. GFS raised a similar comment at the issues conference. Tr. P. 234: 11 to 235:22. Dr. Nieto claims that once he was made aware of the sonars he examined the sonar profiles for himself. *See* Nieto Report, ¶10. While Dr. Nieto says the most recent profile shows the sagging roof, he does not state how he arrived at that conclusion. He also does not explain how he came to characterize the sagging as "premature", which apparently has a temporal component that also goes unmentioned and unexplained. What SLPWA really offers by way of an opinion on Well 58 is a 'me-too' that is not backed up by an adequate offer of proof ." *Id.* Their me-too is an attempt to buttress Dr. Clark's opinion but in fact fails to do so.

FLLPG's expert, Dr. Gowan, provides a more sound and reasonable explanation for why the series of sonar profiles, as depicted on the cross-sections, do not line up exactly at the roof and floor of the cavern associated with Well 58. *See*, Gowan Report, p. 28. Dr. Gowan explains that the depth of the wellhead differs by five feet in the sonars taken in 2011 and 2013, which explains the five-foot change in elevation of the Well 58 cavern roof and floor. *Id.* GFS dismisses this explanation by saying this doesn't explain the shape of the cavern roof they observe in the sonar. Tr. 235:12-15. However, the FEA, which evaluated Well 58, shows the cavern to be structurally sound during future LPG operations. Additionally, Well 58 roof containment and integrity will again be demonstrated by the applicant prior to first injection of LPG into Gallery 2 as Draft Permit Condition 3 states that the Permittee must conduct a mechanical integrity test to a pressure equivalent to at least 0.75 psi/ft. *See* OHMS Doc. No. 00012. Moreover, Draft Permit Condition 1(f) requires the Permittee to maintain a hydrocarbon and/or nitrogen blanket (i.e., roof pad) in Well 58 at all times during storage operations and/or shut-in periods. This protective blanket will help ensure that cavern stability and well integrity are maintained by preventing further solutioning of the Well 58 cavern roof and protection of the casing seat (i.e., cement seal between the formation and casing).

As a legal matter, SLWPA's and GFS's concerns about the five-foot sonar misalignment and shape of the sonar do not point to any statutory or regulatory requirement which the applicant cannot meet. *See Matter of Thalle Industries, Inc.,* Ruling of the Administrative Law Judge on Party Status and Issues, 2003 N.Y. Env. Lexis 106., December 10, 2003. Past and current sonar surveys are required by Department staff from applicants for an underground gas storage permit and if not provided, serves as a basis for denying a permit. *See*, *Matter of Bath Petroleum Storage, Inc. and E.I.L. Petroleum, Inc*., 2002 N.Y. Env Lexis 36, July 26, 2002.

However, once submitted, there is no regulatory or statutory standard which dictates the preciseness of how those surveys should be superimposed on a cross-section of the storage galleries. Whether the cross-sections are deemed acceptable by Department staff is dictated, at least initially, by ECL 23-1301, and Department staff would, of course, prefer for sonar surveys to be depicted on cross-sections with a certain degree of preciseness. However, when they are not, the cure is to have the applicant resubmit the cross-sections and "zero out" and align the depths of all available sonars. The cure is not an adjudicatory hearing.

e. Ongoing operational solutioning does not pose a risk to cavern integrity.

The fourth issue proposed for adjudication by SLPWA concerns their claim that enlargement of the caverns "is likely to pose an unacceptable risk to cavern integrity." SLPWA petition at 20. Their offer of proof for this issue is in the form of proposed testimony from Dr. Vaughn who claims that FLLPG's plan to use undersaturated brine "guarantees that the storage caverns that exist in the future point in time will be bigger and thus will not be the same caverns that have been pressure-tested." SLPWA Petition, ¶60. This issue is neither substantive nor significant.

The fact that the caverns will be different years from now, if operated as a storage field, is a statement of the obvious. Enlargement of the caverns is not only expected, as described in the RSR, it is planned and accounted for in the draft permit conditions prepared by Department staff. *See*, OHMS Doc. No. 00003, Document I.A.6; OHMS Doc. No. 00012, Draft Conditions 1(a) through 1(e). It seems SLPWA's expert does not understand that use of undersaturated brine for product displacement, which causes operational solutioning of the caverns, is a necessity and if not used, could cause operational problems. As FLLPG points out in its February 9, 2015 response to the petitions for party status, use of undersaturated brine for LPG displacement is

necessary to prevent "salting" which could result in complete blockage or obstruction of the product displacement tubing (i.e., brine string). *See* OHMS Doc. No. 00030, FLLPG's Response to Party Status Petitions, Memorandum of John Istvan, p. 9. Also, the fact that the salt beds and caprock at the project site are laterally extensive, unlike a salt dome, negates any concern for cavern growth due to operational solutioning within the limits of the FEA.

Operational solutioning and the resulting cavern growth should not be confused with active solutioning. DEC staff considers operational solutioning as any growth that does not exceed 2% annually and the Department's permitting criteria requires applicants to describe how caverns will be developed and operated over time to meet that criteria. *See* OHMS Doc. No. 00003, Doc. I.A.1. Several draft permit conditions are designed to monitor and control cavern growth, such as Draft Permit Condition 1(b), which requires FLLPG to use brine from the base of the brine ponds (i.e., most saturated brine available) as a displacement fluid during product withdrawal to limit the amount of operational solutioning that will occur. Further, Draft Permit Condition 1(c) is the condition that will limit cavern growth due to operational solutioning to 2% by volume on a calendar year basis.

It is not practicable to disallow any growth of the caverns (i.e., operational solutioning) during storage operations by mandating the use of fully saturated brine for LPG displacement. Rather, the Department sets conditions to control and limit cavern growth. The Department also requires applicants to prepare an FEA to model the ultimate cavern dimensions to evaluate cavern stability over the life of the project. Therefore, the FEA has already taken into account any operational solutioning that will occur, and permit conditions, such as draft permit condition 1(e) limits the cavern span to that analyzed in the FEA.

SLPWA's petition for party status made the general observation that cavern growth will occur but did not offer any analysis as to why this is substantive and significant. They also neglected to account for the draft permit conditions proposed by Department staff which rebut the alleged concern. Established precedent dictates that an offer of expert testimony must state the basis of their testimony and take into account proposed mitigation. *See*, *Matter of Jay Gardinia*, Interim Decision of the Commissioner, 1990 N.Y. Env. Lexis 83, Sept. 21, 1990, ("Offers of expert testimony contrary to the application are not . . . necessarily adequate in and of themselves to raise an issue for adjudication. This is especially true where the basis for the contrary expert opinion is not identified or where it is apparent that the expert opinion has not taken into account all proposed project mitigation."); *Matter of Adirondack Fish Culture Station*, Interim Decision of the Commissioner, Aug.19, 1999 at 8, *citing Matter of Akzo Nobel Salt Inc.*, Interim Decision of the Commissioner, Jan. 31, 1996, ("Offers of proof by a petitioner may be rebutted by the application, the draft permit and proposed conditions. . .).

f. Cavern 43 is not "abandoned"; All Caverns Have Been Evaluated.

SLPWA's fifth proposed issue for adjudication is their proposal to have Dr. Vaughn testify that an abandoned salt cavern associated with Well 43 was not evaluated in the FEA and that as a consequence the FEA should be "withdrawn or disallowed" until the cavern is analyzed. SLPWA Petition, ¶62 to 68. What Dr. Vaughn identifies as an abandoned cavern is the outline of Cavern 43 in 1976 based on a sonar survey completed that year. The cavern is not abandoned, it was filled with rubble after the 1976 sonar survey as the cavern was solutioned upward. *See* Briggs Aff. ¶27. The Department sought further clarification of the rubble pile for the same cavern and FLLPG responded in their, September 28, 2010, Response to Second Notice of

Incomplete Application 2. *See*, OHMS Doc. No. 00003, Doc. I.A.8, at 8 (DEC Comment 3); *See also*, OHMS Do. No. 00030, Memorandum of John Istvan, Feb. 9, 2015, pgs. 9-10.

SLPWA states that this cavern was not considered "in terms of its being a link in a leakage pathway or its involvement in pressure testing for leak detection." SLPWA at ¶62. However, the rubble-filled portion of all proposed storage caverns were tested during the long-term pressure tests completed by FLLPG. Those tests indicate that both Gallery 1, which includes Cavern 43, and Gallery 2 are pressure tight, and have pressure integrity beyond that proposed for LPG storage. The FEA included with FLLPG's September 28, 2010 response to the second NOIA also included an analysis of the southern portion of the gallery, contrary to Dr. Vaughn's opinion. *See*, Point 2(C) (2) (h), below. There is therefore no dispute of fact and this proposed issue is not substantive and significant.

g. Rubble piles are expected in solution-mined interbedded salt caverns.

GFS's petition for party status proposed three issues for adjudication. Their first issue, revolves around Dr. Clark's opinion about the level of specificity on the geologic cross-sections. Their second issue, which they argue is a basis to postpone the issues conference, is that the cross-sections do not "include thrust faults and tear faults and incorrectly display cavern floors as being solid rather than mounds of broken rock." GFS Petition at 9. Both of these issues are addressed in Point II(C)(2)(a), above, and as to their third issue, which concerns the rubble piles in the bottom of the caverns, there is no substantive and significant issue as described below.

Petitioners take issue with the fact that the sonar surveys, depicted in two dimensions on the cross-sections, appear to have a flat bottom. However, it is well understood that in solution-mined interbedded salt caverns, the majority of insoluble material will fall to the floor of the

cavern as development of the cavern moves upward. *See* Final Generic Environmental Impact Statement for the Oil, Gas and Solution Mining Regulatory Program, 1992, Figure 14.4 at http://www.dec.ny.gov/energy/45912.html. FLLPG's expert, Dr. Gowan, describes the process in his review of Dr. Clark's report. *See*, Gowan report, Section 2.22 at 24. Department staff also certainly understood that the bottom of the most recent sonar is a reflection off of the top of the rubble pile. This is not an operational concern and GFS's petition doesn't point to any statutory or regulatory provision that requires FLLPG to depict the sonars differently on the cross-section. GFS also fails to identify why the existence of rubble in a solution-mined cavern, in itself, is a substantive and significant issue. They state generically in their petition for party status that the omission of the rubble pile leads to questions about the "linkages between cavities that FLLPG claims are separate" but the full 360 view of the sonar profiles showing the top of rubble are already in the application, as are the brinefield map showing galleries and cross-sections which show and indicate interconnected caverns. These have been reviewed by Department staff and Department staff concludes that all connections have been identified. GFS Petition, at 9.; See, Briggs Aff., ¶27.

Dr. Clark's report largely focuses on the cross-sections prepared by FLLPG and his opinion on what should be included on those selected slices of geological information. Again, the geologic cross-sections are not required by statute or regulation to reflect every piece of geological data available for the project. The cross-sections themselves are a composite of other information included in the underground gas storage application and are intended to show the vertical profiles of the existing and planned caverns. The fact remains is that the galleries have been tested and are pressure tight, and Dr. Clark's recitation of what Charles Jacoby wrote in 1973 or earlier does not undercut modern sonar surveys.

GFS, at the issues conference, also made the unsubstantiated claim that "Once the Applicant starts flushing unsaturated brine through that rubble it can dissolve any salt that may be in those fractures and it can begin a leakage process." Tr. 228:6-10. GFS is incorrect in all respects. Aside from the fact that they don't offer any record citations, literature references or an offer of proof to support this claim, the rubble piles are not going to be "flushed." During the LPG storage process, the placement of the end of the brine string above the rubble pile means that brine is introduced and circulated above the rubble pile, not through it. The location of the brine string, which will always contain a column of brine, is depicted on Vertical Section B-B' and is noted as "BTS."

DEC's draft permit conditions also would require FLLPG to draw brine from the bottom of the brine pond, which means the most saturated brine will be used for displacement of LPG. OHMS Doc. No. 00012; condition 1(b). GFS's theory that the rubble pile will be "flushed" is an over-simplistic take on product cycling which bears no relationship to the rate of product movement or the densities of the fluids involved. Their offer of proof in this regard is wholly inadequate to meet their burden of demonstrating that adjudication is necessary to understand the composition of the cavern floor in in Gallery 1.

h. GFS's conclusory statement that the age of the caverns poses a risk to cavern integrity is unsupported.

In their petition for party status, GFS offered a conclusory statement that "[r]eview of other scientific sources also provides information not portrayed on the Applicant's map and cross-sections that indicates that the Project's caverns 'show effects of age and anomalies suggesting that long-term integrity may not be possible.'" GFS Petition at 9. In support of this statement, GFS cites to page two of their expert's report, but their expert's report repeats the same generalized statement and there are no references to the 'geological literature' that

supposedly supports GFS's claim. This fails to suffice as an offer of proof and is by no means a substantive and significant issue. *See*; *Matter of New York State Thruway Authority*, 2002 N.Y. Env. Lexis 25, ("The responsibility of a proposed party at the issues conference state is to offer proof that establishes a factual basis for a dispute, not merely that a dispute exists"), *citing*, *Matter of Sithe/Independence Power Partners, L.P.,* Interim Decision of the Commissioner, Nov. 9, 1992.; *see generally*, *Matter of Pennsylvania General Energy*, 2001 N.Y. Env. Lexis 23, Ruling on Issues and Party Status, May 3, 2001, (where evidence needed to contradict boundaries of unit required geologic information specific to the field).

Department staff does not find that the age of the caverns affects their suitability for storage use and has not observed any significant anomalies that would impact the proposed storage operations. *See also*, FERC Order, supra, ¶25. The caverns have been tested and evaluated for integrity to the Department's satisfaction. Of course, while the age of the caverns is not a concern, the age and condition of the wells that access the caverns needs to be evaluated and monitored. The applicant will be plugging and abandoning all of the older wells associated with the project and will be replacing these wells prior to storage operations. All storage and monitoring wells, whether existing or new, will have a casing inspection and evaluation completed prior to storage operations (i.e., base logs) and every 10 years thereafter in accordance with Draft Permit Condition 5. The evaluation will include a: (i) cement bond log, (ii) gamma ray-neutron log, (iii) magnetic flux log and (iv) an electromagnetic thickness log, or equivalent logs approved by the Department.

Subsidence monitoring will be completed prior to commencement of LPG storage operations in the form of a baseline survey and at least every two years thereafter to evaluate potential subsidence of the ground surface from storage operations pursuant to Draft Permit

Condition 4. The production casing and casing shoe at the top of the cavern will be tested using mechanical integrity tests prior to storage operations and every 10 years thereafter pursuant to Draft Permit Condition 3. Sonar surveying will be completed every 10 years to evaluate cavern growth and dimensions pursuant to Draft Permit Condition 2. Finally, daily pressure readings of every well will be completed to evaluate caverns pressures on a daily basis, pursuant to Draft Permit Condition 1 which requires that operation of the facility is done in accordance with FLLPG's application. The testing and monitoring that are required by permit conditions will test and monitor the integrity of the caverns on a routine basis and will allow time for corrective action, if needed.

Since GFS offered only conclusory statements that the age of caverns is a factor in cavern integrity, they failed to account for the draft permit conditions proposed to mitigate any potential for the condition of the wells or the caverns to impact operation of the project, their proposed issue for adjudication should be rejected.

i. The Draft Permit Conditions Address All Aspects of the Project; GFS's Proposed Permit Conditions are Either Redundant or Unnecessary.

Dr. Clark, GFS's expert, also proposes that additional permit conditions should be imposed on the applicant and GFS argues that without these additional permit conditions, "DEC cannot ensure that emerging integrity problems will be timely identified." GFS Petition at 9. GFS's memorandum of law didn't provide any argument as to why each of those suggested permit conditions is connected to a potentially significant impact posed by this facility, nor did they explain why those alleged impacts are not already addressed by the draft permit conditions prepared by Department staff. *See*, 6 NYCRR 617.3(b); *Town of Henrietta v. DEC*, 76 A.D.2d. 215 (4rd Dept., 1980), at 8-9, ("SEQRA does not authorize DEC to attach conditions to a permit

or approval where such conditions have no relevance to the permit or approval sought.") Although GFS failed to support their proposed permit conditions with an offer of proof that the conditions are reasonably related to impacts, Department staff offer that each of the proposed conditions is either redundant to Department staff's draft permit conditions or are not relevant to this project.

One of GFS's recommended permit conditions would require FLLPG to conduct a subsidence survey, similar to the one that FERC required at the neighboring gas storage facility. Tr. P. 283:19 – P. 284:6. Appendix A of the FERC Order requires Arlington to: "Establish and maintain a subsidence monitoring network over the proposed Gallery 2 caverns' storage area." *See*, FERC Order at 38, ¶3(c). USSalt is already conducting a subsidence monitoring program at the project location and Department staff, through imposition of Draft Permit Condition 4, would require that FLLPG conduct its subsidence monitoring program that would include monitoring of all wells accessing Galleries 1 and 2, including future and plugged wells, every two years. *See*, Draft Permit Condition 4. There is therefore no dispute among the parties as to whether subsidence monitoring should be required of the applicant.

Dr. Clark also recommend that dedicated subsidence measuring monuments should be used to minimize effects such as weather. Though they didn't explain this in their petition or at the issues conference, the purported concern is that a monument used to detect subsidence should not be subject to movement from freezing and thawing of the ground. However, Draft Permit Condition 4 specifies that all wells, including future wells, must be incorporated into FLLPG's Subsidence Monitoring Plan. Using wells cemented and anchored into bedrock as subsidence monuments will ensure minimal impact from weather-induced movement, such as frost upheaval. Draft Permit Condition 4 also leaves open the option to require installation of

additional monuments, if Department staff finds it necessary. This therefore addresses GFS's concern about whether FLLPG is merely, "measuring the weather" by not having properly anchored subsidence monitors, if that's what their remark concerned. Tr. P.283:9-11.

GFS also suggests that horizontal and tilt measurements over Gallery 1 should be added, and that borehole seismic sensors should be installed in each well similar to those used at a facility in Louisiana. Again, GFS didn't say in their petition or at the issues conference why such conditions are needed in light of the permit conditions already proposed, or why the risk purportedly being addressed by their proposed conditions are present at this facility. That was their burden to do so. As to their request, Department staff submits that those conditions are not practical or necessary at this facility, as many of the conditions Dr. Clark requests are required at facilities which have already experienced problems, which require specialized monitoring techniques, or were developed in a geological setting that differs from the project proposed by FLLPG.

While there is always something to learn from incidents at other facilities, it is important to recognize both the similarities and differences between projects and their environmental setting when imposing permit conditions. For example, the Louisiana facility mentioned in Dr. Clark's report is a salt dome facility, not one constructed in interbedded salt. As a result there are geological and operational differences between the facilities that must be taken into account. *See* FERC Order, supra, ¶30 (". . . Cavern integrity is evaluated on an individual basis, taking into account, among other things, all geological information, including the type of formation, i.e. bedded salt cavern or salt dome.")

USSalt and its predecessors have already monitored for subsidence for a number of years at the project location. The additional FLLPG monitoring program required by the Department's

draft permit conditions would ensure that a robust monitoring program specific to the proposed storage operations is in place. Along with regular sonar surveys, mechanical integrity tests and FLLPG's commitment to conduct daily monitoring of wellhead pressures, which is enforceable through Draft Permit Condition 1, the Department's draft permit conditions already address the potential risks posed by this facility.

Of course, as Department staff identified at the Issues Conference, there is always an opportunity to respond to conditions in the field. Tr. P.275:11-18. Specifically, Draft Permit Condition 6 provides Department staff with the authority to require the Permittee to perform any additional tests or procedures to verify compliance with the permit. *See*, OHMS Doc. No. 00012, Condition 6.

In sum, GFS, through their expert, listed a number of additional permit conditions they believe should be incorporated into the draft permit. They did not, however, offer any support to demonstrate the significance of their requested conditions, or otherwise describe how those permit conditions are reasonably related to impacts that may be present at the proposed facility. They summarily stated that monitoring requirements imposed at other underground storage facilities should be imposed here, but gave no consideration to why such conditions are either irrelevant here or are made redundant by the numerous permit conditions provided by Department staff.

j. Other inaccuracies related to cavern integrity need to be clarified.

There were a number of other statements made by petitioners at the issues conference that need to be corrected for the record. Many statements are either factually incorrect or are simply conjecture. Either way, if not clarified or corrected, the record of the issues conference will not accurately reflect the true nature of the record in this proceeding. First, GFS opined that there is

a "hanging ledge . . .poised to fall. . ." in Gallery 1. Tr. 231:17-19. Department staff is aware of what the sonars show and the limitations of the sonar surveys due to the shape of the caverns. However, there is no evidence in the record or anywhere else to substantiate the claim that a ledge is about to fall and GFS is wrong to include such speculation. The FEA provided by FLLPG evaluated the stability of the caverns using the ultimate cavern dimensions and therefore accounted for any further growth of the cavern during operational solutioning. Since standard operating procedure, enforceable through Draft Permit Condition 1(f), would require FLLPG to use a blanketing material to prevent future solutioning of Gallery 1's roof, there is nothing in the record to suggest that questions remain about the stability of the Gallery 1 roof.

Second, GFS believes that during storage operations the operator will "fill the bottom part of the cavern, which they actually haven't examined the extent of, with brine." Tr.233; L.8-10. Actually, FLLPG doesn't have to fill the bottom of the cavern with brine, it is already brine-filled. More importantly, FLLPG did analyze the entire cavern. Both GFS and SLPWA make this claim, however, the FEA itself illustrates in Figures 2, 4 and 6 that the modeled boundaries of Gallery 1 are extremely conservative and include all caverns that makeup the gallery. *See*, OHMS Doc. No. 00003, Document I.A.8, FLLPG's Response to Second Notice of Incomplete Application, September 28, 2010, Exhibit C. Petitioners are simply wrong on this point.

Next, GFS made a few claims related to Well 44 and argues that once LPG is injected into Well 44 there is no mechanism in place to detect a leak. In reality, Draft Permit Condition 1(a) does not permit routine storage of product in the cavern accessed by Well 44 (which will be plugged and replaced with new Well FL2) and therefore product will not be injected into any well accessing this cavern. In addition, Draft Permit Condition 1(h) provides a means to detect whether there are pressure changes observed in Well FL2 that indicate migration of product to

this cavern. Well FL2 is required to have a digital pressure recorder and the draft permit condition states the threshold for a pressure change to be considered a reportable incident. *See,* OHMS Doc. No. 00012, Condition 1(h).

With respect to Well 58, GFS argues what they believe is a roof sag in a 2013 sonar of Well 58 and is a. . . "sign of impending roof collapse." Tr.235:21-22. However, there is no evidence in the record to anywhere else to substantiate this conclusory statement. GFS goes on to claim that in Well 58 "[t]he blanket is not going to be enough." Tr. 285:L8-9. They are referring to the product blanket that would be required by Draft Permit Condition 1(f) to be maintained in both Gallery 1 and Gallery 2 to protect the cavern roof from further solutioning. However, as noted in the draft permit condition, the specific product blanket thickness has not been established yet, so any claims about its sufficiency is not only unsupported but is premature. *See*, OHMS Doc. No. 00012, Draft Condition 1(f). The blanket thickness would be proposed after a sonar survey is done on Well FL1, which has not yet been drilled. Department staff has the depth information for Well 58 but the preference is to establish the product blanket thickness for both caverns at the same time. Regardless, the use of a product blanket or blanketing material is standard operating procedure in gas storage operations and is relied on as a means to inhibit upward cavern growth. *See*, *for illustrative purposes*, *Natural Gas Salt Cavity Storage – Guidance to Inspectors of Borehole and Cavern Design, Cavern Leaching and Operation of the Borehole and Cavern*, Section 7, Health and Safety Executive, at: http://www.hse.gov.uk/foi/internalops/hid_circs/enforcement/spcenf185.htm. Any potential concern about the stability of either roof has therefore been mitigated.

SLPWA also argued that TEPPCO's decision to move their LPG storage operation across the street is a "strong suggestion there that LPG storage in the past may have had problems." Tr.

280:1-2. There is nothing in the record, or anything in SLPWA's petition for party status, to back up that claim. It's speculation and should not serve as a basis for any aspect of the Department's decision in this matter. Nevertheless, the first draft of the RSR submitted to the Department on October 9, 2009, contained a statement from FLLPG that TEPPCO closed the facility when their contract ended because they needed additional capacity that USSalt couldn't provide. See, OHMS Doc. No. 00003, Doc. I.A.2. In addition, attached as Appendix F, is a November 1, 1979 letter from DEC to International Salt, documenting an understanding that International Salt will be diverting heat exchanger condensate to producing galleries, and that this operational change will prevent International Salt from being able to continue their contract with TEPPCO to store gas. Although Appendix F is simply a reflection of what DEC understood in 1979 and may not have been TEPPCO's understanding, the letter directly contradicts SLPWA's theory of why TEPPCO stopped storage operations in 1984 and corroborates the applicant's statement in October 9, 2009. *See Matter of Jointa Galusha, supra*. As to the basis for SLPWA's and Dr. Meyers' belief that the TEPPCO facility caused an increase in salt levels in Seneca Lake, which is addressed below, it's worth repeating that the caverns previously used by TEPPCO are not the same caverns proposed for use by FLLPG.

Both SLPWA and GFS raised several issues for adjudication related to cavern integrity, but none of their proposed issues meet the definition of a substantive and significant issue. Their theories, such as the re-interpreted fault, are not backed up by an analysis of available data or are directly contradicted by opinions held by petitioner's other witness. Their claims that there is missing information in the application, such as GFS's and SLPWA's claim that Cavern 43 wasn't included in the FEA, are rebutted by the application materials and Department staff's analysis. GFS's suggestion that additional permit conditions should be imposed on FLLPG was

not backed up by a showing that such conditions were relevant to this facility and could be reasonably connected to a risk actually posed by FLLPG's proposed project and petitioners arguments failed to take into account the permit conditions already proposed by Department staff, which were based on Department staff's extensive history in permitting and regulating underground gas storage facilities. As petitioners failed to provide a sufficient offer of proof and failed to demonstrate that a substantive and significant issue exists, petitioner's request to adjudicate cavern integrity should be denied.

E. GFS, SLPWA AND SLC FAILED TO RAISE AN ADJUDICABLE ISSUE CONCERNING WATER QUALITY

Petitioners raise a two-part issue for adjudication related to chloride concentrations in Seneca Lake. They argue first that previous storage operations, in a different set of caverns than those proposed for use by FLLPG, coincide with a "spike" in chloride levels in Seneca Lake. *See*, SLPWA petition, ¶48; SLC petition, p.13-14; GFS Petition, p.12-14. Based on this theory, petitioners then speculate that storage of LPG in the actual caverns proposed to be operated by FLLPG will lead to the same type of increase that occurred in the 1960s. Petitioners essentially layer theory on top of speculation to craft this proposed issue for adjudication. However, the purpose of an adjudicatory hearing is to hear disputes of *material* facts, not to test the theories and hypotheses of petitioner's experts. Nevertheless, the factual underpinnings of petitioner's arguments do not support the first part of their claim and basic principles of science and common sense contradict the second leg of their water quality issue. Therefore, as detailed below, GFS, SLPWA and SLC failed in all manners to raise an adjudicable issue related to water quality.

1. ANY INCREASE IN CHLORIDE LEVELS IN SENECA LAKE CANNOT BE ATTRIBUTED TO PRIOR LPG OPERATIONS.

In support of the first leg of petitioner's theory, SLC's offer of proof is an affidavit from Dr. John Halfman, and GFS offers a memorandum from Dr. Tom Myers. SLC's chosen expert, Dr. Halfman, offers that "correlations between previous activity in these caverns and spikes in chloride in the Lake raises a question about whether there is a connection." SLC petition, at 14, *citing* Halfman Aff, ¶9, 11. Dr. Halfman's ultimate conclusion about the connection between historical LPG storage and Seneca Lake chloride levels is that "there is not enough publicly available information to properly answer this question" and SLC proposes that the adjudicatory hearing support an investigation into this "coincidence." *Id.* Dr. Halfman didn't come right out and conclude that it was LPG storage operations by TEPPCO that caused the 1960's "spike" - - in fact, his 2014 update concludes that elevated concentrations observed today can be attributed to a time lag between the pre-1970s inputs and the point where the lake reaches equilibrium - - but this notion found a supporter in Dr. Myers, GFS's and SLC's other expert, who conclusively states that the ". . . Cl discharges in the mid-1960s were caused by the LPG storage activities taking place at the time." Myers memo at 1.

The data relied on by Dr. Halfman, and others, in support of their conclusion that there was a spike in chloride levels is data reported by Glen Jolly with the U.S. Geological Survey. *See* Affidavit of Dr. John Halfman "Halfman Aff.", Ex. B, Fig. 15. Mr. Jolly has not published a report of his findings, but has presented his findings at technical conferences. Dr. Halfman, and other proposed witnesses, such as Dr. Myers, refer to the spike as starting in the mid-1960s but Mr. Jolly himself indicates, in a conference abstract, that the increase in chlorides occurred in 1967. *See"Did a 'Mid-Century Pulse of Groundwater' Control Cayuga and Seneca Lakes Water Quality?," available at:* https://gsa.confex.com/gsa/2012AM/webprogram/Paper211940.html.

Pinpointing the date of Jolly's observed increase in chloride concentrations is important because petitioners claim that the increase coincided with the start of LPG storage operations by TEPPCO. However, what a review of the data indicates is that LPG storage operations beginning in 1964 did not coincide or correlate with the increase in chloride levels in Seneca Lake; storage operations preceded the chloride increase by almost three years. Moreover, petitioner's theory about the cause of the chlorides increase ignores the fact that solution mining and hydraulic fracturing had been taking place for years in the Watkins Glen Brine Field, at pressures that far exceed the pressure gradient of a typical LPG storage operation. In fact, Dr. Jacoby reported on a hydraulic fracturing event that involved the pumping of 65,000,000 gallons of fluid at an average rate of 400 gallons per minute. This took place in 1955. *See* Appendix C. An event of even this scale does not coincide with the chloride increase, yet petitioners would argue that LPG storage – which results in a small pressure differential during product cycling – would somehow alter the chemical landscape of Seneca Lake, some fourteen miles away from the project site. The data just doesn't support their theory.

Petitioners also fail to take into account that LPG storage operations in neighboring caverns continued until 1984, when the contract between International Salt and TEPPCO ended. Yet chloride levels, as reported by Dr. Halfman, were already on the decline. *See*, Halfman Aff. Ex. B, Figure 15. Moreover, storage of natural gas, at storage pressures higher than the pressures used in LPG storage, has occurred in adjacent caverns for decades, and there was no corresponding rise and fall in chloride levels recorded. Petitioners fail to account for that fact too.

Petitioner GFS also believes that the lack of any possible alternative explanation for the increase and subsequent decrease in chloride levels in Seneca Lake leads GFS and SLC to

conclude that LPG storage operations must be the root cause of Seneca Lake's chloride levels. *See*, Myers Memo at 2, 11, ("Other potential sources of chloride, such as road salt, discharge from salt mines, . . . are insufficient. . . to explain the large spike. . ."); Tr. P. 289:3-10. Dr. Myers dismisses mine waste as a contributor to chloride levels but there's certainly evidence that the amount of mine waste assumed to be discharged to the lake was underestimated by Dr. Halfman, whose work is relied on by Dr. Myers. For instance, Dr. Halfman uses 16,645 lbs/day, which is the average chloride discharge rate in the waste stream at the Cargill facility, to calculate the mean annual loading to Seneca Lake from the Cargill facility but if you add that to the levels documented at the primary outfall at International Salt's facility, which in 1981 amounted to approximately 40,000 lbs/day, a clearer picture emerges as to the more likely source of chlorides. *See* Halfman Aff. Ex. B, Table 5, ("Cargill Waste Stream Avg. Cl: 7,550 kg/day, Oct 97-May 14."); *see also*, attached as Appendix G, *Technical Review of the Chloride Effluent Limits in International Salt's Watkins Glen Facility,* May 7, 1981, at 21 ("Based on the average 10.8 MGD and the mean chloride concentration of 444 mg/l, ISCO currently discharges 40,000 pounds of chloride per day to Seneca Lake.") Since chloride levels were already on the decline in the 1970s and 1980s, and the Watkins Glen plant was just one of the operating mines on Seneca Lake, it's not necessary to search for enigmatic explanation for reported chloride levels.

Dr. Myers also dismisses the notion that mine waste discharges would explain chloride levels in the lake, because, according to him, it wouldn't make sense for mining companies to dispose of a product they intend to sell. It's clear Dr. Myers and petitioners have a limited understanding of the waste streams at issue here. Salt production waste streams include vacuum pan bleeds, brine purges from evaporators, heat exchanger condensate, sludges resulting from purification of raw brine and contaminated salt. Some of these waste streams are discussed in

the attached report by Huff & Huff, prepared to support an increase in permitted levels of chloride in an outfall at the Watkins Glen facility. *Id.*

Department staff offers Appendix G for the purpose of showing that there were other significant sources of chlorides to Seneca Lake. Dr. Myers may believe that there is no other reason, except the storage operations conducted by TEPPCO, to explain why chloride levels would be elevated, but often the most obvious answer is often the correct one. Mine site discharges were not regulated by the state, either by the Department of Health or DEC, until the 1960s. Prior to that time, mining operations on both Cayuga and Seneca Lake were unregulated and on Seneca Lake there were three different mine sites discharging to the lake at the time when the rise in chloride levels were reported. GFS dismisses mine waste as a source of chlorides to Seneca but its clear their expert didn't review all of the facts before jumping to this conclusion. Dr. Myers simply relied on the qualitative assumptions made by Dr. Halfman as to the amount of loading into the lake and didn't do an analysis of his own.

In short, even if we accepted as true the notion that there was an increase in chloride levels in the 1960s, the data petitioners themselves rely on indicates that the increase did not occur until three years after the start of LPG storage operations by TEPPCO, and levels decreased while storage was ongoing. The actual cause of the increase, assuming there was one, would be the subject of academic debate since the data already precludes previous LPG storage as the cause. Since an adjudicatory hearing should not be used as a forum of academic debate, Department staff submits that there is no material fact here that needs to be adjudicated. *See Matter of Jointa Galusha,* 2002 N.Y. ENV LEXIS 27, Interim Decision of the Commissioner, May 7, 2002, *citing, Adirondack Fish Culture System*, Interim Decision of the Commissioner, August 19, 1999, *citing*, *Akzo Nobel Salt*, 1996 N.Y. ENV LEXIS 4, January 31, 1996.

2. THERE IS NO SCIENTIFIC SUPPORT FOR GFS'S "ADVECTION" THEORY.

The second leg of petitioner's water quality issue is the hypothesis that pressurization of the caverns proposed to be used by FLLPG will cause an increase in sodium and chloride levels in Seneca Lake and the mechanism for this cause and effect theory is espoused by GFS and their expert, Dr. Myers. Dr. Myers opines that pressurization of the caverns will cause an advection-like process where "pressure from the LPG activities is transmitted along the salt formation until it essentially squeezes out high-Cl groundwater into the bottom of Seneca Lake." *See*, GFS Petition, Exhibit 3, Technical Memorandum of Tom Myers, ("Myers Memo"), at 1. There is no credible scientific evidence to support this theory.

In New York, *Frye v. United States*, sets the standard for the introduction of novel scientific evidence in both civil and criminal courts. *See Frye v. United States*, 293 F. 1013 (D.C. Ct. Appls., 1923). The *Frye* evidentiary standard requires the proponent of a theory to establish that such theory or principal has "gained general acceptance" in the scientific community. *People v Wesley*, 83 NY2d 417, 422 (1994), quoting *Frye v United States*, supra, at 1014. However, once the proponent of a theory establishes that there is general acceptance of a scientific principle, there must also be a showing that a proper foundation has been laid for the specific application of the principle by a proposed expert. *Wesley* at 458-9.

In this matter, it is not possible for GFS to establish that Dr. Myers' advection theory, based on the notion that a pressure wave from LPG storage operations can travel fourteen miles up-dip and cause an increase in chloride levels in a body of water, has found general acceptance in the scientific community. There is no literature in the record that supports it and the literature relied on by Dr. Myers involve groundwater systems that are not present here. Likewise, there is no possible way for Dr. Myers to establish the reliability of his theory by testing it, because Dr.

Myers himself plainly stated that the data needed to prove his theory doesn't exist. In fact, the only proof of Dr. Myer's theory, according to Dr. Myers, is the spike observed in the 1960s, but as demonstrated above, if that increase occurred it does not coincide with startup of LPG storage. Dr. Myers makes a point to say that his advection response "would be felt under the sediments under Seneca Lake *instantaneously*." Myers memo, App. F at 4, (emphasis added). Yet, the spike observed in 1967 does not correlate with the start of LPG storage operations. Also, if there was a correlation between LPG storage and chloride levels, then levels would have remained consistent throughout the period where LPG storage was ongoing. Both Dr. Halfman and Dr. Wing show a decline in chloride levels starting in the early 1970s. *See* OHMS Doc. No. 00020, Halfman Aff., Ex. B; OHMS Doc. No. 00033.

The scientific principles relied on by Dr. Myers and used by him in an attempt to prove that it is even possible for pressures imposed on the salt layers to impact salinity levels over fourteen miles away are not relevant. His report rattles through the concepts of poroelasticity, viscoelastic flow, and hydrostatic pressure, and he includes numerous literature references but none of those concepts actually support GFS's proposed issue for adjudication. GFS and their expert attempt to force fit an LPG storage operation into the mold of a shallow groundwater system, but the comparison is not appropriate.

Poroelasticity depends on a fluid-filled porous medium which the salt zones below the proposed facility are not. Dr. Myers' theory depends on the assumption that the salt layers at issue beneath the proposed project contain brine. He quotes: "Goodman et al (2011) discuss the early wells drilled to and through the salt beds encountered significant brine which indicates the salt was not dry." Myers report, App. F at 4. The referenced article, however, concerned wells drilled in the northern areas of the Finger Lake region near the salt sub-crop area, not at the

Finger Lakes facility. Historic well drilling at the proposed project site at issue here have all demonstrated that the salts are neither saturated with nor contain brine.

Myers also compares the viscoelastic behavior of salt to shallow groundwater flow systems impacted by tides, barometric pressure changes, aquifer pumping, etc. *See*, Myers report, Appendix F. However, the salt layers which contain the proposed storage caverns are not groundwater-bearing and they do not behave like tidal systems. They are not shallow, porous, permeable or saturated, though Dr. Myers improperly implied that they are. *Id.*

GFS cannot establish that there is general acceptance in the scientific community that pressure increases in a dry salt layer can propagate over any distance, much less fourteen miles, and result in a discharge of brine into lake sediments, and they also cannot establish the reliability of Dr. Myers' conclusion specific to this facility. This is because Dr. Myers himself, did not take any steps to prove his own theory. The beginning of his memo starts with his absolute certainty that injection of LPG will result in an increase in chloride levels fourteen miles away, but the end of this memo states that the purpose of his memorandum was to merely "describe some of the mathematics that would be necessary to model the potential for pressure-related strain to cause pressure changes under Seneca Lake." Myers report, Appendix F, at 7. He didn't actually do any modeling to support his statement, he just described some of the math needed to do the modeling.

In fact, Dr. Myers doesn't actually believe it is even possible for someone else to model and prove his theory because according to him, the data doesn't exist. *Id.,* ("The mechanics of this are extremely complex, and the data needed . . . is not available."). There is no better example of an unsupported, conclusory statement than the statements made by Dr. Myers in his report, and his vague references to hydrogeological principles are irrelevant. *See Citizens for*

Clean Air, 135 A.D.2d. 256 (3d Dept. 1988). There is also no conceivable way for GFS to pass the *Frye* test and establish the reliability of their advection theory.

Looking closer at GFS's theory only reveals how untenable it is. Their expert theorizes, in Appendix F of his memorandum, that "the gallery, <u>if it does not leak</u>, would transmit pressure to the surrounding media similar to a balloon. . . pushing on the formations." Myers report, Appedix F, at 1. At the issues conference we heard the analogy of a "tube of toothpaste," suggesting that when pressure was applied at the surface during product cycling, the brine found in the galleries would push on the salt layers until brine oozes out into Seneca Lake. Tr. P.292:1-8. Dr. Myers' theory - - and what GFS attempted to argue - - is that the cap of the toothpaste is left on the tube and the energy applied somewhere along the tube will somehow "transmit" pressure in a single direction, and somehow that direction happens to be towards the point where the salt outcrops under Seneca Lake, fourteen miles away.

Along the way, the pressure applied would have to overcome the lithostatic pressure of the overlying formations, the hydrostatic pressure of the lake and the friction due to salt movement along the way, among other conditions. Common sense dictates that this is a ridiculous notion.

GFS and Dr. Myers believe that during LPG storage "changing the fluids from brine to LPG in the cavern results in very high pressure changes that can propagate through the salt beds." Myers report at 12; Tr. P. 291:4-24. Actually, LPG is generally injected into the caverns during the non-hearing season and withdrawn during the heating season. Much of the time, conditions in the caverns are static. Even during product cycling, it is important to understand that, unlike natural gas storage, LPG relies on a balanced system where the brine string

connecting the supply of brine and the caverns is always in place and operates under a consistent pressure level. *See OHMS Doc. No. 00032.*

Dr. Myers, in appendix G of his memorandum, cites to the 2002 FEA submitted with FLLPG's permit application to explain his theory about the pressures utilized during storage operations. However, the Department rejected the sole use of the 2002 FEA because it was developed for the adjacent natural gas storage facility, not FLLPG's proposed project. *See*, OHMS Doc. No. 00003, Doc. I.A.7. Therefore, references in Dr. Myers report to "2900 feet of head" are based on the wrong information.

The FEA developed for the Finger Lakes project actually calculated the amount of deformation expected from each of the caverns under different operating conditions and as FLLPG's expert, Dr. Gowan, explains, the FEA shows that the amount of deformation "only extends a short distance into the surrounding rock and has been shown to have no effect on the inter-cavern pillar between Gallery 1 and Gallery 10." Gowan report at 43. Department staff agrees with this conclusion. FEA is used in several types of applications including accident reconstruction and in civil engineering. *See, generally*, *Lascano v. Lee Trucking*, 208 A.D.2d 1123, 617 N.Y.S.2d 960 (3d Dept., 1994); *Transcontinental Gas Pipeline Corp. v. Societe d 'Exploitation de Solitaire, S.A. et. al.*, 2007 U.S. Dist. Lexis 67691 (Sept. 11, 2007). It is therefore a reliable predictor of the effect of stress on the caverns proposed for use by FLLPG.

When GFS defended their theory that pressures can continue uninterrupted for fourteen miles against the fact that no pressure increases were recorded in adjacent caverns during prior LPG or natural gas storage GFS argues that "pressure changes. . .wouldn't normally be recognized in the neighboring cavern wall because the wall of the cavern would interrupt the signal." Tr. P. 296:11-15. So GFS will concede that a cavern, located a short distance away from

another cavern, will stop the advection 'signal' but fails to consider all the other geological conditions that would also be present along the fourteen mile distance between the proposed facility and outcrop of the salt layer which would have the same effect.

Interestingly, the balance of GFS's petition for party status, and that of SLPWA who raises a similar issue, consist of their attempts to prove that there are open channels or pathways between the proposed storage galleries and the bottom of Seneca Lake, as in Dr. Nieto's reformulated fault, and also GFS's and SLPWA's theory that the Jacoby-Dellwig fault reaches beyond the salt layer. If GFS and SLWPA are right about everything they assert in their petitions then any pressure applied during injection and withdrawal activities would not only incredulously cause brine to travel along faults into both Seneca Lake through the hypothesized east-west fault, but it will also reach the surface (as it supposedly did during fracturing of Well 29) and yet the caverns will also somehow stay intact (i.e. keep the cap on the tube of toothpaste) so as to propagate a 14-mile pressure differential to the point of outcrop of the salt layers under Seneca Lake - all with an amount of pressure that does not exceed the in-situ pressure of the plugged wells. Unfortunately, the theories put forth by GFS and SLPWA are not only inconsistent with one another, but they are not backed up by any fact based offers of proof. Their proposed water quality issue is based on a coincidence between LPG storage activities and chloride levels that doesn't exist and their advection theory apparently, according to Dr. Myers, is too complicated to understand and cannot be proven. *See*, Myers report at 2. Department staff submit that petitioners failed to raise an adjudicable issue.

F. THE SEQR RECORD ON PUBLIC SAFETY IS COMPLETE

Petitioners for party status raised public safety as an issue for adjudication. *See* GFS Petition, p. 10-12; SLC petition, p. 18-19; FLWBC petition, 19-21; Petition for Amicus Status of Van A. Harp and Michael L. Lausell ("Harp and Lausell petition"), p. 4-14. The specific concerns raised by both petitioners for full party status and amicus status include the adequacy of the FLLPG's risk assessments and the potential for a catastrophic failure at the proposed facility, potential impacts on emergency response resources and rail safety. As detailed below, the record in this proceeding adequately addresses all concerns related to public safety.

The record includes a detailed, project-specific risk assessment that addresses not only the type of risks inherent in FLLPG's proposed project but also the scale of those risks and the scope of impacts that may result from releases at the facility. FLLPG has also conducted a Hazard and Operability Study to investigate the facility's processes to identify and eliminate hazards and their causes before they occur. In addition, as indicated in the DSEIS and draft permit conditions, FLLPG will also have a comprehensive training program and will have an Emergency Response Plan in place at the facility. FLLPG's analysis and the various plans that have been or will be prepared satisfies all SEQR requirements applicable to the proposed project and provides an adequate basis on which to make SEQR findings. Petitioners attempt to introduce their own risk analysis of the project should not serve as a basis for adjudication, since, at best, it is only worthy of being considered a comment on the DSEIS. Not only is the preparer of the report not qualified to render an expert opinion on the risks associated with LPG storage projects, but the analysis itself, under the best light, is an analysis of accidents that occurred at other facilities and does not specifically address the risks of the actual facility proposed by FLLPG.

The proffered testimony from petitioners' other experts is also not helpful, since they offer irrelevant points of fact that would do nothing to aid in SEQR decision-making. The testimony proposed by petitioners SLC, GFS, and FLWBC on the subject of public safety rest on the flawed assumptions that either the proposed project will increase the salinity of Seneca Lake or that an accident at the facility would overwhelm emergency response resources. SLC offers to have several witnesses from the City of Geneva, located at the northernmost part of the lake, testify on what it would cost to treat Seneca Lake's water if GFS's and SLC's theory is true, that pressure applied in the storage caverns would radiate fourteen miles to reach the point where the salt layer meets the lake's sediments and cause a corresponding increase in sodium and chloride. GFS's and SLC's theory, put forth by their proposed expert, Dr. Myers, is not reasonable and no part of Dr. Myers' opinion is generally accepted in the scientific community, nor do the facts support any part of his story. Therefore, SLC's proposal to layer unsupported non-expert opinion on the theoretical outcome of an unproven hypotheses should be rejected. Likewise, the conclusory statements made by their other public safety witness, Richard Kuprewicz, does not raise an adjudicable issue. His generalized thoughts on how LPG storage compares to other types of industries is not relevant or helpful.

The issues raised in the petitions for party status and at the issues conference related to public safety mirror those already raised during the public comment period on the DSEIS and can be addressed in Department staff's response to public comments. *See Matter of Crossroads Ventures*, supra. In sum, petitioners offer nothing new on the issue of public safety, and those issues raised do not meet the definition of a substantive and significant issue.

NYSDEC OHMS Document No. 201166576-00037

1. THE RECORD ADEQUATELY ADDRESSES POTENTIAL RISKS TO PUBLIC SAFETY.

FLLPG's February 16, 2012, *Quantitative Risk Analysis for the Finger Lakes LPG Storage Facility*, ("2012 Quest Report") prepared by Quest Consultants provided a detailed analysis of the potential risk to the public in the event of an LPG release from the proposed facility. No statute or regulation dictates a specific methodology for conducting a risk assessment, nor is a risk assessment specifically required in order for a lead agency to satisfy SEQR. *See* Environmental Impact Review in New York §5.13. Nevertheless, one was prepared and the 2012 Quest Report, based on Quest's extensive experience in the field of risk analysis, utilized a detailed four-step approach to analyzing public safety risks.

Quest began by identifying the potential releases that could result in hazardous conditions outside the boundary of the LPG facility. For each potential release, Quest then calculated the annual probability of the release and defined the hazard zones associated with that specific release. The final task was to combine the previous steps to arrive at a measure of the risk the facility poses to the neighboring public. In all, some 113 different operating scenarios were evaluated. Some of the tools used by Quest to develop the analysis included a review of industrial accidents at other facilities, review of hazard mitigation systems available, and local weather and topography. The methodology was clearly described in the report and Quest responded, in a letter dated April 10, 2012 to questions raised by Department staff. As a whole, the 2012 Quest Report, now supplemented by the, February 9, 2015, *Quantitative Transportation Risk Analysis for the Finger Lakes LPG Terminal,* which specifically addresses the risks associated with rail transport of LPG, provides a sound basis on which to make SEQR findings. *See* OHMS Doc. No. 00030, attachment.

The risk assessments provided by FLLPG address two aspects of public safety: catastrophic impacts and transportation safety. But the record also addresses other features of public safety, such as design considerations, safety training, and an evaluation of local emergency response resources. FLLPG discusses some of the other safety issues, including applicable federal standards, in their February 9, 2015 filing. *See*, FLLPG's Feb. 9 Response, Point VIII. The Department's draft permit conditions also would require FLLPG to develop an emergency response plan, and the draft condition specifies the minimum requirements for such a plan. *See*, OHMS Doc. No. 00012, Draft Permit Condition 7.

Amicus petitioner FLWBC argues that the DSEIS failed to evaluate the potential impacts to the community at large from a catastrophic release and that the proposed mitigation, that would be imposed through Department staff's draft permit conditions is inadequate to address those impacts, including those specifically felt by the agricultural community. Tr. P. 118:21 to 119:13. Since they filed for amicus status, FLWBC was required to identify the legal or policy issues they intend to brief, but the nature of the issues raised were factual. 6 NYCRR 624.5(b)(3)(a). Even then, FLWBC did not raise a substantive or significant factual issue, since the 2012 risk assessment prepared by Quest Consultants specifically evaluated the zones of impact for each risk profile in the event of an LPG release from the facility. *See*, Figures 6-2 and 6-3 of Quest's 2012 Assessment. There isn't a specific statutory or regulatory requirement which obligates a project sponsor or a lead agency to parse out the zoning designations of each parcel of land within a hazard zone. Regardless, the risk contours and the accompanying descriptions indicate that the areas that may be impacted are either undeveloped or are owned by an LPG trucking company or waste transfer stations. *Id.,* Section 6.2.2.

Petitioner SLC's chief concern, related to public safety, is that LPG storage poses a higher risk to public safety than natural gas storage, according to their proffered expert, Richard Kuprewicz. The nature of Mr. Kuprewicz's testimony would be to offer a comparison of LPG storage in underground caverns to either aboveground LPG storage or the storage of natural gas. Of course, a comparison between LPG storage in solution-mined caverns and alternatives that are not viable would not contribute anything relevant to the SEQR record. Therefore, this aspect of Mr. Kuprewicz's testimony fails to raise an adjudicable issue. SLC also suggests that Mr. Kuprewicz will testify to the expected costs associated with emergency response, but the offer of proof did not identify the nature of the evidence they intend to submit at hearing, and did not specify the grounds for Mr. Kuprewicz's opinion. 6 NYCRR 624.5(b)(2)(i). As a result, what SLC offered was a conclusory statement unsupported by any case-specific analysis.

Petitioners Harp and Lausell provided their own risk assessment, prepared by Dr. Robert Mackenzie, and the same report was included in GFS's party status petition. During the public comment period on the DSEIS, Dr. Mackenzie submitted a version of his risk assessment to DEC, so Department staff is familiar with the nature of his comments. GFS holds Dr. Mackenzie out as an expert in risk analysis, based on his previous experience looking at risk in a hospital setting. However experienced Dr. Mackenzie may be in the medical field, his experience is not translatable to LPG storage operations, pipelines or rail safety and when making decisions about the admissibility and weight of a proffered expert's opinion, the expert's qualifications are relevant. *See Matter of Seneca Meadows, Inc.*, Interim Decision of the Commissioner, October 26, 2012.

In order to consider a proffered witness as an expert at the issues conference stage, the party offering the witness should be able to demonstrate that the witness is both competent and

willing to testify. *See Matter of Gernatt Asphalt Products, Inc.*, Ruling on Issues and Party Status, March 3, 1994. Competency is judged by evaluating the witness' "knowledge, skill, experience, training or education" and based on this evaluation, the decision maker may determine if the testimony of the witness is reliable. *Matter of Alleged Violations of Attco Metals Industries*, 1986 N.Y. Env. Lexis 29, September 12, 1986; *see, Schecter et al. v. 3320 Holding LLC et. al.,* 64 A.D.3d 446 (1st Dept. 2009); *Matter of Enu v. Sobol*, 208 A.D.2d 1123 (3rd Dept. 1994).

GFS argues the Dr. Mackenzie has "extensive on-the-job experience" and that his duties included "conducting risk analyses and prioritizing, managing and mitigating risks." Tr. P.104:3-8. His job duties may have required him to look at ways to reduce risks in his workplace, but this doesn't qualify him to render an opinion on how a pipeline failure at an LPG storage facility would impact the general public. His resume didn't identify whether he has ever testified as an expert in the relevant fields of LPG/natural gas storage, pipeline or rail safety before, nor does his resume indicate that he ever received any formal training in preparing risk assessments. GFS may point to his on-the-job experience, but even when an individual has extensive on-the-job experience in a given field, this doesn't automatically qualify them as an expert. *See Schecter et. al.*, supra.

The preparation of a risk assessment requires a high degree of skill. Given the complexity of the subject matter it is not enough that Dr. Mackenzie did some type of risk evaluation as part of his job as a CEO for a medical facility. He needs to have the requisite training, skill or knowledge in a field relevant to gas storage, pipelines, and rail safety in order to be considered an expert, and he does not. *See Matter of Attco Metals Industries,* supra. ("The degree to which one is entitled to give such opinion depends upon the circumstances in which the

testimony pertains. Low thresholds in accepting experts may exist where the issues are few and not complex.")

In *Enu v. Sobol*, the court considered whether a general surgeon was qualified to testify as to whether a urologist was grossly negligent in a patient's treatment. There, the court indicated that the general surgeon didn't have to be a specialist in the same field of medicine in order to testify, but added that "this was especially true when the witness's specialty is closely related to that of the accused." *Enu*, supra, at 1125. In the instant matter, the Department has not challenged whether an engineer is qualified to testify on the geology of the site; the concern here is that GFS is holding a medical doctor out as an expert in environmental risk assessment. Department staff submit that Dr. Mackenzie is not an expert in any closely related field relevant to an evaluation of the proposed facility, and his opinion should not be considered competent or reliable.

Notwithstanding Dr. Mackenzie's lack of qualifications to serve as an expert in the fields of gas storage, pipeline or rail safety, the substance of GFS's "High-Level Quantitative Risk Assessment" warrants a conclusion that very little weight should be given to Dr. Mackenzie's conclusions. There are too many problems with the report to list, so Department staff will provide a few examples. For one, Dr. Mackenzie's report repeats much of the same conclusory statements found in the reports of GFS's other proposed experts, Drs. Clark and Myers and SLC's proffered expert, Dr. Halfman. Dr. Mackenzie goes so far as to discuss the increases in chlorides in the 1960s and even includes a figure from Dr. Halfman's paper in his report. Yet he also says "[t]he author is not offering an opinion on the integrity or lack of integrity of the . . . caverns. . . nor the current or historic causes for the high salt levels in Seneca Lake." Id. at 5, n 9. So he's not offering his own opinion on cavern integrity or whether previous LPG storage

operations caused an increase in chlorides but he nevertheless repeats the unsupported claims of other potential witness and uses those opinions to flavor his conclusion that the proposed Finger Lakes facility should not be permitted. Department staff certainly agrees with Dr. Mackenzie that he is not an expert in cavern integrity, hydrogeology, or geology, so it's unfortunate he treaded into those subject areas anyway.

Second, it's not clear what sources he relied on as a basis to judge the safety of LPG storage operations. For instance, he includes a sample risk matrix in his report and indicates it was produced from a Norwegian website, but his reference doesn't actually lead to that matrix. *See* Mackenzie report at 3, n 2. The other references used by Dr. Mackenzie are questionable. According to Dr. Mackenzie, he used an industry standards document as a source of his "likelihood categories" but that industry standard applies to fixed *offshore* oil and gas production facilities or *floating* production, storage and off-take systems *See*, Mackenzie report at 4, n 6. It's not clear why a fixed, underground LPG storage facility would pose the same classes of risks found at an offshore production facility.

Also, note 32 of his report, suggests that the accidents he reviewed came from just two sources, aside from the Energy Information Administration website. One is a 2008 report from the Health and Safety Executive of the United Kingdom and the other is a textbook written by J.K. Warren. *See*, Mackenzie report, at 9, n 32. Dr. Mackenzie calls this an "extensive literature review" but it's really just two sources. *See*, *Id*. at 5, n 9.

Section 8 of Quest's "*Quantitative Transportation Risk Analysis for the Finger Lakes LPG Terminal*" contains an evaluation of Dr. Mackenzie report. *See*, Quest's February 5, 2015 report, Section 8. Their assessment addresses the technical and quantitative aspects of Dr. Mackenzie's report and raises reasonable questions about his conclusions on not just cavern

safety but rail and pipeline safety as well. Department staff submits that Quest's analysis should be afforded greater weight, in light of Quest's experience in the field of risk analysis. *See Matter of Catherine Norton*, 2003 N.Y. Env. Lexis 78, Commissioner's Decision, October 21, 2003.

2. REGULATION OF THE RAILROAD INDUSTRY IS PREEMPTED

Petitioners GFS and, Harp and Lausell, both argue that DEC's SEQR review should address potentially significant adverse impacts posed by transportation of LPG by railway. Petitioners Harp and Lausell's specific concern is the transportation of LPG through Watkins Glen Park and the sufficiency of the County's Emergency Management Plan. Tr. 124:13 to 125:20. Petitioner GFS also raises rail safety, through the risk evaluation performed by Dr. Mackenzie, though Dr. Mackenzie's analysis evaluates LPG storage generally, and does not look at the risks specific to this facility. *See*, Mackenizie Report, p. 5, n 9. The parties seem to be in agreement that the Department is preempted from imposing mitigation on railway carriers, but the amicus petitioners argue that the DSEIS should have addressed the safety of specific railroad crossings and rail safety anyway.

To be clear, the Interstate Commerce Commission Termination Act of 1995 vests the Surface Transportation Board with exclusive jurisdiction over "transportation by rail carriers" an the "construction, acquisition, operation, abandonment or discontinuance of . . tracks or facilities." 49 U.S.C. § 10501(b). Case law is also indicates that where Congress vests exclusive authority in a federal agency, state agencies may not exercise concurrent or parallel environmental reviews, and are left with whatever jurisdiction is allowed by federal law. *See Matter of Niagara Mohawk Power Corp. v. NYS Dept. of Envtl. Conser.* 82 N.Y.2d 191 (1991). Railway safety is also addressed by the Federal Railroad Safety Act. 49 U.S.C. §20101, et. seq.

Therefore, DEC is left with the jurisdiction supplied by SEQR and may analyze other public safety concerns, such as emergency response, but cannot mitigate impacts identified in the SEQR review when such impacts relate to railway safety. As a consequence, amicus petitioner's concerns related to the condition of the trestle crossing the Watkins Glen gorge is outside of the Department's jurisdiction and SEQR review of its safety is preempted.

Nonetheless, the DSEIS includes an analysis of local emergency response resources in the relevant community and the applicant's supplemental evaluation of transportation safety by Quest Consultants, along with the Affidavit of William Kennedy, further address transportation safety and the capability of the Town of Reading and Schuyler County to respond to accidents. See, DSEIS, Section 4.6.1; OHMS Doc. No. 00032, attachments. The Department's draft permit conditions also address emergency preparedness, in that the draft permit conditions requires FLLPG to Therefore, the purported concerns raised by petitioners GFS, SLC and amicus petitioners Harp and Lausell are rebutted by evidence in the application.

G. THE DSEIS, AS SUPPLEMENTED BY THE APPLICANT AND THE ISSUES CONFERENCE RECORD, CONTAINS AN ADEQUATE DISCUSSION OF ALTERNATIVES, INCLUDING THE NO-ACTION ALTERNATIVE

GFS and SLC argue that the lack of a no-action alternative and failure to include additional site alternatives is a "fatal defect." This argument is without merit since the applicant presented the Department with a discussion of the no-action alternative in 2012, which was publicly available, significant adverse impacts of the underground gas storage project can be mitigated or avoided, and the petitioners have failed to present any specific alternatives and have thereby failed to meet their burden of proof.

According to the SEQR Handbook, the purpose of considering alternatives is as follows:

> An EIS has been required because potentially significant adverse impacts of the sponsor's proposed project have been identified. An analysis of alternative project configurations or designs will enable the lead agency to determine if there are reasonable, feasible alternatives which would allow some or all of the adverse impacts to be avoided while generally satisfying the sponsor's goals. A project sponsor generally develops its project proposal based solely on its own goals and objectives. These goals and objectives may not include maximum protection of environmental factors, and are not always shared by the reviewing agencies or the public. Requiring that reasonable alternatives be discussed allows a reviewer to independently determine if the proposed action is, in fact, the best alternative for that project when all environmental factors have been considered.

See also, *Matter of Orange County Water Authority*, Interim Decision of the Commissioner, p. 4, February 24, 1992 (attached in Appendix "I") ("alternatives need only be considered upon a showing that there are significant adverse impacts associated with the proposed project that cannot be mitigated.");[19] Matter of St. Lawrence Cement Co., Interim Decision of the Commissioner, First Interim Decision of the Commissioner, 2002 N.Y. ENV LEXIS 61 at *73-74, December 6, 2002 (alternative site appropriately rejected due to greater visual impacts and lack of demonstrable net environmental benefit associated with it).

Further, in *Coalition Against Lincoln West, Inc. v. City of New York*, 94 A.D.2d 483, 492, *affirmed*, 60 N.Y.2d 805 (1983), a leading case on alternatives, the First Department stated as follows: "SEQRA does not require that every conceivable alternative must be considered before an EIS will be considered acceptable…. Rather, the rule is one of reasonableness and balance …. We do not believe that respondents must consider every possible alternative. What must be required is that information be considered which would permit a reasoned conclusion." In the Department's 624 hearings context, to meet their burden of proof, petitioners for party status must present specific alternatives. *Matter of Trans Gas Energy Systems, LLC*, Interim Decision

[19] This citation is to the actual decision as the decision is not in Westlaw or Lexis.

of the Commissioner, 2004 N.Y. ENV LEXIS 17 at *23, March 12, 2004 (there was no requirement to consider 73 sites suggested by opponents where specific locations were not given.). *See also, Matter of Gilles Bouchard*, Decision of the Commissioner, 1986 N.Y. ENV LEXIS 40 at *21, January. 24, 1986 (Interveners failed to provide any specific alternatives).

The SEQR regulations require that the range of reasonable alternatives to be included in a draft EIS include the no action alternative. 6 NYCRR 617.9 (b) (5) (v). According to the SEQR Handbook (http://www.dec.ny.gov/permits/55215.html, last visited April 14, 2015), the substance of the "no action" discussion should be a description of the likely circumstances at the project site if the project does not proceed. For many private actions, the no action alternative may be simply and adequately addressed by identifying the direct financial effects of not undertaking the action, or by describing the likely future conditions of the property if developed to the maximum allowed under the existing zoning."

The range of reasonable alternatives also includes alternative sites. However, with regard to private entities, the rules differ from those that apply to public entities. In *Horn v. International Business Machines*, 110 A.D.2d 87, 95-96 (2d Dept. 1985), *appeal denied*, 67 N.Y.2d 602 (1986), the Court stated as follows:

> In certain cases involving proposed development by a private entity an in-depth analysis and discussion of alternate sites for the project may be appropriate and necessary. For example, where two or more competing private entities are striving to obtain approval from a municipality for a particular type of proposed development (such as a shopping mall) on different sites, such discussion and analyses of the different sites, in terms of environmental impact, would certainly be appropriate. However, it would be an illogical and unwarranted extension of SEQRA to require every private developer to address in its EIS the possible development of other sites over which it has no control, which might not be for sale, or which are not economically feasible.

1. NO ACTION ALTERNATIVE

While GFS and SLC are correct in asserting that the DSEIS did not include "no action" among the alternatives, it did discuss the environmental baseline or current setting. Additionally, the DSEIS was supplemented, by letter dated February 16, 2012, with a discussion of the no-action alternative, which was made part of the issues conference record. See http://www.dec.ny.gov/permits/71619.html, last visited on April 14, 2015. (The February 16, 2015 letter is attached to the memorandum of law as "Appendix "J".) This letter was filed over three years ago, was made part of the issues conference record, and all of the potential parties and amicus have had the document.

As described in the letter, "the no action alternative would see the continuation of activities on the US Salt property, such as underground gas storage and solution mining activities. At the surface facility site, owned by Finger Lakes, there would be no activity at the site, although the surrounding properties would continue to be used for rail transportation, trucking; and perhaps solid waste storage." It is clear that the environmental effect of the no-action alternative is that there would be no impacts as to any of the categories of impacts identified in section 4.0 of the DSEIS (e.g., noise, visual, and transportation).

In *Webster Associates v. Town of Webster*, supra, 59 N.Y.2d at 228-229, the Court of Appeals stated, "the purpose of requiring inclusion of reasonable alternatives to a proposed project is to aid the public and governmental bodies in assessing the relative costs and benefits of the proposal. To be meaningful, such an assessment must be based on an awareness of all reasonable options other than the proposed action." Nevertheless, the court refused to overturn the approval of a proposed shopping center even though the EIS had failed to discuss an important alternative since the alternative, according to the Court, had been subject to extensive local publicity and had been a major issue in recent town elections. The court held that since the

decision makers were well familiar with the alternative, its absence from the EIS was not a fatal flaw.

In *Webster, supra*, the Court stated:

> The omission of a required item from a draft EIS cannot be cured simply by including the item in the final EIS. Nonetheless, on the particular facts of this case, the Appellate Division was correct in holding that the omission of the Webster Associates alternative was not fatal. The purpose of requiring inclusion of reasonable alternatives to a proposed project is to aid the public and governmental bodies in assessing the relative costs and benefits of the proposal. To be meaningful, such an assessment must be based on an awareness of all reasonable options other than the proposed action. The degree of detail with which each alternative must be discussed will, of course, vary with the circumstances and nature of each proposal. With respect to the Webster Associates alternative, however, it is clear from the record that both the general public and the relevant public officials were thoroughly familiar with this alternative. The issue of which shopping center project should be constructed was central to the 1979 town board elections, which saw a new majority elected. The relative merits of the two proposals had been the subject of extensive publicity and of debate by public officials and the general public. Moreover, in its draft EIS, Expressway Associates stated that the primary issue of controversy was whether its proposal or that of Webster Associates should be approved. Finally, Webster Associates itself attended every public hearing on the EIS and commented extensively on it. Under these circumstances, the failure to discuss Webster Associates' proposal in the draft EIS was not a fatal defect. [*Webster*, 59 N.Y.2d at 227-29.]

Here, as in the *Webster* case, the no action alternative has been adequately documented to the lead agency and the public. The applicant's 2012 letter, combined with the discussion of setting in the DSEIS, constitutes an adequate description of present and future conditions at the site, which can then be compared to future conditions with the project. There is no point to a remand to staff in this case. Petitioners have not disputed the substance of the statements.

2. ALTERNATIVE SITES

Petitioners' arguments about the failure of the DSEIS to consider alternative sites for storage of LPG should be rejected since petitioners fail to specifically identify any such locations — let alone ones that are owned by the applicant — except for the Savona site. With regard to

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the Savona site, staff did not consider it a reasonable alternative since use of the Savona site would involve greater environmental impacts. Finger Lakes Transcript, February 13, 2015, pages 483-487.

Specifically, the Savona LPG facility, also owned by Finger Lakes LPG Storage, LLC, is located in Steuben County and has been in operation since the early 1950s. The facility consists of approximately 12 storage wells with caverns in various states of development, one brine disposal well and several brine ponds. As mentioned at the issues conference, unlike the proposed FLLPG site, the Savona LPG facility is not located adjacent to a salt plant that can accept its excess brine. The Savona LPG facility disposes of its excess brine via a Department-issued SPDES permit for discharge into its disposal well and into the Cohocton River, with the majority of the brine discharged into the latter. Further, injection into the disposal well is also regulated by the United States Environmental Protection Agency ("USEPA") under its Underground Injection Control ("UIC") program. Brine disposal into deep formations in New York has not typically been a viable option for cavern development as evidenced by the failure of the Avoca Natural Gas Storage ("ANGS") project in Steuben County in 1995. It is the Department's understanding that ANGS invested over 50 million dollars with the drilling of 13 wells (i.e., 7 disposal and 6 cavern) before the project failed due to a lack of injectivity into its planned disposal wells. Expansion of the Savona LPG caverns for additional LPG storage is constrained by the rate at which the facility can dispose of its excess brine, primarily into the Cohocton River, and therefore staff did not deem the facility a viable alternative for project relocation.

Therefore, staff acted rationally in not including the Savona site as an alternative site for the LPG storage. Savona would not reduce or avoid adverse environmental impacts. *See Coalition Against Lincoln West, Inc., supra*, 94 A.D.2d at 492 and *Matter of St. Lawrence Cement, LLC*, First Interim Decision of the Commissioner, 2002 N.Y. ENV LEXIS 61 at *73-74, December 6, 2002 ("I concur with the ALJs that there is no justification to adjudicate alternatives based upon the record before me. In particular, adjudication of the Catskill site is not warranted, and no further information is necessary to make that determination. The Applicant has provided sufficient and detailed information in the record for me to conclude that further review of the Catskill site would not aid in the decision-making process, in particular, the undisputed conclusion that the visual impacts of the Catskill site on Olana would be greater, as well as the lack of any demonstrable net environmental benefit associated with the Catskill site."). Petitioners have thus failed to raise an adjudicable issue or an issue of sufficiency regarding the EIS. See *Horn, supra*, 110 A.D.2d at 95-96; *Matter of Trans Gas Energy Systems, LLC*, Interim Decision of the Commissioner, *supra*, 2004 N.Y. ENV LEXIS 17 at *23; and *Matter of Gilles Bouchard*, Decision of the Commissioner, *supra*, 1986 N.Y. ENV LEXIS 40 at *21.

Finally, as discussed above, the evaluation of alternatives is not an academic exercise. The consideration of alternatives is directly linked to the requirement that significant impacts be avoided or mitigated to the maximum extent practicable. As set out in these pages, significant impacts associated with the Reading site are capable of being avoided or mitigated.

H. STAFF HAVE EVALUATED CUMULATIVE IMPACTS

Whether the DSEIS should have included a separate discussion of potential cumulative impacts was raised as a strictly legal issue by Petitioner GFS. Tr. P. 570:21 to 571:1; GFS

Petition, p. 19. The basic requirement for a cumulative impact analysis is set out at 6 NYCRR 617.9 (b)(5)(iii)('s'). That section states: The EIS must include "a statement and evaluation of the environmental impacts of the proposed action, including the reasonably related short- and long-term effects, cumulative effects and other associated environmental effects." According to the SEQR Handbook, cumulative impacts "occur when multiple actions affect the same resource(s). These impacts can occur when the incremental or increased impacts on an action, or actions, are added to other past, present and reasonably future actions. Cumulative actions can result from a single action or from a number of individually minor but collectively significant actions taking place over a period of time." http://www.dec.ny.gov/permits/47716.html, last visited on April 15, 2015.

GFS argues that the DSEIS is not adequate because it did not include an analysis of potential cumulative impacts from the proposed project and the recently approved expansion of Arlington's Seneca Lake Storage Facility. Specifically, GFS states: "Arlington received FERC permission to acquire the property from NYSEG in August 2010, and DEC knew of 'future NYSEG/Arlington natural gas storage' in the wells providing the expanded capacity by April 2011." GFS Petition at 9-10. GFS then argues that because the Department did not include a cumulative analysis in the DSEIS (which was accepted by the Department as complete in August 2011), it was deficient.

As an initial matter, GFS argues nothing more than that a cumulative impact analysis should have been performed without specifying the cumulative impacts from the two projects or the resources that would be cumulatively effected. GFS does not make any offer of proof and only makes a legal argument that the DSEIS is deficient. Petitioners for party status are required to present an offer of proof specifying the nature of the evidence the person expects to present.

See, 6 NYCRR 625.5(b)(2)(ii). Here, GFS states in their petition for party status that a cumulative impact analysis was needed, but didn't provide an offer of proof to back up their claim.

GFS agrees that what they raise is a legal question. Tr. P. 570:21 to 571:1. Of course, the need for a cumulative impact analysis is not a purely legal question. A decision on whether a cumulative analysis is required is a factual one since a cumulative analysis is not a mandatory exercise when there are no cumulative impacts. *See* 6 NYCRR 617.9 (b)(5)(iii); *Matter of Crossroads Ventures*, supra. During the issues conference, GFS elaborated on the types of resources they believe will be cumulatively affected, naming public safety associated with storing natural gas at two nearby facilities, community character and construction impacts. Despite the fact that GFS failed to provide a fact-based offer of proof, the impacts they identified at the issues conference will not be cumulatively impacted and are not adjudicable. Instead, the Department can address GFS's concern in the response to comments on the DSEIS.

Their first alleged cumulative impact, related to storing natural gas in adjacent caverns, was addressed by the Department. GFS is correct that Arlington was given approval to purchase the facility sometime in 2010 but that does not automatically mean that an application to expand the facility would be filed with FERC. The Arlington application was not officially filed with FERC until 2013, but Department staff was aware that the facility was in the process of changing hands before then. Regardless, Department staff considered the potential for cumulative subsurface impacts even before Arlington purchased the facility, which is why, when FLLPG applied for an underground storage application with DEC, Department staff directed that, "because of the close proximity of New York State Electric and Gas' ('NYSEG') existing natural gas storage operation, the required geomechanical analysis and report must include a gallery

interaction study, under all existing and proposed operation and testing condition. . ." OHMS Doc. No. 00003, Doc. I.A.4, January 11, 2010 NOIA. Once the Arlington project was further along, Department staff asked FLLPG, via the Third Notice of Incomplete Application, dated March 28, 2011, whether their earlier gallery interaction study that included NYSEG's caverns, now owned by Arlington, would still be true in light of Arlington's plans to expand the facility. Department staff also requested that FLLPG to modify their FEA as appropriate to address the Department's concerns. OHMS Doc. No. 00003, Doc. I.A.11.

SEQRA is an iterative process and when it was appropriate to do so, Department staff took proactive steps to determine whether there would be a cumulative subsurface impact from the adjacent projects. Based on the applicant's response to the three NOIAs, Department staff concluded that no cumulative impacts would result. Notably, FERC also reviewed potential cumulative impacts from the two projects and they, like DEC staff, concluded that no significant cumulative impacts were present. See, FERC Order. ¶62, ("groundwater, surface-water quality, and cumulative air impacts were the only resources identified in the EA that could potentially be cumulative affected.") This addresses any potential subsurface impacts of the two facilities.

As to the aboveground impacts, the FERC Order issued in May 2015 describes the work needed to expand the Arlington project and the construction needed there is minimal. See FERC Order, ¶6. GFS raises construction impacts but it's speculative to assume the projects would be constructed at the same time in light of the fact that FERC's approval has already been granted. The two projects would also not have combined traffic impacts since FLLPG plans to transport product by rail and pipeline and there would likely be no combined visual impacts, since, aside from the additional compression unit to be installed by Arlington, there are no other aboveground structures needed at the Arlington site.

GFS is incorrect to claim that FERC did not look at community character and tourism since the FERC Order specifically rejects those claims. FERC Order ¶62, 64. FERC likewise addressed the combined construction and operational impacts of the Arlington and Finger Lakes project, and documented the determinations related to construction impacts, noise, air quality, and aesthetics. Id., ¶66-70. A cumulative impact evaluation was, in fact, done by FERC for the two projects and since the Department may take judicial notice of the FERC Order, their evaluation may be incorporated into the record in this proceeding.

Notwithstanding FERC's evaluation, Department staff independently considered the resources which presented the potential for cumulative impacts and concluded there weren't any. See, Tr. Pgs. 549-563. As detailed above, Department staff considered the potential for cumulative cavern interaction and staff also considered the potential for significant adverse cumulative traffic, dust and light impacts. Arlington's FERC application estimates the duration of construction to be approximately four to six weeks and that most of the equipment needed for construction is already on site. Arlington's application also indicates the following: no clearing of vegetation is required; no improvements are needed to the existing access road; construction of the Gallery 2 Expansion Project will involve no impacts to water bodies or wetlands; and that no improvements to an existing ditch crossing are necessary. Consequently, the short duration of construction expected for the Gallery 2 Expansion Project would not be significant even when combined with construction of the Finger Lakes Project. In operation, the Gallery 2 Expansion Project would not involve additional traffic, as stored product arrives and leaves by pipeline. Therefore, there are no significant additional traffic, dust and light impacts associated with the combined operation of the Seneca Lake Storage facility and the Finger Lakes Project.

The applicant's noise consultant prepared a revised noise study that look at both projects, which was received by the Department in March 2014. See, Hunt Revised Sound Study, with Report Revised July 2013 (http://www.dec.ny.gov/permits/71619.html, last visited on April 15, 2015). The report concludes: "The sound levels have been modeled conservatively and mitigation practices will be incorporated where applicable. With this in mind, it can be concluded that the ambient noise levels will not be increased to an objectionable level, and for the most part will be unnoticeable. To verify that this is a valid conclusion, sound monitoring will be performed at the developed site." Further, see the attached affidavit of Scott Sheeley, which shows that impacts from combined noise from both projects on an common receptor meet the guidelines of the DEC Noise Policy. *See*, Sheeley Aff., ¶16-17.

In summary, the DSEIS adequately addresses the potential cumulative impacts associated with the Project and the pending application related to the Gallery 2 Expansion Project does not raise any significant adverse cumulative environmental impacts not already addressed in the DSEIS.

I. INSURANCE/INDEMNITY

SLC asks the Department to impose a bond, indemnity or insurance requirement to protect communities in the event of an accident that could cause property damage to local communities. SLC Petition at 24. Amicus FLWBC requests the same.

The SEQR regulations provide all involved agencies "…with the authority, following the filing of a final EIS and written findings statement, …to impose substantive conditions upon an action to ensure that the requirements of this Part [Part 617] have been satisfied. The conditions imposed must be practicable and reasonably related to impacts identified in the EIS…." 6 NYCRR 617.3(b).

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The request is not reasonably related to impacts identified in the EIS. In *Matter of Cerame v. Town of Perinton Zoning Bd. Of Appeals*, 27 A.D.3d 1191 (4th Dept. 2006), rejected an attempt by the Zoning Board of Appeals of the Town of Perinton to require a letter of credit to cover road repairs that may be needed in connection with an application to construct a berm. The Court held that the letter of credit was not related to any of the environmental significance criteria. Similarly, the request here for a financial surety to cover damage to private property in event of an accident at the LPG facility does not mitigate or avoid the impacts of significance set out in the DSEIS. There is simply no basis here to require a surety. Neither SLC nor the proposed amicus have set out any authority for doing so.

Further, SLC fails to raise and substantive and significant issue. *See Matter of Hyland Facility Assocs.*, Interim Decision of the Commissioner, 1992 N.Y. ENV LEXIS 52 at 9-10, August 20, 1992, at 5 (potential loss of revenue derived from tourism an economic issue, not an issue of community character).

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CONCLUSION

Department staff's review of the Finger Lakes LPG Storage Project has been ongoing since 2009. Over the course of that time, Department staff have reviewed every aspect of the proposed project that warranted review under SEQR. Department staff's review has been an iterative one, as staff has taken into account changes in the project made by the applicant either at their own initiative or at the behest of Department staff. The end product of Department staff's SEQR review is a record that includes the DSEIS and a comprehensive set of draft permit conditions, which demonstrates that the requisite hard look was taken by Department staff of the proposed project. With the additional public record made at the issues conference, the SEQR record is complete and will serve as a thorough and complete basis on which to make SEQR Findings.

Petitioners for full party status and amicus staff put forth several issues for adjudication in their petitions and at the Issues Conference. However, none of the proposed issues meet the threshold level of importance needed to serve as a basis for adjudication.

On the critical issue of the compatibility of the project with its surrounding the facts speak for themselves, the wine and tourism industry has developed alongside natural gas storage operations. Many of their issues, such as those related to community character, noise and traffic, may serve as comments on the DSEIS and can be addressed in a responsiveness summary and findings including those that will be made by the Department and the Town of Reading. Other issues, such as those related to cavern integrity and water quality, were not backed up by an adequate offer of proof, and raised conclusory statements that do not find any support in the relevant scientific community.

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For the reasons expressed above, Department staff respectfully requests a ruling dismissing the issues proposed for adjudication.

Respectfully submitted:

On behalf of the New York State Department of Environmental Conservation,

_____

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DATED: April 17, 2015

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LIST OF APPENDICES

A	Mamaroneck Beach and Yacht Club v. Planning Board of the Village of Mamaroneck
B	*Storage of Hydrocarbons in Cavities in Bedded Deposits Formed by Hydraulic Fracturing, Charles Jacoby, 1969*
C	*Effect of Geology on the Hydraulic Fracturing of Salt, Jacoby, 1965*
D	Jacoby 1973, *Recovery of Entrapped Hydrocarbons,* Jacoby, 1973
E	*Appalachian Foreland Thrusting in Salina Salt, Watkins Glen, New York Jacoby & Dellwig 1974*
F	November 1, 1979, Correspondence, DEC to International Salt
G	Technical Review of the Chloride Effluent Limits In International Salt's Watkins Glen Facility, SPDES #NY 0002330, 1981
H	Matter of Orange County Water Authority
I	Letter re: no action alternative

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APPENDIX A

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Document hosted at JDSUPRA
http://www.jdsupra.com/post/documentViewer.aspx?fid=5a99213c-247f-4ef3-bf0b-e7982fffbe7b

FILED AND ENTERED ON 9-24 2009 WESTCHESTER COUNTY CLERK

To commence the statutory time period for appeals as of right [CPLR 5513(a)], you are advised to serve a copy of this order, with notice of entry upon all parties.

SUPREME COURT OF THE STATE OF NEW YORK
COUNTY OF WESTCHESTER:ENVIRONMENTAL CLAIMS PART
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In the Matter of the Application of

MAMARONECK BEACH & YACHT CLUB, INC AND MAMARONECK BEACH & YACHT CLUB, LLC,

Petitioners,

For a Judgment Pursuant to Article 78 of the Civil Practice Law & Rules

-against-

ROBERT GALVIN, STEWART E. STERK, MICHAEL IANNIELLO, CARL ALTERMAN and LEE WEXLER constituting the PLANNING BOARD OF THE VILLAGE OF MAMARONECK, THE PLANNING BOARD OF THE VILLAGE OF MAMARONECK and JOHN WINTER, in his capacity as the BUILDING INSPECTOR OF THE VILLAGE OF MAMARONECK,

Respondents,
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ORDER & JUDGMENT
Index No. 5942/08
Motion Date: Aug. 10, 2009

NICOLAI, J.

The following papers numbered 1 to 88 were read on this motion by respondents to dismiss the Petition pursuant to CPLR 3211[a][1]), (CPLR 3211[a][4]), and 3211[a][7]; or alternatively for a stay of the proceeding.

Orders to Show Cause - Petition - Exhibits	1-13; 14
Notice of Motion - Affirmation - Exhibits	15-61
Answering Affirmation - Affidavit - Exhibits	63-71
Replying Affirmation- Exhibits	73-76
Supplemental Affirmations-Affidavits	78-79;80-82;83-84;85-87
Memoranda of Law	62; 72; 77
Filed Papers - PLAN I	88

Upon the foregoing papers it is ordered that the motion to dismiss the petition is

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granted in its entirety. That branch of the motion for a stay of this proceeding has been withdrawn.

In this Article 78 proceeding, petitioners seek default approval pursuant to Village Code §342-79 of an Amended Site Plan application, as amended on January 4, 2008, which was submitted on January 9, 2008, and issuance of a building permit to commence construction of certain improvements to the petitioners' property as shown on the Amended Site Plan. Respondents also allege a cause of action for contempt.

Respondents move to dismiss this proceeding on the grounds of a defense founded upon documentary evidence (CPLR 3211[a][1]), prior pending action (CPLR 3211[a][4]), and 3211[a][7](failure to state a cause of action).

Petitioners initially filed its site plan application in 2004. Public hearings were held, and in addition to certain alternative site plans required by the Planning Board, petitioners submitted a Modified Proposed Action (Alternative G), which modified their original site plan. The Modified Proposed Action (Alternative G) proposal included four free-standing seasonal residences for 20 units. In its SEQRA Findings Statement, the Board found that a combination of Alternatives B-1 and C, which did not include any free-standing residences, was the "one that avoids or minimizes adverse environmental impacts to the maximum extent practicable" (Findings Statement dated October 26, 2007) and permitted, inter alia, construction of a new addition to the existing clubhouse for 12 new seasonal residence units. A separate Article 78 proceeding is pending before this Court with regard to that determination (Mamaroneck Beach & Yacht Club, Inc. V. Galvin, Westchester County Supreme Court, Index No.. 24348-2007).

Petitioners then filed the subject Amended Site Plan application, on January 9, 2008. The Planning Board took no action on this application. It is undisputed that this plan is virtually identical to the Modified Proposed Action (Alternative G) which was submitted in the prior proceedings before the Planning Board.

Petitioners contend that they are entitled to automatic approval of the Amended Modified Site Plan application filed on January 9, 2008 pursuant to Village Code §342-79 which provides as follows:

> The Planning Board shall review the site development plan and act on the application within 45 days from and after the time of submission of the preliminary plan. Failure on the part of the Planning Board to act shall be deemed to constitute approval, unless the time limit is extended by stipulation with the applicant.

Village Law §7-725-a governs site plan review, and requires compliance with the requirements of SEQRA (see Village Law §7-725-a[10]).

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Village Law §7-725-a(8) provides, with respect to site plan approval by the Planning Board, as follows:

> In the event a public hearing is required by local law...the ...board shall conduct a public hearing within sixty-two days from the day an application is received.... and shall make a decision on the application within sixty-two days of such hearing, or after the day the application is received if no hearing has been held..

There is no provision for default approval in Village Law §7-725-a(8) in the event that these time periods are not complied with (cf. Village law §7- 728, which does provide for default approval in the event the required time limits for review of a preliminary or final subdivision plat are not met). Rather, "[a]ny alleged noncompliance by the defendant with the statutory time provisions of Village Law § 7-725-a must be addressed within the context of a special proceeding to compel the defendant to act" (*Nyack Hosp. v. Village of Nyack Planning Bd.*, 231 A.D.2d 617, 618 [2d Dep't 1996]). "The failure of the Legislature to include an approval-by-default provision in the site plan statutes is a strong indication that such exclusion was intended (cite omitted)" (id at 617).

A local law which is inconsistent with state law is generally invalid unless it has been enacted with intent to supersede state law as permitted by Municipal Home Rule Law (see *Kamhi v. Yorktown*, 74 N.Y.2d 423, 431 [1989]; *Turnpike Woods, Inc. v. Stony Point*, 70 N.Y.2d 735, 738 [1987]). Permitting default approval of a site plan pursuant to Village Code §342-79 would result in approval of a site plan without the required SEQRA review and would violate the intent of Village Law §7- 728 to exclude default approvals of site plan applications. This is inconsistent with Village Law §7-725-a. As Village Code §342-79 was enacted prior to the enactment of Village Law §7-725 it could not have been intended to supersede the Village Law and under the circumstances herein, it cannot be relied upon by petitioner to support their claim for default approval.

Further, petitioners' contention that they are entitled to automatic approval of their Amended Site Plan application would result in an approved site plan which conflicts with the SEQRA Findings Statement wherein the Board found the combination of Alternatives B-1 and C to be the most environmentally sensitive alternative, rather than petitioner's Alternative G.

In addition, although petitioners contend that the plan is a "preliminary plan" it can no longer be considered a preliminary plan, as the Amended Site Plan filed on January 8, 2008, is essentially the same plan which was submitted and modified during the SEQRA review process.

Petitioners also assert a cause of action for contempt for alleged violation of an order issued by Justice Lippman on April 20, 2004, in a related proceeding (Matter of

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Application of Mamaroneck Beach & Yacht Club, Inc. v. Frailoi, Index No.05565/04, which was affirmed by the Appellate Division Second Department) which directed respondents to proceed with their SEQRA and site plan review of petitioners' application and render a determination thereon. In a later decision dated April 20, 2006, Justice Lippman granted petitioners' application for contempt to the extent that respondents would be held in contempt of the April 2004 decision, if they failed to comply as soon as reasonably practicable but in no event later than 30 days of the date of that decision. As respondents have demonstrated on this motion that they placed the matter on the agenda for a date within that time period, the motion for contempt accompanying this petition is denied, and petitioners' cause of action to hold respondents in contempt is dismissed.

As to the pending 2007 proceeding (Mamaroneck Beach & Yacht Club, Inc. V. Galvin, Westchester County Supreme Court, Index No. 24348-2007), the Court has received respondents' "Verified Answer, Affirmative Defenses and Objections in Point of Law" and "Memorandum of Law in Support of Verified Answer, Affirmative Defenses and Objections in Point of Law," as well as the Certified Record. Respondents shall serve and file their reply papers on or before October 9, 2009.

Accordingly, it is ORDERED, ADJUDGED AND DECREED, that this proceeding is dismissed.

Dated: White Plains, New York
September 21, 2009

FRANCIS A. NICOLAI
J.S.C.

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APPENDIX B

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Storage of Hydrocarbons in Cavities in Bedded Salt Deposits Formed by Hydraulic Fracturing

Charles H. Jacoby
International Salt Company
Detroit, Michigan

ABSTRACT

In the last two decades a new concept of hydrocarbon storage has been created by the dissolving of cavities in salt and the use of these cavities for hydrocarbon storage. Storage operations in bedded salt are dissimilar to those in dome type deposits. Similarly, the operation of cavities formed by hydraulic fracturing varies from single well jug type operations.

Fractured cavities, although creating more space for the storage of product, are more severely influenced by the geology of the salt deposit. This is true, not only from the standpoint of creating the cavity but also with respect to its operation. Pressure variation created by the input of product and its subsequent recovery, together with the character of the recycling fluid, is of utmost importance.

INTRODUCTION

Until recently, little was actually known about the geology of the bedded salts of the Appalachian Basin. Gradually there are emerging a few basic concepts which tend to explain some of the more complex geological problems that are being encountered in this area today. The existence of this complex geology has been shown during recently accelerated activities in the storage of hydrocarbons, exploration for new salt mines and development of brine fields. The number of new mines in the northeast section of the United States and adjacent to Canada has, in the last ten years, increased from 4 to 9. This increase in the number of salt mines was brought about by the increase in salt consumption in the United States from 16,053,802 tons in 1947 to 34,687,000 tons in 1965.

In 1948, a far reaching experiment was conducted in Keystone County, Kansas by a man named Ballue. In his experiment, Mr. Ballue took advantage of the extremely low permeability of salt to successfully store liquified petroleum gas in an artifically leached salt cavern. It is true that for many years prior to this time, dry salt mines had been used for the storage of various commodities and art treasures but never before had L.P.G. been stored in bedded salt.

This seemingly simple idea has blossomed until now over 17 billion gallons of liquified petroleum gas is stored annually in salt cavities in the United States. The full importance of this storage comes into focus when one realizes that a major portion of this same volume of gas was previously flared or burned at the refinery. If one multiplies this volume of gas by a wholesale price of 10¢ per gallon, you arrive at a rough estimate of the value of Mr. Ballue's idea—$1,700,000,000 per year.

As a waste product, propane, butane and isobutane are hazardous and the economic attendant with their surface storage in large volumes is adverse. Depending upon the type of product and the conditions necessary for its storage and recovery, underground storage can be accomplished for a cost of 1/20th to 1/100th that of surface storage. At the present time, such facilities as International Salt Company's Watkins Glen, New York plant have a static capacity of some 4,000,000 barrels in two cavities created by hydraulic fracturing.

Another visionary, Mr. H.L. Gentry, in 1961 undertook an experiment at St. Clair, Michigan, in which over 300 million cubic feet of natural gas was successfully stored in an abandoned single well brine cavity. Again a major contribution had been

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made to our standard of living, for now large amounts of natural gas can be stored in anticipation of consumer demand during the peak period of extremely cold weather when fuel demands are at a maximum.

Faulting—Watkins Glen, N.Y.

Watkins Glen, New York is one of two locations in the United States where L.P.G. is being stored in fractured cavities. A recent geological interpretation of the structure of the Watkins Glen area is shown in Figure 1. The four wells forming this cross section are in an eastwest direction. As is illustrated in this figure, both the top and bottom of the salt are horizontal in parallel planes. The underlying Vernon shale has a slight regional dip to the south. All wells in the cross section were cored and logged with gamma neutron tools.

When the original wells were drilled in this area, the number of major salt sequences were unknown. Thus as the first wells were drilled, six salts were delineated. The contact between the bottom salt and the underlying Vernon shale is sharp and smooth, forming a plane along which the entire salt series was thrust toward the north-northwest.

Because of the differential pressures exerted against the front of the evaporite mass and the variations in frictional resistance, movement was not uniform. Tear faults developed in the salt layers and the intervening strata of rock. Isopach maps of area show that major movement has occurred adjacent to Lake Senaca with a noticeable reduction in the amount of thrusting action in a westerly direction.

Gamma neutron logs show repeated rock sections in Wells 27, 28, 30 and 31. In Wells 27 and 28 the B2 salt, in keeping with Landes's nomenclature, has been thrust over itself and a horizontal fragment of the B2 rock, on two separate tectogenetic occurrences. The D1 salt has, in Well 27, almost doubled its normal thickness. This was due to either an overthrust of the D1 salt within itself or concurrent sedimentation during the downdropping of the C2 rock. The F unit of salt has

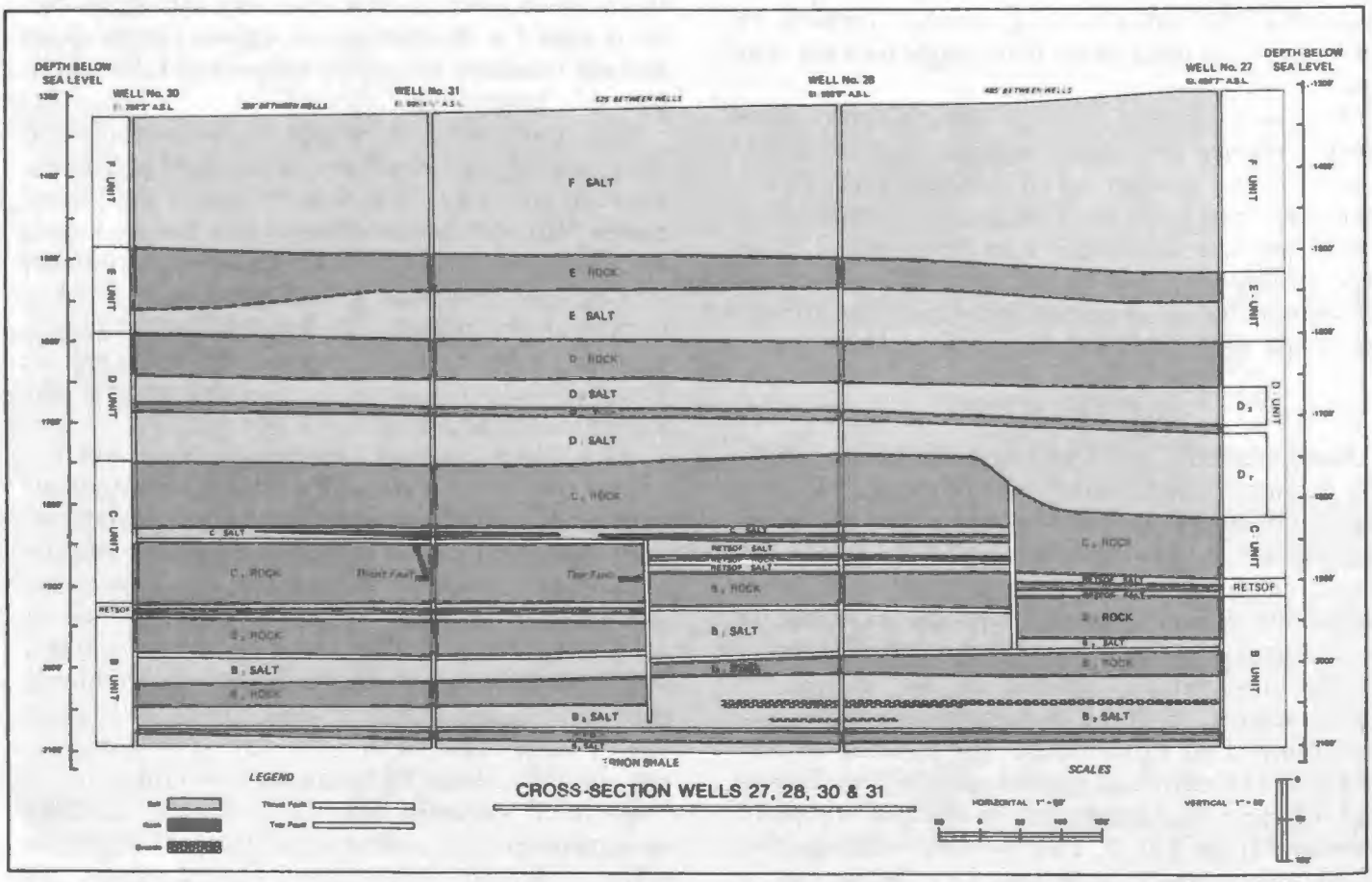

Figure 1.

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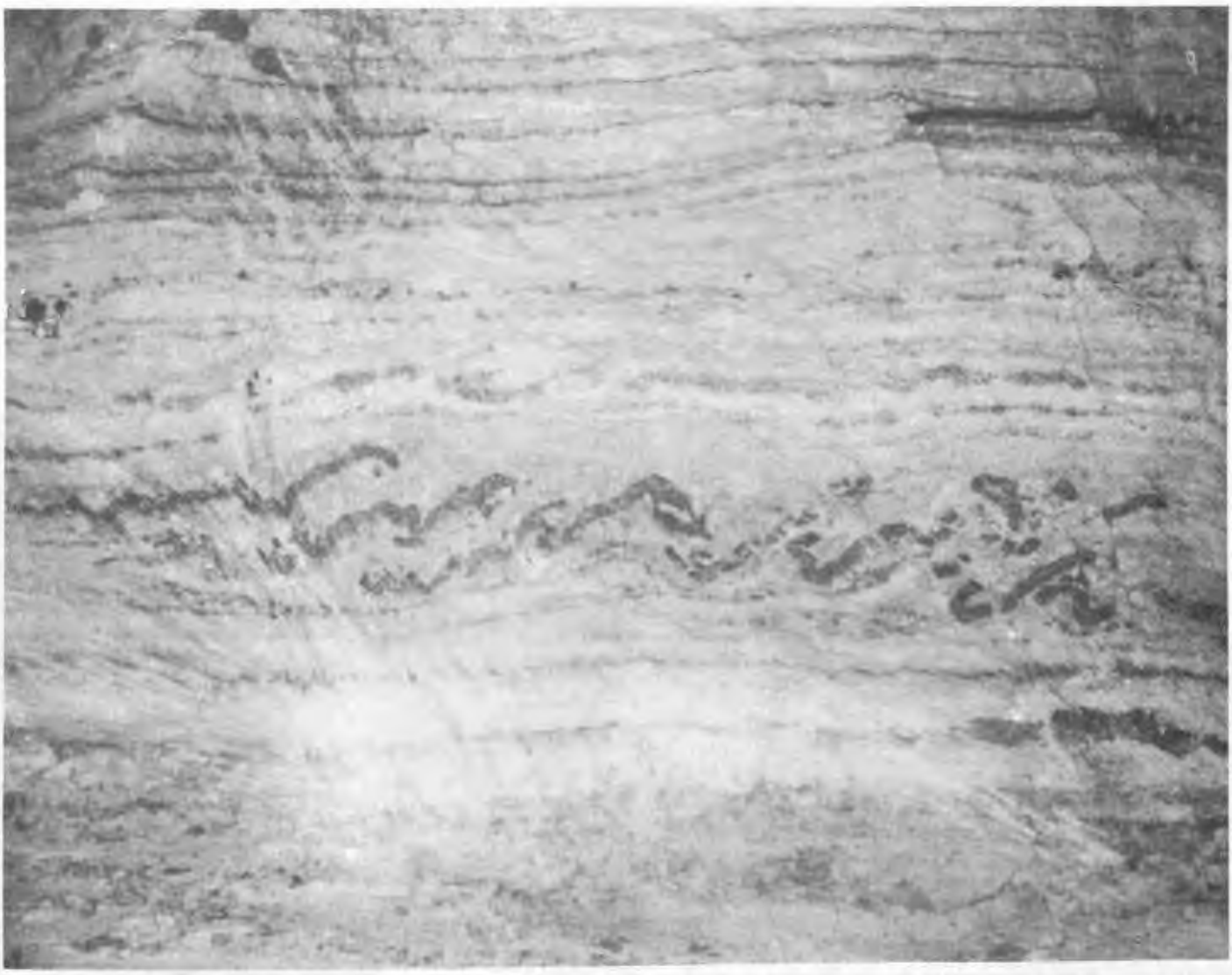
experienced a considerable increase in thickness in Well 27 over the other three wells involved in the cross section. The points of faulting as originally observed in the gamma neutron logs were confirmed by re-examination of the detail lithological logs and cores. At the points on the cross section where faulting has been confirmed, fault zones several feet in thickness are present. This generalized cross section does not attempt to take into consideration all the evidences of faulting but only those of primary concern.

An example of this low angle thrusting section is illustrated by photograph #1 which shows micro thrust faulting within the bed of salt being mined by International Salt Company at their Cleveland Mine. Here both the upper and lower laminae of the salt bed are essentially horizontal and parallel to each other. The mid-section of the bed has experienced a thrust action which has folded and then overthrust the dolomitic anhydritic rock stringer upon itself.

In photograph #2 this same rock stringer at another point in the Cleveland Mine can be seen overthrusting itself. Again it is underlain and overlain by horizontal laminae which are generally flat lying.

Recently, the Morton Salt Company in their drilling at Himrod, New York, found good core hole evidence of a tear fault similar to those in the Watkins Glen area. After nearing completion of a core hole which depicted what was considered to be a normal sequence of salt-rock strata, a zone of



Photograph 1. Cleveland Mine. Micro-thrust faulting shown in a mine face.

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Photograph 2. Cleveland Mine. Micro-thrust faulting shown in a mine face.

lost circulation was encountered in a salt bed. Plugging the hole back up to a point above the top salt, a whipstock was set and the strata recored. This deflected core hole encountered huge thicknesses of salt which in no way correlated with the original hole but were representative of a tear fault.

L.P.G. and hydrocarbon storage.

In the hydraulic fracturing of salt beds to coalesce two wells, either for the solution mining of salt or the creation of hydrocarbon storage facilities, it has been learned that once fluid circulation has been established between the injection well and the target well, a pressure "prop" of the fracture between the two wells must be maintained until a self-supporting opening has been created. Failure to maintain sufficient pressure to prevent convergence of the overlying and underlying portions of the strata, will result in the "healing" of the fracture. Once this "healing" has occurred, we have never been able to re-establish the fluid connection. It is our opinion that this "healing" is brought about by the same phenomenon observed in salt mine excavations. That is, dilation of the salt in the walls or pillars of the cavity; heaving of the floor, particularly where shale underlies the salt bed and sagging of the roof rock.

As the salt and rock close in on the opening, a crystalline halite begins to grow in the crevice until the void is completely filled. This crystal halite is substantially stronger in tension than the original primary salt, thus resisting refracturing. Thus in refracturing a well at the same point as that at which

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it was initially fractured, after the collapse of the beds has occurred, the fracturing fluid will take a direction of secondary preference avoiding the target well. Advantage can be taken of this healing effect in refracturing at the point of the original fracture where the fluid in the original fracture has taken an undesired direction. It is this healing effect that allows fractured cavities in faulted salt beds such as those of New York, Ohio and Pennsylvania to be used for the storage of hydrocarbons.

The structural features found in the Salina Group underlying Watkins Glen, New York, are believed to be characteristic of the entire New York portion of the Appalachian Basin.

As related to the creation of cavities and the operation of these cavities for hydrocarbon storage, the significance of this type of structure is:

1. In the coalescence of wells by hydraulic fracturing, fractures which normally have a tendency of developing in an eastwest direction, can progress in these directions only until the fluid intersects one of the northsouth trending tear faults. Establishment of a second fracture from the original target well, designed to intersect the fracturing fluid previously trapped in the tear fault, has only a very modest chance for success.
2. Fracturing new pairs of wells in such an area, where L.P.G. is already being stored, entails the risk of encountering these storage cavities.
3. As illustrated in Gallery No. 2 of Figure 2 of June 1964, the fracture patterns are not predictable unless the detailed geology of the area is available and understood. Here fractures were produced in the lower portion of the B2 salt in both Wells 30 and 31. The connection between the two wells was finally completed in the fault zone in the overthrust block of the B2 salt.
4. Unless saturated brine is used continually in recycling the product, there is distinct possibility of undermining fault blocks. Illustrated

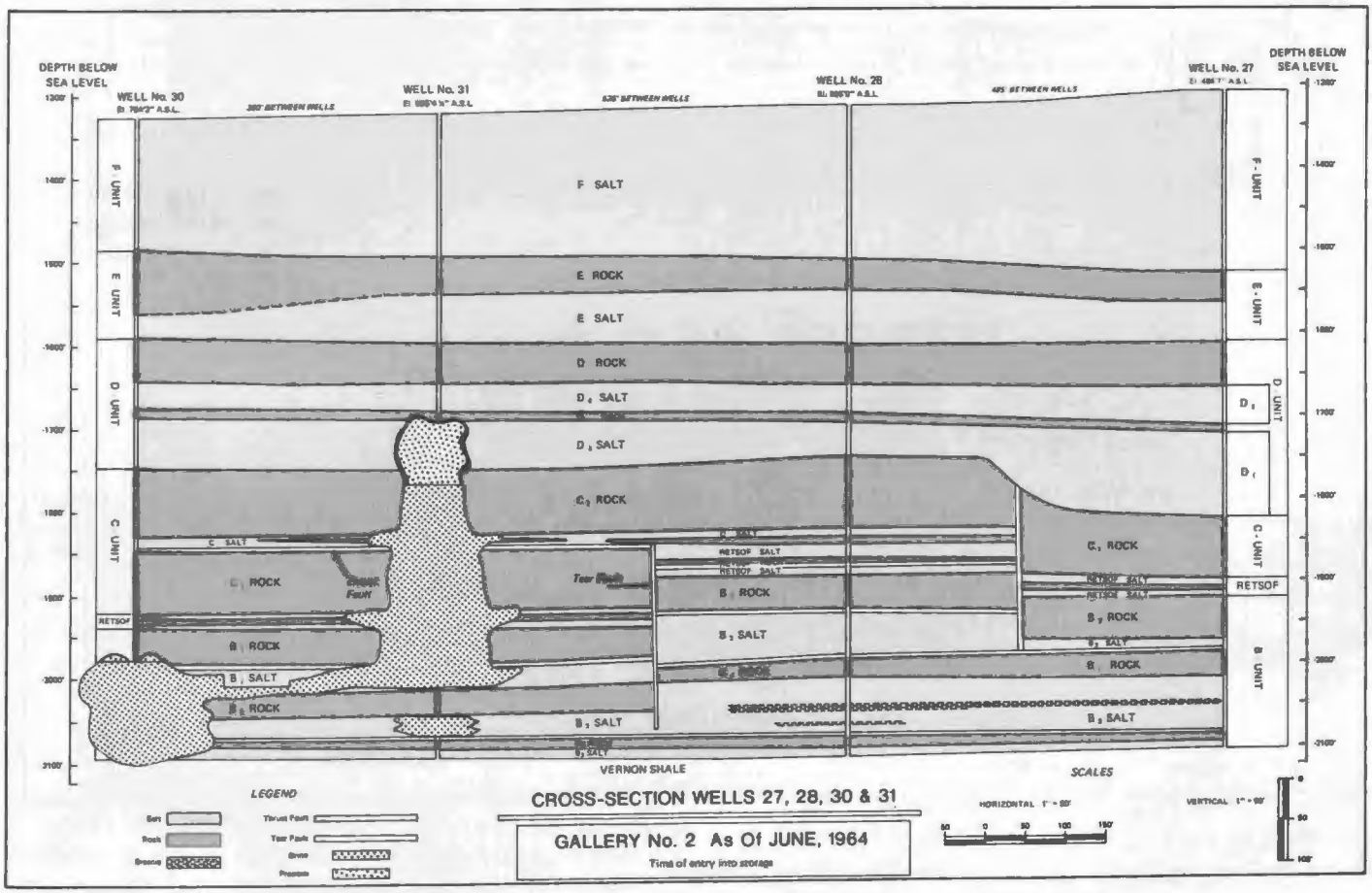

Figure 2.

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in Figure 3 is a large block of rock calculated to weigh over 400,000 tons which fell from the roof even with the use of saturated brine. This portion of the cavity was outlined by using sonar surveying equipment. Although saturated brine is used for a recycling fluid, some minor quantities of salt will be dissolved so that the effluent from the brine well will be supersaturated. Steps must be taken to prevent the salting up of the brine well.

5. Where the brine recycled from the cavity is to be used in a salt refining or chlorine-caustic plant, considerable additional dissolved impurities in excess of those normally found, will be encountered. This condition results from the hydrocarbon flooding of the pile of detrital material associated with the injection well. As the residual brine in this pile of rock is flushed out of the pile, it severely contaminates the mass of brine in the open portion of the cavity.
6. Rock falls of small to medium volume (50 tons) may be unnoticed. Larger falls will form a cloudy brine or hydrocarbon if they occur during the storage or recycling operations. Normally, even the worst of these conditions will clear in 24 to 48 hrs. Wide fluctuations in cavity pressures during storing and recycling operations are one of the main factors in roof or ledge rock falls.
7. Entrapment "losses" are largely related to local dips of the rock beds. In areas such as the Appalachian Basin, rock masses unmined at a point removed from the bore of the well may collapse causing large volumes of product to be entrapped at this remote point.

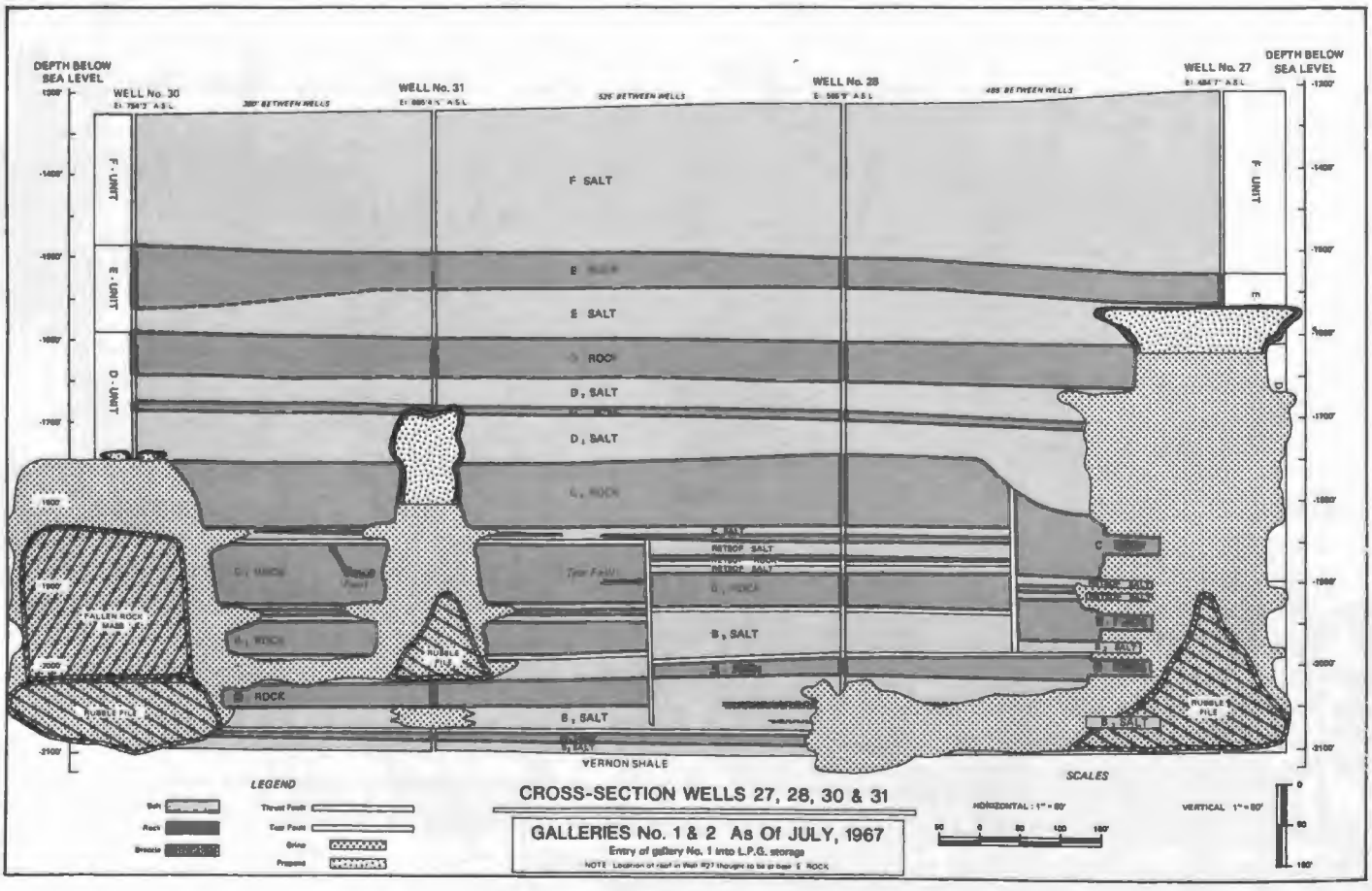

Figure 3.

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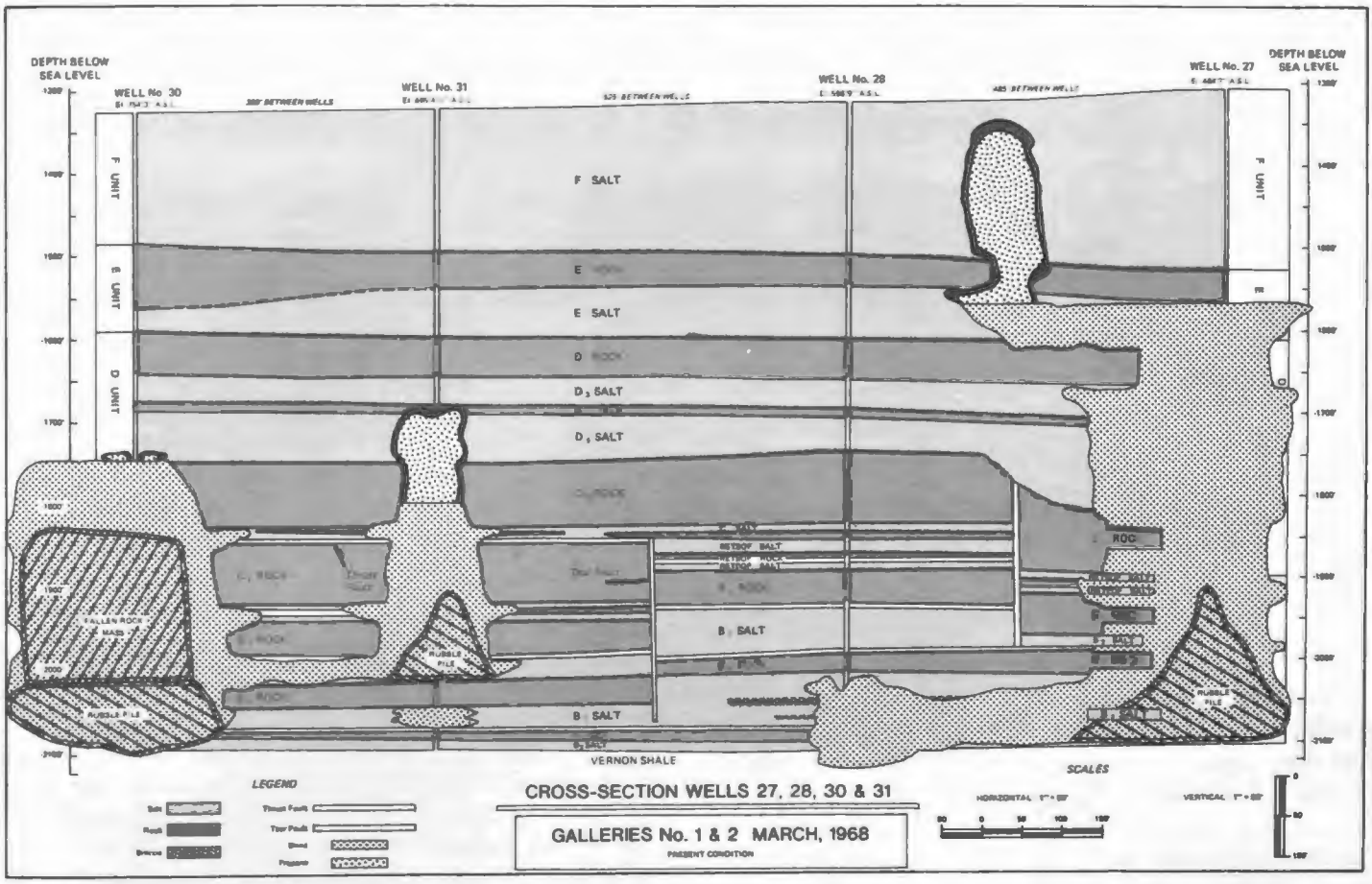

Figure 4.

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APPENDIX C

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Effect of Geology on the Hydraulic Fracturing of Salt

Charles H. Jacoby
International Salt Company
Detroit, Michigan

ABSTRACT

The paper is presented with the intent of bringing into focus a few of the many problems surrounding the successful fracturing of bedded salts. The results of hydraulic fracturing early in the history of the art left many unanswered questions. Based on continuous gathering and evaluation of data over the last ten years, some explanations are beginning to take form. Some of the individuals having the most experience have a "rule of thumb" which specifies, "If two wells do not connect in twenty-four hours, stop pumping." We believe that the major portion of these failures are based on geological irregularities.

A number of our questions concerning our fracturing operations at Watkins Glen, New York, have been answered by recent geological interpretations of salt disposition and subsequent deformation. Initial interpretation of structures based on the plastic flow and leaching of salt by ground water have given way in light of additional geological information to a theory of a system of thrust and normal faults. Former isopach and structural maps depicting folds and which failed to explain fracturing results have been completely discarded for the Watkins Glen area.

Areas such as Wayne County, Michigan, which are underlain by relatively flat dipping beds with gentle monoclinic folds can be shown by isopach maps. These beds, in some cases, have been disturbed by the ground water leaching of the salt with resulting secondary masses of crystalline salt being incorporated in the primary mass. In some locations, lithologic and/or chemical changes in the salt's composition are believed to be responsible for the erratic results obtained during hydraulic fracturing operations. Folding can develop fractures along the axis of the folds forming conduits along which solutions have a tendency to travel. Thus, both in salt beds which have been subjected to relatively sharp movement and those with only minor disturbance, the local geology plays a permanent role.

INTRODUCTION

A large percentage of the companies engaged in the extraction of salt from subsurface deposits by the solution method of mining have practiced the art of hydraulic fracturing with varying degrees of success. Very little has been written or otherwise divulged about any of these fracturing operations except those that are successful. A successful fracturing operation receives less attention, study and technical analysis than do the ones where difficulties are encountered.

Based on the information gathered in the Watkins Glen and Ludlowville, New York, areas over the last ten years, some explanations for our failures and difficult fractured connections are beginning to develop. For the purposes of this article which relates to bedded salt deposits, we have classified them into three major types. These are (1) The flat-lying deposits such as those in the vicinity of Wayne County, Michigan; (2) Folded deposits which are typified by the Ludlowville, New York, area; and (3) Faulted salt beds are represented by Watkins Glen, New York.

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In all cases brought forth in this paper, we are basing our statements on virgin salt deposits in which there are no solution mining operations in relatively close proximity. It is known that solution mining operations adjacent to a new fracturing operation will have a direct bearing on the outcome of the fracture.

BEDDED SALT -- FLAT LYING

Wayne County, Michigan. The salt deposit underlying Wayne County, Michigan Metropolitan Airport was explored by drilling in 1955. The two and one-eighth inch slim hole cores delineated a flat-lying series of salt beds apparently disturbed only by minor monoclinic folding. Figure 1 is a stratigraphic cross section hinged on Hole # 2. This cross section illustrates the termination or "zero line" of the salt beds in the Michigan Basin. The lettering system used in Fig. 1 is a carry-over from a system used locally prior to 1900.

Between Core Hole # 2 and Core Hole # 3, an approximate distance of 2, 800 feet, six salt beds have been leached out completely by ground water. Using the thickness of the intervening rock layers, the collapsed breccia zones of these leached out salt beds were actually correlated in Core Hole # 3 and Core Hole # 4. The drilling of salt wells along the perimeter of the Michigan Basin

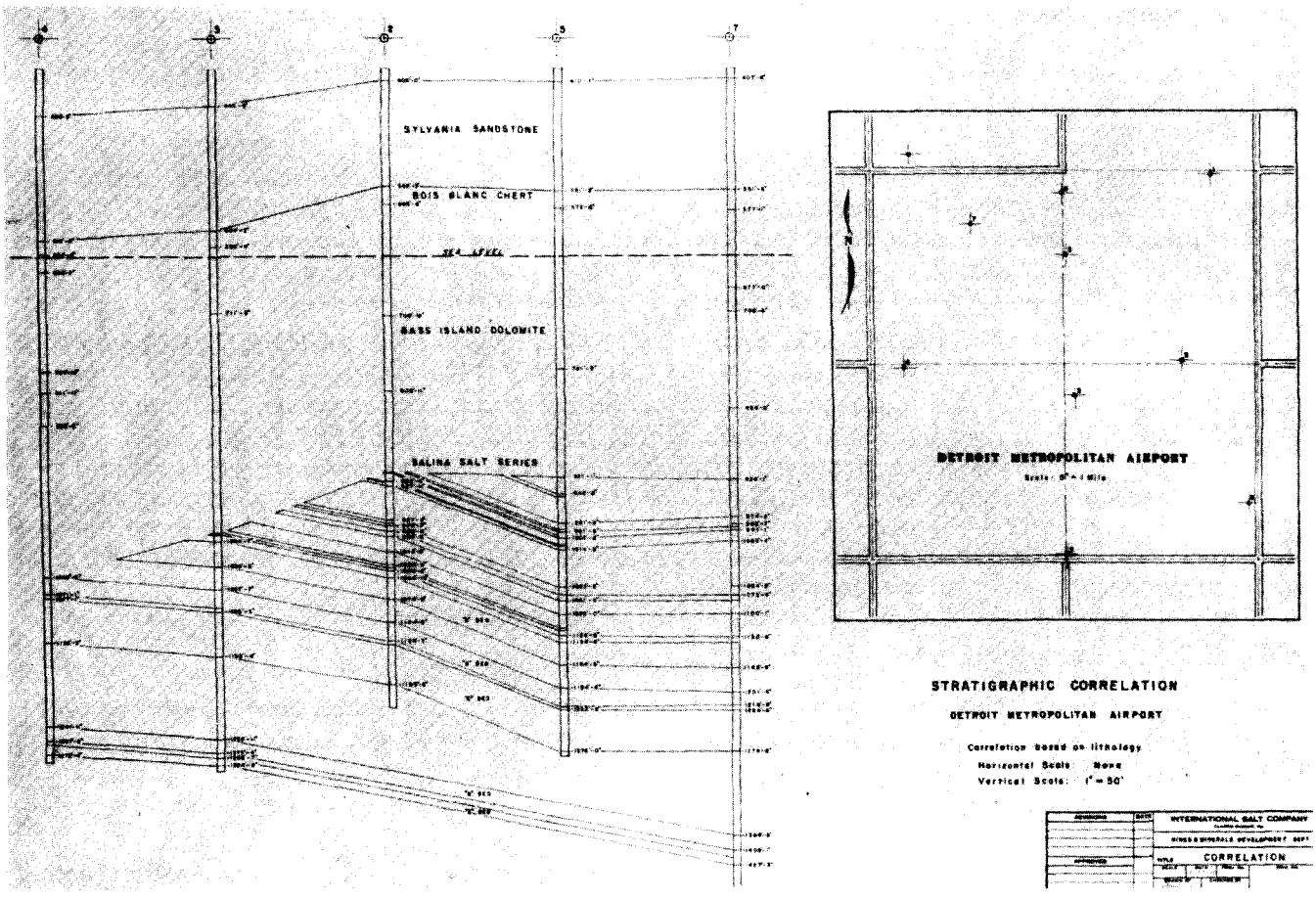

Figure 1

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could have negative results unless careful correlation of the salt beds and their termination points are developed well in advance of any fracturing operations. Wells in which the salt beds were to be fractured could conceivably be drilled and penetrate large thicknesses of salt and yet be near enough to the termination point or zero line of these wells as to have the fracturing fluid travel to the zero line and be lost in the adjacent rock mass.

This possibility is illustrated in Fig. 2 which is an isopach of the "AA" bed. The strike of the zero line of this bed is approximately N52W. Core Hole # 8 disclosed a thickness in this bed of 31 feet. Theoretically, at a distance of less than 1,900 feet due west of Core Hole # 8, the bed is nonexistent.

It is our belief that in cases such as this, the direction of travel of the fracturing fluid would be perpendicular to the zero or line of termination if no other factors dominate. The truncation of this salt bed closely parallels the axis of the Howell anticline and may have resulted from its formation.

There are a number of other factors which in our opinion would influence the direction of flow of a fracturing fluid in flat-bedded salt deposits. Figure 3 shows horizontal laminae exposed in a 24-foot face in the Detroit Mine. It will be noted that these laminae terminate in a mass of salt crystal which constitutes secondary deposition. The laminated salt is primary. Where the seal of the salt bed has been ruptured after primary salt has been deposited, meteoric waters give rise to solution cavities with the resultant formation of included crystal masses.

This mass of crystal shown in Fig. 3 extends from the roof of the mine to the floor. Since the salt bed at this point was only 29 feet thick with four feet of salt in the roof and one foot remaining in the floor, we may assume that the zone extends from the top to the bottom of the bed. A fracturing fluid that migrated along a lamina of this bed would intercept this crystal mass. It is

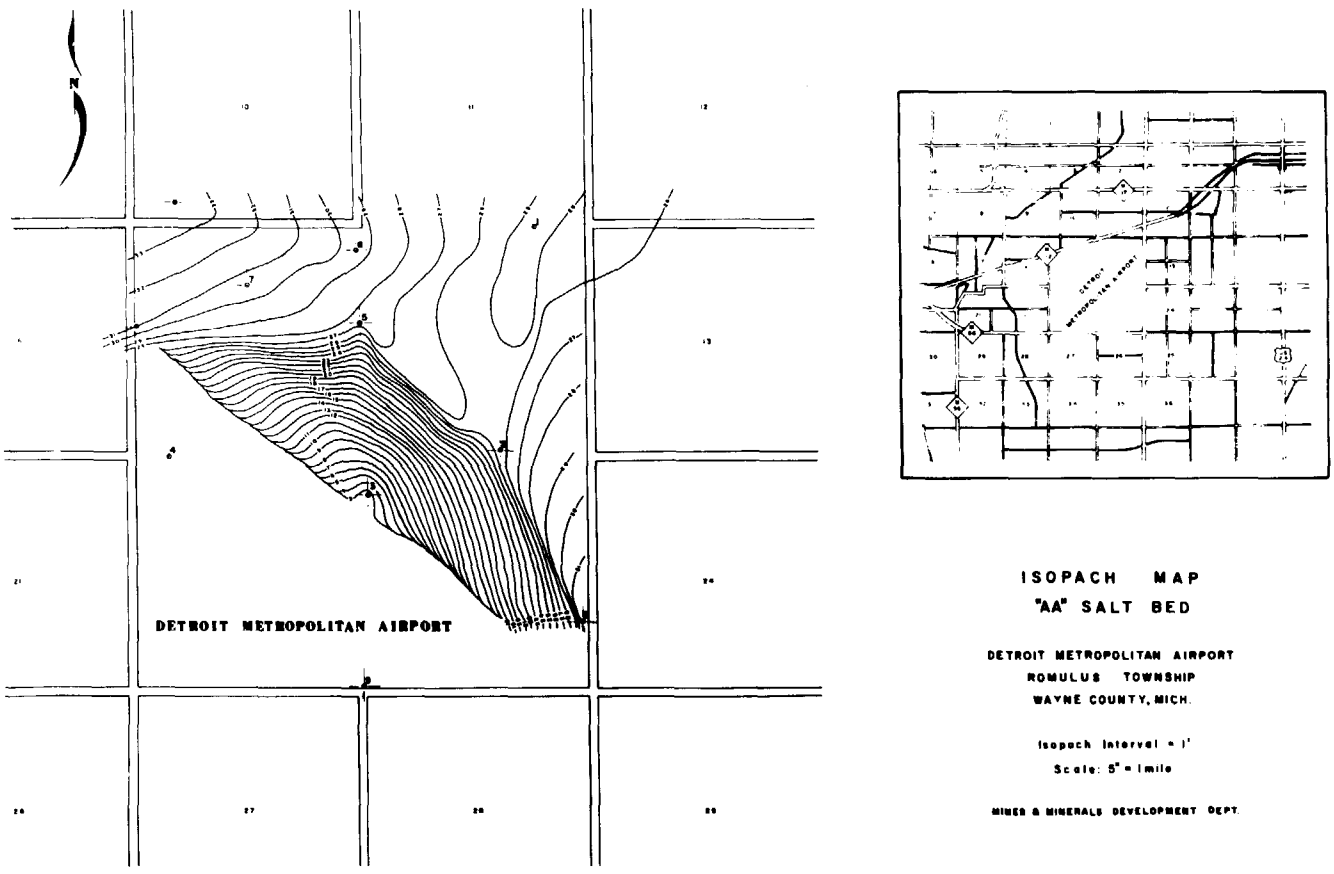

Figure 2

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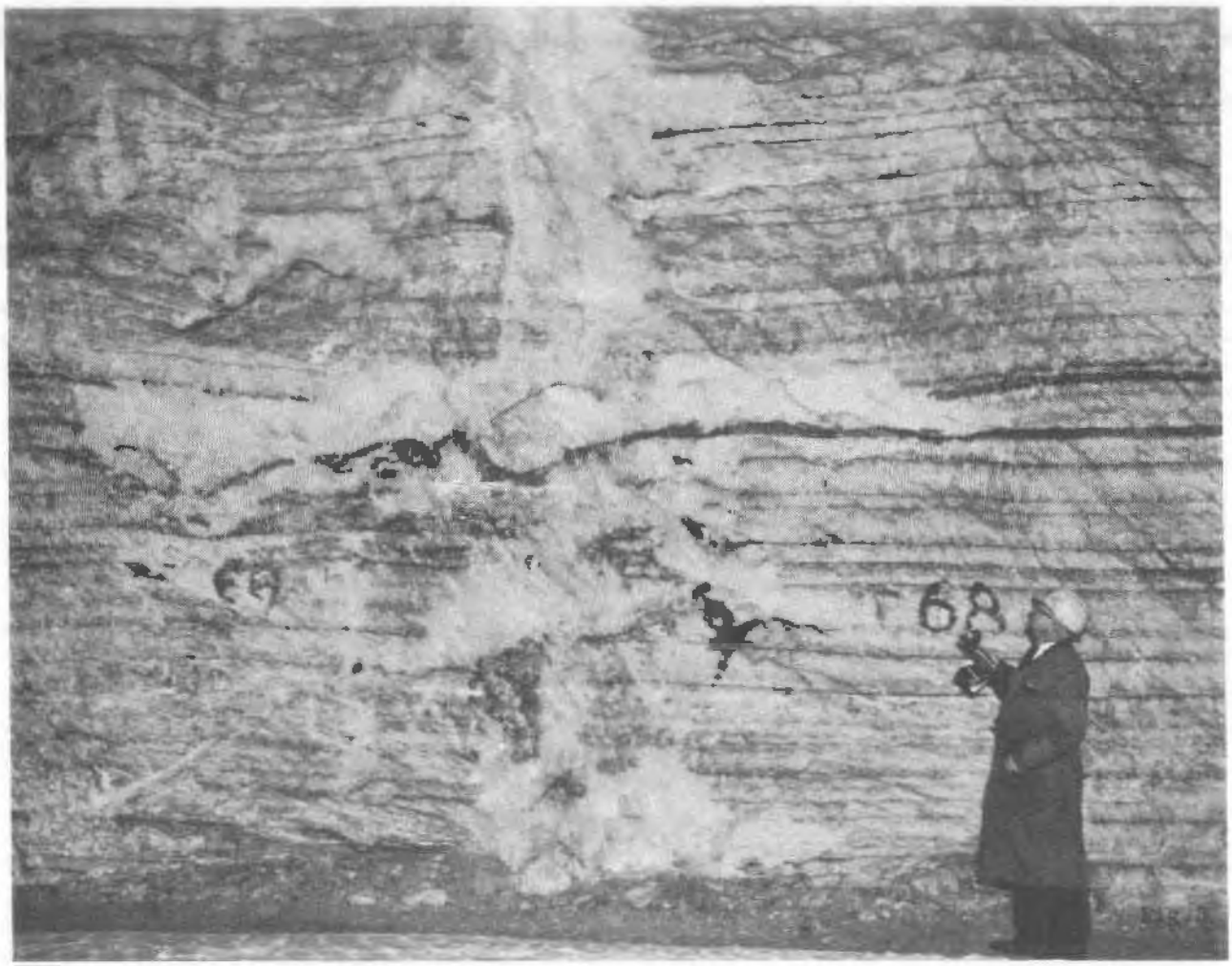

Figure 3

our opinion that at this point, the fluid would have a tendency to either travel parallel to the horizontal direction of the crystal mass or vertically to the top of the salt bed. At the top of the salt bed the fluid would follow the first major plane of weakness that it encountered, thus bed jumping would occur.

In isolated instances, these masses of crystal salt and their accompanying rock masses of solidified impurities have sufficient lateral continuity so that their rock inclusions have been termed "Rivers of Rock," Fig. 4 shows such an enclosed mass. We would not expect a fracturing fluid to split this mass but rather to follow its lateral direction. It may be noted that the salt in the upper portion of the bed is primary with horizontal laminations.

Lithological changes are known to occur in salt beds. An example of the occurrence of such a lithological change is associated with the shaft area of the Detroit Mine. When the shafts penetrated the Salina beds one was logged as "dolomite with salt inclusions." Within a few hundred years of the shaft area, the bed is a "salt, dirty with dolomitic inclusion and at a distance of 2,000 feet runs 95% NaCl. In the case of the "A-2" bed,[1] which is anhydrite in the area of the Metropolitan Airport, it becomes a bed of very pure salt in areas adjacent to and north of Detroit.

Fracturing fluids encountering a gradual change in the lithology of the salt would have a tendency to be deflected from their original direction into a new course. Likewise, impurities

[1] According to Dr. K.K. Landes.

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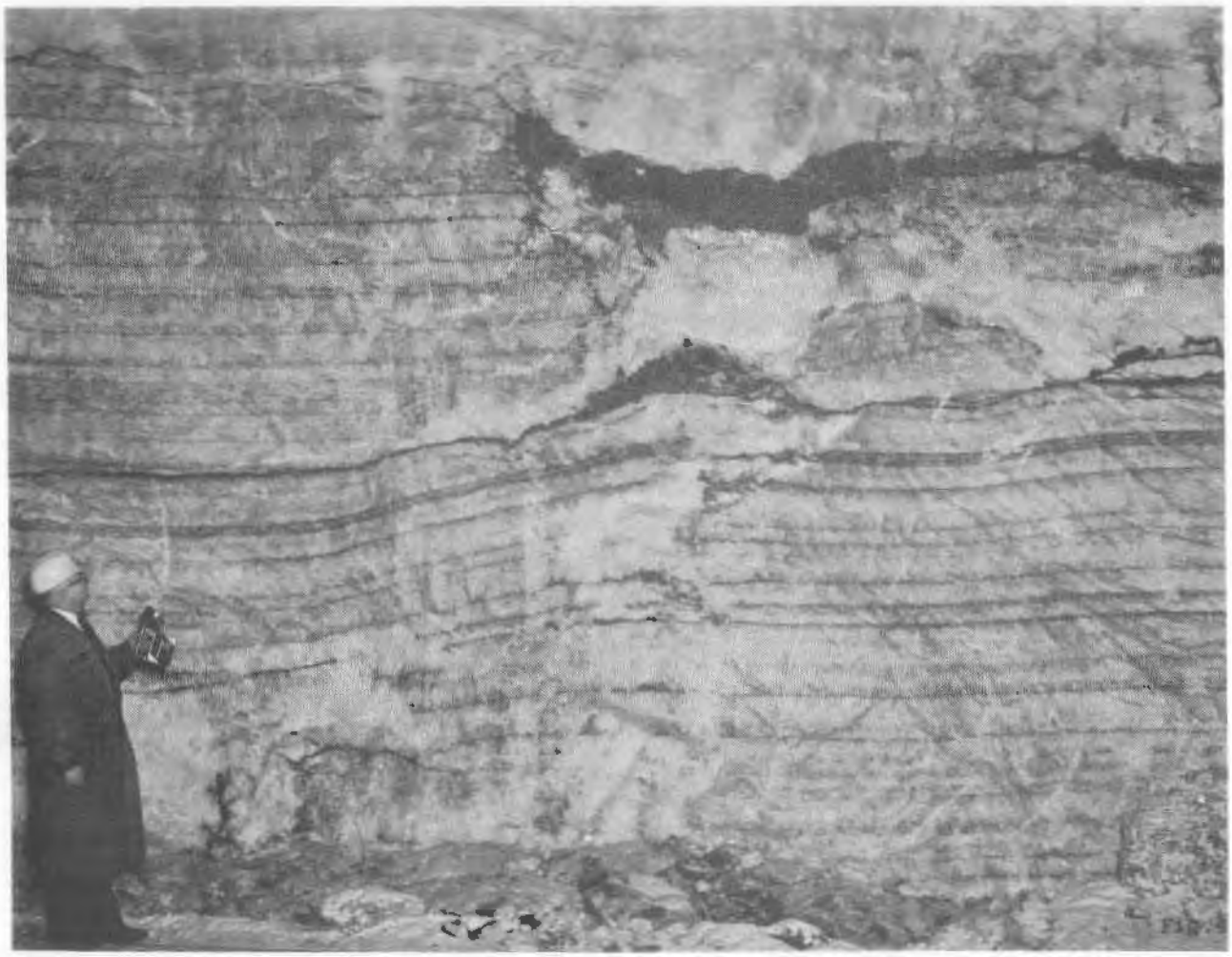

Figure 4

suspended in the fracturing fluid as a result of the dissolving of the salt, enter the crevice and alter the direction of fluid flow. As these insoluble impurities in the salt increase, their influence on direction increases.

FOLDED BEDS

In 1957 construction was begun on a new brine field at Ludlowville, New York. Based on the results of previous hydraulic fracturing operations at Watkins Glen, New York, we had come to the conclusion that the direction of fluid flow in fracturing operations where folded salt beds were involved, was parallel to the axis of these folds. It was our belief that in anticlinal structures the fluid flows more readily parallel to and at the top of any structural unit or member. Conversely, in a syncline, the bottom of a bed has a tendency to be in tension which would facilitate fluid flows along the bottom of the bed and, also, parallel to the axis of the fold. Desiring to conduct our brining operations as near the bottom of the salt bed as possible, we attempted to find a synclinal trough.

This was done by extrapolating from known geological information on the area adjacent to our proposed field and the adjoining wells of the old brine field. The data from this adjacent area, Fig. 5, showed the folding associated with the top of the 4th Salt which was the bed in which we were to attempt our proposed fracture. It was known that the soft rocks underlying the 4th Salt had suffered parallel but much more severe distortion. In some cases, recumbent folds exist at the contact between the bottom of the 4th Salt and the underlying rock. Trough to crest distances of

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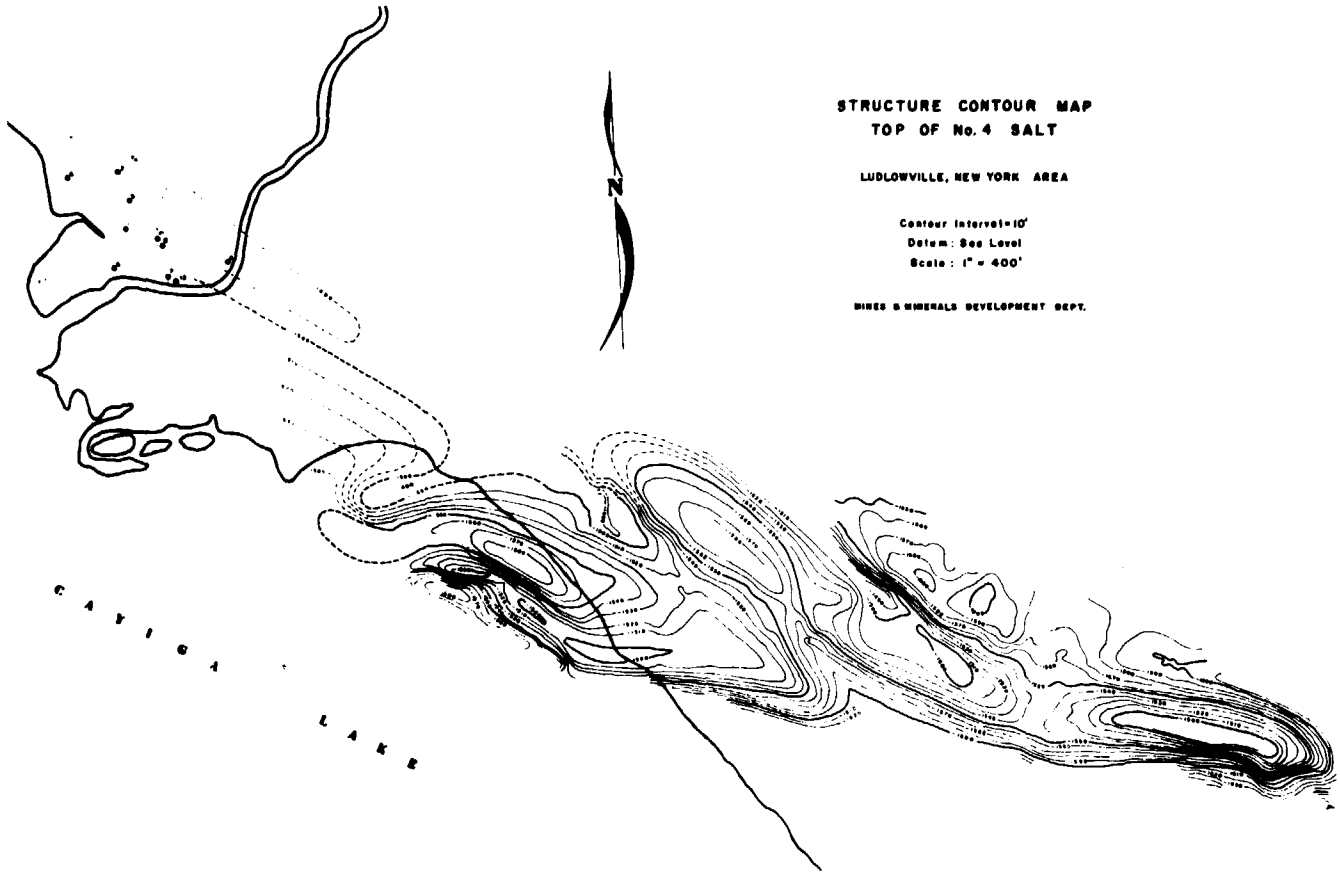

Figure 5

these folds on the bottom of the 4th Salt were as small as 200 feet with the isopach lines of the salt within this same distance ranging from six feet to 120 feet. This salt was considered as metamorphosed material. This made it imperative that both the injection well and the target well be located in the same trough.

The axial direction of the folds on the top of the 4th Salt was in an approximate direction of N65°W. By extrapolation we placed the center line of our injection well and our target well in this same orientation. The distance between these two wells was set at a nominal 500 feet.

Drilling on the injection well, Well # 20, was started by setting and cementing 20 feet of 16-inch conductor pipe. The hole was then continued with a 15-inch bit through this conductor string. Although the airline distance between Watkins Glen and Ludlowville, New York, is approximately 20 miles and the stratigraphy was thought to be the same. But the investigation showed a sharp difference in the character of the rock between the two locations. At Watkins Glen it normally required four to five 15-inch bits to penetrate 2, 100 feet. These footages included reaming of the salt sections after coring.

At a depth of 1, 500 feet, we started the coring of the Salina formation in keeping with our standard operating procedure of coring the salt sections of each new well. This is accomplished by use of a 50-foot double tube core barrel and a diamond bit. In the Watkins Glen area, this procedure with normal care has resulted in an average bit life of 3, 500 feet and a diamond salvage of 75%.

At a depth of 1, 584 feet ten and one-half inches our coring operations cut a periodotite sill which had a thickness of one foot six and one-half inches. This discovery was particularly disturbing in that, if the target well were on one side of the parent dike and the injection well on the other, we felt there could be no communication or coalescence of the two wells. Only one known dike existed in the area and none of the previous wells drilled in the area for oil, gas and salt had

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reported sills or igneous material. The closest point of the only dike known to exist in the area was 8, 500 feet.

The strike of the dike's trace was N15°W. No geophysical work had been done in the area and, thus, a field decision had to be made from the data on hand. The target well, Well # 21, was relocated in a direction of N10°W from Well # 20. With this change in direction from the original N65°W, the distance was also changed from 500 feet to 400 feet. It was our opinion that we could by this reorientation of target well location, take advantage of the same planes of weakness which gave rise to the dike and which it had subsequently caused. The target well was completed, the injection well fractured and a fractured connection established between the two wells.

For reference in future development work, a magnetometer survey was run by Seismograph Services Corporation. This survey, Fig. 6, disclosed a dike due east of Well # 20 at a distance of 925 feet. The southern end of this dike had a trace of N10°W. The trace of this dike curved through a distance of approximately 1, 000 feet, which gave its northern end a direction of N40°W.

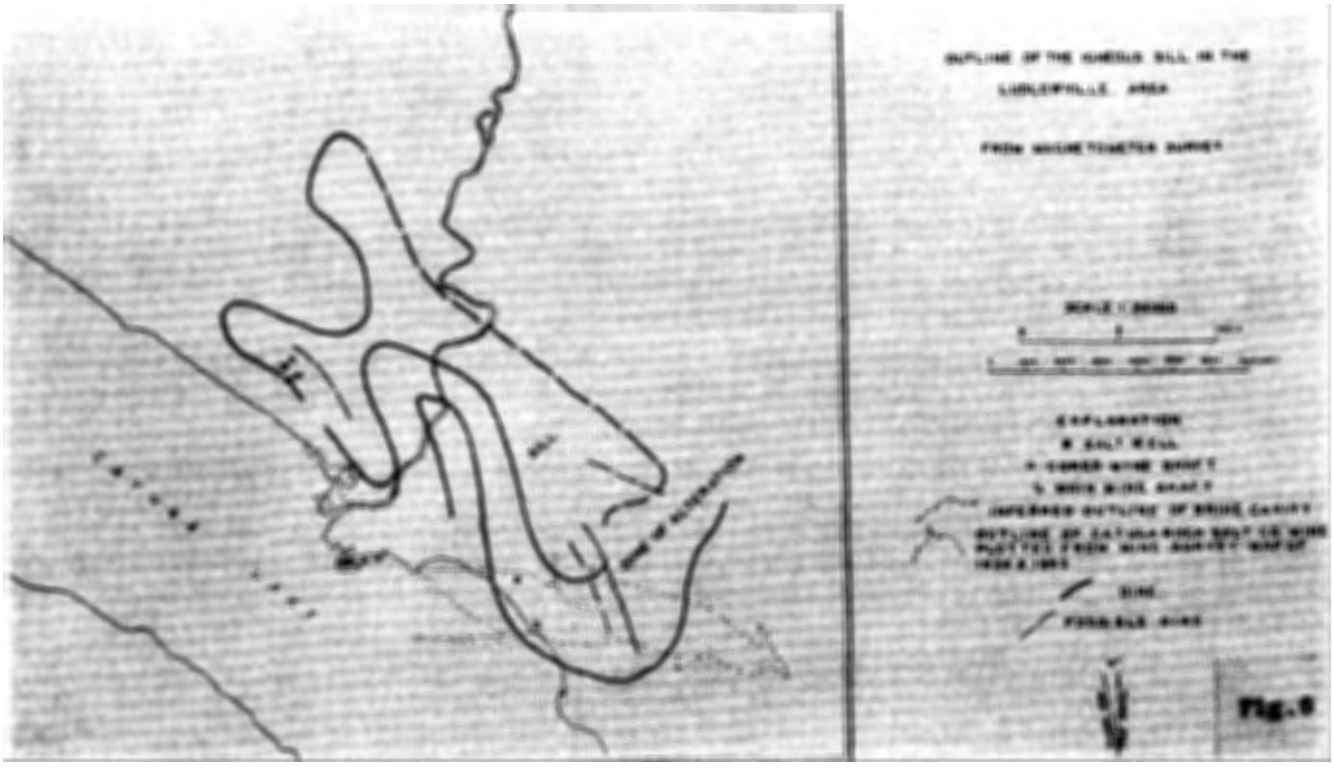

Figure 6

It is our opinion that if the two well locations had straddled this dike, no communication between the wells would have been possible. We believe that the fracturing fluid might have followed one of two courses. We consider that the most probable course would have been to encounter the dike, rise vertically to the first sill, and then flow under the sill in the line of least resistance. The second possibility would be to travel parallel to the dike in a horizontal direction.

FAULTED BEDS

The results of our initial fracturing operation at Watkins Glen were anything but desirable. In 1955 we fractured our first well, Well # 25. The target for this first injection well was a cavity which had one of its wells, Well # 24, just 200 feet north of Well # 25. A total of approximately 65, 000, 000 gallons of fluid was pumped into this well at an average rate of 400 gallons per minute over a nine-month period. Spaced intermittently during the 113 days were periods when we

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allowed the fracture to "cure." After a period of ten days to two weeks of pumping, the well was "shut-in" under pressure. It was during one of the "curing" periods that the pressure recorder fell to zero and we found the well on vacuum. At the time, three reasons were thought to be responsible for our difficulties. These were:

1. Geology of the immediate area, which was largely an unknown quantity at that time.
2. The stress concentration surrounding the cavity which might have deflected any fractures.
3. Rock movement which subsequently induced crevices in the strata overlying the cavity, allowing the escape of the fracturing fluid.

The continued development of this new brine field included the establishment of what is now a standard operating procedure, the coring of the salt sections in each new well. From this exploration work in each of the newly developed wells, there evolved a much better understanding of the local geology. Subsequent wells were located more properly. Structure-isopach maps were developed for each of the salt beds. These geological maps seem to show folded formations with distinct trends that appeared to explain the direction of fluid flow.

In 1962 a pair of two-well galleries were drilled and fractured. Instead of the fracture proceeding in an east-west direction as had been previously experienced and in keeping with the structure maps, the fractures developed in a north-south direction. Well # 33 was an injection well with an intended target of Well # 32 across a distance of 735 feet. Unexpectedly, it connected with Well # 34, or almost due north, a distance of 745 feet. Within 24 hours after the fracture had been initiated, brine was being produced by the target well. The volume of brine produced quickly reached a point where it was proportional to the volume of water injected. The quality of brine with respect to calcium and magnesium chlorides was extremely high, thus being relatively poor for the production of evaporated salt. Pump pressures remained extremely high despite the fact that large quantities of salt were extracted. No second plateau ever developed.

It was surmised that fracturing fluid had passed horizontally along a faulted zone with at least a portion of the travel route being in shale layers. It was in these layers that the brine picked up the large percentages of calcium and magnesium.

Similarly, Well # 29 fractured to Well # 32 or in an approximate north-south direction rather than the anticipated preferred direction of east and west. The original target for Well # 29 was Well # 34 located some 490 feet to the west. Well # 32 was located 810 feet to the south of Well # 29. Again, a high pressure connection between the two wells was established quickly. The brine produced had approximately the same chemical composition as that developed by the fracture between Well # 33 and Well # 34.

All four of these wells were finally abandoned as fractured galleries. A modified Trump-type single well was developed. At this point the brine produced quickly began to improve with respect to its chemical composition, gradually assuming the characteristics of a high purity brine. This conversion required that the main string of casing be perforated near the top of the cavity; a hook-wall packer on a string of casing be set below these perforations and above the end of the casing and that water be circulated down the annulus and back up the tubing.

In view of this unexpected development, our first step was to reëvaluate our geological data. Gradually, there emerged a theory of a double system of faults which controlled the direction of flow of our fracturing fluid. A careful study of our gamma-neutron logs which we had developed previously in Well # 27 and Well # 28, disclosed the # 4 Rock which underlies the 4th Salt, Fig. 7, repeats itself. The gamma-neutron logs from Well # 30 and Well # 31 demonstrated that the # 3 Rock repeated itself. The repetition of rock sequences was not found in any of the wells north of a line between Well # 30 and Well # 27, although there was a material thickening of the 1st Salt in Well # 34. This repetition of beds indicated faulting. The diastrophism which has occurred in this area was probably due to the tectonic force which created the Appalachian Uplift.

Two of our older facilities were relegated to storage of propane. These, two well galleries, were replaced by similar installations, the construction of which was started in October 1963. Based on the geology developed up to that point, we adhered to an east-west line. This was partially due to our geological findings, Fig. 8, and partially to our previous successful fracturing in an east-west direction in this southern portion of the field. Well # 35 was used as an injection

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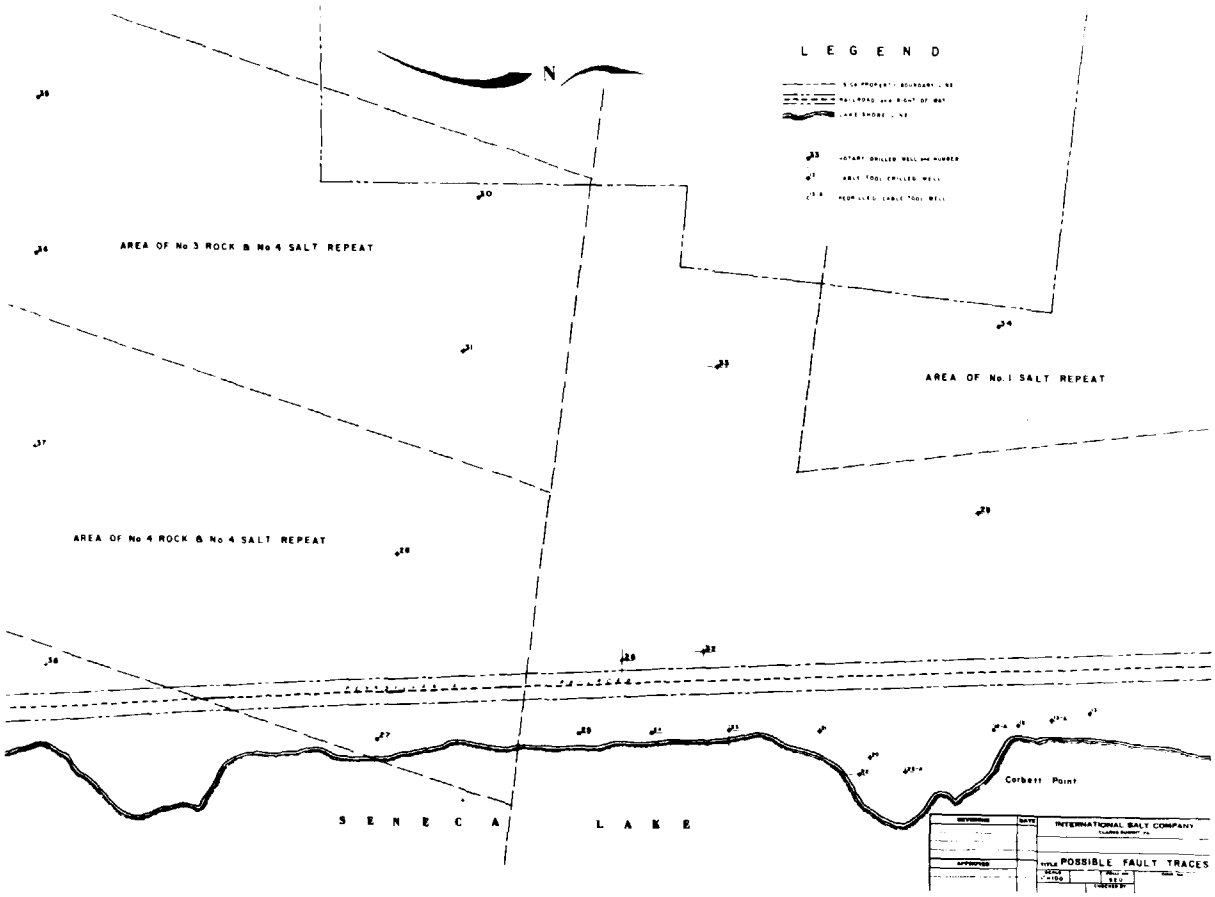

Figure 7

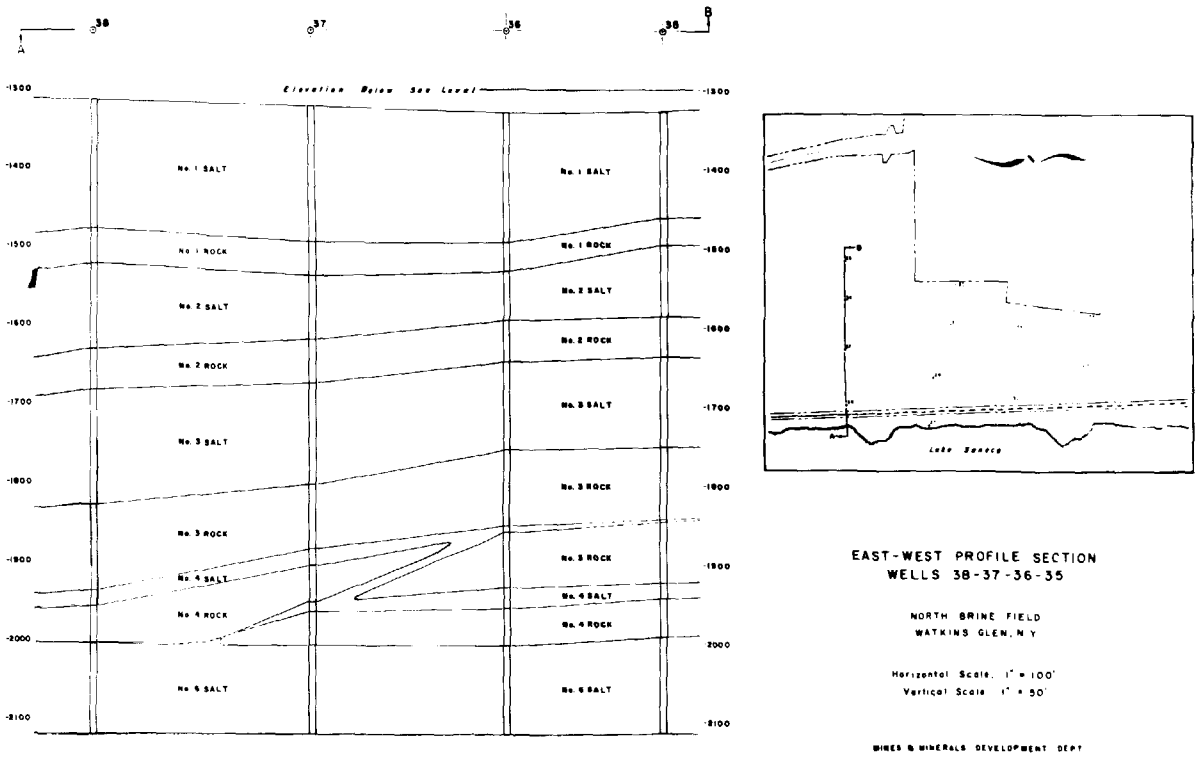

Figure 8

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well with Well # 36 forming the target well. This was designed to form a gallery 410 feet in length. The second new gallery, Well # 37 and Well # 38 were spaced 550 feet apart with Well # 37 forming the injection well. The gallery formed by # 35 and Well # 36, together with the one formed by Well # 37 and Well # 38, were both fractured, connected and washed down to less than 100 p. s. i. in less than 24 hours.

CONCLUSIONS

From the field results we have experienced, we may conclude that an accurate interpretation of the local geology will eliminate a majority of the difficulties that we have encountered during our fracturing operations. These results also point up a number of facets of the geology at Watkins Glen which are not thoroughly resolved.

It is our opinion that except on a hit-or-miss basis, your results experienced during hydraulic fracturing are only as good as your geology is accurate.

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APPENDIX D

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Recovery of Entrapped Hydrocarbons

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ABSTRACT

There are several ways in which hydrocarbons that are trapped in underground salt storage cavities may be recovered. Depending entirely on the conditions surrounding the cavity and the entrapped product, the methods which can be used are (1) drilling to a target of the highest elevation in the entrapment, (2) re-perforating, fracturing and/or washing at the Product Recovery Well and (3) de-watering the cavity so that the product is exposed to the bore of the Recovery Well.

A major portion of entrapment associated with the storage of hydrocarbons in salt cavities is the absorption of the trapped air by the product. Thus, the product fills the space of the original pneumatic trap. This paper deals with the recovery of product from a trap of over 700,000 barrels by drilling to a pre-designated target in the trap area.

INTRODUCTION

In 1956 two salt wells which were designed to furnish raw brine for the Watkins Glen Refinery of the International Salt Company were coalesced by hydraulic fracturing. This fracture was initiated in the lower portion of the bottom salt bed of the Salina formation just above the contact with the underlying soft Vernon shale. The target well for the fracture was 500 feet west of the injection well.

After having produced over 1,500,000 tons of salt in brine form, these wells and the cavity which had been formed were converted into a storage jug for liquid petroleum gas. This conversion occurred in 1964 with some 200 foot thickness of salt forming the roof of the cavity. The 200 feet constituted the top portion of an aggregate total thickness of salt beds of slightly over 500 feet. Pressure testing of the cavity and wells was accomplished by use of a dead weight indicator, with a wellhead test pressure of 0.8 times the vertical height to the top of the cavity. This 72 hour test indicated that the cavity and wells were "tight." Because of the sustained period of pumping required to obtain the pre-selected test pressure it was obvious that a sizeable air pad was associated with the cavity. Due to the fact that only fresh water was available for this test, an extended period of time was required for the cavity pressure to stabilize. This stabilization period was necessitated not only by use of fresh water which had to become saturated with salt, but also to allow the 40°F temperature of the water to reach the 72°F ambient temperature of the cavity. Rough approximations showed the volume of the air pad to be approximately 2,500,000 cubic feet. The entrapped air led to the entrapment of 431,622 barrels of propane at a wellhead pressure of 870 psig. (Table I)

ENTRAPMENT EVALUATION

A number of possible recovery methods were considered and abandoned because of their impracticality, circumstances surrounding the entrapment and/or cost. Among the systems of recovery suggested by various individuals were: (1) Exposing the bore of the well at the top of the cavity to atmospheric pressure; (2) Use of a floating snorkle-tube device whose open end would penetrate the propane above the brine-propane interface and (3) Plugging the bore of the injection well just below the top elevation of the cavity, perforating and fracturing to this high point in the cavity. At the time of this recovery effort, September 1970, there existed a serious question as to whether or not a sonar survey conducted in brine could penetrate a brine-propane interface and successfully record the configuration of the surfaces confining the entrapment. As shown in Figure 1, a successful sonar survey was conducted on September 15, 1970 and the area of entrapment outlined. Entering Well #27, the prophane injection well, with the sonar tool, we outlined the trap in

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TABLE I

Watkins Glen, N.Y. Gallery #1—Evaluation of cavity volume

Depth	Thickness	Area Sq. Inch	Area Sq. Feet	Volume Cu. Feet	Barrels	Bbl. Cumulative
2050-2055	5	.7	1,750	8,750	1,558.37	
2055-2060	5	2.11	5,275	26,375	4,697.39	
2060-2070	10	6.19	15,475	154,750	27,560.98	
2070-2080	10	9.42	23,550	235,500	41,942.55	Total barrels
2080-2090	10	12.91	32,275	322,750	57,481.78	down to the 2110
2090-2100	10	17.51	43,775	437,750	77,963.28	depth.
2100-2110	10	20.64	51,600	516,000	91,899.60	347,622 bbl.
2110-2118	8	←	Entrapment		→	431,622
2110-2120	10	23.75	59,375	593,750	105,746.87	453,369
2120-2130	10	25.26	63,150	631,500	112,470.15	565,839
2130-2140	10	27.47	68,675	686,750	122,310.17	688,149
2140-2150	10	33.40	83,500	835,000	148,713.50	836,863
2150-2160	10	36.91	92,275	922,750	164,341.77	1,001,205
2160-2170	10	38.98	97,450	974,500	173,558.45	1,174,763
2170-2180	10	39.19	97,975	979,750	174,493.47	1,349,256
2180-2190	10	38.36	95,900	959,000	170,797.90	1,520,054
2190-2200	10	34.34	85,850	858,500	152,898.50	1,672,953
2200-2210	10	33.83	84,575	845,750	150,628.07	1,823,581
2210-2220	10	18.04	45,100	451,000	80,323.10	1,903,904
2220-2230	10	12.11	30,275	302,750	53,919.77	1,957,824
						+5% = 97,891 = 2,055,715 bbl.

ten foot contours and selected that area above the depth of the 1990 foot elevation as the target area. This target area is shown in black. The bottom of Well #27, in a true vertical depth position, was calculated at 2,043 feet. The brine-propane interface of the trap occurred at this point.

GEOLOGY OF THE AREA

The Salina salt formations of the Upper Silurian are underlain by the slightly dipping Vernon shale (Fig. 2). The first salt sequences resting on this uniform plane are the D Salts. Progressing upward through 800 feet of evaporites, we encounter a composite aggregate thickness of 500 feet of salt.

Tectonically, the Salina has been disturbed by several thrusting actions of the Appalachian uplift. This diastrophism has given rise to a series of low angle thrust, tear and slip faults. In order to correlate beds of salt across these fault zones, all beds were defined by previously established nomenclature from geophysical logs (Fig. 3). Confusion arises from the fact that despite the thousands of feet of horizontal displacement that have occurred within the evaporites, the upper contact of the topmost salt bed and the lower contact of the bottom salt bed can be said to be parallel.

WELL DESIGN

As shown in Figure 4, the Recovery Well – Well #46, was equipped with 16" 65# per linear ft. H40 casing, in a 22" hole. This was set through glacial fill and into bedrock 140 feet. The extra depth to which this surface casing was set was necessitated by glacier created fractures in the upper portions of the rock which gives rise to mud losses.

After cementing the casing back to surface, drilling continued with a 15" bit to a depth of 1,494 feet. Zones of lost circulation are encountered in the Marcellus, Cherry Valley and Oriskany at an elevation of 1,255 feet to 1,445 feet below the surface. These zones normally contain a hydrogen sulphide bearing, ammonia contaminated connate water which will not only foul the artificial brine but also will throw stored hydrocarbons off specifications.

An intermediate string of 13-3/8" H40 48 pound per linear foot casing was set to a depth of 1,494 feet. This casing was centralized and cemented back to the surface, thus sealing off all the aquifers above the salt horizons. The hole was continued from this point with a 12-1/4" bit, penetrating the top of the first salt bed at –1,848 feet sea level (s.l.) and bottoming at –1,888 feet (s.l.). A string of 8-5/8", K55, 32 pounds per linear foot casing with long

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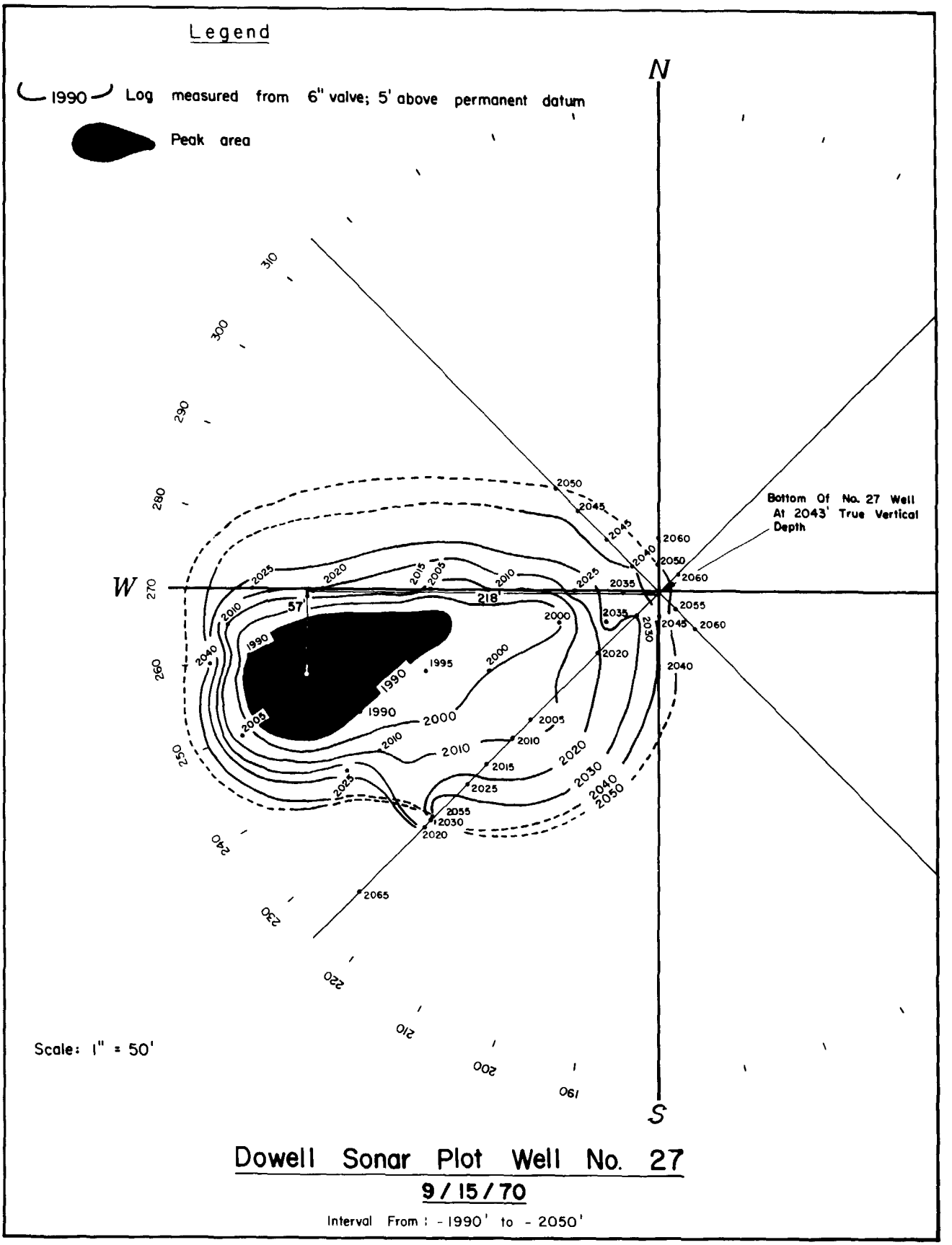

Figure 1. Map of storage area showing the location of the propane injection well #27.

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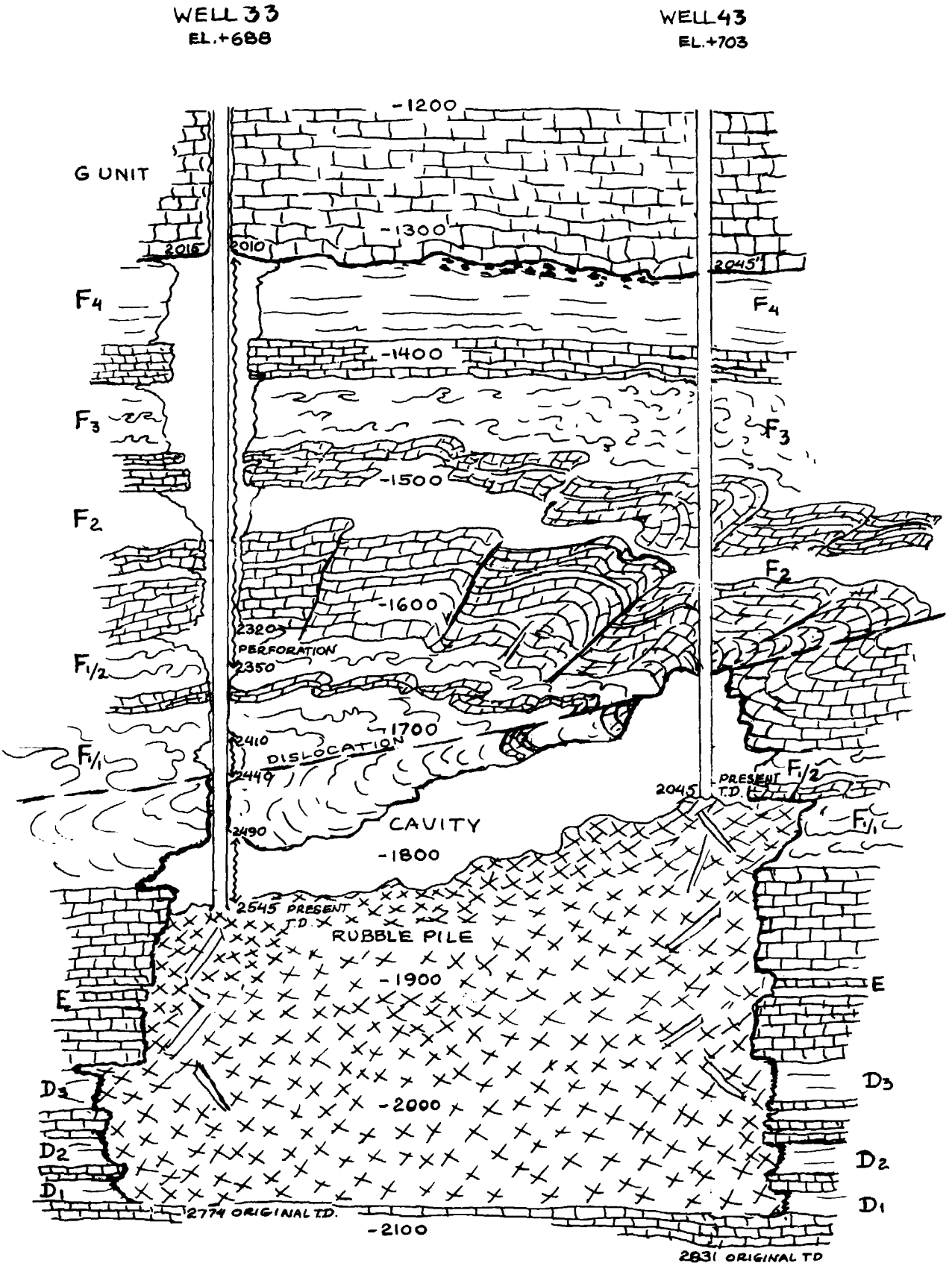

Figure 2. Diagram of the salt storage cavity in the Salina Salt and overlying strata.

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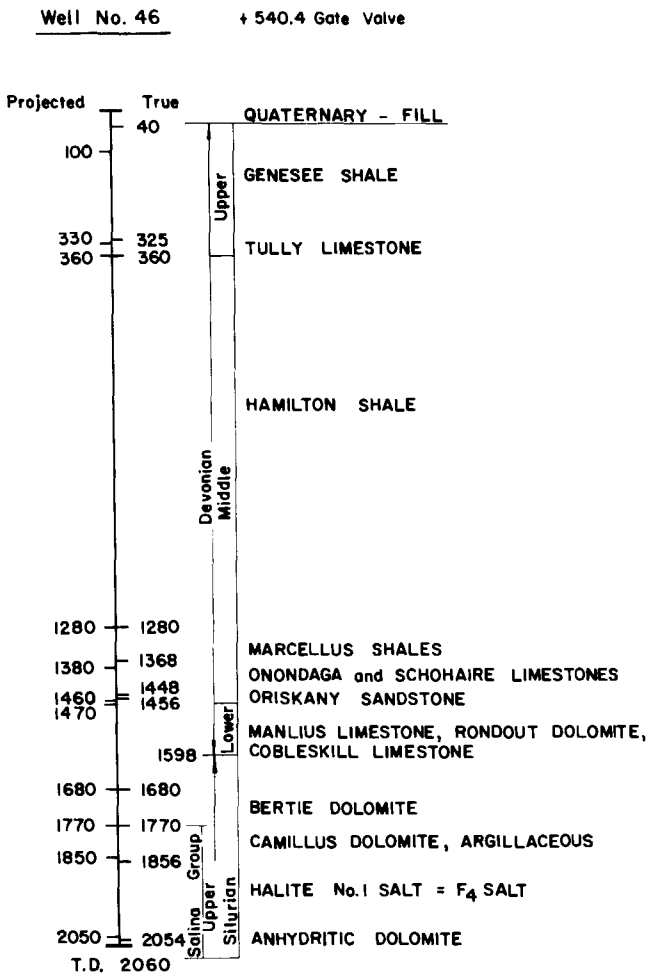

Figure 3. Lithologic log of the stratigraphic sequence as displayed in Well #46.

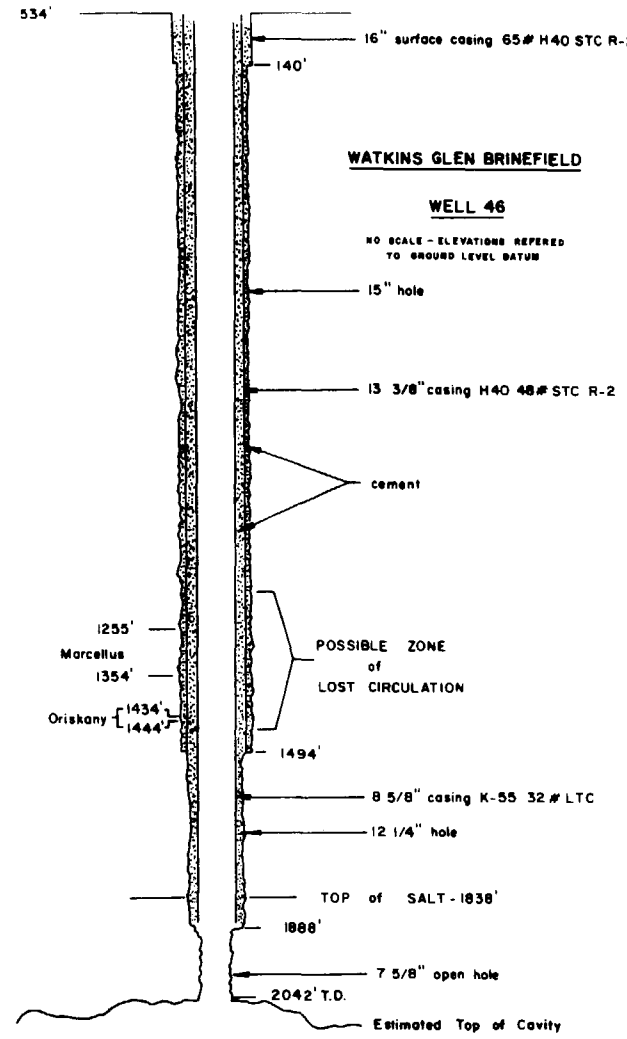

Figure 4. Diagram showing the Recovery Well #46, its casing, and the formations penetrated by the well.

threads and collars was set to the total depth and cemented back to surface. After the cement had set, a 7-5/8" bit was used to drill into the cavity. As the top of the cavity was approached, voids associated with parting planes below the cavity's stress arch were encountered before the piercement of the cavity.

WELL COMPLETION & RECOVERY

Figure 5 illustrates the deviation of the well from the pre-selected target area. Since this deviation was in an up-dip direction and since the solution of salt in situ normally occurs in an up-dip direction, this deviation was considered to be of miniscule importance. The surface location for Well #46 was selected so as to take advantage of the normal deviation experienced in the previously drilled Wells #27 and #28. Due to the incorporation of a bumper sub in the drill string, a device not available during the construction of Wells #27 and #28, the recovery well showed less than normal deviation, thus requiring the setting of two whipstocks for directional control. The first of these whipstocks was set at 1,587 feet and the second at 1,770 feet.

Sperry-Sun supplied the single-shot, vertical-deviation survey instrument whose data was used to develop Figure 5. A slight deviation in the form of a clockwise spiral was noted down to a survey point #5 or 1470'. The whipstock set at 1,587' started a proper hole trajectory as shown in point #6 located at a depth of 1,701 feet. The second whipstock set at 1,770 feet increased the angle of deviation as shown by point #7 located at 1,812 feet. Total deviation from the 10 foot target was 12 feet to the north northeast.

Upon completion of the cementing of the 8-5/8" casing a Hydrill double-ram, blow-out preventers and a rotating head were installed before the follower plug and cement were drilled out. As a safety measure in the penetration of the cavity, the bumper sub and drill collars were omitted

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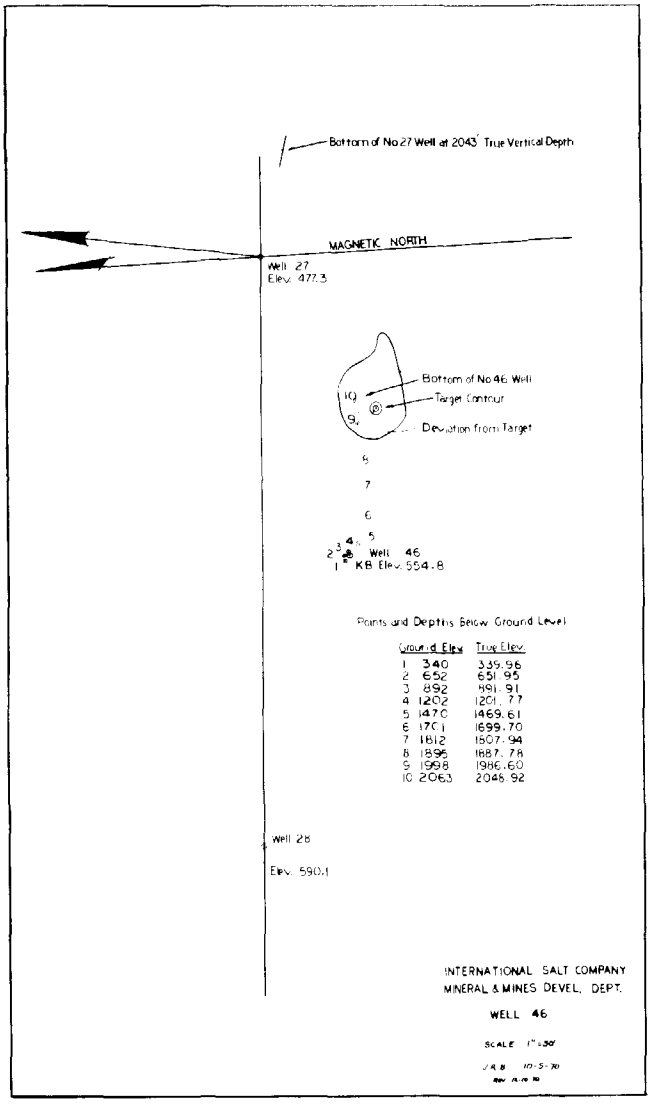

Figure 5. Deviation of the Recovery Well #46 from the pre-selected target.

from the drill string. All equipment and the well were pressure tested before drilling out the cement and after drilling out to a depth of 1,940 feet. Below a depth of 2,025 feet the well began to encounter strata or roof separations. With depth these separations became of great dimension with a corresponding increase in the loss of drilling fluid.

The recyling well, Well #28, had been set in an open flow condition so that drill fluid entering the cavity could displace brine thus maintaining an unobstructed flow of the brine drilling fluid into the cavity. All circulation was lost at a depth of 2,039 feet. The rig pump maintained a flow of 250 gpm at 0 psi. A standby pumping unit began injecting brine into the choke line on the blow-out preventer at 200 gpm and a minor return flow developed. The cavity was intercepted at a depth of 2,048 feet and all return circulation was lost. In order to prove the validity of a cavity interception rather than that of a parting, the drill bit was lowered 4-1/2 feet in the cavity. There was no further return circulation of drilling fluid and no propane was detected at the end of the blooey line with the pipe rams closed.

Consultants for the insurance company insisted on the installation of a Baker stationary-snubber, a platform and another blow-out preventer on top of the Hydrill blow-out preventer which had been installed previously. Withdrawal of the 2-7/8" drill pipe began with the pipe being laid down as it was withdrawn. When all but 5 joints of drill rods had been extracted there was a slight odor of propane from the rods. The rods were filled with brine by connecting up the kelly while still injecting brine into the annulus. Subsequently, the pulling of the rods continued successfully until the bit was landed and the master valve closed. It was unnecessary to use the snubbers.

Immediately a caliper log and gamma ray log were run in the hole. A sonar log was run the following day within the propane entrapment. Figure 6 delineates the parameters of the entrapment area. Well #46, although north of the original projected target, is still south of the high point of the cavity in this survey. The dashed line represents the area of residual entrapment not recoverable through Well #46.

The top of the rubble pile was surveyed resulting in Figure 7. Cross sections of the sonar survey of the cavity in an east west direction are shown in Figure #8. This cross section shows the limit of the original entrapment and the calculated maximum depth of propane-brine interface. This calculated value assumes voids. Subsequent to the survey, the porosity of the rubble pile was found to decrease markedly with increases in depth. As the size of the pile increases with depth and the porosity decreases, the storage volume decreases to a miniscule value near the bottom of the cavity. Figure 9 is another cross section developed as a result of the survey, showing the profile of the cavity and rubble pile in a northeast-southwest direction. Illustrating the northwest-southeast profile of the cavity is Figure 10.

SUMMARY

In summarizing this propane recovery effort with respect to the circumstances surrounding the entrapment, the geology and the recovery effort itself, the following observations can be made:

1. In a cavity capable of holding approximately 2,000,000 barrels of hydrocarbons, an entrapment of over 400,000 barrels is exceedingly inefficient.
2. The entrapment was a direct result of the solubility of the air pad in propane so that the volume of hydrocarbons entrapped was directly related to the volume of air.
3. Cavities in bedded salts in general have larger roof areas per unit of volume of space than dome salts and,

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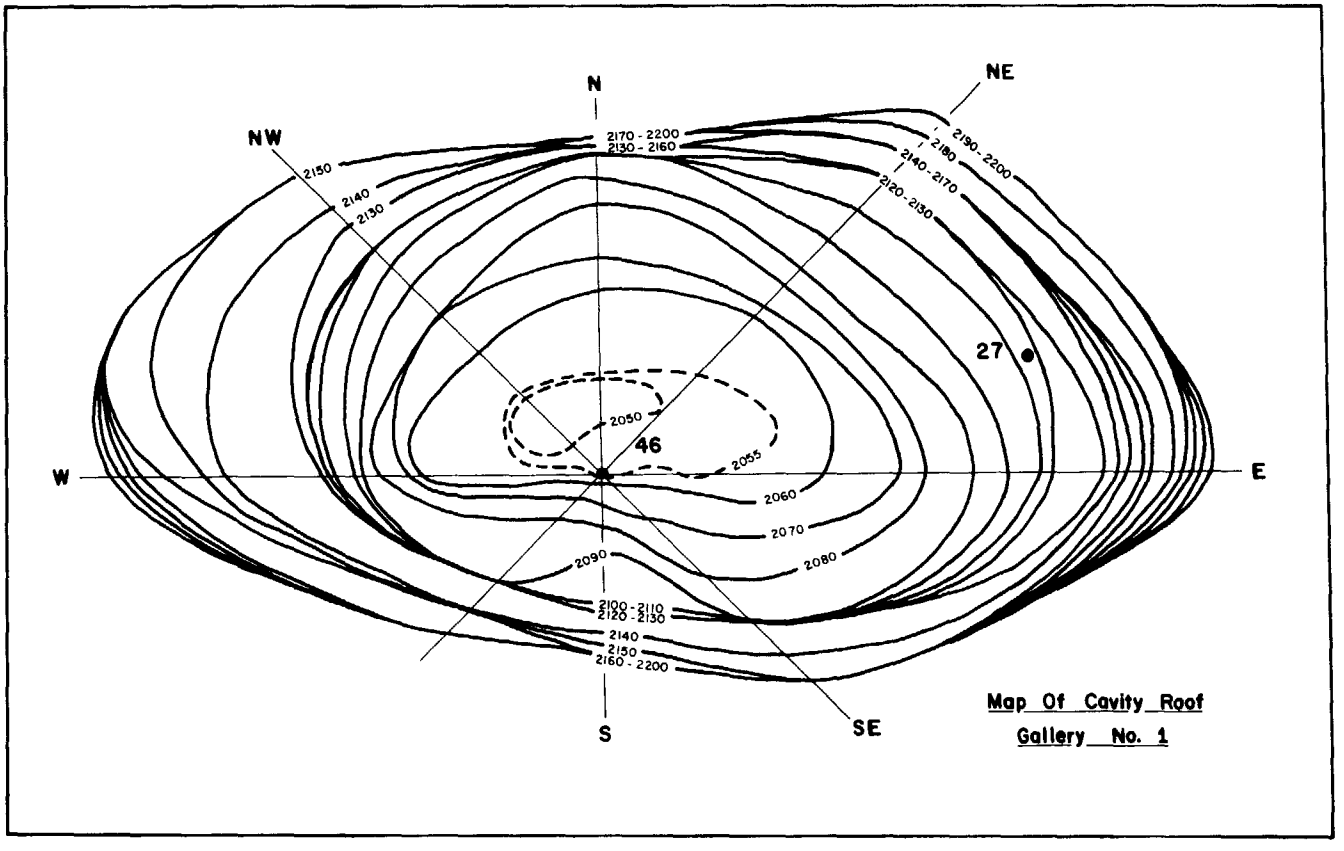

Figure 6. Map of the roof of the cavity in Gallery No. 1.

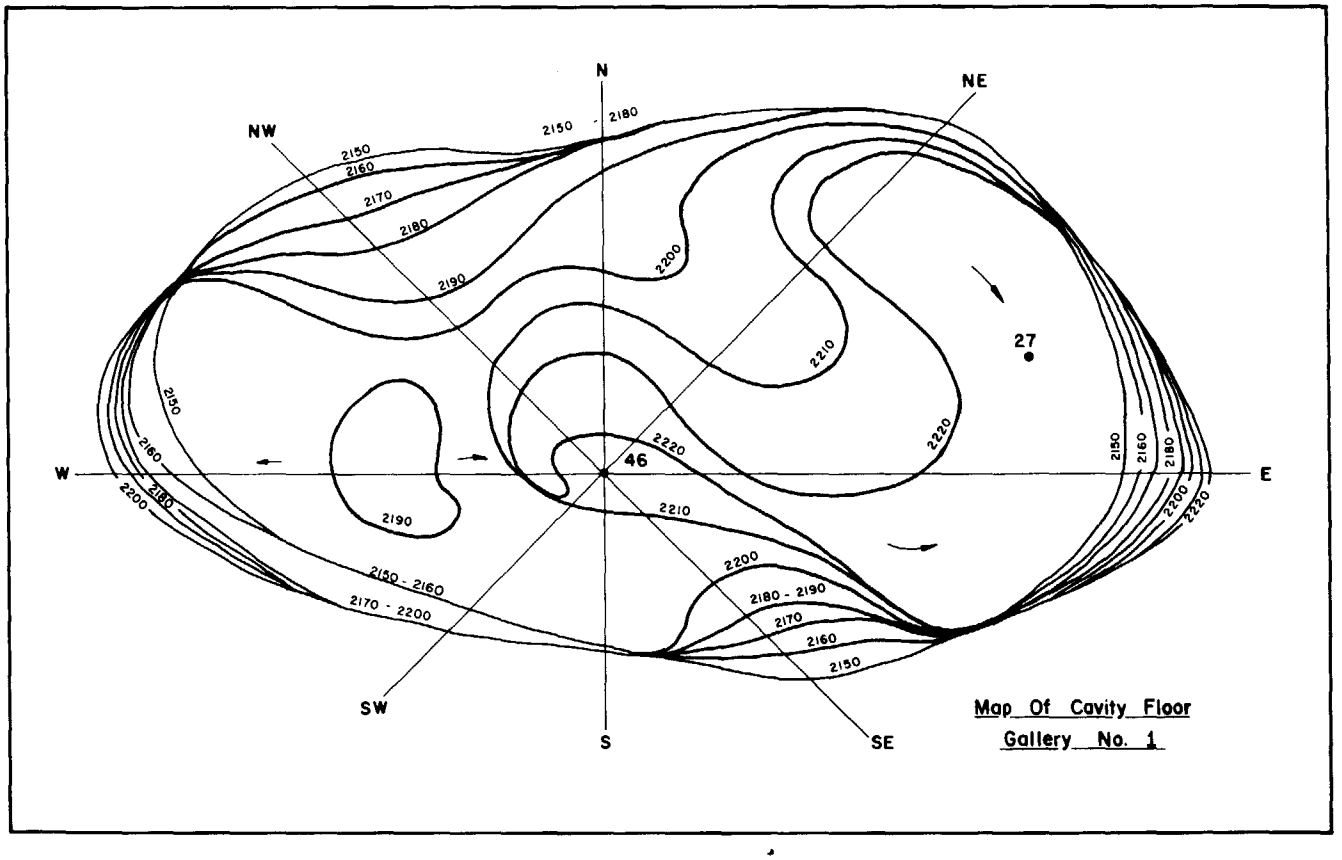

Figure 7. Map of the cavity floor in Gallery No. 1.

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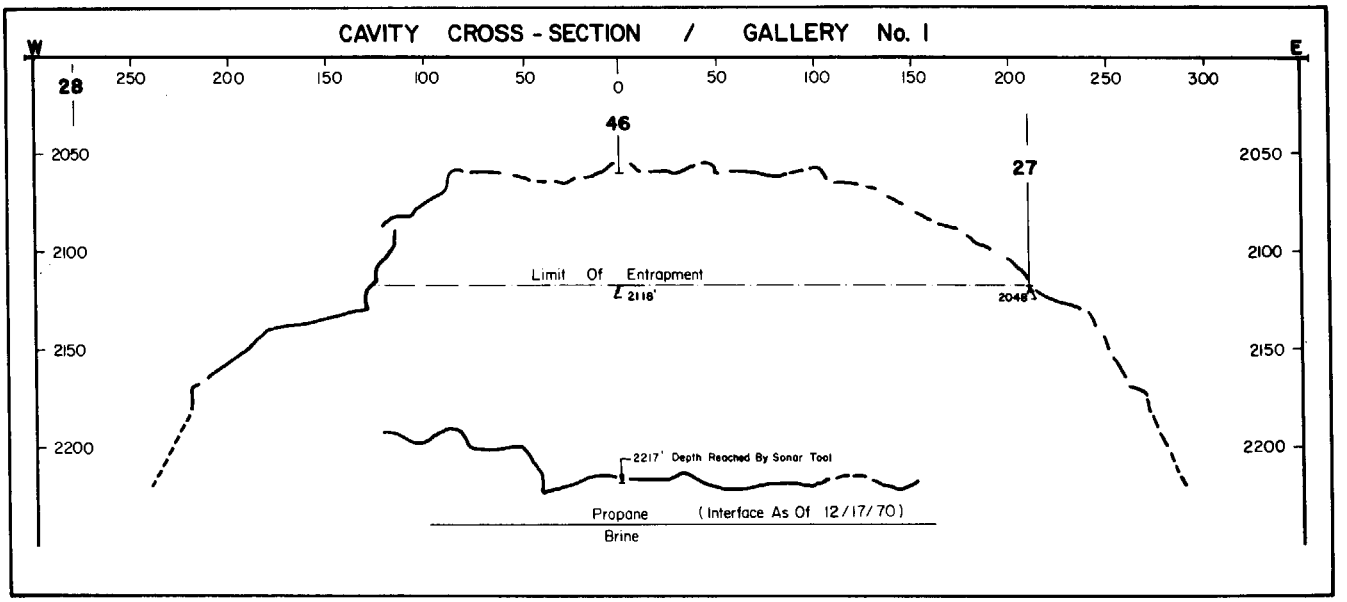

Figure 8. Cross section of the salt storage cavity through Gallery No. 1 (E-W).

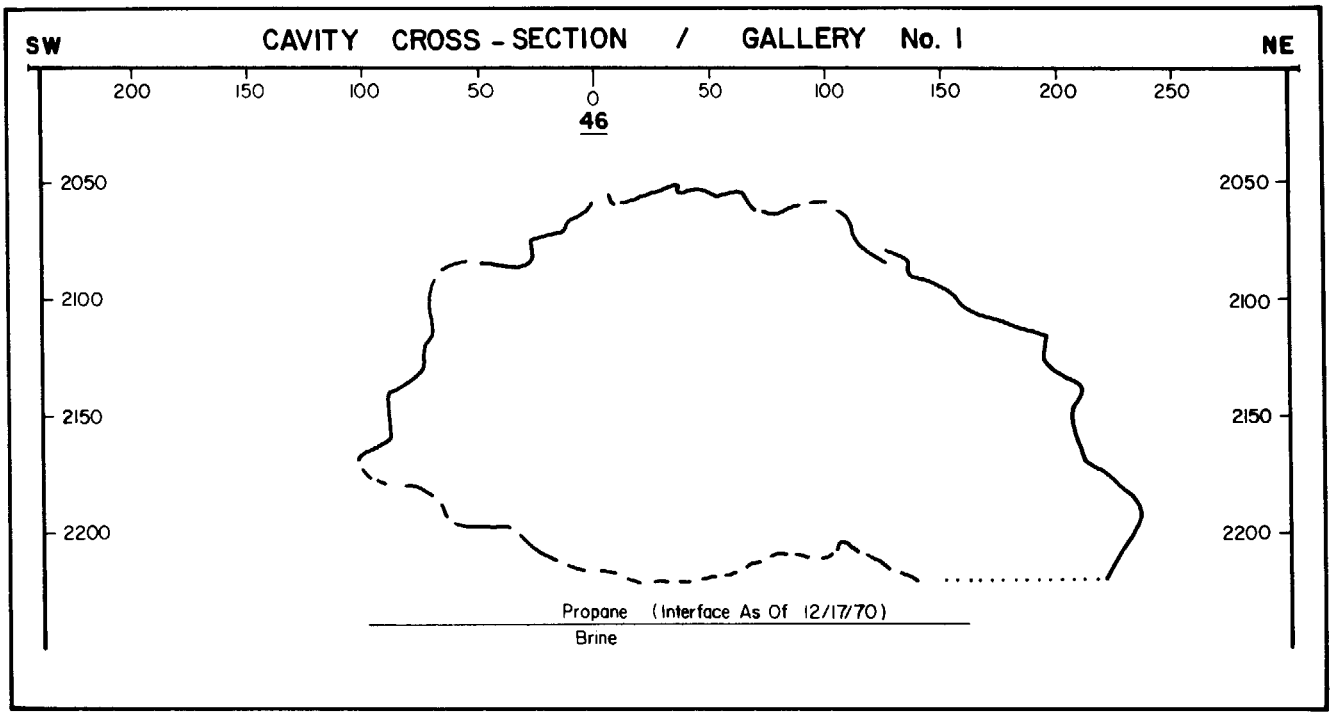

Figure 9. Cross section of the salt storage cavity through Gallery No. 1 (SW-NE).

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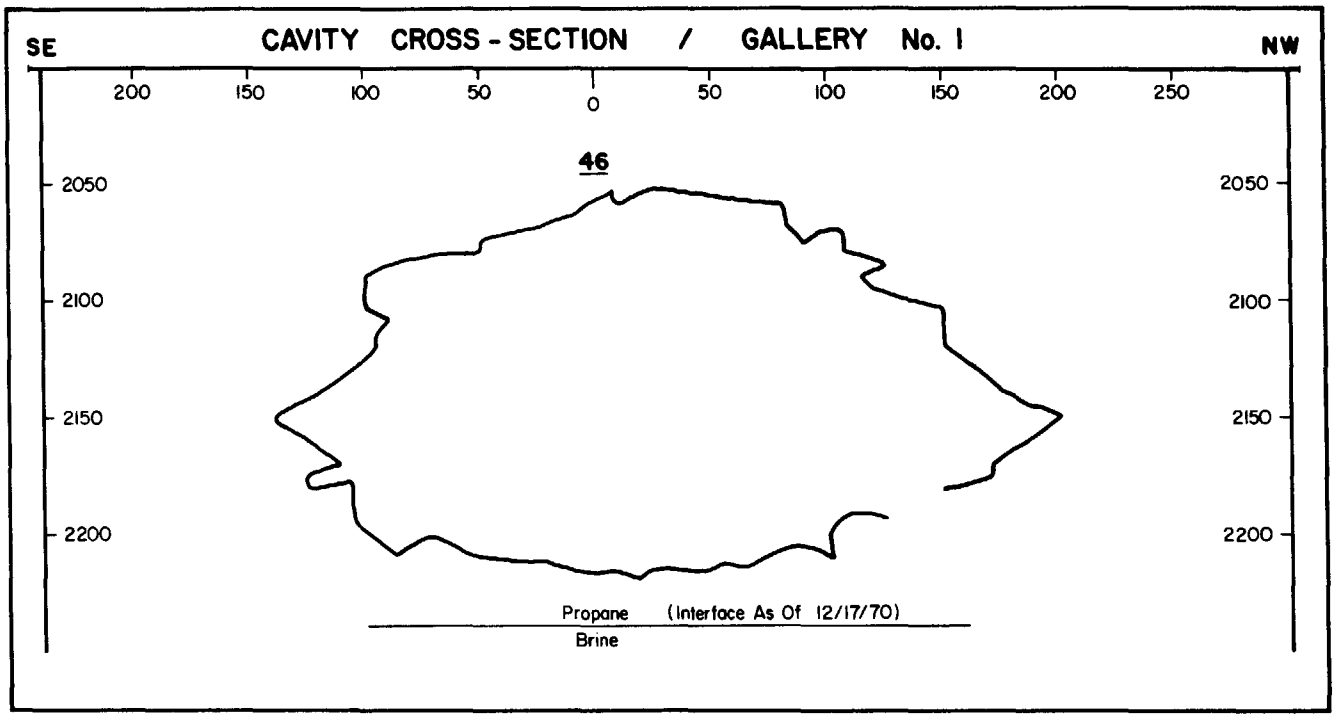

Figure 10. Cross section of the salt storage cavity through Gallery No. 1 (SE-NW).

therefore, a greater potential for a larger entrapment per unit volume of hydrocarbon stored.

4. Since all but approximately 15% of the 431,622 barrels was recovered, the recovery effort was considered successful.

5. The original sonar survey was indicative of the high point in the area of entrapment but the definition was insufficient to provide a precise target for interception by drilling.

6. Separation of laminae or partings may be expected above the cavity roof and below the stress arch. It should be anticipated that these voids may contain propane.

7. Using the proper hydrodynamic techniques, drill rods and bits may be extracted from the recovery well after penetrating the hydrocarbon without the use of such special equipment as stationary snubbers.

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APPENDIX E

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Appalachian Foreland Thrusting in Salina Salt, Watkins Glen, New York

C. H. Jacoby
L. F. Dellwig
International Salt Company
Clarks Summit, Pennsylvania and
University of Kansas
Lawrence, Kansas

ABSTRACT

The Watkins Glen area lies along the western edge, and at the northern termination of mapped Allegheny Plateau folding. Surface mapping of the Devonian strata identified a series of northeast-southwest trending open folds. Studies to the northeast of the brine field in the mine of the Cayuga Rock Salt Company at Myers, New York resulted in the identification of a decollement beneath the mine-salt section, the faulting and folding being easily correlated with the major surface structure. In the Watkins Glen brine field a major north-south strike-slip fault extends down at least to a bedding (step) thrust along which the block to the west of the tear fault has moved north a minimum of 1200' in the southern portion of the brine field. As the thrust breaks up into the upper portion of the section to the north, the fault divides into several faults each of which compensates for a portion of the total displacement along the single thrust to the south. Additional faulting on a small scale as well as minor folding are recorded in nearly all wells, but correlation of these is not possible.

INTRODUCTION

The Watkins Glen area lies along the northwestern edge, and near the northeastern termination of mapped Allegheny Plateau folding (Figure 1). Surface mapping of the Devonian strata in 1909 (Williams, Tarr, and Kindle) defined a series of east-northeast trending open folds, prominent among which is the Firtree Point anticline. Until 1955 most geologists considered such broad open folds of the Appalachian Plateau (Allegheny Plateau of the Watkins Glen area) as deep structures which persisted into the underlying Paleozoic sequence of rocks. Although this view prevailed for the plateau in general, the Cumberland Block marginal to the thrust faulted Valley and Ridge Province in the Southern Appalachians was documented as early as 1934 (Rich, 1934) overlying a bedding thrust (Pine Mountain). Subsequent study (Wilson and Stearns, 1958) resulted in the identification of a similar thrust to the south and west of the Sequatchie anticline.

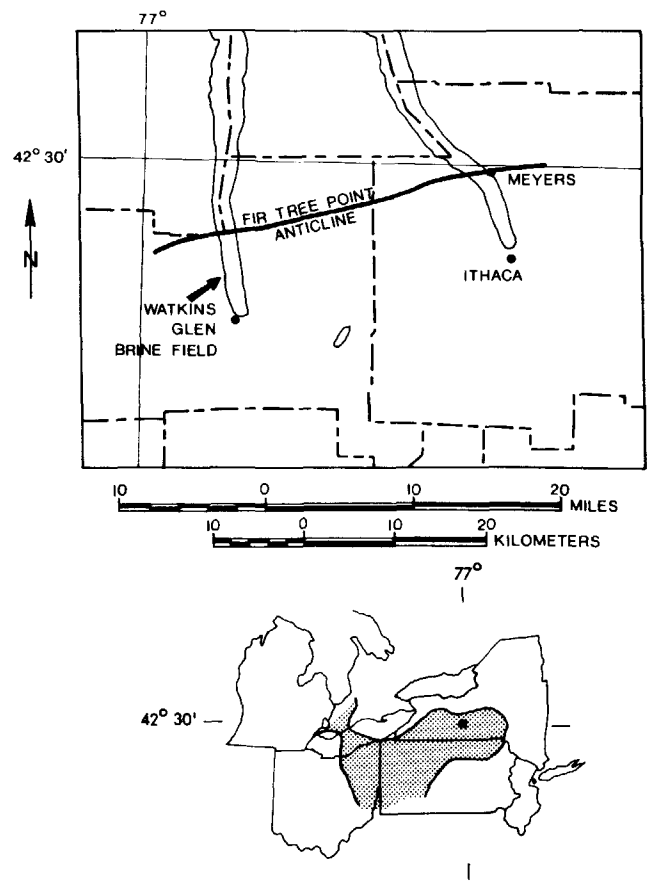

Figure 1. Index map, Watkins Glen, New York area.

Although bedding thrusts were accepted for the Cumberland Plateau of the Southern Appalachians, no such

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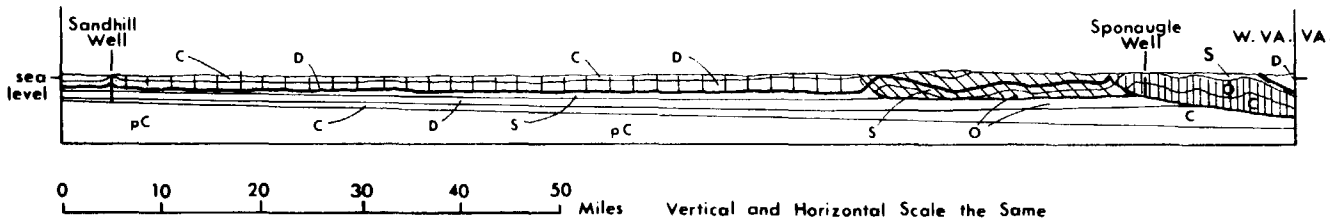

Figure 2. Theoretical cross section of Appalachian Plateau province in West Virginia (along line A-A', Figure 5) to illustrate the decollement hypothesis for folding. Vertical and diagonal lines indicate possible extend of decollements, as in Figure 5. Letter symbols: C—Carboniferous (including Permian); D—Devonian (heavy line = Lower Devonian); S—Silurian; O—Ordovician; C—Cambrian; pC—Precambrian (Rodgers, 1959).

structures were identified or even considered a probability in the Allegheny Plateau adjacent to the Central Appalachians. This in part might be attributed to the domination of the deformation of the adjacent Valley and Ridge Province by folding rather than by faulting. However, with the drilling of the Sandhill Well, in Wood County, West Virginia in 1955, there began the development of the concept of northwestward sliding of the near horizontal strata which overlie the viscoplastic Silurian salt on the Plateau (Figure 2), (Rogers, 1959). This concept has since been documented in several additional areas as a result of renewed subsurface exploration on the Plateau.

Although by 1955, the regional picture of the decollement tectonics in the Allegheny Plateau was well established, little was known about the details of movement in and above the lubricating Salina salt. In 1955 Jacoby obtained the first salt core recovered in the Watkins Glen area and a year later secured a similar Watkins Glen area core from Well 25 (Figure 3) which cut only the F3 and F2 salts. Partially due to the intense deformation and flowage which had been observed in the F1 salt in the Cayuga mine at Meyers, New York, the faulting in the Watkins Glen-Ludlowville area went uninterpreted.

With the drilling of Well 29 at Watkins Glen in 1958, core logs and gamma ray curves gave the first discernible evidence that thrust faulting had occurred. Coring and logging of additional wells led to the establishment of the first cross section of the Salina in this area in 1961 (Jacoby, 1963, 1969).

Prucha (1968) in 1964 conducted a study in the mine of the Cayuga Rock Salt Company at Meyers, New York which resulted in the identification of the decollement beneath the mine salt section, the faulting and folding being easily correlated with the major surface structure. In his analysis of deformation he predicts that southward the surface of detachment would pass into a thrust fault. In 1967, Dellwig undertook a comprehensive study of the structural aspects of the Watkins Glen brine field, utilizing additional cores and gamma logs made available by the drilling of Wells 39, 40, 41 and 42 in 1964. In 1968 this study was further expanded by utilizing logs from the newly drilled Wells 43 and 44 and again in 1972 with data from Wells 47, 48, 49, 50, 51 and 52.

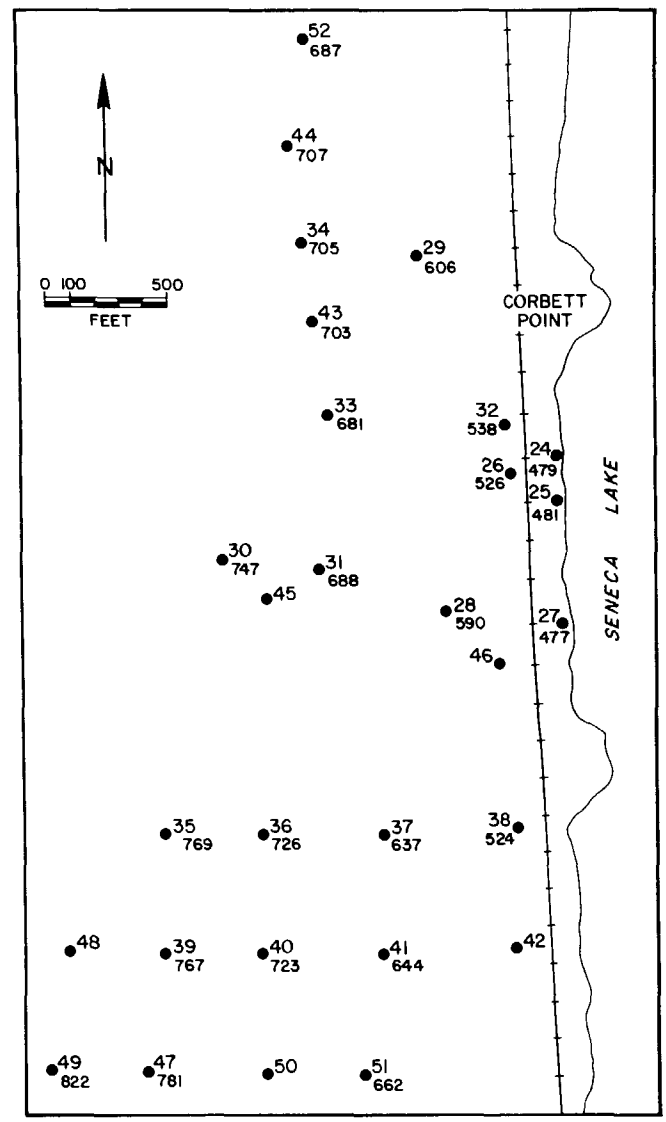

Figure 3. Index map, Watkins Glen, New York, brine field, International Salt Company. Upper number of each pair is well number, lower is surface elevation (where known).

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BRINE FIELD

The first salt well was drilled in Watkins Glen at Salt Point in February 1893. This and the subsequent wells were located in and around International Salt Company's evaporator plant in the development of what is now termed the "South Field." These wells used the system known as "Annular Injection" in which water is pumped down the annulus formed by the casing and the tubing of the well and the brine is recovered through the tubing. Due to the folk-lore belief of the cable tool drillers as to the location of bottom of the salt formation, plus the presence of a 4 to 6 ft. layer of anhydrite within the F3 salt sequence which blankets the Watkins Glen area, wells were terminated after penetrating 90 ft. of the F3 salt.

Wells drilled during these early years were drilled as single wells equipped with a string of swaged two diameter wrought iron casing, some type of pumping device and tubing. The wrought iron casing was not cemented in place and occasionally was galvanized or wrapped to prevent its corrosion by the Oriskany or Cherry Valley "black water." The original air lifts which were installed in the wells were made necessary by the lack of the seal behind the casing which would have isolated the brining fluids from the overlying formational fluids. This air lift system gave way to modernization by the installation of submersible pumps and tubing. Gradually, during brining operations, all of these old style wells which had formed a morning glory-shaped cavity, coalesced with adjacent wells at the contact between the top of the F3 salt and the overlying shale. Due to the broad roof spans which were developed, there was apprehension of damage to the surface by rock movement. Brining operations in the vicinity of the plant were discontinued with the closing down of Wells 4 and 7A in 1960.

With the drilling of Well 25 in 1955, not only was the first accurate subsurface geological data obtained in the Watkins Glen area, but a rotary oil field rig was utilized for the first time for the drilling of a salt well in the state of New York. Additionally, this was the first salt well in the state of New York to be hydraulically fractured. This new style of salt well was fractured at the bottom of the salt sequences which was by then (1955) known to have a total aggregate thickness of over 500 feet. Generally, these wells were drilled with a 12-1/4 in. bit equipped with a string of 8-5/8 in. steel casing and cemented back to surface. This cementing not only allowed a pair of fracture connected wells to operate on pressurized U tube system, but it also protected the casing against the corrosional black waters of the formations penetrated by the well. Fracturing of the salt formations was accomplished either by perforating the casing at a pre-selected point in the salt just above the Vernon shale or "landing" the casing just above this point, drilling out and applying the pressure to the formation exposed to the well bore.

All subsequent wells were cored and electrically logged in order to clarify an understanding of the local geology, interpret the results of hydraulic fracturing and extrapolate these findings for the location of other salt wells. As development proceeded with respect to fracturing and brining operations, it became obvious that more care was required in the interpretation of the geological data.

STRATIGRAPHY

The salt sequence of the Syracuse Formation penetrated by the brine wells at Watkins Glen consists of an interbedded sequence of salt, dolomite and shale, ranging in thickness from north to south from 725 ft. (a true thickness with no duplication through thrusting) to 800 ft. The base of the sequence there is found to depths of 2900 ft. (at an elevation of –2100 ft.) as compared with a depth of –1880 ft. at the Cayuga Rock Salt Company mine. Based on subsurface log data, the base of the sequence strikes N. 78° E. and dips 185-190 ft./mi. to the south.

In the definition of stratigraphic units in the wells in the Watkins Glen brine field, both the classification used in early logging and that of Landes (1945) are indicated. The uppermost identifiable salt of the sequence was originally defined as the No. 1 Salt (F3 Salt) and the rock unit immediately below the No. 1 Rock. On this basis six salt and 5 intervening rock units were originally defined, units were easily recognized by the gamma ray log signature (Figures 4,5). Several stratigraphic logs show some digres-

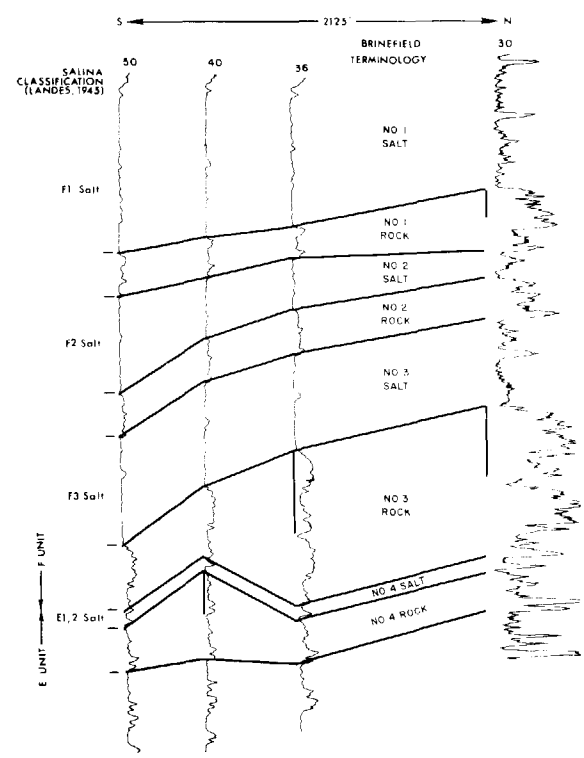

Figure 4. North-south section correlating on gamma ray logs, No. 1 Salt to No. 4 Rock. Thick vertical lines delimit repeated section.

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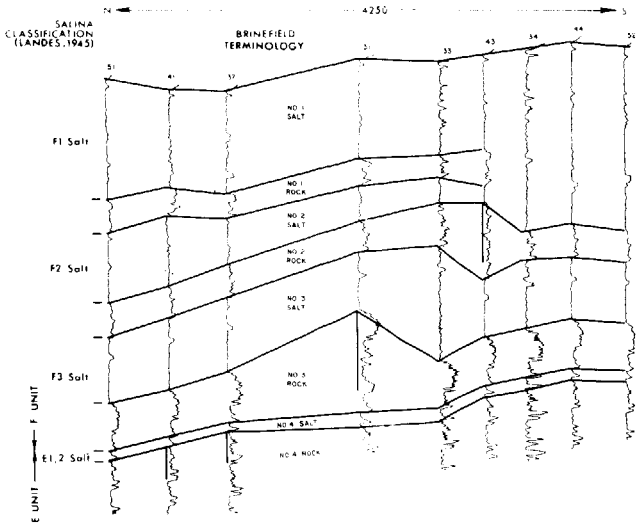

Figure 5. North-south section correlating on gamma ray logs, No. 1 Salt to No. 4 Rock. Thick vertical lines delimit repeated section.

sion from the normal classification and these were revised to fit the normal sequence. At the northern end of the field, correlation of No. 4 Salt, No. 6 Salt and No. 4 Rock can be accomplished with little difficulty, whereas in the south end of the field, repetition of the lower units is common but correlation can be accomplished with relative ease in rock and salt units 1, 2 and 3. Repetition of rock units is generally easily identifiable, for the gamma ray-neutron log "signature" of each individual unit is unique (Figure 6). Repetition within a salt unit is more difficult to recognize because of the lack of a characteristic signature.

STRUCTURE

In gross aspect the local structural picture is relatively simple, provided of course, that one ignores the multiplicity of small faults which play a critical role in the development of the brine field. A major north-south strike-slip fault is located east of Wells 41, 37 and 29; a tear which extends down at least to a bedding (step) thrust along which the block to the west of the tear fault has moved north a minimum of 1,200 ft. in the southern portion of the brine field. This estimate is based on the repetition of the No. 3 Rock in Wells 36 and 30 (Figure 4), the distance between these wells being approximately 1,200 ft. The north-south section through Wells 37 and 31 (Figure 5) shows good correlation of No. 3 Rock, duplication between 30 and 31, but to the south in Well 37 the repeated section is in No. 4 Rock, indicating some tearing between Wells 36 and 37. This condition is not uncommon throughout the brine field. The major tear has been defined by a consistent lack of correlation between wells across this line (Figure 7). As the thrust breaks up into the upper portion of the section to the north, the fault divides

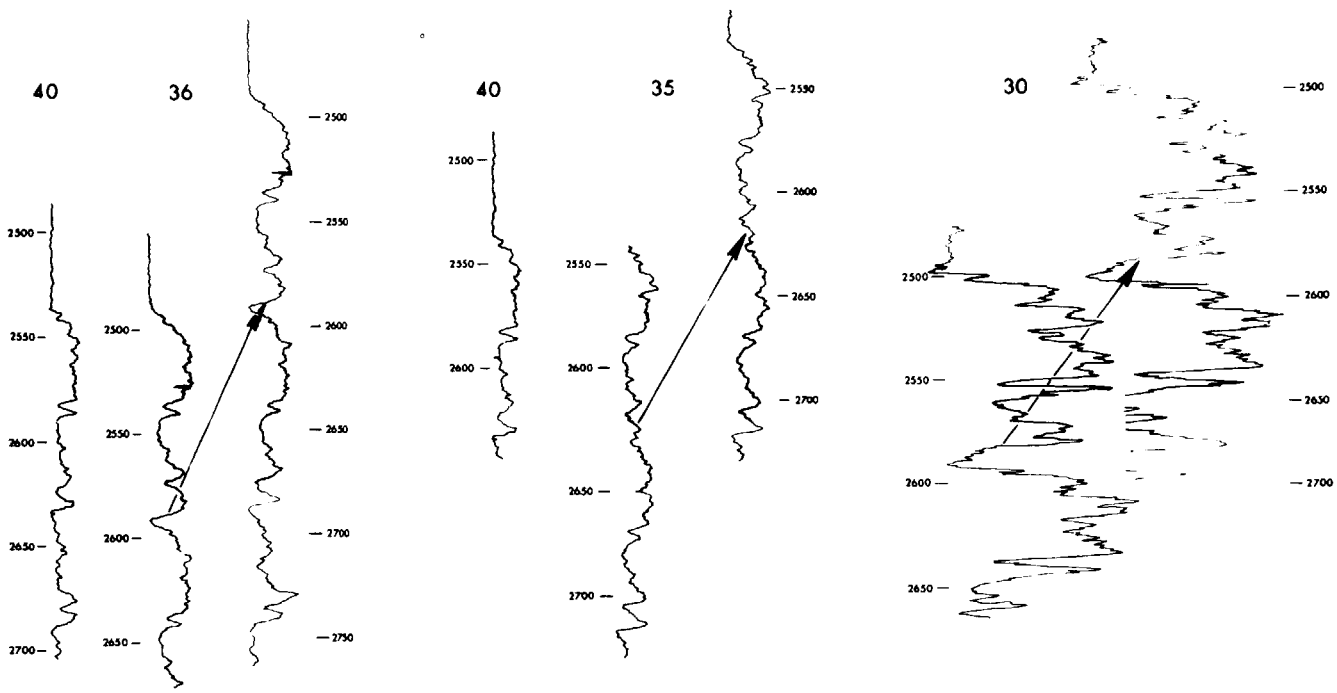

Figure 6. Sample correlations in faulted sections. *Left*—Gamma-ray log for Well 40 is normal, correlation at top of rock unit with Well 36 is shown in center log, correlation at base is effected through movement into position on right. *Center*—Log for Well 40 is normal. Correlation with top of log 35 is shown in center log. Correlation with base of rock unit is effected through movement into position on right. *Right*—Duplication of section is demonstrated through movement of log as shown by arrow, numbers are logging depth, *not* elevations.

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into several faults each of which compensates for a portion of the total displacement along the single thrust to the south. These movements, along with flowage in the incompetent salt units, collectively accommodate the movement along the single fault to the south. Additional faulting on a small scale as well as minor folding are recorded in nearly all wells, but correlation of these is not possible. East of the tear fault, thrusting is on a small scale and displacement is negligible. The absence of significant repetition through thrusting east of the tear fault has been used to establish the position of the fault.

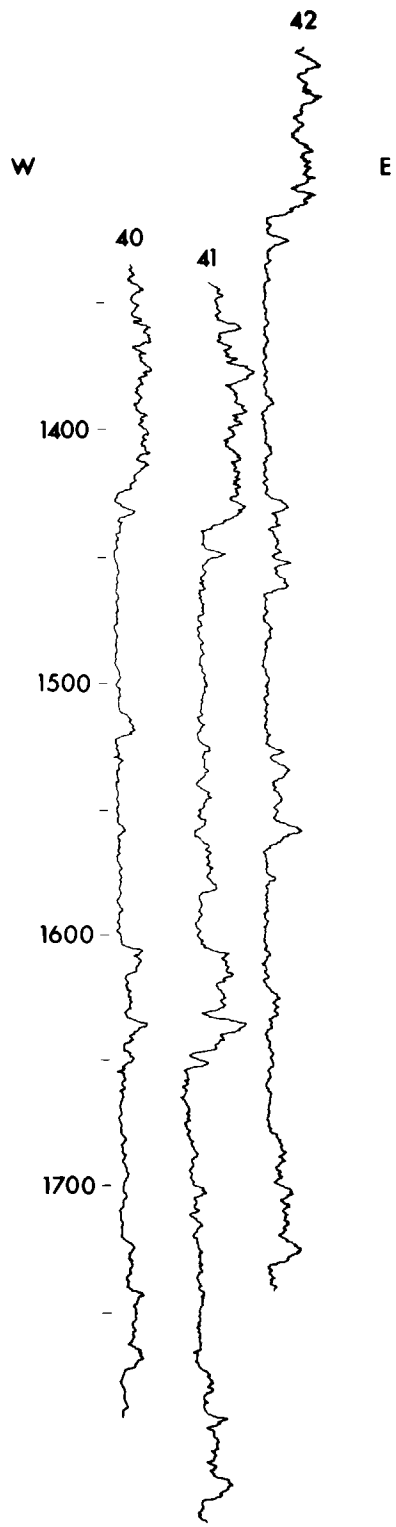

Figure 7. Offset across tear fold is marked by offset between Wells 41 and 42. All logs plotted relative to sea level datum as shown on left.

The major thrust in the western half of the brine field is identifiable through repetition of beds in the lower portion of the section at the south end of the field. Thrusting apparently has occurred in shale beds or along salt-shale contacts. At irregular intervals the thrust breaks into and across the overlying rock and salt to the next higher lubricating shale layer along which movement can continue. As the fault breaks across the No. 3 Rock into the overlying salt, the angle of dip of the fault plane increases and the fault horsetails. Some thickening and locally high dips in the beds indicate that flowage has also compensated for some of the displacement which appears to have been along the single fault surface to the south. The structure contour map on the top of the salt gives no indication of the faults breaking up into the overlying sediments. It would seem reasonable to assume that to the south the fault drops down into the underlying Vernon Shale.

Structure contour and isopach maps reveal that both the upper and lower surfaces of the salt are relatively uniform; the lower surface shows a regional southerly dip and the upper surface shows a pronounced dip to the west as a result of a general southeasterly thickening of the salt unit. However, thickening to the southeast is contrary to expectations, because thickening through faulting has occurred west of a north-south tear fault east of Wells, 41, 37, and 29 and west of Well 28. Repetition of units east of this line has been minor.

In addition to the faulting described, it is noted in lithologic logs that slickenslides at the top of the No. 3 Rock are apparently common to all wells. In general the section downward from the top of the No. 3 Rock is dominated by clastics, whereas the section above the No. 3 Rock is predominantly salt. The movement of the upper more plastic section over the underlying more rigid section would be anticipated and apparently has occurred, but the extent of movement cannot be determined. In the northern portion of the field, to accommodate slippage along this contact, the major strike-slip fault may extend down below the thrust fault to the top of the No. 3 Rock.

In detail the picture is much more complex. Numerous small faults resulting in repetition of section and identifiable in only a single or several wells are found throughout the field. Variations in thickness of salt units though flowage and/or faulting (inseparable because of the lack of a characteristic log signature) is also not uncommon and this, combined with the faulting presents a complex pattern of minor displacements superimposed on a general

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south dipping decollement broken by a major north-south tear, the terminal expression of the total movement finding surface manifestation in the Firtree Point anticline.

STRUCTURAL CONTROL OF BRINEFIELD DEVELOPMENT

It should thus be expected that difficulties in production arising from the geologic environment should be encountered and explainable to at least some degree in the light of the structural setting. For example,

Well 29. During fracturing, a flow of brine at the surface 0.5 mi. to the north must certainly be interpreted as the result of movement of brine from the well along the tear fault.

Well 33, 34, 43. In fracturing of Well 33 to 34, alternate buildup and recession of pumping pressures indicated that the solution channel was being closed by rock movement from time to time. In the light of subsequent geologic information, the occurrence of intermittent collapse should not have been unexpected, inasmuch as in this area of the brine field the major thrust has broken up, into and through the No. 3 Salt. Faulting above the cavity created by solution between Wells 33 and 34 may have resulted in a weakness which led to the observed periodic collapse and pressure buildup. It is over this area that the major thrust bifurcates at several different points, creating a series of planes of weakness in the section overlying the solution zone.

Wells 41, 42, and 37. The inability to fracture from Well 41 to 42 and the subsequent connection between 41 and 37 may be related to the position of the tear fault. One might postulate that movement of solution from Well 37 may have been blocked to some degree by the tear fault (if it extends below the thrust) but, even if this were not the case, movement of fluid along the tear fault or up dip along the thrust would be with a much greater degree of ease than across the tear fault into Well 42. However, an effort to fracture from Well 40 to Well 39 resulted in connection with Well 42; no connection was made with 41, this demonstrating the complexity of the structural setting in this area.

SENECA LAKE SALT ANTICLINE

The total salt-rock sequence shows a constant increase in thickness in a west to east direction (Figure 8). As mentioned previously, the base of the salt shows a consistent dip to the south, whereas the top of the sequence expresses the increase through a dip to the west.

Seneca Lake stands a 445 ft. above sea level and bottoms at 174 ft. below sea level. Northward projection of data obtained through drilling south of the lake in glacial valley-fill suggests that the lake is bottomed with approximately 600 ft. of gravel, thus, the estimated elevation of

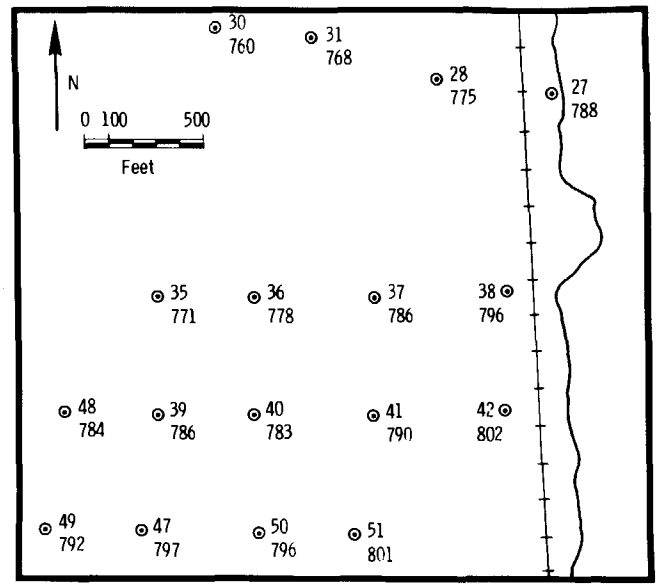

Figure 8. Southern half, Watkins Glen brine field showing well designations (upper figure of each pair) and total salt thickness (lower figure of each pair).

the bedrock surface at the bottom of the lake is approximately –775 ft. The top of the salt section in Wells 24, 25, and 27 next to the lake is at an elevation between 1305 ft. and 1315 ft. Westward from the lake in the brine field area the ground elevation rises to approximately 300 ft. above lake level. Thus the salt in the brine field is loaded with approximately 2,000 ft. of rock compared with the salt beneath the lake which is loaded with the equivalent (assuming a porosity of 30 per cent for gravel and an average rock density of 2.7) of 1300 ft. of rock. In the present atmosphere of geofantasy one cannot help but postulate that the higher elevation of the upper salt surface to the east toward the lake is in large part due to flowage of the salt toward the area of least overburden beneath Seneca Lake and there is the possibility of the existence of a salt structure province in west central New York.

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APPENDIX F

NYSDEC OHMS Document No. 201166576-00037

November 1, 1979

Mr. James A. Loose
International Salt Company
Watkins Glen Refinery
Watkins Glen, New York 14891

Dear Mr. Loose:

Re: SPDES Permit NY-0002330
International Salt Company
Reading (T), Schuyler (C)

This confirms our telephone conversation of October 30, 1979.

It is noted that this Department approved the final report and plans for the condensate recycle system by letter dated September 14, 1979. We agree that the permit limit of 250 mg/l chlorides for outfall 002 will not be met upon permit issuance. Construction of facilities approved in September 1979 will continue through 1981.

The sanitary discharge, outfall 005, will be eliminated by connection to the Town of Reading sewer along Salt Point Road. This sewer should be constructed by the end of 1981 or earlier.

The U. S. Environmental Protection Agency official "guidance" is that compliance schedules may not be contained within the SPDES permit for your facility. Accordingly, the facility will be "not in compliance" with the permit upon permit issuance. Therefore, this Department will issue a Commissioner's Order against the company, including a schedule of compliance. I expect the order to be issued with consent of the company.

I have reviewed our files on this matter, including the schedule proposed by Mr. Theilgard in his letter to us of April 27, 1978. I am also aware that complications exist regarding the company contracts with Texas Eastern relating to propane storage.

The purpose of this letter is to request your assistance in preparing background information regarding the proposed order on consent. The following information is requested:

a) Current and past production levels and methods
b) Cost of implementing pollution control projects already completed.

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b) Con't. - Production lost or other profit opportunities missed due to pollution control projects should be included. Such items as partial shutdown to allow installation, utilization of space within a restricted area, energy costs, etc. should be explained.
c) Cost of poposed condensate recycle system.
d) Brief history of compliance with permit limits. Graphs prepared previously which show compliance as the result of equipment installation, i.e. demister pads installed in the B-Train resulting in compliance for that discharge.
e) Discussion of schedule proposed by the Company and activities already undertaken without the duress of a formal order.
f) Recurring brine spills and actions taken to reduce frequency.

I am enclosing portions of internal memoranda prepared by our staff for your information. I have reserved Monday, November 26, 1979, to discuss this in more detail with you and will call you that morning to confirm the meeting. I understand you will be on vacation the previous week.

Very truly yours,

Paul F. Schmied, P.E.
Regional Engineer

PFS:cb

Enclosures

cc: Mr. Hansen w/o Enc.
Mr. Cronin w/o Enc.
Mr. Loveridge w/o Enc.

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International Salt Company
Reading (T), Schuyler Company

Background

The International Salt Company plant on Salt Point Road, Reading (T), Schuyler County, is over seventy five (75) years old. The plant produces table salt and purified salt using solution mining followed by evaporation, filtration and drying. Commonly accepted procedures thru the 1950's at salt processing facilities was the discharge of all wastewater and solid wastes without treatment. Because this plant is old, water pollution abatement has been particularly difficult. Nonetheless, International Salt Company has over the years embarked on programs for eliminating chlorides discharges to Seneca Lake.

In the early 1960's salt reclaiming dissolvers were made operational. Studies of deep well disposal for wastes were initiated and deep well disposal designs were submitted and evaluated between 1967 and 1970. In December 1971 the deep well injection system for concentrated waste brines commenced operation. In 1972 an improved waste salt dissolver was constructed and tied in to the deep well injection system. In September 1972 the Region #8 office of New York State Department of Environmental Conservation (NYSDEC) requested that International Salt Company take such action as was necessary to meet a total chloride level in discharge #002 of 250 mg/1. The company voluntarily agreed to meet this limit. In 1975 the limit was incorporated in the company's NPDES permit. In 1975 demister pads were installed on the fourth effect of each evaporator train to eliminate chlorides carryover from the evaporators. In 1976 a dilute brine waste handling system was constructed with dilute brines being conveyed to the plants working salt galleries. Chlorides levels have been reduced from maximum levels of over 5,000 mg/1 in 1973 down to maximum levels today which are rarely over 1,000 mg/1. Based on monthly averages, the company has generally achieved chlorides levels of 500 mg/1 or less.

Recent correspondence from International Salt Company indicates the remaining chlorides problems are due to the development of leaks in their evaporator heat exchangers. The solution proposed is diversion of all heat exchanger condensate (480 GPM) to the company's producing galleries. This is a complex problem as it will eliminate the company's capability for storing propane gas, under contract, as received from Texas Eastern Company.

Compliance With Permit Limits

The S/NPDES permit requires that the company meet a gross chlorides limit of 250 mg/1 in discharge #002. This limit was established by this

NYSDEC
SENT TO JIM LOOSE
LETTER DATED 11/01/79

NYSDEC OHMS Document No. 201166576-00037

A review of the company's operating data since July 1977 indicates that the company has, on occasion, met the 250 mg/l limit. Based upon average monthly data, the company's #002 discharge has ranged from a low of 299 mg/l to a high of 1150 mg/l. The cause of the high chlorides levels appears to be heat exchanger tube leaks which would require a partial shutdown of operations to effect repairs. The repairs themselves take 10-14 hours to accomplish. These leaks are allowed to continue over a period of time until monthly maintenance can be performed.

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This is in response to the questions you raised on May 19th with regard to this company's past performance and the proposed Consent Order compliance schedule.

International Salt Company has spent over $750,000 since 1970 to abate chloride discharges to Seneca Lake. Initial Department requirements for the company revolved around the removal of suspended solids from the waste stream through the use of deep well injection for concentrated process brines. The deep well operation began in December, 1971. By August, 1972, it became apparent that there were still chlorides entering the lake from the plant discharges. By letter dated August 1, 1972, Mr. Sugumele established the 250 mg/l based upon protection of the lake as a water supply. This limit was subsequently adopted and used as an effluent limit by EPA for both International Salt and Watkins Salt Company. Since 1972, International Salt Company has taken steps to eliminate the various chloride waste sources at the plant. Projects implemented to date have been: installation of demister pads on the last effect of the salt evaporators, capture and disposal of dilute brines to the production cavity, capture and dissolving of salt dust collected in plant with disposal to the deep well. Additionally, the company has eliminated an oil problem through a fuel substitution program. With all of the work done through 1976 chloride levels now average between 350 ppm and 400 ppm on a monthly basis. Even though the 250 ppm limit has not been met, considerable abatement progress is evident.

The last remaining abatement program involving chlorides is the rerouting of up to 480 gpm of condensate waters from evaporator heat exchangers to the working salt cavities. Once this rerouting is made the company can no longer accept any propane gas for storage from Texas Eastern. International Salt Company has a 20-year agreement with Texas Eastern to store propane until 1984. The compliance schedule they proposed, and we accepted, will actually cause storage operations to cease by 1981 unless alternate storage facilities can be planned and constructed. It is for this reason that International Salt Company requested additional time beyond the January 1, 1980 date originally proposed. Time is needed to work out alternate arrangements with Texas Eastern. The International Salt Company propane storage facility is

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Texas Eastern's major reservoir for New York and the New England states. About 4.5 million barrels (180,000,000 gallons) of propane were stored there last year. The time requested by the company to work out an alternate storage program is still considered reasonable.

Following is the schedule for construction anticipated on this project:

1. In 1979 - Install 1800 feet of high pressure pipeline to the south brine field -- $46,000.

2. In 1980 - Install new waste collection system in pan room, includes pump station and electrical work -- $54,000.

3. In 1981 - Relocate an existing 400 hp pump to convey condensate to the brine field -- $17,000.
   System would be operational at this point.

4. In 1982 - Extend the high pressure pipeline 2200 feet to the north brine field -- $63,000.

5. In 1983 - Construct a second 4000 feet of high pressure pipeline as a backup for the first line -- $105,000.

6. In 1984 - Relocate a second 400 hp pump as a backup for the first pump -- $25,000.

Total Project Cost: $310,000

In addition to the above project, the company is spending $250,000 under an agreement with Air Resources to install air emission controls on their boilers.

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APPENDIX G

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TECHNICAL REVIEW OF THE CHLORIDE EFFLUENT LIMITS IN INTERNATIONAL SALT'S WATKINS GLEN FACILITY SPDES #NY 0002330

by

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Chapter 1

INTRODUCTION

On April 9, 1980, the New York State Department of Environmental Conservation (NYSDEC) issued SPDES permit #NY0002330 to International Salt's Watkins Glen Facility. This permit contains the following effluent limitations which are of concern:

Outfall	
001	Daily Average Chloride - 16 lbs/day Daily Maximum Chloride - 32 lbs/day
002	Daily Maximum Chloride - 250 mg/ℓ

A review of the technical and legal merits of these limitations is presented in this report, including toxicity data on chlorides, health implications, U.S. EPA requirements, NYSDEC regulations, water quality information, and a cost:benefit analysis. This report serves as a basis for modifying the chloride limits contained in the SPDES permit.

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Chapter 2

EXECUTIVE SUMMARY

An analysis of the technical justification and control costs of the SPDES permit conditions on chlorides for International Salt's Watkins Glen facility was undertaken. A literature review of the environmental effects of sodium chloride revealed that 250 mg/ℓ chloride is often specified as a water quality limit because of taste considerations. Toxic levels of sodium chloride on aquatic organisms were all several orders of magnitude higher than the 250 mg/ℓ level.

Federal regulations currently covering the brine solution mining industry do not contain chloride limitations. No effluent standards for chlorides or total dissolved solids (TDS) were found in a review of the New York State regulations. In fact, no chloride water quality standard currently exists on Seneca Lake. Thus, no basis for the existing permit limitations on chlorides was found.

A 500 mg/ℓ TDS water quality standard does exist on Seneca Lake. The possibility that the chloride effluent limitation was imposed to maintain the TDS water quality standard was also explored. However, the chloride level in the lake (and presumably the TDS level) has been decreasing over the last eight years with ISCO's present discharge loading. Chloride levels have been below 250 mg/ℓ throughout this period, and, based on this monitoring, it is safe to assume the TDS level has remained well below the 500 mg/ℓ level.

Requiring ISCO to achieve a 250 mg/ℓ chloride level in outfall 002 would result in a 6.3 mg/ℓ drop in the chloride level in Seneca Lake. A benefit:cost analysis of this requirement was made. Annual benefits were estimated at $4,600 per year and were primarily attributed to improved water quality for public water supply users on Seneca Lake and Seneca River. However, the annualized cost to achieve these benefits was estimated at $640,000 for ISCO. Thus, a benefit:cost ratio of 1:140 will result from implementation of this project. Clearly the expenditures

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far exceed the benefits to be gained; and thus this project is not an efficient allocation of economic resources.

The salt industry is competitive and price is the primary factor in buying decisions. Extraordinary costs incurred by the Watkins Glen plant for compliance with the 250 mg/ℓ limit would result in a 6% increase in product price. The anticipated reduction in output is expected to be greater than the price rise because of import competition and excess capacity in the industry. The full extent of output and ultimately employment reductions cannot be predicted because of changes in market conditions, but the potential impact should be considered.

Based on a review of the environmental effects of sodium chloride, the apparent lack of regulatory authority to impose the chloride limitations contained in the SPDES permit, the benefit-cost analysis, and the economic impact on the Watkins Glen facility, the present chloride permit limits should be modified. For outfall 001 the pounds limitations on chlorides should be deleted entirely. The chloride levels in outfall 001 amount to 0.04% of the total chlorides discharged by ISCO, and the monitoring and administrative costs far exceed any benefits gained by the permit limits.

Outfall 002 should only be regulated to assure the chlorides discharged in the future do not increase significantly above the present levels. This basically requires ISCO to continue to operate and maintain its present abatement equipment and to fix leaks and correct upsets in a timely manner. To assure this, the permit should be modified to incorporate the following chloride limitation in lieu of the present limits:

> The average chloride level over any two consecutive days (running average) shall not exceed 140,000 pounds per day.

The 140,000 pounds per day is based on a major leak developing, which typically results in the chloride level increasing from less than 500 to over 1,600 mg/ℓ. The two consecutive day average would require ISCO to shut down the leaking evaporator within 24 hours of detection.

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The above permit modifications would not result in higher chloride levels being discharged. In 1980, ISCO averaged 444 mg/ℓ chlorides in outfall 002, and no significant changes from this level would be expected. The only way higher chloride levels can occur is if ISCO fails to operate its present equipment or if leaks and process upsets go uncorrected. The proposed permit condition on outfall 002 would require continued operation and maintenance of the abatement equipment.

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Chapter 3

ENVIRONMENTAL EFFECTS OF CHLORIDES

Sodium chloride (NaCl), commonly known as salt, is a mineral that is found in both the solid and liquid form. The solid form, known as halite, is mined extensively in the United States. The ionic bonds that hold sodium chloride together are weak and in the presence of water will dissociate into the sodium (Na^+) and chloride (Cl^-) ion. Salt in an aqueous solution is known as brine. Salt enters freshwater systems through naturally occurring phenomena and through the activities of man. A certain amount of sodium chloride is required for proper growth and development in all living organisms; however, in excessive quantities it can produce adverse effects. Those levels necessary to disrupt normal activities or produce toxic symptoms will be discussed in this Chapter as it relates to the freshwater ecosystem, agriculture and livestock practices, and human health. A statewide material balance on total dissolved solids (TDS) in Illinois is also presented in this Chapter to place the impact of point source discharges in perspective.

3.1 Toxicity of Sodium Chloride in the Freshwater Environment

A review of the available literature on chloride toxicity indicates that, in general, chlorides are non-toxic to freshwater biota. Excessive concentrations of chlorides are required to immobilize or kill freshwater flora and fauna.

As would be expected, the toxicity of chlorides varies from one species to another due to different physiological adaptions or tolerance limits. However, even when tests are performed utilizing the same species, different results are sometimes obtained. The differences are believed to be due to the chemical composition of the test waters, possibly the nature of the water in which the organism lived prior to testing and/or the age and size of the organism used in the tests.

Tests conducted on the golden Shiner with salt added to distilled water showed that this particular species could survive 148 hours in 5000 mg/ℓ of sodium chloride. As the concentration was increased to

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20,000 mg/ℓ NaCl, the average survival time decreased to 1.33 hours.[1] Table 3-1 demonstrates the relationship between sodium chloride concentrations and average survival time.

Again these tests were performed using NaCl dissolved in distilled water. Tests which utilize salt dissolved in river or lake water have shown that in general an even higher concentration of salt is needed to immobilize or kill freshwater fish. Although no data could be found where the golden shiner had been tested in river or lake water, studies by Doudoroff and Katz[2] reported that 8,500 mg/ℓ of sodium chloride in distilled water and 10,000 mg/ℓ in tap water were toxic to minnows and perch exposed from 4 to 8 days. In another test comparing NaCl in distilled water versus tap water, these authors concluded that 12,000 mg/ℓ in distilled water and 20,000 mg/ℓ in tap water were harmless to sticklebacks.

Ellis found that goldfish were not harmed when exposed for 25 days to 5000 ppm NaCl in river water.[2] Bass and perch were not killed when exposed for a period of two weeks in water containing 14,000 mg/ℓ sodium chloride. Brook trout have survived and recovered from immersion in 30,000 mg/ℓ NaCl for 30 to 60 minutes, but 50% died after 15 minute exposure in 50,000 mg/ℓ salt.[2] The median tolerance limit for three different species of fish in high turbidity water are shown in Table 3-2.[3]

Nakamura tested the effect of NaCl on developing carp eggs and found that they could continue to develop in water containing 4,500 to 6,000 mg/ℓ chlorides.[2] Doudoroff and Katz also reported[2] that trout eggs after a 24-hour exposure to 21,000 mg/ℓ of NaCl could resume normal development.

It should be noted that in nature changes in salt concentrations are usually gradual, giving the fish a period of adjustment to the stress. In laboratory tests, experimental fish are usually submitted to a sharp increase in salt concentrations, and those surviving are extremely hardy. Also in laboratory tests the fish are contained, whereas in nature the fish will avoid a stressful environment and locate to a more favorable one.

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Table 3-1

NaCl CONCENTRATIONS AND AVERAGE SURVIVAL TIME IN THE GOLDEN SHINER

Concentration, mg/ℓ	No. of Fish	Average Survival Time, hrs	Size of Fish, cm
20,000	5	1.33	9.5 - 11.5
15,000	5	4.73	10.0 - 11.0
10,000	6	97.0	9.5 - 11.0
5,000	6	148.0	8.5 - 11.0

SOURCE: Reference 1.

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Table 3-2

MEDIAN TOLERANCE LIMIT FOR THREE FISH SPECIES
TO NaCl IN HIGH TURBIDITY WATER

TL_M, ppm	Duration of Test, Days	Fish Species
18,100	2	Mosquito fish
13,700	1	Goldfish
14,125	1	Bluegill
12,940	4	Bluegill

SOURCE: Reference 3.

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In assessing the impact of NaCl on the freshwater ecosystem, it is not enough to merely look at those concentrations that are detrimental to fish populations. Those organisms on which the fish are dependent for food must also be evaluated. Anderson observed that many small crustacea and fish fry were immobilized by salt concentrations above 3,100 mg/ℓ.[2] Daphnia magna (an important source of food for fish fry) exposed to 3,680 mg/ℓ chlorides in Lake Erie water caused a 50% immobilization in 64 hours of exposure.[2] Euglina (algae), nematodes (round worms) and chironomids (insect larvae) have been found in freshwaters with chloride concentrations ranging from between 13,000 to 20,000 mg/ℓ.[1] In general, however, a salt concentration above 3,000 mg/ℓ is reported to be deleterious to fish food organisms.

The susceptibility of aquatic vegetation to chloride concentrations is of concern because the aquatic flora is the base of the aquatic food chain. They perform a two part service for the aquatic community by oxygenating water through photosynthesis and providing a source of food for first order consumers. In a report prepared by NcNabb and Tierney, the authors conclude that the addition of chloride to environments otherwise suitable for maximum growth will increase the production of aquatic plants.[4] In fact, the element as chloride, has been demonstrated to be essential for growth in studies of algae as well as non-aquatic angiosperms. Eyster demonstrated that the growth of the alga Chlorella pyrenoidosa in culture was stimulated by the addition of as little as 0.2 mg/ℓ chlorides to their basic medium.[4] Maximum growth occurred in these cultures when chloride concentrations ranged between 2000 and 6000 mg/ℓ. Only concentrations in excess of 6000 mg/ℓ inhibited the growth of this particular alga. In other tests, Seeter, working with the widely distributed freshwater angiosperm, Potamogetor pectinatus, found that vegetative growth of young plants was inhibited by 9000 mg/ℓ; vegetative growth of older plants by 15,000 mg/ℓ; seed production was reduced 50% at 3000 mg/ℓ; and, seed germination was inhibited by 15,000 mg/ℓ. Chloride was added to his cultures as sodium chloride and his controls were grown in tap water.[4] In light of these findings it would appear that aquatic vegetation is tolerant of a wide range of chloride concentrations; in fact,

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the measurement of chlorides has seldom been a part of the analytical monitoring of such aquatic systems where ecological studies have been in progress.[4]

3.2 Chloride Toxicity in Agriculture and Livestock

The toxicity of chlorides to livestock varies as to the species under study and the age of the individual animal. Tyler observed that 2000 mg/ℓ NaCl in the drinking water of baby chicks was harmless; 5000 to 10,000 mg/ℓ caused edema, poisoning, disease, and death; and, 20,000 mg/ℓ was lethal within 3 days.[2] For sheep, Pierce found water containing 2% (20,000 mg/ℓ) salt was very toxic to sheep, and water containing 1.5% (15,000 mg/ℓ) harmed some sheep by lowering feed intake, while a concentration of 10,000 mg/ℓ was tolerated by all sheep. The upper safe limit of salt concentration in water used for animals is listed in Table 3-3.

The effects of sodium chloride in irrigation water vary with the individual plants, the species, and environmental and climatic conditions.[5] Irrigation waters high in chlorides have been shown to reduce crop production. The effect of salinity on production has been tested by many researchers. The following are suggested guidelines for salinity in irrigation waters.[6]

	TDS, mg/ℓ
Waters for which no detrimental effects will usually be noticed	500
Water which can have detrimental effects on sensitive crops	500-1000
Water that may have adverse effects on many crops	1000-2000

The TDS concentration which causes a reduction in crop yield varies according to plant type. A decline in corn yield begins at a TDS level of 1000 mg/ℓ in irrigation waters. Wheat and soybean yields are affected at TDS concentrations of 3000 and 2500 mg/ℓ, respectively.[6]

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Table 3-3

THE UPPER SAFE LIMIT OF SALT CONCENTRATION
IN WATER USED FOR ANIMALS

Animal	NaCl Concentration, mg/ℓ
Poultry	2,860
Pigs	4,290
Horses	6,435
Beef cattle	10,000
Adult dry sheep	12,900

SOURCE: Reference 2

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3.3 Human Health Concerns

The National Technical Advisory Committee to the Secretary of the Interior stated that the recommended criteria for chloride in public water supplies is 250 mg/ℓ. However, water containing chloride as high as 2000 mg/ℓ has been used without adverse effects once the human system has adjusted to this situation.[2] The criterion of 250 mg/ℓ on drinking water is based primarily on taste and aesthetics rather than health. Moore reported that 750 mg/ℓ NaCl was harmless, 1000 to 1500 mg/ℓ was generally unpalatable, while 10,000 mg/ℓ caused vomiting.[2]

Salt intake from public water supplies makes up only a small percentage of the total salt intake in most people's diet. The salt content in most public water supplies is rarely high enough to concern even individuals on mild or moderate sodium diets. Persons on restricted sodium diets typically have an intake restriction from 500 to 1000 mg/day of sodium, as compared to 5000 mg/day in the average unrestricted diet. Restrictive sodium diets generally specify bottled water because the natural background sodium levels in nearly all public water supplies are above the recommended 20 mg/ℓ sodium limit.

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3.4 Sources of TDS

An important question, which this section addresses, is discerning the influence of industrial effluents on the overall TDS levels in receiving waters. While this is a difficult question to answer, an attempt was made to do a TDS material balance in Illinois.[6] This previous cost-benefit study concluded that the Illinois effluent standard for TDS was not warranted, and recommended the effluent standard be eliminated.[6]

Table 3-4 reproduces the Illinois TDS material balance results. The incremental result of enforcing the Illinois effluent standard would have been a decrease of 1.5% of the total TDS loading in the waterways. Stormwater runoff contributed over 65% of the total TDS loading in the Illinois waterways.

While the Illinois results may not be directly transferable to New York the results are probably similar in all populated states. The benefits to be derived from controlling such a small percentage of the total loading on a state-wide basis makes little sense while ignoring the major contributor, stormwater runoff.

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Table 3-4

TDS MASS BALANCE FOR ILLINOIS

Source	Average TDS Discharged to Illinois Waterways, 10^6 lb/day	Percent of Total TDS[1] Loading, %
Background from Lake Michigan	2.85	6.5
Domestic waste contribution	1.90	4.3
Background from municipal ground water	1.25	2.8
Background from industrial ground water	1.08	2.4
Road de-icing	1.64	3.7
Irrigation	0.19	0.4
Industrial contribution		
Dischargers <1000 mg/ℓ	4.16	9.4
Dischargers >1000 mg/ℓ		
Contribution of 1st 1000 mg/ℓ	0.74	1.7
Contributions of >1000 mg/ℓ	0.64	1.5
Storm-water runoff	28.9	65.5
Total	43.35	98.4

[1]Average TDS leaving the state via the seven rivers presented in Table 2-4 is 44.1×10^6 lb/day.

SOURCE: Reference 6.

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Chapter 4

REGULATIONS AFFECTING SODIUM CHLORIDE DISCHARGES

International Salt's effluent is regulated both at the federal and state levels. Federal regulations include Best Practical Control Technology (BPT) standards while the state of New York relies on water quality standards for determining appropriate effluent limitations. Both types of regulation are described in this chapter.

4.1 Federal Standards

On March 11, 1974, the U.S. EPA published final rules establishing point source effluent guidelines for the inorganic chemical industry. Subpart P of 40CFR415 applies to sodium chloride production by solution brine-mining process. These BPT standards, which were effective July 1, 1977, place numerical limitations on only two pollutants; total suspended solids (TSS) and pH. No effluent limitations were imposed on sodium chloride or any other pollutant in the 1977 regulations.

These same regulations imposed a "zero discharge" requirement on process wastewater, to be effective July 1, 1983 for the solution brine-mining industry. However, the 1977 amendments to the Clean Water Act postponed these regulations, known as Best Available Technology Economically Achievable (BAT), until July 1, 1984. The 1977 Amendments no longer required BAT standards for conventional pollutants including TSS and pH. Conventional pollutants were to achieve less demanding effluent limits, termed Best Conventional Treatment (BCT) by July 1, 1984. The U.S. EPA is also required to review the existing guidelines for conventional pollutants and adjust the standards from BAT to BCT, as appropriate. The U.S. EPA has not yet completed its review of the solution brine-mining BAT standards. It is our considered judgment that the zero discharge requirement will be dropped from the regulations.

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Thus, at the present time, the only federal regulations related to International Salt's operation are BPT standards on pH and TSS. No effluent standard on sodium chloride currently exists at the Federal level.

4.2 New York Water Pollution Regulations

The New York Regulations on the State Pollutant Discharge Elimination System (Parts 750 through 757, Chapter X, Division of Water Resources, Title 6) include the basis for effluent limitations in discharge permits. Part 754.1 requires the NYSDEC to use the following; whenever applicable:

(1) Effluent limitations under Sections 301 and 302 of the Federal Clean Water Act.

(5) Any more stringent limitations, including those:

(i) Necessary to meet water quality standards, treatment standards, or schedules of compliance, . . .

(ii) Necessary to meet any other State or Federal law or regulation.

Section 754.2 requires that

> the department shall specify average and maximum daily quantitative limitations for the level of pollutants in the authorized discharge in terms of weight. . . . The department may, in addition to the specification of daily quantitative limitations by weight or by other terms, specify other limitations, such as average or maximum concentration limits, on the pollutants in the authorized discharge.

The requirement of Part 754.2 was not achieved in the preparation of International Salt's permit limitation for Outfall 002, which contained only a maximum concentration limitation for chloride.

As described in Section 4.1, there are no federal effluent standards currently applicable to International Salt. A review of the New York regulations revealed no state effluent standards applicable to International Salt. Thus, the apparent basis for the chloride limitations in ISCO's permit is maintenance of the water quality standard in Seneca Lake.

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A review of the state water quality standards reveals a 500 mg/ℓ total dissolved solids (TDS) applicable in Seneca Lake. No chloride surface water quality standard in New York was found during a review of the state regulations. Thus, the 250 mg/ℓ chloride limitation contained in International Salt's permit does not appear to be required by law, and in fact there does not appear to be a legal basis for it at all.

The primary component of TDS in International Salt's discharge is sodium chloride. If the effluent standard was imposed to maintain the 500 mg/ℓ TDS water quality standard, then the equivalent chloride water quality standard would be:

$$\frac{500 \text{ mg/}\ell \text{ TDS} \mid \text{Molecular Weight } Cl^- \ (35.5)}{\mid \text{Molecular Weight NaCl } (58.5)}$$

Equivalent Chloride Water Quality Standard: 303 mg/ℓ

Imposition of a water quality standard as an effluent limitation can only be applied where necessary to maintain the water quality in the receiving body of water.

Based on a review of the existing state and federal effluent and water quality standards, there appears to be no basis for the chloride effluent limitations contained in ISCO's permit. Maintaining the TDS water quality standard in Seneca Lake is the only possible explanation for the limit, although the limits were improperly established if this indeed is the basis. More will be discussed in the following chapter relative to the existing water quality in Seneca Lake.

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Chapter 5

DESCRIPTION OF INTERNATIONAL SALT'S OPERATION AND ENVIRONMENTAL IMPACT

5.1 Process Description

Solution mining of sodium chloride at International Salt's Watkins Glen facility involves pumping water from Seneca Lake through wells down into the bedded salt deposits. Saturated brine flows from the deposits through adjoining wells to the surface. This brine is then pumped to holding tanks until required for salt production. Approximately 75% of the production at Watkins Glen is produced from this raw brine. The remaining 25% is piped to a treatment area where caustic soda and soda ash are introduced to precipitate most of the calcium and magnesium from the brine. This pretreated brine is then used for the production of a high grade purified salt.

The salt is produced in two quadruple effect evaporators which produce crystals as the water evaporates in the vessels. The slurry is then pumped through various devices to rotary drums filters where it is washed and most of the moisture is removed. The salt is then cooled and delivered to various areas of the plant for packaging and loading.

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5.2 History of Chloride Reduction

In the early 1960s the Watkins Glen Refinery was actively pursuing means to decrease the amount of salt entering Seneca Lake. By the mid-1960s a salt reclaiming dissolving system was in operation and a deep well system was being studied for the disposal of process bleed streams.

In 1970 the deep well system was initiated for removing all process bleeds and chemical plant wastes from Seneca Lake. The initial capital cost of this system was $132,500 through 1972. Further capital dollars were expended to upgrade, modify, and replace portions of the facility from 1972 through 1979, increasing the total capital investment to $262,000. Major repair and operating expenses for this system have been high throughout the years so that the actual cost of installing and operating this system has been over $500,000 through the ten-year period.

In 1972 a central waste dissolver was installed. This unit collects and dissolves all the waste salt generated in the plant. The saturated liquid is then added to the deep well disposal system.

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Commencing in 1973 and extending over four years, a weak brine recycle system was installed, forming a closed loop in the pan room. The dilute brine waste stream is filtered, pumped to storage tanks, and eventually pumped into the producing wells as makeup water. Disposal of this weak brine stream into wells has been attempted but to date these efforts have been unsuccessful. The capital expenditures for the various collection and pumping facilities have been over $160,000 plus disposal well costs to date of $224,000.

In 1975 "demister" mesh pads were installed in the top of both fourth effect vessels. This project resulted in a significant decrease in the salt carryover into the barometric condenser outfall.

During 1978 several plant piping and equipment modifications were completed to further reduce chloride losses. These changes include the following: (1) relocated chemical building floor sump pump discharge from dissolver building to hydrosieve in pan room, (2) installed a larger screen on the hydrosieve to allow greater flow-through capacity, (3) poured concrete in the opening between the building wall and the dissolver to eliminate brine leakage to sewer, and (4) installed a salt dissolving system in the pan room to handle wet granulated salt.

The above environmental improvements have reduced the quantity of chlorides discharged to Seneca Lake to a fraction of the level discharged in the early 1960s. The costs for these projects has been staggering. Nearly $1 million in capital investments have been added at this one facility. Operating and maintenance costs are approximately $150,000 per year for pollution control. The gas storage operation has been severely curtailed already, reducing revenues by $200,000 per year. The biggest impact is the 10% reduction in the pre-1970 production capacity directly attributable to pollution abatement. This impact has <u>not</u> been felt to date because of the relatively low market demand for salt.

5.3 Existing Effluent Chloride Levels

The chlorides discharged in outfall 002 account for well over 99%

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of the total chlorides discharged from ISCO's Watkins Glen facility. Thus, this section will review only outfall 002's discharge levels. The discharge rate from outfall 002 averages approximately 10.8 MGD. The monthly average and daily maximum chloride levels in outfall 002 for 1980 are presented below:

Month	Mean Cl^-, mg/ℓ	Daily Max Cl^-, mg/ℓ
January 1980	416	1,611
February "	566	1,263
March "	461	1,589
April "	392	1,553
May "	990	6,032
June "	341	910
July "	416	2,570
August "	327	901
September "	411	886
October "	363	815
November "	348	1,483
December "	292	790
Annual Average	444	

A peak chloride value of 6,032 mg/ℓ was recorded on May 26, and the highest monthly average was also May, 1980. The annual chloride level in 1980 was 444 mg/ℓ; the long term chloride loading that effects water quality and is therefore of prime concern. From an environmental perspective, the daily and even the monthly average values have no significance.

Based on the average 10.8 MGD and the mean chloride concentration of 444 mg/ℓ, ISCO currently discharges 40,000 pounds of chlorides per day to Seneca Lake. The background chloride level in the incoming water averages 172 mg/ℓ, or 15,500 pounds per day. Thus, ISCO's actual

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contribution to the chloride level is 24,500 pounds per day.

5.4 Chloride Levels in Seneca Lake

Seneca Lake drains 704 square miles, and the average discharge from the Lake is 517 cfs, based on a 36 record period. Accoring to J. Hood, of the U.S. Geological Survey, Seneca Lake is underlined with salt, with only the top 150 feet considered freshwater. The U.S.G.S. estimates that only the top 50 feet of the Lake "turnover," with the remainder relatively stagnant.

ISCO has monitored the chloride level in Seneca Lake since 1972. These monitoring data are graphically depicted in Figure 1. Based on the 303 mg/ℓ chloride level being equivalent to the 500 mg/ℓ TDS water quality standard, there has not been a water quality violation over the period of record. In fact, the chloride concentration is actually declining in the Lake since 1972, with an average chloride level of 172 mg/ℓ in 1979. These results clearly demonstrate that ISCO's operation is not resulting in increasing chloride levels in Seneca Lake. Water quality is being attained and there is no evidence that would indicate the restrictive effluent limits in ISCO's permit are warranted to protect water quality.

5.5 ISCO's Impact on Seneca Lake

From the previous two sections, the impact of International Salt's discharges can be calculated. The mean flow out of Seneca Lake is 517 cfs or 334 million gallons per day. As sodium chloride is a conservative pollutant, the incremental increase in the chloride level can be calculated based on the 24,500 pounds per day of chlorides added, as shown below.

$$\text{Chloride Concentration in Seneca Lake Attributable to ISCO} = \frac{24{,}000 \text{ lbs/day}}{8.34 \times 334 \text{ MGD}}$$

$$= \underline{\underline{8.6 \text{ mg/}\ell}}$$

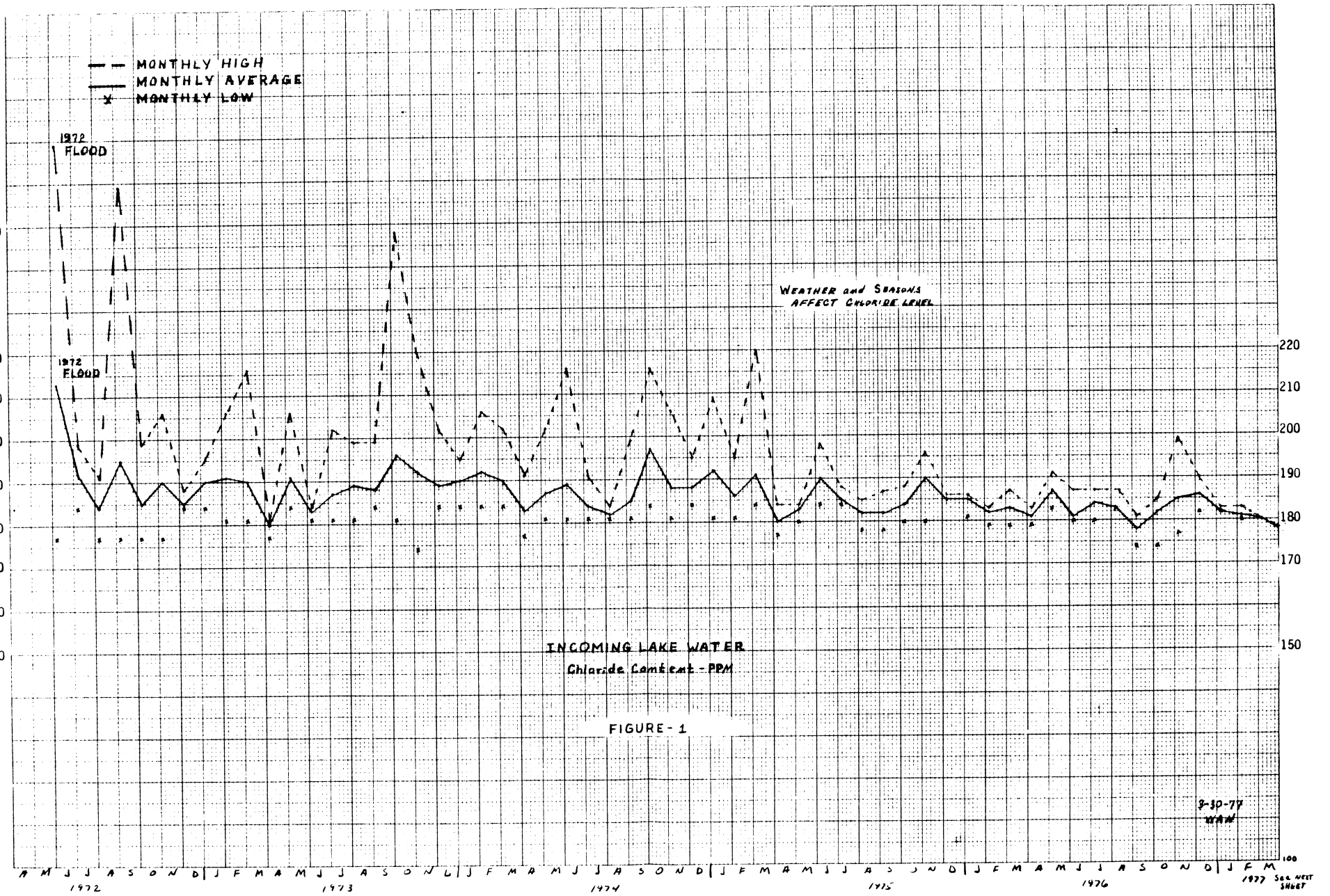

FIGURE - 1

47 1322
K+E 10 X 10 TO 5 INCH 46 1320 KEUFFEL & ESSER CO.
NYSDEC OHMS Document No. 2011085700037

NYSDEC OHMS Document No. 201166576-00037

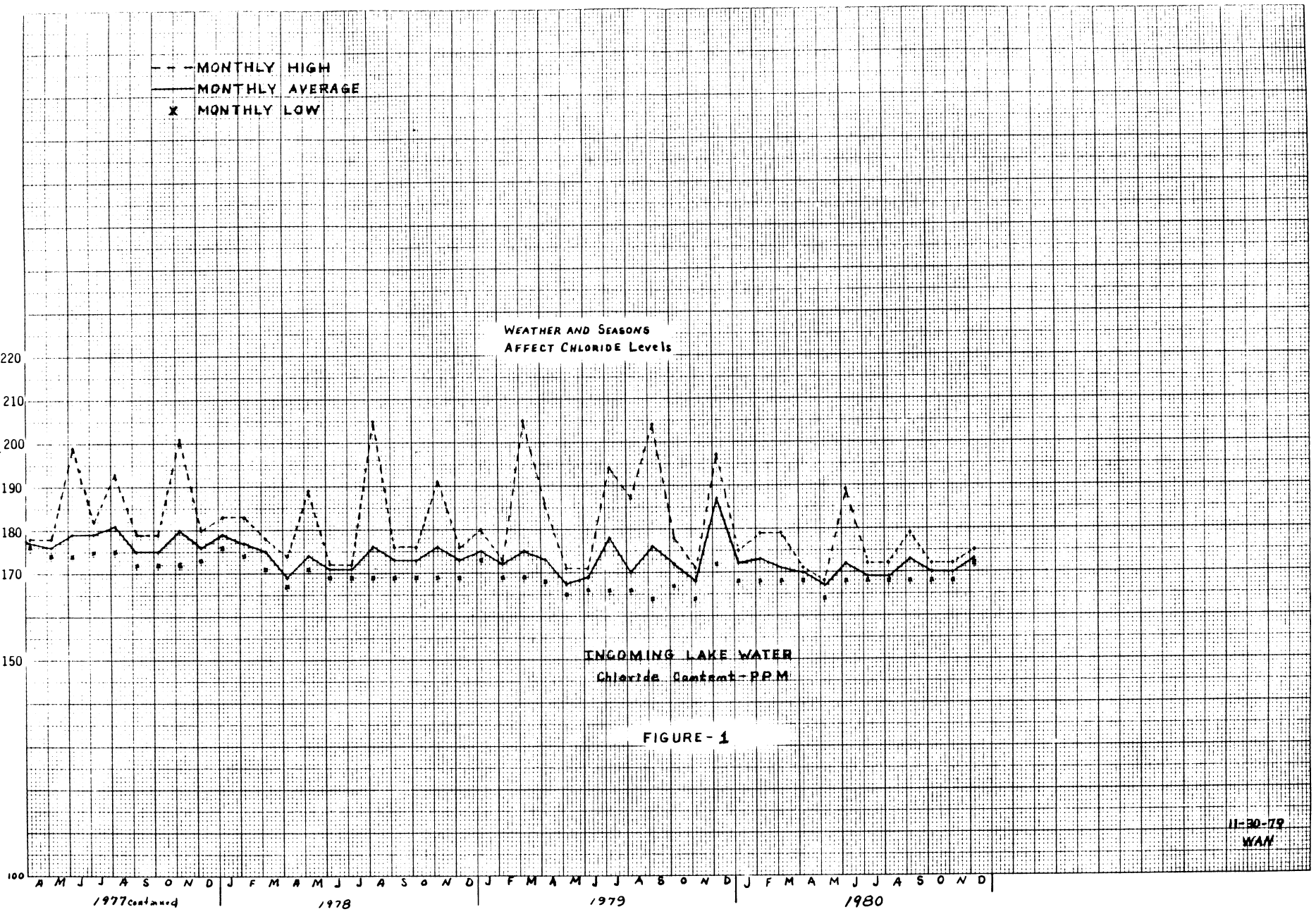

FIGURE - 1

K+E 10 X 10 TO 5 X 7 INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
47 1322

NYSDEC OHMS Document No. 201166576-00037

If ISCO is forced to achieve the present permit limitation of 250 mg/ℓ chlorides, the change in chloride loading would be:

$$(444-250)\ \text{mg}/\ell \times 8.34 \times 10.8\ \text{MGD} = 17{,}500\ \text{lbs/day}$$

The resultant improvement in water quality in Seneca Lake would be:

$$\text{Net Change in Chloride Concentration if ISCO achieves 250 mg}/\ell = \frac{17{,}500\ \text{lbs/day}}{8.34 \times 334\ \text{MGD}}$$

$$= \underline{\underline{6.3\ \text{mg}/\ell}}$$

5.6 Benefits of ISCO Achieving 250 mg/ℓ Chlorides

Based upon the incremental change in the chloride level, the potential benefits can be estimated. There are eight water use categories which could be effected by reduced concentrations of sodium chloride. Each are discussed herein, based in part on the information presented in Chapter 3.

5.6.1 Aesthetics

The major aesthetic impact of sodium chloride is related to the taste of coffee. However, the taste threshold of chlorides in brewed coffee is between 400 to 500 mg/ℓ.[5] Thus, the incremental change in chlorides from 172 mg/ℓ to 166 mg/ℓ in Seneca Lake will result in no incremental improvement in aesthetic value of the Lake.

5.6.2 Agriculture

As discussed in Chapter 3, salinity levels below 500 mg/ℓ have no effect on crop irrigation. Thus, compliance with the 250 mg/ℓ chloride effluent standard will not result in improved agricultural yields.

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5.6.3 Commercial Fishing

Chloride levels below 250 mg/ℓ have no impact on fish, as discussed in Chapter 3. Thus, no benefit from improved commercial fishing will result from enforcement of the permit standard.

5.6.4 Residential Water Supplies

The greatest benefit gained by enforcement of the 250 mg/ℓ chloride standard pertains to the residential water supplies. The presence of dissolved minerals in residential water supplies inflicts some damage on appliances and personal items in contact with the water. Even at low concentrations of TDS, corrosion and accelerated depreciation of household appliances occur. The useful service life of household plumbing fixtures and appliances can be directly related to the TDS concentration in the water.

Tihansky[8] provided a summary of the literature regarding the damage costs of TDS and hardness in residential water supplies. Table 5-1 lists the items for which Tihansky was able to develop mathematical relationships between damage and TDS levels.

For the state of New York, Tihansky calculated an annual damage cost of $3.15 per capita for TDS plus hardness. Updating this 1970 value to 1980 utilizing the consumer price index yields a damage cost of $6.25 per capita per year. Assuming this value is representative for Seneca Lake, and assigning all of the damage to TDS, yields an incremental damage cost of $0.015/mg/ℓ TDS/capita/year.[a] This damage value is an overestimate because it includes hardness, which is not impacted by the sodium chloride discharge.

A list of water supplies impacted by ISCO's discharge is presented in Table 5-2. This list includes all public water supplies on Seneca

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[a]Based on an average TDS level of 410 mg/ℓ in Seneca Lake. The damage function is linear based on Tihansky.[8]

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Table 5-1

HOUSEHOLD ITEMS DAMAGED
BY TDS AND HARDNESS

Item	Affected by
Bottle water	TDS
Cooking utensils	TDS
Faucets	TDS
Garbage grinders	TDS
Sewage facilities	TDS
Soap and detergents	Hardness
Toilet facilities	TDS
Washable fabrics	TDS
Washing appliances	TDS
Wastewater piping	TDS
Water heaters	TDS
Water piping	TDS
Water softeners	Hardness
Water utility systems:	
distribution	TDS
production	TDS
service lines	TDS
storage	TDS
water meter	TDS

SOURCE: Reference 8.

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Table 5-2

PUBLIC WATER SUPPLIES IMPACTED BY ISCO'S WATKINS GLEN DISCHARGE

Community	Volume of Water Withdrawn, MGD	Population Served	Water Supply
Ovid	0.07	800	Seneca Lake
Willard Water District	0.55	700	Seneca Lake
Seneca Army Depot	0.09	2,000	Seneca Lake
Waterloo	0.83	5,500	Seneca River
Geneva	2.6	18,500	Seneca Lake
Border City	0.05	600	Seneca Lake
Watkins Glen	0.5	2,800	Seneca Lake
Total	4.69	30,900	

SOURCE: Personal Communication, Mr. Dunn, New York State Health Dept., February 19, 1981.

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Lake and the Seneca River all the way to Lake Ontario.

The incremental improvement in chlorides in Seneca Lake was computed previously and was 6.3 mg/ℓ. This is equivalent to 10 mg/ℓ TDS. Utilizing Tihansky's unit damage cost, the annual benefits to the residential sector will be:

$$\frac{10\ \text{mg}/\ell \;\Big|\; \$0.015 \;\Big|\; 30{,}900\ \text{people}}{\text{mg}/\ell \cdot \text{capita} \cdot \text{yr}} = \underline{\underline{\$4{,}600/\text{year}}}$$

Thus, forcing ISCO's Watkin Glen facility to achieve the 250 mg/ℓ permit condition would result in $4,600 per year added benefits to the residential users.

5.6.5 Ecology

The effects of TDS on the vegetation, wildlife, and general environment were discussed in Chapter 3. The threshold concentration where biological effects were discerned were all above 1,000 mg/ℓ. From Table 3-3, poultry were effected above sodium chloride levels of 2,860 mg/ℓ. The levels of sodium chloride in Seneca Lake are well below any threshold values where ecological effects can be discerned. Thus, no ecological benefits will accrue from ISCO achieving the 250 mg/ℓ chloride level.

5.6.6 Human Health (Ingestion and Water Contact)

The U.S. Public Health Service has recommended a 500 mg/ℓ TDS level, primarily based on taste effects. More than 100 water supplies across the United States have TDS levels in excess of 2,000 mg/ℓ. Acclimitization to these levels is needed, but no ill effects have been reported.[5]

The present sodium level in Seneca Lake is estimated at approximately 110 mg/ℓ. If ISCO achieves the 250 mg/ℓ chloride standard, the sodium level will drop 4 mg/ℓ or to 106 mg/ℓ. The 106 and 110 mg/ℓ sodium levels in the drinking water pose no health risks, except to individuals on restrictive salt diets. As described in Chapter 3, these individuals are generally required by their doctors to drink water containing less

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than 20 mg/ℓ sodium. Thus, these individuals would not use Seneca Lake water under either scenario. The average user would have a net increase of 8 mg/day to his sodium intake, or 0.2% of his total. Any benefit to human health therefore would be insignificant.

5.6.7 Recreation (Water Contact)

Recreational activities, such as swimming and water skiing, would not be affected by a change in sodium chloride in Seneca Lake. No aesthetic changes would also occur, which could impact recreational use, thus no recreational benefits would accrue.

5.6.8 Recreation (Water Non-Contact)

Recreational activities which are considered non-contact water sports primarily relate to fishing, boating, and camping. The effects of sodium chloride on aquatic life was covered in the ecology section. No additional recreational benefits are related to changes in the sodium chloride levels of concern.

5.6.9 Summary of Projected Benefits

As described in this section, the only measurable benefit resulting from ISCO achieving the 250 mg/ℓ is to the residential water users. An annual benefit of $4,600 would result from ISCO achieving 250 mg/ℓ chloride standard as compared to its present chloride level of 444 mg/ℓ.

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Chapter 6

COST AND ECONOMIC IMPACT OF ISCO ACHIEVING COMPLIANCE

In this chapter a description of the salt industry is provided to give the reader a clearer understanding of the economic impact pollution abatement costs can impose. A preliminary cost estimate for ISCO to achieve compliance is then presented, followed by a specific economic impact analysis. The impact analysis was developed based upon information in the public domain and does not include any site specific information from International Salt.

6.1 Economic Characteristics of the Salt Industry

The salt industry is a mature industry with a low growth rate. The inorganic chemicals industry is one which has well established uses with little opportunity for dynamic growth. Salt is one of the most widely used inorganic chemicals on a tonnage basis. The three forms of salt (brine, rock, or evaporated) represented in 1976 26% by weight of the major inorganic chemicals shipped.[9] However, the revenue associated with salt was only 6% of the total revenue for the group of inorganic chemicals.[9] Thus, the unit value of salt has been far below that of other inorganic chemicals.

Those factors which affect the competitive aspects of an industry are the number of producers, product differentiation, number of buyers, product demand, and the possibility of entry. In 1979 there were 49 salt-producing companies with 89 plants in 17 states.[10] The supply of salt resources are unlimited, and such factors increase competition within the industry. The salt industry has three products--brine, rock, and evaporated salt--and within each group there is little product variation. Thus, product cost is the major factor in the buyer's decision. Sixty percent of the salt (primarily brine) is purchased by the chemical industry,[9] while evaporated salt and rock salt are purchased by communities for ice removal or as a food additive. Ice removal needs represent 18%

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of the product demand and other miscellaneous uses account for the remainder. Table 6-1 presents the salt production from 1967 through 1979. Although the overall growth rate for inorganic chemicals was 1.6% per year, the rate for the salt industry was only half or 0.8% per year. Thus, the product demand has grown at a very slow rate.

The supply of salt producers is more than adequate to handle the demand, and there is strong price competition among the producers. In 1979 new production capacity came on line at three facilities. Thus, U.S. competition has increased since demand has not expanded to the same extent. Until 1976 exports of salt represented 5% of the production, and 7% of the demand was accounted for by imports into this country. Now, however, imports from Canada, Mexico, and the Bahamas have captured a greater share of the market increasing competitive pressure upon the U.S. producers. The highway deicing market demand was 9.6 million tons in 1977. Of this amount, 26% or 2.5 million tons, were imported into the United States.[11] Thus, imports have captured a large percentage of the rock salt and evaporated salt markets. Table 6-2 depicts the change in price index for salt compared to the inorganic chemical market between 1967 and 1976. The cost increases due to energy, labor, and pollution control have only been passed on as a 52% price increase in salt compared to a 115% increase for inorganic chemicals. Between 1976 and 1979 price per ton of salt increased from $16.17 per ton to $22 per ton due to additional operating costs associated with energy, labor, and pollution control.[10] Import competition over the last five years has probably occurred because price increases experienced by U.S. producers have been higher than Canadian or Mexican operations. Therefore, even with shipping costs Canadian prices are equivalent to U.S. prices.

To remain viable in the industry requires an efficient operation with operating cost equivalent to or lower than market prices. With no product differentiation and minor service factors, selling price is the primary factor for the buyer. The salt industry is therefore a

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Table 6-1

PRODUCTION TRENDS IN THE SALT INDUSTRY

Year	Salt Production, thousand tons				Total Production of 19 Largest Inorganic Commodities
	Brine	Rock	Evaporated	Total	
1967	22,000	11,700	5,300	39,000	138,000
1973	25,900	11,900	6,100	43,900	161,000
1974	27,500	12,600	6,500	46,600	169,000
1975	21,700	13,700	5,600	41,000	153,000
1976	22,300	13,000	5,900	42,000	160,000
1978	-	-	-	42,869	-
1979	-	-	-	43,100	-
Average Increase per Year	0.2%	2.0%	1.2%	0.8%	1.6%

SOURCE: Kline, Guide to Chemical Industry, 1977, p. 75.

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Table 6-2

PRICE INDEX OF SALT (1967 = 100)

Year	Price Index for Salt	Price Index for Inorganic Chemicals
1967	100	100
1968	102	100.7
1969	100.8	100.4
1970	102.9	99.5
1971	104.5	102.7
1972	102.2	103.2
1973	108.1	112.4
1974	102.2	143.9
1975	134.3	192.1
1976	152.3	215.3

SOURCE: Kline, Guide to Chemical Industry, 1977, pp. 75-76.

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competitive one. Any extraordinary costs of one producer cannot readily be passed on without loss of market share because of the competitive aspects of this industry.

6.2 Cost Estimate for Achieving 250 mg/ℓ Chloride Level

The production of evaporated salt is characterized by high corrosion rates in the multi-effect evaporators. Leaks in the condenser tubes occur frequently, even with the titanium tubes presently utilized. With over 8,000 tubes, either 22 or 26 feet long, it is evident that leaky tubes cannot be readily located and plugged. As leaks cannot be predicted or readily repaired, ISCO's only alternative to achieve the 250 mg/ℓ daily maximum chloride standard is to go to "zero" discharge. A project considered by the facility in 1980 included taking the condensate streams from the evaporators back to the production wells. This modification would probably bring the chloride discharge below 250 mg/ℓ on a monthly average, but daily maximums would still exceed 250 mg/ℓ chloride. These peak values would occur when salt carryover from the fourth effect evaporators reached the barometric condensers.

The proposed zero discharge scheme includes taking all of outfall 002 to a spray cooling pond, with recirculation to the barometric condenser. Blowdown from the spray cooling pond would be utilized as make-up water to the brine wells.

The spray cooling pond will be sized for 80°F cooling water, with a 20°F increase across the barometric condensers (including the condensate streams). Under these design conditions, 12,000 gpm will be pumped through the barometric condensers. The ponds will have to remove 100×10^6 Btu/hr. Utilizing the procedure of Shell and Wendt,[12] ten aerators of 50 HP each will be required in a 200,000 ft^3 basin. At the recommended basin depth of 5 feet, the basin will cover approximately 1 acre.

The preliminary capital cost for this project is summarized below:

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Item	Estimated Installed Cost, $
Cooling Basin	100,000
Pump Station	300,000
Floating Spray Coolers	400,000
Piping	250,000
Engineering & Contingency	150,000
	1,200,000

Operating and maintenance costs for this installation include additional lost revenues from the gas storage operation of an estimated $200,000 per year. This is above the lost revenue of $200,000 per year already experienced due to pollution abatement. The total O&M cost, including amortized capital investment is tabulated in Table 6-3. ISCO will have to expend an additional $640,000 per year to comply with the 250 mg/ℓ chloride standard, as compared to the present 444 mg/ℓ annual average level. This cost is above and beyond the pollution abatement expenditures ISCO has incurred in the past 15 years.

6.3 Impact on International Salt

The International Salt plant at Watkins Glen is one of two refineries owned by ISCO and it has an average capacity of 250,000 tons per year of evaporated salt. This production rate represents 4% of the nation's demand for evaporated salt. Excess supply exists in U.S. production facilities due to market demand and import competition. The Watkins Glen plant has operated at approximately 75% of maximum capacity over the last few years, because of the excess capacity in the industry.

Pollution control costs incurred at Watkins Glen will either be absorbed by the company or passed on in higher product costs. In the last ten years chloride removal facilities have already cost $1,000,000 in capital investment and increased operating costs of $150,000 per year. In addition, gas storage revenues of $200,000 per year have been foregone due to re-injection requirements. The additional capital costs of $1,200,000 for future reductions and $640,000 for annual costs may also be incurred,

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Table 6-3

ISCO'S ANNUAL COST FOR COMPLIANCE WITH 250 mg/ℓ CHLORIDE STANDARD

Item	Annual Cost, $
Electrical-Spray Coolers[a]	130,000
Maintenance[b]	60,000
Operations Labor	10,000
Lost Revenue from Gas Reservoirs	200,000
Annualized Capital Investment[c]	240,000
Total	640,000

[a]Assumed $.08/KWH and an average of 5 spray coolers operated year around

[b]5% of capital investment

[c]15% interest rate and 10 year life

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unless relief is granted. The total pollution control costs associated with chloride reduction are $1,000,000 per year ($640,000 projected + $350,000 already incurred) for this plant. If these costs are distributed over the average production rate of the facility, an increase of $4.00 per ton of salt is anticipated, as compared to the existing cost impact of $1.40 per ton.

The additional pollution control costs represent an increase in price of 6% for the product from Watkins Glen. Since these costs are peculiar only to this plant, the selling price of salt at this plant will either be above market price or absorbed by the company, raising serious questions about the long term viability of the plant. Because there is excess supply, import competition, and little product differentiation, price is the primary determinant of the buyer. A premium cost, especially at time of discounting, will result in a demand shift greater than the price increase itself. Since a small percentage of the product is long term contract, the higher priced salt must compete in the spot market. Thus, the impact upon Watkins Glen will be an output reduction greater than 6%. The actual magnitude of the reduction depends upon the proximity of competitors and the amount of salt sold at the edge of the ISCO geographical market. ISCO will lose those customers who now find it cheaper to purchase salt from a competitor whose incremental transportation costs are less than the increased ISCO price.

Thus, additional pollution control expenditures will result in a significant economic impact upon the Watkins Glen plant. The probability of reduced output and reduced profitability is inevitable considering the competitive nature of the industry and the trend of dry salt imports. Expanding supplies of more cost-efficient operations exacerbates the operating problems of an older plant facing additional pollution control expenditures.

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Indicative of the financial and economic constraints of the salt industry is the history of the salt industry in New York. At one time there were three plants located on Seneca Lake. One of these plants has already closed lending credence to the marginal economic conditions of the New York salt industry.

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Chapter 7

CONCLUSIONS AND RECOMMENDED PERMIT LIMITATIONS

7.1 Conclusions

In this report the legal basis, environmental basis, and the costs and benefits of ISCO's Watkins Glen facility complying with the 250 mg/ℓ chloride standard have been reviewed. No legal basis in either the federal or New York State regulations were found to justify the 250 mg/ℓ chloride standard. Water quality in Seneca Lake is actually improving with ISCO's present effluent quality. Thus, maintenance of the TDS water quality standard is not the basis for the permit limitation.

The environmental effects of chlorides are minor until levels much higher than currently exist in Seneca Lake are reached. The major benefit from ISCO achieving the 250 mg/ℓ chloride level will be to the public water supplies on Seneca Lake and River. An estimated benefit of $4,600 per year will accrue to the public water supply users if ISCO achieves the 250 mg/ℓ level. However, the annual cost to ISCO for achieving this level will be $640,000, for a benefit:cost ratio of 1 to 140. Clearly requiring ISCO to achieve the 250 mg/ℓ chloride level is not an efficient use of our nation's limited resources.

The economic impact on ISCO, which was described in Chapter 6, will be significant. Salt is primarily sold based on price; excess capacity and import competition currently exist in the U.S. salt market. The Watkins Glen facility would lose customers if it tried to pass on the 4 to 6% additional cost associated with achieving the 250 mg/ℓ limit.

To alleviate the economic impact on ISCO's Watkins Glen refinery and to assure efficient alloction of resources, ISCO's SPDES permit limitations should be modified. Part II - General Conditions Number 1a of the SPDES permit specifies that the permit provisions "will reasonably assure compliance with applicable water quality standards." This same provision states that if "a modification of the permit is necessary to assure maintenance of water quality standards or compliance with other

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provisions of ECL Article 17, or the Act, the Department may require such a modification . . ." Presumably, this provision directs the NYSDEC to modify a permit when the inverse holds; that is, when the existing permit conditions are not necessary to assure maintenance of water quality standards or compliance with other provisions. In fact, the NYSDEC sent a letter to ISCO's Watkins Glen facility requesting ISCO to submit justification for a permit modification, if desired.[a]

7.2 Recommended Permit Modifications

Outfall 001, which includes boiler blowdown, ash scrubber, and contaminated storm water, is currently limited to 16 and 32 lbs per day chlorides daily average and daily maximum, respectively. These values represent 0.04% of the total chlorides discharged from outfall 002. It makes no sense to regulate such a de minimus amount of chlorides when 99.96% of the chlorides are discharged from outfall 002. Clearly the monitoring and administrative costs far exceed any benefits to be gained from such a limit.

Recommendation - Delete the chloride limitations completely from outfall 001

Outfall 002 includes the condensate from the multi-effect evaporators and the barometric condenser water. The permit condition presently limits the chlorides in this discharge to 250 mg/ℓ. It has already been demonstrated that this effluent limitation has no technical or legal basis. The pertinent issue now becomes ascertaining an appropriate limit to replace this standard. Because of the lack of TDS water quality violations in Seneca Lake and the actual improvement in the TDS levels in the lake,[b] one could argue that no effluent limitation should be imposed. However, ISCO recognizes the concern of the DEC that complete elimination of an effluent standard altogether could result in an increase

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[a]Letter from Clarence Shoemaker, NYSDEC dated February 19, 1981.
[b]Based on the chloride water quality trend.

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in the chloride levels discharged. The standard recommended below would require ISCO to continue to operate the present abatement equipment and would require that major leaks or upsets be corrected in a timely fashion. A two day running average chloride limitation would provide adequate protection by requiring a major leak or upset to be corrected on the day following detection. In 1980, chloride concentrations typically increased from less than 500 mg/ℓ to 1600 mg/ℓ over a two day span.[c] Thus, a two day maximum limit based on 1600 mg/ℓ would be sufficient to assure the equipment is operated and maintained properly. The limit should be based on weight to allow ISCO the ability to shut down one evaporator and keep one operating in the event both develop leaks simultaneously. Using 10.8 million gallons per day, an effluent limit of 140,000 pounds per day could be specified as a two day running average value, not to be exceeded.

Recommendation - Modify the chloride limitation for outfall 002 to the following: "The average chloride level over any two consecutive days (running average) shall not exceed 140,000 pounds per day."

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APPENDIX H

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APPENDIX I

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Book

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
50 WOLF ROAD
ALBANY, NEW YORK 12233

In the Matter

- of the -

Application of ORANGE COUNTY WATER AUTHORITY for Permits for the Construction of the Orange County Water Supply Project in Orange County, New York.

DEC Project No. 3-3399-00003/00001-0

INTERIM DECISION

February 24, 1992

NYSDEC OHMS Document No. 201166576-00037

INTERIM DECISION

This Interim Decision is in relation to appeals filed to the October 4, 1991 rulings (the "Rulings") of Administrative Law Judge ("ALJ") Andrew S. Pearlstein regarding the captioned proceeding. The project would involve two main water sources - the construction of a 670 acre, 4 billion gallon capacity reservoir on the Dwaar Kill in the Town of Crawford and a connection to New York City's Catskill Aqueduct in the Town of Montgomery. The reservoir would also be supplied by a diversion of flows from the Shawangunk Kill. The project includes a raw water transmission system, a water treatment plant and a finished water transmission system. For the reasons stated below, I find that the Rulings should be upheld.

An ALJ's ruling on issues and party status is intended to set the scope of the hearing and define the rights of parties to participate. With the evolution of the hearing process under the Department's rules of practice, the issues and party status ruling has become an increasingly important watershed in the proceeding. In this case, for instance, the Rulings are both extensive in length and exhaustive in their treatment of arguments offered by parties and potential parties.

An interlocutory appeal of those rulings is provided by regulation principally to ensure that the ALJ has not misapplied the standards for determining issues or party status. It is not intended that the Commissioner simply repeat the ALJ's work. If that were the case, it would be more efficient for the Commissioner to make all issues and party status rulings in the first instance.

It is therefore disappointing that two potential parties, Watchtower Bible and Tract Society of New York, Inc. and the Town of Mamakating, have chosen to ignore the analysis provided in the Rulings by submitting appeals that, for the most part, reiterate verbatim the arguments previously made to the ALJ. ALJ Pearlstein has already articulated the reasons why those arguments are insufficient to raise an issue for adjudication. I have reviewed his reasoning and I find no need to supplement it. The issues appealed by the Town of Mamakating which take the Rulings into account are addressed immediately below.

Town of Mamakating

The Town maintains that it should be granted party status even in the absence of a showing that it could offer evidence that would substantively contribute to the record. The Department has stated in numerous prior decisions that the test established by the regulations require a showing of both environmental interest

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and the ability to assist in the development of the record (In the Matter of Orangetown Sewer District No. 2, Interim Decision of the Commissioner, March 23, 1989). The Town has not made an adequate showing on this latter point and no matter how strong its interest, party status cannot be granted.

The Town also differs with the limitations placed by the ALJ on the Department's role in the State Environmental Quality Review Act ("SEQRA") process. The ALJ correctly points out that the Department's authority is limited to that of an involved agency. Absent a change in lead agency status, determinations of significance can only be made by OCWA, the lead agency (6 NYCRR §617.6(g)). OE also expresses concern that the lead agency is also the project sponsor. However, the decision to allow governmental project sponsors to fulfill the lead agency role is a legislative one and not subject to review in this forum (see ECL §8-0105(4)(i)).

Orange Environment ("OE")

While the appeal of OE has addressed itself to the Rulings, it suffers from another defect. All of the issues appealed suffer from the common failing that they do not provide the specificity that is needed to judge the strength of OE's contentions and the evidence that it would offer at the hearing. Ultimately, the standard for determining issues requires that the decisionmaker be convinced that there is a substantive dispute which has the potential of affecting the outcome of the permit process (In the Matter of Hydra-Co. Generations, Inc., Interim Decision of the Commissioner, April 1, 1988). OE's submittal does not indicate the nature of the evidence it will present except in the most general terms. From these statements, it is impossible to conclude that a substantive dispute exists.

Shawangunk Valley Conservancy and the Town of Shawangunk ("SVC")

SVC proposes to adjudicate the use of the Neversink Aquifer as an alternative water supply source. Upon review of the existing record, I conclude that no further review is warranted.

There are three factors which lead me to this conclusion. First, there are significant administrative inefficiencies attendant to adjudicating the relative merits of two entirely different alternative projects and it is not yet clear that there is a need to look any further at alternative projects. Second, where the Department acts in an involved agency capacity, there are sound legal and policy reasons to use the Department's hearing process sparingly to adjudicate issues arising principally from the lead agency's environmental impact statement process. Last, the best available information demonstrates that it is very unlikely that the Neversink alternative would receive the regulatory approval that it needs from the Delaware River Basin Commission ("DRBC").

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The parameters of the Neversink alternative are not well defined and the impacts of such a project have hardly been analyzed. In order to have an adequate basis to compare the impacts of the Neversink alternative, a great deal of environmental impact analysis would need to be performed. That analysis would be quite complicated as there are many potential cumulative impacts (see the April 30, 1991 letter from Gerald M. Hansler, Executive Director of the DRBC to Robert F. Bradford, Executive Director of OCWA). Therefore, it would be quite burdensome and administratively inefficient to require the adjudication of the relative merits of the Neversink alternative before the need to further examine project alternatives is established. No further need to examine such alternatives is required under ECL §15-1503(2) and would only be required under SEQRA upon a showing that there are significant adverse impacts associated with the proposed project that are unmitigatable.

SVC suggests that cost is a consideration when comparing the merits of an alternative. While the project sponsor appropriately may examine alternatives with that purpose in mind, cost is only a factor for a regulatory agency when judging the feasibility of requiring mitigation that may increase project costs. Here, even if the Neversink alternative were significantly less costly than the proposed alternative, that would not be a decision criterion for the Department.

The alternatives issue also arises in a context where the Department is not the lead agency under SEQRA. As pointed out in my recent Interim Decision,

> "Coexisting with the requirement that each involved agency must make independent findings is the notion that the lead agency is solely responsible for the management of the environmental impact statement process, although other involved agencies are encouraged to participate in that process. Therefore decisions to use the Department's hearing process in a way which may be the practical, if not the legal, equivalent of the SEQRA process must be used sparingly where the Department is not itself the lead agency and has before it a final environmental impact statement. To act otherwise would negate SEQRA's intent to establish a single coordinated review process.
>
> "Finally, I must consider the directive that SEQRA not change jurisdiction between or among agencies (6 NYCRR 617.3(b)). Agencies that are directly undertaking actions must make certain entrepreneurial decisions concerning a project. This last principle suggests that where the project sponsor is the lead agency, the Department should

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> only exercise its SEQRA authority in a way that is contrary to those entrepreneurial decisions where there exists a demonstrated environmental impact that has not been adequately addressed."
>
> In the Matter of the Development Authority of the North Country, Interim Decision of the Commissioner, July 24, 1990 at pg. 3.

The Department's status under SEQRA as an involved agency is therefore yet another reason to avoid adjudication of the alternatives until it is established that the proposed project will entail significant and unmitigatable adverse environmental impacts.

While each of the foregoing reasons are sufficient on their own to support this ruling, I also find that the record demonstrates that examination of the Neversink alternative is likely to be a futile effort. It is not necessary to show that an alternative is legally precluded in order to conclude that further examination is not justified. In order to avoid overburdening the review process with unrealistic alternatives, judgments about the feasibility of alternatives can and must be based on reasonably reliable indicators.

In this case, all such indicators point to the conclusion that the Neversink alternative is extremely unlikely to be approved. The Executive Director of the DRBC as well as representatives of New York State and New York City have voiced opposition to the alternative, citing the potential adverse impacts of such a project. The other member states who could not possibly gain, and might suffer, from the withdrawals are unlikely to support it either. The withdrawals also would be inconsistent with long standing DRBC policy to oppose interbasin transfers of water. Against this background, the SVC offers no realistic basis to believe any of these impediments could be overcome.

Finally I note that the recent correspondence from the Environmental Protection Agency concerning the status of the federal review of the project does not warrant taking any different action.

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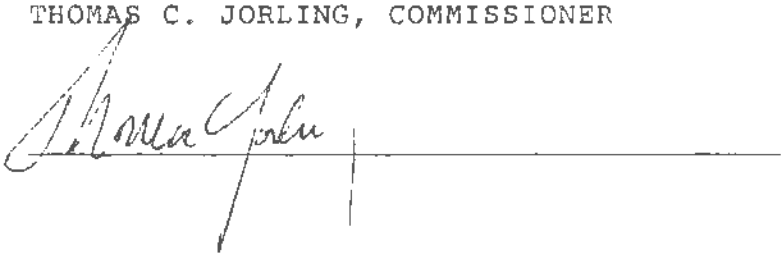
Summary

The Rulings of ALJ Pearlstein are upheld in total. This proceeding is remanded to him for the development of a record on the one issue requiring adjudication - the impact of the proposed withdrawals from the Shawangunk Kill on the aquatic biota in that stream.

IN WITNESS WHEREOF, the Department of Environmental Conservation has caused this Interim Decision to be signed and issued and has filed the same with all maps, plans, reports, and other papers relating thereo in its office in the County of Albany, New York this 24 day of February, 1992

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
THOMAS C. JORLING, COMMISSIONER



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February 16, 2012

VIA OVERNIGHT DELIVERY

David L. Bimber
Deputy Regional Permit Administrator
New York State Department of Environmental Conservation
Regioin 8
6274 Avon-Lima Road
Avon, New York 14414

Re: *Finger Lakes LPG Storage, LLC*
Proposed Liquid Petroleum Gas Storage Facility, Town of Reading, Schuyler County

Dear Mr. Bimber:

As you know, on January 20, 2012, on behalf of Finger Lakes LPG Storage, LLC ("Finger Lakes"), we submitted information in response to comments received on the Draft Supplemental Impact Statement ("DSEIS") for the proposed Liquid Petroleum Gas ("LPG") storage facility in the Town of Reading, Schuyler County (the "Project"). As we noted, Finger Lakes has made changes to the Project that further minimize and/or mitigate any potential environmental impact of the Project. We provided information regarding certain of these changes as well as additional information for inclusion in the SEQRA record. The purpose of this letter is to provide additional information which either was not available at the time of our January 20 submission or further respond to certain public comments.

A. Quantitative Risk Assessment

A Quantitative Risk Assessment ("QRA") study has been completed by Quest Consultants, Inc. ("Quest") to provide a detailed report providing a quantitative assessment of the potential risks posed by the proposed facilities. See **Exhibit 1**. Quest is a well recognized expert in the field and has performed numerous QRAs. The study was composed of four distinct tasks.

Task 1. Determine potential releases that could result in hazardous conditions outside the boundaries of the LPG facility.

Task 2. For each potential release identified in Task 1, derive the annual probability of the release.

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Task 3. For each potential release identified in Task 1, calculate the potentially lethal hazard zones.

Task 4. Using a consistent, accepted methodology, combine the annual probabilities from Task 2 with the potential release consequences from Task 3 to arrive at a measure of the risk the facility poses to the neighboring public.

The first task identified 113 accident scenarios. Each scenario is a unique combination of an operating mode and a specific product (propane or butane) for one portion of the system. Each of these scenarios was further expanded to include 4 release hole sizes and two release orientations.

The second task, calculation of accident frequencies, relied on historical data available from the sources identified in Section 4.

The third task involved quantification of the hazards posed by the individual accident scenarios. Each scenario identified in the first task was evaluated under a range of weather conditions, and for multiple hazard types. The results of these calculations limited the overall analysis to areas within about 1,500 feet of any potential release source. This was the maximum extent, under the worst-case weather conditions, that a flammable hazard created by a release of LPG from the facility could travel off site. All other offsite hazard zones were smaller for all other potential accidents. Because most release sources are away from the property lines, potential impacts outside of the facility boundaries are less than this maximum extent.

The fourth task undertaken was the calculation of the risk posed to the public.

Based on its analysis, Quest concluded that the hazards and risks associated with the Finger Lakes LPG facility are similar to those presented by LPG storage, transport and processing facilities worldwide. While the offsite risk associated with the operation of the LPG facility is not zero, the offsite areas impacted by the higher risk levels are limited to a few uninhabited locations, and most offsite areas are found to be impacted with relatively low levels of risk. In addition, this analysis is conservative in nature, so it should provide an overprediction of the true risk posed by this facility.

B. Miscellaneous Safety Comments

Commenters expressed concerns over the history of catastrophic failure of hydrocarbon storage in salt caverns. These comments focus on the 2008 British Geological survey report and analysis of incidents at underground salt storage facilities. The British Geological Survey appraisal of underground gas storage technologies and incidents

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was reviewed when identifying examples of potential accidents at salt cavern LPG storage facilities to evaluate in Section 4.6.4 of the DSEIS.

Other commenters mention a John Hopper article which identifies multiple catastrophic events involving salt cavern storage facilities. The main failure mechanisms encountered at those salt caverns were problems associated with or the failure of the well or well casing, failure of above ground infrastructure (valve, pipes, wellhead or compressor units), loss of cavern capacity due to operational pressures being too low to maintain cavern walls, and the overfilling of caverns. Given the differences between those facilities and the proposed Finger Lakes facility and the safety measures and testing that will be in place and implemented by Finger Lakes, none of the accidents summarized in this article (which are also described in the 2008 British Geological survey report, pp. 154-164) are likely at Finger Lakes' facility.

Another safety feature will be gas detectors that will be located around active wells, and other operational areas, connected to the PLC for alarm and operation (closure of valves and ESD). The QRA also addresses potential releases and their pathways, taking into account topography and wind speed.

C. Brine Pond Design and Construction

As described in our January 20 letter, Finger Lakes has decided to substantially reduce the size of the brine pond located on the east side of NYS Route 14 and move it further south (on property it owns). In addition, Finger Lakes will construct an approximately 1 million barrel brine pond on its property at the surface facility (the former Casella property) located west of NYS Route 14 and off of NYS Route 14A.

The double lined design described in the Engineer's Report in the DSEIS will remain for both brine ponds, including 3 feet of free board. Final P.E. stamped design drawings will be provided to the Department prior to the commencement of construction.

A full-time engineering inspector will be present on-site during construction of the ponds, including during installation of the geomembrane liner system. The engineering inspector will be experienced in geomembrane installation. In addition, as stated in the project specifications that are included in the Engineer's Report (Appendix F to the DSEIS) (310519.18): (1) the installer is to be manufacturer approved and to have a minimum of 50 acres of installed geomembrane experience; (2) all liner installation and welding is to take place under the supervision of an experienced supervisor and master seamer; and (3) there will be testing (both destructive and non-destructive) performed on the geomembrane welds to verify that they meet the required project specifications. The liners are covered by a warranty of 20 years.

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D. Storage Facility Brine Operations Plan

A description of how Finger Lakes will address the reduction of brine pond storage capacity as part of its operational injection and withdrawal plan is attached as **Exhibit 2**.

E. Revised Site Operations Plan and Relocation of Plant Area

The Site Operations Plan submitted with our January 20 letter has been slightly revised to elongate the pipe segment west of NYS Route 14 before it turns towards the Casella property and to move the truck unloading rack and bullet tanks further away from NYS Route 14A (**Exhibit 3**). The primary reason for this move has been to further avoid wetland impacts and/or to reduce potential risk per the QRA. A revised site plan for the surface facility is attached as **Exhibit 4**.

F. Revised Wetlands Report

In our January 20 submission, we provided an updated wetlands report. Finger Lakes has been successful in avoiding nearly all permanent impacts to wetlands and streams. These activities are covered by a Nationwide Permit (NWP). The NWP requires a Pre-Construction Notification (PCN). Finger Lakes recently submitted its PCN to the U.S. Army Corps of Engineers and a copy of that submission is attached hereto as **Exhibit 5**. Our expectation is that the Corps' verification of the applicability of the NWP will also include a jurisdictional determination confirming the wetlands and other Waters of the U.S. described and depicted in the wetlands report attached to the PCN.

G. Stormwater

Construction activities will disturb greater than 1 acre and therefore under the DEC State Pollutant Discharge Eliminations System ("SPDES") regulations, Finger Lakes must comply with the SPDES General Permit for Stormwater Discharges from Construction Activity, GP-08-001 ("General Permit"). In accordance with the General permit, a Stormwater Pollution Prevention Plan ("SWPPP") was prepared and revised as described below for the project to comply with the General Permit and in conformance with DEC technical standards applicable at the time of the initial Notice of Intent for erosion and sediment controls and also water quality and quantity controls. See DSEIS, Appendix H.

During the summer of 2009, a SWPPP was developed for the Finger Lakes project as envisioned at that time. This original stormwater plan covered a railroad siding and associated offices, a plant area, a pipeline, and a two celled brine storage facility. This plan was completed and the Notice of Intent was signed and mailed on August 20, 2009. An Acknowledgement of Receipt was received from DEC with permit NYR10R595 coverage effective 5 business days after August 24, 2009. In conjunction

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with this original authorization a request to disturb more than 5 acres was submitted to DEC on August 21, 2009. After review of the plan by DEC's stormwater management specialist, and minor plan modifications, approval for disturbance was received on September 15, 2009.

Following original plan approval, Norfolk Southern required that a runaround track be installed north of the site to allow for delivery of rail cars into the siding. In addition, the brine pond design was refined and modified to a single cell. To accommodate these changes, Revision 1 to the stormwater plan was completed in June of 2010. This revision was reviewed with DEC's stormwater management specialist and received approval; a revision document was generated and supplied to the DEC stormwater management specialist.

Between June 2010 and February 2011, additional changes were made to the site plan by Finger Lakes. These changes included the removal of the electrical switch yard and substation (since electric has been provided by NYSEG from existing transmission and distribution lines) as well as the addition of a truck staging area. The stormwater practices associated with the electrical infrastructure were removed from plans. Modifications to the office area stormwater plan and addition of stormwater practices to serve the staging area were made. These modifications were reviewed with DEC's stormwater management specialist and revision 2 to the stormwater plan was submitted on March 4, 2011.

In terms of the storm water conveyance system, the description in section 4.2.2 of the DSEIS is accurate. With the change in the location of the brine ponds, the stormwater plan will once again be revised to comply with the technical standards in place at the time of the initial authorization (September 2009) and kept at the site prior to construction. The objective of the stormwater management system remains to have a runoff quantity (rate) equal to or less than pre-existing conditions by use of stormwater ponds, dry swales, and extended detention. In addition, the quality of the runoff will be maintained by directing small runoff volumes through dry swales and dry ponds and directing larger volumes through ponds with extended detention. Runoff from the affected areas will be diverted around the planned projects, ensuring that the quality of this water is maintained. Outlet protection will also be located at the outlets of all culverts and basins.

H. Water Needs

The only water needs for this project relates to potable water at the truck/rail facility, emergency water for fire safety purposes and for well backwash for well tubings. There will be one or two pumps housed in a structure on US Salt property next to Seneca Lake to facilitate the water supply for fire safety purposes. If needed, the pumps will be able to pump approximately 3000-3500 gallons per minute. Otherwise, fresh water is

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not needed to operate the underground storage system. The water lines are now shown on the Site Operations Plan.

I. Supplemental Geological Information

In response to public comments made regarding geology, geologic faults, seismic concerns and the ability of the salt caverns to retain liquid petroleum gas, we provide in our January 20 submission a memorandum prepared by geologists Leonard Dionisio and John Istvan of Inergy Attached to the memorandum were two study reports, one prepared by Dr. John C. Fountain and one prepared by Dr. Robert D. Jacobi. Finger Lakes claimed that these study reports were protected from disclosure under 6 NYCRR § 616.7. Upon further review of these reports, Finger Lakes withdraws its claim of confidentiality.

J. Inergy and Finger Lakes' Capability to Construct and Operate the Facility

1. Inergy's Experience

Numerous public comments question whether Inergy, Finger Lakes' parent, is equipped to operate the Finger Lakes facility. Finger Lakes owns and operates an underground LPG facility in Savona. In addition, Finger Lakes has retained an experienced engineer and contractor, Superior Energy Systems, Ltd. ("Superior") to construct the surface facility. Moreover, Inergy owns and operates other underground LPG storage facilities as part of its propane business, and has constructed and operates similar types of facilities as part of its natural gas storage and transportation business.

2. Experience of Facility Design Engineer

As noted above, the surface facility has been designed by Superior. William J. Young, Vice President of Engineering at Superior, spoke at one of the public hearings and submitted written comments. Mr. Young has 50 years of experience in designing LPG facilities, varying from a small standby system for a McDonalds Restaurant to an Ocean side receiving facility with storage of 30-100,000 gallon tanks. Mr. Young has also been responsible for the design of numerous rail delivery terminals and several pipeline delivery terminals.

Mr. Young has been a member of the National Fire Protection ("NFPA") 58 Liquefied Petroleum Code Committee for over 20 years. He is also a member of NFPA 59 Utility LP-Gas Plant Code, NFPA 160 Standard for the Use of Flame Effects Before an Audience, and NFPA 1126 Standard for the Use of Pyrotechnics Before a Proximate Audience. He is Chairman of two American National Standards Institute ("ANSI") Technical Advisory Groups on Gas Consuming Appliances, and has been involved in

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the ANSI codes for over forty years. Mr. Young has also been involved with Voluntary Consensus Code Development and Design of Large LPG Facilities.

In correspondence attached to our January 20 letter, Mr. Young addressed compliance with the 2011 edition of NFPA 58, *Liquefied Petroleum Gas Code*. Superior has also addressed the applicability of standards API 2510 and 2510A, in light of New York's adoption of NFPA 58 and 70 (the National Electric Code).

K. Inergy's Plans at the Project Site

Finger Lakes' affiliate, Arlington Storage Company, LLC ("Arlington Storage Company"), has filed an application with the Department to expand the Seneca Lake Natural Gas Storage Facility. This expansion into Gallery 2 (located on Arlington Storage Company's property) was previously authorized by the Federal Energy Regulatory Commission ("FERC") in 2002, but never permitted by DEC because Seneca Lake Storage, Inc., an affiliate of NYSEG (the former owner of the facility) withdrew its application. Finger Lakes' underground storage permit application (including a Finite Element Analysis model) evaluates the proximity of Finger Lakes Galleries 1 and 2 to the Seneca Storage Facility, including the proposed Gallery 2. No other applications by Finger Lakes or its affiliates have been filed with DEC. Although Inergy's public filings indicate that the Finger Lakes storage caverns are suitable for future expansion, any such expansion would be subject to receipt of all required regulatory approvals, including DEC authorization. Thus, there can be no claim of improper segmentation.

L. Pipes, Valves or Pumps

There were comments regarding potential issues with pipes, valves, and pumps. With respect to any freezing of such equipment, Finger Lakes and US Salt have not experienced freezing of its pipes, valves or pumps. The brine lines will mostly be buried. At Savona, periodic ultrasonic thickness testing is performed on aboveground piping and regular visual inspections are conducted. At US Salt, regular visual inspections are conducted of the brine lines and, when needed, piping and other equipment is replaced or repaired.

With respect to corrosion of the pipes, valves, and pumps, Finger Lakes will perform corrosion surveys yearly. Any corrosion anomalies found on piping or other components outside of acceptable safety standards will be repaired or replaced.

M. Truck Loading

We would also like to clarify perceived inconsistencies in the DSEIS noted by some commenters with regard to hours of operation. The 4 a.m. to 8 p.m. hours referenced in

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the DSEIS relate to more than truck loading. During these hours, employees will open the site, prepare the plant to load trucks, open wells to maintain the necessary volume in the aboveground tanks, load trucks, and close the plant. The truck loading process itself involves doing preliminary paperwork, hookup to the truck, truck loading, unhooking from the truck, and final paperwork.

It is estimated that 2 trucks every 30 minutes will go through this process or 4 trucks every 1 hour. On average, trucks will be loaded over an 8 hour period during site hours (discussed below) for an approximate number of trucks of 32 per day, near the estimated 30 trucks per day that Finger Lakes has noted in its documents. If during a particularly busy period, trucks are loaded over a 12 hour period during site hours, this would equate to 48 trucks per day.

N. "No Action" Alternative

Certain public comments criticized the DSEIS because of the absence of a No Action alternative. It should be noted that the DEC approved and publicly reviewed scoping outline did not require that the DSEIS include a No Action Alternative. Nevertheless, this section is intended to provide an evaluation of a No Action Alternative. According to the SEQRA Handbook, the substance of the "no action" discussion should be a description of the likely circumstances at the project site if the project does not proceed. For many private actions, the no action alternative may be simply and adequately addressed by identifying the direct financial effects of not undertaking the action, or by describing the likely future conditions of the property if developed to the maximum allowed under the existing zoning. In this case, the no action alternative would see the continuation of activities on the US Salt property, such as underground gas storage and solution mining activities. At the surface facility site, owned by Finger Lakes, there would be no activity at the site, although the surrounding properties would continue to be used for rail transportation, trucking, and perhaps solid waste storage.

If the no action alternative was selected, the substantial need for the Project would go unfulfilled. The Northeast propane market is approximately 43 million barrels (mmbbls) or 1.8 billion gallons (bgls). Approximately 70% or 1.25bgls is consumed during the October to March period. During this period, as much as 40% or 720 million gallons (mmgls) of demand may occur during the December to January period.

Due to the supply traveling such long distances (from, for example, Canada and the southwestern United States) and the finite capacity of the TEPPCO system there are imbalances where demand exceeds local available supply during peak periods. In severe winters this can be extreme. There is only approximately 1.7mmbls (71mmgls) of local storage. Additionally, it is not readily available to the market as it is used to

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supplement the TEPPCO pipeline deliveries throughout the winter period which are apportioned based on shippers summer deliveries.

The combination of pipeline allocation and any disruption from waterborne imports (i.e. late ships which occur frequently) or stranded tank cars, and refinery outages during peak winter demand creates a shortfall in supply that causes demand for spot market product that is immediately available by truck or tank car. This drives local pricing spreads from the approximate average of 15 cents per gallon (cpg) over the Mt. Belvieu, Texas pricing index to 60cpg. In more severe winters these spreads can eclipse 90-100cpg.

Based on the average retail propane prices as referenced in United States Energy Information Administration data, these spreads could cause increases in retail prices to consumers between 20-35% which would increase the average price of a 400 gallon winter tank fill from $1000 to $1350. Not only is this an economic burden for the consumer but it often drives consumers to seek cheaper and less clean sources of fuel. Because these spreads are driven by transportation and spot product economics they do not change with energy prices. When overall energy prices are lower, the percentage increase in prices to consumers due to the spot spread can be in the 50-60% range.

There is a demonstrated need for additional propane storage infrastructure in the area. The New York State Energy Plan Petroleum Assessment (December, 2009) characterizes propane fuel as a "small volume, essential source of energy for New York residents and business owners." Similarly, the New York State Energy Research and Development Authority ("NYSERDA") has stated that "[p]ropane is an important heating fuel in NYS and the strong demand during the winter heating season puts a strain on the industry's ability to meet that demand." In fact, 370 million gallons of propane will be consumed by New Yorkers each year, through an infrastructure of truck, rail, pipe, and storage terminals. The New York Propane Gas Association reports 233 retail locations serving New York. Over 220,000 New York Households use propane for primary space heating, mostly in suburban and rural areas. In addition, approximately 287,691 New York Households use propane as primary fuel for heating water. Moreover, approximately 514,000 New York State Households use propane for cooking. Over 20% of residences use propane in Schuyler County. The residents and businesses in the area use this kind of clean energy for heating and cooking and storage and transportation services are essential to serving these residents. LPG has been stored and transported safely in this area for decades.

Each year, with truck and rail terminals operating at optimal capacity, New Yorkers will consume the propane in storage and import additional supply depending on the severity of winter. Current storage capacity of New York is not enough to off set imports. For the

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past 12 winters, the TEPPCO propane terminals in New York have allocated the propane supplied via pipeline during 40 % of the peak winter demand period, November through February. Current pipe capacity is not enough to offset imports.

New York propane customers will directly benefit from the addition of 63 million gallons of new propane storage capacity at Finger Lake's Facility. Access to more storage in New York remedies 3 key areas of concern for the winter home heating season:

1) Lowers propane supply cost to New York consumers – Access to local storage will decrease need to pay the higher transportation fees associated with truck and rail car supply imported into the market to meet winter demand.

2) Increases efficiency – Increasing storage capacity will allow the pipeline to operate more efficient east of Watkins Glen, NY, thus improving total propane supply to the state and region.

3) Security of supply – More propane available within the state, rather than hundreds of miles away, will minimize the distribution risk associated with using other methods of propane transportation. The Finger Lakes Storage Facility will significantly increase supply security to the State of New York, minimize truck and rail logistics, and ultimately optimize consumer dollars spent on home heating demand.

In addition to the need for storage that a No Action Alternative would not fulfill, the direct financial benefits that would not occur if the No Action Alternative was chosen are substantial. For example, it is expected that approximately 50 construction jobs and 8-10 permanent full time jobs paying approximately $40-50,000/job will be created. The Facility will also result in indirect job creation. In addition, Finger Lakes' operations in Schuyler County and the Town of Reading will also generate real property tax revenues for the County, Town and local school district.

Consistent with the above-referenced demonstrated need, New York State has declared that providing for underground gas storage is in the public interest. See ECL § 23-301. Thus, selecting the No Action Alternative in an area that has proven to be a safe place for such storage would be in direct contravention of this stated public interest.

The 1992 GEIS evaluated alternative actions. In keeping with the state's declaration of public interest, the 1992 GEIS stated that the "total prohibition would be contrary to state and national interests. . . lost income and reduction of our domestic supply of oil and gas would necessitate increased imports of oil and gas , increased domestic energy conservation or replacement by alternate energy sources. . . Prohibition of underground gas storage would limit gas supplies in the winter months resulting in severe shortages.

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New York State is the third largest salt producer in the nation and prohibition of this industry could cause nationwide shortages."

Based on the foregoing and the fact that propane is the sole fuel source in many rural areas in Upstate New York, the No Action Alternative is not a viable option.

Please note that some of the information provided with this transmittal and the information contained in the attachments (e.g., the QRA) contain confidential information or confidential and/or proprietary, trade secret or business information and should be treated as privileged and confidential and should not be released pursuant to the provisions of 6 NYCRR § 616.7.

* * *

The public comment period closed on November 14, 2011, three (3) months ago. Given the critical nature of the energy infrastructure that this Project provides, the reduced impacts from the changes to the brine pond(s), and the information provided herein, we request that the Department expedite the completion of its review and quickly issue a Final Environmental Impact Statement so that an underground storage permit can be issued.

Four (4) additional sets of this submission are being provided to you for distribution to Department Staff. The entire submission will be placed on a CD and five (5) CDs will be subsequently provided.

If you have any questions regarding this matter, please call. Thank you.

Sincerely,

BOND, SCHOENECK & KING, PLLC

Kevin M. Bernstein

Enclosures

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List of Exhibits to Letter to David Bimber dated February 16, 2012

Exhibit 1	Quantitative Risk Assessment study prepared by Quest Consultants, Inc.
Exhibit 2	Brine Operations Plan
Exhibit 3	Revised Site Operations Plan
Exhibit 4	Revised Site Plan for Surface Facility
Exhibit 5	Pre-Construction Notification Submission to U.S. Army Corps of Engineers

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STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of the Application for an Underground Gas Storage Permit Pursuant to Environmental Conservation Law (ECL) Article 23, Title 23, by

FINGER LAKES LPG STORAGE, LLC,

Applicant.

AFFIDAVIT OF SCOTT E. SHEELEY

DEC Permit Application ID No. 8-4432-00085

State of New York)
) s.s.
County of Livingston)

Scott E. Sheeley, being duly sworn, deposes and says that:

1. I am employed by the New York State Department of Environmental Conservation ("DEC" or "Department") as the Regional Permit Administrator (Environmental Analyst 3) in the Division of Environmental Permits ("DEP") Region 8 Office in Avon, New York. I have worked at DEP for over sixteen years as an Environmental Analyst. I have held my current position for just over four years.

2. I have a Bachelor's of Science Degree in Biology/Environmental Science from Taylor University and a Master's of Science Degree in Environmental and Forest Biology from the State University of New York College of Environmental Science and Forestry.

3. I have personal knowledge of the facts and circumstances of this matter generated through the exercise of my official regulatory duties and review of DEC files.

4. Among my responsibilities in my current position, and in prior work within DEP as an Environmental Analyst, I review and coordinate the review of staff in administering any applicable requirements of the New York State Environmental Quality Review Act ("SEQR"),

ECL Article 8, during the Department staff's processing of applications for various Department permits. In this role my duties also include applying the Department's Program Policy on Assessing and Mitigating Noise Impacts (DEP-00-1) ("DEC Noise Policy") (available on the Department website at http://www.dec.ny.gov/regulations/2374.html). Since the adoption of the revised DEC Noise Policy in 2001, I have evaluated noise analyses prepared for projects under the DEC Noise Policy, both as an Environmental Analyst with direct responsibility for project management and as a supervisor of other Environmental Analysts working on projects that include evaluation of noise impacts. This experience has included at least 17 project-specific noise evaluation reviews on various projects.

5. I reviewed the SEQR Draft Supplemental Environmental Impact Statement ("DSEIS") (see, OHMS Document Number 201166576-00003, Document List IV.A) submitted by Finger Lakes LPG Storage, LLC, ("Finger Lakes" or "Applicant") in support of its application for a permit pursuant to ECL Article 23, Title 13 ("Permit") for a new underground liquefied petroleum gas ("LPG") storage facility ("Project" or "Facility") to be located in the Town of Reading, Schuyler County. I also reviewed supplemental application materials submitted by the Applicant after the Department's 2011 acceptance of the DSEIS, including the 2012 and 2013 sound study updates and the 2014 sound study supplement described in paragraph 7 below.

6. I submit this affidavit in support of the Department staff's position that the Department should issue the Permit without adjudicating any issue related to sound levels from the Project 1) because the application materials demonstrate that Project sound levels were evaluated in a manner consistent with the DEC Noise Policy and would not exceed the guidelines of the DEC Noise Policy, and 2) because the draft Permit condition at Attachment 3,

Special Conditions Section D: Other, Number 1/Sound Monitoring, would require confirmation of that same demonstration once the Permit was issued (see, OHMS Document Number 201166756-00012). Also, the Sandstone Environmental Associates, Inc. Noise Review dated January 14, 2015 ("Sandstone Report"), submitted by petitioner for party status, Gas Free Seneca, as Exhibit 4 to their petition (see, OHMS Document Numbers 201166576-00020 and -00026), does not demonstrate that any issues related to noise impacts are "substantive" or "significant" and thus require adjudication under the Department's permit hearing regulations at 6 NYCRR Part 624.

7. The noise impacts from this proposal are discussed in section 4.3 (Noise Impacts) and in Appendix I (Sound Study prepared by Hunt for Finger Lakes LPG Storage, LLC, Proposed Watkins Terminal) of the DSEIS (see, OHMS Document Number 201166756-00006, Document List IV.A.1 and IV.A.3). Additionally, the Sound Study addresses Project modifications made after the preparation of the DSEIS. The original January 5, 2011 study, a first-level noise impact analysis, was modified in May, 2011 to reflect comments by the Department in its April 28, 2011 letter. The Sound Study was again updated in a January 20, 2012 transmittal to the Department and generally reflects the reconfiguration of the site in partial response to public comments. The reconfiguration of the site included changes to brine pond siting and size, including the addition of a second pond, addition of a fire safety system (water pump and lake water transmission line infrastructure), relocation of the plant area, and addition of a second brine pump at the West brine pond site. The Sound Study was updated in July, 2013 to clarify and correct data from one of the sound sources (brine pump). Finally, a March 7, 2014 supplement to the July, 2013 study was provided to evaluate the potential impacts to Receptor #7 using ambient noise measurements taken for the nearby Arlington Storage Company, LLC

("Arlington") Gallery 2 Expansion Project (August 30, 2013[1]; available on the Federal Energy Regulatory Commission website at: http://elibrary.ferc.gov:0/idmws/File_List.asp?document_id=14142631). The July, 2013, Sound Study and March 7, 2014 Supplement (together hereinafter, "Hunt Sound Study") are found at OHMS Document Number 201166756-00006, Document List I.B.32.

8. In summary, none of the potential sound level increases would exceed the guidelines of the DEC Noise Policy. Only two receptors may experience sound levels increases over 6 dBA, which is the threshold at which potential sound increases require closer evaluation of impacts. Of those two receptors, one is a neighboring industrial site that is not considered a sensitive receptor, and the other is a motel site where impacts will be mitigated and remain below a level that is considered significant pursuant to the DEC Noise Policy.

9. The Hunt Sound Study adheres to the methods identified in the DEC Noise Policy. Nearby receptors were properly identified, representative ambient noise levels were obtained, noise levels from Project noise sources were properly estimated, and expected changes in noise levels were properly estimated.

10. The Hunt Sound Study objectives included establishing day/night ambient noise levels at seven locations and describing the maximum estimated noise levels with all facilities operating. Ambient noise levels were measured on May 12, 2011 and ranged from 54.0 A-weighted decibels (dBA) (Leq) to 63.1 dBA(Leq) (Hunt Sound Study, Appendix B, Table 2) at the seven receptor locations (Hunt Sound Study, Appendix A, Figures 1 & 2).

[1] A revised Hoover & Keith Inc. report, dated February 11, 2014, was also prepared for the Arlington Gas Storage Seneca Gallery 2 Expansion Project, but the revisions did not introduce or rely on new ambient noise measurements.

11. The Hunt Sound Study identified three primary sources of noise during Facility operation that might have the potential for significant impact to ambient sound levels: 1) the truck and rail loading facility on State Route 14A, 2) the electric brine pumps (located in the vicinity of the East and West brine ponds), and 3) the electric injection pumps (LPG), located in the plant area. The potential noise levels from each of these sources were appropriately estimated for use in the Hunt Sound Study, which included use of representative measurements from a similar facility and use of equipment manufacturer specifications, both of which are acceptable under the DEC Noise Policy (Section V.B.3, p. 17). Empirical noise data for the truck and rail loading facility used in the Hunt Sound Study were obtained from the Savona LPG facility, a similar gas storage facility currently owned by Finger Lakes and formerly owned by its parent company Crestwood Midstream Partners LP[2], located in Steuben County, New York. All processes (movement of rail cars by the engine, truck loading activities, and truck loading pumps) were measured. On January 5, 2011, measurements were taken at the Savona LPG facility to obtain representative train operation noise levels. Train activities produced a maximum sound level (caused by the train engine) of 88.9 dBA and a Leq of 76.1 dBA for the duration of train activities. It should also be noted that according to the DSEIS (Section 4.4.2, pp. 127 & 128), rail operations at the Finger Lakes LPG Project site will not involve sounds from train horns or crossing signals. On May 12, 2011, a similar protocol was used to obtain empirical data on the truck loading facilities at the Savona LPG facility, which established a

[2] Crestwood Midstream Partners LP (NYSE: CMLP) merged with and into Inergy Midstream, L.P. (NYSE: NRGM) on October 7, 2013. Contemporaneously with the closing of the merger, Inergy Midstream, L.P. changed its name to Crestwood Midstream Partners LP and changed its NYSE listing symbol to "CMLP". Finger Lakes LPG Storage, LLC, US Salt, LLC and Arlington Gas Storage, LLC remain wholly-owned subsidiaries of Crestwood Midstream Partners LP (formerly Inergy Midstream, L.P.). The properties to be used for the Finger Lakes LPG storage Project continue to be owned by Finger Lakes Storage, LLC and/or US Salt, LLC, and the identity of the Applicant, Finger Lakes LPG Storage, LLC, has not changed. (see, OHMS Document Number 201166756-00006, Document List I.B.31.)

maximum sound level (Lmax) of 79.2 dBA and a Leq of 71.3 dBA. Equipment manufacturer specifications (Lmax) for truck loading pumps (75 dBA), LPG injector pumps (85 dBA), brine pumps (81.5 dBA), and fire pumps (84 dBA) were included in Appendix C of the Hunt Sound Study, and are also found in Table 1 of the Hunt Sound Study.

12. Based on projected noise levels, including mitigation measures, the expected noise level increases at each receptor are 6 dBA or less, with "worst case" exceptions at Receptor #7 (motel site) and at Receptor #2 (an industrial property), both of which also comport with the DEC Noise Policy as discussed further below. Section V.B.1.c of the DEC Noise Policy (pp. 13-15) discusses thresholds for a significant sound pressure level ("SPL") increase. It states that "sound pressure increases of 6 dB may require closer analysis of impact potential depending on existing SPLs and character of surrounding land use and receptors". It also states (p. 14):

> "In non-industrial settings the SPL should probably not exceed ambient noise by more than 6 dB(A) at the receptor. An increase of 6 dB(A) may cause complaints. There may be occasions where an increase in SPLs of greater than 6 dB(A) might be acceptable. The addition of any noise source, in a non-industrial setting, should not raise the ambient noise level above a maximum of 65 dB(A). This would be considered the 'upper end' limit since 65 dB(A) allows for undisturbed speech at a distance of approximately 3 feet."

13. During day operations, train noise may result in sound increases in the vicinity of the rail/truck loading facility for Receptors #2 (+4.1 dBA, Leq) and #5 (+1.6 dBA, Leq) over ambient levels (Hunt Sound Study Appendix B, Table 3). Night rail/train operations are not expected at this Facility (DSEIS Section 4.4.2, pp. 125-128). However, if night rail/train operations were to occur, train noise could result in sound increases in the vicinity of the

rail/truck loading facility for Receptors #2 (+5.3 dBA, Leq) and #5 (+2.8 dBA, Leq) over ambient levels (Hunt Sound Study, Appendix B, Table 3), neither of which exceed a 6.0 dBA increase.

14. During night operations, noise from the brine or injection pumps would cause increases over night ambient levels. At night, brine pump #2, and truck loading and unloading activities may result in sound increases in the vicinity of the rail/truck loading facility for Receptors #2 (+2.8 dBA, Leq and +8.4 dBA, Lmax) and #5 (+0.3 dBA, Leq and +5.9 dBA, Lmax) (Hunt Sound Study, Appendix B, Table 3). At night, the injection pumps, located in the plant area south of the East brine pond, may result in sound increases for Receptors #6 (+1.4 dBA, Lmax) and #7 (+3.3 dBA Lmax) using distance attenuation alone (Hunt Sound Study, Appendix B, Table 3).

15. It should be noted that Receptor #2 is a Facility property line that adjoins an industrial property, so there will not be any residential impacts, and the projected value of 61.2 dBA, Lmax is still below 65 dBA (see paragraph 12 above). Therefore, the potential Lmax increase of 8.4 dBA at Receptor #2 should not be viewed as significant under the DEC Noise Policy.

16. At the Finger Lakes eastern Project site, operation of the brine pump and injector pump has the potential to impact the same receptor identified in the Arlington acoustical assessments (the Receptor #7 motel site). In combination, the sound from the Finger Lakes injector pump located near the East brine pond, the Finger Lakes brine pump and the Arlington Gallery 2 Expansion Project operation would result in sound levels of approximately 50.3 dBA (47.3 dBA from Arlington and 46.6 dBA from Finger Lakes). This estimated sound level would represent an increase over the lowest ambient day-time (42.4 dBA) and night-time (45.0 dBA)

noise level measurements in the Arlington study of 7.9 dBA and 5.3 dBA, respectively, assuming all three activities occur simultaneously.

17. This potential night-time increase at the Receptor #7 motel site is below a level that would require mitigation beyond the measures already proposed. While the day-time increase is over 6 dBA, the estimated sound level of 50.3 dBA is still well below 65 dBA, which is the maximum recommended sound pressure level in a non-industrial setting in the DEC Noise Policy. In addition, as noted in the DEC Noise Policy, EPA's "Protective Noise Levels" guidance found that ambient noise levels of 55 dBA L(dn) were sufficient to protect public health and, in most cases, did not create annoyance. As a result, none of the increases discussed above exceed the guidelines of the DEC Noise Policy.

18. Noise from construction of the East and West brine ponds, plant area, and other infrastructure would be temporary (one construction season or less) in nature. Construction of facilities should take approximately 23 weeks from construction of access roads to final seeding (SWPPP, Revision 4, September 2012, Section 6, Construction Sequence) (see, OHMS Document Number 201166576-00003, Document List I.B.24). Noise associated with drilling and construction of the storage monitoring wells would also be temporary and intermittent. Potential noise impacts from drilling and construction of wells and access roads are also addressed in the 1992 Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, which can be found on the Department's website at http://www.dec.ny.gov/energy/45912.html . Moreover, Finger Lakes intends to use existing access roads for its wells and consequently there would be no impacts, including noise, from access road construction. Additionally, to further minimize construction noise impacts, the

Applicant has proposed, and DEC staff have agreed to, a condition in the Permit that would limit construction hours. The proposed condition is as follows:

> "Construction activities on the LPG storage project, including all project components (including but not limited to rail terminal, truck terminal, brine ponds, piping), will commence no earlier than 6 a.m. and cease no later than 8 p.m., with the following limited exceptions:
>
> - Well-related activities (including but not limited to drilling, logging, running casing, cementing) that must be performed continuously;
> - Activities required in response to non-routine incidents to prevent harm to the environment and to protect employees and the public; and
> - Upon prior written notice to, and approval from, the Department, any activities to address unusual events not specified above.
>
> Non-routine incidents must be reported in accordance with Permit Condition 8 of Attachment 1."

19. The mitigation considered in the Hunt Sound Study was noise attenuation by distance (inverse square method) alone, with the following exceptions: 1) use of an enclosure around the proposed fire pumps, 2) use of an aluminum-sided building around the injector pump at the east Project site, and 3) attenuation from vegetation and barriers at the brine pump and injector pump located near the East brine pond. The Project design will minimize noise from pumps by including enclosures and barriers at the injection and brine pump locations (DSEIS, Section 4.3.3 and Hunt Sound Study).

20. A confirmatory sound study must also be completed by the Applicant after the Facility begins full operation. If sound caused by Facility operation exceeds the higher of either

ambient or estimated levels as described in the Hunt Sound Study, additional mitigation is required by the draft Permit conditions. Such mitigation measures could include, but are not limited to: additional barriers, additional plantings, and muffling. A condition detailing the post-construction monitoring requirements is included in the SEQR conditions attached to the Underground Storage Permit (see, OHMS Document Number 201166576-00012, Attachment 3, Section D, Number 1).

21. Gas Free Seneca wrongly claims that the scope of the Hunt Sound Study is improper. The scope of the Hunt Sound Study provided by the Applicant adequately evaluates noise impacts.

22. Potential receptors were property identified by the Hunt Sound Study. These included properties surrounding the Facility on the west side of Seneca Lake, the side of the lake where the Project is located. No information provided in the Hunt Sound Study suggests that there is a potential for adverse noise impacts to properties located on the east side of the lake.

23. Also, contrary to the claims made in the Sandstone Report, the evaluation of off-site truck traffic and train noise is beyond the scope of the action under review, and need not be addressed.

24. The state highways and road systems adjacent to the site and in the surrounding areas already exist, and already carry commercial truck traffic from a variety of sources (e.g., agricultural, construction, freight, and fuel delivery). Further, the New York State Department of Transportation has indicated in their letter dated January 11, 2012 (OHMS Document Number 201166576-00003, Document List I.B.4) that the Project does "not represent a substantial increase to the existing traffic volumes." There are also no modifications to any roadways proposed as part of this Project (e.g., no addition of lanes or changes in intersections.). As a

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result, all assertions in the Sandstone Report, and related petition, that the Hunt Sound Study is deficient because potential impacts of traffic noise were not characterized or evaluated are irrelevant – such an evaluation was not necessary.

25. Apart from the proposed rail siding terminal proposed on the Project site, the rail line to which the siding will be connected already exists and carries rail traffic. No significant changes in the volume of train traffic are proposed as part of this Project (DSEIS, Section 4.4.2, pp. 125-128). As with truck traffic, the evaluation of train noise on an existing rail line beyond the Project site is outside the scope of the proposed action. However, the potential impacts of train noise associated with the proposed rail sidings and turn around constructed specifically as part of this Project proposal are an appropriate area of evaluation, which has been provided by the Applicant.

26. The Sandstone Report asserts that construction noise has not been analyzed and cannot be analyzed with currently available information. While the DEC Noise Policy does include references to construction-related noise impacts [Sections III.C (p.3), IV (p.6), V.B.3 (pp. 16 & 17), V.C (pp. 23 & 24), V.D (p 26)], the policy does not specify when it may be appropriate or necessary to provide a detailed evaluation of construction noise impacts or mitigation. To the extent that such impacts are temporary in nature, and involve certain types of heavy equipment for excavation, earthmoving, and equipment installation, there is little opportunity for noise impact mitigation other than ensuring that all equipment is properly muffled and limiting the timing of construction (e.g. hours and days of operation). In this case, as noted above in paragraph 18, the expected duration of construction is one construction season or less, and the Applicant and DEC staff have agreed to a draft Permit condition that would limit

the hours of construction (See, paragraph 18 herein). As a result, construction noise does not represent a substantive or significant issue under 6 NYCRR Part 624.

27. Sandstone also wrongly calls into question the Hunt Sound Study's choice of ambient noise measurements. The Hunt Sound Study ambient noise measurements were provided in accordance with the guidance of the DEC's the DEC Noise Policy.

28. Receptors were properly identified and include the properties closest to the proposed Project. Section V.B.1.b of the DEC Noise Policy discusses the identification of appropriate receptor locations. This discussion allows flexibility in determining whether the receptor location is identified at the property line of the proposed Facility, or some other specific receptor site. Consistent with this policy, each of the receptor locations provided in the Hunt Sound Study was shown on a map included with the study (see, OHMS Document Number 201166576-00003, Document List I.B.32, Figures 1 and 2 in the July 2013 study). Receptors #1 and #2 are conservatively placed along the property lines of the western Project site where there are no residential receptors present. It is worth noting that while Receptors #1, #3, #6 and #7 are in proximity to adjacent roadways and, therefore, ambient measurements may be influenced by road noise depending on the precise location of the measurement, Receptors #2, #4, and #5 are located much further from roadway locations and would be less affected. In particular, Receptor #5 is a residential receptor located approximately 500 feet from the existing rail line and 500 feet from NYS Route 414 A, and would therefore would be little influenced (if at all) by the location of the measurement relative to the structure at Receptor #5. The daytime ambient value at Receptor #5 (54.5 dBA, Leq) is the lowest among residential receptors but is comparable to the ambient values provided at Receptors #1, #2, and #4. Even if the ambient values for Receptor #5 (the residential receptor with the lowest measured ambient daytime noise level) were assumed

for other receptors (in particular Receptor #3), the analysis provided shows there will be no significant adverse impacts from noise. For Receptor #7, the hotel site on the east side of NYS Route 14, the Hunt Sound Study (supplemental sound analysis of March 7, 2014) adequately addressed the differences in ambient values measured on the road side of the hotel versus the back side shielded from the road. The potential impacts of injection pump noise on Receptor #7 were evaluated appropriately using the most conservative ambient values – those measured on the back side of the hotel. As a result, there is no further need to examine the location of ambient measurements provided in the Hunt Sound Study, contrary to the claim made in the Sandstone Report.

29. The Sandstone Report identifies no representative receptors or ambient values on the east side of the lake directly across the lake from, and closest to, the proposed Facility. Instead, the report uses Receptor A, which is located approximately 1.1 mile north of a point that would be directly across the lake from, and closest to, the Project site. See attached to this affidavit as Exhibit A a copy of Sandstone Report Figure 3 that I have marked to show the approximate locations of the Project site, and approximate distances between the Project site and Receptor A. For consistency, the distances shown on my mark-up are based on a scale I derived from the distances over land and water that are shown on the Sandstone Report Figure 3[3]. If a point were identified directly across the lake from the Project site, it would be located much closer to Route 414 than the Sandstone Report Receptor A. Again, by the map scale estimated from Sandstone Report Figure 3, that cross-lake point would be approximately 250 feet from Route 414, compared to 1,700 feet from Route 414 for Receptor A. As a result, it would be

[3] Using the distances noted between points A-D and A-C on the Figure 3 of the Sandstone report, results in an approximate scale of 1 inch ≈ 4,800 feet over water (horizontal distance), and 1 inch ≈ 5,500 feet over land to estimate sloping distance on the west side of Seneca Lake.

reasonable to conclude that ambient measurements at a receptor directly across the lake from the Project site would be subject to greater noise from Route 414, have higher ambient values than the values reported for Receptor A, and therefore, be less affected by any Project-related noise than the Sandstone Report claims receptors on the east side of the lake would be.

30. Even assuming for the sake of argument that it is appropriate for the Sandstone Report to use Receptor A to analyze potential noise impacts on the east side of the lake, the Sandstone Report provides incorrect distances between Receptor A and the Project site (i.e., noise sources). As noted above, Receptor A in Figure 3 of the Sandstone Report is not located directly across the lake from the Project site, yet the analysis is based on distances from point A to point D on the figure. However, Point D in Figure 3 of the Sandstone Report is not located on the Project site and the distances provided from point A to point D (see Sandstone Report Section 2.4) are shorter than the distance between Receptor A and the Project site (i.e., noise sources) (see Exhibit A to this Affidavit). Since the Sandstone report relies on incorrect (shorter) distances, the Sandstone analysis underestimates the amount of noise attenuation, and overestimates the potential noise impacts of the Project on Receptor A. Using my mark-up of Figure 3 of the Sandstone Report (Exhibit A), the distance between Receptor A and the western Project site (including the rail facility) would be approximately 6,300 feet over water and 6,500 to 6,800 feet along the slope of the land (compared to 6,000 feet over water and 3,400 feet over land in the Sandstone Report). At the adjusted distances the amount of noise reduction from the western Project site to Receptor A , using the attenuation factors provided in the Sandstone Report[4], would be approximately 48 dBA instead of the 45 dBA cited in the Sandstone report (p.

[4] Section 2.4 of the Sandstone report uses a decrease in sound per doubling of distance of 6 dBA over land and 3 dBA over water.

9). Therefore, the projected train noise Lmax of 89 dBA would be approximately 41 dBA at Receptor A, instead of the 44 dBA estimate provided in the Sandstone report (p. 9). The projected Leq of 78 dBA for train noise, would be reduced to 30 dBA at Receptor A, rather than the 33 dBA estimate provided in the Sandstone report (p. 9).

31. All of these estimated noise values, both the values based on attenuation in the Sandstone report using the erroneous distances, or the values in my analysis based on adjusted distances, are well within the existing ambient noise level measurements provided in Section 2.3 of the Sandstone Report (p. 7) when properly accounting for the currently existing "Anthropogenic sources from Reading". Ambient noise levels are understood to be a baseline and properly include all existing non-Project noise. Further, these estimated noise levels (30-44 dBA) are within those characterized in the DEC Noise Policy as ". . . approximately 35 dBA in a wilderness area . . " and "a quiet seemingly serene setting such as a rural farm land . . . at the lower end of the scale at about 45 dBA" (p. 20).

32. Also, the Sandstone Report Section 3.3 incorrectly suggests that the Leq and Lmax values provided in the Applicant's noise analysis, the Hunt Sound Study, are insufficient. Leq and Lmax measurements are both acceptable under provisions of DEC Noise Policy. While the DEC Noise Policy does indicate that L(90) is often used to designate the background noise level (p. 12), according to the DEC Noise Policy (p. 7), "Equivalent sound level is considered to be directly related to the effects of sound on people since it expresses the equivalent magnitude of the sound as a function of frequency of occurrence and time." It is, therefore, generally acceptable within the guidelines of the DEC Noise Policy to provide an equivalent sound level (Leq) value to characterize ambient noise levels, particularly if projected noise levels are also provided as an Leq value and will be used as a basis for comparison. In addition, the policy

indicates that the Lmax value should also be provided where Leq values are provided (p. 7). The Hunt Sound Study provides this information, consistent with the policy. The recommendation in the Sandstone Report Section 4.1.10 to provide an L(90) noise value for purposes of noise monitoring is unnecessary since the sound monitoring requirements proposed by the Department in the draft Permit conditions require comparison to both Leq and Lmax values.

33. Further, the Sandstone Report incorrectly asserts that night-time ambient noise level measurements used in the Hunt Sound Study were artificially high due to cicada noise. The implication in Section 3.3 of the Sandstone Report is that the seasonal nature of the night-time ambient noise measurements artificially and significantly raised ambient values and, therefore, renders the Finger Lakes LPG Storage Hunt Sound Study inadequate or incomplete is unsupported. The Sandstone Report incorrectly states that night-time noise levels were measured in July (p. 12). The Hunt Sound Study (July 2013) clearly indicates that day-time and night-time measurements were taken on May 12, 2011, which is during a time of year in New York when cicadas are much less likely to be contributing to night time noise. Further, the portion of the Hunt Sound Study (March 7, 2014) provided to address the potential impacts on Receptor #7 is based on ambient measurements provided in the Arlington Gas Storage Seneca Gallery 2 Expansion Project noise evaluation prepared by Hoover & Keith Inc. (August 30, 2013[5]; available on the Federal Energy Regulatory Commission website at: http://elibrary.ferc.gov:0/idmws/File_List.asp?document_id=14142631). Those ambient measurements were taken August 12, 2013 and do indicate that the night-time ambient value of 45.0 dBA was approximately 3 dBA higher than the day-time ambient value of 42.4 dBA,

[5] A revised Hoover & Keith Inc. report, dated February 11, 2014, was also prepared for the Arlington Gas Storage Seneca Gallery 2 Expansion Project, but the revisions did not introduce or rely on new ambient noise measurements.

partially due to the effect of insect noise (p.4). However, the portion of the Hunt Sound Study provided March 7, 2014 concerning Receptor #7 conservatively relies on the lower of the two ambient measurements to evaluate the potential impacts of the Finger Lakes LPG Storage Project on Receptor #7. In addition, while there is general recognition that night-time insect noise, or other natural sounds (*e.g.*. singing frogs), may be present in the spring and summer months that would not be present at other times of the year, and could contribute to higher night-time ambient noise levels, the DEC Noise Policy (p. 10) states that:

> "Summer time noises have the greatest potential for causing annoyance because of open windows, outside activities, etc. During the winter people tend to spend more time indoors and have the windows closed. In general, building walls and windows that are closed provide a 15 dB reduction in noise levels. Building walls with the windows open allow for only a 5 dB reduction in SPL."

As a result, the 15 dB reduction in indoor noise levels contemplated in the DEC Noise Policy during winter would likely more than offset any allowance for quieter winter time ambient noise levels due to the absence of insect noise or other natural sounds. In either event, the DEC Noise Policy does not require seasonal noise evaluations.

34. Also contrary to the Sandstone Report, noise sources associated with the operation of the proposed Project were adequately identified and quantified for purposes of the Hunt Sound Study.

35. The Sandstone Report recommends in Section 4.1.3 that octave band information be obtained for noise sources. As explained below, noise frequency was already adequately taken into account in the Hunt Sound Study. Equipment noise was adequately characterized with manufacturer's data, as provided in the Hunt Sound Study. These equipment noise sources

included injector pumps, brine pond pumps, and emergency fire pumps. All of the values for pump data provided in Appendix C of the Hunt Sound Study are in dBA values, which are A-weighted decibel scale values. In addition, other noise sources associated with the Project and evaluated in the noise study were provided as A-weighted decibel values. According to the DEC Noise Policy (p. 7), A-weighted values are "weighted toward those portions of the frequency spectrum, between 20 and 20,000 Hertz, to which the human ear is most sensitive."

36. Train, truck and compressor noises were measured at Savona LPG facility where there are existing similar operations. Train noise was determined to be the loudest operational noise at the Facility and, conservatively, the highest Leq (76.1 dBA) and Lmax (88.9 dBA) train noise measurements were used for purposes of the Hunt Study evaluation of the proposed Finger Lakes LPG storage Project. It should also be noted that according to the DSEIS (Section 4.4.2, pp. 127 & 128), rail operations at the Finger Lakes LPG Project site will not involve sounds from train horns or crossing signals. Train operations were measured with an A-weighted meter at 50 feet, providing representative measurements of the Leq (76.1 dBA) and Lmax (88.9 dBA) sound levels for train operations. The report also provides measurements of Leq and Lmax values for ambient noise levels and train operation noise levels at 800 feet (Table 1 of the Hunt Sound Study). Section 3.5 of the Sandstone Report questions the validity of the train operation sound levels at 50 feet on the basis that the Leq and Lmax values for train operations at 800 feet are 67.3 dBA and 76.6 dBA, respectively. They assert that such values at 800 feet would mean that the Leq and Lmax values for train operations at 50 feet would be closer to 91.3 and 100.6, respectively, due to an increase of 6 dBA for every halving of distance toward the source. However, when the ambient sound levels recorded by the Hunt Sound Study at 800 feet are taken into account, the Sandstone Report's conclusion is unsupported. The ambient noise levels

recorded at 800 feet were a Leq of 66.6 dBA and Lmax of 74.2 dBA, a difference from the train noise Leq and Lmax measurements of 0.7 dBA and 2.4 dBA, respectively. The DEC Noise Policy provides a method for approximating sound levels when two sound levels are added together (provided in Table A of the policy). In this case the two sound levels being added for train operations at 800 feet would include 1) the ambient sound levels recorded at 800 feet and 2) the train noise as attenuated by distance at 800 feet. The differences noted above between the ambient measurements and the overall train measurements (which includes ambient) suggest that the portion of the overall measurement affected by attenuated train noise could be close to 58 dBA for the Leq value and 71 dBA for the Lmax value. Using these values to estimate noise levels at 50 feet result in a Leq of 82 dBA and Lmax 95 dBA, which are both lower than the Leq of 91.3 dBA and Lmax of 100.6 dBA incorrectly speculated in the Sandstone Report (p. 14). Given the increased potential for ambient, non-train noise to affect measurements at 800 feet, which introduces uncertainty, it would be more appropriate to use measurements of train noise taken at 50 feet as a basis to evaluate actual noise from train operations as was done in the Hunt Sound Study.

37. Fire pump operations will have no significant impact on potential receptors on the east side of Seneca Lake. According to the Hunt Sound Study (p. 4), these pumps will only be used during non-emergencies twice per year for testing purposes, and then during the mid-day hours for short duration. If emergency use is required, it will be of a short-term, temporary nature, which will not result in significant noise impacts. In the unlikely event of an emergency requiring their operation, other noise sources are likely to overshadow pump noise (*e.g.,* emergency vehicle sirens). Further, these pumps will be enclosed in a structure to help mitigate noise impacts (Hunt Sound Study, p. 4).

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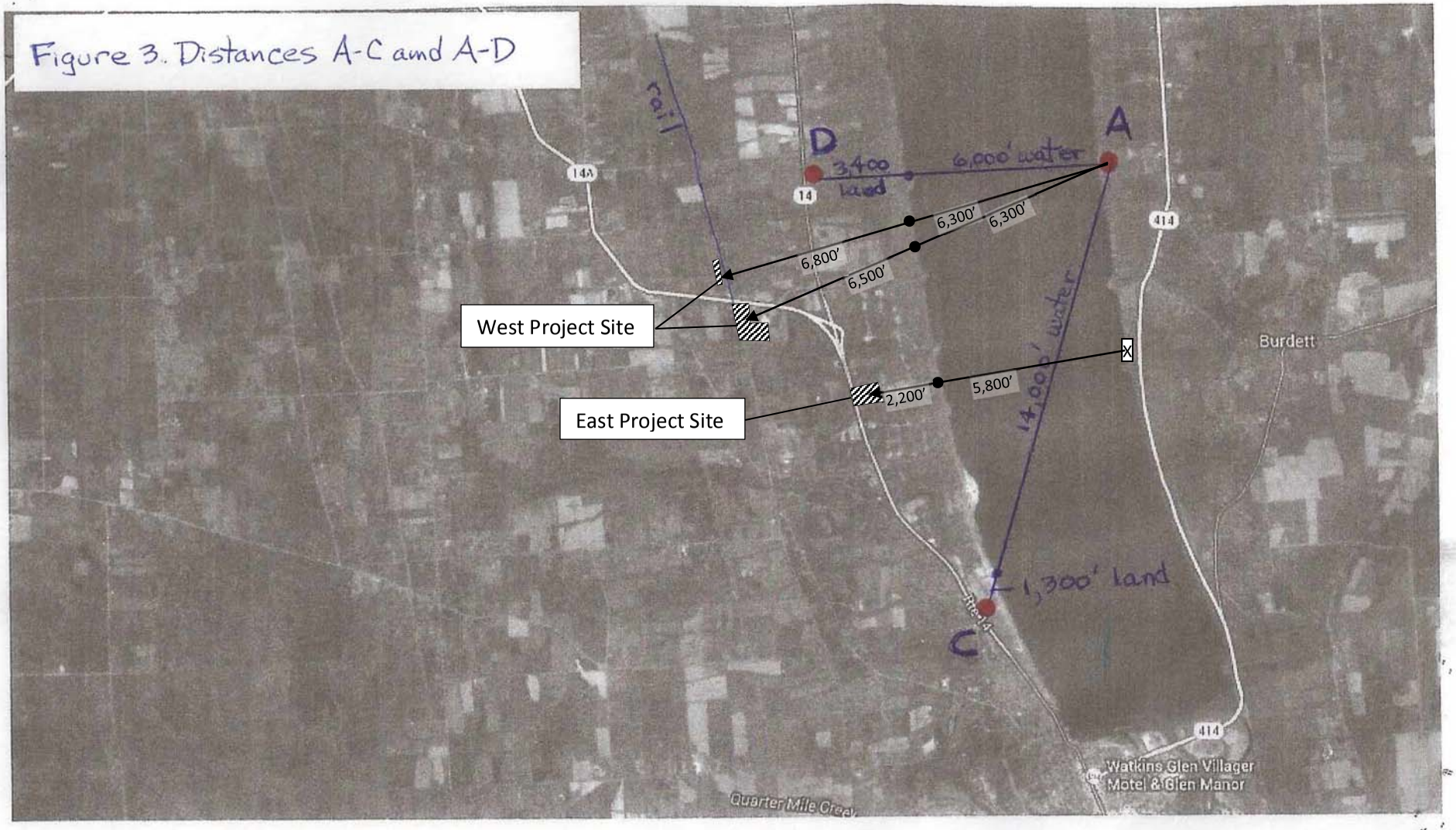
38. For all these reasons, no significant noise impacts are expected to result from the Project, and the Permit may be issued without an adjudicatory hearing of any issue related to noise.

Scott E. Sheeley
SCOTT E. SHEELEY

Sworn to me this 17 day of April, 2015.

Irene L. Terry

IRENE L. TERRY
Notary Public, State of New York
No. 01TE6010106
Qualified in Monroe County
Commission Expires July 13, 20 18



0 4,800

1 inch ≈ 4,800 feet over water and level land

0 5,500

1 inch ≈ 5,500 feet over sloped land

EXHIBIT A TO SHEELEY AFFIDAVIT
APRIL 17, 2015

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STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
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In the Matter of the Application for an Underground Gas Storage Permit Pursuant to Environmental Conservation Law (ECL) Article 23, Title 13, by

FINGER LAKES LPG STORAGE, LLC

Applicant.

----------X

AFFIDAVIT IN SUPPORT OF DEC STAFF INITIAL POST-ISSUES CONFERENCE BRIEF

Appl. No. 8-4432-00085

STATE OF NEW YORK)

COUNTY OF ALBANY) ss:

ERIC RODRIGUEZ, being duly sworn, deposes and says as follows:

1. I am a Mineral Resources Specialist 3 in the Division of Mineral Resources of the Department of Environmental Conservation ("Department") in Albany, New York. My principal duties include work related to the permitting and regulation of solution salt mining and underground gas storage facilities. Additionally, my duties include the use of geographic information systems ("GIS") to produce maps for geographic analysis and the communication of geographic information. I have worked with the Division of Mineral Resources for approximately three years. My prior work experience includes 15 years as a geologist with an environmental consulting and engineering firm in its New York and New Jersey offices, where my responsibilities included, among other things, management of project staff to complete geographic analysis and reporting of data.

2. I have a Master of Science Degree in Geoscience and a Bachelor of Arts Degree in Geography from Montclair State University. In addition, I have completed GIS coursework at

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Hunter College, as part of graduate studies at The Graduate Center, City University of New York.

3. I am familiar with matters relating to Finger Lakes LPG Storage, LLC ("Finger Lakes") and its underground storage permit application for the construction and operation of an underground LPG storage facility in the Town of Reading, Schuyler County.

4. Using the Department's GIS, I prepared the attached map, entitled *Property Type Classification Depicting 2013 Land Use Along Southwestern Seneca Lake* dated April 14, 2015.

5. The map was compiled from the from the following sources:

- New York State GIS Program Office (Data Originator). *Village Boundaries* [Vector Digital Data]. New York State Department of Environmental Conservation, Albany, New York. February 3, 2015.
- New York State GIS Program Office (Data Originator). *Town and City Boundaries Clipped to Shoreline* [Vector Digital Data]. New York State Department of Environmental Conservation, Albany, New York. February 3, 2015.
- Schuyler County Real Property Tax Services (Data Originator for Schuyler County Dataset). *New York State RPS Tax Parcel Polygons by County* [Vector Digital Data]. New York State Department of Environmental Conservation, Albany, New York. September 25, 2013.
- New York State Office of Real Property Services. *Assessor's Manual, Appendix B – Property Type Classification and Ownership Codes* [Reference Document]. New York State Office of Real Property Services, Albany, New York. September 1, 2006.

6. The map depicts, among other things, land use along the western shore of Seneca Lake in the Town of Reading and along the shore in the adjoining Village of Watkins Glen. Land use categories shown on the map were derived from property type classification codes contained in the PROP_CLASS field in the *New York State RPS Tax Parcel Polygons by County* dataset and were developed by grouping these classification codes into 12 categories. The land use categories were labeled based on classification code descriptions provided in Appendix B (Property Type Classification and Ownership Codes) of the 2006 New York State Assessor's Manual ("Assessor's Manual"). The classification codes used to develop each land use category

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are summarized below. Descriptions of the Category, Division and Subdivision Codes are contained in the Assessor's Manual.

- Agricultural – Includes Category Code 100, excluding Subdivision Code 105.
- Vacant Land (Agricultural) – Includes Subdivision Code 105.
- Forest, Conservation and Parks – Includes Category Code 900.
- Residential – Includes Category Code 200, excluding Subdivision Code 283.
- Vacant Land (Residential and Rural) – Includes Division Codes 310 and 320.
- Residential with Incidental Commercial Use – Includes Subdivision Code 283.
- Commercial and Industrial – Includes Category Codes 400 and 700.
- Vacant Land (Commercial, Industrial, Public Utility) – Includes Division Codes 330, 340 and 380. Also includes two parcels from Category Code 300 (General Code for Vacant Land) which were not classified at the Division or Subdivision level.
- Public Services (Utilities, Transportation, Waste Disposal) – Incudes Division Codes 830, 840, 850, 870 and 880.
- Public Services (Water) – Includes Division Code 820.
- Recreation and Entertainment – Includes Category Code 500.
- Community Services and Other – Includes Category Code 600.

7. To the best of my knowledge, the map is an accurate depiction of the land use, during 2013, that occupies the areas shown on the map.

Eric Rodriguez

Sworn to before me this 16th day of April, 2015.

Cristin M. Clarke

Notary Public

CRISTIN M. CLARKE, ESQ.
NOTARY PUBLIC - STATE OF NEW YORK
NO. 02CL6056390
QUALIFIED IN SARATOGA COUNTY
COMMISSION EXPIRES MARCH 19, 2019

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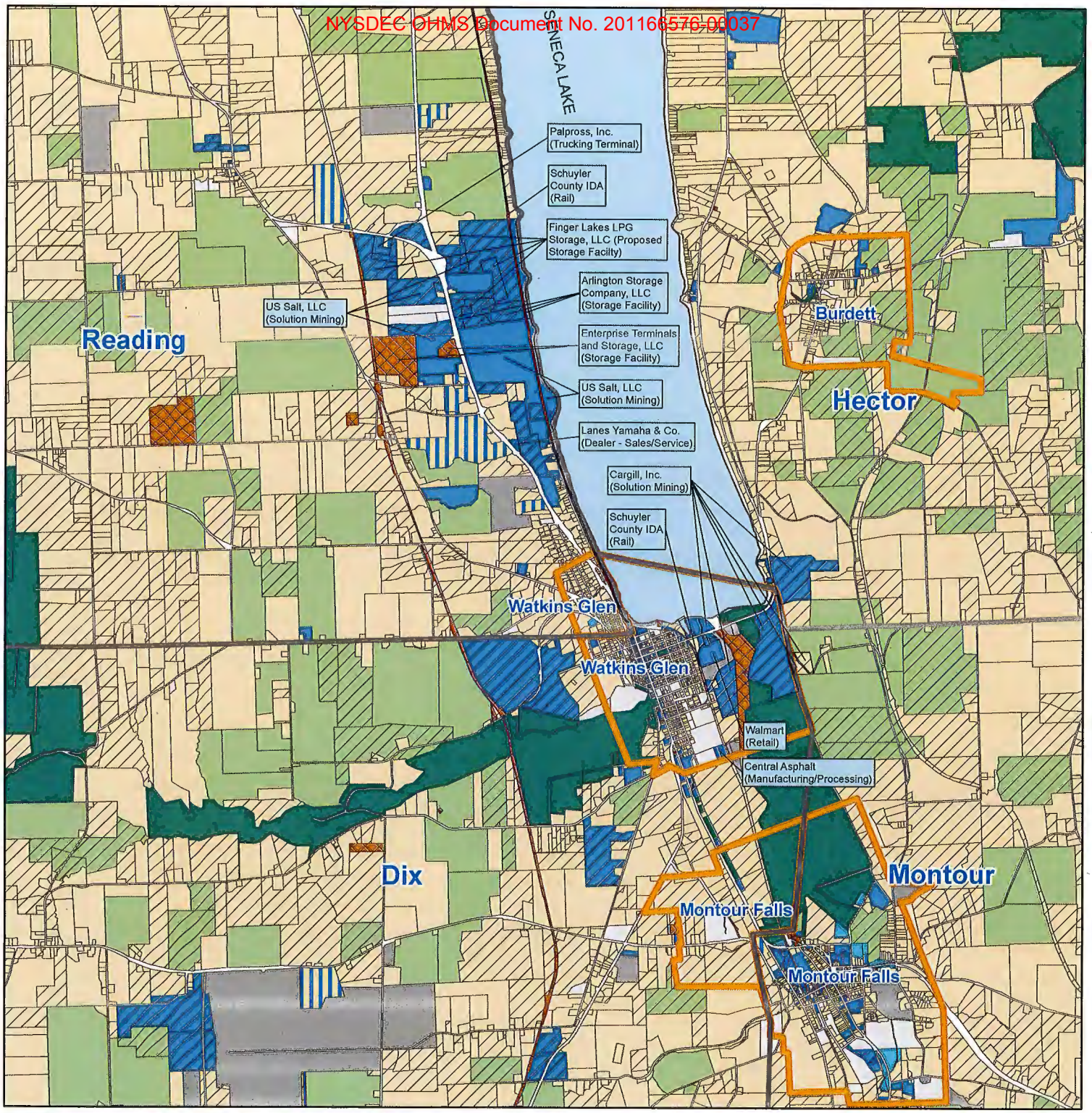

Legend

- Town/City Boundary
- Village Boundary
- Agricultural
- Vacant Land (Agricultural)
- Forest, Conservation and Parks
- Residential
- Vacant Land (Residential and Rural)
- Residential with Incidental Commercial Use
- Commercial and Industrial
- Vacant Land (Commercial, Industrial, Public Utility)
- Public Services (Utilities, Transp., Waste Disposal)
- Public Services (Water)
- Recreation and Entertainment
- Community Services and Other

0 0.5 1 2 Miles

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Property Type Classification Depicting 2013 Land Use Along Southwestern Seneca Lake

Sources:
1. NYS GIS Program Office. *Village Boundaries* [Vector Data]. NYSDEC. February 3, 2015.
2. NYS GIS Program Office. *Town and City Boundaries Clipped to Shoreline* [Vector Data]. NYSDEC. February 3, 2015.
3. Schuyler County Real Property Tax Services. *New York State RPS Tax Parcel Polygons by County* [Vector Data]. NYSDEC. September 25, 2013.
4. NYS Office of Real Property Services. *Assessor's Manual, Appendix B - Property Type Classification and Ownership Codes* [Reference Document]. NYS Office of Real Property Services. September 1, 2006.

Notes: Land use based on 2013 property type classifications. Labeled parcels based on NYSDEC records and tax parcel data.

Map Date: April 14, 2015

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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AFFIDAVIT IN SUPPORT OF DEC STAFF INITIAL POST-ISSUES CONFERENCE BRIEF

Appl. No. 8-4432-00085

STATE OF NEW YORK)

COUNTY OF ALBANY) ss:

PETER S. BRIGGS, being duly sworn, deposes and says as follows:

1. I am the Director of the Bureau of Oil & Gas Permitting and Management in the Division of Mineral Resources of the Department of Environmental Conservation ("Department") in Albany, New York. I have served in this capacity for approximately four and one-half years. Prior to that time, I was the Chief of the Division's Permits Section, a Mineral Resources Specialist III and a Mineral Resources Specialist II. I have worked in the Division for almost 27 years. My prior work experience includes six years of petroleum engineering positions in well drilling, production, completions and workovers with Texaco Inc. in Morgan City, Louisiana. I have a Bachelor of Science Degree in Mineral Engineering from The University of Alabama. My specialization was petroleum engineering.

2. I make this affidavit in support of Department staff's initial post-issues conference brief.

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3. As the Director of the Bureau of Oil & Gas Permitting and Management, I am responsible for the administration of permitting, compliance, and enforcement programs pertaining to oil, gas and solution mining development, and underground storage of natural gas and liquefied petroleum gas ("LPG"). My previous positions with the Division also included duties and responsibilities related to these programs.

4. I am familiar with matters relating to Finger Lakes LPG Storage, LLC ("FLLPG") and its underground storage permit application for the construction and operation of an underground LPG storage facility in the Town of Reading, Schuyler County.

5. According to the Department's website at http://www.dec.ny.gov/energy/35817.html, there are 26 underground natural gas storage facilities and three LPG storage facilities in New York.

6. The Department's website at http://www.dec.ny.gov/energy/93157.html includes a map showing the general location of underground storage and solution mining facilities in the state which are concentrated in the central and western regions of the state. Some of these existing facilities are located near or along the shores of the Finger Lakes.

7. The current operation at each of the 29 underground gas storage facilities in the state is either grandfathered (as of October 1, 1963 when Environmental Conservation Law '"ECL"' Article 23 Title 13 was effective) or permitted under an underground storage permit or underground storage modification permit issued by the Department in accordance with ECL Article 23, Title 13.

8. New underground gas storage facilities must obtain an underground storage permit from the Department prior to commencing storage operations. Permitted and

grandfathered underground storage facilities must obtain an underground storage modification permit from the Department prior to modifying storage capacity. Nevertheless, all underground gas storage facilities in the state fall under the authority of the Department.

9. ECL § 23-0101(17) defines "Reservoir" to mean any underground reservoir, natural or artificial cavern or geologic dome, sand or stratigraphic trap, whether or not previously occupied or containing oil or gas. Therefore, FLLPG's proposed storage Galleries 1 and 2, which are solution-mined caverns, are considered reservoirs under ECL Article 23.

10. ECL § 23-1301(1) states that no underground reservoir shall be devoted to the storage of gas or liquefied petroleum gas unless the prospective owner of such storage reservoir shall have received from the Department, after approval of the State Geologist, an underground storage permit. This section further states that the application for an underground storage permit shall include the following: a) a map showing the location and boundaries of the proposed underground storage reservoir, b) a report containing sufficient data to show that the reservoir is adaptable for storage purposes, c) a storage rights affidavit signed by the prospective owner stating, among other things, that it has acquired at least 75% of the storage rights in said reservoir and buffer, and d) such other information as the Department may require.

11. The Final Generic Environmental Impact Statement ("FGEIS") on the Oil, Gas and Solution Mining Regulatory Program, dated July 1992, establishes the basis for environmental reviews and approvals of Department actions subject to the Oil, Gas and Solution Mining Law of which underground storage permits are included. The action to modify or propose a new underground gas storage project requires a site-specific environmental assessment, and may require a supplemental environmental impact statement depending on the

scope of the project. Pages 14-6 and 14-7 of the 1992 FGEIS reiterate the application requirements stated in ECL § 23-1301(1) while Page 14-10 of the 1992 FGEIS reiterates the application fee contained in 23-1301(5)(a). The 1992 FGEIS which was drafted in 1988 also suggests new requirements in the form of regulations pertaining to underground storage applications but none have been promulgated since the FGEIS was released. However, the Department has fulfilled the 1992 FGEIS suggestions with respect to underground storage application requirements through reliance on ECL § 23-1301(1)(c) which allows the Department to obtain other information that it may require.

12. Since my initial employment with the Department's Division of Mineral Resources in 1988 and continuing today, the Division has relied on the same permitting process for underground storage permit applications and underground storage modification permit applications. This process is described on the Department's website at http://www.dec.ny.gov/energy/1612.html. This process satisfies the requirements of ECL §§ 23-1301(1) and 23-1301(5)(a).

13. The above noted permitting process has been used and relied upon by the Department to issue at least eight underground storage permits, and at least nine underground storage modification permits for a total of at least 17 underground storage permits since 1988.

14. Of the above noted 17 underground storage permits issued since 1988, six of them were for gas storage in salt caverns which included the following applicants: Bath Petroleum Storage, Inc., Avoca Natural Gas Storage, New York State Electric and Gas Corporation, Amoco Oil Company, New York LP Gas Storage and Inergy Midstream, LLC.

15. A pre-application meeting conducted by the Department was held with FLLPG on February 19, 2009. One of the purposes of the meeting was for the Department to communicate the state's underground storage permit application requirements to the prospective applicant. On February 24, 2009, the Department provided a follow-up letter to FLLPG reiterating the underground storage permit application requirements discussed at the pre-application meeting. The correspondence included: 1) detailed list of requirements for a state underground storage permit application, 2) generalized application process entitled "How to Apply for an Underground Storage Permit," and 3) distribution and timing table showing contact information and time frames for submittal of underground storage permit application materials.

16. For permitting purposes, the proposed FLLPG storage facility is considered a new facility (i.e., new storage reservoir), and as such FLLPG submitted an underground storage permit application dated October 9, 2009, which was received by the Department on October 13, 2009.

17. Upon receipt of FLLPG's underground storage permit application, the Department commenced its customary review of the materials including verification that all of the components required by ECL §§ 23-1301(1) and 23-1301(5)(a) were provided by FLLPG in a form satisfactory to the Department.

18. The Department subsequently issued three Notices of Incomplete Application ("NOIA") on January 11, 2010, August 12, 2010 and March 28, 2011, and FLLPG provided a response to each of the NOIAs that was received by the Department on May 17, 2010, September 29, 2010 (revised November 18, 2010) and April 20, 2011 respectively. The

Department made several additional information requests and received a response from FLLPG to each request.

19. In its application and responses to the NOIAs, FLLPG provided information and data on its re-entry work on plugged wells in Gallery 1 and Gallery 2. After a salt cavern is closed and abandoned by the plugging of the well(s) that access it, cavern pressure will build up as the salt creeps. The re-entry pressures encountered and measured by FLLPG demonstrate that the caverns successfully contained fluid at pressures ranging from a gradient of 0.66 psi/ft to 0.67 psi/ft at Gallery 1 (based on re-entry pressures at Wells 33 and 34, after approximately 5 years of the caverns' wells being plugged) and 0.81 psi/ft at Gallery 2 (based on reentry pressure at Well 58, after approximately 6 years of the cavern's well being plugged). These re-entry pressures are greater than anticipated LPG operating pressures.

20. After re-entry of Gallery 1 and Gallery 2, FLLPG completed a long-term brine pressure test on each proposed storage gallery by subjecting each gallery to induced pressure through the use of mechanical pumps. Each test reached a maximum pressure of 0.80 psi/ft (measured at Well 33 for Gallery 1 and Well 58 for Gallery 2), which is greater than anticipated LPG operating pressures, and the proposed allowable maximum operating pressure of 0.75 psi/ft in the Draft Underground Storage Permit, and significantly less than the fracture pressures recorded within the salt beds at the site (1.36 to 1.70 psi/ft).

21. During the long-term brine pressure tests conducted by FLLPG on Gallery 1 and Gallery 2, all proposed storage galleries including interconnected cavern space and rubble pile were subjected to a maximum pressure gradient of 0.80 psi/ft (measured at Well 33 for Gallery 1 and Well 58 for Gallery 2). The brinefield map showing galleries (dated August 28, 2014) and

cross-section (Vertical Section B-B′ updated July 16, 2013) provided by FLLPG as part of its application and responses to the NOIAs along with subsequent submittals show and indicate the interconnected caverns within Gallery 1. Gallery 2 consists of a single cavern. In FLLPG's February 9, 2015, response documents, Gowan's Figure 2 Schematic of Finger Lakes Caverns also shows the interconnectedness of caverns within Gallery 1.

22. In FLLPG's application and responses to the NOIAs, and its January 19, 2012, memorandum (prepared by Dionisio and Istvan), along with Department staff's own evaluation, it was confirmed that the north-south strike-slip fault referenced as Fault No. 20 in the 1979 Stone & Webster report is the same fault referenced in the 1974 Jacoby & Dellwig paper, and the applicant satisfactorily demonstrated that the fault, to the extent it runs along Seneca Lake, would not intersect the proposed galleries, compromise the caprock or otherwise pose a risk to cavern integrity.

23. The Federal Energy Regulatory Commission's ("FERC") experts evaluated the presence of faulting in the area and the potential for faults to intersect the gallery proposed for use by Arlington Storage Company, LLC ("Arlington"), at the nearby Seneca Lake Storage Facility. Department staff agrees with FERC, that the fault's location does not intersect the proposed and existing storage galleries, and that successful operation of the facility for 20 years and pressure tests demonstrate there is no evidence of leakage from either gallery.

24. Both Department staff and FERC reviewed isopach and structure contour maps which depict the stratigraphy of the area in the vicinity of the FLLPG and Arlington projects, and those contour maps give no indication of faults breaking outside of the salt interval into the caprock or the underlying formation.

25. I have read and am familiar with various papers prepared by Jacoby, and Jacoby & Dellwig that relate to FLLPG's project site, and discuss site geology and faulting. Jacoby's (1969) *Storage of Hydrocarbons in Cavities in Bedded Salt Deposits Formed by Hydraulic Fracturing* and Jacoby & Dellwig's (1974) *Appalachian Foreland Thrusting in Salina Salt, Watkins Glen, New York* both state that faulting is confined to the salt interval. In Jacoby (1969), Figure 1 shows that the beds in the upper half of the Syracuse Formation are relatively consistent in their thickness and elevation. In Jacoby & Dellwig (1974), it states "Structure contour and isopach maps reveal that both the upper and lower surfaces of the salt are relatively uniform." In Jacoby's (1973) *Recovery of Entrapped Hydrocarbons*, it states "Confusion arises from the fact that despite the thousands of feet of horizontal displacement that have occurred within the evaporites, the upper contact of the topmost salt bed and the lower contact of the bottom salt bed can be said to be parallel." This evidence, based on Jacoby and Dellwig's analysis of rock core logs and geophysical logs collected from wells at the site, along with Department staff's own evaluation of approximately 58 geophysical logs, clearly refutes the thrust faulting hypothesized by Dr. Nieto that was included with the Seneca Lake Pure Water Association ("SLPWA") January 16, 2015 petition.

26. I have read and am familiar with SLPWA's January 16, 2015 petition and it does not discuss how the approximately 450 feet of open water and the approximately 550 feet of unconsolidated overburden (i.e., saturated sediment), and resulting hydrostatic pressure above the Seneca Lake valley bedrock may affect horizontal stresses on the proposed storage caverns and reduce valley stress relief.

27. On August 12, 2010, I sent FLLPG a Second NOIA. Within the Second NOIA, FLLPG was asked to clarify the status of cavern space depicted on Vertical Section B-B′ with respect to a "Well 43 1976 Sonar" outline, despite the fact that FLLPG's Well Status and Condition Report (October 9, 2009 application, Tab D) stated for Well 43 "Top of rubble, bottom of existing cavern = 2,322 feet" which would place the existing cavern bottom above the 1976 sonar outline. In correspondence dated September 28, 2010 (and November 17, 2010 revised response), FLLPG responded to Department staff's question and verified that the cavern space related to the 1976 sonar is "filled with rubble" and not an abandoned cavern as SLPWA claims in its January 16, 2015 petition.

28. On August 17, 2011, the Department issued a combined Notice of Complete Application, Availability of a Draft Supplemental Environmental Impact Statement, and Notice of Hearing ("Combined Notice") for the FLLPG project.

29. With its issuance of the above noted Combined Notice, the Department acknowledged that FLLPG had satisfactorily completed and provided all underground storage application requirements as specified in ECL §§ 23-1301(1) and 23-1301(5)(a).

30. On March 15, 2013, the Department received approval from the State Geologist for FLLPG to utilize the proposed underground storage reservoir for storage purposes, thus fully satisfying all statutory criteria applicable to the project as specified in ECL §§ 23-1301(1) and 23-1301(5)(a).

31. The underground storage permit application requirements and Department review imposed on FLLPG for permitting of its proposed storage reservoir are consistent with the

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requirements and reviews conducted by the Department for the above noted other 17 underground storage permits issued since 1988.

32. The Draft Underground Storage Permit is protective of the environment and public safety. Attached is a *Summary of Select Draft Underground Storage Permit Conditions* prepared by Department staff that highlight and elaborate on conditions that a) protect cavern integrity, b) monitor cavern integrity and c) address emergency response procedures, non-routine incidents, and site security.

Dated: April 15, 2015

Peter S. Briggs
Director, Bureau of Oil & Gas
Permitting and Management
Division of Mineral Resources

New York State Department of
Environmental Conservation
625 Broadway
Albany, New York 12233-6500

Sworn to before me this 15th day
of April, 2015.

Notary Public

CRISTIN M. CLARKE, ESQ.
NOTARY PUBLIC - STATE OF NEW YORK
NO. 02CL6056390
QUALIFIED IN SARATOGA COUNTY
COMMISSION EXPIRES MARCH 19, 2019

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FINGER LAKES LPG STORAGE, LLC
Summary of Select Draft Underground Storage Permit Conditions

Conditions that Protect Cavern Integrity

- Permit Conditions 1.a and 1.d: These conditions specify the locations where product can be stored in each storage cavern and/or gallery and the type of product (i.e., LPG) allowed. The maximum volume allowed in each storage gallery is also specified. Conditions to control product location, type and volume ensure that the storage galleries are operated as described in the Permittee's application, which has been evaluated and deemed satisfactory by the Department.

- Permit Conditions 1.b and 1.c: These conditions limit cavern growth in each gallery due to operational solutioning. Product displacement fluid is limited to brine from the base of the brine ponds, which ensures that the most saturated brine available is used to displace product. This results in limited cavern growth from operational solutioning. Monitoring and record keeping of the salt saturation level of the displacement fluid must be performed at least daily during product displacement, and made available to the Department upon request. In addition, cavern growth from operational solutioning is limited to 2% by volume on a calendar year basis. This further limits growth from operation solutioning and results in slower, stable development of the caverns over time.

- Permit Condition 1.e: This condition specifies the allowable maximum cavern span within each gallery and ensures that it does not exceed the maximum span modeled in the FEA. The FEA evaluated pillar and roof stability using the ultimate dimensions of the caverns and demonstrated they will be structurally stable under specific operating conditions. Such operating conditions are also controlled by permit conditions described in the draft permit.

- Permit Condition 1.f: This condition requires use of a hydrocarbon and/or nitrogen blanket in any cavern that contains product. The blanket serves to protect the cavern roof from any additional solutioning during storage operations. The blanket also protects the cement seal between the production casing shoe and formation.

- Permit Condition 1.g: This condition specifies the minimum and maximum cavern pressures, as measured at the casing shoe for each storage well, during operation of the facility. Minimum and maximum operating pressures were modeled in the FEA. This permit condition ensures LPG operating pressures will remain within the range of pressures modeled and deemed to be protective of the environment and public safety.

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- Permit Condition 1.h: This condition requires that Gallery 10 and its wells be pressure tight (brine) and the results of a long-term brine pressure test demonstrating pressure integrity of Gallery 10 must be reviewed and approved by the Department prior to injection of LPG into Gallery 1. Gallery 10 is located north of Gallery 1 and will not be used for storage. However, the requirement that Gallery 10 be pressure tight prior to injection of LPG into Gallery 1 ensures that any inadvertent connection with Gallery 10 would be contained.

- Permit Condition 15: This condition requires that Wells 33, 34, 43 and 44 be plugged and abandoned prior to injection of LPG into Gallery 1. Further, each well's casing shoe must be demonstrated to have mechanical integrity prior to well plugging. Plugging of these wells, and verifying mechanical integrity at the casing shoe prior to plugging, will mitigate the risk of these wells leaking brine and/or product and thus further maintain integrity of the storage caverns.

Conditions that Monitor Cavern Integrity

- Permit Condition 1: This condition requires the Permittee to operate the storage field in accordance with its application, which includes daily pressure monitoring of the storage wells among other requirements. Observance of pressure data on a daily basis will allow for timely identification of any loss of brine and/or product based on unexpected pressure changes on either the brine or product side of the wellhead. Loss of pressure at the wellhead would require prompt reporting to the Department per Permit Condition 8, which would include a description of corrective actions taken and any proposed corrective actions that may be required.

- Permit Condition 1.h: This condition requires continuous pressure monitoring of Gallery 1 at Well FL2 and Gallery 10 at Well 52. A digital pressure recorder is required on Well FL2 for the purpose of monitoring pressure and detecting any migration of LPG from Cavern FL1 to Cavern FL2, and a digital pressure recorder on Well 52 for the purpose of monitoring pressure and isolation of Gallery 10. Although testing and modeling of Gallery 1 has been completed and show that the gallery is tight and suitable for storage purposes, and that the specified volume of product allowed in Cavern FL1 will prevent migration to Cavern FL2, the Department requires the additional monitoring specified in this condition as a conservative measure to ensure that any migration of LPG from Cavern FL1 to Cavern FL2 is detected and that corrective action is taken to prevent future migration. In addition, continuous monitoring of Gallery 10 will provide confirmation of its isolation from Gallery 1 for the life of the project.

- Permit Conditions 1.i and 2: These conditions require sonar surveying of the storage caverns on a routine basis. Sonar surveys are useful for identifying changes in cavern shape and size over

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time. They are required whenever a well is newly re-entered or drilled to access a storage gallery, at an interval not to exceed 10 years, and when a gallery reaches its maximum permitted storage capacity or maximum cavern span. A report summarizing the sonar survey results is due to the Department within 90 days of completion of such survey. The report must compare the survey results to the cavern growth model, and discuss the effects, if any, on the conclusions reached in the FEA. Any deviation and/or any unexpected cavern growth must be included in the report, as well as any proposed corrective actions as needed. The Department may require additional analysis or corrective action based on its review of the report.

- Permit Condition 3: This condition requires routine mechanical integrity tests ("MIT") on the production casing and casing shoe. MITs demonstrate that the production casing and casing shoe have sufficient mechanical integrity to prevent leakage of brine and/or product during storage operations. They are required prior to initial injection of product into a gallery, and at subsequent intervals not to exceed 5 years. A report summarizing the results of an MIT is due to the Department within 90 days of completion of such test. The report must note any unexpected occurrences and include proposed corrective actions, if necessary. The Department may require additional analysis or corrective action based on its review of the report.

- Permit Condition 4: This condition requires routine subsidence surveys to monitor the elevation of the ground surface above the caverns. Subsidence of the ground surface in appreciable amounts could be indicative of a failure in cavern integrity. As such, monitoring of the ground surface is another method of evaluating cavern integrity. Surveys are required every 2 years. All wells, including future and plugged wells within Galleries 1 and 2 must be included in each survey.

- Permit Condition 5: This condition requires production casing evaluations and inspections for all storage and monitoring wells in the storage galleries. These must include, at a minimum, a cement bond log, gamma ray-neutron log, magnetic flux log, and electromagnetic thickness log, or other equivalent logs approved by the Department. These logs evaluate the quality and bonding of the cement seal between the casing and formation and the thickness and integrity of the production casing. Containment of LPG and brine within the storage galleries is ensured by verification of the condition of wells accessing the caverns in each gallery.

- Permit Condition 6: This condition allows the Department, for reasonable cause, to require performance of additional sonar surveys, well and/or cavern MITs, subsidence surveys, casing evaluations and inspection logs or any other tests or procedures and require reporting and analysis to verify compliance with permit conditions in the draft permit or any New York State

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statute, rule, regulation and/or order. The above-outlined conditions are sufficient to monitor routine operations and verify compliance, but this particular permit condition gives the Department wide latitude to require additional testing and related reporting and analysis, or completion of tests or procedures not outlined in the draft permit, if it is deemed necessary and appropriate to verify compliance. This ensures that the draft permit has sufficient flexibility to accommodate changes in recommended testing technology and/or testing frequency based on industry standards or scientific study and that the draft permit can respond to non-routine events that might give cause to require additional testing.

Conditions that Address Emergency Response Procedures, Non-Routine Incidents, and Site Security

- Permit Condition 7: This condition requires installation and maintenance of safety and emergency shutdown devices at the storage facility. This includes, but is not limited to, automated, remote, and manual devices that can shutdown facility equipment in the event of an emergency and prevent escape of product and/or brine, and continuous monitoring and detection systems such as gas detectors and flow regulators that will detect potential hazards and respond accordingly. All such safety and emergency response systems, which must conform to stringent regulatory standards, must be included in the Permittee's Operations, Maintenance and Contingency Plan, which must be submitted to the Department for its review and approval. Such plan must include, at a minimum, a Spill Prevention and Control Manual, Hazard Communication and Assessment Program, Safety Plan, and Emergency Response Plan. This set of deliverables must detail important aspects of the safety and emergency response program for the facility in sufficient detail. In addition, such deliverables must be reviewed and approved by the Department prior to injection of LPG into any gallery.

- Permit Condition 8: This condition requires reporting of any non-routine incident. The incident must be reported orally within 2 hours of discovery, in writing within 24 hours of discovery, and as required by all applicable statutes and regulations. Non-routine incidents include, but are not limited to, i) any indication of the abnormal presence of storage gas and/or product displacement fluid outside the storage reservoir (i.e., storage galleries) authorized by the draft permit and/or the wells accessing the storage galleries, and ii) casing failures, cement failures, wellhead failures, fires, blowouts and spills. Non-routine incident reporting requires prompt reporting of incidents that may impact the public and/or environment, and requires that the action causing or suspected of causing the incident be ceased immediately upon discovery and that initial remedial actions be commenced. Further, for reasonable cause, the Department

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may require cessation and/or suspension of storage operations, or partial or complete removal of LPG from the caverns.

- Permit Condition 11: This condition requires that the site is secure during all phases of construction and operation. The purpose of this condition is to prevent unauthorized persons from entering the site for their safety and for the safe operation of the facility.