#### **Findings Statement**

Pursuant to the State Environmental Quality Review Act (SEQR) of the Environmental Conservation Law (ECL) and the SEQR Regulations 6NYCRR Part 617, the New York State Department of Environmental Conservation makes the following findings.

## Name of Action

Adoption of the Final Generic Environmental Impact Statement (GEIS) on the Oil, Gas and Solution Mining Regulatory Program.

#### **Description and Background**

In early 1988, the Department of Environmental Conservation released the Draft GEIS on the Oil, Gas and Solution Mining Regulatory Program. The Draft GEIS comprehensively reviewed the environmental impacts of the Department's program for regulating the siting, drilling, production and plugging and abandonment of oil, gas, underground gas storage, solution mining, brine disposal, geothermal and stratigraphic test wells. Six public hearings were held on the Draft GEIS in June 1988.

The Final GEIS was released in July 1992. It contains individual responses to the hundreds of comments received on the Draft GEIS. The Final GEIS also includes more detailed topical responses addressing several controversial issues that frequently appeared in the comments on the draft document.

Together, the Draft and Final GEIS and this Findings Statement will provide the groundwork for revisions to the Oil, Gas and Solution Mining Regulations (6NYCRR Parts 550-559). These regulations are being updated to more accurately reflect and effectively implement the current Oil, Gas and Solution Mining Law (ECL Article 23).

The Draft GEIS included suggested changes to the regulations in bold print throughout the document. In the interests of environmental protection and public safety, a significant number of the suggested regulatory changes are already put in effect as standard conditions routinely applied to permits. All formal regulation changes, however, must be promulgated in accordance with the State Administrative Procedure Act (SAPA) requiring separate review, public hearings and approval. Further public input during the rulemaking process may cause some of the new regulations, when they are eventually adopted, to differ from those discussed in the GEIS. Any regulations adopted that differ significantly from those discussed in the GEIS will undergo an additional SEQR Review and Determination.

# **Location**

Statewide.

#### **DEC Jurisdiction**

Jurisdiction is provided by the Oil, Gas and Solution Mining Law (ECL Article 23).

# **Date Final GEIS Filed**

The Final GEIS was filed June 25, 1992/#PO-009900-00046. The Notice of Completion was published in the Environmental Notice Bulletin July 8, 1992.

# Facts and Conclusions Relied Upon to Support the SEQR Findings

The record of facts established in the Draft and Final GEIS upholds the following conclusions:

 The unregulated siting, drilling, production, and plugging and abandonment of oil, gas, solution mining, underground gas storage, brine disposal, geothermal and stratigraphic test wells could have potential negative impacts on every aspect of the environment. The potential negative impacts range from very minor to significant. Potential impacts of unregulated activities on ground and surface waters are a particularly serious concern. The potential negative impacts on all environmental resources are described in detail in Chapters 8 through 14 and summarized in Chapter 16 of the Draft GEIS.

- 2. Under existing regulations and permit conditions, the potential environmental impacts of the above wells are greatly reduced and most are reduced to non-significant levels. The extensive mitigation measures required under the existing regulatory program are described in detail in Chapters 8 through 14 and summarized in Chapter 17 of the Draft GEIS.
- 3. The potential environmental impacts associated with the activities covered by the Oil, Gas and Solution Mining Regulatory Program also have economic and social implications. For example, it is less expensive to prevent pollution than pay for remediation of environmental problems, health care costs, and lawsuit expenses. The State also receives significant economic benefits from the activities covered by the regulatory program. The regulated industries provide jobs and economic stimulus through the purchase of goods and services, and the payment of taxes, royalties and leasing bonuses. Additional information on the potential economic impacts associated with the activities covered by the regulatory program is provided in Chapter 18 of the Draft GEIS.
- 4. The Department's routine requirement of: 1) a program-specific Environmental Assessment Form (EAF) with every well drilling permit application, 2) a plat (map) showing the proposed well location, and 3) a pre-drilling site inspection, allows the Department to:
  - reliably determine potential environmental problems, and
  - select appropriate permit conditions for mitigating potential environmental impacts.

The EAF is printed in its entirety and discussed in detail on pages FGEIS 30-34 of the Final GEIS. Information on the permit application review process is summarized in Chapter 7 of the Draft GEIS.

- 5. The majority of the industry's activity centers on drilling individual oil and gas wells for primary production. For purposes of this Findings Statement, standard oil and gas operations are defined as:
  - any procedure relevant to rotary or cable tool drilling procedures, and
  - production operations which do <u>not</u> utilize any type of artificial means to facilitate the recovery of hydrocarbons.

The basic features of standard oil and gas operations are described in detail in Chapters 9 through 11 of the Draft GEIS.

- 6. The diverse types of wells covered by the regulatory program have enough design and operational characteristics in common to group them according to their potential environmental impacts. Design and operational aspects of these wells are described in detail in Chapters 9 through 14 of the Draft GEIS.
- 7. The magnitude of potential environmental impacts associated with any proposed well covered by the regulatory program is strongly influenced by the types of natural and cultural resources in the well's vicinity. New York State's environmental resources are described in Chapter 6 of the Draft GEIS. Most of the information on the potential environmental impacts of the regulated activities on these environmental resources can be found in Chapter 8 of the Draft GEIS, which deals with siting issues. Additional information on potential impacts related to specific stages (drilling, completion, production, plugging and abandonment) of well operation can be found in Chapters 9 through 11 of the Draft GEIS. Additional information on potential environmental impacts related specifically to enhanced oil recovery, solution salt mining, underground gas storage and waste brine disposal can be found in Chapters 12 through 15 of the Draft GEIS.

8. The range of future alternatives concerning the activities covered by the Oil, Gas and Solution Mining Regulatory Program can be divided into three basic categories: 1) prohibition on regulated activities, 2) removal of regulation, and 3) maintenance of status quo versus revision of existing regulations. A prohibition on these regulated activities would deprive the State of substantial economic and natural resource benefits. Complete removal of regulation would lead to severe environmental problems. While the existing regulations and permit conditions provide significant environmental protection, there is still room to improve the efficiency and effectiveness of the program. Revision of the existing regulations is the best alternative. Chapter 21 of the Draft GEIS contains a more detailed assessment of the environmental, economic, and social aspects of each alternative.

#### **SEQR Determinations of Significance**

The SEQR determinations on the significance of the environmental impacts associated with the activities covered by this regulatory program are presented in the following table. The determinations are supported by the conclusions listed above, which in turn are supported by the referenced sections of the Draft and Final GEIS.

# SEQR DETERMINATIONS

	Agency Action	Environmental Impact	Explanation
a.	Standard individual oil, gas, solution mining, stratigraphic, geothermal, or gas storage well drilling permits (no other permits involved).	not significant	Rules and regulations and conditions are adequate to protect the environment. The Draft and Final GEIS satisfy SEQR for these actions. A site- specific EAF is required with the permit application.
b.	Oil and gas drilling permits in State Parklands.	may be significant	Site-specific conditions of State Parklands are not discussed in the Draft and Final GEIS. Further determination of significant environmental impacts is needed for State Parklands. A site-specific EAF is required with the permit application.
c.	Oil and gas drilling permits in Agricultural Districts.	may be significant	Rules and regulations and conditions are adequate to protect the environment. For most oil and gas operations in Agricultural Districts which utilize less than 2½ acres the GEIS satisfies SEQR. If more than 2½ acres are disturbed, this is a Type I action under 6NYCRR Part 617 and an additional determination of significance is required. A site- specific EAF is required with the permit application.
d.	Oil and gas drilling permits in the "Bass Island" fields.	not significant	Special conditions and regulations under Part 559 are adequate to protect the environment. The Draft and Final GEIS satisfy SEQR for these actions. A site-specific EAF is required with the permit application.

Oil and gas drilling permits for locations above aquifers.	not significant	Rules and regulations and special aquifer conditions employed by DEC have been developed specifically to protect the groundwater resources of the State. The Draft and Final GEIS satisfy SEQR for these actions. A site-specific EAF is required with the permit application.
Oil and gas drilling permits in close proximity (less than 1,000 feet) to municipal water supply wells.	always significant	A supplemental EIS is required dealing with the groundwater hydrology, potential impacts and mitigation measures. A site-specific EAF is required with the permit application.
Oil and gas drilling permits in proximity (between 1,000 and 2,000 feet) to municipal water supply wells.	may be significant	A supplemental EIS may be required dealing with the groundwater hydrology, potential impacts and mitigation measures. A site-specific assessment and SEQR determination are required. A site- specific EAF is required with the permit application.
Oil and gas drilling permits when other DEC permits required.	may be significant	A site-specific SEQR assessment and determination are needed based on the environmental conditions requiring additional DEC permits. A site-specific EAF is required with the permit application.
Plugging permits for oil, gas, solution mining, stratigraphic, geothermal, gas storage and brine disposal wells.	Type II *	By law all wells drilled must be plugged before abandonment. Proper well plugging is a beneficial action with the sole purpose of environmental protection, and constitutes a routine agency action.
	Oil and gas drilling permits for locations above aquifers. Oil and gas drilling permits in close proximity (less than 1,000 feet) to municipal water supply wells. Oil and gas drilling permits in proximity (between 1,000 and 2,000 feet) to municipal water supply wells. Oil and gas drilling permits when other DEC permits required. Plugging permits for oil, gas, solution mining, stratigraphic, geothermal, gas storage and brine disposal wells.	Oil and gas drilling permits for locations above aquifers.not significantOil and gas drilling permits in close proximity (less than 1,000 feet) to municipal water supply wells.always significantOil and gas drilling permits in proximity (between 1,000 and 2,000 feet) to municipal water supply wells.may be significantOil and gas drilling permits when other DEC permits required.may be significantOil and gas drilling permits when other DEC permits for oil, gas, solution mining, stratigraphic, geothermal, gas storage and brine disposal wells.Type II *

\* Under 6NYCRR 617.13, a Type II action is one which has been determined not to have a significant effect on the environment and does not require any other SEQR determination or procedure.

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j.	New waterflood or tertiary recovery projects.	may be significant	For major new waterfloods and new tertiary recovery projects, a site specific environmental assessment and SEQR determination are required. A supplemental EIS may be required for new waterfloods to ensure integrity of the flood. Also, a supplemental EIS may be required for new tertiary recovery projects depending on the scope of operations and methods used. A site-specific EAF is required with the permit application.
k.	New underground gas storage projects or major modifications.	may be significant	A site-specific environmental assessment and SEQR determination are required. May require a supplemental EIS depending on the scope of the project. A site-specific EAF is required with the permit application.
1.	New solution mining projects or major modifications.	may be significant	A site-specific environmental assessment and SEQR determination are required. May require a supplemental EIS depending on the scope of the project. A site-specific EAF is required with the permit application.
m.	Spacing hearing.	not significant	Action to hold hearing is non-significant. A review and SEQR determination with respect to all other issues must be made before the hearing. Any permit issued subsequently will be reviewed on issues raised at hearing. A site-specific EAF is required with the permit application.
n.	Variance hearing.	not significant	Action to hold hearing is non-significant. A review and SEQR determination with respect to all other issues must be made before the hearing. Any permit issued subsequently will be reviewed on issues raised at hearing. A site-specific EAF is required with the permit application.

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<ul> <li>p. Natural Gas Policy Act pricing recommendations.</li> <li>q. Brine disposal well drilling or conversion permit.</li> <li>Action only results in recommendations to Federal Energy Regulatory Commission; therefore, action is not subject to SEQR.</li> <li>The brine disposal well permitting guidelines require an extensive surface and subsurface evaluation which is in effect a supplemental EIS addressing technical issues. An additional site</li> </ul>
<ul> <li>q. Brine disposal well drilling or conversion permit.</li> <li>The brine disposal well permitting guidelines require an extensive surface and subsurface evaluation which is in effect a supplemental EIS addressing technical issues. An additional site</li> </ul>
specific environmental assessment and SEQR determination are required. A site-specific EAF i required with the permit application.

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#### **SEQR Review Procedures**

Upon filing of this Findings Statement, the following SEQR Review procedures will be adopted for the Oil, Gas and Solution Mining Regulatory Program:

- A shortened program-specific Environmental Assessment Form (EAF) will continue to be required with every well drilling permit application, regardless of the SEQR determination listed in the previous table. Information required by the EAF is considered to be an essential part of the permit application. It contains vital site-specific information necessary to evaluate the need for individual permit conditions.
- 2. In the following cases where the GEIS satisfies SEQR, Department staff will no longer make Determinations of Significance and a Negative or Positive Declaration under SEQR will no longer be required so long as projects conform to the descriptions in the Draft and Final GEIS:
  - Standard individual oil, gas, solution mining, stratigraphic test, geothermal or gas storage well drilling permits,
  - Oil and gas drilling permits in the "Bass Islands" field, and
  - Oil and gas drilling permits for locations above aquifers.
- 3. In addition to the short program-specific EAF, permits for the following projects will also require detailed site-specific environmental assessments using the Long-Form EAF published in Appendix A of 6NYCRR Part 617. A site or project-specific EIS may also be required for the following projects depending upon the information revealed in the permit application and accompanying EAF's:
  - Oil and gas drilling permits in Agricultural Districts if more than two and one-half acres will be altered by construction of the well site and access road.

Oil and gas drilling permits in State Parklands.

Oil and gas drilling permits when other DEC permits are required.

- Oil and gas drilling permits less than 2,000 feet from a municipal water supply well.
- New major waterflood or tertiary recovery projects.
- New underground gas storage projects or major modifications.
- New solution mining projects or major modifications.
- Brine disposal well drilling or conversion permits.
  - Any other project not conforming to the standards, criteria or thresholds required by the Draft and Final GEIS.

# **Other SEQR Considerations**

In conducting SEQR reviews, the Department will handle the topics of individual project scope, project size, lead agency, and coastal resources as described below.

<u>Project scope</u> - Each application to drill a well will continue to be considered as an individual project. An applicant applying for five wells will continue to be treated the same as five applicants applying to the Department individually, since the wells may not be drilled at the same time or in the same area. Planned future wells might not be drilled at all depending on the results of the first well drilled.

The exceptions to this are proposed new or major expansions of solution mining, enhanced recovery or underground gas storage operations which require that several wells be drilled and operated for an extended period of time within a limited area.

- 2. <u>Size of Project</u> The size of the project will continue to be defined as the surface acreage affected by development.
- 3. Lead Agency In 1981, the Legislature gave exclusive authority to the Department to regulate the oil, gas and solution mining industries under ECL Section 23-0303(2). Thus, only the Department has jurisdiction to grant drilling permits for wells subject to Article 23, except within State parklands. To the extent practicable, the Department will actively seek lead agency designation consistent

with the general intent of Chapter 846 of the Laws of 1981.

4. <u>Coastal Resources</u> - On the program specific EAF that must accompany every drilling permit application, the applicant must indicate whether the proposed well is in a legally designated New York State Coastal Zone Management (CZM) Area. Neither the policies in the New York State CZM Plan, nor the provisions of individual Local Waterfront Revitalization Plans (LWRP's) are covered in the GEIS. Once an LWRP is adopted by a community, it is a legally binding part of the New York State CZM Plan. The Department cannot issue any drilling permit unless it is consistent with the New York State CZM Plan to the "maximum extent practicable."

# CERTIFICATION OF FINDINGS TO ADOPT THE FINAL GENERIC ENVIRONMENTAL.

# IMPACT STATEMENT ON THE OIL, GAS AND SOLUTION MINING REGULATORY

# PROGRAM

Having considered the Draft and Final GEIS, and having considered the preceding written

facts and conclusions relied upon to meet the requirements of 6NYCRR Part 617.9, this

Statement of Findings certifies that:

- The requirements of 6NYCRR Part 617 have been met; 1.
- 2. Consistent with the social, economic and other essential considerations from among the reasonable alternatives thereto, the action approved is one which minimizes or avoids adverse environmental effects to the maximum extent practicable; including the effects disclosed in the environmental impact statement, and
- 3. Consistent with social, economic and other essential considerations, to the maximum extent practicable, adverse environmental effects revealed in the environmental impact statement process will be minimized or avoided by incorporating as conditions to the decision those mitigative measures which were identified as practicable.
- 4. Consistent with the applicable policies of Article 42 of the Executive Law, as implemented by 19 NYCRR 600.5, this action will achieve a balance between the protection of the environment and the need to accommodate social and economic considerations.

. H. Mas Aupt, 24, 1992 Date

Director **Division of Mineral Resources** 

# P0-009900-00046

### Supplemental Findings Statement

Pursuant to the State Environmental Quality Review Act (SEQR) of the Environmental Conservation Law (ECL) and the SEQR Regulations 6NYCRR Part 617, the New York State Department of Environmental Conservation makes the following supplemental findings on the Final Generic Environmental Impact Statement (GEIS) on the Oil, Gas and Solution Mining Regulatory Program.

# Name of Action

Adoption of supplemental findings on leasing of state lands for activities regulated under the Oil, Gas and Solution Mining Law (ECL Article 23).

### **Description and Background**

In early 1988, the Department of Environmental Conservation released the Draft GEIS on the Oil, Gas and Solution Mining Regulatory Program. The Draft GEIS comprehensively reviewed the environmental impacts of the Department's program for regulating the siting, drilling, production and plugging and abandonment of oil, gas, underground gas storage, solution mining, brine disposal, geothermal and stratigraphic test wells. The findings statement issued on the Draft and Final GEIS in September, 1992 neglected to specifically mention DEC's program for leasing of State lands for these resource development activities.

Prior to adoption of the GEIS, proposed lease sales underwent a segmented review. Segmented reviews are permitted under certain circumstances if they are no less protective of the environment. This is true given the highly speculative nature of oil and gas leasing practices:

- It is impractical to review the potential environmental impacts of development activities at the leasing stage. Information on the placement of well sites is not generally known, even by the lessee. Not until a company successfully obtains a lease does it invest time and money in preparing the exploration and development plans that will be submitted to the Department for approval if the lessee wishes to commence operations.
- Most of the land leased will never be directly affected by development activities. Based on a 15 year record of the State's leasing program, less than one percent of all the State land leased has been subject to any direct impact.
- When the lessee does decide on a proposed well site on a State lease, the lessee must obtain a site-specific drilling permit from the Department. With eve well drilling permit application the Department requires: 1) a program-specific Environmental Assessment Form, 2) a plat (map) showing the proposed well location and support facilities, and 3) a pre-drilling site inspection that allows the Department to :
  - reliably determine potential environmental problems; and

- select appropriate permit conditions for mitigating potential environmental impacts.
- Possession of a lease does not <u>a priori</u> grant the right to drill on a lease.
   Nor is the lessee in any way guaranteed approval for their first-choice drilling location. Clauses included in the lease inform the lessee that any surface disturbing activities must receive Department review and approval prior. to their commencement. Leases also contain clauses recommended by other State agency staff that are necessary for protection of fish, wildlife, plant, land, air, wetlands, water and cultural resources on the leased parcels.

#### **SEOR Determination of Significance**

The Department has determined that the act of leasing State lands for activities regulated under ECL Article 23 does not have a significant environmental impact. This determination is supported by the facts listed above.

# **SEOR Review Procedures**

Department staff will no longer make Determinations of Significance and Negative or Positive Declarations under SEQR for leases on State lands for activities regulated under ECL Article 23 at the time that the lease is granted; SEQR reviews will continue to be done as needed for site-specific development.

# CERTIFICATION OF SUPPLEMENTAL FINDINGS ON THE FINAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM

Having considered the Draft and Final GEIS, and having considered the preceding written facts and conclusions relied upon to meet the requirements of 6NYCRR Part 617.9, this Supplemental Statement of Findings certifies that:

- 1. The requirements of 6NYCRR Part 617 have been met.
- 2. Consistent with the social, economic, and other essential considerations from among the reasonable alternatives thereto, the action approved is one which minimizes or avoids adverse environmental effects to the maximum extent practicable; including the effects disclosed in the environmental impact statement.
- 3. Consistent with the social, economic, and other essential considerations, to the maximum extent practicable, adverse environmental effects revealed in the environmental impact statement process will be minimized or avoided by incorporating as conditions to the decision those mitigative measures which were identified as practicable.
- 4. Consistent with the applicable policies of Article 42 of the Executive Law, as implemented by 19 NYCRR 600.5, this action will achieve a balance between the protection of the environment and the need to accommodate social and economic considerations.

April 19, 1993

Gregory H. Sovas, Director Division of Mineral Resources

/S/

New York State



**Division of Mineral Resources** 

# Final Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program

July 1992 Reprinted 2003

New York State Department of Environmental Conservation

George E. Pataki, Governor

Erin M. Crotty, Commissioner

# FINAL

# **GENERIC ENVIRONMENTAL IMPACT STATEMENT**

# On the Oil, Gas and Solution

**Mining Regulatory Program** 

July 1992 Reprinted Without Revision 2003

Bradley Field, Director Division of Mineral Resources NYS Department of Environmental Conservation 625 Broadway, Third Floor Albany, New York 12233-6500

# ACKNOWLEDGEMENTS

# Prepared By

Charles B. McGranahan, Bureau Director Toni M. Callaway, Chief, Program Development Section Laura Snell, Mineral Resources Specialist III Clemsford A. Pollydore, Mineral Resources Specialist III Kathleen Fitzpatrick, Mineral Resources Specialist II Peter S. Briggs, Mineral Resources Specialist II

Special thanks are given to the members of the NYS Oil, Gas and Solution Mining Advisory Board for their review and comments on the draft as part of the Department's internal review process. Thanks are also given to the Division of Mineral Resources' Bureau of Oil and Gas Regulation, Leasing and Mining Section, Region 8 and 9 staff for helpful review and to the Bureau of Resource Management and Development's clerical staff, Jeannine Ross, for her conscientious and endless work effort.

# FINAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM

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#### I. EXECUTIVE SUMMARY

In early 1988, the Department of Environmental Conservation (DEC) released a draft Generic Environmental Impact Statement (GEIS) on the oil, gas and solution mining regulatory program. This final GEIS was prepared after thorough review and consideration of the extensive public comments on the draft GEIS. A minimum of ten days after release of the final GEIS, DEC must issue its Findings under the State Environmental Quality Review (SEQR) Act.

Together, the draft and the final GEIS and SEQR Findings will provide the groundwork for revisions to Parts 550 through 559 of the Department's regulations. These regulations (6NYCRR Parts 550-559) are being updated to more accurately reflect and effectively implement the current Oil, Gas, and Solution Mining Law (ECL Article 23). The draft GEIS included suggested changes to the regulations in bold print throughout the document. All regulation changes, however, must be promulgated in accordance with the State Administrative Procedure Act (SAPA) requiring separate review, public hearings, and approval. Further public input during the final rulemaking process may cause some of the new regulations, when they are eventually adopted, to differ from those proposed in the draft GEIS and discussed in this document.

#### A. PURPOSE AND NEED

The primary purposes of this document are to clearly establish the basis for environmental review and approval of DEC actions subject to the Oil, Gas, and Solution Mining Law and to facilitate implementation of needed regulatory changes. The goals of both the draft and final GEIS include the following:

- Comprehensively review the oil, gas, underground gas storage and solution mining regulatory program.
- Analyze the environmental, social, and economic impacts of the regulated industries.
- 3) Develop guidelines for environmentally acceptable oil and gas drilling and development, solution salt mining, underground storage of gas, geothermal development, and drilling of stratigraphic and brine disposal wells in New York State.
- 4) Establish thresholds under which these regulated activities can continue with minimal adverse environmental impacts.
- 5) Eliminate the need for a site-specific environmental impact statement (EIS) for individual well-sites with respect to matters that are not unique to each particular site.
- 6) Establish criteria for those actions which will require additional detailed sitespecific environmental impact statements. Specific conditions or criteria are set forth under which future actions will be undertaken.
- Recommend appropriate modifications to the regulations as proposed in the draft GEIS.

#### **B. BACKGROUND**

This document includes some background information on the development of the draft GEIS. It also contains responses to all comments received during public review of the draft. The frequency of comment on seven policy issues necessitated the development of topical responses to these issues. These are included, as is a listing of errata in the draft GEIS.

# 1) Contents of the Final GEIS

This document includes the following:

- Executive Summary
  - Purpose and Need
  - Background
- SEQR Conclusions
  - Proposed SEQR Requirements and Determinations
  - Future SEQR Compliance
  - Parameters for Future SEQR Reviews
- Public Involvement
  - Albany Public Hearing Record
  - Topical Responses
  - Comment-Response Table
  - Summary
- Errata to the Draft GEIS

The "Conclusions" chapter is very important. The Findings Statement that the Department will issue no sooner than 10 days after publication of the final GEIS will be based largely on the Conclusions chapter. The Findings Statement will contain the Department's determinations under the State Environmental Quality Review Act with respect to the regulated activities. General criteria against which projects will be reviewed and a summary of actions that the Department undertakes will be presented in the Findings Statement.

#### 2) Contents of the Draft GEIS

Because of the size of the draft GEIS, it was necessary to divide it into three volumes as follows:

#### FGEIS3

# Volume I (Chapters 1 - 11)

- Chapters 1 and 2 were introductory chapters.
- Chapter 3 was a summary on the application of SEQR to the Oil, Gas and Solution Mining Law.
- Chapters 4 through 7 contained background information on the State's history, geology, environmental resources and the oil, gas and solution mining permitting program.
  - Chapters 8 through 11 focused on the procedures followed for each major phase of a well's development (i.e. siting, drilling, production and abandonment). The environmental factors and regulatory measures needed to mitigate the impacts of each phase of development were detailed.

#### Volume II (Chapters 12 - 21)

- Chapters 12 through 14 covered the existing and proposed regulatory programs for enhanced oil recovery, solution salt mining, and underground gas storage operations.
- Chapter 15 detailed the complex interagency coordination involved in the brine disposal, underground injection, and oil spill response programs.
- Chapters 16 and 17 summarized the adverse environmental impacts which can result from all of the activities described in Chapters 8 through 15 and the mitigation measures applied through the State's regulatory program.
  - Chapter 18 discussed the economic benefits derived from oil, gas, solution mining and underground gas storage activities and the projected cost of environmental regulation of these activities.

- Chapters 19 through 21 detailed unavoidable adverse impacts, irreversible and irretrievable commitments of resources and alternate actions, all topics which must be examined in any environmental impact statement.
- A glossary of technical terms and the references used in the preparation of this document were also included in Volume II.

Volume III (Appendices 1 -8) - Appendices on the following subjects were included in Volume III:

- Underground Storage: Certificate of Public Convenience and Necessity- Explains Federal Energy Regulatory Commission (FERC) requirements for underground gas storage.
- Freedom of Information Law--Explains how a citizen may request access to information on file with the Department.
- Movement of Contaminants in Aquifers--Gives technical description of potential worst case aquifer contamination.
- Mineral Ownership and Leasing Summary--Explains oil and gas leasing practices and nomenclature.
- Environmental Assessment Form (EAF)--Shows the April 1, 1986 version of the EAF. The EAF has since been revised with SEQR Committee approval.
- Gathering Lines--Explains NYS Public Service Commission requirements for gathering lines that collect gas from individual wells.

 Brine Disposal Well Permitting Guidelines--Explains Department requirements for brine disposal wells.

8. Forms used in Oil, Gas and Solution Mining Program--Briefly describes the major forms used in the Oil, Gas and Solution Mining regulatory program.

### 3) Areas of Controversy

As was expected, various aspects of the draft GEIS proved to be controversial during the public review process. Several frequently raised issues that pertain to general policy rather than to specific GEIS statements or proposals are addressed in depth in Topical Responses, contained herein just before the Comment-Response Table.

One such concern is the issue of public taking without compensation. Department regulations or permit conditions may under some circumstances prevent an oil or gas well from being drilled in the most desirable location with regard to geology or spacing. However, to demonstrate that a government "taking" had occurred in such a case, the minerals owner would have to demonstrate that the land was rendered unsuitable for <u>any</u> purpose. The proofs required are listed in the Topical Response on public taking without compensation.

A second issue addressed topically is that of visual resources and their assessment. While the Department realizes that most visual impacts of oil, gas, and solution mining activity are minor and/or short-term, the protection of visual resources is mandated by State law. The Topical Response describes how this is accomplished objectively and uniformly.

The Environmental Assessment Form (EAF) and site-specific permit conditions are thought by many operators to be onerous and unnecessary. They cannot, however, be completely eliminated. The Department's position with respect to the EAF has changed since the draft GEIS was published. Details of this determination and the reasoning behind it can be found herein in the Conclusions section as well as in the Topical Response.

Inclusion of access road construction in the project review is addressed topically because the oil and gas industry argues that construction of access roads is a contractual matter between

the landowner and operator. Construction of an access road, however, can disturb a much greater area than the actual drill site. Possible environmental impacts and how they are evaluated for each site are discussed in the Topical Response.

Proposed regulations were listed in the draft GEIS in order to provide the impetus for public discussion. Much discussion centered on whether or not this was appropriate. The Department believes, as explained in the Topical Response, that inclusion of proposed regulations was not only appropriate but necessary to meet the requirements of SEQR. Adoption of this final GEIS does not in any way constitute promulgation of any regulations proposed in the draft GEIS, although many of the recommendations are routinely included as permit conditions in order for the Department to issue a negative declaration stating the project has nonsignificant environmental impacts under SEQR.

Another area of controversy discussed topically is that of conflicts between the surface owner and minerals owner and their respective rights. Local governments and agricultural organizations advocate more protection for the surface rights owner, while industry commentators contend that Department regulations often interfere with contractual agreements between landowners and well operators. The Department's regulatory program plays an important role in protecting the environment for all parties, including landowners, lessees, and the people of New York State. This is further discussed in the Topical Response on surface/mineral owner lease conflicts.

The final issue addressed by a Topical Response involves the concept of soil as a "public natural resource." Soil disturbance is a likely environmental impact of any oil, gas, or solution mining operation and must be evaluated as such. This is true whether or not soil is a <u>public</u> natural resource subject to the same kind of regulation as air and water. The reasons soil

#### FGEIS7

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disturbance is regulated as an environmental impact are described more fully in the Topical Response.

Specific operational recommendations in the draft GEIS that generated some controversy included those on:

1. information required on well plats submitted with drilling applications,

2. well setback requirements,

3. pit construction, lining, and maintenance,

4. tank overflow/leakage prevention and control,

5. site reclamation deadlines, and

6. notification/approval requirements for changes in wellbore configuration.

Debate on these issues is more technical in nature, so each comment is addressed separately within the Comment-Response Table. Some recommendations were reevaluated based on the public comments; these are discussed in the summary which follows the Comment-Response Table.

Issues outside the jurisdiction of the Division of Mineral Resources that generated frequent comments included:

1. archeological reviews,

2. wetland and stream protection permits, and

3. regulation of water well drillers.

With respect to the first two items, industry commentators generally advocated giving jurisdiction to the Division of Mineral Resources, thus facilitating a "one-stop shopping" approach to the application, review, and issuance of drilling permits. As noted in our responses, the Department has worked with the Office of Parks, Recreation and Historic Preservation (OPRHP) to significantly shorten the turnaround time for archeological reviews. OPRHP continues to

maintain the maps necessary for accurate archeological review. Regarding wetlands and stream protection permits, the Division of Mineral Resources does not have the technical expertise to evaluate these issues, so they will remain outside our jurisdiction.

As stated in the draft GEIS and the Comment-Response Table, the Department has supported proposals for regulation of water well drillers. Regulation of water well drillers would require legislative changes outside the scope of the Oil, Gas, and Solution Mining Law.

An additional issue that industry commentators claim is outside Department jurisdiction involves safety concerns. No exclusive safety regulations without environmental impact are proposed in the GEIS. Non-regulatory recommendations are made with the intent of encouraging and promoting safe practices. In circumstances such as blowout prevention and control, where failure to regulate safety could have adverse environmental impacts, the Department must retain an active role in enforcing regulations that protect the environment as well as worker and public safety. Also note that neither the federal Occupational Safety and Health Administration (OSHA) nor the New York State Department of Labor perform drilling rig safety inspections in New York State.

There were many written and oral comments about the length of time it has taken to prepare the GEIS and additional discussion about the cost of the GEIS took place at the public hearing in Wellsville. Two major reasons for the length of time it took to prepare the GEIS are: 1) its expanded scope to serve as a public information and educational document and 2) limited staffing resources. The thorough scope of the draft GEIS required extensive research efforts. After the draft was released, a great deal of effort was given to providing detailed responses to more than 850 comments received during public review. None of those involved in preparing the GEIS were able to work on it full time.

Benefits to the taxpayer include the assurance that regulated activities are carried out in an environmentally sound manner, in compliance with the State Environmental Quality Review Act. Although environmental compliance does increase industry's cost of doing business, there are substantial savings realized by negating the need for separate, detailed environmental impact statements and lengthy environmental reviews for each and every single well drilled.

#### 4) Status of Proposed Regulations

Proposed additions and changes to 6 NYCRR, Parts 550-559, were included in the draft GEIS. Department staff are presently preparing new and revised regulations to implement the current Oil, Gas, and Solution Mining Law. Authority to implement these regulations will be found in both ECL Article 23, the Oil, Gas, and Solution Mining Law, and Article 8, the State Environmental Quality Review Act. The proposed regulations will undergo the public review process mandated by the State Administrative Procedure Act (SAPA).

#### 5) Promulgation of Emergency Regulations

Chapter 846 of the 1981 Amendments to the Oil, Gas, and Solution Mining Law eliminated the distinction between new and old field areas so that all oil and gas wells in New York State became subject to the same environmental protection restrictions. The actual text of the regulations was not modified to conform to the statute, but the Department uniformly and consistently implemented the legislation in accordance with the amendments.

The Allegany County Supreme Court ruled in June 1990 that the regulatory distinction between old and new fields continued in force and effect. There is no environmental basis for a distinction between old and new fields in terms of necessary and appropriate measures to protect against possible adverse impacts. Although the court decision is being appealed, the Department promulgated emergency regulations in August 1990 to correct the discrepancy between the text of

the statute and the text of the regulations. The emergency regulations implemented the explicit legislative intent of ECL 23-0305 by removing the outmoded references to old field and new fields. These emergency regulations were adopted as final regulations in September 1991.

#### II. SEOR CONCLUSIONS

The State Environmental Quality Review Act defines a process that introduces the consideration of environmental factors into the early planning stages of actions that are directly undertaken, funded or approved by local, regional and State agencies. By incorporating a systematic interdisciplinary approach to environmental review in the early planning stages, projects can be modified as needed to avoid adverse impacts on the environment.

The law mandates that agencies act on the information produced in the environmental review. This may result in project modification or project denial if the adverse environmental effects are overriding and adequate mitigation or alternatives are not available. One of the primary purposes of this final GEIS is to clearly establish the guidelines for environmental review and approval of the DEC actions subject to the Oil, Gas and Solution Mining Law.

A Generic Environmental Impact Statement differs from the site or project-specific Environmental Impact Statement (EIS) by being more general or conceptual in nature. A GEIS may be used to assess the environmental effects of:

- (1) a number of separate actions in a given geographic area which, if considered singly may have minor effects, but if considered together may have significant effects,
- (2) a sequence of actions, contemplated by a single agency or individual,
- (3) separate actions having generic or common impacts, or
- (4) an entire program or plan having wide application or restricting the range of future alternative policies or projects.

The final GEIS sets forth some of the specific conditions or criteria under which future actions will be undertaken. Site-specific impacts which have not been addressed adequately or analyzed in this statement may be subjected to additional review through the drafting of a supplemental EIS. The Findings Statement that the Department must issue no sooner than 10 days after the final GEIS is published will be based largely on the following sections regarding SEQR requirements, determinations, compliance and reviews.

### A. PROPOSED SEQR REQUIREMENTS AND SEQR DETERMINATIONS

(1) The permitting of any standard, individual oil, gas, solution mining, stratigraphic, geothermal or gas storage well, pursuant to the Oil, Gas and Solution Mining Law and its current regulations, in combination with casing and cementing permit guidelines and/or aquifer, wetland, and drinking water watershed permit conditions when applicable, is considered to be a non-significant action under the State Environmental Quality Review Act.

(2) Permits for the following types of projects will require detailed site-specific environmental assessments (i.e. long-form EAF) and may require site or project specific environmental impact statements:

- Oil and gas drilling permits in Agricultural Districts if more than two and one-half acres will be altered including the access road.
- Oil and gas drilling permits in State Parklands.
- Oil and gas drilling permits when other DEC permits are required.
- Oil and gas drilling permits less than 2,000 feet from a municipal water supply well.
- New major waterflood or tertiary recovery projects.
- New underground gas storage projects or major modifications.
- New solution mining projects or major modifications.
- Brine disposal well drilling or conversion permits.

Any other project not conforming to the standards, criteria or thresholds required by the draft and final GEIS.

Table 1 represents the general criteria against which each of the agency actions will be reviewed. The table summarizes the various actions that DEC undertakes with regard to the oil, gas, and solution mining regulatory program and the environmental impact determination under the State Environmental Quality Review Act based on current regulations, special permit conditions and the discussions contained within the draft and final GEIS. This final GEIS satisfies SEQR requirements for all these standard operations when they conform to the thresholds described in Table 1 on pages FGEIS16 through FGEIS18.

#### **B. FUTURE SEQR COMPLIANCE**

Based upon the conclusions and findings of this final GEIS:

- 1) A shortened Environmental Assessment Form (EAF) specific to oil, gas, solution mining and other wells drilled under Article 23 legislation will continue to be required with every well drilling permit application submitted. The EAF is the best tool to evaluate whether an action triggers any of the thresholds requiring further environmental assessment and SEQR review. See the Topical Response on the EAF and site-specific permit conditions for further discussion of the EAF issue.
- 2) No further SEQR compliance is required so long as site-specific projects subject to the oil, gas and solution mining regulatory program are carried out in conformance with the general conditions and thresholds listed above and in Table 1.
- 3) Permit conditions will continue to be added on a site-specific basis to ensure that the drilling of a well, for example, will not have a significant effect on the environment. Again, see the Topical Response on this subject for further

discussion.

- 4) A supplemental EIS may be required if the proposed action is not addressed in this document and if the subsequent action involves one or more significant adverse environmental impacts.
- 5) A supplemental findings statement will be required if the proposed subsequent action is not adequately addressed in the final GEIS.

#### C. PARAMETERS FOR FUTURE SEQR REVIEWS

For the purpose of future SEQR reviews that may be necessary for oil, gas and solution mining permit applications, the following parameters are used for the description of a project, size of the project and lead agency status.

1) <u>Project</u> - Each application to drill a well is considered as an individual project. An applicant applying for five wells is treated the same as five applicants each applying to the Department individually, because the wells may not be drilled at the same time or in the same area. Planned future wells might not be drilled at all depending on the results of the first wells drilled.

The exceptions to this are proposed new or major expansions of solution mining, enhanced recovery or underground gas storage operations which require that several wells be drilled and operated for an extended period of time within a limited area. The environmental disturbance of even these multi-well projects can be mitigated by using common access roads and other measures. These multi-well projects will require further environmental assessment, and will require a negative declaration or supplemental environmental impact statement.

2) <u>Size of Project</u> - The size of the project is defined as the surface acreage affected by development. The Department's drilling, completion, plugging and spacing requirements preclude

any subsurface impacts other than the permitted action to recover hydrocarbons or brine. Surface acreage includes the acreage disturbed for the drilling of the well, the access roads, the drill site, and any other physical alteration necessary. Even though the statewide spacing of natural gas wells is generally a maximum of one well per 40 acres (i.e. the approximate area defined by the required setbacks from property lines and other wells), the actual total disturbance is usually less than two acres. Additionally, it should be noted that the physical disturbance is temporary in nature. After the well is drilled and completed, the remaining area of disturbance for the producing well may be as small as 20 feet by 20 feet, or 1/100 acre, plus the access road if one is necessary for well maintenance.

3) <u>Lead Agency</u> - In 1981, the Legislature gave exclusive authority to the Department to regulate the oil, gas and solution mining industries:

"The provisions...shall supersede all local laws or ordinances relating to the regulation of the oil, gas and solution mining industries; but shall not supersede local government jurisdiction over local roads or the rights of local governments under the real property tax law." (Section 23-0303(2))

Thus, only the Department has jurisdiction with respect to the granting of drilling permits for wells subject to Article 23 legislation, except within State Parklands. The criteria for lead agency specify that the lead agency should be the one that has the broadest governmental powers for investigation into the impacts and the greatest capability for the most thorough environmental assessment of the action. These criteria would support the Department as lead agency. However, if the proposed action falls under the jurisdiction of more than one agency based upon local approvals necessary for a floodplain or wetland permit, for example, the lead agency must be determined by agreement among the involved agencies. An involved agency has the obligation to ensure that the lead agency is aware of all issues of concern to the involved agency.

To the extent practicable, the Department will actively seek lead agency designation, consistent with the general intent of Chapter 846 of the Laws of 1981, to establish the DEC as the primary regulator of the oil, gas and solution mining industries in New York State.
# TABLE 1

## SEQR DETERMINATIONS

	Agency Action	Environmental Impact	Explanation
a.	Standard oil, gas, stratigraphic and geothermal well drilling permits (no other permits involved).	not significant	Rules and regulations and conditions are adequate to protect the environment. The draft and final GEIS satisfy SEQR for these actions.
Ъ.	Oil and gas drilling permits in State Parklands.	may be significant	Site-specific conditions of State Parklands are not discussed in the draft or final GEIS. Further determination of significant environmental impacts is needed for State Parklands.
C.	Oil and gas drilling permits in Agricultural Districts.	may be significant	Rules and regulations and conditions are adequate to protect the environment. For most oil and gas operations in Agricultural Districts which utilize less than 2½ acres the GEIS satisfies SEQR. If more than 2½ acres are disturbed, this is a Type I action under 6NYCRR Part 617 and an additional determination of significance is required.
d.	Oil and gas drilling permits in the "Bass Island" fields.	not significant	Special conditions and regulations under Part 559 are adequate to protect the environment.
е.	Oil and gas drilling permits for locations above aquifers.	not significant	Rules and regulations and special aquifer conditions employed by DEC have been developed specifically to protect the groundwater resources of the State.
f.	Oil and gas drilling permits in close proximity (less than 1,000 feet) to municipal water supply wells.	always significant	A supplemental EIS is required dealing with the groundwater hydrology, potential impacts and mitigation measures.

	Agency Action	Environmental Impact	Explanation
g.	Oil and gas drilling permits in proximity (between 1,000 and 2,000 feet) to municipal water supply wells.	may be significant	A supplemental EIS may be required dealing with the groundwater hydrology, potential impacts and mitigation measures. A site-specific assessment and SEQR determination are required.
h.	Oil and gas drilling permits when other DEC permits required.	may be significant	A site-specific SEQR assessment and determination are needed based on the environmental conditions requiring additional DEC permits.
i.	Oil, gas, solution mining, stratigraphic, geothermal and gas storage well plugging permits.	Type II	By law all wells drilled must be plugged before abandonment. Proper well plugging is a beneficial action with the sole purpose of environmental protection, and constitutes a routine agency action.
j.	New waterflood or tertiary recovery projects.	may be significant	For major new waterfloods and new tertiary recovery projects, a site specific environmental assessment and SEQR determination are required. A supplemental EIS may be required for new waterfloods to ensure integrity of the flood. Also, a supplemental EIS may be required for new tertiary recovery projects depending on the scope of operations and methods used.
k.	New underground gas storage projects or major modifications.	may be significant	A site-specific environmental assessment and SEQR determination are required. May require a supplemental EIS depending on the scope of the project.
1.	New solution mining projects or major modifications.	may be significant	A site-specific environmental assessment and SEQR determination are required. May require a supplemental EIS depending on the scope of the project.

	Agency Action	Environmental Impact	Explanation
m.	Spacing hearing.	not significant	Action to hold hearing is non-significant. A review and SEQR determination with respect to all other issues must be made before the hearing. Any permit issued subsequently will be reviewed on issues raised at hearing.
n.	Variance hearing.	not significant	Action to hold hearing is non-significant. A review and SEQR determination with respect to all other issues must be made before the hearing. Any permit issued subsequently will be reviewed on issues raised at hearing.
0.	Compulsory unitization hearing.	not significant	Action to hold hearing is non-significant. A review and SEQR determination with respect to all other issues must be made before the hearing. Any permit issued subsequently will be reviewed on issues raised at hearing.
p.	Natural Gas Policy Act pricing recommendations.	none	Action results in only recommendations to Federal Energy Regulatory Commission; therefore, action is not subject to SEQR.
q.	Brine disposal well drilling or conversion permit.	may be significant	The brine disposal well permitting guidelines require an extensive surface and subsurface evaluation which is in effect a supplemental EIS addressing technical issues. An additional site specific environmental assessment and SEQR determination are required.

## III. PUBLIC INVOLVEMENT

Two informal scoping meetings were held on the GEIS in Jamestown and Olean in March, 1985. A thirty-one page outline was distributed in advance and the Department received many suggestions on additional topics to be included. These suggestions were incorporated into the draft that was released for review in early 1988.

Approximately 1,000 copies of the draft GEIS were released for public review in March and April 1988. The distribution list included affected communities, government agencies, public interest groups, members of the petroleum industry, and the general public. More than 850 written and oral comments were received from the following interested parties:

#### Government Offices

- Allegany County Office of Economic Development
- Jamestown Board of Public Utilities
- New York State Department of Agriculture and Markets
- New York State Department of Environmental Conservation
  - Division of Fish and Wildlife
  - Division of Hazardous Substances Regulation
  - Division of Lands and Forests
  - Division of Regulatory Affairs
- U.S. Representative Amo Houghton

#### Industry

- Envirogas, Inc.
- Honeoye Storage Corporation
- Kidder Exploration, Inc.
- Lenape Resources Corporation
- National Fuel Gas Supply Corporation
- Pennzoil Products Company
- Quaker State Corporation
- Universal Resources Holdings, Inc.

#### **Industry Organizations**

- Independent Oil and Gas Association of New York
- New York State Oil Producers Association

## Environmental Organizations

- Chautauqua County Environmental Management Council
- Monroe County Soil and Water Conservation District

## Individuals

- Dr. Peter S. Gold SUNY, Buffalo
- William J. Plants Cuba, NY

Public hearings on the draft GEIS were held in June 1988 in Albany, Buffalo, Canandaigua, Ithaca, Jamestown, and Wellsville. Extensive oral testimony was presented by interested parties at the hearings in Buffalo, Jamestown, and Wellsville in the historic oil and gas production areas.

Each written and oral comment received on the draft GEIS is printed in its entirety with the Department's response in the Comment-Response Table. Copies of the letters and testimony are printed in the table with the Department's coded responses. A listing of the codes used for each organization/individual can be found at the front of the Comment-Response Table.

It is readily apparent from the above list of commentators that many diverse and sometimes opposing views were expressed. The concerns of environmental groups and government agencies are often quite different than those of industry. The Department responses recognize, as did the draft GEIS, that all concerns are valid. The Department's role is to strike the balance that best meets our mandate under the law to prevent waste, protect correlative rights, and to prevent pollution while ensuring greater ultimate recovery of oil and natural gas.

A careful reader of the Comment-Response Table will note many instances where the Department agrees with the commentator and/or acknowledges possible alternatives to Department proposals. However, there are also many counter-proposals and recommendations that had to be rejected because, even though they spring from valid concerns, they do not fit within the framework of our mandated goals. Such proposals fall on both ends of the spectrum;

some are more stringent than the original recommendations and some are less so. The Department is endeavoring to strike the same reasonable balance in new and revised regulations.

Seven topics were raised so frequently that the Department decided it was more efficient to prepare general Topical Responses instead of repeatedly responding to the same points in the Comment-Response Table. The Topical Responses address:

1. Public taking without compensation

- 2. Visual resources and assessment requirement
- 3. Environmental assessment form and site-specific permit conditions
- 4. Access roads as part of project
- 5. Reasons for including the proposed regulations in the GEIS
- 6. Surface/mineral owner lease conflicts

7. Soil as a public natural resource

Because several hearings were held statewide, the individual oral comments delivered at each hearing are included in the Comment-Response Table. Instead of including complete transcripts of all the Public Hearings in the final GEIS, just the record from the Albany Public Hearing is included. This decision was made to avoid duplication and give equal weight to all comments regardless of type.

## STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter

-of-

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a Public Hearing on the Draft Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program

TRANSCRIPT OF PROCEEDINGS at a public hearing in the above-entitled matter held by the New York State Department of Environmental Conservation at its Central Office, 50 Wolf Road, Albany, New York, on the 6th day of June 1988, commencing at 1:00 o'clock p.m. PRESIDING:

ROBERT S. DREW

Chief Administrative Law Judge

## PROCEEDINGS

MR. DREW: Ladies and gentlemen, good afternoon. I'll formally call this public hearing to order.

This is a public hearing before the Department of Environmental Conservation on the Department's Draft Generic Environmental Impact Statement for Oil, Gas and Solution Mining Regulatory Program. The Department staff has prepared this Draft Environmental Impact Statement dated January 1988, consisting of two volumes.

MR. SOVAS: Three volumes.

MR. DREW: Three volumes, excuse me. And the Department has asked the Office of Hearings, in which I'm located, to hold a series of hearings around the state on the Draft Impact Statement.

My name is Robert Drew. I'm Chief Administrative Law Judge in the Office of Hearings, and I'll be chairing today's hearing here in Albany and hearings later this week on June 9th in Ithaca and Canandaigua. On the

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following week on June 14th, there's an additional hearing in Amherst which is outside -- in Amherst Town Hall which is outside of Buffalo, on the 15th in Jamestown, New York and on the 16th in Wellsville.

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This is a cumulative hearing record, so that while people are free to attend any or all of the hearings, we ask that you only make a statement at one of the hearings unless later on, if you speak at one of them you want to make a supplemental statement. It will be a combined hearing record of all the hearings and, in addition, written statements may be filed until July 8th, and my address is Robert Drew, Chief Administrative Law Judge, New York State Department of Environmental Conservation, Office of Hearings, Albany, New York, 12233.

Notice of today's hearing was published in the Department's Environmental Notice Bulletin on April 27th and in many newspapers around the state and, for this area, it was published in the Albany Times-Union on April 28th and 29th. I have proofs of

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publication which I won't read or mark for all the other papers around the state.

At this time, I'd like to call on Mr. Greg Sovas from the Department's Division of Mineral Resources to give a brief synopsis and highlights of what is proposed in the Draft Impact Statement and the purpose of the draft statement.

MR. SOVAS: Thank you.

Good afternoon, ladies and gentlemen. My name is Gregory H. Sovas. I'm the Director of the Division of Mineral Resources within the New York State Department of Environmental Conservation.

As part of the stewardship and management of the state's natural resources, DEC regulates the drilling, operation and plugging and abandonment of oil and natural gas underground gas storage, solution salt mining, brine prime disposal, geothermal and stratographic wells.

The purpose of the regulatory program is to ensure that the activities related

to these wells are conducted in an environmentally sound manner consistent with the legislative mandates found in Article 23 of the Environmental Conservation Law.

Aside from strengthening environmental concerns, DEC is also responsible for preventing waste of the state's oil and gas resources and protecting correlative rights; that is, the right of any mineral owner to recover the oil and gas resources beneath his land.

New York State first began regulating oil and gas activities with the passage of the first comprehensive legislation in 1963 which -- excuse me -- which eventually was codified as Article 23 of the Environmental Conservation Law. Based on this law, rules and regulations were adopted under Parts 550 to 559 of Title 6 of the New York State Code of Rules and Regulations. Thus, both legislation and rules and regulations are in place to regulate the oil, gas and solution mining industries in this state.

	MR.	DREW:	Just a little slower.
	MR.	SOVAS:	A little slower, O.K.
I can give	this to	you in	writing in any event.
	MR.	DREW:	О.К.

MR. SOVAS: Since the passage of the State Environmental Quality Review Act in 1977, the Department has endeavored to establish a rational basis and consistent criteria for environmental review of DEC actions in matters of discretionary approval such as the granting of permits.

The primary method of review for a broad regulatory program is the preparation of a Generic Environmental Impact Statement, GEIS, which is designed to be a general -- to be general and conceptual in nature. The goals of the GEIS are to assess the environmental impact on the entire regulatory program and to suggest changes that may be necessary to strengthen the program.

The Department pursued the development of this GEIS with the state's ongoing oil and gas regulatory program to show

compliance of the existing regulatory program with the state's Environmental Quality Review Act.

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In addition to the passage of new oil and gas legislation in 1981, the Legislature mandated that the state's authority for regulation of these industries should supersede all local regulation with the exception of taxation and local roads. Because of the supersedure issue and the need for public information, the Department has expanded this GEIS to be an information document to help the public and local governments understand the oil and gas industries in the state and how DEC regulates these industries.

Further, because of the major overhaul of the legislation in 1981, both new and amended rules and regulations are necessary. Thus, the GEIS has been expanded to include proposed regulations as well as suggested changes to existing regulations so that a full public discussion of all the issues can be accomplished in one document. It should

be recognized, however, that regulatory changes can only be promulgated through a separate process dictated by the state's Administrative Procedures Act.

Many of the primary issues and areas of concern covered in this GEIS were identified by the process known as "scoping". Through this process, the affected community agencies, public interest groups, members of the petroleum industry and the general public were notified by DEC about the preparation of the GEIS and their comments were solicited through mailings and public hearings in the early 1980s. A comprehensive outline of the GEIS was distributed to facilitate their review.

The GEIS represents a major accomplishment in providing the public with information on how the Department manages these non-renewable natural resources. A great deal of effort has been expended over a period of nine years to produce a working document that will serve as the basis for public discussion on the way in which the state regulates these

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industries and how the process can be approved. More than 1600 copies of this document have been distributed statewide to a variety of different individuals, institutions, local governments and other authorities having any interest in the oil and gas and solution mining industries.

To be as effective as possible, public comment and discussion are encouraged and welcomed.

Thank you.

MR. DREW: I just wanted to check that figure again. Was that 1600 copies? MR. SOVAS: Yes.

MR. DREW: Various units within the state.

Thank you, Mr. Sovas. The purpose of the hearing is to solicit comments from either the general public or those representing units of government or various trade or professional associations. Members of the Department staff, in addition to Mr. Sovas, are here today and I'm sure that, if you have any questions, they'll be free to answer them when the hearing ends.

At this time, for the purpose of making a statement on behalf of the Independent Oil and Gas Association of New York, I'll call on Mr. Richard Runvik, Vice-President. You can stay right there.

MR. RUNVIK: Thank you very

much.

Ladies and gentlemen, my name is Dick Runvik. I'm Vice-President of the Independent Oil and Gas Association of New York and I wish to present this statement of that Association at this time.

On behalf of its members, the Independent Oil and Gas Association of New York wishes to express its appreciation for the opportunity to publicly comment on the Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program prepared by the staff of the DEC Division of Mineral Resources.

The Independent Oil and Gas Association of New York, IOGA, is a

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not-for-profit trade organization representing oil and gas producers, contractors, allied service companies and suppliers and professionals who serve that industry. At the present time, IOGA has 250 members.

A committee of IOGA members has reviewed every page of the Draft GEIS. The committee members included engineers and geologists, all of whom had extensive experience in oil and gas operations. The committee met several times and conducted the technical review which forms the basis of our comments. In addition to the work contributed by the committee, IOGA sought advice from its Legislative and Legal Committees, its board of directors and other industry members.

We want to make the point that the framework of existing law and regulations, when coupled with existing permit conditions, are more than adequate to protect the environment and to regulate the oil and gas industry. Much of what now exists as permit conditions should be adopted as regulations. In this

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regard, IOGA supports the DEC's desire for a more evenly administered uniform regulatory program as evidenced by the numerous recommendations made in the GEIS.

What we will present today is an overview of some of the general points and areas of concern to the oil and gas industry.

First, we note that this is industry's first opportunity to review and comment on this Draft GEIS even though the DEC has taken several years to prepare the document. In any project of this size, there are bound to be some discrepancies or oversights. On the whole, however, we feel an honest effort has been made by the agency to accurately depict New York's oil and gas industry from its beginning up to the present time.

Second, IOGA disagrees with the present GEIS format in which the agency makes lengthy and detailed proposals for future recommended legislation, rules, regulations, permit conditions and mitigating measures. We firmly believe the GEIS should only cover (1) the history of the industry; (2) the current operating procedures and the technical advances of the industry and (3) the present body of law, regulation, rules and permit conditions imposed on the industry to protect the environment.

Third, we make the following

comments not as criticisms, but as our sincere belief that these areas would need to be addressed differently than they are in the Draft GEIS. Such action will allow our industry to function as it must to develop the state's resources in a responsible manner that will protect our environment and the rights of the landowner and the operator, as well as to continue to provide jobs, tax dollars, royalty payments and other benefits associated with oil and gas development.

Point Number 1: State action in the form of regulations or permit conditions can effectively prohibit the mineral owner's right to recover his oil and/or gas reserves. Should this occur, we believe that the involved parties

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should be financially compensated by the state for the unrecoverable reserves at full market value.

Point Number 2: The oil and gas regulations or permit conditions applicable to land or resources privately owned should also similarly apply to resources owned by New York State. There should not be separate rules for state-owned lands.

The third point: The DEC does not have the legal right to impose itself as a third party in landowner/operator contracts. Numerous statements made in the GEIS are covered in contractual agreements and DEC involvement here would be an infringement of landowner rights.

The fourth point: We do not believe access roads should be regulated by the DEC because (a) this is a contractual matter between the landowner and the operator and (b) such access roads are not regulated in any other industries such as timbering or agriculture.

Five: The GEIS makes reference

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to safety concerns of oil and gas operations. The safety of such activities is already regulated by New York State Department of Labor, the federal Department of Labor, OSHA and MSHA. We believe the DEC should defer to the more than adequate standards and regulations developed by these other agencies and which are already in place.

Six: We're in agreement with the present casing and cementing guidelines, but we disagree with the use of grouting as a means of protecting fresh water aquifers. Although this is a very technical point, we mention it here because grouting often appears in the GEIS and we do not believe it will achieve the DEC's objective.

Seven: All well drillers, including water well drillers, should be regulated to ensure comprehensive and adequate protection of fresh water aquifers.

Eight: Most visual impacts of the oil and gas operations occur during the drilling phase which is temporary. Once a well

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is drilled and the land reclaimed, the visual impact is negligible. Regulation of visual impacts in this instance is too subjective and discretionary.

Point 9: Statements made in the GEIS imply that soil is a commonly held natural resource similar to air and water. This concept is then used to justify regulation of private property. We disagree that soil is a commonly held natural resource requiring special protection by the DEC in every instance.

10: Several sections of the GEIS refer to changes that will occur in the future but which in fact, have already taken place. These sections should have been revised before the document was released for public comment. Finally, the GEIS is of critical

importance to our industry. The outcome of these hearings and the final decisions made on the GEIS will affect New York's oil and gas industry for many years to come. It is vital to the life are our industry that the final document addresses our concerns.

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I want to thank you for the opportunity to comment. Our detailed technical presentation will be submitted at a later date. MR. DREW: By "a later date", Mr.

Runvik, do you mean at one of the additional hearings or in writing before the deadline of July 8th?

MR. RUNVIK: It certainly will be before the deadline of July 8th.

We have a small problem in that the technical committee of review has referred this to our board of directors which has yet to meet. Hopefully we will meet yet this week and these comments will then be available if they don't -- if they aren't subject to further change.

MR. DREW: My point is that, since this is a cumulative record, both the oral statements at all the hearings and whatever written statements that come in, that, if you have comments that are really specific point by point on -- and this is a lengthy document, obviously, it's probably best served if those

things were just filed in writing and that, if you wanted to come to any of the other hearings, you may -- you could make additional comments such as you did today.

MR. RUNVIK: Yes, sir, I understand that. We have -- we have a great number of comments, and until our board has passed on them, we don't want to put them into the record but we will do that most assuredly. MR. DREW: There's no question

that these comments are welcome.

MR. RUNVIK: Yes.

MR. DREW: It's just the means of the easiest way of getting them into the record.

MR. RUNVIK: I don't think we'd

want to read them into the record. I think they'd be a little bit one-sided. We'd take too much time away from the general public. MR. DREW: Let me go off the

record and see -- I take it you have other representatives who are with you today and you're all part of one group.

> PAULINE E. WILLIMAN Certified Shorthand Reporter

MR. RUNVIK: That's correct. MR. DREW: I see there are several DEC people around the room, and there are one or two over in the back corner who have indicated they're just observers. Are there any others who would wish to make a statement for the record at this time? (There was no response.) At this time, we'll go off the record for ten minutes to see if there are any late arrivals. (A short recess was taken.) MR. DREW: We'll go back on the record. It does not appear that there are any other speakers who have arrived since we went off and who want to make statements at this time.

With that in mind, at this time

I'll formally conclude today's session and mention that the next session is on June 9th at 1 p.m. in the city of Ithaca offices, the Common Council Chamber on the first floor, 108 East

> PAULINE E. WILLIMAN Certified Shorthand Reporter

Green Street in Ithaca.

On behalf of Commissioner Jorling and the Department staff, I thank you for coming to this first of the several hearings on the Draft Generic Impact Statement, and we stand adjourned.

(Whereupon, at 1:40 p.m., the

hearing was adjourned.)

STATE OF NEW YORK ) COUNTY OF ALBANY ) Pauline E. Williman, being duly

sworn, deposes and says:

That she is a Certified Shorthand Reporter licensed by the University of the State of New York under permanent Certificate Number 297 issued May 21, 1949; that she acted as the Official Reporter at the hearing herein on June 6, 1988; that the transcript to which this affidavit is annexed is an accurate transcript of said proceedings to the best of deponent's knowledge and belief.

Pauline & Williman

Sworn to before me this 30Hh day of June, 1988.

eorgette n. Herning

GEORGETTE N. HOERNING Notary Public. State of New York Qualified in Albany County My Commission Expires March 30, 19

#### PAULINE E. WILLIMAN CERTIFIED SHORTHAND REPORTER

## **B. TOPICAL RESPONSES**

#### TOPICAL RESPONSE #1: Public Taking Without Compensation

Several commentators on the draft GEIS voiced the opinion that:

- (1) the Department's regulations and permit conditions can effectively prohibit a mineral rights owner from recovering oil and/or gas reserves; and
- (2) the involved parties should be compensated by the State for the unrecovered reserves.

The Department recognizes that governmental land use regulations may, under extreme circumstances, amount to a "taking" of the affected property; however, the mere existence of governmental regulation or the requirement to obtain a permit does not in itself "take" the property.

#### Definition and Determination of "Taking"

To determine whether a mineral rights owner can be awarded just compensation for a taking of mineral property, the legitimate public interest served by environmental land use restrictions must be balanced against the equally legitimate property rights of the mineral rights owner. The New York Court of Appeals has interpreted this balance to mean that a taking has occurred only if the property is rendered unsuitable for any reasonable income-producing or private use for which it is adapted, and thus its economic value, or all but a bare residue of its value, is destroyed.

To establish that a "taking" has occurred, the minerals owner must do the following:

- (1) present evidence of the monetary value of the property under the current and proposed permitted use,
- (2) show that the permit has been applied for and denied,
- (3) demonstrate that the effect of the denial is to prevent economically viable use of the land, and
- (4) show that the mineral rights were obtained prior to the regulations that limit the property use.

The courts will entertain the taking issue only if the minerals owner presents "dollars and cents" evidence that the property has lost all but a bare residue of its value and that all avenues of administrative remedy have been exhausted. The minerals owner must also demonstrate to the court that the prohibited use would not have a negative or conflict-creating effect on the protected land.

#### Conclusion

When Department regulations or permit conditions prevent an oil or gas well from being drilled in the most desirable location with regard to geology or spacing, it is still unlikely that the minerals owner will successfully marshal the proof necessary to show a taking has occurred. Directional drilling, or other more sophisticated but expensive techniques, can be employed from offsite to recover oil and gas from beneath the property in question. Regulations and/or permit conditions restricting well location would rarely eliminate all drilling possibilities. Even if a permit to drill a well was denied, and the operator could not recover the minerals from the property, the owner would have to demonstrate that the land was rendered unsuitable for any purpose.

#### TOPICAL RESPONSE #2: Visual Resources and Assessment Requirement

The axiom, "beauty is in the eye of the beholder" is a widely accepted principle. Oil and gas industry commentators argue that:

- (1) consideration of visual impacts is not germane and should be removed from the GEIS;
- (2) determination of the value of visual resources and the severity of impacts on these resources is subjective;
- (3) imposition of regulations to protect visual standards is arbitrary; and
- (4) the visual impacts of oil and gas operations are negligible and temporary.

#### Visual Resources Protection Legislation

The protection of visual resources is mandated by New York State law. Therefore, a discussion of visual resources and the requirement for assessment of these resources is an appropriate subject for the GEIS and cannot be deleted.

Under ECL 1-0101(3)(a), it is official State policy to assure "surroundings which are healthful and aesthetically pleasing." The State Legislature further emphasized this mandate when it passed ECL Article 49, entitled "Protection of Natural and Man-Made Beauty." Other laws, including the Wild, Scenic and Recreational Rivers Act (ECL Article 15, Title 27) and the Historic Preservation Act (Parks, Recreation and Historic Preservation Law, Article 14), also require the Department to enforce protection of aesthetic and visual resources of statewide significance. Procedures outlined in the State Environmental Quality Review Act (ECL Article 8) (SEQRA) provide the primary means by which aesthetic resources are evaluated.

#### **Objective Assessment of Visual Resources**

It is accepted that the value of visual resources cannot be determined by a precise formula and that subjective standards are applied when different people evaluate the same visual effect. The background setting of a proposed activity also greatly affects perception. Those people who would not notice a small drilling rig and clearing on a wooded hillside may object to placing a rig in the town park.

To facilitate an objective determination of whether a proposed action may have significant impacts, a Visual Environmental Assessment Form Addendum has been developed by the Department for use in the SEQR review process. A copy of the Visual EAF Addendum is attached for information. This optional form focuses on four criteria for measuring the visual significance of a project:

- (1) description of the existing visual/scenic environment,
- (2) identification of the degree to which the proposed action will be visible,

- (3) determination of who will see the project and in what context (e.g. worker, tourist, local resident), and
- (4) identification of the degree of visual compatibility or incompatibility with the existing environment or the "projected" environment.

To avoid arbitrary imposition of these criteria, the Department evaluates all actions within its jurisdiction, including oil and gas operations, using the same form and objective criteria. Resources of statewide and regional significance are the focus of protection. With respect to identification and evaluation of aesthetic resources of local significance, the Department is guided by public comment. Most actions, particularly oil and gas drilling operations, are not likely to trigger SEQR thresholds or the comprehensive environmental review which might require use of the Visual EAF Addendum.

#### Visual Resources of Statewide Significance

As stated in the draft GEIS, the most important visual resources in New York State are National Parks, State Forest Preserves, National or State Wild, Scenic and Recreational Rivers, State Game Refuges, National Wildlife Refuges, National Natural Landmarks, National or State Historic Sites, and State Parks.

There are two National Wildlife Refuges, nine National Wildlife Landmarks and roughly 25 State Parks within the State's oil and gas producing region. Most of the 400 plus National or State Historic Sites in this region are in highly populated urban areas that are unlikely to experience oil and gas activity for cost reasons.

When it is determined that a proposed activity might have a negative visual impact on a historic site, a National Wildlife Refuge, or National Landmark or State Park; the permit might be denied, or appropriate mitigating conditions might be added to the permit. Such conditions include limited drilling hours and camouflage or landscaping of the drillsite.

Drilling in or adjacent to State Parklands is one of the few circumstances where oil and gas operations might trigger SEQR thresholds requiring a supplemental environmental assessment and/or permit conditions to mitigate visual impacts. Some members of the oil and gas industry strenuously objected to this, based on the grounds that these lands should not be treated differently than the lands of any other surface owner. However, State Parklands are different. They have heightened statutory significance and are usually of some special scenic, historic or environmental value to be held in trust and administered for the benefit of all citizens.

#### Summary

The Department has developed uniform, objective procedures for analyzing visual impacts. The imposition of mitigating permit conditions to protect visual resources would be the exception, rather than the rule. The GEIS finds that visual impacts resulting from oil, gas and solution mining drilling and completion activities are primarily minor and short term. The visual impacts from these activities vary with topography, vegetation, and distance to viewer.

When the producing life of a well is over and the well has been plugged, abandoned, and final site reclamation is completed, there are usually no permanent or very minor visual impacts. Depending on the previous land use, there may be moderate long-term changes (defined as greater than two years) in landscape contours and vegetation caused by clearing and construction of the well site and access road.

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# 617.21 Appendix B State Environmental Quality Review Visual EAF Addendum

This form may be used to provide additional informatic	on relati	ng to Q	uestion	11 of P	art 2 of	
the Full EAF. (To be completed by Lead A	aency)					
ibility Distance Between			les)			
1. Would the project be visible from:	0-1/4	1/4.1/2	1/2-3	3.5	5+	
<ul> <li>A parcel of land which is dedicated to and available to the public for the use. enjoyment and appreciation of natural or man-made scenic qualities?</li> </ul>						
<ul> <li>An overlook or parcel of land dedicated to public observation, enjoyment and appreciation of natural or man-made scenic qualities?</li> </ul>						
<ul> <li>A site or structure listed on the National or State Registers of Historic Places?</li> </ul>						
• State Parks?						
• The State Forest Preserve?						
<ul> <li>National Wildlife Refuges and state game refuges?</li> </ul>					Q	
<ul> <li>National Natural Landmarks and other outstanding natural features?</li> </ul>						
National Park Service lands?						
<ul> <li>Rivers designated as National or State Wild, Scenic or Recreational?</li> </ul>						
<ul> <li>Any transportation corridor of high exposure, such as part of the Interstate System, or Amtrak?</li> </ul>						
<ul> <li>A governmentally established or designated interstate or inter-county foot trail, or one formally proposed for establishment or designation?</li> </ul>						
<ul> <li>A site, area, lake, reservoir or highway designated as scenic?</li> </ul>						
<ul> <li>Municipal park, or designated open space?</li> </ul>						
County road?						
• State?						
Local road?						
<ul> <li>2. Is the visibility of the project seasonal? (i.e., screened by summer foliage, but visible during other seasons)</li> <li>Yes</li> </ul>						
3. Are any of the resources checked in question 1 used b during which the project will be visible? □Yes □No	y the p	oublic du	iring th	e time	of year	

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Agricultural				
Suburban residential				П
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River, Lake, Poliu			Π	Π
Cliffs, Overlooks				ā
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Other				
NOTE: add attachments as needed				. –
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## TOPICAL RESPONSE #3: Environmental Assessment Form and Site-Specific Permit Conditions

#### Environmental Assessment Form

The Environmental Assessment Form (EAF) discussed in the GEIS is a modified version of the (Long Form) Environmental Assessment Form that the Department uses in all its programs. In 1985, the Division of Mineral Resources tailored the questions on the form to specifically reflect the activities of the oil, gas, and solution mining industries and their potential environmental impacts. Before implementation, the form was reviewed and approved by the SEQR Committee and New York State Oil, Gas, and Solution Mining Advisory Board. Operators have been required to submit a completed EAF with each well drilling application.

The EAF was the subject of many comments. The commentators maintained that:

- 1. the form was too long, cumbersome, and contained many questions the average oil and gas operator could not reasonably be expected to answer;
- 2. the GEIS should address all the impacts resulting from standard oil, gas and solution mining drilling operations; and
- 3. the EAF requirement should be eliminated after adoption of the final GEIS.

The requirement for a site specific environmental assessment cannot be completely eliminated. Without a complete EAF, including site-specific information, the Department cannot determine whether the proposed activity is consistent with the Findings Statement that will be issued after the final GEIS. Depending on the nature of the activity and its impact, the Department will require the level of environmental review under SEQR that is determined in the Findings Statement.

#### **Future Requirements**

After consideration of the comments received and extensive review and analysis of the EAF, DEC agreed that the form could be shortened and still provide adequate information to assess those environmental impacts that are site-specific to a chosen drilling location. The EAF has been revised accordingly.

The revised EAF received SEQR Committee approval in January 1990. In addition to being much shorter, the new EAF is also easier to fill out. Check off columns provided for several questions make them quicker to answer, and the layout of the form has been improved. Although the new EAF is shorter, it still requires a description of the physical setting of the well site, pits, and access road. Operators must answer questions regarding the current land use of the project site (residential, agricultural, woodland, etc.) and its physical characteristics and proximity to natural resources. The revised EAF requires the operator to provide information on the physical dimensions of the access road and well site and the plans for handling access road construction, erosion control, drilling operations, waste disposal, and site restoration. The environmental impacts of these activities can vary significantly depending on site-specific factors.

The draft GEIS implies that the Environmental Assessment Form would cease to be required after the necessary provisions of the EAF are incorporated into the drilling permit application. However, the Department has determined that the revised, shortened and simplified EAF should still remain as an attachment to the drilling permit application form.

#### Site-Specific Permit Conditions

Regulations generally address the routine aspects of the regulated activity. Site-specific permit conditions designed to mitigate potential impacts are still necessary because of the wide variation in natural features, the type of regulated activity, and the procedures the permittee elects to follow. For example, a permit condition imposing erosion control measures might be required for an access road or well site with steep slopes and highly erodible soils which drain to a river and/or other particularly sensitive natural resources. Site-specific permit conditions addressing noise impacts might be appropriate where drilling is proposed in highly populated or urban areas. Permit conditions restricting the location of the temporary on-site waste storage pit may be needed for a site adjacent to a wetland, but may not be necessary if the operator intends to discharge all waste fluids to a tank. Additional examples of site-specific permit conditions are described throughout Chapters 8 to 15 and summarized in Chapter 17.

#### Summary

In order to ensure adequate protection of natural resources, the site-specific conditions of any proposed activity must be evaluated. Information from the EAF is reviewed in part to identify site-specific considerations that might warrant imposing mitigation measures necessary to declare the project impacts non-significant. Even the most comprehensive, up-to-date rules and regulations could not mitigate the varied potential impacts that might occur at any given site. Thus, special permit conditions may be provided to require the necessary mitigation. The revised and shortened EAF specific to wells drilled under Article 23 jurisdiction is included for information.
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONS	SERVATION		
	0014		
Attachment to Drilling Permit Application			
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AME OF APPLICANT	BUSINESS TELE	PHONE NUI	MBER
	( )		
DDRESS OF APPLICANT			
TY/P.O.		STATE	ZIP CODE
SCRIPTION OF PROJECT (Briefly describe type of project or action)		_	i
PROJECT SITE IS THE WELL SITE AND SURROUNDING AREA WHICH WILL BE DISTURBE	ED DURING CONST	RUCTION C	OF SITE.
ACCESS ROAD, and PIT AND ACTIVITIES DURING DRILLING AND COMPL (PLEASE COMPLETE EACH QUESTION—Indicate N.A., if not a	ETION AT WELLHE	EAD.	
ND USE AND PROJECT SITE			
Approximate square footage for items below:			
During Construction (sq. ft.)	Af	ter Construc	tion (sq. ft.)
a. Access Road (length x width)			
h Mail Cia (length y width)			
U. Well Olde (helly hiddi)			
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CULTURAL RESOURCES		· ·	
6. Are there any known archeological and/or historical resources which will be affected by drilling operations?	Yes		
<ol> <li>Has the land within the project area been previously disturbed or altered (excavated, landscaped, filled, utilities installed)?</li> </ol>	🗌 Yes		
If answer to Number 6 or 7 is yes, briefly describe			·
EROSION AND RECLAMATION PLANS	%	150, -1	9/
9. Are erasion control measures needed during construction of the access road and well site?			
If ves, deacribe and/or sketch on attached photocopy of plat			
10. Will the topsoil which is disturbed be stockpiled for reclamation use?		Yes	
11. Does the reclamation plan include revegetation?		Yes	
If yes, what plant materials will be used?			
			· · · · · ·
12. Does the reclamation plan include restoration or installation of surface or subsurface drainage features to prevent erosion or conform to a Soil and Water Conservation Plan?		Yes	N
If yes, describe	······		<u></u>
13. Are you going to use existing or common corridors when building the access road?     Locate access road on attached photocopy of plat.		Yes	
RiLLING 14 Anticipated length of drilling operations? days			×. ·
VASTE STORAGE AND DISPOSAL		and the second sec	···.
15. How will drilling fluids and stimulation fluids:			
a. Be contained?			
b. Be disposed or?	······		<u> </u>
15. Will production brine be stored on site? If yes:		Yes لين	
How will it be stored?			
How will it be disposed of?	· · · · · · · · · · · · · · · · · · ·		
17. Will the drill cuttings and pit liner be disposed of on site?	•	Ves	- <b>N</b>
If yes, expected burial depth? feet			· · · · · · · · · · · · · · · · · · ·
DDITIONAL PERMITS 18. Are any additional State, Local or Federal permits or approvals required for this project?		T Yes	
	·		
	Date Application Submitted	Date Ap Rec	plication eived
		1 1	
Stream Disturbance Permit (DEC)			ليبيد ومسايت
Wetlands Permit (DEC or Local)			<b>I</b>
Floodplain Permit (DEC or Local)			
Other		LL	
REPARER'S SIGNATURE			
REPARER'S SIGNATURE			
REPARER'S SIGNATURE		LL	

	Su	aggested Sources of Information for Division of Mineral Resources Environmental Assessment Form
3. LA S	ND USE Sources:	Local Planning Office Town Supervisor's Office Town Clerk's Office
5a. P S	RIMARY Sources:	OR PRINCIPAL AQUIFER Local unit of government NYS Department of Health NYSDEC, Division of Water—Regional Office Availability of Water from Aquifers in New York State—United States Geological Survey Availability of Water from Unconsolidated Deposits in Upstate New York—United States Geological Survey
5b. P S	UBLIC W Sources:	ATER SUPPLY Local unit of government NYS Department of Health NYS Atlas of Community Water Systems Sources, NYS Department of Health, 1982 Atlas of Eleven Selected Aquifers in New York State, United States Geological Survey,
5c. A	GRICULT ources:	URAL DISTRICT INFORMATION Cooperative Extension DEC, Division of Lands and Forests NYS Department of Agriculture and Markets DEC, Division of Regulatory Affairs—Regional Office DEC, Division of Mineral Resources—Regional Office
5f. SC S	DIL AND	WATER CONSERVATION PLAN Landowner County Soil and Water Conservation District Office
5g. 1( S	00 YEAR	FLOOD PLAIN DEC Division of Water DEC, Division of Regulatory Affairs—Regional Office DEC Region 9, Division of Mineral Resources has flood plain maps by municipality
5h. W S	ETLAND	S DEC, Division of Fish and Wildlife—Regional Office DEC Region 9, Division of Mineral Resources has wetlands maps by municipality
5i. CC S	DASTAL : ources:	ZONE MANAGEMENT AREAS Local unit of government NYS Department of State, Coastal Management Program DEC, Division of Water (maps) DEC, Division of Regulatory Affairs—Regional Office
5k. Th S	HREATEN	NED OR ENDANGERED SPECIES DEC Significant Habitat Unit—Delmar DEC, Division of Regulatory Affairs—Regional Office
6. AR S	CHEOLC	GICAL OR HISTORIC RESOURCES NYS Office of Parks, Recreation and Historic Preservation circles and squares map DEC, Division of Construction Management—Cultural Resources Section DEC, Division of Regulatory Affairs—Regional Office
18. Al S	DDITION ources:	AL PERMITS NEEDED DEC, Division of Regulatory Affairs—Regional Office DEC, Division of Mineral Resources—Regional Office NYS Office of Business Permits

### TOPICAL RESPONSE #4: Access Roads as Part of Project

In order to conduct oil, gas, solution salt mining, or underground gas storage drilling operations, the operator must construct access roads to move drilling rigs, pipe, vehicles, and other equipment to and from the well site. These roads, which are a critical, indispensable part of these activities, also constitute a major disturbance feature of these operations. Indeed, construction of an access road can actually disturb a greater surface area than the individual drill site. Moreover, some of the adverse environmental impacts can continue after construction for as long as the road is used.

Several comments were received from the oil and gas industry objecting to the inclusion of access road construction in the project review. Oil and gas operators argued that access roads should not be reviewed as part of the permit application or regulated by the Department for the following reasons:

- (1) access roads are not regulated in other industries such as logging and agriculture; and
- (2) access road construction is a contractual matter between the landowner and the operator.

First, access roads are an essential part of the drilling operation and are routinely included in the project review for other actions requiring Department permits, such as the construction of shopping centers, sewage treatment plants, gravel mines and landfills. SEQR requires a review of the entire project; therefore, review of the access road cannot be excluded. Second, the existence of a third party contract between the operator and landowner does not preclude government regulation of any activity that can have negative impacts on important environmental resources.

There are several valid environmental concerns associated with the construction of access roads. These include:

- potential soil erosion, compaction, and sedimentation

- possible loss of productive agricultural lands
- possible loss of fish and wildlife habitat

As part of the Department's well drilling permit application, an operator must submit an Environmental Assessment Form (EAF). Several questions in the EAF must be completed to help evaluate the potential impacts of an access road at a given site. There are questions about the physical dimensions and size of the project site and access road, the possibility of utilizing an existing or common corridor for the access road, and whether erosion control measures are needed.

The answers to the above questions, along with other general information on the nature of the drill site, are necessary to evaluate the potential environmental impacts of the project.

Mitigation measures that might be included as permit conditions include:

- (1) alternate siting of the road to minimize potential impacts,
- (2) provision of drainage control to minimize potential erosion problems,
- (3) use of a common access road when there is more than one well, and
- (4) restrictions on the location of stream crossings.

Regulations mandating specific erosion control measures on <u>every</u> access road would be costly and unnecessary. Not all access roads have steep slopes or natural resources present that are particularly sensitive to erosion and sedimentation problems, nor will a single erosion control technique be suitable for all circumstances. Therefore, mitigation of potential impacts resulting from access road construction is best handled through site-specific permit conditions rather than regulations.

### **Summary**

Proper access road siting, construction and maintenance is treated as a valid environmental concern by the agriculture, construction, logging, and other industries. Likewise, access roads form an integral part of oil and gas well drilling operations, and under SEQR, they cannot be excluded from the Department's review and permitting process.

#### TOPICAL RESPONSE #5: Reasons for Including the Proposed Regulations in the GEIS

Industry commentators have objected to the inclusion of proposed regulations in the GEIS, claiming that:

- (1) the GEIS is not the appropriate forum for new proposed regulations;
- (2) many of the proposed regulations are already in effect as part of the current regulatory program;
- (3) normal procedures for promulgating requirements are being circumvented; and
- (4) the proposed regulations will become effective upon adoption of the final GEIS.

Proposed regulations were included in the draft GEIS, not to circumvent State Administrative Procedure Act (SAPA) requirements, but for the following reasons:

- (1) to provide the basis for public discussion prior to the formal publication of proposed new and revised regulations; and
- (2) to provide in one document a comprehensive listing of current standard permit conditions, policies, and guidelines that must be formalized into regulations.

# **SEQR Requirements**

Under SEQR Regulations Part 617.14(f)(3) & (7) of 6NYCRR, an Environmental Impact Statement must enumerate the environmental impacts of a proposed action and describe mitigation measures. Under Part 617.15(b), a GEIS must "set forth specific conditions or criteria under which future actions will be undertaken or approved." Therefore, a GEIS on an entire regulatory program which determines that portions of a current program are inadequate must include a discussion of proposed mitigation measures. The proposed new and revised regulations listed in the GEIS incorporate such proposed mitigation measures.

### Public Discussion

Public input is stimulated by inclusion of the proposed regulations in the GEIS. Commentators have expressed support for some regulatory proposals and have submitted reasonable alternatives to others. Alternate proposals that effectively meet the resource management and environmental protection goals of the original recommendations will be considered during the rulemaking process. Discussion of the recommendations prior to their formal submission as proposed regulations and amendments helps ensure that they are carefully reviewed before proposed regulations are formally drafted.

# Listing of Standard Permit Conditions, Policies, and Guidelines

Because the regulations governing oil, gas, and solution mining operations have not been updated to reflect the major legislative revisions of 1981 and 1984, permit conditions have been imposed so that many standard operations will have non-significant environmental impacts under

current law. A prime example is the casing and cementing guidelines, implemented April 1, 1986, which have not yet been promulgated as regulations. Any assessment of the current regulatory program must consider these permit conditions and guidelines. They are listed in the GEIS as proposed regulations because it is Department policy to formalize existing standard permit conditions into regulations where possible.

Comprehensive listing in one document of permit conditions, policies, and guidelines that are being proposed as regulations helps fulfill the industry's need for a documented, consistent regulatory program, and also provides complete information to the general public.

# **Summary**

Proposed regulations were included in the GEIS to provide a framework for public discussion of recommended changes to the oil, gas, and solution mining regulatory program, and to provide in one document a comprehensive listing of current permit conditions, policies, and guidelines that are likely to be formalized into regulations. Although all proposed regulatory changes are subject to the State Administrative Procedure Act review and public hearing requirements, including them in the GEIS facilitates the rulemaking process. It encourages public discussion and enables the Department to evaluate feasible alternative means of achieving its mandated objectives of resource management and environmental protection.

### TOPICAL RESPONSE #6: Surface/Mineral Owner Lease Conflicts

There are opposing viewpoints on the subject of surface versus mineral owner rights. These contrasting views are summarized from the public comments as follows:

- (1) Many industry commentators contend that mineral resource development activities are governed by contractual agreement between the landowner and the well operator and that the Department should not, under any circumstance, attach conditions to permits requiring:
  - a) adoption of erosion and siltation control measures,
  - b) stockpiling of topsoil for use during site reclamation,
  - c) timetable for site reclamation, and
  - d) the movement of wells and/or access roads to the edges of fields where they will interfere less with farming operations.
- (2) Local governments and agricultural organizations, on the other hand, believe that the Department's concept of lease terms and agreements is "faulty". They assert that the Department does not adequately protect the current landowner, regardless of whether or not the current landowner signed the original lease agreement that remains in effect.

## Legislative Mandates

The Department is mandated by law to protect the environment, correlative rights, and public safety during resource development activities by the oil, gas, underground gas storage and solution mining industries in New York State. Although most of the potential conflicts between the landowner and the well operator should be handled during the leasing process, the Department's regulatory program does play an important role in minimizing problems and protecting the environment for both the original and secondary landowners of a leasehold. The Department can and will attach permit conditions under certain circumstances to protect environmentally sensitive resources (e.g. surface and groundwaters, floodplains, agricultural districts, wetlands) and the public.

However, the Department cannot intervene into third party contracts where there are no environmental or public resource management concerns. Anyone acquiring property is ultimately responsible for being aware of all encumbrances upon that property.

It should be noted that there are rules and regulations which regulate the activities of oil and gas operators whether they occur on public or private lands. The lease is only one aspect of the overall control of land use. Laws, rules and regulations that require the adoption of erosion and siltation control measures, drilling pit and drilling site reclamation, or that prevent non-point source discharges into streams, and the damage of prime agricultural lands, all supplement provisions contained in an oil and gas lease.

There are also numerous public outreach programs sponsored by the Department, other state agencies, the Farm Bureau and Cooperative Extension that are designed to provide information on oil and gas leasing to rural landowners.

One of the purposes of the GEIS is to provide public information. Greater public awareness and understanding of the oil, gas, underground gas storage and solution mining industries and mineral lease considerations should help reduce the potential for conflict between landowners and operators engaging in new lease agreements.

# TOPICAL RESPONSE #7: Soil as a Public Natural Resource

Some supportive comments were received from the oil and gas industry on the proposed regulatory requirement for topsoil stockpiling in agricultural areas and later distribution during site reclamation. They claimed that this is a standard industry practice. Other industry commentators objected to this proposed requirement, claiming that:

- (1) statements made in the GEIS imply that soil is a commonly held natural resource, similar to air and water;
- (2) the concept of soil as a natural resource is used in the GEIS to justify the regulation of private property; and
- (3) earth disturbance regulations are only appropriate under certain circumstances where they are necessary to protect a commonly held resource, such as surface waters, from excessive siltation.

The draft GEIS does state that soil is an important natural resource. Soil has long been recognized as an important natural resource under both State and Federal laws. While the majority of government programs specifically address the importance of soil to agriculture, other values of soil are also recognized under New York State's Fish and Wildlife Law (ECL 11-0303) and the Federal Soil and Water Conservation Act of 1977. Quite simply, soil, like water, is a basic natural resource. Without it plants cannot grow and without plants wildlife cannot exist.

Whether or not soil is a <u>public</u> natural resource which can be regulated in the same manner as air and water is not the primary issue. Soil disturbance is an inevitable part of oil and gas drilling operations. SEQR requires an agency to consider the entire proposed action during the review of potential environmental impacts. As a component of mineral resource development, disturbance of soil and the potential impacts must be considered in the environmental review before a permit can be issued.

#### Soil Disturbance as Part of Project

During normal oil and gas drilling operations, soil may be affected in several ways. These include soil removal for the building of access roads and the preparation of drill sites, and soil compaction from vehicles or other heavy equipment. There is also the potential for soil contamination from spills of oil, brine, and other drilling site materials. All of these can affect the ability of the soil to sustain plant life, and can trigger such problems as loss of fish and wildlife habitat, loss of agricultural lands, or soil erosion and sedimentation.

As part of the permit application process, an oil and gas operator wishing to drill a well must submit an Environmental Assessment Form to the Department and answer certain questions to help evaluate the potential impacts of soil disturbances. These questions concern the predominant land use at the site. The operator must state whether topsoil will be stockpiled for reclamation use, and whether any portion of the site is within an Agricultural District established pursuant to Article 25AA of the Agriculture and Markets Law.

The answers to the above questions, along with other general information on the nature of the drill site, are used to evaluate the potential impact of soil disturbance at the site.

### Agricultural Lands Protection

The Constitution of New York State directs the Legislature to provide for the protection of agricultural lands. Article 25AA, Section 300 of the Agricultural and Markets Law states:

"It is the declared policy of the State to conserve and protect and to encourage the development and improvement of its agricultural lands for the production of food and other agricultural products. It is also the declared policy of the State to conserve and protect agricultural lands as valued natural and ecological resources which provide needed open spaces for clean air sheds, as well as for aesthetic purposes..."

Thus, proper restoration of the natural soil profile is a special concern in agricultural areas. Topsoil is essential for soil fertility and plant growth. It takes hundreds of years to form an inch of topsoil. Its loss, through commingling with other material, misplacement or erosion, can have severe long term impacts on the ability of the disturbed acreage to support crops and other vegetation.

#### Summary

The Department is not seeking to regulate the use of property absent the occurrence of a regulated activity. Rather, an application for a permit to drill a well triggers an environmental review of the proposed action. Since SEQR requires an agency to consider the whole action, disturbance of the soils and potential impacts must be considered in the review. Furthermore, protection of agricultural lands is mandated by law. Therefore, the Department has recommended that topsoil stockpiling and redistribution during site reclamation be required in all agricultural areas. Additional measures, such as paraplowing where compaction has occurred, are recommended as permit conditions only where warranted by site-specific conditions.

# C. COMMENT-RESPONSE TABLE

# INDEX FOR COMMENTS ON DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM

The comments on the draft GEIS have been arranged in an order to facilitate responses. The acronyms used to identify the letters of comment are listed below in the order that they appear in this document.

<u>Acronym</u>	Agency/Organization/Individual	Page
I	Independent Oil & Gas Association of New York	CR1-CR63
IA4	Independent Oil & Gas Association of New York Appendix 4	. CR64-CR68
OPA	New York State Oil Producers Association	. CR69-CR72
ENG	Envirogas Inc.	. CR73-CR87
KEI	Kidder Exploration, Inc.	. CR88-CR90
WJP	William J. Plants	CR91
URH	Universal Resources Holdings, Inc.	CR92-CR125
LEN	Lenape	CR126-CR127
CCD	Chautauqua County Environmental Management Council	CR128-CR133
MCSW	Monroe County Soil and Water Conservation District	CR134
QS	Quaker State Corporation	CR135
DRAL	NYS DEC - Division of Legal Affairs	CR136
DLF	NYS DEC - Division of Lands and Forests	CR137
DHSR	NYS DEC - Division of Hazardous Substances Regulation,	
	Bureau of Hazardous Waste Program Development	CR138
DFWE	NYS DEC - Division of Fish and Wildlife, Bureau of	
	Environmental Protection	CR139-CR141
DFWW	NYS DEC - Division of Fish and Wildlife, Bureau of Wildlife	CR142
DFWF	NYS DEC - Division of Fish and Wildlife, Bureau of Fisheries	CR143-CR145
SUB	Peter S. Gold, SUNY at Buffalo	CR146-CR147
HSC	Honeoye Storage Corporation	CR148-CR151
PPC	Pennzoil Products Company	CR152
NF	National Fuel	CR153-CR154
BPUJ	Board of Public Utilities, Jamestown, NY	CR155
NYAM	NYS Department of Agriculture and Markets	CR156-CR160
MCAH	Amo Houghton, Member of Congress	CR161
ACED	Allegany County Office of Economic Development	CR162-CR163
PHLW	Public Hearing, Larry Williamson	CR164-CR171
PHBF	Public Hearing, Brayton Foster	CR172
PHWH	Public Hearing, Walter Haker	CR173-CR174
PHJL	Public Hearing, John Luensman	CR175-CR176
PHRK	Public Hearing, Rolland Kidder	CR177-CR179
PHMP	Public Hearing, Marion Panzarella	CR180-CR181
PHAVT	Public Hearing, Arthur Van Tyne	CR182-CR183
PHMH	Public Hearing, Mark Haskins	CR184-CR185

Acronym	Agency/Organization/Individual	Page
PHWG	Public Hearing, William Gunner	CR186-CR196, CR207-CR210
PHTH PHMS	Public Hearing, Thomas Hungerford         Public Hearing, Mike Schaffner	CR196 CR197-CR200, CR205-CR206
PHJP PHPP PHGQC	Public Hearing, James PfeiflePublic Hearing, Paul PlantsPublic Hearing, William Gunner (cost question)	CR201, CR211 CR202 CR203-CR204



RECEIVED

OF: \_\_\_\_\_

July 1, 1988

The Honorable Robert S. Drew Chief Administrative Law Judge New York State Department of Environmental Conservation Office of Hearings, Room 409 50 Wolf Road Albany, New York 12233

Dear Juäge Drew:

Enclosed are the comments of the Independent Oil and Gas Association of New York on the Draft Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program.

We will be happy to answer any questions or provide additional information if desired.

37 Franklin Street + Suite 210 + Auffalo, New York 14202 + (716) 856-4791

Thank you for the opportunity to comment.

Sincerely,

many Trutus Mary Mietus Executive Director

Enc.



#### COMMENTS

of the

INDEPENDENT OIL & GAS ASSOCIATION OF NEW YORK, INC.

on the

DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM

JUNE 1988

37 Freeklin Street + Suite 219 + Bulle - Ness Unite 14909 + (716) 856.4791



RECEIVED JUL 5 1988 

#### SUMMARY

of the Technical Comments

prepared by:

INDEPENDENT OIL & GAS ASSOCIATION OF NEW YORK, INC.

on the

DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS & SOLUTION MINING REGULATORY PROGRAM

JUNE 1988

#### OUTLINE OF COMMENTS

#### on the

#### DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT

1) Summary of Technical Comments

2) Technical Comments

Glossary

- 4) Comments on Appendix 4
- 5) Attachment #1 Impact of One-Time Dormant Season Application of Gas Well Brine to Forest Land
- 6) Attachment #2 IOGA's Proposed Revisions to the Well Drilling and Completion Form
- 7) Attachment #3 Liability Risks of Free Gas Clauses
- 8) Attachment #4 Comments of IOGA President Arthur Van Tyne

Sec. A.

Independent Oil & Gas Association of New York (IOGA) is a not-for-profit trade organization representing oil and gas producers, contractors, allied service companies and suppliers, and professionals who serve that industry. At the present time, IOGA has 250 members.

A committee of IOGA members, including engineers and geologists with extensive experience in oil and gas operations, has reviewed every page of the draft GEIS. The committee met several times and conducted the technical review which forms the basis of our comments. In addition to the work contributed by the committee, IOGA sought advice from its Legislative/Legal Committee, its Board of Directors and other industry members.

We want to take this opportunity to express our firm belief that the framework of existing law and regulations, when coupled with existing permit conditions, are more than adequate to protect the environment and regulate the oil and gas industry. Much of what now exists as permit conditions should be adopted as regulations. In this regard, IOGA supports the DEC's desire for a more evenly administered, uniform regulatory program as evidenced by the numerous recommendations made in the GEIS.

Listed below is an overview of some of the points we wish to stress, and some of the areas of concern to the industry that we feel must be addressed.

First, we note that this is the general industry's first formal and direct opportunity to review and comment on the draft GEIS even though the DEC has taken several years to prepare the document. In any project of this size, there are bound to be some discrepancies or oversights. However, on the whole, we feel an honest effort has been made by the agency to accurately depict New York's oil and gas industry from its beginning up to the present time.

Second, IOGA disagrees with the present GEIS format in which the agency makes lengthy and detailed proposals for future recommended legislation, rules, regulations, permit conditions and mitigating measures. We firmly believe the GEIS should only cover: 1) the history of the industry; 2) the current operating procedures and the technical advances of the industry; and 3) the present body of law, regulations, rules and permit conditions and mitigating measures imposed on the industry to protect the environment.

Third, we make the following comments, not as criticisms, but as our sincere belief that these areas will need to be accessed differently than they are in the draft GEIS. Such action will allow our industry to continue to function as it must to develop the State's resources in a responsible manner

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which will protect our environment and the rights of the landowner and the operator, as well as continue to provide jobs, tax dollars, royalty payments and other benefits associated with oil and gas development.

1 1) State actions in the form of regulations or permit conditions can effectively prohibit the mineral owner's right to recover his oil and/or gas reserves. Should this occur, we believe the involved parties should be financially compensated by the State for the unrecoverable reserves at full market value.

1-2 2) There should not be separate rules for State-owned land. The oil and gas regulations or permit conditions applicable to privately owned land or resources should also apply to resources owned by New York State.

- 1-3 3) The DEC does not have the legal right to impose itself as a third party in landowner/operator contracts. Numerous statements made in the GEIS are governed by contractural agreements, and DEC involvement here would be an infringement of landowner rights.
- 1-4 4) We do not believe access roads should be regulated by the DEC because: a) this is a contractural matter between the landowner and the operator; and b) such access roads are not regulated in other industries such as timbering or agriculture.

1-5 5) The GEIS makes reference to safety concerns of oil and gas operations. The safety of such activities is already regulated by the New York State Department of Labor, the federal Department of Labor, OSHA and MSHA. We believe the DEC should defer to the more than adequate standards and regulations developed by these other agencies which are already in place.

6) We are in agreement with the present casing and cementing guidelines, but we disagree with the use of grouting as a means of protecting freshwater aquifers. Although this is a (very technical point, we mention it here because grouting often appears in the GEIS as a means to protect freshwater aquifers and we do not believe it will achieve the DEC s objective.

1-7 7) All well drillers, including water well drillers, should be regulated to ensure comprehensive and adequate protection of freshwater aquifers. Regulation should be extended to <u>anyone</u> who penetrates the groundwater zone for whatever reason. The mineral rights owner cannot exercise his right to recover oil and/or gas reserves at expense to the environment or at expense to resources held in trust for all citizens of the State. See Topical Response Number 1 on Public Taking Without Compensation.

The oil and gas regulations and permit conditions, such as casing and cementing guidelines, which are applicable to privately owned lands are also applicable to State-owned land. There are additional conditions that the State as the landowner can impose in the leases granted to develop the resources on State owned lands. Any landowner or lessor, including the State may impose contractual obligation in the lease to protect its interest(s).

The DEC does not have the right nor does the DEC impose itself as a third party in landowner/operator contracts. However, the DEC does have the right and obligation to protect the State's natural resources for the benefit of all its citizens. Some programs that protect natural resources (e.g. tidal wetlands, freshwater wetlands, stream disturbance permits, etc.) are also viewed by many landowners, as well as the oil and gas industry, as an infringement of individual and landowner rights, but State protection and regulation of these important common resources has been upheld in the courts.

Access roads are regulated for other industries whose actions require a State permit. Under SEQR, access roads are considered "part of the action" to drill a well. See Topical Response Number 4 on Access Roads as Part of Project.

DEC must regulate safety in circumstances where failure to do so could have a deleterious effect upon the environment. Blowout prevention and control is one such circumstance. With respect to non-environmental safety concerns, the intent of the GEIS is to encourage adherence to safety guidelines rather than to propose specific safety regulations. OSHA does not have drilling rig safety regulations. They do have guidelines, but there is no federal safety inspection staff to enforce their guidelines, "Comprehensive Safety Recommendations for Land-Based Oil and Gas Well Drilling". The State Department of Labor (DOL) has adopted the federal safety regulations, but as stated above there are no federal drilling rig safety regulations, and the DOL does not make drilling rig safety inspections in New York State.

As stated in the text, grouting is commonly used in shallow surface holes as a means of protecting freshwater aquifers from infiltration of surface contaminants. It does meet this limited objective. Support for adopting the present casing and cementing guidelines as regulations is noted. The DEC also supports regulation of water well drillers. Legislation is needed to accomplish this goal.

**CR-4** 

I-6

I-7

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8) Visual impacts as a whole are subjective, and the creation of a visual standard cannot help but lend itself to arbitrary imposition. What is visually repugnant to one person may be beautiful or interesting to another. An activity such as logging may disturb certain segments of the public, who hate to see trees cut, but the owner of the trees should still be allowed to dispose of them as he desires. Even though some people may be bothered by this, the visual impact is not permanent. Similarly, most visual impacts of oil and gas operations occur during the drilling phase which is temporary. Once a well is drilled and the land reclaimed, the visual impact is megligible. References to visual impacts are not germane to a GEIS and should be removed from this document.

1-8

1-9 9) Statements made in the GEIS imply that soil is a commonly held natural resource, similar to air and water. This concept is then used to justify regulation of private property. We disagree that soil is a commonly held natural resource regulring special protection by the DEC in every instance. Earth disturbance regulations should only be allowed which prevent excessive siltation of surface waters, which <u>are</u> a protected, commonly held resource.

1-10 10) Several sections of the GEIS refer to changes that will occur in the future, but which, in fact, have already taken place. These sections should have been revised before the document was released for public comment.

Finally, the GEIS is of critical importance to our industry. The outcome of these hearings and the final decisions made on the GEIS will affect New York's oil and gas industry for many years to come. It is vital to the life of our industry that the final document addresses our concerns.

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The DEC agrees that the visual impacts from a properly sited and reclaimed drilling operation are neglible and temporary, but these impacts, however limited, must be addressed under SEQR regulations. See Topical Response Number 2 on Visual Resources and Assessment.

I-9 See Topical Response Number 7 on Soil as a Public Natural Resource.

I-10

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The extensive lead time required for printing and **distributing** a document the size and scope of the GEIS precludes it being absolutely up to date. TECHNICAL COMMENTS

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- - CR-6

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#### I. INTRODUCTION

- I-11 1-1, 3rd para., last sentence: DELETE phrase "beneath his land", REASON: Way not be "his" land; minerals might have been severed from surface.
- 1-12 1-2, 1st full para., line 3: phrase "discretionary approval such as granting of permits." COMMENT - why "discretionary? If operator agrees to comply with regulations and has financial security, does the DEC have discretionary authority?
- 1-13 1-2, last para., line 2: COMMENT The GEIS has been expanded to include proposed recommendations which may be enacted after the GEIS is approved and adopted. We feel the inclusion of proposed regulations in the GEIS to be inappropriate and that the document, when finally adopted, should contain only the requirements necessary to allow an operator to be issued a permit. It may have been more appropriate to include the proposed recommendations for changes to the regulatory program in an appendix to the GEIS until each is approved and adopted.
- 1-14 1-3, 2nd para., line 9: COMMENT: socioeconomic impacts - this was the <u>only</u> information requested from the regulated community, contrary to claims made by others that industry <u>wrote</u> the GEIS.

#### II. DESCRIPTION OF PROPOSED ACTION

- 1-15 2-1, 2nd para., line 12: DELETE sentence "A review is made of viable alternatives...", REASON: Many alternatives that could have been considered were not, or at least they are not discussed in this document. What are these undiscussed alternatives?
- 1-16 2-2, 1st para., line 5: DELETE: "in part", REASON: The GEIS should cover all actions except those specifically exempted on page 3-3, #1-8.

III. MAJOR CONCLUSIONS ON THE APPLICATION OF THE STATE ENVIRONMENTAL QUALITY REVIEW ACT TO THE OIL, GAS AND SOLUTION MINING LAW.

1-17 3-2, B, line 6. AGREE with the statement that permitting oil and gas wells is a "non-significant action," as the drilling process is a temporary disturbance of the environment and the current regulatory program provides adequate safeguards against future significant environmental impacts once the well is drilled and in production.

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- I-11 Deletion of the phrase "beneath his land" does not substantially change the intent of this paragraph. See Appendix 4, pages 1-2 for details on mineral rights severance.
- I-12 Most State issued permits are discretionary. With a non-discretionary permit, only an application and fee are needed for automatic granting of the permit (e.g. fishing permit). "Discretionary" in reference to oil and gas drilling permits means that a review and judgment must be made by the Department before the permits are issued. Therefore, a permit is not automatically issued when the application and fee are submitted.
- I-13 As stated, the proposed changes to existing regulations were included so that a full public discussion of all the issues could be made. Many of the proposed regulations are currently imposed as permit conditions because they are critical to environmental protection, and a negative declaration could not be issued without them. It is Department policy to formalize standard permit conditions into regulation as soon as possible. In addition, a GEIS must assess the environmental impact of a regulatory program and determine what changes are needed to strengthen the program. See Topical Response Number 5 on Reasons for Including Proposed Regulations in the GEIS.
- I-14 Industry personnel were present at the GEIS public scoping hearings where GEIS outlines were distributed for public comment. Industry had the same opportunity to respond as the public. In addition, in 1982 DEC met with IOGA to obtain information on standard oil and gas industry practices and concerns.
- I-15 A full range of regulatory alternatives is discussed in Chapter 21, from prohibition of resource development to maintenance of status quo. If the commentators want discussion of a specific alternative, it should be identified and submitted.
- I-16 The GEIS was developed to satisfy SEQR requirements and does serve as an EIS for all standard operations when they conform to the thresholds described in Table 3.1. Conformance of these standard operations to the thresholds in the table cannot be determined without the Environmental Assessment Form (EAF) which details the unique physical conditions of each drilling site. See Topical Response Number 3 on EAF and Site-Specific Permit Conditions.
- I-17 Certain parts of this sentence when taken out of context can be , misconstrued.

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- I-18 3-3, top line: ADD the word "supplemental" before "environmental assessments"
- 1-19 3-3, #1, CLARIFY: is the "two and one-half acre disturbance" for each well? If so, ADD the phrase "per well" after two and onehalf acres.
- 1-20 3-3, #2, DELETE #2, REASON: Disagree with the need for a specific supplemental environmental assessment for State parklands and the perceived need to treat the State differently than other surface owners.
- 1-21 3-3, \$3, LIST other possible DEC permits which may be necessary. We feel that the Division of Mineral Resources should have the ability to streamline the permitting process and should be able to provide all necessary permit approvals. Not only has applying to different DEC divisions for permits been costly and timeconsuming, but the divisions have had conflicting requirements and have required producers to submit material already submitted to another division, thereby increasing costs and length of time needed to secure permits.
- 1-22 3-3, \$5: CLARIFY the term "major" used in this context, i.e., how many wells? Existing federal permitting requirements would answer many concerns for new waterflood projects. In regards to surface environmental disturbance, there is not a change in the type of disturbance - only in the degree. Therefore, the GEIS should apply with a few modifications to cover surface disturbance for multi-well projects.
- I-23 3-3, #6, same comment as #5 above.
- 1-24 3-3, #7, DEFINE "major" in this context.
- 1-25 3-3, #8, DELETE this statement. REASON: It is a catchall phrase and too vague. The GEIS is intended to be specific to the oil, gas and solution mining industry and "any other project" would probably not fall within, or be subject to, the conditions of the GEIS.
- 1-26 3-3, 2nd para., #3. DELETE #3. REASON: We do not believe the reason stated should constitute the standard for a Type I action unless the <u>State</u> holds the mineral rights within or contriguous to any publicly-owned park land. The taking or controlling of private mineral rights by regulation is unjustified.
- 1-27 3-4, para 1, DELETE this paragraph. REASON: We do not believe the location of the well should be a matter of concern for the DEC, but rather a private contractural agreement between the landowner and the operator. Purther, although <u>some</u> leases may have been written without current landowner approval, the current landowner was aware of the lease agreement when the property was purchased. The current landowner has probably realized benefits as a result of the lease either through royalties, sale of the

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I-18 The word "supplemental" should be inserted.

I-19

- The statement is more correct as written. Usually, one well is defined as a project, but there are multi-well projects which are exceptions to this rule.
- I-20 There are reasons that State Parklands are treated differently. These lands are usually of some special scenic, historic or environmental value and are held in public trust for the benefit of all citizens.
- I-21 Streamlining the permitting process is a goal of good government, but Mineral Resources staff does not have the expertise to evaluate potential impacts on environmental resources such as wetlands and streams. Responsibility for these other statutory programs is assigned to other DEC Divisions. The Division of Regulatory Affairs in each Regional Office is responsible for coordinating the review of permit applications for those actions governed by the permit procedures set forth in the Uniform Procedures Act (UPA) ECL Article 70 and 6NYCRR Part 621. Article 23 well drilling permits are not governed by the UPA; however, such permits as those for wetlands disturbance stream crossing and brine waste hauling are governed by the UPA review procedures. Those procedures require that all permits subject to UPA provisions and relevant to a proposed action be simultaneously reviewed by the Department.
- I-22 "Major" in this context means more than one well or a multi-well project. "Major" could be removed from this item without changing the intent. The federal permitting requirements do not supersede State requirements. We agree that the existing federal USEPA UIC permitting requirements would answer many of the technical concerns, but they do not address surface environmental impacts. Multi-well projects can trigger SEQR thresholds. If these thresholds are triggered, Part 617 regulations apply.
- I-23 Under Federal Energy Regulatory Commission (FERC) requirements, environmental impacts must be addressed. FERC does not have this requirement for all expansions and increases in storage capacity. The federal permitting requirements and environmental assessment can satisfy many State concerns, but they do not supersede State requirements. See response to I-22.
- I-24 See response to I-22,

I-25

We agree that the wording should be changed to "Any other project regulated by the Oil, Gas and Solution Mining Law, ...,"

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I-26 The wording in the GEIS comes directly from Part 617.12 of the SEQR regulations. It applies to all publicly owned parkland, not just State parkland.

**CR-8** 

minerals or reduced cost of the land surface due to mineral severance.

- 1-28 GENERAL COMMENT FOR PAGE 3-4: Granting of rights to the surface owner by regulations when the mineral rights were not purchased in the deed to the surface is unjustified and amounts to confiscation of the mineral owner/operator property.
- 1-29 3-5, D.: DELETE first paragraph. REASON: Once the GEIS is approved, it should stand as the set of conditions with which operators must comply to be issued permits. As new regulations are promulgated and enacted, they can be included as part of the GEIS. In the meantime, special conditions are now added to permits, and have been for some time, to ensure that drilling is a non-significant SEOR action.
- 1-30 3-5, D. para 2. COMMENT: Once the GEIS is in place, the EAF should be eliminated. Otherwise, what is the purpose of the GEIS?
- I-31 3-6, line 1, 1st sentence: DELETE the word "application" and substitute "GEIS".
- I-32 3-6, line 2, DELETE the word "revised" and replace with "adopted".
- 1-33 3-5a, Table 2-1, b & c: COMMENT: If the State is not the minerals owner, these sections should be removed.
- 1-34 3-5b, Table 3-1,j,k,l. COMMENT: These project are not different in kind from single well projects, just in degree. Also, adeguate federal regulations are now in existence.
- I-35 3-6, \$2, CHANGE "EAF" to "permit application". REASON: The new permit application form, when approved, will request environmental assessment information.
- 1-36 3-6, #3, COMMENT: on pg. 3-3 note that page 3-6 should be referenced.
- I-37 3-6, #4, CLARIFY or give an example of a "supplemental finding statement."
- 1-38 3-7, 2 para. line 1: DEFINE "major", i.e., number of wells, etc.
- 1-39 3-8, #2, line 2: DELETE: "affected", REPLACE with "disturbed".
- I-40 3-8, \$2, line 3: DELETE phrase "the access roads". REASON: Access roads are not regulated for other industries and should not be regulated for oil and gas operations.
- 3-9, para 2, line 2: CLARIFY what "local" means in this context.

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- I-27 DEC is concerned if the location of the well will result in environmental degradation. DEC does not become involved with aspects of third party contracts having no resource management implications.
- I-28 DEC has never suggested any regulation to confiscate separately owned mineral rights and grant them to the surface owner.
- I-29 Even after the GEIS is approved, site-specific permit conditions will be required in some cases to adequately assure environmental protection and allow DEC to issue a negative declaration.
- I-30 The GEIS states that the Environmental Assessment Form will be required until the drilling permit is revised to include this information, but it is more practical to keep it as an attachment than to have a multi-page drilling permit form. The EAF is being substantially revised and shortened. See Topical Response Number 3 on EAF and Site-Specific Permit Conditions.
- I-31 See response to I-30.
- I-32 See response to I-30.
- I-33 The requirements regarding State Parklands and Agricultural Districts come directly from the SEQR regulations. Therefore, the Division of Mineral Resources cannot change them. The SEQR regulations protect the surface regardless of mineral rights ownership.
- I-34 Waterflood, tertiary recovery, underground gas storage and solution mining projects do have potential environmental impacts that are different from single well projects. See Chapters 12, 13, and 14. As stated earlier, existing federal requirements do not always adequately address all environmental concerns. See responses to I-22 and I-23.
- I-35 See response to I-30.
- I-36 There is already a cross-reference between these two sections of the text. I-37 After a final environmental impact statement has been completed, an
  - After a final environmental impact statement has been completed, an agency must write a findings statement certifying that the SEQR requirements have been met, and provide written support for the agency decision. Occasionally, an agency inadvertently fails to address a substantive issue in the findings statement, and when this occurs a supplemental findings statement must be prepared.
- I-38 See responses to I-22 and I-23.
- I-39 Under some circumstances the term "affected" could include acreage outside the project area or the actual disturbed area.
- I-40 An access road can represent a significant portion of the acreage disturbed for a project and must be considered as a potential source of erosion and sedimentation affecting surface waterbodies. Improper placement or construction of access roads can have negative impacts in agricultural areas, wetlands, floodplains and significant habitats (See Chapter 8). Access roads may also have a longer-term impact where they are left in place after the drill site has been reclaimed. See Topical Response Number 4 on Access Roads as Part of Project.
  - In this context "local" refers to a county, town, city, or village which has adopted its own floodplain or wetland permit program as provided for in State laws.

CR-9

I-41

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- 1-42 3-9 f, Table 3.2 COMMENT: The symbols are hard to read and it is difficult to determine the designation. More distinct symbols are needed.
- 1-43 3-10 and top of 3-11: QUESTION: A line is missing. What is it?
- i-44 3-11, 13, COMMENT: In addition, there would be negative impacts, such as some unwarranted impediments to resource development and the resulting decrease in employment and other economic benefits.

CHAPTER IV: HISTORY OF OIL, GAS AND SOLUTION SALT PRODUCTION IN NEW YORK STATE.

- 4-1, #1, at end of paragraph, REFERENCE "Orton, 1899" not "Herrick".
- I-46 4-1, #2, last sentence, ADD the word "test" so that the first part of the sentence reads, "The first recorded oil test well in New York State..."
- 4-2, line 1, CHANGE "900" to "600".
- 1-48 4-2, line 2, REFERENCE "Herrick, 1949" not "Dodd, Mead".
- 1-49 4-2, 2nd para. last line, CHANGE "300" to "192" new wells in 1986 and add a statement to read "...in 1987 less than 200 new wells were drilled."
- I-50 4-2, 3rd para, last line ADD phrase to read, "and regulations do not significantly increase the cost of production."
- I-51 4-2, 4th para., first sentence, ADD phrase at end of sentence to read, "and federal and state regulations."
- I-52 4-2, figure 4.2, CHANGE "33.7 bcf" to "34.2 bcf" in notation on table.
- I-53 4-3, 2nd sentence, ADD "producing" so that the line reads, "Chautauqua County is the State's leading natural gas producing county..."
- I-54 4-3, \$4, 2nd sentence, QUESTION: Does anyone store liquid petroleum gas in aquifers, or do you mean <u>depleted</u> aquifers?
- I-55 4-5, D, line 3, CHANGE spelling of "Allegheny" County to the correct spelling "Allegany"
- I-56 4-5a, Figure 4-3, REVERSE #2 and #3 and add #6 to show "Texas Brine, Wyoming". Note this addition on the map by inserting a circle in the upper right corner of Wyoming County.
- I-57: 4-6, 1st para., NOTE in this paragraph that the creek is now completely clean and has been for many years.

- I-42 Comment noted.
- I-43 The missing line is "on the road. Major changes in land use patterns, traffic and the need for..."
- I-44 The negative economic impacts of the proposed regulations on the oil and gas industry are discussed in Chapter 18. While we recognize the industry's current economic difficulties, we have a mandate to protect New York State's environment. The oil, gas and solution mining regulatory program and proposed revisions are warranted by the need for mitigation of potential adverse environmental impacts of activities regulated by the program.
- I-45 The information is also in Herrick's Empire Oil.
- I-46 We agree that the addition of the word "test" would be more appropriate.
- I-47 Correction noted; "900 feet" should be "600 feet".
- I-48 Correction noted; "Dodd, Mead" should be "Herrick".
- I-49 According to Division of Mineral Resources' records, 308 wells were spudded and 293 wells were completed in 1986. In 1987, 299 wells were spudded and 279 wells were completed. This information was published in 1988 in the Division's annual report.
- I-50 "Economics" as used in this context refers to all costs of oil and gas activity, including those necessary to comply with regulations.
- I-51 We agree that regulations have an influence on new drilling and production. Federal and State regulations are included as "other factors" in the sentence as it is currently written.
- I-52 Correction noted.
- I-53 Correction noted.
- I-54 Natural gas is stored in undepleted aquifers in the State of Illinois. Liquid petroleum gas (LPG) is not.
- I-55 Correction noted.

I-56 Correction noted.

I-57 This paragraph is discussing historical occurrences, and does not imply anything regarding the current state of the creek.

CR-10

- I-58 4-7, first line, DELETE "or upward" from this line. REASON: There is always a confining rock bed, otherwise it wouldn't be a reservoir. Delete last three sentences of the paragraph beginning on page 4-6 through the top of 4-7. The example given is hearsay.
- I-59 4-7, 1st full paragraph, DELETE last two sentences, REASON: Environmental contamination was insignifcant, even at that time.
- 1-60 4-7, 2nd para., third line, ADD phrase "after continued spills" to read, "and bacterial action will break down the oil so that, within a short period of time, no harm will be found."
- 1-61 4-10, 1st full paragraph under "e", line 5, CHANGE "40,000" to "over 50,000" and cite Don Drazen as the reference. DELETE phrase at the end of this sentence beginning with ... "when the state first began keeping records." Also, strike the last sentence in paragraph. REASON: This is an overstated representation of the problem.
- I-62 4-11, 1st full paragraph, last sentence, ADD at the end of the sentence "...in conjunction with the Pederal EPA regulatory program."
- 1-63 4-11, 3rd para., line 3, DELETE "to" and add "should" so that the phrase will read, "...should allow for the greatest ultimate recovery of oil and gas."
- 1-64 4-12, 2nd full para., 1st sentence. DELETE this sentence. REASON: It is untrue. Casing and cementing regulations were updated in 1985 and Bass Island regulations were implemented in 1986.
- 1-65 p.4-12, 2nd full para., line 6, DELETE phrases "high pressure" and "(high for New York)" in this sentence.
- 1-66 p. 4-12, 2nd full para., line 6, COMMENT: Regulations covering drilling in the Bass Island trend now exist.

CHAPTER V. NEW YORK STATE GEOLOGY AND ITS RELATIONSHIP TO OIL, GAS AND SALT PRODUCTION

- 1-67 COMMENT ON TITLE OF CHAPTER V: It would be more accurate to insert the phrase "DEC Interpretation" in the title of this section.
- 5-2, #2, 2nd last sentence, DELETE "nearly", and add "not".
- I-69 5-3, B, 1st para., 2nd to last sentence, ADD phrase "temperature and", so that sentence reads, "Over geologic time, temperature and bacterial activity..."

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1-70 5-3, last para., line 6, DELETE "upward".

- I-58 Although a reservoir could not form without a confining rock bed, a confining bed can be breached by improperly completed wells. The word "breach" instead of the word "absence" in this sentence would be more appropriate. A reservoir can also exist without a confining caprock for quite a while, though it would be a short time geologically (i.e. natural seep areas). The example cited is documented on pages 314-315 of . Herrick (1949), where the operator claimed responsibility and agreed to pay damages.
- I-59 This statement makes no judgment regarding significance.
- I-60 Suggested addition is unnecessary. The paragraph already states that surface pollution is usually temporary.
- I-61 Correction noted. "40,000" should be "over 50,000." References are VanTyne (1967) and IOCC (1955). Change "State" to the "Department of Environmental Conservation." The last sentence is not an overstatement. The lack of adequate information on many of these wells has been a serious hindrance to the Department when investigating pollution problems in areas drilled prior to 1966.

#### I-62 Correction noted.

- I-63 The use of the word "to" maintains parallel treatment of the phrase "to help protect mineral rights of well owners."
- I-64 The regulations have been updated since 1972 with respect to Part 551.2, Part 554.2, Part 556.6, and Part 559. The word "extensively" should be added in front of "updated" to make this sentence technically correct. The casing and cementing guidelines are not yet regulations.
- I-65 Our records indicate that the Bass Island pressures are "relatively high" for New York with initial pressures very close to hydrostatic.
- I-66 Permit conditions were imposed on Bass Island wells before the regulations were promulgated.
- I-67 DECs interpretation is implied since DEC is the author of the entire GEIS.
- I-68 Rewording the phrase "is nearly continuous" to "is nearly complete with only minor breaks" would be more technically correct.
- I-69 Rewording this phrase to "Over geologic time, temperature, pressure and bacterial activity..." would be correct.
   I-70 The suggested deletion of "upward" is more technically correct.

CR-11

- 1-71 5-4, 1st para., line 4. CHANGE "structure" to "feature" REASON: It's not always a structure.
- 1-72 5-5, top of page, line 4, CHANGE "150" to "120".
- I-73 5-5, #1, 3rd para, 2nd last line, DELETE "like shales". REASON: shales in New York have low porosity.
- 1-74 5-7, 2nd full para., line 2, ADD sentence to read "Interstate and intrastate gas transportation has also helped maintain low prices for gas utilities and gas consumers." A sentence should also be ADDED in this paragraph that addresses the disincentives to drill caused by increased state and federal regulatory programs which can have the effect of increasing costs to the point where the economic benefit of oil and gas development and production is outweighed by the cost of compliance with these regulations.
- 1-75 5-8, 1st full para., 2nd last line. CHANGE "33" to "nearly 60".
- I-76 5-9, 1st full para., ADD sentences at the end of the paragraph to read, "There is an ongoing discussion concerning whether the State's production allowables have increased ultimate recovery. Industry believes regulations have actually caused waste and decreased ultimate recovery."
- 1-77 Figures 5.2 and 5.3. COMMENT: There is an inconsistency in the designation of bedrock. The maps should not overlap.
- 5-15 top line DELETE this line. It appears on the bottom of page 5-14.
- 1-79 5-16 line 4, REFERENCE (Van Tyne, 1981).
- 1-80 5-16, 1st full para., REFERENCE (Van Tyne, 1981).
- I-81 5-17, 3rd full para., REFERENCE (Van Tyne, 1981).
- 1-82 5-18, top of page, 3rd line, REFERENCE (Van Tyne and Copley, 1983).
- 1-83 5-18, 2nd full para., line 1, CHANGE "1,000" to "2500".
- I-84 5-21, 2nd full para., line 6, CHANGE this sentence to read, "Through repeated use of this driller's misnomer, the Akron has become known as New York's "Bass Island Formation," and is considered to be the source bed for the oil and gas produced throughout the Bass Island trend."
- I-85 5-23, 4th full para., line 4, CHANGE to read "...plain, is represented by sandstone in the area of the deltaic deposition and thins ..." Also, ADD the word "predominately" between "continuous" and "limestone" in the last sentence of this paragraph.

- I-71 The suggested rewording is more technically correct.
- I-72 Gas wells were producing between 1821 and 1865.
- I-73 This section is a general discussion on porosity and permeability and is not specific to New York. Adding the modifier "immature" in front of "shales" would be more technically correct.
- I-74 The complexities of intrastate and interstate gas transportation are beyond the scope of the GEIS. For a fuller discussion of economic impacts resulting from regulation which affect the oil and gas industry, refer to Chapter 18.
- I-75 Change "33 percent" to "nearly 60 percent". During the preparation of this document, additional declines occurred.
- I-76 The suggested addition goes beyond the scope of this section of the GEIS.
- I-77 Correction noted. These maps should not overlap.
- I-78 Correction noted.
- I-79 Add the reference (VanTyne, 1981).
- I-80 Add the reference (VanTyne, 1981).
- I-81 Add the reference (VanTyne, 1981).
- I-82 Add the reference (VanTyne and Copley, 1983).
- I-83 Rewording of this phrase to "The Salina Group forms a sequence up to 2,500 feet thick of red..." is more correct.
- I-84 Explanation for including the Rondout is given in preceding text. The complex geology along the Bass Island trend has various interpretations.
- I-85 This paragraph is a general discussion of Tully limestone deposition. A detailed discussion of time equivalent lithologic variations is beyond the scope of the GEIS.

- 1-86 5-25, a. line 6, DELETE the sentence beginning on this line, REASON: It is not true.
- 1-87 5-26, 1st full para., 3rd line from the bottom. DELETE phrase, "...the faults appear to cut across the folds." and change to read ... "the faults parallel the folds." REASON: They do not cut across the folds, they parallel the folds.
- 1-85 5-26, b. 1st para., last line, ADD phrase so the line reads.... but no evidence for this gap exists in the far eastern part of the state."
- [-89] 5-27, 1st full para., 2nd last line, CHANGE \*1974\* to \*1977\*.
- 1-90 5-28, 1st full paragraph, line 3, CHANGE: "Genesee" should be "Geneseo". Also, ABD "could" to second last line to read ... "huge area underlain by gassy shales could make them a significant contributor to..."
- I-91 5-28, 2nd full paragraph, DELETE last sentence. REASON: The statement is incorrect, as it has not been demonstrated.
- I-92 5-29, e., 1st paragraph, 2nd last line, CHANGE "Most" to "All" so the line reads, "All of the Upper Devonian oil fields occur in Allegany..."
- I-93 5-33, 1st full paragraph, line 6, CHANGE "Triassic" to "late Paleozoic".

CHAPTER VI. ENVIRONMENTAL RESOURCES

1-94

6-1, 1st para., After the last sentence, ADD the phrase, "... however, data indicate that many of the sites return to their original state even if left alone." REASON: Environmental effects attributed to the industry from the early 1900's can no longer be detected.

- 1-95 6-1, 2nd para., DELETE 3rd sentence beginning on line 6, REASON: This is not necessarily true, and if conflicts do arise, they are currently being adequately handled by mitigation measures set forth in permit conditions.
- I-96 6-3, C, 1st para., line 8, DELETE phrase "...as well as the watersheds that supply them." REASON: "Water supply" is the term that will be used in developing future regulations and the implication of using the term "watershed" is not known.
- I-97 6-3, C, 1st para., line 8, DEFINE term "significant amounts" in this context.
- 1-98 6-4, 1st full para., last line, CHANGE "can" to "may". REASON: There are valleys without any sand or gravel deposits.

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- I-86 The following rewording is more correct: "The Oriskany production is characterized by high pressure and good reservoir capacity when compared with most other New York producing formations."
- I-87 The line ",but where the axial direction of the anticlines changes from northeast to east the faults appear to cut across the folds." should be deleted.
- I-88 Correction noted. Insert "far" before the word "eastern".
- I-89 There were two possible reef discoveries in 1986 and 1987. Delete "Although no additional reef fields have been discovered since 1974," and start the sentence with "Future discoveries..."
- I-90 Change "Genesee" to "Geneseo." The Geneseo Formation is equivalent to the lower "Genesee" Group. The use context of "resource base" in this sentence is estimated potential reserves.
- I-91 Orton (1899) lists numerous examples of wells near Lake Erie that encountered gas-bearing black shales at 100-300 feet. The shale encountered by these wells is assumed to be the Dunkirk Shale, which is the shallowest of the Devonian black shales that has been identified as a potential gas producer.
- I-92 The suggested change is correct.
- I-93 Changing the sentence to read ". . . Appalachian Orogeny occurring in the late Paleozoic through Mid-Triassic..." is more correct.
- I-94 This general statement is not specific to the oil and gas industry, and it is correct as written.
- I-95 This sentence does not address the availability or adequacy of mitigation factors.
- I-96 Watersheds must be considered in any surface water supply protection plan. The Department of Health has watershed regulations (Section 1100 of Article 11 of the Public Health Law).
- I-97 "Significant amounts" is part of the definition of aquifer, and the definition of "significant" would vary among different areas.
- I-98 The suggested change to this text would not alter the intent of this sentence.

**CR-13** 

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- I-99 6-4, 2nd full para., last sentence. CHANGE: This sentence should be changed as it is mid-1988 and the maps are not yet available.
- 1-100 6-5, 2nd full para., COMMENT: The possibility for contradictory regulations exists unless these programs are closely coordinated.
- I-101 6-6, D. Public Lands, COMMENT ON THIS ENTIRE SECTION: If development of privately-owned oil and gas under public lands is in anyway impaired by DEC regulation, then DEC should purchase the mineral rights at fair market value.
- 1-102 6-8 F. Wetlands, COMMENT ON THIS ENTIRE SECTION: If development of privately-owned oil and gas in wetlands areas is in anyway impaired by DEC regulation, then DEC should purchase mineral rights at fair market value. In addition, wetlands maps for the same areas vary from DEC region to DEC region. There is a need for updated, standardized wetlands maps available for sale to the public.
- I-103 6-9, G., 1st para., line 5. DELETE sentence starting with "Severe loss of life...in these areas." REASON: The statement does not belong in a GEIS concerning oil and gas. It is our interpertation that "development" in this context is meant to indicate housing or industrial development, not oil and gas.
- I-104 Figure 6.4 CHANGE: Figure needs to be redrawn. Can't discern from the key what the map is supposed to depict.
- I-105 6-11, I, 2nd para., 2nd sentence, DELETE this sentence. REASON: Private dollars have also been invested in oil and gas leases and in the production of oil and gas in New York State.
- 1-106 6-12, 1st full para., DELETE whole paragraph. REASON: It doesn't deal with environmental matters relating to oil and gas.
- I-107 6-14, K. Significant Habitat. COMMENT: The term is broad enough to include all <u>habitats</u> and the definition is so broad as to be meaningless. DEFINE what has to be dealt with so that it can be understood by the industry. Also, DEFINE what is meant by "wildlife" in this context.
- I-108 6-15, 1st full para., COMMENT: If the State or private groups wish to acquire fish and wildlife areas, then the owners of mineral rights under these lands should be compensated at full market value.
- 1-109 6-16, L. COMMENT: Local minerals managers should have access to precise information locating historic or culturally significant areas (in distances less than the current one mile) to save operators the expense of archeological surveys.
- I-110 6-16 M. QUESTION: Are the DEC's facts on acid rain compatible with those of the federal government?

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- I-99 Several of these maps are currently available.
- I-100 Comment noted.
- I-101 The taking issue has been addressed by New York State courts. See Topical Response Number 1 on Public Taking Without Compensation.
- I-102 See response to I-101. The Division of Fish and Wildlife staff, who regulate wetlands, are aware of this problem and are working toward standardization of the Wetland Classification Maps.
- I-103 This statement obviously refers to floodplain development in general, and is not specific to the oil and gas industry.
- I-104 We apologize for the reproduction quality of this map.
- I-105 This sentence is one of fact regarding agricultural lands, the subject of this section. We recognize also that the same statement could apply to oil and gas operations in New York State.
- I-106 This paragraph is relevant in addressing the possible impacts on agricultural lands by oil and gas operations.
- I-107 This is the standard definition used by the Department. See reference section, page 6 entitled "Significant Wildlife Habitats in New York", Division of Fish and Wildlife. According to Webster's Ninth New Collegiate Dictionary "wildlife" is defined as living things that are neither human nor domesticated.
- I-108 See Topical Response Number 1 on Public Taking Without Compensation.
- I-109 The Office of Parks, Recreation and Historic Preservation (OPRHP) feels it is necessary to restrict access to these maps.
- I-110 No. New York State and the federal government disagree on the severity of the problem.

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- I-111 6-17 N. COMMENT: Whose subjectivity will be accepted and whose subjectivity will prevail concerning visual resources? We believe all references to visual impacts in the GEIS should be deleted as they allow for enormous discretionary authority for the reason stated in this section - that "their value cannot be precisely defined." In addition, the greatest visual impact will occur during the drilling phase which is temporary. After completion of drilling operations, 90% of the equipment involved is buried underground.
- 1-112 6-18, 1st full sentence. DELETE this sentence. REASON: Aesthetic compatibility standards are not relevant to oil and gas operations. Most of the drilling locations in New York State are in remote, sparsely populated areas and actually provide a visual curiosity that draws interested onlookers. The whole idea of regulating visual impact is so far-reaching and arbitrary as to be frightening, i.e. in California, some rigs must be camouflaged by building of facades.

CHAPTER VII. NEW YORK STATE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM.

- 1-113 7-1, 2nd para., COMMENT: It should be noted that operators or companies drilling wells may disagree with the statements made in this paragraph and may believe that the State's regulatory programs do not always allow for the claims made here and, in fact, may actually promote waste.
- I-114 7-2, 1st full para., line 10, ADD phrase after the word "drainage," to read, "but may make reserves unrecoverable."
- 1-115 7-2, a. line 3, DELETE phrase beginning with "...and an assessment of probable adverse environmental impacts..." REASON: Permit conditions should be based on the facts of the situation involved in that particular setting, not improbable "what if" situations.
- I-116 7-5, 2, #4) DELETE #4. REASON: This should no longer be necessary once the GEIS is in place. Also, this will be addressed in the new permit application form.
- I-117 7-5, 4th full para., line 2 and 3: DEFINE what "information" will be required on nearby wells. Also, DEFINE what is meant by "nearby."
- I-118 7-6, 1st sentence at the top of the page. COMMENT: The procedure to transfer the fee from one permit to another should be formalized and listed in the GEIS under "permit application."
- 1-119 7-6, 1st para., line 1, COMMENT ON THE EAF: Constant reference is made to the use of an EAP throughout the GEIS. The GEIS should obviate the need for an EAP except in certain specified instances. Purther, line 1 should read "...The environmental assessment information incorporated in each permit application"

- I-111 See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-112 See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-113 This paragraph is merely a restatement of 6NYCRR Part 550.1.
- I-114 Variances may be granted to any operator who can show that reserves may be unrecoverable under current spacing requirements.
- I-115 "Probable" in this statement means adverse environmental impacts that are likely in our best professional judgment to occur.
- I-116 This section describes the current permit application requirements.
- I-117 Again, this section describes the existing requirements of 6NYCRR Part 552.2.
- I-118 Transfer procedures are already formalized. Please see 6NYCRR Part 552.4.

and this paragraph and the one immediately following should be changed to discuss the fact that this information will be requested on the permit application form.

- I-120 7-6, 2nd full para., GENERAL COMMENT ON ACCESS ROADS: DELETE the reference to "access roads" in the 2nd paragraph. No other industry is subject to regulation concerning access roads and neither should the oil and gas industry. This is a matter dealt with by agreement between the operator and the landowner.
- I-121 7-7, 3, last sentence on the page, QUESTION: What happens if no answer is received from the DEC within 15 days?
- I-122 7-9, line 10 midway down the page, DELETE this sentence. REASON: The GEIS should be all inclusive when finalized.
- I-123 7-9, last para., GENERAL COMMENT: WE BELIEVE ALL PROPOSED CHANGES TO REGULATIONS SHOULD BE REMOVED FROM THE BODY OF THE GEIS AND INCLUDED IN A SEPARATE APPENDIX. THE PROPOSED REGULATIONS ARE JUST THAT - PROPOSED. THEY HAVE NOT BEEN FINALIZED AND ADOPTED.

CHAPTER VIII. SITING OF OIL AND GAS WELLS

- I-124 8-1, 2nd & 3rd para., DELETE references to access roads for reasons cited above.
- I-125 8-1, B. 2nd para., 2nd last line, ADD phrase so that sentence reads, "Well spacing regulations do not apply to solution mining wells or gas storage wells."
- 1-126 Figure 8-1, DELETE access road from figure.
- 1-127 8-2, 1, 1st para., line 6, CHANGE to read, "Spacing of any future waterfloods proposed for new oil field areas would be at the discretion of the operator. There are no spacing requirements on any secondary or tertiary operations." REASON: The operator possesses the greatest expertise and interest in maximum resource recovery. These projects are very expensive to initiate and administer.
- I-128 8-2, 1, 1st para., ADD phrase at the end of the last sentence to read, "...except along the Pennsylvania-New York state line where a 330' setback is in effect."
- I-129 8-2, 1, 2nd para., line 1, DEFINE term "temporarily" as used in this context.
- I-130 8-3, C, line 7, DELETE references to access roads for reasons cited earlier in these comments.
- I-131 8-3, C, line 11, CHANGE \*2,640 feet" to \*1,000 to 2,000" REASON: It does not coincide with information given in Table 3.1. Also, the word "well" should be ADDED so the statement reads, "...within 1,000 to 2,000 feet of a municipal water supply well."

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- I-119 This section describes current procedures. See Topical Response Number 3 on EAF and Site-Specific Permit Conditions.
- I-120 See Topical Response Number 4 on Access Roads as Part of Project.
- I-121 During preparation of the GEIS, the SEQR regulations were amended and the 15-day time period for the Department to review the pertinent environmental data and make a determination has been extended to 20 days. This review period is directory, not mandatory.
- I-122 See Topical Response Number 5 on Reasons for Including Proposed Regulations in the GEIS.
- I-123 The proposed regulations are clearly separated in **bold type** and summarized again in **bold type** in Chapters 16 and 17. See Topical Response Number 5 on Reasons for Including Proposed Regulations in the GEIS.
- I-124 See Topical Response Number 4 on Access Roads as Part of Project.
- I-125 Correction made. Well spacing does not apply to gas storage or solution mining wells.
- I-126 See Topical Response Number 4 on Access Roads as Part of Project.
- I-127 The operator would, of course, propose spacing in his application for a new waterflood. This spacing proposal would still have to be reviewed by Department staff.
- I-128 We agree that the suggested wording is more correct.
- I-129 Forty-acre statewide spacing was adopted based on the readily available information. When the workload allows, DEC staff will determine if the spacing rules need revision. In the meantime, any operator who can show that greater ultimate recovery would be achieved by a change in well spacing can apply for a spacing variance on a field and formation basis. We receive very few requests for spacing variances.
- I-130 See Topical Response Number 4 on Access Roads as Part of Project.
- I-131 These are item's listed on the pre-drilling site inspection form which is filled out by the field inspection staff. It is a checklist for both the ' proposed well and access road, and correspondence to Table 3.1 is not intended. See pages 8-17 and 8-18 for an explanation of the 1,000', 2,000' and 2,640' figures.

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- I-132 8-4, D, 1, ADD variance provisions as addressed in Section C, "Siting Regulations and Policies."
- I-133 8-4, 1, 1st para., line 12, ADD phrase at end of the sentence beginning with "Geology largely dictates..." to read "...in conjunction with lease restrictions and state regulations,"
- I-134 8-4, 1, last sentence, bottom of the page. COMMENT: Landowners purchased the property knowing leases were in effect.
- 135 8-5, 1st full para., DELETE this paragraph. REASON: It is unnecessary and self-serving.
- I-136 8-5, 2nd full para., last sentence. COMMENT: If this regulation is adopted, it should allow a variance from 660' setback from lease boundary line or house.
- 1-137 8-5, 3rd full para., line 6, DELETE parenthetical comment "(as occurred in the spring of 84)." REASON: It is enough to simply state "accidental explosion of an oil tank"
- I-138 8-6, 1st full para., DISAGREE with this recommendation. REASON: The drawings would serve no real purpose. Field conditions at the actual time of drilling are likely to change due to wind conditions, etc., and the drawings would be meaningless.
- I-139 8-6, 2, DELETE references to visual impacts for reasons cited earlier in these comments.
- I-140 8-6, 2, a. AGREE with the statement concerning the temporary nature of noise, visual and air quality impacts.
- I-141 8-8, 1st full para., AGREE that the degree of aesthetic compatibility or incompatibility is a subjective matter influenced greatly by perception. In reality, will anyone ever be able to do anything without affecting visual impact on someone?
- I-142 8-9, #3, QUESTION: What is the basis of the statement concerning the nighttime sound level in "quiet, rural New York"? We doubt the nighttime sound level is 30 dBa. What data were used to determine this?
- I-143 8-10, 1st para., and formula, DELETE. REASON: It is difficult to implement regulations based on calculations and equations which are effectively meaningless due to their inexact nature.
- 1-144 8-10, 2nd para., line 4, DELETE requirement for muffler, etc. REASON: This is unreasonable due to transient nature of shortterm drilling operations.
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- I-132 The variance provisions addressed in Section C apply by implication to Section D, since it is extremely unlikely that associated drilling equipment would be located a significant distance from the well.
- I-133 Sentences in the text above and below address lease restrictions and State regulations.
- I-134 See Topical Response Number 6 on Surface/Mineral Owner Lease Conflicts.
- I-135 See Topical Response Number 6 on Surface/Mineral Owner Lease Conflicts.
- I-136 There is no 660' setback requirement from houses. Variances from the 660' lease boundary setback may be granted.
- I-137 Commentators on earlier GEIS drafts requested specific examples of pollution incidents.
- I-138 The purpose of the sketch of equipment placement is to insure that these items are placed with consideration to public safety and environmental factors. We realize that changes might be necessary because of field conditions. At the time the permit application is reviewed, the field inspector will verify that equipment setbacks are adequate. An alternate proposal to accomplish this same goal would be to require setbacks specific to the entire drilling site instead of the wellbore.
- I-139 See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-140 Most noise, visual and air quality impacts are temporary. Section 8.D.2.b. discusses the longer-term noise and visual impacts.
- I-141 Comment noted.
- I-142 Comment noted. This information was obtained from a letter written by Robert Vessels, Director, PSC Office of Energy Conservation and Environmental Planning to Richard Brescia, Chairman, New York State Oil, Gas and Solution Mining Advisory Board. Please note personal communication number change from #58 to #69.
- I-143 This section is included in the GEIS for information only. Discussion of noise impacts is required by SEQR regulation. The Department is not proposing at this time to regulate noise.
- I-144 The recommendation of a requirement for a muffler is not made. As stated in the text, pneumatic mufflers and sound barriers might be appropriate only under special circumstances.

- I-145 8-11, b, line 8, DISAGREE with the proposal. REASON: 45 days is too arbitrary and unreasonable. Reclamation activities are greatly affected by weather, and greater environmental damage could occur if reclamation takes place at the wrong time of year.
- I-146 8-11, 4th para., last line, DELETE parenthetical comment "(known as a Christmas tree)". REASON: The device used in this area is not a "Christmas tree" as commonly known.
- 1-147 8-12, 2nd full para., DELETS references concerning visual impacts and camouflage measures for reasons cited earlier.
- I-148 8-12, c, 1st paragraph, DELETE #1-4. REASON: The second paragraph under 'c' goes on to state that these categories do not occur in New York's oil and gas producing region.
- I-149 8-13, sentence beginning on line 8, DELETE sentence. REASON: DEC should not attach permit conditions unless lessor is the State. Otherwise, conditions will be set in the lease agreement.
- 1-150 Figure 8.2. QUESTION: Where is the brine tank in this drawing?
- I-151 8-14, lst full para., line 3,4, & 5, DELETE phrases "and Department staff," and "permit conditions under special circumstances," so that the sentence reads, "However, landowners can restrict the siting of well site facilities through lease conditions." REASON: Distance limitations are established by law and regulation and are the only legitimate regulatory siting restrictions for oil and gas facilities. This is a matter for agreement between the landowner and the operator. The sentence as it reads in the GEIS implies that the DEC will always side with the landowner in private contract negotiation.
- I-152 8-14, E, 1st para., 2nd sentence. AGREE that the "Protection of water quality is the most important concern in regulating oil and gas development." This statement should be included in the Introduction to the GEIS.
- I-153 8-14, E, 2nd para., line 3, DEFINE what is meant by surface water bodies in this context. Is it surface water supply wells?
- I-154 8-15, 1st full para.,line 11, CHANGE "well" to "wellsite" and "150" feet to "100 feet". COMMENT: A map showing non-intermittent streams on a 7-1/2 minute topo sheet would be very helpful.

I-155 8-15, 1st full para. 2nd line from bottom, DELETE public notice and hearing requirements. REASON: This type of waiver is not significant enough to require public notice or hearings. Variance from 660' boundary is an administrative decision.

I-156 8-16, 2, 2nd para., AGREE with this recommendation if the springs are currently used for domestic water supply.

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- I-145 This proposed requirement is not arbitrary; it is keyed to the existing pit reclamation requirements of the current regulations in 6NYCRR Part 554.1(3), and as stated, extensions can be granted by the Regional Minerals Manager for reasonable cause. Reasonable proposed alternatives will be considered during the rulemaking process.
- I-146 The term "Christmas Tree" is defined as the assembly of valves, pipes and fittings used to control the flow of oil and gas from the casing head (Manual of Oil and Gas Terms 6th edition, Williams and Meyers).
- I-147 See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-148 This is a listing of the most important visual resources in New York. This listing would not be complete without items 1 through 4.
- I-149 The requirements concerning State Parks, historic sites, etc. are guided by SEQR regulation Part 617.12.
- I-150 This is not a drawing but an actual photograph. This well did not have a brine tank; most wells do, but there are many gas wells that produce negligible amounts of brine. Wells with brine tanks are more common now that blowdown pits have been prohibited. We agree that we should have chosen a well with a brine tank to represent a typical gas well.
- I-151 More is inferred from the cited paragraph than was intended. The special circumstances referred to are circumstances listed under current regulation.
- I-152 Comment noted.
- I-153 "Surface water body" refers to public lakes, streams, rivers, canals, creeks, etc. It does not refer to surface water supply wells.
- I-154 This reasonable counterproposal to the recommended setback restriction will be considered during the rulemaking process.
- I-155 Variances from the 660' setback requirement cannot be granted administratively to private parties. Public hearings are required as stated in 6NYCRR Part 553.4. Municipalities are the only entities that can receive administrative variances.
- I-156 Support for setback restrictions for domestic springs is noted.

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- 1-157 8-16, 3, last sentence, AGREE that government bodies should compensate full market value of any resource rendered unproduceable by the creation of a buffer zone.
- 1-158 8-17, line 3, DEFINE "other sources of pollution" as used in this context.
- I-159 8-17, line 6, ADD "new" before "wells" and "current" before "surface," so the sentence reads, "It is recommended the minimum siting restriction on the proximity of new wells and associated production facilities to current surface municipal water supplies be increased to 150 feet." A waiver of this spacing restriction should be allowed. There should also be a reimbursement clause for access to mineral rights that might be lost if the recommendation is enacted. DEFINE "surface municipal water supplies" as used in this context.
- I-160 8-17, b, line 7, CHANGE "2,640" to "1,000-2,000".
- 1-161 8-19, 1st full para., AGREE with casing and cementing permit conditions in aquifers, but believe protection would be improved if any casing below surface casing having contact with the aquifer formations would be cemented with 25% excess cement, rather than being cemented to surface. A sentence could be ADDED to read, "All formation open hole sections shall be cemented." REASON: This change would allow for better abandonment procedures.
- I-162 8-19, 1st full para., line 7, COMMENT: The DEC's policy for grouting down from the surface if circulation is not achieved may not accomplish the DEC's intent. Technical problems associated with grouting may cause more harm than good. Also, DEC needs to develop a better aquifer map on a scale of 1<sup>s</sup> to 2,000.
- I-163 8-19, 4, line 1, CLARIFY first sentence in this context. What is the difference between a community water system and public water system?
- 1-164 8-21, 4th para., line 7. ADD phrase, "under which oil and gas operators must operate," after sentence ending with "drilling permit conditions," so that the sentence will read, "All water wells are protected by the drilling, casing and cementing guidelines and the aquifer permit conditions under which oil and gas operators must operate." IOGA recommends that water well drillers and any other party or operation penetrating aquifers be subject to the same regulations.
- 1-165 8-22, lst full para., line 8, CHANGE to read, "For these reasons, a 100 foot setback from private water wells is recommended unless the water well owner approves a smaller setback. Additionally, the plat accompanying the drilling application should show the location of all private water wells within 1,000 feet of the wellsite as shown on tax maps. If a setback is necessary,
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- I-157 See Topical Response Number 1 on Public Taking Without Compensation.
- I-158 The phrase "other sources of pollution" refers to any structure or equipment which could introduce pollutants into surface municipal water supplies.
- I-159 The suggested additions are unnecessary. This chapter is on siting; one cannot site old wells. Waivers of all spacing or siting restrictions are granted for just cause. See Topical Response Number 1 on Public Taking Without Compensation.
- I-160 See response to I-131.
- I-161 We find some merit to this suggested alternative. Reasonable counterproposals will be considered during the rulemaking process.
- I-162 Comment noted.
- I-163 Both "community" and "non-community" are public water supply systems. Thus, both are included in the definition of "public water supply systems".
- I-164 We agree with the suggested text clarification, and the comment that water well drilling should be regulated.

compensating variances from boundary lines should be automatically allowed. The DEC will have the authority to grant such setback waivers."

- I-166 8-22, 1st full, para., line 16 beginning with, "It is recommended..." This sentence should be included with the recommendation listed beginning on line 8 (addressed above). The sentence should be CHANGED to read, "It is recommended that DEC approval be required for a waiver of the restrictions proposed for private water wells and springs used as a current domestic water supply."
- I-167 8-24, 2, 2nd para., last line, DELETE "future" and ADD "existing" before "land" so that sentence reads, "Bowever, in many instances access roads can be planned according to existing land use needs."
- I-168 8-25, 3, 2nd para., line 5, AGREE with recommendation that landowner approval be obtained to bury either trash or the drilling pit liner.
- 1-169 8-25, 3, 3rd para., line 2. AGREE with the recommendation, but request information on where the safe buffer depth of 4 feet is now specified.
- I-170 8-26, line 5, DEFINE technical data used to substantiate Seneca County Soil and Water Conservation District claim concerning crop yields. (See Attachment #1 entitled, "Impact of One-Time Dormant Season Application of Gas Well Brine to Forest Land.")
- I-171 8-26, line 8, DELETE the proposed recommendation. REASON: This recommendation constitutes inappropriate interference in private contractural matters between landowner and operator.
- I-172 8-26, 1st full para., line 2, sentence beginning with "Brine and oil ..." DELETE this sentence. REASON: Courts have ruled that damage to crops apply to one year's growing season and not to future crops. Further, brine and gas would not affect crop yield for more than one year, and oil would be stripped from the soil by bacterial action.
- 1-173 8-26, 4, 1st para., DELETE first paragraph. REASON: The use of the word "suspected" in line 3 makes this a leading statement. Proof should be provided or the whole paragraph deleted.
- I-174 8-27, 5, AGREE completely with this entire section.
- I-175 8-28, 6, DELETE this entire section. REASON: DEC can only intervene as noted in section 5. All statements given in 6 are covered by contract.
- I-176 8-29, COMMENT: Streams should be defined by solid blue lines on USGS survey maps:

- I-165 This is not a reasonable alternative. County tax maps do not usually include water wells.
- I-166 This sentence is a clarification of the above proposal stating that the landowner waiver of the surface restriction should be in writing. The DEC would not waive a setback requirement of this kind without landowner approval.
- I-167 The sentence as written is more appropriate.
- I-168 Support for requiring landowner approval for pitliner or trash burial is noted.
- I-169 A safe buffer depth of four feet was recommended by the Department of Agriculture and Markets, and it is being recommended in the GEIS that four feet be specified as the safe buffer depth. Support for the recommendation is noted.
- I-170 The Seneca County SWCD should be contacted for detailed information on their technical data. The effects of brine application on crop productivity cannot be compared to topsoil loss or burial.
- I-171 See Topical Response Number 7 on Soil as a Public Natural Resource.
- I-172 The information in this paragraph was provided by the Department of Agriculture and Markets. We know that gas would have no adverse impacts, but the associated brine and/or oil can cause serious damage to many crops.
- I-173 The reason for using the word "suspected" is detailed in the paragraph.
- I-174 Comment noted.
- I-175 The DEC can intervene and attach permit conditions only under special circumstances to safeguard specified protected resources (e.g. floodplains, Agricultural Districts, wetlands, etc.) or to avoid or mitigate impacts to significant resources which are not otherwise protected but have been identified during review under SEQR.
- I-176 Many protected streams are depicted as broken blue lines on USGS survey maps.

- I-177 8-30, 2, 1st para., DELETE 1st paragraph. REASON: Impacts are not major, as they are temporary in nature.
- 1-178 8-30, 2, 2nd para., line 4, DELETE sentence beginning with, "For example,...". REASON: The example is not now relevant as it occurred several years ago and the stream is now clean.
- 1-179 8-30, 2, 2nd line from bottom of the page. QUESTION: When did the Department start to require that collector lines be buried adjacent to the access road crossing? Please cite regulatory reference for requirement. COMMENT: This may cause increased environmental disturbance due to added pipeline right-of-way.
- I-180 8-31, 4, line 6, DELETE phrase beginning with, "...and be obtained from State approved sites." REASON: As long as operators meet permit specifications for fill, the State should not care where it is obtained.
- I-181 8-32, H. COMMENT on explanation for this section: The description of what <u>may</u> happen seems to greatly exaggerate what is <u>likely</u> to actually occur.
- I-182 8-34, 2, line 3, DELETE sentence beginning with, "Accordingly, conditions..." REASON: Special conditions should generally be covered by the GEIS. Also, DELETE the sentence beginning on line 5. REASON: An EAP will not be submitted with a permit application once the GEIS is final. Environmental information will be made part of the permit application form.
- I-183 8-34, 2, 2nd para., line 4, sentence beginning with, "However, a 50 foot....for sedimentation problems." CLARIPY what this sentence means.
- I-184 8-35, line 5, sentence beginning with, "This is further...." AGREE, but sentence should be moved to section dealing with proposed recommendations concerning buffer zones.
- I-185 8-35, I, 1, line 2, CLARIPY what is meant by "eligible areas" in this context. How are operators to know what constitutes an eligible area?
- 1-186 8-35, I, 1, 2 para., line 2, sentence beginning with, "In the event...individual circumstances." COMMENT: If well can't be drilled, compensation for loss of mineral revenues at full market value should be required.
- I-187 8-35, I, 1, 2nd para., beginning on line 5 through 2nd line on the top of page 8-36, DELETE this section. REASON: Additional permit conditions now exist for these situations.

- I-177 We agree that "major" is too strong a modifier.
- I-178 The example given is relevant to the issues discussed in this sentence.
- I-179 There is no reference to regulation for this requirement. It is sometimes imposed as a permit condition by the Division of Regulatory Affairs under the Stream Disturbance Permit Program.
- I-180 This is a Stream Disturbance Permit condition which requires that fill be obtained from permitted sand and gravel mines. The State requires that sand and gravel mining be done under permit.
- I-181 This section addresses the potential impacts of soil erosion and sedimentation.
- I-182 See Topical Response Number 3 on EAF and Special Site-Specific Permit Conditions. Their occurrence at every site is unlikely.
- I-183 This sentence means that distance alone is not an adequate indication of the potential for sedimentation problems.
- I-184 The discussion on page 8-15 includes the effect of topography and vegetation on the adequacy of buffer zones. The sentence addressed by this comment is an appropriate conclusion to the discussion of sedimentation problems.
- I-185 The Regional Permit Administrator in each DEC regional office has a list of areas eligible for inclusion on the State and Federal Historic Site Lists.
- I-186 See Topical Response Number 1 on Public Taking Without Compensation.
- I-187 This illustration of possible permit conditions in historic sites is appropriate in this section.

- I-188 8-36, 2, 4th para., COMMENT: The DEC area minerals managers should have an archeological map (scale: 1" to 2,000) that will accurately determine location of archeological sites in order to reduce the costs to oil and gas operators by decreasing the number of archeological studies required to be performed by consultants. IOGA conducted a survey of members after this archeological survey requirement took effect in 1965 which showed that almost \$100,000 had been spent on archeological surveys that uncovered four significant "artifacts".
- 1-189 8-37, J. Significant Habitats, GENERAL COMMENT on \$1 through 3 of this section: If relocation of the wellsite is required and results in loss of mineral recovery, then the operator should be compensated by the State at full market value.
- I-190 8-39, K. Floodplain. GENERAL COMMENT on the introduction to this Section: We believe that floodplain permit conditions are inappropriately applied to oil and gas operations and that mitigation conditions would be pointless if a flood actually occurred. Floodplain conditions are intended to reduce property damage by excluding housing and other building developments.
- 1-191 8-40, 1, Mud or Reserve Pits and 2, Brine and Oil Tanks GENERAL COMMENT on these sections: (See comment immediately above).
- I-192 8-41, 2, 2nd para., 3rd line from bottom of page. DELETE this recommendation. REASON: This proposal is already covered by the federal SPCC (spill prevention control and counter measures) plan. In addition, federal regulations allow other containment measures aside from dikes.
- F193 8-42, para 2, line 3 & 4, DEFINE what is meant by the phrase "deposited in a suffocating layer" and the term "weathered oil" in this sentence.
- 1-194 8-43, 1st full para., sentence beginning with, "Completion fluids...." DELETE or provide basis for this sentence.
- I-195 8-43, 4. DELETE section on brush debris. REASON: No other industry is required to comply with such a requirement.
- I-196 8-46a, Table 8.1, DEFINE criteria that would satisfy "compelling economic or social need" as described in Class I Wetlands in this table.
- [-197] 8-50, Figure 8.7, line 8 of the caption accompanying this photograph, ADD phrase to read "...in a pink Cadillac," after "deer were sighted driving to the well..."
- I-198 8-51, 7, AGREE with first sentence of this section which states that access roads can enhance wetland's value.

- I-188 Comment noted. See response to I-109.
- I-189 See Topical Response Number 1 on Public Taking Without Compensation.
- I-190 The primary permit conditions imposed on oil and gas operations located in floodplains are restrictions on the time of year drilling can take place (not during flood season) and anchoring requirements for permanent structures. These conditions are designed to prevent environmental impacts and reduce flood damage.
- I-191 The text of these sections explains the reasons for the required mitigation conditions.
- I-192 The substitution of berms or walls for dikes is not excluded. Unless special agreement is made, federal regulations do not supersede or substitute for State regulation. The State does not have authority to enforce federal regulations, and local federal enforcement staff is not usually available.
- I-193 Weathered oil in which the light constituents have evaporated can sometimes sink and suffocate benthic fauna.
- I-194 See sections 9.H.6. and 7.
- I-195 DEC only regulates floodplain activities in those communities that do not have a local program. Under DEC issued Floodplains Permits, there are brushy debris handling requirements for all activities.
- I-196 6NYCRR Part 663.5(f)(4)(ii) states "The word 'compelling' implies that the proposed activity carries with it not merely a sense of desirability or urgency, but of actual necessity, that the proposed activity must be done; that it is unavoidable." Recently, the Division of Fish and Wildlife's interpretation of permitting requirements for Class I wetlands has shifted the review emphasis from a demonstration of need to a weighing question based on the magnitude of any unmitigated impacts.
- I-197 This sentence should say "About 30 deer were sighted by DEC staff while driving..." Under NYSDEC regulations, deer are not permitted to sell Mary Kay cosmetics or drive pink cadillacs.
- I-198 Comment noted.

- I-199 8-52, 8, para 2, DELETE this paragraph. REASON: Situation is irrelevant to GEIS and happened six years ago.
- 1-200 8-53, N. State Lands GENERAL COMMENT on this section: The state should be required to purchase mineral rights at fair market value if drilling cannot take place due to regulations.
- I-201 8-54, 2, 2nd para. COMMENT: IOGA does not object to OPRHP as lead agency for oil and gas drilling activities in state parklands, however, if it is determined that drilling cannot occur in state parklands, then the fair market value of privately held mineral interests should be paid to the owner by the state.
- 1-202 8-55, line 3, DELETE statement concerning to scenic resources. REASON: The protection of scenic resources from the temporary nature of drilling operations allows too much discretionary authority. Scenic resources are subjectively established and are inappropriate for consideration by an oil and gas GEIS.
- i-203 8-57, 0, 1st para., line 3, PROVIDE a copy of the Type I list referred to in this sentence.
- 1-204 8-57, 0, 3rd para, line 2, CLARIFY what is meant in this context by the phrase, "...a benefit or threat to public health or safety..."? Also, on line 3 of this paragraph DELETE reference to "aesthetic significance."

CHAPTER IX. DRILLING PHASE: DRILLING, CASING AND COMPLETION OPERATIONS

- I-205 9-1, A, para 1, line 1, DELETE "access road" and replace with "wellsite".
- 1-206 9-1, para 2, line 6, QUESTION: Why is a change recommended from 48 hours to five business days? CLARIFY last sentence of recommendation beginning with, "...through the clerk of the county, city or town..." Who is to be notified? We suggest that the recommendation be CHANGED to read, "Written notification should be required at least five business days prior to the beginning of drilling operations, or verbal notification at least 48 hours prior to the beginning of drilling operations with signed verification of the verbal notification required, and local jurisdictions should be notified through one specified clerk of the county, city or town, whose land will be physically affected."
- 1-207 9-1, A, 3rd para., line 4, AGREE with recommendation and that phone notice to the DEC should be verified by a DEC confirmation number given at the time of phone notification.

1-208 9-1, A, 4th para., line 3, AGREE with recommendation and would

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- I-199 This example is illustrative of the damages that can occur as a result of brine discharge into a sensitive wetland habitat. The paragraph further explains that discharges of this nature have not occurred recently.
- I-200 See Topical Response Number 1 on Public Taking Without Compensation.
- I-201 See Topical Response Number 1 on Public Taking Without Compensation.
- I-202 See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-203 See SEQR regulations, 6NYCRR Part 617.12, for a complete listing.
- I-204 Local governments designate areas such as inactive hazardous waste sites as Critical Environmental Areas (CEA) because of the threat to public health or safety which could be caused by disturbance. They can also designate their public water supply as a CEA because of the important benefit it provides to public health.
- I-205 See Topical Response Number 4 on Access Roads as Part of Project.
- I-206 Reasonable alternative proposals will be considered during the rulemaking process.
- I-207 Support is noted for our recommendation and the suggestion for a confirmation number has merit.

**CR-23**
ADD phrase at the end of the sentence stating, "and if permit is not used, fees are transferrable to a new permit application within 12 months from the date of permit approval."

- I-209 9-2, 1, 1st para., line 4, CHANGE "powder", substitute with "grains".
- I-210 9-2, 1, 2nd para., line 6, CHANGE "2,000", substitute with "5,000". REASON: Many Oriskany wells were drilled with cable tools rigs to 5,000 feet.
- I-211 Figure 9.1, COMMENT: This is not typical of rotary rigs used to drill shallow oil wells.
- I-212 9-3, line 1, ADD "excessive" before phrase, "amounts of water are encountered".
- 1-213 9-3, 1st full para., line 4, CHANGE line 4 to read, "...through sait layers to prevent the salt from dissolving and rapidly enlarging the borehole."
- I-214 9-3, 2nd full para., line 4, CHANGE sentence beginning with, "Mud is.." to read, "Mud is also expensive to dispose of properly."
- I-215 9-3, 2nd full para., line 8, CHANGE "or" to "and" so line reads, "...needed and used when unusually high formation pressure and volumes are..."
- I-216 9-4, 1st para., line 6, CHANGE "small" to "smaller".
- I-217 9-4, 1st para., line 11, CHANGE to read, "..."production casing" may extend the full length of the well and is used to carry..."
- I-218 9-4, 4, GENERAL COMMENT: All contractors are responsible for the safe operations and training of employees. Further, these safety regulations are covered by federal law under OSHA and are not a responsibility of the DEC.
- I-219 9-5, 1st full para., line 3, DELETE phrase beginning with "...motivated and retained to become career oil field staff."
- 1-220 9-5, 2nd full para., line 1 beginning with "Therefore.." should be CHANGED to read, "It is required by federal law that first aid and emergency procedure information be posted in a conspicuous place should these be needed in the case of an accident." DELETE the next sentence and replace with, "Contractors are required by federal law to have the appropriate equipment on site."
- 1-221 9-5, 3rd full para., CHANGE paragraph to read as follows: "It is advised that employee clothing should be well-fitted (not loose) and include long sleeves and pant legs, and that employees not wear jewelry, that hair be short or tied-back, and safety shoes, hard hats, goggles, face shields for welding, safety glasses and/or hearing protection be worn as needed. Employee protection against falls has been taken into account by having safety belts,

- I-208 Support for the recommendation to extend the expiration date of drilling permits to 12 months is noted. Transfer of permit fees is covered by 6NYCRR Part 552.4(a).
- I-209 Delete the phrase "to a powder."
- I-210 Although many wells in the past have been drilled deeper than 2,000 feet with cable tool rigs, present day economics restrict the use of cable tool rigs to shallower wells as stated in the GEIS.
- I-211 Correction noted. However, the majority of wells drilled in New York State at this time are not shallow oil wells.
- I-212 The sentence is correct as written. The word "excessive" is intended to modify both "pressure" and "amounts of water."
- I-213 The suggested change would not appreciably alter the intent of this sentence.
- I-214 The suggested change is correct but it would not appreciably alter the intent of this sentence.
- I-215 The suggested change would not appreciably alter the intent of this sentence.
- I-216 The suggested substitution of "smaller" for "small" in this sentence would be more technically correct.
- I-217 The suggested substitution of "may extend" for "extends" in this sentence would be more technically correct.
- I-218 As stated in the response to I-192, federal regulatory agencies usually do not have sufficient local enforcement staff. In addition, OSHA regulations are not comprehensive with respect to drilling rig safety. Many aspects of rig safety, such as blowout prevention equipment guidelines which could have a direct effect on the environment, are left to the states to regulate.
- I-219 The suggested removal of this phrase has merit.
- I-220 The recommendations in this paragraph are not yet part of the federal (OSHA) requirements.

lifelines and lanyards of suitable strength to protect them."

- I-222 9-6, 1st full para., line 4, ADD phrase at sentence ending on line 4 to read, "....as specified in OSHA regulations."
- I-223 9-6, 1st full para., line 8, ADD sentence at beginning of recommendation to read, "When blowout preventers are used under extraordinary circumstances, the process is for the drilling contractor to make regular operating tests.
- 1-224 9-7, b, REWRITE this section to coincide with SPCC regs.
- I-225 9-8, 1st para, line 1, QUESTION: What are the new regulations referred to in this sentence? We recommend that line 7 of the recommendation be CHANGED from "one barrel of oil" to "10 barrels of oil in aggregate." The sentence beginning on line 7 should be DELETED as safe operations are already covered by OSHA regulations. The last sentence of the recommendation should be CHANGED to read as follows: "All drilling contractors must be registered in New York State."
- I-226 9-8, B. 2nd para., ADD phrase at beginning of sentence to read, "Although most conductor casing is driven, when the hole...."
- I-227 9-9, line 6, ADD final sentence at the end of this paragraph to read, "Because of this requirement, conductor strings in primary aquifers are routinely drilled rather than driven."
- 1-228 9-9, 1st full para., line 8, ADD phrase at the end of sentence to read, \*...however, grouting from the surface may not accomplish a complete seal between conductor and formation which may cause damage to the aguifer.\*
- I-229 9-9, 2nd full para., QUESTION: Are these steps required of water well drillers and others penetrating aquifers?
- I-230 9-9, 3rd full para., line 2, ADD sentence to read, "This occurs only if the conductor hole is drilled and the conductor cemented back to surface."
- I-231 9-11, line 1, 1st sentence, QUESTION: Under what conditions can surface casing be omitted?
- F232 9-11, 2nd full para., 1st sentence, DELETE this sentence. REASON: Inadequate cement jobs can result from poor hole conditions, rather than industry's reliance on a "recipe."
- 1-233 9-11, 2nd full para., line 5, CHANGE first part of the sentence beginning on this line to read, "Many New York operators do not practice reciprocating (rotating or moving) the... and ADD phrase at the end of this sentence to read, "...however, reciprocation and rotation can cause lost circulation during cementing resulting in a poor cement job. The primary purpose of
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- I-221 The suggested text changes do not significantly change the intent of this paragraph.
- I-222 These requirements are not yet specified in OSHA regulations.
- I-223 The suggested wording does not significantly change the intent of the recommendation.
- I-224 Federal regulations do not supersede or substitute for State regulations as previously stated. In addition, the existing State regulations detailed in this sentence are intentionally more stringent than the federal requirements.
- I-225 The phrase "New regulations require" should be replaced with the phrase "Article 12 of the Navigation Law requires". With respect to spill and leak notification, reasonable alternative proposals will be considered during the rulemaking process. See response to I-218 with respect to OSHA regulations and rig safety. Change the last sentence to read: "All contractors who drill wells regulated by the Division of Mineral Resources must be registered in New York State."
- I-226 The suggested additional clarification is given in the next sentence of the text.
- I-227 The suggested additional wording is correct.
- I-228 Generally, the conductor pipe is not of sufficient length to extend into subsurface aquifers. It is recognized that a complete seal over the entire length of the conductor pipe will probably not be achieved with surface grouting. The primary intent of these requirements is to have a sufficient seal at the surface to prevent penetration of surface contaminants.
- I-229 The DEC supports regulation of water well drillers; however, legislation to this effect has not yet been passed.
- I-230 The suggested addition adds nothing to the intent of this sentence.
- I-231 The circumstances under which this is allowed are detailed in the preceding text on page 9-10.
- I-232 This sentence would be more technially correct if worded as follows: "Inadequate cement jobs can result from the use of a standard recipe of cement weights and additives when borehole conditions dictate that special consideration be given to the design of the cement slurry."

reciprocating and rotating is to remove mud that may be used when drilling. Mud is not commonly used in New York State."

- 1-234 9-11, 2nd full para., line 10, ADD phrase after the word "used" on this line to read, "...as required by state law."
- I-235 9-11, 3rd full para, line 1, ADD phrase after "the rig" to read "...that will disturb the casing..." ADD sentence to this paragraph that reads, "This time is used to service the rig - an activity that will not disturb the cement job."
- I-236 9-12, line 3, DELETE phrase "...or during a routine well drilling site inspection." REASON: Logging must be performed in a timely fashion to ensure effective cementing operations.
- I-237 9-12, line 12, DELETE sentence beginning on this line and REPLACE with, "This information is given on the well completion form." REASON: The form is already being used.
- I-238 9-13, 1st, full para., COMMENT: Grouting may not achieve what is intended by the State. Other states, such as Pennsylvania, have eliminated grouting because of problems associated with the potential to cap in gas, thereby forcing its migration into water supplies in some instances.
- 1-239 9-13, 1, line 3, ADD new sentence after sentence ending "...February, 1985" to read, "Industry and the state worked cooperatively on developing the new requirements."
- I-240 9-13, 1, line 5, DELETE "is published", REPLACE with "is adopted".
- 1-241 9-13, 1, line 5, CLARIPY statement beginning on this line. What revisions are being referred to EIS or GEIS?
- I-242 9-13, 1, 2nd para., line 6, CHANGE "2,700 psi" to "1,800 psi" REASON: Pipe will be cemented back to surface anyway.
- I-243 9-13, 1, bottom of 2nd para., ADD line to read, "The DEC should be required to have an inspector available within eight hours notice."
- 1-244 9-14, 1st full para, line 2, ADD phrase after "wells" to read, "...for which there are no existing drilling practices regulations,""
- I-245 9-14, 2nd full para., last line, ADD phrase at end of sentence to read, "however, since no regulations exist for water well drilling, these problems could result from improper water well drilling and construction."
- 1-246

9-14, 3rd full para., last line, ADD new sentence after last

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- I-233 Reciprocation is not a standard New York State practice, but it is recommended by many industry experts. We agree that improper reciprocation techniques can cause pressure surges which could result in lost circulation. However, there are many benefits of rotation and reciprocation. While the primary purpose of rotation or reciprocation of pipe may be mud removal, other purposes include improved circulation and reduction in cement channeling.
- I-234 The casing and cementing guidelines only state that cement baskets shall be installed above major lost circulation zones. See page 9-15.
- I-235 This suggested addition is correct.
- I-236 This paragraph is discussing logs that would be run after cementing operations to verify cement top and/or bond. The temperature log would only be effective for a short time after the cementing operations, but a cement bond log can be run at any time.
- I-237 The suggested change is correct. The new completion form was adopted during the preparation of the GEIS.
- I-238 Where this situation is likely to occur, the operator should discuss a waiver of this requirement with the Regional Minerals Manager.
- I-239 Comment noted.
- I-240 The suggested change is not necessary because reviews are made and approvals are obtained before the final GEIS is published.
- I-241 The reference is to the GEIS.
- I-242 Reasonable alternative requirements will be considered during the final rulemaking process.
- I-243 The State makes every effort to have an inspector available within eight hours.
- I-244 See response to I-229.
- I-245 This point is made more appropriately elsewhere in the text. See page 8-22.

sentence to read, "It is also noted that the implementation of surface casing cementing guidelines with some alterations could be applied to water well drilling operations." REASON: Most contamination of water wells occurs from surface entry.

- 1-2471 9-14, Surface Casing Guidelines. COMMENT on this section: The regulations and permit conditions should be equally enforced and complied with in all DEC regions.
- 1-248; 9-15, last statement after #11 at the bottom of the page, line 1 of final paragraph, ADD the phrase "within five days" so that this line reads, "When requested by the department in writing within five days..."
- 9-16, 1st para., line 4, ADD phrase at end of sentence to read "as specified in the GEIS." REASON: The GEIS encompasses those 1-2491 areas requiring special regulations.
- 1-2501 9-16, #12, line 1, ADD the word "design" so that this line reads, "The production casing cement design shall extend ... "
- 9-16, #12, line 6, ADD phrase to sentence ending on this line to read, "but as the frontiers in New York State become deeper, 1-2511 this may not be possible, and could be detrimental in deeper producing horizons."
- 1-252 9-17, 1st para, line 1, ADD phrase "within five days" so that the sentence reads, "When requested by the Department in writing within 5 days...\*
- 1-253 9-17, 2nd para, line 4, ADD phrase at end of sentence to read, "as specified in the GEIS."
- 1-254| 9-17, Note (1): DELETE this note. REASON: The State sets these requirements.
- 9-18, 1st full para., line 4, CHANGE sentence beginning on this 1-2551 line to read, "Cement will filtrate into permeable zones." COMMENT: This is a reason why grouting is not advisable.
- 9-18, 1st full para, line 6, ADD phrase so that sentence 1-256 beginning on this line reads. The majority of these situations are temporary and may be due to unregulated water well drilling..."
- 1-257 9-18, 1st full para, DELETE last sentence. REASON: Interferrence in agreements between landowner and operator.
- 9-18, D, line 2 and line 5, DELETE the word "high" in these two 1-2581 sentences.
- 1-259 9-18, D, line 6, DELETE the word "high" and ADD a phrase to read, but this is not applicable to cable tool rigs."

- I-246 See response to I-229. I-247 We agree with this comment. I-248 The Department has no time limit for requesting pertinent records or information. I-249 The text is correct as written. The suggested addition is limiting in nature. I-250 The text is correct as written. The suggested addition would change the intent of the requirement. I-251 In the stated situation, intermediate casing might be appropriate. I-252 See response to I-248. I-253 See response to I-249. I-254 The note is included because it is necessary to follow manufacturer's specifications for minimum hole size to avoid problems such as stuck casing. I-255 is noted, I-256 See response to I-245. I-257 This is not a suggested State requirement. Any responsible operator would
  - I-258 This is a general description of a blowout. It is not specific to New York.
  - I-259 The suggested changes alter the intent of the text.

- The suggested change is technically correct. Comment regarding grouting
- volunteer to replace the affected landowner's water well in this situation.

- I-260 9-19, 2nd para., "lines 1 and 2, ADD the phrase "or screwed" so that these two lines read, "The BOP is flanged and bolted to the spool which is flanged and bolted or screwed to the casinghead. The casinghead is welded or screwed to the top of the surface casing."
- 1-261 9-21, 2nd full para, line 7, ADD sentence to read, "Casing grade and weight may not be known on older wells."
- I-262 9-21, 2nd full para., line 7, DELETE recommendation. REASON: The revised drilling permit application form is already being used. COMMENT on the newly revised form: IOGA has proposed some minor revisions to the form (Attachment #2).
- I-263 9-22, E. 1st para., line 2, DELETE sentence beginning on this line. REASON: The statement is too general. Production string size can vary greatly.
- 1-264 9-22, 2nd para., line 8, DELETE phrase "and a listing of emergency duties."
- I-265 9-23, 1st full para., line 3, ADD phrase "from the completion zone" after the word "casing." REASON: This further explains current regulations.
- I-266 9-23, 1, 1st para, line 3 of the recommendation, CHANGE word "proposed" to "recommended." On line 4, ADD a phrase so that the end of the sentence reads, "aquifers be cemented from the bottom to the surface." IOGA AGREES with the recommendation as reworded.
- 1-267 9-24, 2, 2nd para., line ll, DELETE phrase "under fixed conditions" REASON: This could be confusing and the definition is complete without this phrase.
- I-268 9-24,2, 3rd para., IOGA AGREES with the DEC's understanding of testing programs.
- 1-269 9-24, 2, 3rd para., DELETE this recommendation. REASON: It is standard operating practice. Well testing information is proprietary and well testing programs apply mainly to gas wells and should not be in a general section. Further, well test results are reported on completion reports.
- 1:270 9-25, 1st para., lines 1,2, and 3, REWRITE as follows: "There are open hole completions. Instead of running the full length of the wellbore, the production casing is set above the producing formation." DELETE last three sentences of this paragraph. REASON: Open hole completions are not always the simplest due to plugging back, cement drill outs, etc., and are not always less costly. It is standard industry practice to do this in some areas, however, and it can increase efficiency in recovering the hydrocarbons.

- I-260 We agree. Since screwed connections are allowed in New York, this recommendation should be added to the text.
- I-261 We agree that the casing grade and weight may not be known in some older wells. The suggested change to the text is not appropriate to this section because the overall focus is on new wells.
- I-262 Correction noted. The drilling permit form has been revised to include casing weight and grade.
- I-263 This is the most common size production casing in New York. This statement is true for New York; thus, "In New York" should preface the sentence.
- I-264 The sentence should be corrected to state "A listing of crew member responsibilities for blow-out prevention control must be posted in the dog house by the drilling company."
- I-265 6NYCRR Part 554.4(d) requires sufficient cement behind the production casing to prevent any migration of oil, gas or other fluids behind pipe whether flow be from the production zone or other intervals.
- I-266 The suggested changes would alter the intent of the proposal.
- I-267 Correction noted. The phrase "under fixed conditions" should be deleted.
- I-268 Comment noted.
- I-269 The Regional Minerals Manager must be aware of oil and gas activities in his or her region that have potential for adverse environmental impact.
- I-270 The first two sentences would be more correct if reworded as follows: "Open hole completions are those where the production casing is set just above the producing formation instead of running the full length of the wellbore. Open hole completions can present problems." The last sentence is correct as written.

- 1-271 9-25, 2nd para., line 1, CHANGE "most" to "some". REASON: Open hole completions have been used routinely in shallow oil wells and a growing number of gas wells.
- 1-272 9-25, 2nd para,, line 7, DELETE phrase "Gas and water" in sentence beginning on this line.
- 1-2731 9-25, 2nd para., line 10, DELETE last sentence in this paragraph. REASON: It is technically incorrect.
- 1-274 9-26, line 4, CHANGE "every Medina well" to "some Medina wells"
- 1-2751 9-26, line 6, DELETE last sentence. REASON: Very seldom are 100% returns of fluids seen.
- 1-276 9-26, 1, 2nd para., line 5, CHANGE line to read, "... New York the pressure can range from between 400 to 4,000 psi."
- 1-277 9-26, 1, 2nd para., line 8, DELETE phrase "in width" in this line.
- 1-2781 9-26, 1, 2nd para., DELETE "once sufficient" and REPLACE with "as".
- 1-2791 9-27, line 4, DELETE sentence beginning on this line. REASON: It is technically incorrect.
- 1-2801 9-27, 1st full para., line 2, DELETE "with coiled tubing and nitrogen" and REPLACE with "by mechanical means." REASON: This is not common practice in New York. Other means are used, such as swabbing, etc.
- 1-2811 9-27, 1st full para., line 5, ADD phrase at end of last sentence to read "and to increase surface area for water injection in a waterflood."
- 1-2821 9-27, 2, 1st para., DELETE this paragraph. REASON: It is not true.
- 1-2831 9-27, 2, 2nd para., line 1, CHANGE first sentence to read, "Foam fracturing systems typically contain only 20 to 40 percent liquid with the remainder being nitrogen."
- 1-2841 9-28, 3, 1st para., line 7, DELETE sentences beginning with "Sometimes this method..." and "Wastes from..." REASON: These situations are already covered by regulations and penalty provisions are in place if they do occur.
- 1-285[ 9-28, 3, 1st para., last sentence, DELETE this sentence. REASON: Statement is inflammatory and unwarranted.
- 1-2861 9-29, 1st full para., line 5, DELETE sentence beginning on line 5. REASON: Frac valves are used to control any flowback.
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- 1-271 Although most shallow oil wells are completed open hole, these wells currently represent only 5% of the new well completions. Some new gas wells are also completed open hole, but cased hole completions are more common. Therefore, the sentence starting "In most new wells in New York . . ." is correct.
- I-272 These sentences should be reworded as follows: "Gas, oil and water zones can be isolated by selective perforation of the casing as long as adequate cement bond exists between the zones behind pipe. Perforated casing completions . . ."
- 1-273 Reword as follows: "Since most gas wells in New York must be stimulated to produce, setting casing across the producing zone and perforating is the preferred method of completion. In some areas of the State the open wellbore is so competent that it can be perforated and hydraulically fractured like a cased and cemented well."
- I-274 Correction noted. The word "every" should be deleted from this sentence. I-275
- Correction noted. Insert the words "most of" into the sentence before the volume information.
- I-276 Discussion in this section concerns typical surface pressures required during stimulation, not absolute stimulation pressure ranges.
- I-277 The suggested change is more technically correct.
- I-278 Replacing the word "Once" with the word "When" is preferable to replacing it with "As".
- I-279 The phrase "back up without a trace" should be deleted.
- I-280 The phrase should be reworded as follows: ". . . must be assisted by mechanical means such as swabbing or coiled tubing and nitrogen."
- I-281 Addition of the phrase "or for the movement of injected water from the wellbore through the formation" would better convey the information.
- I-282 Foam fracs which have gained popularity in recent years can cause gas marketing problems for some New York wells. Wells fractured with foam. which contains nitrogen, will flow back gas containing increased amounts of nitrogen for a period of time. Nitrogen has no heating value, and many pipelines limit the amount of nitrogen they will accept in purchased gas. Recently, marketing problems resulting from nitrogen contamination have been minor.

I-283 The suggested text change is more technically correct. I-284

- A description of possible problems is appropriate.
- I-285 We agree the phrase ",abrade paint off cars," should be deleted from the last sentence.

I-286 See response to I-284.

- I-287 9-29, 2nd full para., line 2, DELETE phrase "in about 50 percent of the" and REPLACE with "many" REASON: The 50 percent figure is not documented.
- I-288 9-29, G. COMMENT: The definition of "completion" in the regulations and on the completion form is not the same.
- I-289 9-30, 1st full para, line 10, COMMENT: The two sentences in bold print are not new recommendations.
- I-290 9-30, 2nd full para., DISAGREE with the need to implement this recommendation. REASON: These situations are already covered under existing regulation. There is a need for greater guidance in completing the form.
- I-291 9-32, 1st full para., DELETE this recommendation. REASON: Walls with angles of less than 45 degrees could cause problems with fluid loss from the pit, plus a substantial increase in surface disturbance could occur in constructing the pit. If any limitations on angle are made, they should only be made for two walls of the pit. And, as stated, on p. 9-31, "the best type of pit construction will vary with well location."
- 1-292 9-32, 3, 1st para, line 6, DELETE sentence beginning on this line. REASON: It is irrelevant due to types of waste fluids. Line should be REPLACED with, "Clay lined pits function adequately for temporary fluid containment."
- -293 9-32, 3, line 9, DELETE "factory" replace with "effectively".
- 1-294 9-33, line 6, COMMENT: IOGA doesn't disagree, but pit size, direction and containment need to be decided on a site-by-site basis.
- 1-295 9-33, 1st full para., line 7, IOGA AGREES with this recommendation.
- I-296 9-34, 1st full para., line 1, DELETE first sentence. REASON: It is impractical and unreasonable. Field installation is adequate.
- 1-297 9-34, 4, Pitless Drilling. COMMENT: IOGA AGREES that this technique may be desireable and would like to see regulations to allow for this action in other settings as well.
- I-298 9-35, 5, GENERAL COMMENT: Tanks are on site during the drilling phase. There are usually no permanent tanks.
- I-299 9-35, 5, 2nd para., line 4, CHANGE "are required" to "may be required"; line 5, DELETE "all" before the word "permanent".
- I-300 9-35, 5, 2nd para., line 8, IOGA doesn't necessarily disagree, but this may not be the best practice because vegetation keeps dike walls in place.
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- I-287 Regional field staff estimated that tanks were used in about 50 percent of the flowback operations. Whether the text states "about 50 percent" or "many" makes no appreciable difference.
- I-288 There is no definition of "completion" on form 85-15-7.
- I-289 It is true that this information has been required for several years, but these requirements have not been formalized into regulations.
- I-290 Submissions of specific suggestions for better guidance in completing the form will be reviewed. This sentence recognizes that the regulation exists, but states non-compliance is a problem.
- I-291 Low-angle pit walls are not being recommended for every well. The commentators should submit information to DEC substantiating their claim. Reasonable alternative proposals will be considered during the rulemaking process.
- I-292 The adequacy of a clay-lined pit for containing brine depends on the chemical nature of brine and clay used. Calcium chloride brines in particular can cause permeability problems in pits lined with a clay which contains sodium ions. Clay lined pits can also react chemically with any acidic wastes.
- I-293 Manufacturer information gathered by this Department indicated that factory installed seams were the most effective. Reasonable alternative proposals will be considered during the rulemaking process.
- I-294 This recommendation does not preclude site-specific determination of pit requirements.
- I-295 Support for the proposed minimum pit liner standards is noted.

I-296 See response to I-293.

I-297 Support for additional regulations allowing pitless drilling is noted. Reasonable additions to existing and proposed regulations will be considered during the rulemaking process.

I-298 Comment noted.

I-299 The current regulations in 6NYCRR Part 556.4(c) state. "When it is deemed necessary by the Department for the protection of life, health, or property, the Department may require any lease or other oil storage tanks be surrounded by an earthen dike . . . "The Department deems diked oil tanks necessary where an oil spill would result in contamination of surface and groundwaters. Therefore, this sentence is correct as written.

I-300 The sentence that the space within the dike must be kept free of <sup>4</sup> vegetation, not the dikes themselves, was taken directly from the existing regulations (6NYCRR Part 556.4(c)). Reasonable revisions to these regulations will be considered during the rulemaking process.

- I-301 9-36, b, 2nd para., line 4, DELETE "chromium" REASON: It not used in drilling muds in New York State.
- 1-302 9-37, d, 2nd para., line 1, CHANGE "all" to "some".
- I-303 9-38, 1st full para., line 1, CHANGE line to read, "Some produced fluids from the shallow Devonian shales can have barium levels from...", line 3, CHANGE sentence beginning on this line to read, "The produced fluids from the Medina sand can have..." REASON: Chemical characteristics of various formations are not the same, can vary from location to location, and will not help general permit effort.
- I-304 9-38, 2nd full para., line 1, DELETE this sentence. REASON: It is irrelevant to the section on the drilling phase of operations.
- 1-305 9-39, a, 3rd para., COMMENT: AGREE with this paragraph.
- I-306 9-41, d, 1st para., 2nd last line, DEFINE "sufficient quantity and long period of time." What quantity? What period of time?
- I-307 Table 9.2 DELETE Column C and source reference. REASON: It is irrelevant. No values are given.
- I-308 9-44, 8, 2nd para., line 2, ADD sentence to read, 'Dual permitting requirements under state and federal guidelines make the procedure for actually placing a disposal injection well in operation a very long (years) and expensive proposition.

### CHAPTER X - WELL COMPLETION AND PRODUCTION PRACTICES

- 1-309 10-1, B, Recommendation beginning on last line: DEFINE what is meant by "partial restoration" in this context.
- I-310 10-2, 1, lines 1 and 2. DELETE references to Christmas tree. REASON: Term as commonly applied does not cover equipment used in New York State.
- I-311 10-4, Formula. COMMENT: Should be in a top to bottom and left to right order.
- I-312 10-6, Produced Brine. COMMENT: DEC fails to make the distinction between blow boxes and flow-through separation pits associated with SPDES permits.
- I-313 10-6, Produced Brine, line 7, ADD phrase to sentence ending on this line to read, "but this does not apply to flow-through separation pits associated with SPDES permits and/or lined temporary brine storage ponds."
- 1-314 10-6, Produced Brine, line 7, DELETE sentence beginning on this

- I-301 The GEIS recognizes that drilling mud is rarely used in New York. However, were drilling mud to be used chromium ligno-sulfonate, a common mud conditioning additive, might be used in non-aquifer areas.
- I-302 The word "most" should be inserted in place of the word "all".
- I-303 Correction noted. The word "can" should be added to these two sentences.
- I-304 Correction noted.
- I-305 Comment noted.
- I-306. Sufficient quantity and length of time needed for a substance to pose an environmental threat would depend on site-specific conditions and the substance composition.
- I-307 Comment noted. This table was taken as published in the Upstate Groundwater Management Plan.
- I-308 The suggested addition would be more appropriate in Chapter 15.
- I-309 Partial restoration means restoration of that portion of the site not needed for production. Full restoration would occur only after plugging and abandonment.
- I-310 See response to I-146.
- I-311 Comment noted.
- I-312 This section applies only to gas wells. Flow-through separation pits are associated with oil production.
- I-313 The suggested additional wording is not necessary as this section clearly applies to producing gas wells. The term "brine blowbox" or "brine blowdown pit" should have been used instead of the term "brine disposal pit."

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line. REASON: Blowboxes are no longer authorized as of June 1987.

- I-315 10-7, line 2 ADD phrase so that end of sentence on this line reads, "may increase or decrease up to five barrels a day."
- I-316 10-7, 2, 2nd para., line 4, DELETE "the" so that sentence beginning on this line reads, "Paraffin clogs in small underground plastic flow lines..." REASON: Most flow lines are steel.
- I-317 10-7, 2, 3rd para., line 3, DELETE phrase starting with "stock tank" to the end of the sentence and REPLACE with "specialized separation vessels for separating oil and water."
- I-318 10-8, sentence beginning on line 4, COMMENT: This would be a rare occurrence.
- 1-319 10-9, line 4, DELETE rest of paragraph beginning in bold print on line 4 through the end of the paragraph. REASON: Current regulations allow for fines to be imposed if these situations occur and the special permit conditions could encourage discriminatory practices against operators. In addition, well tenders monitor wells in New York State.
- 1-320 10-9, 1st full para., COMMENT: The statements made in this paragraph seem to contradict theory on page 10-10, paragraph 3.
- I-321 10-10, 3rd para., line 9, QUESTION: Are these numbers correct? The concentrations are very small to have an environmental impact.
- I-322 10-11, Produced Brine, line 6, ADD sentence before recommendation to read, "In addition, some produced brine is disposed of in municipal wastewater treatment facilities or brine injection wells."
- I-323 10-11, Produced Brine, line 6, COMMENT on recommendation: New York State does not have a large commercial facility for brine disposal or oilfield waste materials. Further, prior to drilling, an operator doesn't know the guantity of brine to be encountered or if any brine will be encountered. In any event, an approved plan is required for disposal - why must this must done in advance?

1-324 10-12, line 1, CHANGE "150'" to "100'".

1-325 10-12, 3, GENERAL COMMENT. The Bass Island production regulations have not necessarily prevented waste. The production allowables and required pressure testing have, in fact, decreased and, in some cases, stopped production. The industry has pointed out that the reservoir is a fault fracture, and not matrix. Therefore, matrix production gas/oil ratios are not applicable

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- I-314 Blowboxes are no longer authorized. Enforcement action is currently being taken against those operators who have not complied with the blowbox or blowpit elimination order.
- I-315 Correction noted. The sentence should read, "As the well gets older the volume of brine may increase or decrease."
- I-316 Correction noted. The sentence should read "Paraffin clogs in the small flow lines have also been known to cause the lines to rupture or leak."
- I-317 The suggested wording is technically correct.
- I-318 Comment noted.
- I-319 As part of the current administrative enforcement process, an operator who consistently had this problem could be given a choice between paying a stiff fine or installing automatic shut down equipment. Such permit conditions might be appropriate mitigation for a wellsite in a sensitive wetland. These actions in either case are not discriminatory.
- I-320 The referenced sections do not contradict each other.
- I-321 This discussion deals with the concentrations of pollutants that could inhibit microbe metabolism, not the concentrations which would have environmental impact.
- I-322 The suggested addition is appropriate.
- I-323 A conscientious operator will plan in advance for waste handling and disposal.
- I-324 Reasonable alternative proposals will be considered during the rulemaking process.

and are not necessarily prudent production practice. The State has the Bass Island reservoir listed as a fracture reservoir on the Oil and Gas Map and on 1985 and 1986 production reports. State pressure testing and pooling have further indicated linear fracture reservoirs. IOGA believes production regulations should now be updated to conform with testing and production results.

1-326 10-12, 3, 1st para., line 4, DELETE phrase beginning on this line with "whether the operator...practices", REPLACE with "reservoir drive mechanism."

- I-327 10-12, 3, 2nd para., line 2, CHANGE regulatory reference from "556.8" to "554.8".
- 1-328 10-12, 3, 2nd para., line 7, DISAGREE with recommendation. IOGA feels that proper enforcement of existing regulations should suffice, but suggests that wording of recommendation be changed as follows:

\*Por this reason, it is recommended that a notice of intention be required for any operation that will in any manner alter the casing, permanent configuration, or designated use and status of a well. It is not the intention of this recommendation to require a permit for routine well servicing. Notification will be required for the following action:

- To perforate casing in a previously unperforated interval for the purpose of production and injection in existing zone

- To mill out or remove casing or liner

- To run and cement casing or tubing

- To drill out any type of permanent plug

Permits may be required for the following actions:

- To redrill or deepen any well

- To set any type of permanent plug (bridge, cement, sand, gravel, gel, etc.

No notification is required for the following actions:

- To run and set an inner string or casing or liner

- To run and cement an inner string of casing, liner or tubing - To repair damaged casing by means of cementing, or by placing a casing patch, swaging, etc.

REASON for deleting "possible permit" in recommendation: time frame for permit application procedures would not be conducive to responsible operations and these activities are inconsequential environmental actions. Further, it could significantly increase the paperwork burden on operators. The notice of intention should suffice.

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I-325 Comment noted.

I-326 The suggested change would alter the intent of this section on production reports and conservation of resources. The intent of the sentence was to state that the gas-oil ratio is one indication of prudent production practices.

I-327 Correction noted; change "556.8" to "554.8".

REASON for deleting notification requirements for some items listed above: these are normal actions which occur in the course of routine operations.

#### CHAPTER XI. PLUGGING AND ABANDONMENT OF OIL AND GAS WELLS

- 1-329 11-1, A, 4th para., line 3, DEFINE "severe problems" as used in this context.
- I-330 11-2, line 9, COMMENT on sentence beginning on line 9: This would create large amounts of temporary surface damage in areas surrounding old wells.
- I-331 11-2, 1st full para., line 2, ADD a phrase so that the beginning of the first sentence reads, "In actively plowed agricultural areas..."
- I-332 11-3, line 2, CHANGE to read, "...good conscience, a few old, abandoned wells may have caused serious localized environmental problems. Most wells have never caused any environmental problems."
- 1-333 11-3, 2, 2nd para., line 4, DELETE phrase "Until new regulations are written" and begin sentence with, "It has been the...."
- I-334 11-4, C, line 4, DELETE "natural" so that first part of sentence reads, "A bentonite mud..." REASON: What is unnatural bentonite mud?
- 1-3351 11-4, C, line 7, IOGA AGREES with the recommendation.
- **1-336** 11-5, 2nd full para., line 2, DELETE "small" in sentence beginning on this line, REPLACE with "any".
- 1-337 11-5, 3rd full para., line 5, DEFINE phrase "a small percentage" in this context.
- I-338 11-6, E, line 9, COMMENT: There is no reference in existing regulations to perforating or ripping casing. Line 12, ADD phrase so that this line reads, "...uncemented surface casing recovery inadvisable, three reasonable attempts must be made..." REASON: There must be some limit to what will be expected so that expense and effort is worthwhile, and not futile. For example, rigs commonly used to plug shallow oil wells could not be used if the proposed recommendation is adopted. There are not enough cable tool rigs in New York to plug the number of shallow wells that should be plugged if every well has to be ripped.
- 1-339 11-6, 1, 1st para., line 4, DEFINE term "surface water bodies" as used in this context.
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- I-328 This reasonable alternative will be considered during the rulemaking process.
- I-329 A "severe problem" would generally be defined by the operator. The problem is severe when he judges the cost and/or technical difficulty would make continued drilling inadvisable.
- I-330 The basis for this comment cannot be found in the referenced sentence.
- I-331 The casing cut-off requirement should not be restricted to actively plowed areas. Over the years, farmers commonly rotate the use of their agricultural lands.
- I-332 The Department has reliable information to support the contention that several old abandoned wells have caused serious localized environmental problems. Therefore, we do not agree with the suggested change, but do agree that a change from "many" to "some" would be appropriate.
- I-333 The introductory phrase gives a sense of history of the Department's regulatory program. This has been our practice throughout the text of the GEIS.
- I-334 The suggested change is more technically correct, but the word "natural" was added to deliberately emphasize that the use of synthetic muds would not be appropriate.
- I-335 Support for the minimum mud density and gel-shear strength requirements is noted.
- I-336 The use of the word "small" is meant to convey the idea that a smaller volume plug stands a greater chance of being contaminated and creating a poor cement plug than a larger volume one. We realize that other sized plugs could also be contaminated.
- I-337 The term "small" is used in the relative sense. The specifics would be determined by the operator before a particular cement job is undertaken. Commonly 5% bentonite is added to reduce shrinkage.
- I-338 Although no direct reference is made in the current regulations to perforating or ripping casing, the current regulations call for a well to be plugged in such a manner as to prevent migration. With uncemented casing the only way to prevent migration is to pull, rip or perforate prior to placing cement. The material in bold type is meant for consideration in future regulations. Reasonable alternative proposals will be considered during the rulemaking process. In many cases, one conscientious attempt would be sufficient.

See response to I-153.

I-339

- I-340 ll-7, 2, a, line 5, DELETE sentence beginning on this line. REASON: It is covered in the sentence immediately following. Line 7, DELETE first part of sentence and ADD phrase so that sentence reads, "The regulations and common sense prohibit operators from shutting-in wells capable of commercial production...."
- 1-341 11-10, 3rd para, ADD statement at the end of this paragraph to read, "The State should make every possible effort to contact the current operator and allow him adequate time to perform the plugging operations under his own supervision."
- 1-342 11-11, b, line 2, IOGA AGREES and feels it is necessary due to the possibility of future opportunities for secondary and tertiary recovery, as well as the potential for impnoved economics in the natural gas market which may make these projects commercially viable again.
- I-343 11-11, F, 2nd para., COMMENT: Plugging regulations should be enacted which outline a generic procedure for plugging and abandonment of wells.
- 1-344 11-12, 1st full para., IOGA DISAGREES with this recommendation. REASON: It would greatly increase plugging and abandonment costs. Cementing facilities would have to be on location for a substantial period of time. Recommendation could triple plugging costs. ADD an option that would allow for an increase in the size of plugs, rather than tagging.
- 1-345 11-13, line 1, DELETE sentence beginning on this line. REASON: The statement is irrelevant.
- 1-346 11-13, line 11, DELETE sentence beginning on this line. REASON: It conflicts with comment on p. 11-12, lst paragraph, line 10, concerning the DEC's feeling that more wells may be plugged under these requirements.
- 1-347 11-15, 1st full para., line 2, COMMENT: Minimum gel requirements would be a new requirement and should be listed in bold-face print. IOGA AGREES with this recommendation.
- I-348 11-15, d, 2nd para., COMMENT: This may be difficult if lost circulation zone is substantial, i.e., a gravel zone.
- 1-349 11-16, 1st full para., line 3, COMMENT: Sentence beginning on this line doesn't need to be in bold print.
- 1-350 11-16, #2, QUESTION: How would one get casing below the shoe plug?

- I-340 The suggested changes are not appropriate to the context of this paragraph.
- I-341 It is understood that the State would make every possible effort to contact and inform the current operator of the need to plug the well.
- I-342 Support for extending the temporary shut-in regulations to all wells regardless of commercial potential is noted.
- I-343 The proposed regulations do outline generic plugging procedures for wells of different type and construction. See pages 11-22 to 11-26.
- I-344 The option of increasing the plug size rather than a mandatory tag of plug location is given, but the State still has the authority to require the location of any cement plugs be verified.
- I-345 The sentence is very relevant to the discussion concerning the proper abandonment of wells in the old oilfields in order to insure protection of potable water zones.
- I-346 The referenced sentences are not in direct conflict.
- I-347 This recommendation is in **bold** type on page 11-4 where it is first proposed, and again in the summary on page 11-23. It is not necessary to emphasize it repeatedly throughout discussion text. Support for the recommendation is again noted.
- I-348 Even if circulation is not possible, zone isolation can be achieved with the proper placement of cement.
- I-349 Although 15-foot cement plugs at the surface are currently required, this requirement is not clearly stated in the current regulations.
- I-350 The shoe plug referred to in this sentence is clearly not the casing shoe plug, but the cement plug just placed across the casing shoe.

- 1-351 11-17, Option 1. COMMENT: This is not a current regulation. IOGA DISAGREES with this option because costs would be excessive due to the need for additional equipment. Temporary surface damage would result. It is believed that there are not enough cable tool rigs in New York to make this a viable option anyway.
- 1-352 11-19, b, line 1, DELETE first sentence. REASON: Operators are not required to rip or perforate any uncemented casing left in the hole.
- 1-353 11-20, line 1, DEFINE "calculated excess" as used in this context. IOGA suggests 25% excess.
- I-354 11-20 c, heading of this section. DEFINE specifically what is meant by "significant brackish" water zones in this context.
- 1-355 11-21, d. 2nd para., line 3, Recommendation should be an option. REASON: This may not be recommended in all cases.
- 1-356 11-22, G. SUMMARY OF THE PROPOSED REGULATORY REQUIREMENTS COMMENT: IOGA feels that all proposed changes to regulatory requirements should have been listed in a separate appendix to the GEIS. IOGA feels that the current plugging and abanconment procedures are adequate and IOGA's suggested changes would enhance the effectiveness of these regulations.

- I-351 This section is a part of the text discussion on possible options to achieve plugging objectives. It is understood that most operators will not usually choose the more expensive option, but that decision is left to the operator.
- I-352 See response to I-338 and I-351.
- I-353 Calculated excess in the context of this sentence refers to the cement amount which might fall into the annulus below the casing stub. Reasonable alternative proposals will be considered during the rulemaking process.
- I-354 In the context of this sentence the word "brackish" could be removed or replaced with the word "saline". The word "significant" should modify "water zones". The reference is to any water zone with a measurable flow.
- I-355 Reasonable alternative proposals will be considered during the rulemaking process.
- I-356 See Topical Response Number 5 on Reasons for Including Proposed Regulations in the GEIS.

# CHAPTER XII. OLD OIL FIELD WATERFLOOD OPERATICNS AND ENHANCED

- 1-357 GENERAL COMMENT on this section: The distinction should be made between primary oilfield recovery and waterflood recovery operations.
- 1-358 12-1, A, 2nd para., line 1, CHANGE phrase "5 to 30 percent" to "5 to 60 percent".
- 1-359 12-1, A, 2nd para., REFERENCE at end of paragraph (Van Tyne, Foster, 1980).
- 1-360 12-1, A, 4th para., beginning on line 7, CHANGE this section to read, ... "bearing zone from an aquifer (water drive) and/or;<sup>1</sup> 4) the force of gravity (gravity drive). In many reservoirs, only one or two recovery mechanisms may exist."
- 1-361 12-3, \$6, CHANGE to read, "Original oil-in-place is the volume of the total pore volume occupied by oil at initial conditions."
- 1-362 12-5, C, 1, 2nd para., line 3, ADD phrase to sentence ending on this line to read, "however, New York oil-wet sandstone can be flooded to a residual oil saturation of 30 to 60 percent."
- 1-363 12-6, last para., line 4, CHANGE sentence beginning on this line to read, "Anaerobic sulphate-reducing bacteria that must be eliminated often proliferate in produced waters."
- 1-364 12-7, line 2, CHANGE sentence beginning on this line to read, "Some sulphate precipitates are relatively insoluble and are..."
- 1-365 | 12-7, line 5, CORRECT spelling to "phosphonates."
- 1-366 12-7, 1st full para., line 1, CHANGE "must" to "may".
- 1-367 12-7, 2nd full para., COMMENT on the use of the terms "open and closed". Open systems are those that typically do not seek to exclude contact of the injected fluid with air. Closed systems are designed to prevent contact of injected fluid with air. Supplemental freshwater is added even to closed systems for makeup. Produced fluid may be injected in either open or closed systems.
- 1-368 12-7, 2nd full para., line 6, CHANGE "more" to "different".
- I-369 12-7, 3rd full para, line 3, CHANGE "production facilities" to "water handling".
- 1-370 12-7, 4th full para., line 1, CHANGE "should" to "may". REASON: All these tests may not be necessary, i.e., temperature is appropriate for gas wells, but not water injection wells; radioactive tracer surveys are not commonly used in this area because if there is a tubing leak it could allow the uncontrolled

- I-357 This chapter primarily concerns waterflood enhanced oil recovery operations.
- I-358 The word "usually" prefacing the range of "5 to 30 percent" means this is an average range. Sixty percent primary recovery would be very exceptional.
- I-359 This information is general textbook knowledge and was not obtained from the given reference. However, the information in the first two sentences of the third paragraph can be found in the given reference.
- I-360 The addition of "and/or" is correct. The next sentence should be reworded as follows: "All four drive mechanisms may be present, but in most reservoirs only one or two recovery mechanisms are present or dominant."
- I-361 The text is correct as written.
- I-362 According to IOCC (1955), initial oil saturations in New York averaged around 45 percent and ranged as high as 60 percent only in the better producing areas. Flooding to a residual saturation of 30 to 60 percent would mean almost no oil was recovered.
- I-363 The suggested wording is correct. "Sulphate-based" should be changed to "sulphate-reducing".
- I-364 The suggested change is more technically correct.
- I-365 Correction noted.
- I-366 The suggested change does not significantly change the intent of the sentence. We do not mean to imply that injection fluids must always be treated, only where reservoir plugging, shale swelling, and corrosion problems are likely to occur.
- I-367 Comment noted.
- I-368 Correction noted. Change "more" to "different".
- I-369 "Production facilities" in this context includes water handling facilities.

loss of radioactive material; annuli are not closed so annular pressure checks are not needed; caliper logging to ensure tubing integrity is not done because the water-in-annulus test is routinely performed as part of the federal UIC program.

- 1-371 12-8, 1st full para., COMMENT: Numbers guoted throughout this paragraph may not be typical for Allegany County and the numbers may vary from well to well.
- 1-372 12-9, 1st full para., COMMENT: The reserve information needs to be updated. Also, if reserve figures are included in the GEIS, they will have to be updated each year. Line 10 should be DELETED as the figure cited is taken from a study done more than 10 years ago and includes <u>all</u> recovery methods, not just enhanced.
- I-373 12-9, a, 2nd para., line 2, CHANGE sentence beginning on this line to read, "The accepted practice was to create an 8 inch hole through the unconsolidated surface deposits."
- 1-374 12-10, 2nd full para., line 4, DELETE sentence beginning on line 4 and REPLACE with "Stimulation methods have changed over the years in the oil and gas fields. However, nitorglycerin may be a more effective stimulation technique in certain shallow reservoirs. The transition from nitroglycerin to other stimulation techniques evolved from individual review of reservoir information and necessary fracture increases."
- 1-375 12-12, 1st full para., line 3, CHANGE paragraph starting with sentence beginning on this line to read, "In New York State, water is typically produced with the oil and the water cut (percentage) typically increases throughout the life of the well. When production is no longer economical, the well is plugged and abandoned. Many of the wells in the old oilfields were not plugged by modern standards." DELETE last sentence unless data can be provided to demonstrate this claim.
- I-376 12-12, 2nd para., COMMENT: Although it is stated that the DEC is aware of problems, no problems are cited in this paragraph. QUESTION: What strategies are the DEC considering and to what end?
- I-377 12-12, b, 2nd para., COMMENT: The information in this paragraph may be more appropriately given on p. 12-9 under Historical Waterflood Operations because it is not currently relevant.
- I-378 12-12, b, 3rd para., line 4, COMMENT: Conversion of production wells to injection wells is not common in this area.
- 1-379 12-13, 3rd para., line 5, DELETE phrase, "As DMN met initial staffing requirements" and START sentence with "In 1982, ..." REASON: phrase is not relevant now.
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- I-370 Correction noted; change "should" to "may". Note: The reason stated by the commentator for not using radioactive tracer surveys is incorrect.
- I-371 "Typical" in the context of this sentence refers to an example of a good waterflooding prospect. It is understood that these parameters vary from well to well.
- I-372 Updated reserve figures are published each year in the Division's annual report. In line 9, "To date" should be changed to "In 1980" and "has been" should be changed to "was". That waterflooding was responsible for production of 14 percent of the original oil in place was taken directly from page 49 of VanTyne and Foster (1980).
- I-373 Change ". . . drive a 10 inch hole . . . " to ". . . drill a 10 inch hole . . . " This comes directly from Interstate Oil Compact Commission (1955), page 4, and this reference should be added to the text.
- I-374 The sentence is correct as written. The preceding sentence in the text states that nitroglycerin might be more effective in certain instances.
- I-375 The suggested text change does not significantly add to the reader's understanding of waterflood production. Proposed waterflood projects have been rejected by both the State and the EPA because of numerous improperly plugged wells on adjacent leases. The fact that improperly plugged wells exist was proven by re-entering some of the old wells.
- I-376 The types of problems that can occur are described in section 4.D. of the GEIS. Although that chapter is historical in nature and the problems have lessened in severity and frequency, there is always a chance for adverse environmental impacts when outdated drilling and completion methods are used. The GEIS and the proposed regulations are part of DECs strategy to better assure environmental protection in the oil fields. The DEC is also working on a supplemental enforcement strategy to address problems specific to the old oil fields.
- I-377 Comment noted.

I-379

- I-378 This is a description of the types of activities waterflood operators may undertake regardless of how common they are. The practice of converting producers to injectors is described by VanTyne and Foster (1980) as one that does occur in New York. In addition, a waterflood project recently approved by DEC staff includes plans to convert several production wells to injection wells.
  - The suggested change does not significantly alter the intent of this sentence. It was the increased staffing levels that enabled the Division of Mineral Resources to implement and enforce more effective casing and cementing guidelines.

- 1-380 12-13, 4th para, line 1, CHANGE "water" to "surface".
- I-381 12-14, 1st full para., line 5, DELETE the following phrase appearing on this line, "of southwestern New York is a sporadic". REASON: This is not specific to southwestern New York.
- 1-382 12-14, 1st full para., lines 6 & 7, DELETE two sentences beginning on these lines and REPLACE with, "These zones may be highly fractured and permeable, or exist as caverns."
- I-383 12-14, 2nd para., line 2, DELETE phrase "approximately 70 percent" and REPLACE with "some".
- 1-384 12-15, 2nd full para., line 4, DELETE sentence beginning on this line. REASON: It is incorrect.
- 1-385 12-15, 3rd full para., line 1, CHANGE to read, "The production and injection strings are usually..."
- i-386 12-15, 4th full para., line 4, DELETE "minimizing formation damage."
- 1-387 12-16, 1st full para., line 3, CHANGE "rubbers" where it appears twice in this line and REPLACE with "elements"
- 1-388 12-16, 1st full para., line 7, CHANGE "1,500 to 3,500" to "400 to 4,000"
- 1-389 12-16, 2nd full para., line 2, CHANGE "rubber" to "element" and "pea gravel" to "filler material". Line 5, CHANGE "pea gravel" to "filler materials". ADD sentence at the end of this paragraph to read, "The above procedures also apply if the formation is not notched."
- 1-390 12-16, 4th full para., line 4, CHANGE "1-inch macaroni string" to "smaller diameter string" COMMENT: Tubing repair not usually part of completion phase. ADD language to clarify this.
- 1-391 12-16, 5th full para., line 3 to end of paragraph on 12-17, CHANGE to read, "If the well is to be pumped, downhole pump equipment is installed. The tubing-to-borehole annulus remains open from total depth to surface where it may be connected to a gas line." DELETE last sentence in this paragraph on page 12-17. REASON: This is not the only acceptable method. Wells that do not have cement around the surface pipe routinely pass UIC mechanical integrity tests.
- 1-392 12-17, 1st full para., DELETE this paragraph. REASON: New York State oil operators do not intentionally cement production tubing into their wells or they would be impossible to produce.

- I-380 Change "water" to "surface".
- I-381 This is a discussion of casing and cementing practices in New York oil fields, and the old oil fields in New York are in the southwestern part of New York. The thief zones are not specific to southwestern New York, but the old oil fields are.
- I-382 The text is correct as written, and gives a better explanation of why lost circulation zones are a problem.
- I-383 This information was obtained from an informal survey of DMN field staff which was made prior to implementation of statewide casing and cementing guidelines in April 1986.
- I-384 This sentence should be reworded as follows: "The plug, displacement water and applied pump pressure can be used to prevent cement backflow."
- I-385 Correction noted. Change ". . . production and injection string . . ." to ". . . production or injection string . . ."
- I-386 Add the following sentence: "However, some operators, particularly those with close well spacing and potential channeling problems, prefer nitro-stimulation with its high velocity detonation and 360° radius of fracturing."
- I-387 Correction noted.
- I-388 See response to I-276. This sentence should be prefaced by "Average".
- I-389 Descriptive field terms were used in the text to better illustrate these procedures to the public. The suggested addition is correct.
- I-390 Correction noted. Change "1-inch macaroni string" to "tubing of smaller diameter". Description of this common remedial recompletion technique is appropriate in this section.
- I-391 Again, descriptive field terms were used in the text to better illustrate procedures to the public. The text would be more technically correct by replacing the word "connects" with "may be connected". The remainder of the paragraph is correct as written.
- I-392 We know that cementing the tubing annulus will result in gas interference and locking of the pump, but it has been reported to DMN staff that some operators do this. It certainly is not a common practice in recent years. It apparently has occurred in the rare circumstance where sufficient waterflood pressure caused some wells to flow.

- I-393 12-17, 2nd full para., line 2, CHANGE to read, by a single well pumping unit, or by jacks connected to a central power unit."
- 1-394 12-18, line 8, DELETE phrase, "as verified by percolation test." REASON: Percolation tests are inappropriate for artificial liners. How could a percolation test be done on a pit that's being used?
- 1-395 12-18, 3rd full para., line 5, DELETE sentence beginning on this line or provide data to substantiate claim. REASON: Conversion of producing wells to injection wells is uncommon today.
- I-396 12-19, c, line 4, CHANGE to read, "...facilities has occurred among New York operators in this past."
- 1-397 12-19, 2nd para., line 6, CHANGE "no" to "little"; Line 7, CHANGE "however" to "can"; Line 8, CHANGE to read, "water source wells can produce..."
- 1-398 12-19, 3rd para., line 2. CHANGE line to read, "...formation. This is a common practice in New York's oil fields."
- 1-399 12-19, 5th para., line 4, DELETE sentences beginning on this line to top of p. 12-20, line 2. REASON: This is not done in New York.
- I-400 12-20, 2nd full para., line 2, ADD phrase at sentence ending on this line to read, "...used to estimate formation fracture pressure and instantaneous shut-in pressure."
- 1-401 12-20, 3rd full para., line 4, CHANGE "pump" to "facility".
- 12-21, 3, COMMENT on this section: IOGA does not believe it is accurate. Many of the existing waterfloods in NY contain wells within their boundaries that have been plugged using old techniques and the waterfloods have never experienced any difficulties even though water has been injected at several hundred to over a thousand pounds pressure into the reservoirs penetrated by these old wells. If old plugging methods were inadequate, difficulties in conducting more recent waterflood operations would have been encountered.
- I-403 12-21, 3, 2nd para., DELETE the last two sentences of this paragraph beginning with "Many thousands...." REASON: These wells may not be the cause due to the low fluids levels as cited earlier in the GEIS.
- I-404 12-23, E, 1, line 2, MOVE "xanthan biopolymers" to end of line 1 after "polysaccharides."
- 1-405 12-25, 4, ADD reference (Van Tyne, Foster, 1980) at end of both paragraphs in this section.

- I-393 Descriptive field terms were used to better illustrate the equipment to the public. I-394 The test should be performed before the pit is used. I-395 See response to I-378. I-396 Change the word "is" to "was." I-397 Correction noted. I-398 Only three operators reported the reinjection of produced waters in the 1987 Brine Survey. I-399 These sentences describe common oil field water treatment methods which may or may not be used in New York. I-400 The suggested addition is not appropriate. I-401 The suggested change does not alter the intent of this sentence. I-402 Many existing New York waterfloods do not have problems, but documentation exists that many others do or have had problems. Both statements are true. I-403 Low fluid entry from the production zone does not preclude the possibility of commingling and contamination when fluid from other zones can enter
- I-404 Correction noted.
- I-405 Some of this information is contained in the given reference, but it was not the source.

the wellbore and raise the fluid level.

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- I-406 12-28, 3, REFERENCE (Van Tyne, Foster, 1980) at the end of both paragraphs in this section. 1st para., line 8, CAPITALIZE "Third"
- 1-407 12-31, 4, REFERENCE (Van Tyne, Foster, 1980) at end of the 1st and 2nd paragraphs in this section.
- I-408 12-31, 4, 3rd para. through the end of this section. DELETE all. REASON: There is the suspicion that this was an attempt to defraud the public by raising money for a project that was unworkable and was, in fact, a scam. It is also believed that the principals behind this project were later indicted for other attempts to defraud the public and are thought to have been convicted and jailed.
- I-409 12-32, H, 12-32, line 7, CHANGE to read "...passed in 1981 should be addressed by adding specific environmental conditions to individual drilling and plugging permits until new regulations are promulgated and adopted."
- 1-410 12-34, 2nd para, DELETE this paragraph. REASON: This information is not commonly available prior to drilling of the well, and is an unreasonable requirement for permitting of a waterflood. It is not necessary to know the exact geologic structure for secondary oil projects.
- I-411 12-36, 4, 3rd, line 3, DELETE "\$1,000", REPLACE with "\$500 to \$5,000 depending on the individual well".
- 1-412 12-36, I. 1st para, line 6, DELETE sentence beginning on the this line. REASON: This statement is exaggerated. Where is evidence of proven health problems?
- I-413 12-36, I, 2nd para., line 1, ADD phrase so that this line reads, "Contamination problems, of which there are few recorded,"
- I-414 12-37, #1, COHMENT: Elsewhere in the GEIS, it has been stated that low fluid levels associated with these wells will prevent them from being sources of contamination.
- I-415 12-37, \$2, COMMENT: Many injection wells do not have cemented surface casing and they routinely pass mechanical integrity tests under the federal UIC program which is intended to demonstrate the integrity of the surface casing.
- I-416 12-37,#3, COMMENT: Most operators are conscientious businessmen and maintain their equipment to avoid environmental degradation and the fines associated with such damage.
- 1-417 12-37, #4,5, & 6, COMMENT: This is allowed under SPDES permits.
- 1-418 12-37, #6, COMMENT: It has not been demonstrated that infiltration into groundwaters will occur.
- 1-419 12-37, 1st full para., first two sentence and last sentence in

- I-406 Add the reference (VanTyne and Foster, 1980). Correction noted.
- I-407 Add the reference (VanTyne and Foster, 1980).
- I-408 Whether or not the behavior of these operators was fraudulent has no bearing on the fact that the State had no regulations to prohibit this sort of scheme.
- I-409 The sentence is correct as written.
- I-410 This information is not usually available before drilling the first well, but waterflooding is usually initiated after several years of primary recovery, data gathering and interpretation.
- I-411 Correction noted.
- I-412 The sentence would be more correct if the term health hazard was used instead of health problems. Health problems associated with the BTX components of oil have been documented in other states but not New York. The nuisance, inconvenience, and hazard caused by localized pollution in New York are well documented.
- I-413 The suggested wording is unnecessary.
- I-414 The GEIS is being misquoted. The flooding of these improperly plugged wells by subsurface water zones can raise the fluid level and result in contamination of freshwater zones even from depleted low pressure formations. This scenario is described on page 10-8, where the text states that this situation is "unlikely", not that it cannot occur.
- I-415 Many New York wells have not passed the mechanical integrity tests.
- I-416 We agree with this comment.
- I-417 There are many more points of discharge than there are SPDES permits.
- I-418 Infiltration into unconfined aquifers from surface brine pits has been demonstrated many times.

this paragraph. DELETE or provide substantiation for these claims.

- I-420 12-37, 2nd full para., line 2, CITE specific source of this claim. ADD information on how long it took until the stream recovered from a spill of this size.
- I-421 12-38, 1st full para., line 2, DELETE sentence beginning on this line. REASON: The source of the pollution is unverified. It may not have been a result of oil operations.
- 1-422 12-38, 2nd full para, COMMENT: We don't believe that crude oil in water poses an inhalation or absorption threat. General conclusions should not be drawn from one sample.
- 1-423 12-38, 3rd full para., line 3, QUESTION: What "other impacts" are being referred to? No documentation has been provided to demonstrate that "other" impacts have occurred, and we do not believe they have.
- 1-424 12-39, #2, COMMENT: Duration of land use is no longer than that of gas or primary production wells.
- I-425 12-39, #3, COMMENT: These facilities produce no greater emissions than those of other production operations. Most of these projects are run on electricity.
- I-426 12-39, #4, COMMENT: Pollution potential is not increased due to new well construction standards and the plugging of old wells.
- I-427 12-39, 1st full para., line 1, CHANGE "infill" to "additional project".
- I-428 12-39, 1st full para., line 2, DELETE phrase beginning with "...building injection and chemical processing plants..." REASON: The land use is minimal - no more than a housing site.
- 1-429 12-39, 2nd full para., line 3, DELETE phrase beginning with "...from chemical mixing stations for chemical processes." REASON: The increased air emissions related to chemical mixing for waterflood operations is equivalent to mixing a gallon of paint in a 20 acre field.
- I-430 12-39, 3rd full para., DELETE "injected nitrogen", REPLACE with "gas". REASON: The chance for this happening under the UIC program is extremely remote.
- 12-40, \$1, COMMENT: Additional requirements under the SEQR for secondary waterflood operations should consist only of an erosion and sedimentation control plan and a federal UIC permit. These are the only considerations peculiar to waterflood developments that would not also apply to primary oil wells or gas wells.
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I-419 Reproduction of all of the documented cases of pollution is not possible in this text. Many IOGA members were present at the presentation given by DMN staff at the Oil, Gas and Solution Mining Board meeting in May 1986. Field investigations determined that of the 125 complaints received by DMN during 1985 and the first quarter of 1986, 62.4 percent were found to be related to oil and gas activities.

- I-420 The cited reference is given in the bibliography.
- I-421 In the referenced case, while it was not proven that the adjacent operator was entirely responsible, such overwhelming evidence of environmental pollution was found that the operator agreed to replace the polluted water supply.
- I-422 Usually benzene poisoning from inhalation or skin absorption occurs in an industrial setting. This paragraph does not state that crude oil in water wells poses an inhalation or absorption threat. Internal consumption from drinking water can also pose a threat. EPA's toxicity tests were certainly not based on one sample.
- I-423 The other potential impacts referred to are detailed in the remainder of the paragraph.
- I-424 Waterflooding extends the economic life of many oil fields.
- I-425 Comment noted. The use of electrical power to operate these facilities will certainly decrease the emission of pollutants from the project area.
- I-426 The use of better well construction standards and the proper plugging of old wells do mitigate the increased potential for pollution from these operations. In fact, well construction and plugging standards are purposely designed to mitigate any potentially adverse impacts.
- I-427 The suggested change does not appreciably change the intent of this sentence.
- I-428 The land use impacts of waterflooding operations are being compared to those of other oil and gas production facilities, not those of housing construction.
- I-429 We agree that the air emissions from each of these individual activities are minimal, and that they do not all occur at each waterflood project, but taken collectively they can result in a measurable increase over the air emissions from standard oil and gas operations.
- I-430 The UIC program does not ban the use of nitrogen for enhanced qil recovery. I-431 The EPA UIC regulations do not address surface environmental conc
  - The EPA UIC regulations do not address surface environmental concerns as required under New York State SEQR regulations. See response to I-22.

- 1-432 12-40, 42, COMMENT: With the exception of effective relative and absolute permeability, reservoir temperatures, fluid properties, and aerial extent of reservoir, all other items in this paragraph are already required by the UIC permitting process. These parameters may be impossible to ascertain until some wells are drilled, and the necessity to report on them is arguable.
- I-433 12-40, #3. COMMENT: Regulations concerning conversion of wells for enhanced recovery purposes are already addressed under the federal UIC regulations, and duplication of requirements by the State should be avoided.
- 1-434 12-40, \$4. COMMENT: Waterflood spacing should be at the discretion of the operator. REASON: The operator will have mmore expertise than the DEC, and due to the large sums of money necessary for waterflood development, the operator will have the greatest motivation to ensure correct spacing.
- 1-435 12-40,#5. COMMENT: This is not peculiar to waterflood operations.
- I-436 12-40, \$7, line 1, ADD phrase at end of the first sentence to read, in the confining zone." REASON: This coincides with UIC regulation. Submittal of ISIP and step rate pressure tests should be allowed as they are under the federal UIC program.
- I-437 12-40, 18, COMMENT: Produced fluids from waterflood operations will be more dilute than those from primary production operations and therefore should be subject to less stringent regulation, not more stringent.
- 1-438 12-40, #10, COMMENT: The requirement is not peculiar to secondary recovery.
- I-439 12-42, K, line 6, DELETE "Farmersville Pool" REASON: Such a project would be totally uneconomic as the Farmersville Pool has never produced more than a few barrels of oil.
- 1-440 12-42, K, line 6, COMMENT: Waterflooding in the Bass Island trend is questionable.
- I-441 12-43, line 8, DELETE sentence beginning on this line. REASON: Thermal methods are highly unlikely due to the characteristics of the oil and the formation.
- I-442 12-43, L. GENERAL COMMENT on this section. The GEIS should be an informative document stating facts to be used as reference for administering the current DEC permitting regulatory program. It should not be a forum for subjective criticism.
- 1-443 12-43, L, 2nd para., last line. DELETE sentence beginning on this line through top of p. 12-44. REASON: Pew, if any, waterfloods have had environmentally unacceptable impacts.

- I-432 See responses to I-22 and I-410. I-433 See responses to I-22, I-192, and I-224, I-434 We agree with this comment, but see response to I-127. I-435 Comment noted. I-436 Correction noted. Add the phrase "in the confining zone." I-437 This requirement is not more stringent than that required for undiluted brine. I-438 Comment noted. I-439 Comment noted. I-440 Comment noted. I-441 Comment noted. I-442 Section L primarily is a summary of practices used in the old waterflooded oil fields that are in violation of current state and federal laws. The main conclusion of this section is that these practices must be eliminated. This
  - I-443 Documentation of adverse environmental impacts caused by waterflood operations exists in the Department's files.

detailed in the GEIS.

conclusion is not subjective but based on facts gathered by DMN staff and

- 1-444 12-44, 1st full para., line 3, DELETE sentence beginning on this line. REASON: The statement conflicts with EPA program mandates.
- 1-445 12-44, 3rd full para., line 2, (REFER TO P. 10-8)
- 1-446 12-44, 4th full para., line 1, COMMENT on "surface discharge". This is a viable, economical alternative. The State's attitude towards surface discharge of brines into streams and rivers is hypocritical. The state endourages operators to transport their water to other states in order for it to be processed properly for stream disposal, but there is not one single commercial surface discharge facility located in the State of New York for the processing of production brines.
- 12-44, 4th full para., line 4, COMMENT on sentence beginning on this line: It is inappropirate to include integrity of cement casing and injection strings of wells among the items needing additional regulations, as this is already assured by the existing UIC regulations, and the implication is that the UIC program is inadequate.
- I-448 GENERAL COMMENT ON SECTION 12: Preparation of an erosion and sedimentation control plan and submittal of a federal UIC permit should be the only supplements to the GEIS required for a sitespecific environmental impact statement for a proposed waterflood project.

CEAPTER XIII. SOLUTION SALT MINING

- [-449] 13-3, 1st para., line 4, CHANGE \*10\* to \*18\* and \*another 40\* to to \*many more\*.
- I-4501 CHAPTER XIV. UNDERGROUND GAS STORAGE

14-2, B, 1, 3rd para., line 2, ADD phrase so that line reads"...reservoir usually consists of obtaining shut-in well head pressures..."

- 1-451 14-6, 1st full para., line 2, QUESTION: How would DEC address potential earthquake dangers? COMMENT: No contingency for earthquakes should be necessary as it is too costly to mitigate, and it is unlikely that a earthquake will occur. Most of the fields would be developed in areas not known to be earthquake prone, anyway, since it is not in the best interests of storage field operators to develop a field that has earthquake potential.
- 1-452 14-7, #4, CLARIFY what information may be required.
- 1-453 14-7, 1st full para., line 1, QUESTION: Does dark print indicate regulation already in existence?

- I-444 See responses to I-22, I-192, and I-224.
- I-445 See responses to I-403 and I-414.
- I-446 The fact that there are no brine treatment facilities located in New York is the result of decisions made by private industry based on economics, not State regulations. The Division of Mineral Resources does not regulate the siting or operation of brine treatment facilities.
- I-447 See responses to I-22, I-192, and I-224.
- I-448 See response to I-431.
- I-449 Correction noted. Change "10" to "18" and "another 40" to "many more."
- I-450 Correction noted. The suggested change is more technically correct.
- I-451 Comment noted. The DEC is proposing that the operator assess the potential earthquake danger in the environmental assessment required for a new project. In most areas of the State, this would consist of a statement that there is no potential earthquake danger based on a review of pertinent literature on the subject for the project area. We concur with the commentator's conclusion that it would not be in the best interests of the storage operator (or the public) to locate a storage field in an area that has high earthquake potential.
- I-452 The Department would require whatever other site-specific information might be necessary to adequately evaluate suitability of an underground reservoir for gas storage.
- I-453 There is no dark print in the line referred to by the commentator. The bold type at the end of the paragraph describes an amendment to the Oil, Gas and Solution Mining Law that has not yet been incorporated into regulations.

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- I-454 14-8, 1st full para., line 11, COMMENT: This is not a proposed recommendation. It is already in effect in permit conditions.
- I-455 14-1C, 2nd para., line 6, QUESTION: Does this constitute the definition of a "major" project?
- I-456 14-10, 4th para., AGREE with recommendation. It is already being requested in permit application.
- 14-11, #8, CLARIFY what other data may be required.
- I-458 14-11, 1st para., line 5, COMMENT: State geologist may review data, but it hoped that information submitted by the company investing its money, and which is more familiar with technical information than State Geologist, will be considered the more credible reference in cases of disagreement.
- 1-459 14-11, 1st para., line 8, Line 9, DEFINE "major" in this context.
- 14-12, #6, CLARIFY what other information may be required.
- I-461 14-14, D. GENERAL COMMENT on this section. DELETE all references to access roads in Section D. The creation of access roads in other industries is not regulated.
- 1462 14-15, 2nd full para., DELETE this paragraph. REASON: Why does DEC need list of a mud ingredients? It is the company's responsibility to properly dispose of wastes. Disposal now is regulated by the state Division of Hazardous and Solid Waste.
- [-463] 14-17, 1st full para., line 4, DISAGREE with recommendation. Reclamation is accomplished by operator agreement with landowner.
- I-464 14-22, lst & 2nd full para., DELETE these two paragraphs. REASON: In a \$90 million project, about one-half million dollars in well equipment may be visisble, plus the compressor. All lines are buried, and they will not have visual impact. Compressor stations are no more unsightly than other business buildings in New York, i.e., garages. The State's property rights should be the same as any other landowner.
- 1-465 14-22, 4th para., DELETE last paragraph. REASON: This falls under EPA jurisdiction.
- 1466 14-23, 1, a, line 3, CHANGE "0.43 to 0.52" to ".3 to .7".
- 1467 14-25, 2nd full para., DELETE this paragraph. REASON: The unused capacity listed is the gas which may have been withdrawn during the heating season by the storage corporation. It is not unused capacity. The GEIS should compare the maximum amount of cas in storage to the stated total capacity in order to arrive at unused capacity. On an annual basis, the volume used as of December 31 is approximately 60 days into a 150 day withdrawal season, and it would not be unlikely if the percentage was 40% of the storage season as compared with 21.5 percent shown in table on pace 14-

- I-454 All standard permit conditions must be formalized into regulation.
- I-455 This is a proposed clarification for the term "modification of storage .pa capacity" as used in the law [ECL 23-1301.5(b)]. For discussion of the definition of "major" with reference to underground gas storage, see responses to I-22 and I-23.
- I-456 Support for this recommendation is noted.

I-457 See response to I-452.

- I-458 Under current law [ECL 23-1301.1], the State Geologist must approve the suitability of a reservoir for gas storage before a permit can be granted.
- I-459 See responses to I-22 and I-23.
- I-460 The reference is to site-specific information that may be necessary to adequately evaluate suitability of a well for injection and/or withdrawal of natural gas or LPG.
- I-461 See Topical Response Number 4 on Access Roads as Part of Project.
- I-462 The Division of Solid and Hazardous Waste has deferred to the Division of Mineral Resources with regard to drilling waste. Thus, it is our responsibility to assure that this material is non-hazardous and disposed of properly.
- I-463 Reclamation for waste rock disposal on-site can be required as mitigation under SEQR.
- I-464 A large project is likely to trigger SEQR thresholds. Addressing visual and noise impacts (which we agree should be minimal) is part of the required environmental assessment under SEQR which is already law.
- I-465 Underground gas storage and LPG are not regulated by the EPA.
- I-466 Most gas reservoirs are normally pressured; 0.43 to 0.52 psi/ft. of depth is the average range of normal hydrostatically pressured reservoirs nationwide. As stated in the GEIS, most New York producing formations are under pressured. According to DEC records, the initial pressure gradient range of the 21 New York gas storage fields was .23 to .52 psi/ft. of depth and the average for these gas storage fields was .39 psi/ft. of depth.
- I-467 Correction noted. Beginning with the 1987 gas storage report, the DMN staff have calculated unused storage capacity by subtracting the maximum storage volume from the total storage capacity.

I-468 14-25 The capacity of storage fields is given in two numbers - working gas and cushior gas.

- 14-27, 2nd para., ADD line at the end of the paragraph to read, "Most reservoirs do not approach a straight line function. They show a hysterises curve. On the withdrawal side of the storage field, the curve has a tendency to dip below the straight line, and on the injection side it has a tendency to go above the straight line, while the end points may be exactly on the straight line. This is due to an effect called "coning," which requires a higher pressure to get gas in the ground in a short period of time, i.e, 150 day withdrawal and 200 day injection."
- 14-28, 1st full para., line 6 through 14-30, line 4. DELETE this entire section. REASON: The Internal Revenue Service, as well as industry representatives, are presently working on the legitimacy of this type of calculation. The calculation should be eliminated as there is no need to calculate gas loss. It is an expense item for the operator and affects bottom line tax considerations. The calculation is too simplistic an approach to a very complex issue.
- 1-471 14-32, 1st full para., line 3, REMOVE bold print. This is an existing regulation. Storage operators already file form 85-15-2 on March 1 of each year for the preceding year.
- 14-32, 1st full para., d. DELETE d. REASON: It is too vague.
- 14-32, 3rd full para., line 2, QUESTION: What other regulations is the DEC working on and what mitigation techniques are being considered? Mitigation techniques after abandonment would encompass the actual production of all gas stored as though it was a producing reservoir over the approximately 20 year life of the reservoir.
- 14-33, J, 2nd para., DELETE phrase, "the proper clean-up and restoration of disturbed surface areas". REASON: The State only becomes involved if the site is left environmentally unsafe. The landowner has the option to sue operator if he does not live up to lease obligations. Actual reclamation could occur 20-30 years after discontinuing operations of the storage field.
- I-475 14-35, 3, line 5, AGREE with information requested in a through d. DELETE e. REASON: This is too vague.
- 1476 14-36, line 4, DELETE reference to earthquake.
- I-477 14-36, 1st full para., line 10, DELETE phrase so that sentence beginning on this line reads, "Filling the cavity void may be warranted."
- 1478 14-36, 4, through end of section on 14-37, DELETE reference to access roads for reasons cited earlier in these comments. DELETE c it is too vague.
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- I-468 For the State's purposes, the total capacity of a storage reservoir is the sum of working gas, cushion gas and unused storage capacity. This definition agrees with that given by Ikoku (1980).
- I-469 The graph shown on page 14-27 is meant to illustrate the ideal relationship between gas production and reservoir pressure. We agree that in actual storage fields, the curve would deviate from the straight line as described by the commentator.
- I-470 The suggested deletion is unnecessary. As pointed out in the text of the GEIS, the "calculations are not intended to pinpoint the gas losses from the reservoir but rather to qualify the storage project in terms of efficiency and environmental safety."
- I-471 As stated in the text, the law [ECL 23-1301.4] requires that an annual storage report, form (85-15-2), be submitted by December 31 of each year. We are proposing that the regulation promulgated under this law allow the operator until March 31 to assemble the data. Under current regulation (6NYCRR Part 551.2(b)), a production report is required by March 31 of each year. Storage report form (85-15-2), which is more appropriate for gas storage operations, will be required in lieu of the production report form (85-15-4).
- I-472 This is a standard provision in most rules and regulations to cover any unforeseen circumstances, and allow for the submission of data pertinent to a specific project which might not be included in the listing of standard data requirements.
- I-473 Specific examples are detailed in the text (a through c) on pages 14-21 and 14-33. The pertinence of the comment to the cited text is not clear.
- I-474 Well site restoration is required for all wells under DEC regulatory authority. 6NYCRR Part 555.5(5)(d) does allow a waiver of this requirement if it has been demonstrated to the Department that no hazard will result, and the landowner has signed an appropriate release.
- I-475 See response to I-472. Support for the requirement that gas storage operators submit an operational report summary upon termination of storage operations is noted.
- I-476 See response to I-451.

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This listing of materials that might be appropriate to fill the cavity void is not all inclusive, and it is provided for public information. See Topical Response Number 4 on Access Roads as Part of Project, and response I-472.

1-479 GENERAL COMMENT ON THIS SECTION: Discussions are underway to encourage regulations that would protect the storage operators from other operators drilling into the storage horizon.

CHAPTER XY - INTERAGENCY COORDINATION: BRINE DISPOSAL, UNDERGROUND INJECTION AND OIL SPILL RESPONSE

- I-480 GENERAL COMMENT: Provisions should be made by other Divisions to give all permitting authority for oil and gas operations to Mineral Resources, i.e, one-stop shopping.
- I-481 15-2, C. COMMENT: There should be a Organization Table showing how all agencies relate to each other and each agency's function.
- 1-482 Table 15.1, CONMENT: The symbols are difficult to read in the copies of the GEIS and may not be easily understand by the public.
- 1-483 15-5, 3rd full para., IOGA AGREES with this recommendation.
- 1-484 15-6, 2, 2nd para., DELETE this paragraph. REASON: It does not belong in the GEIS.
- 1-485 15-6, d. line 3, CHANGE "will" to "may".
- 1-486 15-8, 2nd full para., line 8, CHANGE "an estimated 90 percent" to read "a substantial portion". REASON: The 90 percent figure is undocumented.
- [+487] Tables 15.3 and 15.4 should list sources of information. QUESTION: What is the difference between the use of dashes and zeroes?
- I-488 Pigure 15.1. QUESTION: How is it known that particular towns accept brine? Some towns that do are not listed and some that no longer accept it are shown as towns that do.
- I-489 15-13, 3, 2nd para., DELETE this paragraph. REASON: It is irrelevant to the GEIS.
- 1-490 15-15, 1st para., line 1, ADD phrase so that sentence reads, ....one injection well in Chautauqua County and one well in Livingston County have...\*
- I-491 15-15, 1st para., ADD sentence at end of paragraph to read, "Regulation under one program should be adequate. Regulation by two agencies discourages disposal well development."
- 1-492 15-17, 2nd full para., line 6, COMMENT on sentence beginning on this line: The MOU should be made available for industry comment before it is finalized.
- 1-493 15-19, 2nd para., COMMENT: IOGA believes that it is necessary

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- I-479 The Department supports regulatory efforts to protect gas storage operations from drilling by other operators into the storage horizon. Currently gas storage operations would be protected by permit conditions imposed on any well drilled through the storage horizon.
- I-480 See response to I-21.
- I-481 Table 15.1 does relate each involved agency's area of concern and level of responsibility.
- I-482 Comment noted. Any individuals wishing further clarification concerning interagency coordination can contact this Department.
- I-483 Support for the enactment of a State water well construction code and water well driller licensing is noted.
- I-484 This paragraph is included for public information which is one of the primary responsibilities of government.
- I-485 Correction noted: change the word "will" to "may".
- I-486 The "90 percent" figure was given as an estimate. It was based on all DEC data available at the time: the brine haulers' reports, the 1987 brine survey, and the 1986 oil and gas production report. The Department's recent analysis of 1987 brine production volumes and disposal methods revealed that 79% of reported gas-associated and Bass Island brine was used for roadspreading in New York. A very minute amount of oilfield brine from outside the old waterflooded areas was also used for roadspreading.
- I-487 The source of information is DMN's brine analysis data base. The use of dashes and zeroes is a standard laboratory practice. The dash means the parameter was not measured, and the zero means that it was measured and measurable amounts were not detected or recorded.
- I-488 This information was compiled from the brine haulers' reports which are required yearly under DEC issued Part 364 permits. Figure 15.1 is for the year 1986, and the fact that the towns accepting brine change from year to year is discussed in the text.
- I-489 The cited paragraph is relevant to the discussion of underground injection as a disposal technique in New York.
- I-490 The Livingston County well had not received a State permit at the time the draft GEIS went to print. Since the draft GEIS was printed an additional disposal well in Wyoming County has also received all the necessary State and federal approvals.
- I-491 New York State has elected not to accept primacy for UIC.
- I-492 Industry has input into both the State and federal rulemaking processes. It is not appropriate to involve industry in intergovernmental negotiations. In addition, any actions affecting the regulated community are discussed with the Oil, Gas and Solution Mining Advisory Board which has industry members.

that double bonding be eliminated. We hope discussions between DEC and EPA are successful, and that this situation is resolved quickly.

- 1-494 15-25, 1st full para., line 8, DELETE phrase, "Depending on the severity of the problem" and REPLACE with "typically".
- 1-495 15-26, 2, 3rd para., line 4 through end of paragraph. QUESTION: Are figures given in these lines correct?
  - CHAPTER XVI. SUMMARY OF ADVERSE ENVIRONMENTAL IMPACTS RESULTING FROM OIL, GAS SOLUTION MINING AND GAS STORAGE OPERATIONS
- I-496 16-1, λ, 2nd para., line 6, DELETE reference to access road for reasons cited earlier in these comments.
- 1-497 16-2, 2nd full para., lines 1 and 2, DELETE references to visual impacts for reasons cited earlier in these comments.
- 1-498 16-3, line 2, ADD language to state that vegetation loss is temporary.
- I-499 16-3. 3rd full para., COMMENT on this paragraph. Erosion and sedimentation are natural occurring phenomena that have happened over geologic time. Introduction of the concept that topscil is a commonly held natural resource similar to air and water is incorrect. It should only be regulated to the extent that it prevents excessive erosion leading to resultant excessive stream sedimentation.
- J-500 16-3, 4th full para, line 3, COMMENT: These permit conditions are ad hoc regulation and could be applied in a discriminatory manner.
- I-501 16-4, line 6, CHANGE remainder of this paragraph to read, "...the site reclamation plan is left to the provisions of the lease agreement in conjunction with the law." DELETE last sentence in this paragraph. REASON: It is untrue.
- 1-502 16-4, b. COMMENT on this section: The operator is the best judge of the size of the site. The landowner is protected by the lease agreement. What constitutes productive use of land is subjective. Oil and gas operations could be considered to be a productive use of land, and not all land supporting oil and gas operations is agricultural. IOGA AGREES with the statement that 30 years is too long to wait to reclaim land.
- 1-503 16-4, c. DELETE this section. REASON: This is not an appropriate concern of the GEIS. Brine spills would have a temporary, one year impact on an area due to the high amount of rain in New York. Brine has a high mineral content and is viewed as a positive impact by some farmers. Soil is not a natural resource protected by law.

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- I-493 We agree, but an MOU to eliminate double bonding has not yet received approval from regional EPA legal staff.
- I-494 These agencies are notified in only a relatively small percentage of the spills. The decision to notify other agencies is based not on the size of the spill, but on its consequential impacts: resources endangered, threat to public health, need for evacuation, etc.
- I-495 Yes, these numbers are correct.
- I-496 See Topical Response Number 4 on Access Roads as Part of Project.
- I-497 See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-498 This chapter summarizes adverse environmental impacts, and short term vegetation loss is not a particularly adverse impact. However, vegetation cannot be expected to return to either the access road or the portions of the well site used for production facilities, both of which might be present for over thirty years.
- I-499 See Topical Response Number 7 on Soil as a Public Natural Resource.
- I-500 See response to I-29.
- I-501 The text as written is correct. According to correspondence with Seneca County Soil and Water Conservation District (Cool, 1982, Personal Communication #14) reduced crop yields can be expected for 20 years or more because of topsoil loss.
- I-502 Comment noted.
- I-503 Although the effects of some brine spills may be short-term, all environmental impacts must be addressed by the GEIS. See Topical Response Number 7 on Soil as a Public Natural Resource.

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- 1-504 16-5, a, 2nd para., line 6, DELETE remainder of paragraph beginning on this line. REASON: These matters are addressed in lease agreements. This constitutes interference by the DEC into landowner/operator contracts.
- I-505 16-6, 1st full para., line 2, DELETE sentence beginning on this line. REASON: The sentence exaggerates the potential impact.
- 1506 16-6, 3rd full para., line 4, DELETE the sentence beginning on this line. REASON: This is covered in contracts between operators and landowners and should not be a matter for regulation. The farmer is being compensated for the use of his land or has benefitted from low-cost land.
- I-507 16-7, 1st full para., line 3, COMMENT: The DEC makes pre<sup>1</sup>site inspections, so it should not be possible that an important area will be unknowingly disturbed.
- I-508 16-7, c, COMMENT: Erosion is a natural geologic process, not necessarily the result of any construction.
- I-509 16-7, d, COMMENT: The mitigation measures presently administered by the DEC have been found to improve wetlands. Concerning the last sentence in this section on p. 16-8, most trees in wetlands are already dead.
- I-510 16-8, e. 1st para., line 3, DELETE reference to visual impacts for reasons cited earlier in these comments.
- I-511 16-8, f. CONMENT: This is the type of contractural arrangement most operators have with landowners, not just the State, and it is the way it should be done. Existing mineral rights are also based on contract and should be observed rather than abrogated by regulation or permit condition after the fact.
- Id-10, line 1, COMMENT: Small amounts of hydrogen sulfide do not pose extreme health hazards. This is an overstatement.
- I-513 16-10, 1st full para., QUESTION: How is a stock tank vented without having fumes escape? Line 3, CHANGE "recognize" to "notice" in this line.
- 1514 16-10, h, lst para., line 5 ADD phrase to sentence ending on this line to read, "...however, many housing developments have been built near well locations by choice." COMMENT: Typically, houses in buffer zones were constructed after the well was drilled.
- I-515 16-10, h, 2nd para., line 5, DELETE sentence beginning on this line. REASON: This is covered by lease agreement.

- I-504 This material is provided for public information. To provide information in the public interest is not "DEC interference into landowner/operator contracts".
- I-505 The sentence is a very neutral statement of fact. This description of potential adverse impact is appropriate to this section.
- I-506 This sentence is included for public information purposes.
- I-507 The possibility that a significant habitat will be overlooked does exist because not all DEC inspection staff are trained botanists or biologists.
- I-508 ' Natural geologic processes can be greatly accelerated by construction activities.
- I-509 Comment noted. A newly formed wetland often kills existing trees, but these are replaced by other species which are indigenous to wetlands.
- I-510 See Topical Response Number 2 on Visual Resources and Assessment Requirement.

## I-511 Comment noted.

- I-512 We disagree; the maximum amount of H<sub>2</sub>S to which a person can be exposed for an hour without serious consequences is only 170 ppm. Respirators are usually recommended for exposure above 10 ppm.
- I-513 In the context of this sentence, an improperly vented tank would be one that is a nuisance. A vapor recovery system on a stock tank could be required under air quality regulations should circumstances warrant it. The suggested word change does not appreciably alter the intent of the sentence.
- I-514 The State currently has no regulations prohibiting the construction of housing in the buffer zone around wells which have already been drilled.

I-515 The State must protect public safety even in the absence of a lease agreement to do so.

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- I-516 16-11, 1st full para., DELETE this paragraph. REASON: Visual impacts are too difficult to define. Lease rights allow storage tanks and other equipment that might be considered by some to have a negative visual impact.
- I-517 16-11, i, COMMENT on this section: Archeological maps are checked during pre-site inspection and further studies may be required if the proposed location is found to be in an archeologically sensitive area. It should be unlikely, therefore, that such areas will be accidentally damaged.
- I-518 16-12, j. COMMENT: Tree removal encourages growth of other flora, and this usually leads to increases in many animal species populations.
- 1:519 16-12, 3. a. AGREE that most siting impacts are generally minor.
- I-520 16-13, 1st full para., COMMENT: This is not a problem in New York and can be controlled by an adequate erosion and sedimentation control plan.
- 1-521 16-13, 2nd full para., COMMENT: The situations described in this paragraph are too extreme to be associated with oil and gas operations; they would usually occur in connection with large housing developments or removal of forests for farmlands. QUESTION: Concerning the statement that heavy sedimentation can lead to a shutdown of a public water supply, can an actual occurrence be cited? That much earth was never moved for oil and gas operations in New York.
- 1-522 16-16, line 6, COMMENT: Note p. 8-26 of GEIS. This is an indication of the normal weathering process that will render oil innocuous and is in conflict with 8-26.
- I-523 16-17, 1st full para., line 7, CHANGE sentence beginning on this line to read, "Cement will filtrate into permeable aquifer zones."
- I-524 16-18, 2nd full para., line 1, CHANGE "will" to "may"; Line 4, CHANGE "can" to "may".
- I-525 16-18, 2nd full para., line 4, ADD sentence to this line to read, "This is an argument against grouting."
- I-526 16-19, c, line 2, CHANGE sentence beginning on this line to read, "Very few spills are the result of storage tank failures, and often are very minor problems."

1-527 16-19, c, line 7, DELETE phrase "quite severely" in this line.

- I-516 See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-517 Not all archeological sites have been identified in New York State.
- I-518 Comment noted.
- I-519 Comment noted.
- I-520 Comment noted.
- I-521 It is true that these impacts are more likely to result from larger construction activities. One incident resulting from oil and gas construction activities which affected a public water supply occurred in the Town of Westfield.
- I-522 The statements on this page are not in conflict with the comments regarding crop damage from brine and oil spills on page 8-26.
- I-523 The text is correct as written and more informative.
- I-524 Change "will" to "may" in line 1. In line 4, changing "can" to "may" would not appreciably alter the intent of this sentence.
- I-525 Since grouting is typically reserved for conductor or surface casing, the suggested addition is not appropriate in this discussion of production casing cementing operations.
- I-526 Since the draft GEIS was published, field staff have indicated that although storage tank failures do occur the majority of spills come from other sources.
- I-527 The text is correct as written.

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- I-528 16-20, 1st full para., line 5, COMMENT: In order to avoid tagging, the industry would agree to a plug greater than 15' in length.
- 1-529 16-20, 1st full para., line 11, DELETE #4, REASON: There are no data to support this statement.
- J-530 16-21, 2nd full para., line 3, COMMENT: see 16-22. Statement on p. 16-21 cites many impacts. P. 16-22, 2nd full para., line 6 states that impacts are minimized by SPDES program. This latter statement is correct.
- I-531 16-21, 3rd full para., line 3, DELETE "losses". REASON: existence of oil and gas operations should not be defined as a loss of land - it's a different use of land and the use of the land is compensated.
- I-532 16-21, 3rd full para., line 4, DELETE "separator ponds, tanks". REASON: Loss may be less due to centralized nature of stock tanks and impoundments of secondary operations.
- I-533 16-22, line 2, DELETE sentence beginning on this line. REASON: The EPA requires that an MIT be performed every two years under the UIC program for wells with uncemented surface casing to prove that there is no conduit for pollution.
- I-534 16-22, line 4, DELETE sentence beginning on this line. REASON: Casing failure is not a routine occurrence.
- I-535 16-22, 1st full para., line 1, QUESTION: What proof is available that there are thousands of unknown or deserted improperly plugged wells?
- I-536 16-22, 1st full para., line 3, COMMENT: There is not enough pressure to cause fluids to migrate.
- I-537 16-22, 1st full para., line 99, QUESTION: If the wells are unplugged and unmapped, how does the State know they are located in old waterflooded areas?

1-538 16-22, D. line 1, CHANGE "five" to "six" in this line.

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- I-528 Comment noted. See response to I-344.
- I-529 The sentence is technically correct as written. The reason for requiring fluid between cement plugs is stated on page 11-3 of the GEIS. Note that in comment I-335 IOGA agreed with DECs recommendation regarding density and gel-shear strength requirements for the mud placed between plugs.
- I-530 See response to I-417. As previously stated, there are many more points of discharge in the old waterflood areas than there are SPDES permits.
- I-531 Rewording the sentence as follows would be more correct: "Increased land use may occur more frequently due to . . ."
- I-532 This list of waterflood facilities is included for public information. Although stock tanks may be centrally located at most waterflood operations, when the components of any enhanced recovery facility are taken as whole, they generally result in increased land use compared to standard oil and gas operations.
- I-533 See response to I-415. As previously stated, not all New York wells routinely pass the mechanical integrity tests.
- I-534 Delete the words "routinely fails" from this sentence and insert "can fail". New York's old oil wells, with their lack of cemented surface casing and long field life, fit the profile of wells statistically prone to corrosion failure.
- I-535 The Division estimates that as of early 1988, over 61,000 wells had been drilled in New York since 1821. Only about 5,700 of these wells are known to have been plugged since 1971 when the Division began compiling statistics on plugged wells, and 14,377 known unplugged wells were reported by operators in 1986. This leaves approximately 41,000 wells of unknown status. This information was presented at the March 1988 Oil, Gas, and Solution Mining Advisory Board meeting. References are IOCC (1955), VanTyne (1967), and Reed, et al (1987).
- I-536 See response to I-414.

I-537

It is common knowledge that the majority of the early wells were drilled in Allegany and Cattaraugus Counties, and that they were first waterflooded in the early 20th century. See response to I-535.

I-538 Although the suggested correction was appropriate when it was written, there are now five facilities operating; the Tully Valley Brine Field has been shut-in.

## CHAPTER XVII. SUMMARY OF MITIGATION MEASURES

- 1-539 17-1, 1st para., COMMENT: Special conditions or guidelines should be listed so that the operator knows that, if he is involved in a certain situation, certain things will have to be done. Special conditions attached to some permits should not be construed to be regulations and generally applied to all permits.
- 1-540 17-2, c, line 6, ADD phrase at the end of "...and other nearby wells" to read "...within 1,320 feet of the proposed wellsite," REASON: Current spacing regulations specify this.
- I-541 17-2, c, GOMMENT on EAF: Information now supplied on the EAF will either be specified in the GEIS or required by the new permit application form to be developed.
- 1-542 17-3, line 2, COMMENT: All the information should flow through the Division of Minerals, even though other reviews are conducted by other government agencies. It would streamline the process and be less costly if an operator only had to answer to the Division of Minerals, unless a permit is required from another division. Even then, the Division of Minerals should be the lead agency.
- I-543 17-3, 2, a, line 4, ADD phrase to the sentence ending on this line to read, "...however, the proposals will not be binding," REASON: It is impossible to tell before a well is drilled what the final casing, cementing, completion, testing and stimulation procedures will be.
- 1-544 17-3, B, 1, a, line 2, ADD "active", so that this lines reads, "...1,320 feet from another active well completed in the same formation." REASON: Other wells in the same formation could be plugged and abandoned.
- 1-545 17-4, c, lines 1 and 2, DELETE references to access roads for reasons cited earlier in these comments.
- 1546 17-4, d, line 2, DELETE reference to access roads.
- 1-547 17-5, e, QUESTION: Are permit conditions now in effect which specify the number and size of culverts?
- 1-548 17-5, g, line 5, CHANGE "one acre" to "2.5 acres".
- 1-549 17-5, g, line 6, DELETE lines 6 and 7. REASON: This is accomplished by lease agreement.
- 1-550 17-6, k, line 2, DELETE "vicinity", REPLACE with "within the grounds of the historic site."
- I-551 17-6, k. line 4, DELETE this line. REASON: Visual screening is not necessary. Visual impact is temporary.

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- I-539 Chapter 17 is a summary of mitigation measures likely to be necessary during various phases of oil, gas, solution mining, enhanced recovery, and underground storage operations. Examples of situations requiring special permit conditions (wetlands, floodplains, stream disturbance, etc.) are cited throughout the GEIS. The special permit conditions applied for the above situations are tailored to each site, and they are not construed as regulations or applied to all permits.
- I-540 The suggested addition is incorrect. 6NYCRR Part 552.2(b) lists well plat requirements.
- I-541 See Topical Response Number 3 on EAF and Site-Specific Permit Conditions.
- I-542 See response to I-21.
- I-543 As stated on page 7-5 of the GEIS, it is understood that the final completion program may be different from what is originally proposed. Notification and approval of the Regional permitting DMN manager is required for changes resulting in revision to the permanent wellbore configuration.
- I-544 As noted in the text, exceptions to the 40 acre spacing rule would apply for old oilfields and variances to the current spacing requirements could be granted as warranted. The sentence in the text is paraphrased from 6NYCRR Part 553.1(a) of the existing regulations. Reasonable alternative proposals will be considered during the rulemaking process.
- I-545 See Topical Response Number 4 on Access Roads as Part of Project.
- I-546 See Topical Response Number 4 on Access Roads as Part of Project.
- I-547 The floodplain permits issued by DEC's Division of Regulatory Affairs often contain permit conditions specifying number and size of culverts.
- I-548 Comment noted.
- I-549 See response to I-175.
- I-550 Suggested change would inappropriately alter the meaning of the sentence.

conditions are unnecessary unless the drilling site is on the grounds of an historic landmark.

- I-552 17-6, 2, a, line 3, CHANGE this line to read, "...100 feet from public and private buildings, historical landmarks, or dwellings." COMMENT: If the drilling site must be moved, setback requirements should be amended appropriately.
- 1-553 17-6, 2, a, line 4, CHANGE "150" to "100".
- 17-7, b, CHANGE this section to read, "Plat Map. The plat submitted with the drilling permit application will show all water wells of public record within 1,000 feet of the proposed well site as shown on tax maps." REASON: Rig equipment varies, and the location of all well site facilities may not be known at the time the drilling permit is submitted.
- 1-555 17-7, c, line 2, CHANGE "45" to "180". REASON: Seasonal changes and other considerations may prohibit complete reclamation within 45 days.
- 1-556 17-7, d, COMMENT: Topsoil is not a commonly held natural resource.
- I-557 17-7, d, line 7, CHANGE this line to read, "...cut well casing when plugging and abandoning in an active agricultural area to a safe..."
- 1-558 17-7, d, line 9, DELETE. REASON: The requirement to paraplow is unreasonable.
- 1-559 17-7, e, DELETE this section. REASON: It is covered by lease agreement.
- 1-560 17-7, f, COMMENT: The section on dikes should conform with existing federal SPCC requirements to eliminate confusion.
- I-561 17-8, C, l, g, line 2, DELETE phrase reading, "...must grout..." REASON: The sentence will then agree with existing cementing requirements.
- **1562** 17-9, h, 1, 5th subsection (centralizers), line 2, CHANGE "120" to "150".
- **1563** 17-12, q, 3rd subsection, line 2, COMMENT: IOGA does not believe grouting will achieve the DEC's objective.
- 1-564 17-13, line 1, DELETE phrase "after drilling operations have ceased". REASON: The operator may want to dispose of fluids during drilling operations.
- 1-565 17-13, 2, a, COMMENT: Providing a 24-hour notification phone number of someone with the authority to approve commencement of drilling operations would be very helpful.

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- I-551 The regulations also apply to lands adjacent to historic sites. If the well is a producer the visual impact could be long-term. Whether or not visual screening would be appropriate must be evaluated on a site specific basis.
- I-552 Comment noted. Alternate proposals will be considered during the rulemaking process.
- I-553 See response to I-552.
- I-554 See response to I-138.
- I-555 See response to I-145.
- I-556 See Topical Response Number 7 on Soil as a Public Natural Resource.
- I-557 See response to I-331.
- I-558 We do not view this requirement as unreasonable. Plants may not be able to grow in areas unduly compacted by oil and gas activities, therefore, paraplowing may be necessary.
- I-559 We do not agree. Please see comment I-168 where the commentator agreed with this proposed regulation.
- I-560 See response to I-192.
- I-561 See response to I-228.
- I-562 The figure of 120 feet is in the cementing guidelines that were implemented on April 1, 1986. Alternate proposals will be considered during the rulemaking process.
- I-563 Previous comments on problems associated with grouting have been noted. See response to I-238.
- I-564 We concur that it is acceptable to dispose of fluids during drilling operations.
- I-565 The Department does not approve the commencement of drilling. Rather, it approves of the drilling of a well via the issuance of a drilling permit. The operator then has the responsibility to <u>notify</u> the Department of the commencement of drilling 24 hours in advance of the start of such drilling operatons. Spud notification is required so that drilling activities may be monitored. The best time to notify the Department is during normal busines hours so that the information can be officially recorded. In any event, the Department maintains 24 hour telephone contact numbers which operators may use to transact business.

- 1-566 17-14, b, line 2, CHANGE "five" to "48 hours"
- I-567 17-14, c, AGREE that the permit expiration date should be extended.
- 1-568 17-14, d, DELETE this section. REASON: Safety concerns are covered by OSHA, the Dept. of Labor, and other agencies in existing regulations. It is unnecessary and improper for the DEC to develop more regulations in this area.
- 1-569 17-14, e, line 4, ADD phrase so that this line reads, "...blow out preventers and personnel on location will have kick response..."
- I-570 17-14, g, line 3, DELETE "to the surface" and REPLACE with "within the surface casing. Cement should be run in sufficient quantities to tag back to the next deepest casing."
- 1-571 17-14, j. DELETE this section. REASON: The DEC already has the ability to fine or prosecute violators.
- I-572 17-15, k, line 7, CHANGE to read, "Seams must be effectively installed."
- I-573 17-15, k, line 10, DELETE balance of paragraph beginning with "Base material shall be free...". REASON: This requirement is impractical, i.e., hay is frequently used to cushion the lining. The first part of section k covers all contingencies.
- I-574 17-15, 1, line 2, DELETE "longitudinally", REASON: This is not always the best method. Also, it will increase environmental impact by making the location size larger.
- 1-575 | 17-15, m, line 4, CHANGE "one" to "10".
- I-576 17-15, o, DELETE this section. REASON: The Regional Division of Minerals manager should not be involved in the design or implementation of the testing program. This is proprietary information done at the discretion and expense of the operator.
- I-577 17-16, 1, a, COMMENT: The gas/oil ratio in the Bass Island regulations was initially enacted because it was determined by the State to be a matrix fed reservoir. Pressure testing in 1986 and subsequent temporary pooling by the State indicated that the reservoir is fracture-oriented, thereby invalidating the State's first determination. Also, increased ultimate recovery is in the operator's best interest.

- 1-578 17-16, 1, c, DELETE this section. REASON: It is too vague.
- 1-579 17-16, 2, a, line 2, CHANGE "45" to "180".

- I-566
   Reasonable alternative proposals will be considered during the rulemaking process.

   I-567
   Support for extending the permit expiration date is again noted.
- I-568 See response to I-218.
- I-569 We agree that all personnel at the well site should have kick response training.
- I-570 Reasonable alternative proposals will be considered during the rulemaking process. This option is discussed on page 9-23 of the GEIS, where it is stated that permission may be granted to cement the production casing 50 feet into the surface or intermediate casing in special circumstances.
- I-571 As stated in the response to I-290, non-compliance has been a problem. Increased compliance is the goal of this recommendation.
- I-572 Reasonable alternative proposals will be considered during the rulemaking process. See response to I-293.
- I-573 Delete the word "grass". The sentence should read as follows: "Base material shall be free from <u>angular</u> rocks, roots and vegetation." Preparation of the base with hay is acceptable.
- I-574 See response to I-294.
- I-575 As previously stated, reasonable alternative proposals will be considered during the rulemaking process.
- I-576 As stated in the response to I-269, the Regional Minerals Manager must be aware of oil and gas activities in his or her region that have potential for adverse environmental impact.
- I-577 Comment noted. The Bass Island regulations were implemented to increase safety, prevent wasteful practices, and gather data to help understand the primary reservoir drive mechanism in order to ensure greater ultimate recovery. The reservoir characteristics of the Bass Island trend have been subject to debate ever since the first field production.
- I-578 As stated in the response to I-29, site-specific permit conditions are sometimes necessary to assure environmental protection and allow DEC to issue a negative declaration.
- I-579 Reasonable alternative proposals will be considered during the rulemaking process.

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- 1-580 17-16, 2, b, COMMENT: It will be difficult to determine quantities of brine without having produced the well.
- 1-581 17-16, 2, c, COMMENT: This may lead to a false sense of security that mechanical equipment will operate properly at all times.
- 17-18, j, line 3, ADD phrase at the end of this sentence to read, "...after the DEC has made three reasonable attempts to notify the owner."
- I-583 17-18, 2, a, QUESTION: Why will it be necessary to submit a complete proposed abandonment procedure with the notice of intention? The information is given on the form itself.
- 1-584 17-19, GENERAL COMMENT on b, c, d, and 4: These proposed regulations may conflict with federal requirements.
- I-585 17-19, b, line 2, INSERT a comma between "injection" and "disposal" on this line.
- 1-586 17-19, c, line 5, DELETE phrase beginning with "...or other approved fluids." and REPLACE with "as referenced in part d of this section."
- I-587 17-19, d, line 1, CHANGE this sentence to read, "Intervals not occupied by cement shall be filled with fluid as specified by the Regional Minerals Manager."
- 1-588 17-20, line 5, QUESTION: Under what circumstances will tagging be required?
- **1-589** 17-20, g, 3rd subsection. QUESTION: In reference to placing 25 feet of cement in wellbore above above what?
- 1-590 17-21, k, line 1, DELETE "all", REPLACE with "three reasonable".
- 1-591 17-22, 2nd subsection on Production casing with uncemented surface casing, line 2, DELETE "Every", REPLACE with Reasonable efforts". Line 3 of this section, DELETE phrase "including milling out the pipe."
- I-592 17-22, m, QUESTION: Under what conditions will tagging be required?
- 1-593 17-23, n, line 1, ADD "active" so that the beginning of the line reads, "In active agricultural..." REASON: If it is a fallow field, there is no reason to cut off casing below plow depth.
- I-594 17-24, d, line 2, DELETE sentence beginning on this line. REPLACE with, "Venting of annular gas is approved by the Department."
- I-595 17-24, e, line 2, CHANGE "impervious" to "impermeable". REASON: Flow-through treatment ponds are allowed under SPDES permit.

- I-580 As stated in the response to I-323, a conscientious operator will plan in advance for waste handling and disposal.
- I-581 A responsible operator would not rely solely upon the mechanical equipment, but would continue personal inspection of storage tanks to ascertain fluid levels and equipment condition.
- I-582 As stated in the response to I-341, it is understood that the State would make every possible effort to contact and inform the current operator of the need to plug the well.
- I-583 Replace the words "be accompanied by" with the word "include".
- I-584 As stated on page 15-17 of the GEIS, the DEC is working on developing a Memorandum of Understanding with the EPA in order to prevent conflicting requirements with respect to plugging and abandoning injection wells.
- I-585 Correction noted. The comma should be inserted.
- I-586 Correction noted.
- I-587 Correction noted.
- I-588 Site specific field conditions will dictate necessity or lack thereof for tagging plugs.
- I-589 The cement would be placed in the wellbore directly above the point where the injection tubing was severed.
- I-590 See response to I-338.
- I-591 We agree that the words "Every effort" should be replaced with "Reasonable efforts". Under special conditions, such as gas leaking at the surface, milling out a section of casing might be appropriate.
- I-592 The DMN could require tagging of a plug anytime staff deemed it necessary to verify the cement top.
- I-593 See response to I-331.

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- I-594 This section is on flaring, not venting. Hence, the comment is not appropriate. See page 9-24 of the draft GEIS.
- I-595 The suggested change is more technically correct. Change the word "impervious" to "impermeable".

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1-290	17-25, 2, b, line 1, DELETE sentence beginning on this line.	
	REASON: Much of this information would not be available until the	1
	well has been drilled. Line 4, ADD phrase at the end of the	:
. 1	sentence on this line to read, "if available."	

- I-597 17-25, d, DISAGREE. REASON: This should be done at the operator's discretion.
- I-598 17-25, e, line 2, DELETE "watertight tank", REPLACE with "or pits or tanks."
- I-599 17-25, g, line 4, ADD phrase so that this line reads, ...step rate pressure or instantaneous shut-in pressure data test...
- 1-600 17-26, h, line 3, QUESTION: How will this be determined?
- 1601 17-26, j, line 1, DELETE "documentation", REPLACE with "volume".
- 1-602 17-26, k, line 2, DELETE phrase "...and produced".

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- 1-603 17-29, H, 1, a, DEFINE "test well" as used in this context.
- I-604 17-29, H, 1, b, line 2, DEFINE what is meant by "any operation" in this context.
- I-605 17-30, k. DELETE this section. REASON: It is covered by lease terms.
- 1-606 17-31, b, line 2, DEFINE "major" in this context.
- 1-607 17-31, c, line 1, DEFINE "test well" in this context.
- I-608 17-31, d, DELETE this section. REASON: Operators would certainly consider earthquake potential before making a substantial investment.
- 1-809 17-31, h, line 4, DEPINE "test well" in this context.
- I-610 17-31, i, line 2, DELETE phrase beginning with "...and the proposed....permit application." REASON: All operators are required to dispose of mud in a proper manner.
- i-611 17-31, j. DELETE this section. REASON: It is covered by lease agreement.
- I-612 17-32, k, DELETE this section. REASON: The visual impact is no greater than that of any other business. Ninety percent of the material is underground.
- 1-613 17-32, 1, DELETE this section. REASON: It is covered by present regulations under the Division of Regulatory Affairs.
- 1-614 17-32, m, COMMENT: This requirement already exists.

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- I-596 See response to I-410.
- I-597 See response to I-127.
- I-598 Agree with intent of the comment. The text should read "in watertight pits or tanks."
- I-599 The suggested change is appropriate. Add the words "...by submission of the instantaneous pressure data (charts) from several nearby wells stimulated in the same zone or a step-rate pressure test..."
- I-600 Any evidence of brine stress on surrounding or down gradient vegetation would lead to a determination of environmental damage.
- I-601 Correction noted; change "Documentation" to "Volumes".
- I-602 The suggested deletion is not appropriate.
- I-603 A test well is a well drilled before the project is initiated for geologic information to determine the suitability of the reservoir for storage.
- I-604 Change the phrase "...for any operation devoted to..." to "...for the conversion or excavation of any subsurface reservoir for..."
- I-605 See response to I-474.
- I-606 The word "Major" could be removed from this sentence without changing the intent. Any modification, defined as a change in storage capacity, would require a permit and SEQR review. I-607 See response to I-603.
- 1-007 See response to 1-003
- I-608 See response to I-451.
- I-609 See response to I-603.
- I-610 See response to I-462.
- I-611 See response to I-463.
- I-612 See Topical Response Number 2 on Visual Resources and Assessment Requirement.

 It is appropriate to include permit conditions which might be required by the Division of Regulatory Affairs (DRA) under SEQR and attached to the DMN issued storage permit.
 I-614 See response to I-471.

I-615 17-32, n, COMMENT: This is too vague. What infractions and what mmtigation measures are being considered? Routine operations should not be considered infractions.

1-616 17-32, o, QUESTION: What procedures are being contemplated?

I-617 17-32, q, COMMENT: Abandonment of facilities would occur approximately 20 - 30 years after discontinuing the storage operations.

#### XVIII. ECONOMICS

- I-618 GENERAL COMMENT on this chapter. IOGA appreciates the separate chapter on the economics of the industry.
- 1-619 18-1, 2nd para., line 4, QUESTION: Does this figure include regulatory personnel overseeing the oil and gas industry?
- 1-620 18-1, 2nd para., 2nd line from bottom, CHANGE "most" to "some".
- I-621 18-1, 2nd para., last line, DELETE "nearby Pennsylvania", REPLACE with "neighboring states".
- 1-622 18-2, 1st full para., line 2, ADD phrase at the end of the sentence on this line to read, "...however, localized areas in oil and gas producing counties have had higher unemployment rates, both currently and historically, and the loss of jobs related to oil and gas has had a much larger relative impact in these areas."
- 1-623 18-5, C, 1, 2nd para., last line, ADD phrase so that the line reads, "...usually \$1 or \$2 per acre, depending on the history of nearby producing wells, for each..."
- I-624 18-5, C, 1, 2nd para., ADD sentence at the end of this paragraph to read, "If leasing costs become too high, it may affect the potential for drilling on the lease."
- 1-625 18-5, C, 1, 3rd para., line 1, DELETE "equitable" so that the sentence reads, "With a leasing contract, the landowner can enjoy many benefits." ADD phrase to read, "Possible benefits of leasing are: 1) royalties from production..." ADD parenthetical phrase at the of 1) to read, "(an estimated \$6 million in royalties were paid in 1987)".
- 1-626 18-5, C, 1, 3rd para., line 2, ADD the word "limited" before "free produced gas". ADD a sentence at 3) to read, "Operators are very concerned about the safety of homeowners' free gas hookups, which are not currently regulated or supervised by any

- I-615 We agree that this section is too vague. Examples of infractions would be brine spills or gas leaks caused by casing or tubing failures.
- I-616 See 14.J. for detailed procedures.
- I-617 Comment noted.
- I-618 You're welcome.
- I-619 The entire employment spectrum for the State is included in the multiplier effect.
- I-620 Changing the word "most" to "many" is more appropriate than changing it to "some".
- I-621 The suggested change does not appreciably alter the intent of this sentence.
- I-622 The suggested additional information is detailed later in the text.
- I-623 Add the phrase "...depending on the history of nearby producing wells, for each..."
- I-624 The suggested addition is not necessary. The point being made is obvious.
- I-625 The suggested changes do not appreciably alter the intent of the paragraph.

government agency." COMMENT on homeowner gas hook-ups: These could be permitted and regulated by the DEC, and the permitting fee could provide the State with another source of income. (NOTE: See Attachment #3, "Liability Risks of Free Gas Clauses".)

- 1-627 18-10, D, 1, 3rd para., line 2, CHANGE "much" to "some".
- I-628] 18-11, 2, a, QUESTION on this section: Why can't it be regulated?
- I-629 18-13, c, COMMENT on this section: AGREE that access roads are a benefit, yet throughout the GEIS, the DEC cites access roads as an adverse environmental impact.
- 1-630 18-13, 3, 2nd para., line 2, DELETE "when gas is plentiful and cheap" and REPLACE with "in the summertime".
- 1-631 18-14, 1st full para., line 4, DELETE sentence beginning on this line.
- 1-632 18-15, 1st full para., line 6, DELETE sentences beginning on lines 6 and 7. REPLACE with "When water injection is halted, the integrity of the flood front is lost, gravity separation occurs, and the economic feasibility of the project may be greatly diminished. In most cases, reinstituting a waterflood is impossible due to changes in relative permeability."
- I-633 18-18, G. GENERAL COMMENT on this section: It grossly exaggerates the affect of the oil and gas industry on the health of New York State's citizens.
- 1-634 18-18, G, 2nd para., (Aquifer Permit), line 2, DELETE \*\$1,500 to 3,000", REPLACE with "from \$3,000 to 10,000 depending upon the depth of the well."
- -635 18-19, (Brine Blowdown), line 2, DELETE "\$200 to \$500", REPLACE with "\$800 to \$1,000".
- 1-636 18-19, 2nd para., line 1, QUESTION: What is the net economic effect (in dollars) of past industry practices to society?
- I-637 18-19, 2nd para., line 6, COMMENT: The unspoiled wilderness may not belong to (be owned by) the people appreciating it. Visual impacts cannot and should not be regulated. There is an assumption that the wilderness is spoiled by oil and gas operations. Wilderness areas can be enhanced by these operations. The roads created by industry can allow the public greater access to wilderness areas.
- 1-638 18-19, 2nd para., 2nd line from bottom. QUESTION: What is the estimate of decreased health care costs? What proof does the State have that industry caused <u>increased</u> health care costs? The assumption could certainly be made that industry salaries and taxes assisted in decreasing health care costs.

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- I-626 Add the word "limited" before "free produced gas". The other suggested addition is not appropriate. For more information on the subject, see 18.D.2.a.
  - The suggested change does not appreciably alter the intent of the sentence.

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- I-628 The DEC does not have the appropriate technical staff to regulate landowner connections for free gas. In addition, landowner gas hook- ups are more of a safety issue than an environmental issue, and the Public Service Commission (PSC) regulates only high pressure lines. The PSC does not have personnel to cover the additional regulatory responsibilities.
- I-629 The DEC does not cite access roads as an adverse environmental impact. We maintain that access roads can have environmental consequences, and that they must be considered as part of the project for the environmental review.
- I-630 Change the sentence as follows: "...injecting it in the summertime when gas is more plentiful, and withdrawing it..."
- I-631 The suggested deletion cannot be considered without a given reason.
- I-632 The suggested change is more technically correct.
- I-633 This section was required to supplement the section on the costs of environmental regulation. The discussion on the health costs of environmental pollution gives a general outline of how the health costs are computed by lawyers and insurance companies. It does not specifically target the New York State oil and gas industry.
- I-634 The Division of Mineral Resources derived the figures listed in the GEIS from an informal survey of operators at the time the revised conditions were implemented. The commentator is welcome to supply documentation for the increased cost estimates. Many of the operators surveyed reported that they cemented production casing to the surface prior to the State requirement.
- I-635 Again, the figures in the GEIS are documented by information provided by operators. The commentator may wish to supply DMN with substantiation of the higher figures cited. Costs do increase with time and it is quite likely that those operators who complied with the brine pit elimination order when it was first issued four years ago paid less.
- I-636 The net economic effect (in dollars) of past industry practices is difficult to quantify.
- I-637 The requirement that visual impacts be assessed does not carry the assumption that wilderness is spoiled by oil and gas activities. See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-638 Increased health costs could occur, for example, in cases of BTX contamination. Regulations designed to prevent the occurrence of this or other types of contamination would contribute to decreased health costs beyond the contribution made by industry salaries, insurance, benefits, etc.

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### CHAPTER XIX. UNAVOIDABLE ADVERSE IMPACTS

- 1-640 19-1, 2nd para., COMMENT on this paragraph: All activities do not occur at the same time and in the same place which, in and of itself, minimizes impact.
- 19-1, A, line 4, CHANGE "expected" to "possible".
- 1-642 19-1, A, line 11, DELETE "visual".
- **1643** 19-1, A, line 15, ADD "temporary", so that the line reads, "...or temporary distribution of...".
- 1-644 19-2, lines 5 and 5, DELETE these lines. REASON: One could say the same of a car.
- 1-645 19-2, line 7, CLARIFY this statement.
- 1-6461 19-2, B, line 3, DELETE "visual disturbance".
- [-647] 19-3, D, line 5, DELETE "visual disturbance".

CHAPTER XX. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

- 1-648 GENERAL COMMENT on this section: Over the course of the time that oil and gas production has occurred in New York State, there has been no irreversible or irretrievable commitment of resources, beyond the irretrievable loss associated with the development of the minerals.
- 1-649 20-1, line 2, DELETE "human".
- I-650 20-1, λ, line 1, COMMENT: The production of oil and gas is the very purpose of the industry. The value of these resources is not realized until they are developed and brought to the surface.

CHAPTER XXI. ALTERNATIVE ACTIONS

- I-651 21-1, 1st para., line 8, DELETE "versus", ADD "Alternative D Revision of Existing Regulations".
- 1-652 21-3, B, 1st para., line 7, CHANGE "spewed" to "leaked".

- I-639 Although air and water contamination have been responsible for most documented cases of oil and gas related health problems, human health could certainly be affected by large oil or brine spills in agricultural areas.
- I-640 Comment noted. However, when the activities are repeated and concentrated in certain areas of the State, the potential for impact increases.
- I-641 The sentence is correct as written.
- I-642 The sentence is correct as written. See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-643 The suggested change does not appreciably alter the intent of the sentence. Changes in plant and animal distribution may or may not be temporary.
- I-644 This draft GEIS applies to the oil, gas, and solution mining industries. Environmental impacts of automobiles are irrelevant.
- I-645 This sentence includes a number of possible minor impacts that may or may not occur. In addition to produced hydrocarbons and brines, there could be spills of rig fuel, mud or cement additives, and other chemicals or lubricants used at the drill site.
- I-646 See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-647 See Topical Response Number 2 on Visual Resources and Assessment Requirement.
- I-648 This section describes all possible irretrievable losses or irreversible commitments of resources associated with oil, gas, and solution mining activities. This includes losses or commitments of resources above and beyond simply the loss of the produced hydrocarbons themselves.
- I-649 The sentence is correct as written. See response to I-648.
- I-650 Nevertheless, once these resources are produced, they are irreplaceable.
- I-651 The suggested change does not appreciably alter the intent of the text, which is to describe the range of available alternatives.

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I-652 Change "spewed" to "leaked".

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1-653 21-5, 1st para., DELETE this paragraph, ADD sentence to the beginning of the 2nd paragraph to read, "Regulation is the cooperative effort of government and industry to operate in an effective, efficient and conscientious manner that avoids harmful consequences." REASON: This paragraph is purposely antagonistic and negative. In every field, there are those who do not operate conscientiously, and who intentionally violate laws and regulations. This includes government agencies. Indeed, there are those who believe that management of resources can no longer be entrusted to government. The oil and gas industry is in no way suggesting that our environment be entrusted to unregulated industries. In fact, we are suggesting that some unregulated situations be regulated, i.e., water well drillers.

1-654 21-5, C, ADD \*D. REVISION OF EXISTING REGULATIONS\* and divide appropriately into two sections.

1-655 21-5, C, line 2, CHANGE "1972" to "1984".

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- 4 1-656 21-5, C. 1st para., last line, ADD phrase at the end of the last sentence to read, "...because the Generic Environmental Impact Statement was not in place."
  - 1-657 21-6, 1st full para., line 7, DELETE the sentence beginning on this line. REASON: The industry as a whole never presumed it could sacrifice long-term environmental protection for short-term gain.

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21-7, 2nd para., line 6, CHANGE "extensive" to "minor".

I-653 The paragraph is included for public information. While it is true that irresponsible parties operate in many industries, this draft GEIS pertains only to oil, gas, and solution mining. As previously stated, we agree that there should be more regulation of water well drillers.

I-654 See response to I-651.

- I-655 Add the word "extensively" before the word "updated" to make this sentence technically correct. As stated in the response to I-64, some provisions of the regulations have been updated since 1972.
- I-656 The suggested addition is inappropriate because permit conditions might be necessary in some instances to assure a negative declaration even after the GEIS is in place. See Topical Response Number 3 on EAF and Site-Specific Permit Conditions.
- I-657 The suggested deletion is unnecessary. The DEC has never accused the entire industry of making such a presumption. We are merely describing the cyclic nature of the industry for the public, and stating that long-term environmental protection is always necessary regardless of the current economic state of the industry.
- I-658 This sentence states the conclusion of the GEIS, which details recommendations for extensive revisions and the reasons these revisions are necessary. As previously stated, reasonable alternatives to any proposed revisions or additions to the regulations will be considered during the rulemaking process. At that time there will again be ample opportunity for industry input at public hearings.

GLOSSARY

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GLOSSARY
IOGA proposes that the following definitions be changed as indicated:
BCF: billion cubic feet of natural gas.
Blowout: uncontrolled flow of gas, oil or water from a well.
Drilling Fluid: mud, water, foam or air pumped down
Infill Drilling: to move the minimum spacing unit inside an existing area. (NOTE: This definition should be placed between "Insert Gas" and "Intermediate Casing or String")
Kill Fluid: a heavy fluid which exerts a hydrostatic pressure equal to the bottom hole pressure.
Macaroni String: DELETE term - not commonly used in New York.
MCF: thousand cubic feet of natural gas.
MMCF: million cubic feet of natural gas.
NGPA: Natural Gas Policy Act of 1978.
Native Gas: ADD phrase to read, "Term is usually associated with gas storage."
Nonwetting Phase: the pore space fluid which is not attached to the reservoir rock.
Plat: a drafted map of the site location.
Potable: consummable by humans.
Production Casing: casing through which the well produces.
Real Property: includes mineral claims, surface and water rights.
Reservoir Rock: (CHANGE definition 2 to read) "Reservoir means any underground reservoir, stratigraphic or structural trap"
Sequestering Agent: chemical additives that reduce chemical reaction.
Show: (NOTE: should be moved between "Short Ton" and "Shut In") small quantity of fluid.
Spudding: breaking of the surface in the initial stage of drilling a well.
Squeeze: pressure cementing technique.
Step Out: to move the minimum spacing unit outside an existing $\sim$

1-659	It is commonly understood that "BCF" usually refers to a volume of
	natural gas.

- I-660 The current regulations (6NYCRR Part 550.3(c)) do not include "water" in the definition of a blowout, but water is likely to be present. Therefore, the suggested change is more technically correct.
- I-661 Anything derived from mud, water, gas, or air, along with common . additives, is included in this definition.
- I-662 The suggested addition is appropriate, but "Infill Drilling" would be more clearly defined as "Drilling between known producing wells to better exploit the reservoir."
- I-663 The suggested change is more correct, but the purpose of kill fluid as stated in the GEIS definition is also correct.
- I-664 This definition is included in the glossary because this descriptive field term was used in the GEIS for illustrative purposes.
- I-665 It is commonly understood that "MCF" usually refers to a volume of natural gas.
- I-666 It is commonly understood that "MMCF" usually refers to "million cubic feet of natural gas."
- I-667 Correction noted. Add the words "of 1978" after the word "Act".
- I-668 Clarification noted. The suggested phrase should be added.
- I-669 The definition given in the GEIS is more technically correct, but addition of the suggested definition adds clarity.
- I-670 The suggested definition alone is too restrictive, but its' addition to the existing text adds clarity.
- I-671 The definition should be changed to read, "suitable for drinking by humans."
- I-672 Change the text as follows: "Casing set above or through the producing zone through which the well produces."
- I-673 Correction noted. Add the word "surface" after the word "claims".
- The definition in the text was taken directly from the Oil, Gas and Solution I-674 Mining Law.
- I-675 Correction noted. Change "reaction" to "reactions" and delete the phrase "between injected fluids and formation fluids."
- I-676 Correction noted.
- I-677 Correction noted. The definition should read "The breaking of the earth's surface in the initial stage of drilling a well."
- I-678 It would be more correct to add the words "under pressure" after the word "forced". Add the phrase "..., between two strings of pipe, or into the casing-hole annulus" at the end of the definition.
- I-679 Correction noted. As suggested in comment I-662, "infill drilling" should be added to the glossary as a separate entry.

1-680 Stimulation: act of increasing production by artificial means.

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1-681 Strippers: a well producing less than 10 barrels of oil per day or 60 thousand cubic feet of gas per day.

I-682 NOTE: Please add term "Exploratory Well" and define as follows: a well drilled outside a proven area or horizon. I-680 The definition given in the GEIS is technically correct, but it would be more descriptive to define "stimulation" as "the act of increasing a well's productivity by artificial means such as hydraulic fracturing, acidizing, shooting, etc."

I-681 Correction noted. Delete the word "oil" the first time it occurs and add "or 60 thousand cubic feet of gas per day".

I-682 Inclusion of this term in the glossary is appropriate.

### IOGA COMMENTS ON

### APPENDIX 4 - MINERAL OWNERSHIP AND LEASING SUMNARY

(Prepared for IOGA by John H. Heyer, Esq.)

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### COMMENTS RELATING TO APPENDIX 4 OF THE DRAFT GEIS PREPARED BY DEC

The introductory paragraph states that an oil and gas lease creates the potential for impacts where none existed before. This is nonsense. The mineral owner has every right to explore for oil and gas before he signs these rights over to a lessee. This is nothing more than a transfer of certain rights. The rights existed both before, during and after the execution of an oil and gas lease. In Section A, Mineral Ownership, the author states that fee simple title gives all rights in and to, among other things, the air space. This is rather a silly idea to express in a statement of this sort as it is both untrue and irrelevant. The Author also states that the fee simple may be acquired by a Warranty Deed; in fact, the fee simple may be acquired by any type of deed, if the grantors interest being conveyed, is in fact a fee simple. This would include Quit Claim Deeds, Bargain and Sale Deeds, Executor's and Administrator's Deeds, Sheriff's Deeds, Trustee's Deeds, Tax Deeds or any of a number of other varieties. It might also be noted that the owners rights are limited by zoning laws, and various other types of land use regulations including restrictive covenants. There is also reference to an "act of severance". but it is not made clear that this is effected by the same means that any other voluntary transfer of real property is made, i.e., by deed, will, etc. Also, I am unaware of any titles originating from government patents in any oil and gas areas of New York State.

The author points out that purchase of a fee simple estate for the purpose of oil and gas development is rare, and that "the use of mineral deeds. . sees little contemporary use." This raises the question of why the author pothers to review these in any depth at all. IA4-1 The number of private landowners with the knowledge, resources and willingness to risk a dry hole, who are also ready on their own, to develop and market any hydrocarbon resources underlying their land is relatively small. The oil and gas lease almost invariably transfers the development rights from those who are unable or unwilling to assume development risks to those who are.

IA4-2 Air space is relevant insofar as it is generally included in the definition of "fee simple." While air rights are not owned to infinity, the surface owner has the right to as much as he needs in connection with the use of his land.

IA4-3 Deletion of the word "warranty", so as to not exclude these other types of deeds, would be technically correct. The purpose of this Appendix was to provide some background material and a very broad overview of oil and gas leases for people unfamiliar with them in order to illustrate the general scope and responsibilities covered by such agreements. This was clearly stated in the first paragraph of the Appendix. It was never intended to be a definitive text on the subject of leasing.

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The fact that they are rare does not render their use invalid.

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The author's understanding of the cature of an oil and gas lease appears to be deficient. While it is true to state that a deed is a grant of a separate estate, separate from what? The oil and gas lease is also a grant of a separate leasehold estate. Under the common law, estates can be for a term of years or for an indefinite period. While it is also true to state than an oil and gas lease may have an implied covenant to develop, the doctrine of implied covenants has been pretty well eroded by the inclusion in the lease of specific clauses to preclude a Court substituting an implied covenant in law for the apparent lack of intention on the part of the parties to the lease. The doctrine of implied covenants is a late 19th and early 20th century development, the application of which is precluded by modern drafting practices. However, the main difference between a deed and a lease is that the lessor retains a reversionary interest and more importantly a royalty interest. The author again refers to the potential for negative environmental impact due to the lessee's implied easement to use the surface. This easement is usually an express easement rather than implied and it should be pointed out that the lessee is not the beneficiary of any rights created by the lessor, but only of rights transferred by the lessor. There is no net increase in rights to the property. The doctrine of dominant and serviant estates is one that is being eroded by modern Court decisions and by State and Federal environmental laws and regulations.

IA4-9

forms were examined by the author.

IA4-5 The subject of discussion was a mineral deed as compared to an oil and gas lease. The "separate estate" referred to was the severance of the mineral interest from the surface. This was discussed in part A.2. of page 2 of the Appendix.

LA4-6 Correction noted. This point is discussed in part B.2.c. pages 5 and 6 of the Appendix. The fifth sentence in part A.3. on page 3 should read as follows: "A lease contains provisions to maintain it in force; a deed does not."

LA4-7 Royalty interest is discussed in part B.4. found on pages 8 and 9 of the Appendix.

IA4-8 While the right to use the surface of the leasehold is usually an express point in the lease, occasionally it is not. As the commentator states in his next paragraph: "there are hundreds of lease forms currently in use . ..." In the absence of an express surface use easement, the following maxim still applies: Whoever grants a thing is deemed also to grant that without which the grant itself would be of no effect.

IA4-9 The term "standard provisions" was used to denote clauses which occur so frequently in the vast majority of contemporary oil and gas leases that they could be considered standard inclusions. The list of provisions is by no means all inclusive and was never intended to be. Once again, the purpose of this Appendix was to provide a broad overview to those not familiar with oil and gas leases.

The author's reference to "standard provisions found in a contemporary lease" raises the question of what are "standard provisions"? Since there are hundreds of lease forms currently in use, it would be useful to know which

The author's analysis of the oil and gas lease focuses on the rights of

- 2 -

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2

the lessee, and apparently ignores the lessee's obligation to the lessor, which is primarily to pay monies. This is a not inconsiderable obligation, and is self-evidently the most important consideration and probably the sole inducement to the lessor to execute the lesse in the first place. The author's approach seems to be skewed by a lack of understanding of the primary goal of the lessee, which is to produce oil and/or gas. From the author's point of view, it appears that the lessee's primary goal is to hold leases. This is but a means to the end, which is to produce oil and gas for a profit. Thus, this is the true purpose of the "secondary term". The goal of the lessee is to recover his investment in the well and to profit from additional production. The author's statement that "lessors do not generally resist drilling delay rental clauses" and the paragraph which follows leaves until the end the obvious reason, i.e., the lessors will be paid money for the delay rental period. The author's attitude towards lessees is displayed in the analysis of what is referred to as "defensive clauses". These are referred to as "lengthy and complicated" although they are no more lengthy or complicated than any other clause in the lease. In addition, the reference to "to protect what lessees regard as their legitimate interest" seems to imply that other parties might regard these as illegitimate interests, or that lessees have no legitimate interests. The five clauses which are modifications of the termination clause break down into simple common sense. They all allow the extension of the

IA4-11

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IA4-12

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ANK BLAD HIW YORK making an investment and operating in good faith. The author also uses the term "condemnation" to apparently mean the accumulation of geological evidence that the lease will be most likely be unproductive, rather than the legal term meaning the taking by a governmental

- 3 -

primary term for various causes where it is demonstrated that the lessee is

Because this Appendix was prepared as a source of general information about IA4-10 oil and gas leases, it does not include some of the detailed information described in the comment. Note also that another goal of obtaining leases is to profit from trading, selling, or otherwise disposing of them.

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IA4-11

The fact that defensive clauses are so commonly used by the industry in their oil and gas leases demonstrate that a need for them exists, and discussion of them in this Appendix is appropriate. The text makes no judgment regarding other parties perception of the legitimacy of defensive clauses.

body for public purpose. These clauses all recognize the value of the lessee's economic investment in the property as an alternative to the payment of delay rentals or royalties.

The reference to pooling and unitization provisions fails to mention the impact of spacing regulations and the economic waste resulting from drilling wells in too great a proximity to each other. Pooling and unitization are primarily oil and gas conservation measures. The author again discusses implied covenants, which are discussed hereinabove, and fails to mention that most Courts have adopted some form of the prudent operator rule which requires the lessee to operate in good faith. This rule was adopted in New York by the Appellate Division in the case of <u>Doran & Associates, Inc. v. Envirogas, Inc.</u>, 492 N.Y.S.2d 504 (N.Y. App. Div. 1985); again, implied covenants have been rendered moot by most carefully drafted oil and gas leases.

IA4-14

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In the author's conclusions, mention is made of the lessee's responsibility for surface damage and proximity of wells to structures on the property. Nearly every lease form in use today contains such clauses, and the DEC regulations further govern the location of wells relating to structures, streams, roadways, etc.

It is true to state that an oil and gas lease is a complex instrument, a binding legal document, and certainly legal counsel can be of assistance in the analysis. Whether or not it is true to state that consultation with legal counsel will help landowners to avoid or mitigate potential negative impacts to their property while simultaneously allowing them to enjoy the economic benefits will depend in large part upon the expertise of the attorney in oil and gas matters. IA4-12 Correction noted. Replace "consequences of condemnation" with "termination".

IA4-13 No implied covenants were discussed in connection with the pooling and unitization clause. This clause, along with the five other defensive clauses described in the text were listed due to their presence in most leases.

IA4-14 Comment noted.

IA4-15 Correction noted. The phrase "... landowners should consult with legal counsel..." should be changed to "landowners may wish to consult with legal counsel with expertise in oil and gas lease matters."

## New York State Oil Producers Association

OPA-1

P.O. BOX 265 BOLIVAR, NEW YORK 14715

COMMENTS AS SUBMITTED BY THE NEW YORK STATE OIL PRODUCERS ASSOCIATION TO N.Y.S. DEPARTMENT OF ENVIRONMENTAL CONSER-VATION REGARDING THE PROPOSED FINAL DRAFT OF THE GENERIC ENVIRONMENTAL IMPACT STATEMENT (CEIS).

Presented at Wellsville, New York, June 16, 1988, by Thomas E. Hungerford, President.

The Association contends, and has long believed, that a GEIS (or site specific environmental impact statement) are not necessary for the protection of the environment and certainly not for the environmental impacts recited in the GEIS. The environmental impacts resulting from routine oil and gas operations are minimal and surely anyone who observes the lush vegetation and excellent water supplies in W.N.Y. sees evidence of an undamaged area. This is true even in intensely drilled old oil areas which have been producing over 100 years. For instance, the water supply for the Village of Bolivar, N.Y. comes from drilled wells centered in the most densely drilled portion of the Richburg field, yet the water is of superb quality with no evidence of oil and gas.

The Department recites some instances of environmental damage and we agree that some unsuitable practices occurred in the early development of the industry. However, as we have asked before, can the Department cite cases of any extensive damage, especially subsequent to the regulations imposed as a result of the changes to the Conservation Law in 1963? It appears that the DEC could meet their responsibilities under SEQR without the CEIS, and may of the conditions quoted in this draft were selected and phrased to justify the Departments position. Comments made by some of our members in 1986, on the CEIS, reflect some of the comments we made here today. Since we feel that these '86 comments are very applicable now, they are

attached hereto in their entirety.

OPA-1

The Department has on record numerous examples of damage resulting from oil and gas operations. Anyone wishing to explore this topic is invited to visit our Central Office to review our records, tapes, and films which document violations that resulted in environmental damage. See response to I-419.

SEQR requires government agencies to analyze the environmental, social, and economic impacts of their actions. The GEIS is the most thorough means of accomplishing this mandate.

### OPA-2

We also question the cost effectiveness of the GEIS and note that the taxpayers of this State have supported a costly endeavor to regulate an industry that is declining at an alarming rate. Oil production in '85, '86 and '87 has been 1,071,000, 853,000 and 709,000 bbls. respectively, and without a price increase, under this decline rate, the oil industry will effectively cease to exist in N.Y. State in 5 years (1993). This is a sad commentary on an industry that has had such a magnificient history and contributed so much to the economy of this State. It is noted here that Penna., and Ohio, with much larger oil and gas operations, have not adopted a GEIS.

However, this Association is aware that requests and arguments that the GEIS be abandoned should have been presented in the early comments on its development, and we are realistic enough to believe that this is unlikely now. In view of this some general comments on the contents are submitted as follows:

 All proposed future regulations should be removed. This is not the vehicle to promote additional regulations and if desired they should be proposed individually, through normal procedures.

2. All cementing and completion, plugging and abandonment and well permitting and spacing requirements should be replaced by those existing subsequent to the environmental legislation of 1963. We cannot see any evidence of increased environmental protection by the leter regulations.

3. Many of the <u>suggestions</u> and proposals in the GEIS such as scenic vistas, access roads, aesthetic compatability standards and lease terms are outside the DEC's responsibility and an interference in 3rd party contracts.

In addition, we have prepared some specific comments, identified by page in the draft, which will not be read in here, but are also attached for submission with the written comments. We thank the Department for the opportunity to comment and note that, although our suggestions are not always acdepted, we are always encouraged to present our input on this and other items of concern. OPA-2 New York's old oilfields have been producing for over 100 years. The economic life of most wells is less than 50 years. A decline in production results from natural reservoir depletion, regardless of the existence of regulations and the GEIS. It is true that if no new major discoveries are made economic production in the old fields will eventually cease, even without regulations or the GEIS. Not every state has adopted a State Environmental Quality Review Act (SEQRA) requiring agencies to analyze the environmental, social and economic impacts of their regulatory actions. However, New York State has adopted SEQRA, and the GEIS is a legal requirement. One of the primary purposes of the GEIS is to avoid the requirement of separate costly environmental impact statements on individual wells or projects.

OPA-3 See Topical Response Number 5 on Reasons for Including Proposed Regulations in the GEIS.

OPA-4 Industry experts and regulatory personnel found the regulatory program that was based on the 1963 legislation inadequate with respect to environmental protection and long-term resource management. The major weakness in the 1963 legislation was the almost complete exemption of the old oilfield areas from regulation. For example, casing and cementing technology has advanced dramatically over the past 30 years.

OPA-5 The discussions in the GEIS of scenic vistas and aesthetic compatibility standards are included because SEQR requires that these topics be addressed in any Environmental Impact Statement. In addition, no regulatory proposals concerning these topics were made. If these topics were not addressed in the GEIS or if there were no GEIS, operators might have to address these topics in separate Environmental Impact Statements for each and every well. Access roads are considered "part of the action" to drill a well, and oil and gas operators, contrary to their claims, are not the only industry required to address the impacts of access roads. The GEIS was written, in part, for public information. Providing the public with information on lease terms is not interference in third party contracts.

-2-

OPA-4

OPA-5

OPA-3

### -1-June 16, 1988

# SPECIFIC COMMENTS ON THE GEIS AS PROVIDED BY THE NEW YORK STATE OIL PRODUCERS ASSOCIATION

	PAGE	2	١		• • •
OPA-6	4-1	B. Add: Natural oil some fresh water drink damage is industry rol	and gas seeps have also polluted ing sources and not all fresh water ated.	OPA-6	The commentator's observation is true, but we do not and cannot regulate natural phenomena.
OPA-7	4-2	Last Para. Add: Howev tory operating conditi reserves will be deple	er, under present economic and regula- ons, the <u>economically</u> recoverable oil ted in a very short time.	OPA-7	The suggested addition is not appropriate for inclusion in Chapter 4, on history. This point is covered instead in Chapter 18, on economics.
OPA-8	4-7	lst para. Was the Pee waterflood or was the cable tools, responsib	t Hollow well contaminated by the drilling practice of the time, with ble? We believe the latter.	OPA-8	Herrick (1949) attributed the pollution to waterflooding, but undoubtedly the drilling and completion practices of the time were also contributory.
OPA-9	6-18	Add: The protection of with encouragement of jective and defined st	of visual resources must be consistent industry operations. Also this is sub- andards will never been established.	OPA-9	See Topical Response Number 2 on Visual Resources and Assessment Requirement.
OPA-10	8-2	Item 1. Outside old for wells is unreasons established based on o	tield areas a blanket 40 acre spacing able. A spacing schedule should be lepth of target and/or producing horizon	<b>OPA-10</b>	The DEC encourages operators to submit information to support changes in spacing which will increase ultimate recovery.
		e.g. Oriskany pro and is sconomically u	oduction will support 120-160 acre spac neound at lessor spacings.	ing OPA-11	We recognize that cable tools are an appropriate or acceptable technology for well drilling in some areas of New York State, but it is our understanding that
OPA-11	9-2	Para. 2. Cable tool :	rigs are not confined to shallow wells		7,000-foot wells can no longer be economically drilled with cable tool rigs.
n.e. 1		depths to 7000 ft. Add: They are e several formations is low pressure formatio	specially suitable where evaluation of desired, while drilling. Particularly ns.	OPA-12	This test pressure is far below the lowest API casing strength rating. There must be some assurance of minimal casing integrity.
OPA-12	9-15	5 Item 4. This require into known reservoirs pressure.	ment for surface casing in wells drille which do not exceed 200 psi formation	d OPA-13	The DEC has documented evidence of improperly plugged wells. Most of these wells came to our attention when abandoned wells leaked in response to nearby stimulation or waterflooding activity.
OPA-13	, 11-3	3) Ist para. Has the De wells as improperly p Add: However, m flood areas must have their integrity durin	partment verified <u>many</u> old abandoned lugged? any old abandoned wells in the water- had adequate plugs as demonstrated by g flooding operations.	~	
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	PAGE	
OPA-14	11-7	Item 2a. Temporary abandonment or shut in periods shall be longer than one year, (evidence the continued economic conditions ir the field, presently). Penna. is now considering allowance of a 5 year temporary abandonment.
OPA-15	11-11	Item F. Some reference should be made to the EPA plugging requirements and the fact that one agency or the other will eventually control injection well plugging. Not both as presently required. (This is in addition to Chapter 15 discussion)
OPA-16	12-5	Item C1. Should read "A production potential of 1000-2000 barrels per acre" per acre foot is an error
OPA-17	12-9	2nd para. Enhanced recovery is now projected to recover much less than 8,059,000 bbls. of oil, <u>under present condi- tions</u> . 3,000,000 bbls. without additional development
OPA-18	12-17	"Production" para. Add: Some waterflood operations have flowed or are presently flowing the producing wells. No pumping units are used. Possible for future floods also (if any).
OPA-19	12-30	Add: Mining is a possible secondary or tertiary recovery technique particularly in shallow formations with very high oil reserves in place, such as 18,000 bbls. per acre.
OPA-20	12-31	Item 4. Replace with: Ignition was never attained due to continued failures of the igniter.

- OPA-14 Reasonable alternative proposals will be considered during the rulemaking process.
- OPA-15 Reference is made to the plugging requirements for injection wells under USEPA jurisdiction. See page 11-23 and Figure 11.6 on page 11-26d. It is not a fact that one agency or another will eventually be the sole regulatory agency, but we continue to work toward a like set of standards.
- OPA-16 As stated by the commentator, a production potential of 1,000-2,000 barrels per acre expected waterflood yield is correct for New York State oilfields, but this section of Chapter 12 is on waterflooding in general. New York has thinner sands, lower porosities and lower recovery factors than other areas of the nation. A production potential of greater than 1,000 barrels <u>per acre-foot</u> would be the minimum expected yield to initiate an economic waterflood in other areas of the United States. The minimum production yield needed to initiate an economic waterflood project changes with current and predicted oil prices.
- OPA-17 Correction noted. Division staff has recently recalculated remaining recoverable waterflood reserves to be approximately 3,576,000 barrels.
- OPA-18 The suggested addition is appropriate.
- OPA-19 Oil mining recovery techniques are most appropriate for thick, heavy tar sands which do not occur in New York State.
- OPA-20 VanTyne and Foster (1980) reported that ignition was sustained for 37 days.



**ENVIROGAS INC.** 

One Grimsby Drive Hamburg, New York 14075 716/648-3400

JUL 1 1 1988

OFFICE OF REALTINGS

July 7, 1988

Robert S. Drew, Chief Administrative Law Judge New York State Department of Environmental Conservation Office of Hearings, Room 409 50 Wolf Road Albany, NY 12233

Re: Draft Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program

Dear Judge Drew:

Envirogas Inc. welcomes this opportunity to comment on the long awaited Draft Generic Environmental Impact Statement prepared by the Department of Environmental Conservation. By way of introduction, I should point out that Envirogas Inc. is one of the largest oil and gas exploration and production companies operating in New York, having drilled over 1,500 wells since our incorporation in 1976. Envirogas Inc. has long been recognized as an industry leader, not only due to the level of our operating activities but also as a result of our responsible approach to environmental concerns. Rather than addressing the Draft G.E.I.S. as a whole, we will comment on certain specific statements or proposals contained in it. To simplify your review of our comments, they are presented in the order found in the Draft G.E.I.S.

ENG-1 Envirogas Inc. supports the conclusions set forth on pages 3-2 et seg, and incorporated in Table 3.1 found on page 3-5 et seg., that the permitting of standard individual oil and gas wells should be considered non-significant actions under the State Environmental Quality Review Act. We believe that the proposed disturbance of more than two and one-half acres for a wellsite and access road in an Agricultural District is a reasonable threshold for requiring further environmental assessment by the Department, not requiring



more than a limited, site-specific supplement to the Generic Environmental Impact Statement. The term "municipal water supply well" needs to be defined. There has been some confusion as to whether this term can include privately owned water wells in addition to water wells owned and operated by actual municipalities (i.e. governmental units such as cities). This definition should also include a minimum number of residences which must receive their water supplies from such a well for it to qualify as a "municipal water supply well". What constitutes a "major waterflood or teritiary recovery project or a "major" modification to a gas storage or solution mining project also requires further definition.

ENG-2 Section VIII of the Draft G.E.I.S. begins with a statement, on page 8-1, that "an operator must have a permit before site construction and drilling can commence." while the issuance of a permit by the Department should always be required prior too the commencement of actual drilling, the issuance of a permit has not been, and should not be, a prerequisite to site construction in most cases. Pre-permit site construction should not be prohibited for a well where the issuance of a drilling permit would automatically be considered a non-significant action under the guidelines set forth in Table 3.1 of the Draft G.E.I.S. Oil and gas development in New York is primarily funded by individual investment in drilling program partnerships. Current income tax regulations applicable to such investments has resulted in a situation where drilling activities are primarily conducted during the first and fourth quarters of each calendar year. With a limited "drilling season", oil and gas operators require flexibility in the conduct of their operations and should not be restricted in the construction of wellsites in non-sensitive areas during the administrative processing of a drilling permit.

ENG-3 Figure 8.1 on page 8-la purports to show a typical drilling site layout and depicts a square location with exterior boundaries of one hundred feet. Reference is made elsewhere in the Draft G.B.I.S. to this being the normal size of a well site (e.g. page 8-35). This is not correct. A typical wellsite will encompass approximately one acre during drilling, which equates to a square with exterior boundaries slightly in excess of two hundred feet. Similarly, the width of the access road, during drilling, is necessarily considerably greater than that depicted in Figure 8-1.

ENG-4 With respect to the "siting regulations and policies" discussed on page 8-3, it should be made clear that the "well location" referred to is the actual wellbore.

The recommendation on page 8-5 to increase the siting restriction

ENG-1

The term "municipal water supply" is defined as a water supply operated by a municipal government (city, town, village, etc.). The term does not apply to privately owned public water supplies unless they are under contract to a municipal government. "Major" in the context of a waterflood, tertiary recovery, gas storage or solution mining project would usually mean more than one well or a multi-well project. Other factors including the historic extent of operations in the area would also be considered. "Major" could be removed from items 5, 6, and 7 on page 3-3 without changing the intent of the text. In the case of an underground gas storage facility, a major modification would include increases in the previously approved reservoir storage capacity and buffer zone.

ENG-2 A permit must be issued before site clearing and construction begins. This is required under the State Environmental Quality Review Act. Whether the well can be issued a standard drilling permit, requiring no other permits or site-specific permit conditions, cannot be determined until the pre-site drilling inspection is made by DEC staff.

ENG-3 The figure depicts an average drill site based on information obtained from operators and Regional staffs. The size of drill sites will vary from well to well, and that in some cases, the site may be one acre or more in size.

ENG-4 The suggested clarification is true for the setbacks from private dwellings and public buildings or areas. The reference to "well" in the next paragraph. however, refers to the entire well site. Therefore, add the word "site" after "well" in the first line of the second full paragraph.



from private dwellings to 150 feet is reasonable and should be adopted. However, provision should be made for the automatic reduction of this restriction to 100 feet with the written consent of the owner of the private dwelling.

ENG-6 With respect to the recommendation on page 8-6 that the location of pits, access roads, tanks etc. be sketched on the survey plat accompanying a permit application, it should be noted that such sketch can only show the proposed location and anticipated dimensions of such facilities. Final location and dimensions are necessarily subject to developments during construction and drilling operations and are often also subject to landowner consent.

ENG-7 As with earlier statements relating to the size of drilling sites, the statement on page 8-7 that a pit is generally no larger than 25 feet by 50 feet underestimates the dimensions which are normally encountered. Pits of almost twice that size are not uncommon.

ENG-8 Page 8-11 contains a recommendation that future regulations provide for site reclamation within 45 days after the cessation of drilling operations. This is unreasonable and should not be adopted. Current regulations prohibit the storage of fluids on location for more than 45 days after the cessation of drilling operations, which itself is often unrealistic. After a gas well has been drilled to its total depth, tests are conducted (known as logging) to obtain information concerning the formations which have been penetrated and determine whether the well has sufficient potential for commercial production. If it does, casing is then run into the well and cemented into place. Thereafter, the well is completed (also referred to as being stimulated or frac'ed). After completions the well must generally be treated, often including the use of a service or swabbing rig. These activities which follow the cessation of drilling often require several weeks. The nature of these activities precludes site restoration; including the removal of fluids from and filling in of the pit, being undertaken until after the activities have been performed. For this reason the period of time allowed for site reclamation or oh-site fluid storage should be measured from the date of completion of a well not from the date of cessation of drilling operations. (If there is a concern about the potential for undue delays between cessation of drilling and completion, the regulation could provide for the time of restoration to commence at the earlier of the date of completion or a fixed number of days following the date of cessation of drilling operations.) As indicated earlier, most of the drilling being done in New York is currently done during the winter months. Proper restoration during winter

ENG-5 Support for the 150 foot setback is noted. Reasonable alternative proposals or modifications will be considered during the rulemaking process.

ENG-6 Comment noted.

ENG-7 Again, the pit dimensions given here are averages, based on field observations and discussions with operators. It is realized that pit size will vary from well to well.



Page -

weather is a practical impossibility, especially in the Western part of the State where most drilling occurs. To allow for proper scheduling of restoration, after considering the circumstances under which most drilling occurs, it is recommended that the filling in of pits be required within sixty days following well completion and site restoration be required within nine months following well completion with the Regional Mineral Managars of the Department of Environmental Conservation having authority to grant extensions of time under reasonable circumstances.

It is recommended on page 8-15 that the siting restriction on the proximity of wells to surface bodies of water (formerly defined as a public stream, river or other body of water) be increased to 150 feet and that the restriction also include associated production facilities. We do not agree with this recommendation and are unaware of any evidence of pollution incidents which would support the tripling of the present siting restriction of 50 feet. We do believe that the existing 50 foot restriction should apply to pits and any tanks which contain brine, hydrocarbons or other potential pollutants. If, in reviewing a drilling permit application, the Department determines that specific topographical concerns may increase the risk of pollution to nearby surface waters, it can, as a special permit condition, require that special precautions be taken, such as the use of surface water ditches. Obviously, an increase in a siting restriction has the result of reducing the area of land available for oil and gas development. To allow this to occur, and potentially deprive landowners of the right to have their property fully developed without compelling evidence supporting the need to, is unfair to those landowners.

ENG-10

ENG-9

Envirogas Inc. has no objection to the proposal, found on page 8-16, that the surface water setback restriction be applied to springs being used for a domestic water supply provided that such restriction remains at 50 feet.

ENG-11 A discussion of "municipal water supplies" begins on page 8-16. This term requires formal definition. As implied in the Draft G.B.I.S., because of the statewide spacing requirement mandating a setback of 660 feet of a gas or oil well from lease lines, there is effectively already a siting restriction in place for municipal water supplies located on property owned by the municipality. Of course, a municipality has the ability to waive that informal siting restriction by entering into an oil and gas lease for the development of its property but can include whatever siting restriction it deems adequate as a condition of that lease. Accordingly, consideration of siting restrictions from municipal water supplies principally concerns surface municipal water supplies located on or immediately adjoining privately owned ENG-8 Reasonable alternative proposals will be considered at the time of rulemaking. It is true that completion activities can take weeks if they are scheduled after the cessation of drilling; therefore, an extension or timetable of 60-90 days for final stie reclamation may be reasonable. The DEC has encountered operator delays of several years between drilling and completion activities. Because of the high potential for leakage, pit fluid must be removed for proper disposal within the required time period.

ENG-9 The reasons DEC considers the existing 50-foot setback insufficient are detailed on page 8-15 of the GEIS. Other industry commentators have proposed that a 100-foot setback apply to the entire wellsite. Reasonable counterproposals will be considered during the rulemaking process. We agree that using the distance of 150 foot proximity as a flag for closer permit review to determine whether special precautions are necessary is more reasonable than a 150 foot siting restriction.

ENG-10 Suppor

Support for a smaller domestic spring setback requirement is noted. See response to ENG-9.



ENG-13

Page 5

property and municipal water wells. The Draft G.E.I.S. contains a recommendation, on page 8-17, for a minimum siting restriction for wells and associated production facilities from surface municipal water supplies of 150 feet which, it recognizes, is three times the existing restriction. Envirogas Inc. has the same concerns as it did with respect to the proposed increase in the siting restriction for other surface bodies of water relating to landowners being deprived of the full use of their property. However, Envirogas also recognizes the importance of municipal water supplies and the need to protect them. We accordingly believe that it may be reasonable to apply a 150 foot siting restriction to surface waters, including reservoirs, actively being used as a municipal water supply provided that a variance could be granted from such restriction in the discretion of the Regional Mineral Manager of the Department.

ENG-12 Issues relating to municipal water wells are somewhat more complex due in large part to the requirements which have been added for proposed oil and gas wells within either a 1,000 foot radius or 2,000 foot radius of a municipal water well. The extreme cost associated with an environmental impact statement: which is necessary for relief from these siting restrictions, effectively precludes the development of oil or gas within 2,000 feet of a municipal water well. It is our belief that this potentially constitutes a taking of a mineral interest owner's property without compensation and could result in claims being asserted against the municipality and State. It is our suggestion that the Department of Environmental Conservation use its regulatory powers relating to municipal water supplies to insure that municipalities act reasonably and fairly in locating their water wells (for example. by setting back its water well 340 feet from its property boundary a municipality can insure that no oil or gas well will be drilled within 1,000 feet of its water well thus precluding a situation where an environmental impact statement is mandatory for a proposed oil or gas well).

> Envirogas Inc. believes the recommendation on page 8-22 of a 150 foot setback from private water wells is reasonable and supports its adoption provided that, as recommended, the water well owner has the ability to approve a smaller setback. We do not however believe the companion recommendation, that the survey plat accompanying a drilling application show the location of all private water wells of public record within 1,000 feet of a proposed wellsite, would have any real benefit and strongly feel that it should not be adopted. As pointed out in the Draft G.E.I.S., there are no standard regulations for water well construction and accordingly there are few instances where the location of private water wells are matters of public record.

ENG-11 A "municipal water supply" is defined as a water supply owned and operated by a municipality (city, town, village, etc.). Currently, variances cannot be administratively granted to parties other than municipalities. Part 553.4 of 6NYCRR requires public hearings to decide on requests for variances from any spacing and siting restrictions. Reasonable counterproposals to existing regulations will be considered during the rulemaking process.

ENG-12

This suggestion has merit. The DEC does not currently have the regulatory authority to restrict siting of water wells. See Topical Response Number 1 on Public Taking Without Compensation.



Page 😚

However, the cost to an operator of having a surveyor check all available records for information on the location of private water wells could be substantial. Under these circumstances, we do not believe such expense is justified. Since any property within 150 feet of a proposed wellsite would necessarily be under lease to the oil and gas operator, by contacting the appropriate landowner the operator would have a reasonable means of obtaining ) information on private water wells subject to this siting restriction without need to reference public records.

ENG-14 Envirogas Inc. strongly disagrees with the suggestion on page 8-25 that a permit holder be required to have landowner approval to bury either trash or the pit liner. As a practical matter, it is wirtually impossible to completely remove the pit liner from a property. Following the drilling of a well, the pit liner will contain an unknown but significant weight of drill cuttings, cement (from cementing the casing strings), drilling mud, and dirt (which is placed along the edges of the pit liner to help hold it in place). This weight on top of the plastic pit liner prevents it from being removed intact. A more reasonable approach than requiring removal of the pit liner and trash without landowner consent to bury it would be to specify a minimum depth for the burial of these items (such as 40 inches).

ENG-15 The second recommendation on page 8-25 that well casing be cut to a depth of 4 feet in agricultural areas at the time of plugging and abandonment is reasonable and should be adopted.

ENG-16 The separate stock piling of topsoil in agricultural areas so that it may be redistributed during site restoration is a standard practice, which as recommended on page 8-26, should be adopted. Measures such as paraplowing are generally inappropriate however, and should not be required.

ENG-17 The implication on page 8-28 that the Department of Environmental Conservation may involve itself in the location of wells and/or access roads because of its impression of the potential for interference with farming operations seems a clear interference with the contractual relationship between a landowner and oil and gas operator. This is not properly the role of the Department.

ENG-18 It should be pointed out with respect to the comments on culverts and sills that the need for the use of riprap in culvert installation is the exception rather than a common occurrence. Riprap is not needed for smaller water ways.

ENG-19 As can be seen from the archeological site map reproduced as Figure 8.4 on page 8-36a, areas of potential archeological concern ENG-13 As stated in the GEIS, private water wells enter the public record when a property sale or transfer occurs. An examination of these records, in conjunction with contacting appropriate landowners as described by the commentator, would constitute a reasonable effort to locate all known private water wells. Alternate proposals will be considered during the rulemaking process.

ENG-14 This recommendation was made because the DEC has received numerous complaints from landowners regarding buried trash and/or pit liners. Other industry commentators have expressed agreement with this recommendation. Reasonable counterproposals such as citing a minimum pit liner burial depth will be considered during the rulemaking process.

ENG-15 Support for this proposed regulation is noted.

ENG-16 Support for the proposed topsoil stockpiling requirement is noted. See response to I-558. Paraplowing is not being required at every wellsite, only where compaction has occurred.

ENG-17 The DEC can intervene and attach permit conditions only under special circumstances to safeguard specified protected resources (e.g. floodplains, Agricultural Districts, wetlands, etc.), or to avoid or mitigate impacts to significant resources which are not otherwise protected but have been identified during review under SEQR.

ENG-18 The commentator's observation is correct.



have not been identified with a great deal of specificity. Whenever a permit to drill an oil and gas well shows the proposed well to appear to be within a potential archeological site area, the applicant is required to have an archeological study done at its expense. This is an expensive process and a burden which has not uniformly been imposed on other industries or individuals. Consideration should be given to a means of reducing the frequency of such reports being required by reducing the area of the identified potential archeological sites. Additionally, when an archeological survey is required from a permit applicant the review process by the State Office of parks, Recreation and Historic Preservation seems extremely slow and unduly delays the issuance of a drilling permit. A specific time period within which review of such a survey must be completed, not exceeding ten working days, should be established.

ENG-201

We support the suggestion on page 8-41 that existing regulations should be amended to require that dikes be constructed around all oil storage tanks, regardless of location.

ENG-21 With respect to the Freshwater Wetlands Permit referenced on page 8-45, it should be noted that the permitting process is often extremely lengthy, especially with regard to small projects which will create minimal disturbance to the wetland. It is accordingly suggested that an expedited permit review process be established for proposed activities which would disturb less than one-half acre of actual designated wetland.

ENG-22 The proposal on page 9-1 that written notification, sent by certified mail, to local governments and landowners at least five business days prior to the commencement of drilling operations is unnecessary and could result in causing delays to an oil and gas operator's normal activities. Regulatory jurisdiction of oil and gas drilling activities is vested exclusively in the Department of Environmental Conservation, and there is no jurisdictional need for the local government to have advance notice of the commencement of drilling operations. The principal benefit of requiring notice of the commencement of drilling operations to local governments is to insure the inclusion of a new well on the appropriate real property tax records. Existing notice requirements are satisfactory for that purpose.

ENG-23 Envirogas Inc. supports the second recommendation on page 9-1 to the effect that notification to the Department of Environmental Conservation of the actual commencement of drilling operations be allowed to be made by telephone rather than in writing. A requirement of 24-hour advance notice is not unreasonable. We also strongly support the remaining recommendation on page 9-1 ENG-19 We agree that the process for identifying archeological sites is sometimes burdensome, but this is outside our jurisdiction. The Office of Parks, Recreation and Historic Preservation believes it is necessary to restrict access to their archeological maps.

ENG-20 Support for the proposed oil tank dike requirement is noted.

ENG-21 Wetlands are highly sensitive environments where drilling activities can have adverse impacts beyond the actual boundaries of the project area. In addition, the Freshwater Wetlands Permit is issued by the Division of Regulatory Affairs under ECL 24-0103; therefore, the permit review process is outside the jurisdiction of the Division of Mineral Resources. Discussions among Minerals, Fish and Wildlife staff and the Oil, Gas and Solution Mining Advisory Board are continuing on wetlands issue.

ENG-22 Section 23.0305-13 of ECL requires that permittees give notice by certified mail to any local government or landowner affected by the location of the drilling site prior to the commencement of drilling operations. The law does not, however, specify five days. Landowners are also entitled to notification before a rig arrives on their land under the above section. Reasonable alternative proposals for accomplishing this goal will be considered during rulemaking.

**CR-79** 

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that the effective period for a drilling permit be increased from 130 days to 12 months. Drilling permit fees are higher in New York than in other nearby states, yet none of the other states has a shorter effective period than that currently in effect in New York.

ENG-24 A qualification should be included in the discussion of conductor casing on page 9-9. The Draft G.E.I.S. indicates that for conductor casing which is driven, cementing is only required if the conductor casing is not recovered when surface casing is run. While an operator may honestly intend to recover the conductor casing at the time the surface casing is being run, it is possible that he may be unsuccessful in doing so. Since it will then be too late to do a separate cement job, it is recommended that in such instance the conductor and surface casing strings be cemented together with the conductor casing then being grouted. This procedure should be added as part of the aforementioned discussion. It should also be noted that the matboards placed around the wellhead during drilling to support the rig platform do not allow sufficient room for a 3-foot diameter cement pad. Accordingly, it may not be feasible to create the proposed sloping pad until after the drilling rig leaves location. It should be noted in the brief discussion relating to the reciprocating of casing during cementing operations that for the size of drilling rig normally used in New York reciprocating is neither practical nor safe.

ENG-25] It is noted on page 9-13 that the Department of Environmental Conservation is to receive 8 hours advance notification of the cementing of surface casing. This time was increased from the prior 4 hours to allow the Department adequate time to schedule an inspector to be present during cementing operations (since the Department also receives 24-hour advance ; notification of the commencement of drilling operations, it will already have been able to anticipate the timing of the cementing of the surface casing). Currently, additional conditions attached to drilling permits state that cementing may not commence until a State inspector is present. Given the notification requirements to the Department, this is unreasonable. Provided that the notice requirements are complied with, cementing operations should be allowed to proceed as scheduled, whether an inspector is present or not. Operators must pay substantial costs for idle drilling rig time (most drilling rigs are owned by third-party contractors, not oil and gas operators), and it is unreasonable for operators to be exposed to such expense because of the unavailability of a State inspector.

ENG-26

It is recommended that the word significant be inserted on the

ENG-23 Support for these proposed requirements is noted.

ENG-24 Existing regulations require that the cement behind the surface casing extend from below the deepest potable freshwater zone to the surface, including the space between the surface casing and conductor casing. The statement on page 9-9 that the operator must grout non-recovered conductor casing applies whether or not the operator initially intended to recover the casing. Therefore, the procedures outlined in the GEIS adequately address the commentator's first concern.

With prior approval of the Regional Minerals Manager, a smaller pad may be installed. Additional cement would have to be added after drilling operations had ceased. This would bring the well into compliance with the required minimum diameter of 3 feet.

With respect to reciprocation, see response to I-233. As stated, we realize that conditions in New York State do not warrant requiring reciprocation.

ENG-25

Notification of drilling commencement does not allow DEC to accurately predict when the surface casing will be cemented. Any number of circumstances could cause unforeseen cementing delays. In addition, the cited paragraph on page 9-13 refers only to drilling operations in primary and principal aquifers where a State inspector must be present to witness cementing the surface casing. This requirement does not apply in other areas, as stated on page 9-12. As stated in the response to I-243, the State makes every effort to have an inspector available in the situations where the presence of an inspector is required.

first line of item 6 on **page 9-15** to describe "gas flows." This, we believe, will clarify what is intended by this paragrap.

ENG-27 Page 9-16 includes a portion of the currently effective cement and casing guidelines which the Draft G.E.I.S. adopts. The last sentence of paragraph 14 on that page assumes that all operators using the pump and plug method use a plug catcher (located at the top of the bottom full joint of casing). This is not a correct assumption. Envirogas Inc., for example, either places its design baffle, or a latch down baffle, directly in the float shoe at the very bottom of the casing string. The purpose of this is not to catch the plug but to allow us to be able to pressure test the casing prior to cementing. The use of a plug catcher as assumed by the last sentence of paragraph 14 would preclude this pressure testing format. The Department of Environmental Conservation has accepted the Envirogas Inc. procedure as an alternative to the procedure described in paragraph 14. We would accordingly suggest that paragraph 14 be modified by either deleting the last sentence or by adding a sentence allowing the alternative practice in use by Envirogas Inc.

ENG-28 The first sentence of the first full paragraph appearing on page 9-21 should be changed from an observation that "almost all operators test their blowout preventers for leaks after installation", to a requirement that blowout preventers be tested. In this same paragraph it should also be noted that test pressures in excess of 1,000 psi may be necessary for deeper wells.

ENG-29 The first full paragraph on page 9-23 implies that cementing the production casing to 100 feet above the production zone should be deemed sufficient to prevent the movement of oil, gas or other fluids around the exterior of the casing. What is needed as an absolute minimum is 100 feet of quality cement. It should be recognized that the first volumes of cement pumped normally have not achieved the desired consistency and are not adequate for the purposes intended. We believe that an additional 200 feet of cement (a total of 300 feet above the production zone) should insure the minimum 100 feet of quality cement which is necessary, and because of the importance that must be attached to this procedure, Envirogas Inc. suggests that this become a requirement.

ENG-30 With respect to the first full paragraph appearing on page 9-24, it should be pointed out that the process of well completion includes stimulation and production testing. Later, on the same page, reference is made to the well testing program proposed in the drilling permit application, however, the drilling permit application does not require the inclusion of a well testing program. ENG-26 The text on page 9-15 is a verbatim copy of the cementing guidelines implemented on April 1, 1986. If the word "significant" were inserted, it would then have to be defined and measured. We feel that any gas flows that are "significant" enough to be noticed during drilling operations should be cemented. Reasonable alternatives will be considered during the rulemaking process.

ENG-27 As stated in the cementing guidelines: "The Department recognizes that variations to the above procedures may be indicated in site specific instances. Such variations will require the prior approval of the Regional Mineral Resources office staff." This is a more reasonable approach than to try and include all viable alternatives in the guidelines.

ENG-28 These sentences in the text are observations on common procedures and are provided for informational purposes. We concur with the commentator that all blowout preventers should be tested after installation, and that test pressures above 1,000 psi are appropriate on deeper wells. Currently, BOP equipment and testing procedure requirements are determined by the Regional Mineral Resources office.

ENG-29 The referenced text should have been written in the past tense. The production casing cement height requirement has already been raised to a minimum of 500 feet above the casing shoe or a tie into the previous casing string, whichever is less. This is outlined in the cementing guidelines implemented April 1, 1986.

ENG-30 Attachments to the drilling permit application form may be necessary. A complete drilling program includes the proposed casing cementing, completion, testing and stimulation procedures. These procedures are all considered part of the action to drill a well under SEQRA, as stated on page 7-5 in the GEIS.



ENG-31 The first full paragraph on page 9-25 should include a statement to make it clear that an "open hole completion" does not mean that surface casing in any well can be eliminated. An "open hole" should mean a well where there is no production casing through the producing formation.

- ENG-32 It should be noted in the description of water-gel fracs appearing on page 9-26, as with the descriptions of the materials involved in other procedures described in this section, that reference is being made to a standard "frac job" and that variations are possible. It should also be noted in the last paragraph on this page that in the fracturing of a Medina well the overburden is not overcome.
- ENG-33 Page 9-30 contains a recommendation that the Department of Environmental Cohservation be able to take enforcement action against operators who repeatedly (a term which would require specific definition) submit incomplete Well Drilling and Completion Reports similar to the enforcement action which may be taken against operators for submitting a fraudulent or false report. Unless an intent to misrepresent information, similar to that involved in the filing of a fraudulent or false report, can be established, we believe a more appropriate response would be for the Department to return incomplete reports to the operator, requiring that they be completed and resubmitted.
- ENG-34 The reference in the second paragraph of page 9-31 to most pits as having dimensions of approximately 25 feet by 50 feet is, in our experience, inaccurate. Most pits are considerably larger.
- ENG-35 The recommendation on page 9-32 concerning the angle of pit walls is reasonable and would provide several benefits. However, it should be noted that as a consequence of such a permit condition the size of both the pit and wellsite will be substantially increased. Similarly, the recommendation on page 9-33 of a longitudinal pit would provide some benefit (where it is not impossible to construct due to site restrictions) but will result in the overall size of the wellsite increasing.
- ENG-36 The Department of Environmental Conservation is suggesting two new requirements for pit liners. One requirement which the Department would impose is the use of a one-piece liner rather than allowing an operator to overlay smaller liners together for a pit. If adopted, this will be ;more expensive for operators but may result in improving the integrity of the pit liners. The second proposal would be to require a minimum thickness for pit liners of 10 mils. The selected reference to the practice used in two other states,

ENG-31 The surface casing requirement will not be eliminated.

ENG-32 Because water-gel fracs are the most common stimulation technique, a very general description is given of the pressure ranges and ingredients commonly used. While the text discusses in a general way the mechanics of fracturing, no mention is made of the extent of the resulting fractures. The suggested additional information is appropriate for public information purposes.

- ENG-33 The Department does return incomplete reports to the operator without taking enforcement action, and will continue to do so. But, this practice uses a substantial amount of staff time. The recommendation is aimed at those operators who do not furnish complete information after repeated returns and resubmissions.
- ENG-34 The average pit size given in the GEIS is based on information from operators and field staff in Regions 8 and 9. This information has been reviewed by the Oil, Gas, and Solution Mining Advisory Board.
- ENG-35 Support for the recommendation that pit wall angles be limited and the accompanying comments regarding the effects on the pit and wellsite size are noted.



ENG-37

ENG-40

ENG-41

ENG-42

Page 11

without reference to the practices involved in the many other states having active oil and gas industries, to support this recommendation is misleading. Certain brands of pit liners only 4 mils thick are sufficient in strength for their intended purpose. There has been no evidence submitted showing that the 6 mil pit liners currently commonly in use are inadequate or unsafe. There will be a significant cost increase to operators if a 10 mil thick minimum is established for pit liners. Envirogas Inc. does not believe that any evidence has been shown which is sufficient to justify this cost increase. Accordingly, we do not believe this recommendation by the Department should be adopted.

Contrary to the statement on page 9-36. it is the experience of Envirogas Inc. that drilling mud is not normally reconditioned.

ENG-38 The recommendation relating to site restoration which begins on the bottom of page 10-1 is the same as that found on page 8-11. Please refer to our earlier comments on this proposal.

ENG-39 We concur with the statement, found on page ll-l, that "the plugging and abandonment of oil and gas wells is an operation that is critical for the protection of underground and surface waters". With this in mind, it is the belief of Envirogas Inc. that existing plugging regulations, as described on page ll-3, provide an appropriate plugging procedure for wells where both the surface and production casing strings were cemented back to the surface with documented cement returns (cementing of a casing string is done by pumping cement down through the casing, forcing this cement up the outside or annulus of the casing - having cement returns means visibly sighting cement flowing to the ground surface from such casing annulus).

We believe the material described in the recommendation found on page 11-4 exceeds what is actually needed for the proper plugging of a well. As stated on page 11-3, the required fluid must only be of a consistency to create sufficient hydrostatic pressure to exceed any zone pressures found in the well. However, the fluid should contain a corrosion inhibitor, which was omitted from the Department's recommendation.

We do not agree with the recommendation on page ll-ll to modify the plugging permit application. Envirogas Inc. believes that the existing application provides sufficient information for the Department of Environmental Conservation to review the proposed plugging operation and issue a permit therefore.

The following statement appears on page 11-12, "The DEC may require that the location and/or hardness of any plug be checked

ENG-36 The proposed pit liner requirements were based on a survey of pit liner requirements in several oil and gas producing states, as well as discussions' with several pit liner manufacturers. If the commentator has any documentation in support of reduced minimum pit liner thickness, please submit it to the Department. We realize that adequate liner thickness varies with the material composition and construction. Reagonable alternative proposals will be considered during the rulemaking process.

ENG-37 Comment noted.

ENG-38 See response to ENG-8.

- ENG-39 A 15-foot production zone plug is no longer considered acceptable in any state of this nation.
- ENG-40 This recommendation was made because a density of 8.65 ppg is the minimum necessary to provide a gel-shear strength which will help prevent the flow of fluids within the wellbore if a plug should fail. Sufficient hydrostatic pressure is only one of the functions a good abandonment mud should provide. Other industry commentators have expressed agreement with this recommendation.
- ENG-41 A detailed review and evaluation of proposed abandonment procedures by DEC staff is necessary to adequately protect the environment.

No dia 18



ENG-43

Page 12

by re-entering the well and tagging it." The DEC should not be able to require an operator to drill out a shallower plug so as to be able to tag a deeper one. Also, the circumstances under which tagging can be required by the DEC should be limited. The DEC should ;be able to require tagging only in the event that their on-site inspector observes a problem. Of course, that inspector should require the tagging prior to the setting of any additional plug.

A differentiation should be made in the first sentence of the first paragraph appearing on page 11-18 between wells where only the bottom portion of the production casing has been cemented (to a height above the producing zone) and wells where the entire production casing has been cemented ("to the surface"). Bistorically, Envirogas Inc. has followed the practice of cementing the production casing in its wells back to the surface. We have done this because of our belief that this practice provided important additional environmental safeguards. We also recognized that cementing the production casing back to the surface would allow for a more efficient and economical procedure to plug a well after its commercial life. Our engineering department developed a plugging procedure which complied with existing plugging regulations, recognized the benefits of a policy of cementing the production casing back to the surface and kept plugging costs within reasonable limits. Envirogas Inc. has been extremely frustrated by recent proposals which seem to ignore existing plugging regulations. Our frustration is heightened by statements such as the following which appear in the same paragraph on page 11-18, "Under special circumstances, a bridge plug capped with cement at the top of the zone will be allowed, such as when the production interval is a fracture or lost circulation zone known to take fluids." The sentence is referring to a well without production casing cemented back to the surface and describes a situation which has the most potential for environmental harm. Yet, it is being stated that the least stringent plugging requirements will be applied to such a well. It is our hope that when the Generic Environmental IMpact Statement is completed, it will reflect the benefit of cementing production casing back to the surface.

ENG-44 Envirogas Inc. does have several comments and suggestions with regard to the plugging proposals which appear in the Draft G.B.I.S. Option three under "Production Zone Plugging Requirements", on page 11-19 makes reference to a bridge plug and the volume of cement required on top of a bridge plug. It is appropriate to point out that a bridge plug is extremely reliable and safe to use. In various places throughout the plugging procedure discussion in Draft G.E.I.S. the volume of cement above ENG-42 An operator would not be required to re-enter a well and tag a plug without just cause, such as a problem observed by the on-site inspector.

ENG-43

Under the well conditions described by the commentator, the operator may be allowed to place a bridge plug capped with cement above the production zone, but he would also be required to shoot and squeeze or cut and recover uncemented casing at some point up the hole. This cannot be considered a less stringent procedure.



a plug has been increased from the 15 feet required by current regulations to 50 feet. We are unaware of any evidence to support the need for this substantial increase. Envirogas Inc. believes that 15 feet of cement is sufficient for sealing any formation currently productive in New York. The increase in the volume of cement proposed will cause a significant increase in plugging costs, beyond the cost of the additional cement. The additional volume of cement precludes the use of a dump bailer in the cemepting process, mandating the use of much more expensive equipment.

ENG-45 On the same page, option 1 under "Uncemented Production Casing Plugging Requirements", discusses the placement of a cement plug across the stub of unrecovered pipe. Placing the cement plug 25 feet below the stub will add significant time and expense to the plugging procedure but will not improve the result. The third line of option 3 under the same heading, which is found on page 11-20, should be changed by the substitution of the word "or" for the word "and".

ENG-461 Paragraph f on page 11-22 discusses the plugging of a well with cemented production and surface casing. The paragraph includes a statement of the added costs to an operator of cementing the production casing back to the surface and estimates that cost at between \$1,500 and \$3,000. That estimate ignores the salvage value of the production casing which cannot be recovered at the time of plugging. When the lost salvage value is also considered, the additional cost to the operator of cementing the production casing back to surface is approximately \$8,000. Also with regard to this paragraph, it is the belief of Envirogas Inc. that if there were good cement returns at the time the casing was cemented, at plugging only the bottom and top plugs (with a weighted gel spacer between them) will be needed without a 100 foot plug having to be placed inside the production string across the surface casing shoe.

ENG-47 Paragraph g on page 11-22 contains a recommendation extending the size of the surface plug from 15 feet to 50 feet. As referenced earlier, there is no known evidence to support this recommendation and, if accepted, it would significantly increase the plugging costs to an operator.

**ENG-48** Also as referenced earlier, the fluid information in the first paragraph on page ll-23 is too specific without ;any support or evidence showing the need for the fluid information specified.

ENG-49 The first paragraph on page 13-18 makes reference to the fact that the DEC is not authorized to release production related reports

ENG-44 Comment noted. See response to ENG-39.

ENG-45 The 25 feet of cement below the stub will help ensure that the casing stub is adequately sealed, and minimize the likelihood of fluid flow from the casing stub. The suggested wording change would alter the meaning of the sentence and is not appropriate.

ENG-46 State and federal regulatory personnel do not concur with the opinion that adequate well plugging can be accomplished with a gel spacer between two 15-foot cement plugs.

- ENG-47 The objection to this recommendation is noted. Reasonable alternative proposals will be considered during the rulemaking process.
- ENG-48 See response to ENG-40.

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from the solution mining industry to the public without a producer's consent. This is inconsistent with practices relating to the oil and gas industry where production information is regularly released. The basis for this inconsistency should be examined to see if there is a justification for keeping production information from one industry secret while disclosing similar information for another industry regulated by the same agency.

ENG-50 The buffer zone surrounding a gas storage field is discussed on page 14-7, which discussion includes a statement that no part of a buffer zone shall be more than 3,500 linear feet from the boundary thereof. It should be made clear that the 3,500 foot buffer zone is to be measured from existing storage wells and not an arbitrarily drawn storage boundary.

ENG-51 One of the most important, and recently well publicized environmental issues relating to the oil and gas industry is the proper disposal of brines associated with oil and gas production. Knowing that, it is disturbing to read, on page 15-8, that an estimated 90% of all brine produced in gas and new oil fields in New York is spread on roads for dust and ice control. It is equally disturbing to read on page 15-9 that this includes spreading on both paved and unpaved roads. The road spreading of brine carries with it the potential for serious environmental damage. Historically, there was no reliable alternative method available for the disposal of brine and accordingly, road spreading (on dirt roads) became the best alternative available to producers. However, in recent years more environmentally sound alternatives have developed for the disposal of oil and gas production brines. These include the use of waste water treatment plants and injection wells. These methods do not have the potential for the long range adverse environmental consequences associated with road spreading. Envirogas Inc. urges the inclusion in the Generic Environmental Impact Statement of a firm policy supporting use of injection wells, waste water treatment or similar facilities for the disposal of oil and gas production brines. Road spreading of these materials should be eliminated or curtailed to the greatest extent possible.

> Chapters 16 and 17 of the Draft Generic Environmental Impact Statement are essentially summaries of the prior chapters and the recommendations contained in those chapters. Since we have already commented on various portions of those chapters and many of those recommendations, Envirogas Inc. will not duplicate its comments with respect to specific paragraphs in chapters 16 and 17.

ENG-49 We agree with this observation. Amendments to the current law would be necessary to abolish this discrepancy. Apparently, the solution mining industry has reasons for wanting their salt production records kept confidential and no one has ever objected.

ENG-50 The boundary that the buffer zone is measured from is the reservoir limit. The reservoir limit is established on the basis of technical evidence submitted by the storage operator. The material submitted is carefully reviewed by the professional staffs of DEC and the State Geologist.

ENG-51 We believe that the best disposal method for produced brine is to return it to the zone of origin. Unfortunately, there are too few brine disposal wells in New York State to accommodate all of the produced brine. DEC staff have evaluated the chemical characteristics of both road salt and produced brines, and have found that the brines when properly spread are no more detrimental to the environment than road salt. In the future, it is hoped that substances or methods for dust and ice control will be found which do not have the detrimental effects of either brine or road salt.

### ENG-52 Adjudicatory hearings are not part of the process for preparing a final GEIS.



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ENG-52

In conclusion, Envirogas Inc. would again like to express its gratitude for having the opportunity to comment on the Draft Generic Environmental Impact Statement. We hope that our comments will be helpful to you in reviewing this document and in making the necessary modifications to it. Should any additional information or discussion be desired in preparing your response to the foregoing comments, Envirogas Inc. would be most happy to cooperate with you. Please do not hesitate to contact the undersigned for any such information. We believe that the Draft Generic Environmental Impact Statement contains serious errors, specifically with respect to well plugging and well site restoration; if the comments which we have made are not accepted, we request that an adjudicatory hearing be scheduled before the G.E.I.S. is finalized.

Very truly yours,

ENVIROGAS INC.

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Alan J. Laurita Vice President - Land

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### Kidder Exploration Inc 5 Hunt Road Jamestown NY 14701 716/488-0747

Comments by Rolland E. Kidder, President Kidder Exploration, Inc. Hearing on the Draft Environmental Inpact Statement Held by the New York State Department of Environmental Conservation Jamestown, NY, June 15, 1988

Kidder Exploration, Inc. is an independent natural gas drilling company located here in Jamestown, NY. We are pleased that after many years of work we now have a Draft Environmental Inpact Statement (DEIS) and hope that it, or a variation of it, will be adopted by the Department in the days ahead.

The New York Independent Oil and Gas Association (IOGA) of which we are a member created a special committee to deal with the technical aspects of this document. I would instead like to briefly comment on some overall policy matters which are reflected in this proposal.

#### State Primacy on Regulation

First of all, the DEIS recognizes that the Department of Environmental Conservation is to be the <u>lead agency</u> in regulating the oil and gas industry in New York. It is vital for the health of our industry that state primacy in the regulation of our industry continue.

All major oil and gas producing states have provided statewide regulation for this industry. In Texas (the largest oil and gas producing state) this regulatory control was given in the 1930's to the Texas Railroad Commission. That Commission was at that time the only major regulatory body in the state and regulation of the oil and gas business was deemed necessary. In New York State that regulatory control has been given, more correctly, to an environmental agency--the DEC. You control by the permit process not only the proper spacing of wells, but the proper environmental procedures for drilling and completing these wells.

It is absolutely essential that in this day and age of more and more laws and regulations being imposed by more and more governmental agencies--that there be one agency responsible for the regulation and control of oil and gas drilling. The "Balkanization" of governmental control would bring to a screeching halt an industry that is already reeling from the vorst economics it has seen since World War II.

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If anyone wonders exactly how many considerations are involved in granting a permit--I would refer them to page 8-3 of the DEIS. I count thirteen and that probably doesn't include everything. This illustrates why it is imperative that producers be able to work with one governmental agency when it comes to drilling permits.

In two areas of the DEIS, I would recommend an improvement in the lead agency status.

KEI-1

KEI-2

(1) Historic and Archaeological Determinations:

The law now requires the New York State Department of Parks and Recreation to determine whether or not a site is of archeologic or historic interest. If such a determination is made, a producer must conduct a study that usually costs \$1,000-\$1,500 to complete. More serious; however, are the delays that can occur in the process of waiting for approval. We would recommend that some type of interagency agreement be entered into between the DEC and Parks and Recreation in order to let the Division of Minerals act as the agent for approval or disapproval of historic and archaeological permits. We would also recommend that the map (known as the so-called "bone map") be improved so that it is more site specific; and that it be revised from time-to-time when historic artifacts are not discovered after a digging study has been completed.

(2) Secondly, we would recommend that within the DEC procedures be altered so that wetland determinations can be coordinated through the Division of Minerals. Although the experience with delay has not been a major problem, we believe it would make more sense to have a one-stop-shopping approach whereby we could submit our wetland permit applications to the Division of Minerals along with our other permit requests.

#### Balancing the Interests

Our other general comment on the DEIS, focuses on the area of the "balancing of interests." We believe that overall the document does that and takes into consideration the multitude of environmental concerns the Department must deal with as well as recognizing the realities we as businessmen must live with in drilling for oil and natural gas. That balance must be continued.

For example, there is the often misunderstood issue of brine disposal. Many people do not realize that oil and gas come from sedimentary rocks deep in the earth that were at one time associated with marine environments. 400 million years ago Chautauqua County was underwater--salt water. The sediments of that environment--deltic and coastal barrier bar--are now being drilled 4000 feet down. The decomposed fossil life from those ancient times is trapped in the rock and we produce it as natural ges. KEI-1

There has never been any question that the Department of Environmental Conservation will remain the lead agency for oil and gas regulation in the State. The Department's Division of Mineral Resources and the Office of Parks, Recreation, and Historic Preservation (OPRHP) worked together to establish special procedures for dealing with oil and gas drilling permit applications. These special procedures, which were implemented by OPRHP in 1984, resulted in shortening the average turnaround time for archeological reviews to a few days. It should be noted that a survey of operators conducted by the DMN in 1986 revealed that only a small number of operators who waited for determinations from OPRHP were actually required to conduct archeological investigations. Most companies who conducted investigations did so of their own accord in order to avoid possible delays. As previously stated, OPRHP feels it is necessary to restrict access to their archeological maps. Modifications to these maps, and the archeological review requirements, are outside DEC's jurisdiction.

KEI-2

The Division of Mineral Resources does not have the necessary technical expertise to make wetland determinations. Whenever permits from different Divisions within the Department are required, the Division of Regulatory Affairs (DRA) is the designated coordinator. Natural gas is the cleanest burning fuel in the world--it is absolutely non-polluting. However, as these rock reservoirs decline in pressure--that old sea water starts coming in to these wells. It is not a toxic waster--millions of people swim in it everyday on the beaches of New Jersey, Long Island and Florida. However, it must be disposed of properly and economically.

We hope that the DEC continues to keep this in mind. We need to dispose of this by-product properly, but its disposal is a growing economic burden in the industry and we must keep this overhead cost under control--especially when prices of natural gas are one-half what they were four years ago.

It is the old story again--"there is no free lunch." If people want to continue consuming the most pollution-free fuel in the 'world, then we are going to have to continue to find ways to economically and safely dispose of this ancient seawater. That is what we mean by the need for government to continue "balancing the interests."

KEI-3 Another example of this need is illustrated in our concern with the criteria which could be used by the Department in making wetland permit determinations. We are pleased with the mitigation approach we see on page 8-50 of this document. It is not cheap to drill in wetlands. Marifia paper, bank-run gravel, three acre duck ponds--are not cheap. We do not choose to drill in wetlands unless geologic potential or spacing requirements make that a necessary business decision.

> However, in most cases, where it is done--we believe that environmental inpacts can be minimized or mitigated in wetland environments. We need to balance the need for a clean, domestically produced fuel with the need to protect the environment. This again is what we call "balancing the interests", and we hope it is something the Department will keep its eve on as you adopt this and other regulations in the future.

> Again, we appreciate your coming to the western New York natural gas "patch" to hold this hearing. We believe that as the natural gas business has grown in New York State so has the state's ability to properly regulate this industry improved. We do not seek to be exempt from regulation, but we do seek a regulatory scheme which recognizes the unique problems and characteristics of our industry.

KEI-3

The Department supports a "balancing of interests" and also believes that the environmental impacts of resource development can be minimized and mitigated in wetland and other sensitive environments.

William J. Planta 54 South Shora Cuba, Naw York 14727 June 1.5, 1988 Sentemen: my comments on the GE15 will be brief. WJP-1 This instrument is confusing, discrimination, self contradicting and I question it's being legal. William & Blant

Recident Hears 6 | 16 | 88 Wells ville

**WJP-1** 

**CR-91** 

.85

The GEIS was prepared in order to meet the legal requirements of the State Environmental Quality Review Act (SEQRA). We need specific examples of the portions of the GEIS the commentator finds confusing, discriminatory, and self contradictory to address these concerns.

### UNIVERSAL RESOURCES HOLDINGS, INC.

NEWELL ROAD DUNKIRK, NEW YORK 14048 (716) 673-9116

. John J. Nalbone, Jr., President Louis J. Nalbone, Vice-President Don E. Goodson, Supervisor of Field Operations

REBUTTAL то GEIS



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### URH-1

The referenced paragraph is referring to a proposed 150-foot setback from existing residences to new wells.

UNIVERSAL RESOURCES HOLDINGS, INC.

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PAGE 8-5

Recent changes in the Public Service Commission's (PSC) gas <sup>1</sup> pipeline safety code (16 NiCRR part 255) also discourage the placement of wells less that 150 feet from a residence. Gathering lines installed closer than that to an existing residence or place of public assembly must comply with more expensive increased transmission line standards. The discrepancy between DEC's requirement of 100 feet between wells and homes and PSC's 150 foot restriction for gas gathering lines connected to such wells provides further reason for increasing the magnitude of DEC's surface restriction. \* It is recommended the DEC's siting restriction be increased to 150 feet for private dwellings and provide them protection equal to that for public buildings. \*

### URH-1 COMMENTS:

Set back on this should not be any different than what National Fuel Gas has on all their distribution systems. Old lines should be "Grand Fathered". New lines should have same siting criteria as National Fuel Gas.

-1-

VOLUME I PAGE 8-6

 $c \sim 2d$ 

### URH-2

### As stated, a hand sketch would be acceptable. Support for this proposed requirement is noted.

# UNIVERSAL RESOURCES HOLDINGS, INC.

Although Department staff are aware of the importance of protecting public safety, there is a chance that the above mentioned siting concerns have been overlooked on occasion because existing procedural requirements do not take them into account. \* The existing regulations do not require that the plats accompanying each permit application show the proposed location of pits, access roads, tanks, etc., as survey of these items is not required, but it is recommended the proposed location of the above drill site details be sketched on the plat accompanying each permit application. \*

### URH-2 |

0.K. If free hand sketch by operator is accepted, or separate on site document.

### VOLUME I

COMMENTS:

PAGE 8-11

b. <u>Longer-Term Noise and Visual Impacts</u> - After the well is drilled, the extent of the subsequent activities at the site that could cause visual or noise related disturbances to surrounding areas will depend largely on whether the well is a producer or a dry hole. If it is a dry hole, the site will be reclaimed. This will involve some final use of, and noise from, construction equipment, resulting in a temporary

-2--

# UNIVERSAL RESOURCES HOLDINGS, INC.

increase in noise impacts. Although no timetable exists for site reclamation, pits must be reclaimed within 45 days after the cessation of drilling operations. \* A site reclamation timetable of 45 days is 1 suggested for future regulations. \* Extensions can be granted by the Regional Minerals Manager for reasonable cause, such as seasonal weather conditions.

URH-3 | COMMENTS:

Rough Backfill OK - 45 days- But longer time must be required for final Restoration and seeding, 180 days. Weather such as rain fall and snow does not lend itself to comply to such a regulation.

#### VOLUME 1

### PAGE 8-15

Another weakness in this surface restriction stems form its exclusive focus on well siting. Under the present regulations, mud pits and reserve pits can be dug directly next to surface waters, although this is very unlikely because they must be adjacent to the well. Pits must have an impermeable lining and be large enough to contain all fluids. In spite of these precautions, accidental leaking and overflow has occurred. Storage tanks, oil-water separation ponds and other potential sources of pollution can also be sited directly next to surface waters under existing

-3-

### URH-3

Weather conditions should not delay site reclamation six months. A site reclamation extension for good cause will be granted by the Regional Minerals Manager.
regulations. Although Department staff often place conditions on permits or give instructions to operators limiting the siting of these facilities, the topic should be addressed on a more consistent basis. \* It is recommended the minimum siting restriction on the proximity of wells and associated production facilities to permanent surface bodies of water be increased to 150 feet. \* A waiver of this and most other siting and spacing restrictions can be given following the exception request, public notice and hearing procedures detailed in 6NYCRR Part 553.

#### URH-4

#### COMMENTS:

Way to much - 100 foot - less if waiver is requested and a public hearing on things such as a stream waiver should not be required, as in Pennsylvania, a stream encroachment permit is granted by the Deptartment after an on site inspection. No public hearings are run.

#### VOLUME I

PAGE 8-16

Department staff are aware of the importance of springs and often protect them through conditions on permits. \* It is recommended the surface water setback restriction be applied to springs which are used for a domestic water supply. \*

-4-

#### URH-5 | CONNENTS:

150 feet too much (75 feet in this case)

## URH-4

We agree that a strict 150 foot siting restriction may cause hardship. We have decided to recommend that the distance of 150 foot proximity be a flag on the revised EAF triggering closer permit review to determine whether special precautions are necessary.

URH-5

Other industry commentators have agreed with this proposal. Reasonable alternatives to proposed regulations will be considered during the rulemaking process.

#### Setback restrictions from the drillsite will be considered during rulemaking. It also has been decided that the distance of 150 feet will be a flag in EAF for closer permit review.

## VOLUME I

PAGE 8-17

a. <u>Surface Municipal Water Supplies</u> - Approximately one-forth of the municipal systems in the State are supplied by surface waters. These municipal reservoirs are protected by the same minimum setback requirements that apply to all surface water bodies. However, the existing 50 foot well setback requirement may not provide adequate back-up protection for surface waters in case of an accident. In addition, no regulatory restrictions exist on the placement of pits, tanks, or other potential sources of pollution directly next to surface waters. Department staff are aware of the importance of municipal water supplies and place conditions on the permit to restrict the siting of oil and gas facilities. \* It is recommended the minimum siting restriction on the proximity of wells and associated production facilities to surface municipal water supplies be increased to 150 feet. \*

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### URH-6 | . COH

· COMMENTS:

Should be 100 feet. Siting meaning the edge of the drill location cannot come within 100 feet (as in PA) from the water supply, without Dept. wavier

-5-

#### VOLUME I

PAGE 8-22

\$ 12,50

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Although private water wells considered individually are of less significance than municipal wells, they are equally sensitive to 1 groundwater pollution. In fact, they may be more vulnerable to pollution problems because there are no standard statewide water well construction requirements. Water well casings are not always grouted and extended above ground. Thus they can serve as a vertical collection conduit for surface pollution. In addition, the ground surface surrounding water wells is not always built up to drain surface waters away from the well. \* For these reasons, 1 150 foot setback from private water vells is recommended unless the water well owner approves a smaller setback. additionally, the plat accompanying the drilling application should show the location of all private water wells of public record within 1,000 feet of the wellsite. \*

## URH-7 CONHENTS:

We feel 500 foot is adequate protection of private water supply

VOLUME I

#### PAGE 8-25

Although no formal policy exists, Department staff generally discourage on site trash burial and recommend that it be taken to a landfill. When trash has been buried on site, the burial depth has sometimes been too shallow to prevent damage to plow blades and/or re-emergence of the trash at the surface through frost action (NYS Dept.

-6-

URH-7

It would in an operators best interest to determine the location and predrilling water quality of all private water wells within 1,000 feet, but this may be difficult to determine under some circumstances. We have decided to recommend that the operator be required to only show the location of all private water wells within 660 feet of the wellbore.

of Agriculture and Markets, 1982a). \* Because of complaints concerning burial of trash and pit liners which have a tendency to work their way back to the surface and interfere with farm operations, it is recommended the permit holder be required to have landowner approval to bury either trash or the drilling pit liner. \*

## URH-8 COMMENTS:

WO Not for pit liners, trash O.K.. We have not had any complaints on this subject from any of our land owners.

#### VOLUME I

#### PAGE 8-25

Damage to plow blades has also occurred when they collided with casing left in the ground. \* The Department recommends that the well casing must be cut down below plow depth during plugging and abandonment in agricultural areas. The safe buffer depth is now specified as 4 feet below the surface of the ground. \*

-7-

URH-9 COMMENTS:

•

0.K.

## URH-8

Specification for pit liner burial procedures may be an alternate method of addressing the problem. However, trash burial, depending on the regulations of the local municipality, is usually illegal.

URH-9 Support for this proposal is noted.

URH-10 Support for this proposal is noted.



VOLUME I

#### PAGE8-26

Another major concern in the agricultural community is restoration of the natural soil profile. During access road and well site construction, the land is usually stripped to bedrock or the hardpan clay zone to avoid erosion and sedimentation problems and provide adequate support for heavy equipment. The topsoil that is removed should be stockpiled for later use. Mixing of topsoil with the subsoil below it during either site clearing or restoration will seriously hinder crop production (NYS Dept. of Agriculture and Markets, 1982a). The Seneca County Soil and Water Conservation District has estimated the reduced crop yields may be expected for 20 years or more when the topsoil location is reversed with the subsoil and buried below the plant root zone (Cool, 1982, person communication \$14). \* Therefore, it is recommended that topsoil stockpiling and redistribution during sit reclamation be required in all agricultural areas. Additional measures such as paraploving where compaction has occurred are also recommended. \*

URH-10 | COMMENTS:

001112

0.K.

CR-100

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### URH-11 Support for this proposal is noted.

# UNIVERSAL RESOURCES HOLDINGS, INC.

## VOLUME I

## PAGE 8-41

Tanks on well site locations generally range in size from 12 to 200 barrels (one oil field barrell = 42 gallons). The only significant difference between oil and brine tanks is that the latter are usually lined to prevent salt water corrosion. The Dept. does require that oil holding tanks in primary aquifer areas be surrounded by a dike capable of retaining 1 1/2 times the capacity of the tank. The dikes are usually formed of compacted earth and may also be lined with an impermeable material. \* It is suggested the regulations be amended to require dikes around all oil storage tanks in the future, regardless of their location.

#### COMMENTS:

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URH-111

0.K.

### VOLUME I

#### PAGE 9-1

Prior to the commencement of drilling operations, a person who has been issued a drilling permit must notify by certified mail any local government and any landowner whose surface rights will be affected by

1993

drilling operations [ECL 23.0305-13]. This notification is required to those whose property may be potentially affected by drilling activity and so that local jurisdictions are aware of activity taking place in their area. . \* This notification should be required at least five business days prior to the beginning of drilling operations and local jurisdictions should be notified through the clerk of the county, city or town, and village whose land will be physically affected. \*

#### URH-12 COMMENTS:

Change to three or two business days. Phone call 0.K.

VOLUME I

#### PAGE 9-1

DEC must be notified in writing or by telegram prior to starting actual drilling operations under the current regulatory program [6NYCRR Part 554.2]. This provision is necessary so that the Department is aware of, and can monitor activity provided for in the permit as necessary. \* It is recommended that these regulations be revised so that notification take place a minimum of 24 hours in advance by telephone. \*

-10-

URH-13

0.K.

COMMENTS:

**URH-12** Notification of commencement of drilling operations via a phone call to local governments and/or surface rights owners is not a reasonable alternative. Using certified mail protects the operator in the event an affected party claims to have not been notified. Reasonable alternatives to DEC proposals with respect to how far in advance notification is required will be considered during the rulemaking process.

**URH-13** 

Support for this proposed requirement is noted.

URH-14 Support for this proposed requirement is noted.



#### VOLUME I

PAGE 9-1

The permit must be <u>prominently posted</u> at the drill site and the permit expires if drilling operations do not begin within 180 days [6NYCRR Part 552.3(c)]. \* It is recommended that this regulation be revised so the 180 day time period can be extended to 12 months. \*

URH-14 COMMENTS:

0.K.

VOLUME I

PAGE 9-6

Precautionary measures for the drill site would include proper lighting for working at night, and prohibition of flame heaters in doghouses or out buildings. Drill sites need to have no-smoking area designations and fire and explosion protection equipment. Firefighting equipment needs to be on hand. DEC currently requires a blowout prevention plan from all operators in the Bass Island trend.

CR-103

Arge the

URH-15 See response to I-660 and the "Glossary of Technical Terms."



Responsibilities of individual employees in such an event are to be posted in the dogouse. In addition, the local fire department must be called in the event of a blowout. \* It is also recommended that operators make regular operating tests of blowout preventor and conduct kick response training in order to be prepared in the case of an accident. Where blowout preventor are require, they should be actuated and tested with rig air or another approved method before drilling out the shoe of the surface casing. \*

URH-15

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What is their definition of a Blowout.

#### VOLUME I

COMMENTS:

PAGE 9-8

New regulations require that any loss or spill[ill of oil or gas from pipelines and gathering lines, receiving tanks, storage tanks or receiving or storage receptacles must be reported to the DEC's Division of Water, Bureau of Spill prevention and Response. Their Hot Line phone number is 1-800-457-7362. \* The Division of Mineral Resources will retain jurisdiction over spills and leaks at the wellhead. The appropriate Regional Minerals office should be notified immediately of any wellhead leak of more than one barrel of oil. It is also recommended that

-12-

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the Department's regulations reinforce further the need to conduct safe operations by stating that the owner or operator must perform all operations in a safe and workmanlike manner and must maintain all equipment in a safe conditional for the health and safety of all persons and for the protection of the well, lease, or unit and associated facilities. Additional language for the regulations should direct the owner or operator to immediately take all necessary precautions to control, remove or otherwise correct any health, safely, environmental, or fire hazard and only personnel who are trained and competent to drill and operate wells be used in well drilling operations. Oil and gas well drillers must be registered in New York State. \*

#### URH-16 | COMMENTS:

I don't like this because here the operator decomes liable for drilling subcontractor safty standards - or - completion subcontractors.

Should contain equipment liability clause.

#### VOLUME I

. المعنى:

#### PAGE 9-10 TO 9-11

Most operators run surface casing in their wells. However, current regulations allow them to eliminate the surface casing if the production casing is cemented from total depth to the top of the well in areas where the pressure characteristics of the subsurface formations have been reasonably well established by prior drilling experience [6NYCRR 554.4(a)]. With the exception of the Bass Island trend, which wasn't discovered until 1981, the producing formations in New York State are -13URH-16

Responsibilities and provisions for drilling and completion safety standards can be addressed in the written contract between the operator and subcontractor. However, DEC holds the well operator ultimately responsible for assuring that drilling and associated activities are conducted in an environmentally safe manner.

URH-17 As a practical matter, surface casing requirements are rarely waived.

## UNIVERSAL RESOURCES HOLDINGS, INC.

generally well known and have low formation pressures. Therefore, surface casing can be omitted from many wells under the existing regulations. However, as a practical matter this is rarely done because the surface casing is required for freshwater protection and well control. \* It is recommended this practice be restricted to areas where it has been proven no subsurface pressures or freshwaters exist. \*

#### URH-17 COMMENTS:

0.K.

#### VOLUME I

#### PAGE 9-21

During the BOP test the surface casing is also pressure tested to 1,000 psi. Although the surface casing must be able to withstand 1,800 psi, pressure testing of casing prior to installation is not a requirement. The Completion Report, Notice of Intention to Plug and Abandon, and the Plugging Report that operators submit to the Department should contain information on the casing's grade and weight which directly affects its pressure rating. \* Inclusion of such information on drilling permit applications forms which are being revised, will allow Division of Mineral Resources (DNN) staff to review the adequacy of the casing program ahead of time and require changes if needed. \*

-14-

Sec. Be

## URH-18

COMMENTS:

VOLUME I PAGE 9-23

0.K.

1. Annular Pressure

\* Because of high annular pressures exhibited by many wells drilled in the Jamestown Aquifer area and the difficulty of monitoring annular pressures, it is proposed that all future oil and gas wells in primary and principal aquifers be cemented from total depth to the surface. \*

URH-19

#### COMMENTS:

I am against this if a good surface string and primary string (2) Strings are already cemented to surface. If you cement in the Bass Island string, then your stuck when you want to go for the medina, (except drilling out with a 3 1/2" bit)

#### Support noted. The drilling permit application form has already been revised.

**URH-19** 

When intermediate casing is used, provisions for alternate cementing requirements on the production casing are given in the cementing and casing guidelines.

Any operator who has evidence of inadequate response from an acting manager should provide documentation and file a formal complaint.

# UNIVERSAL RESOURCES HOLDINGS, INC.

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PAGE 9-24

Sometimes an extensive testing program is conducted prior to completing a well to production. This is especially true for wildcat wells. As many as 20 or 30 zone tests may be conducted on a wildcat well. The testing and evaluation time may take several months and may involve alternate stimulation and testing. Flaring may also be allowed upon approval of the Regional Minerals Manager. \* It is recommended that notification of the Regional DMN manager be required prior to any significant changes or time extensions of the originally proposed well testing program, and approval of revisions to the permanent wellbore configuration (casing and cement) proposed in the drilling permit application is required. \*

## URH-20 COMMENTS:

Or acting Regional 1291 - too often they're on vacation when you need them and everyone else passes the buck.

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PAGE 9-30

A major part of the form is the "Record of the Formations

-16-

Water zones can usually be detected when drilling with mud if attention is paid to the mud returns and mud properties.



Penetrated". it shows the name and depth of the rock formations encountered in drilling the well. If the exact formation names are not know, rock descriptions are given. Room is also included on the form for reporting: 1) the depth at which any shows of oil or gas were encounter, 20 any measurements or estimates of their volume, 30 the depths at which any quantities of fresh, salt water or sulphur water were found and 40 if possible, an estimate of the producing capacity of these zones. This information has been so rarely included on the Completion Form, that DEC is considering additional regulations to ensure compliance. \* As part of the aquifer permit conditions, the operator must keep a record of all water producing zones and report them on the Completion Form. This information is now required throughout the State. \* The information is needed to make sure freshwater producing zones have been adequately protected and it may also be helpful in solving any future problems that might develop with the well.

## URH-21 CONNENTS:

How are you going to do this when drilling surface on Mud?

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\* Because of non-compliance by oil and gas operators in furnishing

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UNIVERSAL RESOURCES HOLDINGS, INC.

all the information requested in the Well Drilling and Completion Report (form 85-15-7), it is suggested that enforcement action be taken not only for submission of a fraudulent or false report but also for the repeated submission of an incomplete report which does not have all the information requested. \* Completion Reports are now being returned for missing information.

## URH-22 | 0

#### COMMENTS:

I recommend that they print an information sheet on how they want each information item entry completed. Enforcement action should not be taken against operators submitting incomplete reports unless they are cronic or persistant offenders and have received warning letters from DEC.

#### VOLUME I

#### PAGE 9-32

\* It is recommended that a condition be added to drilling permits limiting the angle of the drilling blow-back pit walls to less than 45 degrees when appropriate as determined from the pre-drilling site inspection. \* This requirement would greatly decrease the chances for pit wall collapse except in areas where pits are excavated in unconsolidated sediments. Once a pit wall collapses it is usually impossible to repair the liner. There can be disadvantages, however. A

-18-

The commentator's suggestion has merit and will be recommended to the appropriate Department personnel.

URH-23 See response to I-291 and I-293.

# UNIVERSAL RESOURCES HOLDINGS, INC.

pit with slanted walls needs a larger area than one with vertical walls and this will necessitate a larger drilling pit and site. In addition, the increased ease of fitting a liner to the slanted surfaces may be offset by the difficulties in handling a larger liner. Availability of a large one piece liner may also be a problem. (See 9.H.3)

### URH-23 |

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## COMMENTS:

This is going to far in meddling with the operators decisions. One large piece liner would be a terrific expense.

#### VOLUME I

#### PAGE 9-33

Waste fluids are often discharged under pressure and the impact can dislodge or rip the liner. Such problems can be lessened if the operator submerges the flow or discharge line below the surface of the pit fluids. However, if frac fluids under high pressure are discharged to a pit, a submerged discharge line may tear or dislodge the liner. Additionally, many drilling contractors monitor the wells drilling progress by observing flow line returns. \* Orienting the pit longitudinally to the flow line or installing a flow line baffle or placing heavy canvas or a plywood sheet at the point of impact can significantly reduce damage. Tanks or beveled pits may be required to contain frac blow-back. It is recommended

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that one or more of these actions be taken. \* Liners can also be punctured by trash and debris thrown into the pit. If Department Staff notice trash in the pit during a site inspection, they require the operator to remove it.

## URH-24

If it is probable that the trash may cut the liner.

#### VOLUME I

COMMENTS:

#### PAGE 9-33

Although it is not currently regulated by the Department, liner thickness is one of the major factors in whether it becomes torn during use. Ideally, all liners should be made of Hypalon, PVC or an equivalent plastic and meet certain minimum thickness and strength criteria. Liners currently used in New York State are as thin as 6 mil, but liner thickness is only one criteria of overall strength. See Table 9.1 for a comparison between New York State's proposed standards and the standards specified in other states. \* The Department suggests that these minimum standards for pit liners be required by regulation. \* Pit standards, like all other proposed standards, can and will be changed with evolving technology.

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COMMENTS:

## URH-24

A drilling pit is not a trash can, nor is a well location a landfill. It is not unreasonable for DMN to require that trash not be thrown into the drilling pit, or that what is thrown in be removed. The probability of trash damaging the pit liner is not the only reason DEC staff would order it removed. Some trash is of high toxicity, and disposal of such trash in the drilling pit may be in violation of the other state and federal hazardous waste laws.

URH-25 See response to ENG-36.

<u>.</u>



URH-25

"Not over 10 mil" due to cost.

VOLUME I

PAGE 10-8 to 10-9

The Department's existing regulations requiring a 50' buffer between wells and surface water bodies also provides some protection to surface waters. Although the existing regulations do not address the siting of storage tanks and other possible sources of oil pollution, DEC staff has the authority place restrictions on these well site facilities through permit conditions. For example, operators are required to install dikes around all oil storage tanks. The diked area around these tanks must have sufficient capacity to retain a minimum of  $1 \frac{1}{2}$  times the tank volume. \* If an operator consistently has a problem with tank leakage or overflow, the Department can apply special permit conditions requiring the tank to be equipped with fluid level controls which will actuate an automatic shutdown of wells producing into the tank and prevent tank overflow. Fluid level monitoring and an automatic shut-down system may be specified as a permit condition or mitigation of a potential hazard in environmentally sensitive areas. \* These controls can prevent spills if the truck that empties the tank is delayed by impassable roads or other causes.

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#### URH-26 | COMMENTS:

Should read " in aquifers" - "environmentally sensitive areas" gives them too broad an authority or descression.

#### VOLUME I

PAGE 10-11

<u>Produced Brine</u> - Brines produced in association with oil in western New York contain sodium, chloride and roughly the same types of heavy metals found in gas field brines. Small amounts of benzene, xylene and toluene may also be present in oilfield production brines. The production brines are typically disposed of by direct discharge under a SPDES permit or road spreading under a part 364 Waste Haulers permit. \* A suggested revision to permit requirements, in primary and principal aquifer areas is to require operators to have an approved brine disposal plan prior to drilling a well. \*

### URH-27

COMMENTS:

Such a plan can be on file with DEC in a blanket generic form in order to avoid unnecessary duplication of administrative paper work.

-22-

See response to I-319. URH-27 Reasonable alternative

URH-26

Reasonable alternative proposals will be considered during the rulemaking process.

There are many other environmentally sensitive areas in addition to aquifers. The Department would not impose special automatic shut-down or fluid control systems on a new facility except in an environmentally sensitive area.

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#### VOLUME I

#### PAGE 10-12 to 10-13

Though provisions exist under the current regulatory program [6NYCRR Part 556.8] to require a notice of intention for other operations such as deepening plug back and conversion operations, the requirement has been ignored to some extent because of confusion with regard to interpretation of the exclusions given to any work conducted in the existing production zone. It is critical that the Department have accurate records of the existing conditions of all wells under its regulatory authority. \* For this reason, it is recommended that a notice of intention and a permit be required from the Department for any operation that will in any manner alter the casing, permanent configuration, or designated use and status of a well. It is not the intention of this recommendation to require a permit for routine well servicing. Notification and possible permit will be required for the following actions:

-perforate casing in a previously unperforated interval for the purpose of production, injection, testing, observation or cementing

1..... -redrill or deepen any well

-mill out or remove casing or liner

2....-run and cement casing or tubing

-drill out any type of permanent plug

3.....-run an set a inner string of casing or liner

The only activity in this listing which requires a permit and fee is deepening, as currently provided for under [ECL 23-1903(1)(b)]. It was not our intention to require permits and fees for the other listed activities, but merely to require notification and approval of the Regional Minerals office.

4.....-run and cement an inner string of casing, liner or tubing

-set any type of permanent plug (bridge, cement, sand, gravel, get,

etc)

5.....-repair damaged casing by means of cementing, placing a casing

patch, swaging, etc. \*

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#### URH-28 COMMENTS:

 OK as long as no extra permit fee is assessed per redrill or only for depth difference in event of deepening. Permitting impromptu is delaysome.

2. Should not have to have permit fee to run tubing or to cement casing previously packed off.

3. Should not need permit to set a liner or inner string not previously contemplated.

4. Ditto

5. Should not need permit to make casing repair

PERMITTING TO EXCESS IS JUST AN EXCUSE TO GENERATE FEES.

VOLUME I

PAGE 11-2

Once the well is plugged, the site must be reclaimed by removing equipment and grading the surface to match the surrounding areas. \* In

#### URH-29 Support for this proposed requirement is noted.



agricultural areas, the casing must be cut off below plow depth (approximately 4 feet). The topsoil cover must be replaced and the site must be seeded to re-establish vegetation. \*

URH-29

0.K.

VOLUME I

COMMENTS:

PAGE 11-4

#### C. MUDDING THE HOLE

The combination of properly placed cement plugs and mud in the well bore can be a more effective method of permanently abandoning a well than a rigid column of cement from total depth to the surface which could develop a microannulus with hydration and time. A <u>natural bentonite mud</u> is the best mud for abandonment because it has good gel-shear strength. It also is less likely to separate with time and leave a water column suspended above the mud or "gel" solids. \* It is recommended all portions of the hole not plugged with cement be filled with a clay base mud with a minimum density of 8.65 ppg and a gel-shear strength (10 min.) of 15.3 to 23.5 lbs/100 sq. feet. Exceptions to this requirement will be reviewed on a field area basis. \*

-25-

URH-30 Sup

Support for this proposed requirement is noted.



URH-30

## VOLUME I

COMMENTS:

0.K.

PAGE 11-6

#### E. ADDITIONAL PLUGGING REQUIREMENTS

Sometimes casing is recovered from the well before abandonment. When casing is to be recovered, the top of cementing the annular space is determined by running a cement bond log or some other free point indicator such as a strain gauge. Once the top of cement has been determined, the casing is cut above that depth and removed <sup>6</sup> from the hole. Then either a bridge plug is set (mechanical method) or a cement plug is pumped in (pum and plug method). If the pum and plug method is used, the operator is required to run an extra quantity of cement to compensate fro possible loss of cement in the casing-hole or casing-casing annular space below the cut. \* Unless the operator can document conditions such as a major lost circulation zone, extreme corrosion or partial casing collapse, etc., which would make uncemented surface casing recovery inadvisable, an attempt must be made to recover uncemented casing. In the event uncemented casing cannot be recovered from the hold, it must be

-26-

perforated or ripped and have cement squeezed or placed into the annular space. \*

URH-31

VOLUME I

COMMENT:

PAGE 11-11

b. <u>Shut in Wells</u> - Current regulations only address the temporary shut-in of vells capable of being produced on a commercial basis. \* It is recommended that the temporary shut-in regulations be amended to include all wells regardless of commercial potential. \*

URH-32

COMMENTS: Wells that are being slowly drilled or are started in the fall and resumed in the spring should have 90 days before going through temporary abandonment.

-27-

VOLUME I

PAGE 11-11

## URH-31 Support for this proposed requirement is noted.

URH-32 Reasonable alternative proposals will be considered during the rulemaking process.

#### F. SUCCESTED FUTURE PLUGGING REGULATIONS

The effectiveness of a cement plug in preventing fluid migration is influenced by: 1) the condition of the mud or drilling fluid in the hole; 2) the volume of water used in mixing the cement and the type of cement and; 3) the technique used for placing the plug. Unfortunately, it is common for cement plugs to not set properly because of contamination by mud or gas while the cement is wet. The most common problem affecting cement plug integrity is the quantity of water used to make up the cement slurry. Excess mix water and the incorporation and infiltration of mud or other substances in the cement affects setting properties, and can result in a cement plug which lacks integrity. Gas migrating up through the plug while it is wat can also create a path for future fluid migration after the plug is set. Dehydration, or normal water loss by the cement as it sets can result in micro-annular channels.

\* Tharefore, it is recommended that the plugging requirements for wells be amended. The Notice of Intention to Plug and Abandon must be submitted to the Department with the complete proposed abandonment procedure. the proposed abandoment procedure will be reviewed before a permit is issued. Special conditions above and beyond the following proposed regulatory requirements may be required by the Department should special circumstances warrant it.

In areas where the environment will not be further compromised (Compelling justification, e.g. old oil field areas where hundreds of wells are located on which there are no racords), an operator may petition

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# Provisions for obtaining verbal approval during ongoing operations exist in the current regulations (6NYCRR Part 555.4(c)), and there is no intention to eliminate these provisions.

for an exception to the proposed plugging and abandoment requirements. For an exception to be granted, it would have to be demonstrated that no existing residence or freshwater aquifera would be impacted. \*

UNIVERSAL RESOURCES HOLDINGS, INC.

#### URH-33 |

I have a problem with them taking time to reviewing abandonment procedures issuing plugging after a several day review. It used to be that we could plug wells while the rig was over the hole- rather than have to book a separate service rig.

### VOLUME I

COMMENTS:

#### PAGE 11-12

Because downhole conditions are different in the shallow depleted sands (i.e., formations with extremely low pressure and fluid content) of the old oilfields and in the deeper gas and Bass Island formations, different abandonment requirements are proposed. In addition, the operator is given several options for proper abandonment of a well. Many of these options will allow cement plugs of shorter length if the operator will guarantee the location of the plug by tagging the plug location for a DEC witneas. Shorter plug lengths and other abandonment options are proposed for the old oil field areas in order to allow these wells to be abandoned with the equipment such as dump bailers and A-frame hoists that

-29-

URH-34 See response to ENG-42. URH-35 Support for this proposal is noted.

## UNIVERSAL RESOURCES HOLDINGS, INC.

these operators currently use. It is hoped more wells will be plugged under these requirements than if the plugging requirements necessitated the use of a larger rig and service companies which could require large <sup>1</sup> expenditures for access roads that might cost more than the actual well plugging costs. \* The DEC may require that the location and/or hardness of any plug be checked by re-entering the well and tagging it. \* Plugs of primary concern to the DEC are the critical producing zone plug and the freshwater protection or surface casing shoe plug.

#### URH-34 | COMMENTS:

I have a problem with this-they should be satisfied that plugs are correct by having:

1. an inspection of job

 Current samples- after well is plugged operator should have no further liabilities.

#### VOLUME I

PAGE 11-16

OK

After plugging the surface casing stub, any water bearing or fluid loss zones in the remainder of the hole must be sealed with cement, and all interplug intervals filled with gel. \* A minimum of 15 feet of cement is required at the surface in all oil oil wells. \*

#### URH-35 COMMENTS:

-30--

### URH-36 Support for this proposal is noted.

UNIVERSAL RESOURCES HOLDINGS, INC.

VOLUME I

PAGE 11-22

g. <u>Surface Plugging Requirements</u> - \* It is recommended that the minimum length of the surface plug in gas wells be extended from 15 feet to 50 feet. \*

URH-36 COMMENTS:

OK

#### VOLUME I

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PAGE 11-26

#### 9. Surface Plugs

\* Minimum cement plug lengths shall be as follows:

-31-

a) Oil Wells - 15 feet

1

URH-37 Support for this proposal is noted.



#### b) Gas Wells - 50 feet \*

VOLUME II PAGE 18-8

OK

COMMENTS:

URH-37

#### 5. Lake Erie Leasing

Although the lands beneath Lake Erie have proven gas potential, as evidenced by Canadian production, current low gas prices make the exploration and development of gas reserves uneconmic at this time. There has been low industry interest in Lake Erie not only because of the low gas prices, but because of the projected expense of operations under the anticipated environmental requirements. It is unlikely that a state lease sale for Lake Erie will be held in the near future unless economic conditions change dramatically. When drilling in lake Erie becomes econimically feasible, prior to any initiation of the leasing program, a public involvement process would be conducted to address the environmental impacts. Any subsequent exploration would be regulated and monitored to avoid damage and contamination to the environment. Other offshore State

-32-

This proposal has merit and will be suggested to the appropriate Department personnel.

lands in Lake Ontario and the Atlantic coast are unlikely to become

UNIVERSAL RESOURCES HOLDINGS, INC.

available for leasing.

URH-38 COMMENTS:

7

SHOULD ALLOW NON-DRILLING LEASING FOR POOLING WITH SHORELINE PROPERTY.

CR-125

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Hormingi File Copy

l am aware that The Independent Oil & Gas Association of New York (10GA) has presented an oral statement at the hearing in Albany on June 6, 1988, and copies of this statement are available if anyone would like one. Lenape is in agreement with IOGA and has the following comments:

First, we feel strongly that the framework of existing laws and regulations, when coupled with existing permit conditions, are more than adequate to protect the environment and to regulate the oil and gas industry. We also support the DEC's desire for a more evenly administered uniform regulatory program. We also realize that any project the size of this GEIS is bound to have some discrepancies or oversights.

Second, we feel an honest effort has been made by the DEC to accurately depict New York State's oil and gas industry from its beginning to the present. We also disagree with the present GBIS format in its recommending future legislation, rules, regulations, permit conditions and mitigation measures. Lenape believes that the GBIS should only be a body of information with regard to present laws, regulations, rules and permit conditions.

Third, in agreement with IOGA's statement, we also feel there are ten general comments to the contents of the GEIS that we feel will need to be addressed differently. Such action will allow our industry to continue operating and providing taxes, jobs and royalties.

 State actions in the form of regulations which prohibit the mineral owners recovering his or her oil and/or gas reserves should allow for financial compensation by the State of the unrecovered reserves at full market value.

LEN-1

- 2) Regulations or permit conditions should be consistent for both State owned and private land.
- The DEC should not impose itself as a third party in landowner/operator contracts. This is an infringement of landowner rights.
- 4) Regulations for access roads should not apply because these roads are contractual matters between the landowner and the operator and are not regulated in other industries such as logging or farming.
- 5) Concerning safety matters, we believe the DEC should defer to the more than adequate standards and regulations already imposed on our industry by the New York State Department of Labor, the Federal Department of Labor, OSHA and MSRA.
- 6) We feel it necessary that the regulations of all well drillers (broadly defined as anyone penetrating an aquifer - this would include water well drillers) is needed to insure comprehensive and adequate protection of fresh water aquifers.

- We feel that regulations of visual impacts of oil and gas operations are too subjective and discretionary to be applicable.
- 8) We feel that soil is not a commonly held natural resource requiring special protection by the DEC.
- 9) Even though we are in agreement with present casing and cementing guidelines, we feel that the use of grouting as referred to in the GEIS may not achieve the objective of protecting fresh water aquifers. In some cases, grouting may cause unforeseen problems.
- 10) The GBIS refers to changes that will occur in the future which in fact have already taken place. These sections should have been revised to show current conditions under which our industry operates.

In summary, I would like to say that the GEIS is of critical importance to our industry. The outcome of these hearings and the final decisions made on the GEIS will affect New York's oil and gas industry for many years to come. It is vital to the life of our industry that the final document addresses our concerns.

Thank you for the opportunity to comment.

LEN-1

The commentator's support for the Independent Oil and Gas Association (IOGA) submission is noted. Please refer to the response to that submission.

#### CHAUTAUQUA COUNTY DEPARTMENT OF PLANNING & DEVELOPMENT

GERACE OFFICE BUILDING MAYVILLE, NEW YORK 14757 (716) 753-4296

> JOHN R. LUENSMAN Director

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## POSITION PAPER

#### DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE GAS, OIL, AND SOLUTION MINING REGULATORY PROGRAM By The chautauqua county environmental management council June, 1988

We have reviewed the Draft Generic Environmental Impact Statement on the Gas and Oil and Solution Mining Regulatory Program, Volumes I through III dated January, 1988. After a detailed review, the following conclusions were reached.

The documents are at the least a decade late. The documents carry statements of recommendations but suggest no time table for changing the present rules and regulations.

If the schedule used for the GEIS is followed to change the regulations and rules as recommended, another boom and bust cycle of the gas and oil industry can pass over Chautauqua County before the regulations are in place. We need the regulations now. We need a commitment, a timetable, a schedule on how the rules and regulations will be changed. We need such a commitment as part of the GEIS process.

In several places in the GEIS there is comment about the unregulated water well drilling industry. Regardless of its unregulated condition, the gas and oil industry has no right to adversely alter the condition of the ground or surface waters of the State of New York.

Basically, the Chautauqua County Environmental Management Council agrees with all of the changes proposed or recommended concerning rules and regulations related to the gas and oil industry. Specifically, we have the following comments:

Page 3-3: There are two items dealing with the SEQR requirements as noted on page 3-3 of the "Draft." They are the conditions for requiring detailed site specific environmental assessment. They are item 4, 0il and Gas Drilling Permits less than 2,000 feet from a municipal water supply well. To use the word municipal to describe a water well is to leave all institutional wells and private wells that may serve hundreds of people, possibly over a thousand people, without the protection which the word municipal provides to 241 villages with fewer than 500 persons if they have a municipal wall on 185 villages with under 250 persons, if per chance they have a municipal water supply well. All water supply systems serving over a particular population possibly as little as 200 persons should have the same level of protection. They should not be protected because the ownership of the well being that term "municipal."

The second item on the page is item 5 which relates to new <u>major</u> water flooding. What is major water flooding? We are unalterably opposed to any water flooding or any secondary or tertiary gas or oil recovery done under or near. Chautauqua Lake waters or the Jamestown Aquifer without a specific Environmental Assessment.

Rec'd At Hearing Usmarting -7PM 15 June 88

CR-129

CCD-1 As stated in the GEIS, most of the proposed regulations are already part of the regulatory program as guidelines and permit conditions. Environmental protection has not been compromised during the preparation of the GEIS. The average time for the promulgation of rules and regulations in New York State is approximately two years.

CCD-2 We agree that the oil and gas industry has no right to adversely impact ground and surface waters. The point being made in the GEIS is that unregulated and improperly constructed water wells also contribute to pollution of groundwater supplies. If a water well is improperly constructed, the DEC has a very difficult time proving that an improperly constructed oil or gas well is the exclusive contributing factor.

- CCD-3 Support for the proposed regulatory changes is noted.
- CCD-4 Water supply well owners should accept some share of the responsibility for protecting the quality of their water (e.g. by insisting on strict well construction standards and/or by owning the land in buffer zones surrounding their wells). The well safeguards, construction, and testing standards of non-municipal water systems are not as stringent as those for municipal systems and, in fact, water well drillers are unregulated.

The decision to require an EIS for any oil and gas well less than 2,000 feet from a municipal water supply well was a Commissioner's decision which was made as a result of public concern in the Jamestown area. This decision was not based on the number of people served, but consideration was given to the logistic feasibility of providing an alternate water supply for a municipality. The Commissioner's decision remains in effect until completion and approval of the final GEIS.

Reasonable additions to current regulations will be considered during the rulemaking process.

CCD-5 The word "major" could be removed from the text without changing the intent. Any new waterflood project will require an environmental assessment. The intent of the word "major" is to ensure that new waterflood operations are reviewed and assessed. Depending on the number of wells, extent, and history in that geographic and geologic area, a site-specific supplemental environmental impact statement may be required.

CCD-1

CCD-2

CCD-3

CCD-4

CCD-5

Page 3-5. Under <u>future SEQR compliance</u> is the statement, "many of the current policies and permit conditions discussed in the GEIS are being proposed for incorporation into rules and regulations." What is the timetable for such action? Based upon the State's response in the creation of the GEIS, we could wait for another decade. We should have a timetable as part of this process.

CCD-7

CCD-6

Page 3-5A. Based on our statement concerning items on page 3-3, we object to the use of the word municipal as used in Table 3.1 in Items f and g.

CCD-8 Page 4-7. The second full paragraph is a throwaway. If one were only dealing with the concept of brine, it might be all right. But to suggest that annual rainfall can dilute oil is news to us. The concept here needs complete rethinking and a rewrite. Since when is the taste of oil easily flushed out?

CCD-9 Page 6-4. The last two sentences continued from the paragraph from page 6-3, "because of ground waters relative slow flow rates contamination introduced into an aquifer usually cannot be removed except over long periods of time. Hence proper management is essential." How do these two sentences on page 6-4 relate to page 4-7 as noted above?

CCD-10 Page 7-3. Under <u>Inspection</u>. In the case of oil wells and their associated storage, we strongly recommend regular inspection of the storage facilities to assure that they are operated in an environmentally sound manner. At one oil well site very near or over the infiltration\_area to the Jamestown Aquifer, we saw many 50 gallon drums placed outside of a dike at a storage facility.

CCD-11|

CCD-13

CCD-15

Page 7-7. We object to the reference only to municipal water supplies. See our point at page 3-3.

CCD-12 Page 8-3. We object to the reference only to municipal water supplies. See our point at page 3-3.

Page 8-4 and 8-5. Given the number of leases that have been negotiated and that may hold for decades with the rest of the property rights changing hands many times, there is no ability to restrict the gas and oil industry any further on such leases. Most early and in place leases give blank checks to the oil and gas lessor. It is strongly recommended that the 150 foot siting restriction be made part of the siting regulations related to private dwellings.

CCD-14 Page 8-6. The regulations should require each plot accompanying each permit to show location of pits, access roads, tanks, etc.

Page 8-11. We have watched site reclamation lag for months and in the case of one company, well over a year. We strongly support a 45-day timetable for site restitution. What is the timetable for future regulations which would include this regulation?

CCD-16 Page 8-15. We strongly support a 150 foot minimum distance from waterbodies for wells and associated production facilities. Where topo and other site features demand it, the distance required to protect the environment must be required to be much greater.

CD-6	See response to CCD-1.
CD-7	See response to CCD-4.
CD-8	Although rainfall will not dilute oil, the most toxic BTX fraction is water soluble and, exposure to the weather for an extended time period will decompose and disperse it.
CD-9	These sentences do not relate to each other; the sentence on page 4-7 is discussing surface spills while the sentences on pages 6-3 and 6-4 are discussing subsurface contamination of aquifers.
CCD-10	Field staff do inspect the oil storage facilities anytime they are present on a lease, and drive by inspections are routine procedure for field inspection personnel.
	Oil in New York is not stored or transported in 55-gallon drums. The drums observed adjacent to the storage facility were probably paraffin treatment chemical drums. These 55-gallon drums are stored on site for pick-up and re-use by the service companies.

- CCD-11 See response to CCD-4.
- CCD-12 See response to CCD-4.
- CCD-13 Support for the proposed 150 foot siting restriction is noted.
- CCD-14 Support for this proposed requirement is noted.
- CCD-15 Pit fluids must be removed within 45 days under the current rules and regulations (6NYCRR Part 554.1(c)(3)). The Department has also observed site reclamation put off for extended periods of time because of reported delays in completing the wells to production.

Industry commentators have pointed out to us that even prudently scheduled completion operations can be justifiably delayed by uncontrollable circumstances and events such as weather, road weight restrictions, etc. For this reason, a 60-90 day timetable for complete site reclamation after drilling or a 30-day timetable for site restoration after well completion, whichever is less, may be a more reasonable requirement. Partial site reclamation involving the removal of pit fluids will still be required within 45 days. Support for the originally proposed 45-day timetable is noted. Unjustified delays in site reclamation will be eliminated.

CCD-16

Support for the proposed 150-foot setback from surface water bodies is noted. The Environmental Assessment Form is designed to identify circumstances where greater protection is required.

-CCD-17

Page C-15 and 8-16. As in the statement on Page 3-3, we object to the use of the word municipal. Ownership by municipal government should not be the criteria for the protection of a public or community water supply. There are many institutional wells and trailer park wells that are not "municipal" that deserve the same protection as a municipal well and they may serve many more people than a "municipal" well.

CCD-18

CCD-23

Page 8-18, line 12 from the top of the page. What does the word unlikely mean? In light of the Upstate Ground Water Plan and the new part 360 regulations dealing with solid waste, can this issue under gas and oil regulations be dismissed with the use of the word unlikely? Does it have the same risk implications and protection as the new part 360 regulations dealing with solid waste disposal? We do not believe that "unlikely" is an acceptable term to express risk. This section and any place else that the word unlikely is used needs to be rethought from beginning to end.

CCD-19 Page 8-19 through 8-21. The topic on these pages is <u>Public (Community</u> <u>and Non-community) Supplies</u>. These pages are very interesting in their explanation and discussion, but they do not provide any protection through the GEIS process to the systems mentioned and the systems mentioned may provide more water supply service to more people than do many of the municipal water supply systems which will require an EIS in the case of certain oil and gas well drilling. Therefore, this whole section without providing protection becomes a non sequiter. These supply systems demand more protection than just that provided to individual private water wells. Many deserve and need as much protection as any "municipal" well.

CCD-20 Page 8-22 at lines 13 through 17. We agree with a gas and oil well setback of 150 feet from any private water well as an absolute minimum.

CCD-21 Page 8-24. The page starts out talking about <u>drainage systems</u> and their importance, but it does not say that if the gas and oil well actions damage or destroy a drainage system that the industry must repair it. The regulations should demand such restoration of such a system. See our comments on faults with leasing later.

CCD-22 Page 8-25 through 8-26. Dealing with soil restoration we agree with the recommendations.

Page 8-27. The DEC concept of lease terms as treated on this page and the following page are written as if there were no leases in existence and all leases were to be negotiated. There are thousands upon thousands of leases in existence. Many of them will run for decades. The rest of the property rights may be held by many persons that cannot exercise any renegotiations of the terms of the original "giveaway" lease. There may have been a lease on a 100 acre parcel of land but it may become many lots of varying dimensions but the lease agreement still runs with them. The old lease agreement will not protect the new owners from the original "blank check" lease. This whole issue needs to be reexamined. There are thousands upon thousands of leases in existence that will last for decades. The treatment here is inappropriate for the future people that will occupy the space.

CCD-24 Page 8-28. "Under DEC permit conditions, most of the potential conflict....should be handled during leasing." This is the same faulty assumption as noted for page 8-27.

See response to CCD-4. Although private and institutional water wells do not receive the same protection afforded to municipal water wells, all water wells are protected by the drilling, casing and cementing guidelines, and the aquifer conditions on oil and gas wells. The Commissioner's decision was an interim protection measure.

CCD-18

CCD-17

The word "unlikely" does not occur on line 12 of page 8-18, but it does occur on lines 15 and 19. The possibility of subsurface leaks 2,000 feet below freshwater zones cannot be compared to the Part 360 regulations which deal with solid waste disposal on the surface immediately above freshwater zones. The probability of fluids from a subsurface corrosion leak reaching a USDW that is behind surface casing in a basin with low corrosion potential similar to that of the Appalachian Basin is estimated at less than 3 X 10<sup>4</sup> per well year or 1 in 300,000 (Mitchie, 1988, "Oil and Gas Industry Water Injection Well Corrosion Study" in <u>UIPC Summer Meeting Proceedings</u>). "Unlikely" in the context used means there is a very, very low probability of the event occurring.

CCD-19 "All water wells are protected by the drilling, casing and cementing guidelines and the aquifer drilling permit conditions" (GEIS, p. 8-21). Oil and gas drilling operations are much more stringently regulated than dozens of other activities which can negatively impact water supply wells.

CCD-20 Support for this proposed requirement is noted.

CCD-21 Whether an operator is responsible for repairing a damaged field drainage system would be determined by a court of law or by prior lease agreement between the landowner and operator.

CCD-22 Support for these proposed requirements is noted.

CCD-23 The Department cannot intervene in the landowner/mineral rights owner disagreements. Persons purchasing property are responsible for being aware of encumbrances. See Topical Response Number 6 on Surface/Mineral Owner Lease Conflicts.

CCD-24 This section is provided for public information. Anyone signing a legal contract is responsible for being informed on the matter. The DEC cannot intervene in third party contracts where there are no public resource management concerns.

CR-131

had been
Page 8-30. Concerning gathering lines: Why are not standards proposed as part of the regulatory system? They should be. They are needed.

CCD-26 Page 8-33 and 8-34. These pages address drinking water reservoirs and the protection of their watersheds. This issue of protection should not be based upon policy. There should be rules and regulations in place. Does this concept and discussion cover only "municipal" drinking water reservoirs or all such reservoirs. It should cover all drinking water reservoirs and the whole statement needs to be rewritten.

- CCD-27 Page 8-41. This page has a discussion on brine and oil tanks. As one reads through the presentation, brine tanks are lost from the text. The final recommendation relates only to oil storage tank. Dikes should be required around brine and oil storage tanks requiredless of their location.
- CCD-28 Page 8-45, lines 6 through 9. There should be a time schedule placed upon management plans concerning oil and gas development on State lands. Too much has been allowed already.
- CCD-29 Page 9-13 at line 16. What protection for the environment takes place when shallow gas is present under the terms of this item?

CCD-251

CCD-30 Page 9-23. Under <u>Annular Pressure</u>: The Chautauqua County Legislature has gone on record in Resolution 42-85.

#### NESCLUTION NO. 42-85 Recomputation to State of New York on Gas & Oil Drilling

by Environmental Consistent: At the Request of Legenz, Crandell:

NeWHEREAS, it is well-known that gas and oil are valuable natural resources of Cheutauque County actively baing extracted, and

terreto, there is evidence to suggest that the extraction of these resources if not reperly handled will advarsely impact the County's water resources, and

MERENS, the State of Mer Nork is charged with responsibility for the control and regulation of the gas and oil industry (see Chapter 346 Laws of 1961), and

NECRESS, based upon arriveral hearings and measure dilians contacts it is evident there there are a growing number of conflicts and a powerial for more conflicts, and that the fashe of New York must review its segulations and participations these for the lit

NENCLARD. That the Cherk of the Legislature and the following recommunications to the homizations of the Nor Rock State Department of Construction, Henry Williams, with copies to local Assemblymes and State Sensors:

a. That the State divide the County into areas of critical concern and lesser bonean, with areas of critical concern being all three areas show moon groundentar measuress of the county, all listed laber, all wittented areas critical areas the State about deaded in it is appropriate to allow driling for gas, gas and all, or all. It is equivalant to the state areas of this meridian areas to protect the motest water resources should be excludent to the critical areas that the state areas to a state and the state areas of the state areas of

b. Their is process the Commy's vance remains. State separations obtain gravitation evolution of the state of the state

BENGLARD, that the Environmental Management Conroll investigate all reasonable means by which the County, through local law or otherwise, could protect the water resources within the County.

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Signed: Hilton, Dillerbury, Olson, Gatto, Stanley, Crandall, Harte

Unaminously Approved, February 13, 1985.

- CCD-25 See Appendix 6 for Public Service Commission (PSC) guidelines on gathering lines.
- CCD-26 It is the legal responsibility of local municipalities to establish drinking water reservoir watershed rules and regulations.

CCD-27 Earthen dikes around brine tanks would not contain brine spills as effectively as they do oil spills, unless they were lined with an impermeable material. Requiring lined diked areas around brine holding tanks is an expensive burden on oil and gas operators. Lined dikes would also collect rain water, snow and ice and greatly decrease the effectiveness of this containment measure.

- CCD-28 We assume this comment refers to page 8-54, not page 8-45 which is a discussion of wetlands. The management plans referred to on page 8-54 will be for all activities on State lands, not just oil and gas drilling. State lands are chosen for leasing only after extensive review by DEC's Division of Fish and Wildlife and other regional DEC staff with respect to environmental implications. Detailed lease provisions afford environmental protection when drilling and production occurs on State lands. Notice of the proposed lease sales are also published in the Environmental Notice Bulletin (ENB) to elicit public comment. The Supervisor of the appropriate town is also notified.
- CCD-29 If shallow gas is present, it is not advisable to place it behind the same casing string as the freshwater zone; thus two casing strings may be required.

Why shouldn't all wells be so cemented? Why only in primary and principal aquifer areas? If DEC holds only to aquifer areas, the following question arises. If a well is 5 feet outside of such an aquifer, it doesn't need cement? This requirement should reach out beyond the edge of an aquifer boundary for some given distance, possibly thousands of feet.

Page 9-33. We agree that there should be minimum standards for pit liners associated with gas and oil wells.

This brings to an end our point-by-point comment. Items become more repetitive as we go further through the document. There are also parts of the document that are opinion, propaganda, and unrelated to the geeds of Chautauqua County.

CCD-32

CCD-311

Through a number of local hearings held by NYSDEC, the representatives of Chautauqua County have spoken about the innocent third party that is damaged by the activity of the gas and oil industry--this damage may include water wells with gas or taste. It may mean a building with gas buildup in it.

In a number of instances in Chautauqua County, property owners have been given different responses when calling in reports of difficulties. In the case of Tim Short, tens of thousands of dollars were spent trying to prove the industry did not cause his problems--the house still stands empty. In the case of Rhodes in Ellington, New York, people from NYSDEC agreed with the property owners that their problems were related to gas and oil drilling but the State could not tell which well was causing the problem.

These and other people have had problems. NONE OF THESE PEOPLE LEASED THEIR LAND FOR GAS AND OIL DRILLING. They received no direct benefit and only very limited indirect benefit.

The NYSDEC has stated these people can get relief in the courts by private action. If the State cannot identify the offending well with all of its skills and resources, how can a small home owner take on the task?

These third party innocent damaged people should be protected. They deserve relief from the acts of the industry. It is a fact that people are harmed by the actions of the industry and there is no mechanism in the GEIS to propose a mitigation of their problem other than the responses we have been given that they may go to court with a private action. CCD-30 The DEC drilling, casing, and cementing guidelines and aquifer conditions which are being recommended in the GEIS for adoption as formal rules and regulations are adequate for meeting the goals stated by this resolution. Because of geologic conditions, the non-aquifer areas do not require the same protection as aquifer areas. The areas mapped as aquifer areas actually extend a considerable distance beyond the aquifers to include the adjacent environmentally sensitive recharge areas.

CCD-31 Support for this proposed requirement is noted.

CCD-32 First, the Department spent significant resources to determine the cause of the problems Tim Short and others have had in Levant. Under no circumstances were there any preconceived notions that the industry was not responsible. The interim report dealt with a number of hypotheses based on available data and additional testing. A final report was issued in June of 1989 which details our findings.

> Second, it is true that the DEC suspects that oil and gas wells are responsible for the problems in Ellington, but have been unable to pinpoint the exact well or wells responsible.

> Third, the problems of proving a cause and effect relationship are significant particularly when dealing with improperly constructed water wells. The Department has worked under very difficult legal and technical constraints to find solutions to these problems.

> Finally, the DEC has explored the need for water testing before any drilling in an area, but found the cost/effectiveness of such a program to be prohibitive. In fact, such a program could not be established that would provide the necessary legal support for a claim. Third party compensation is beyond the DEC's authority and the existing authority under Article 23. Complaints are encouraged to both the DEC and the State Attorney General's Office.

	Wonroe County
and the strength	Soil and Water Conservation District
DISTRICTS T	249 Highland Avenue • Rochester, N. T. 14620 • 473-2120
June 7, 1988	RECEIVED
	JUN 2 0 1966
	OFFICE OF HEARINGS
Mr. Robert S. Dre Chief Admin. Lew C New York Stete De of Environmental Office of Hearings Room 409, 50 W Albany, NY 12233	# Audge pertment Conservation off Roed
Re: Draft Generic	EIS OII, Ges and Solution Mining Regulatory Program
Dear Mr. Drew:	
in reviewing th	e above draft document we would like to offer the following comments for your
consideration in pr	repar ing the fine) OEIS.
MCSW-1 1). Table 3.1, p projects inv	ages 3-5e - Current Proposel is to require permits in Agriculture Districts on volving 2.5 acres or greater.
We fael thet acre limitat determination	there has been enough stress placed upon agricultural soils and would like the ion to be set at 1 acre or greater to be considered Type I action requiring additional on of significant impact.
MCSW-2 2). Re: Oil and Consideratio road or feed Too often, ac restrict full needed drain appropriete affects to vi when traver	Ges Location, access roads and pertinent underground lines locations. In should be made in final OEIS on requiring a full assessment of the impact a well, er line may have on agricultural areas whether in an agricultural district or not. I use of cropland acres or prevent the landowner from installing or maintaining age or erosion control practices. A generic EIS should mandele that SWCD or agency review project proposals prior to permit issuence to avoid detrimental able agricultural soils. Minimum depth requirments should also be considered rsing agricultural lands because of the safety hezerd involved.
It appears th	at all other considerations we have, concerning effects upon agricultural lands, have
been adequately	extressed. We hope you take points 1 and 2 into consideration before the final OEIS
is completed	

if you have any questions regarding our comments, please contact Mr. Robert J. Hartrick - SCS

District Conservationist at (716) 473-2120.

Thank You.

Regards,

Hoyd Rothfuss

Floyd Rothfuss Chairman-Monroe County SWCD

cc: John Lacey, NY Agriculture and Markels Paul Dodd, STC, SCS Synacuse D. Pandergast, NYS SWCC J. Wildeman, NYS SWCC J. O'Neil, NYS NACD

MCSW-1 The decision to increase the SEQR threshold in Agricultural Districts from one to two and one-half acres was made by the Division of Regulatory Affairs after Statewide Public Hearings. This is not our proposal; it is a decision that has already been made. In spite of the change in Type I threshold for Agricultural Districts, oil and gas operators will still be required to submit the EAF addressing agricultural concerns for all wells.

MCSW-2 The DEC protects agricultural concerns to the extent possible under the Environmental Conservation Law. Landowners and farmers should take responsibility for protection of their resources, and have the means to do so through lease provisions. In addition, some of the commentators concerns, such as underground pipelines are under the jurisdiction of the Public Service Commission (PSC), not the DEC. If the minimum 40 inches of soil cover required by PSC in actively cultivated farmland is insufficient, the PSC should be notified.

> The oil, gas, and solution mining regulatory program provides for comprehensive assessment of the impacts of any well, regardless of location. There is no need for review of our permit applications by Soil and Water Conservation Districts or any other outside organizations. It would be more appropriate for such organizations to provide counseling and education to farmers and landowners regarding ways they can protect themselves through lease provisions.



QS-1

The commentator's support for the Independent Oil and Gas Association (IOGA) submission is noted. Please refer to the response to that submission.

RECEIPTE

Honorable Robert S. Drew NYS DEC 50 Wolf Road, Room 409 Albany, NY 12233

## Honorable Robert S. Drew,

As an active member of the Independent Oil and Gas Association of New York (IOGA), Quaker State helped to compile the Association's comments on the GBIS. Since all of Quaker State's comments and concerns were noted in IOGA's submission, Quaker State felt it was not necessary to submit repetitious comments. We hope that you will seriously review IOGA's comments and consider incorporating our proposed changes into the final GEIS.

Sincerely,

June 27, 1988

QUAKER STATE CORPORATION

Paul R. Rodgers

PRR: jcs

QS-1|

cc: Dave A. Lind

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### New York State Department of Environmental Conservation

	MEMORANDUM
TC: FROM: SUBJECT:	Laura Snell Gail Bowers Oil and Gas GEIS
DATE:	May 3, 1988
DRAL-1	The GEIS needs a summary, either separate or included <sup>1</sup> as part of this document 617.14(e). Also, it might be helpful, at some point, to put together a list of the groups who were contacting

1	during scoping (p.3).
DRAL-2	p.2-2 - SAPA mistake - typo
DRAL-3	p.3-7 - definition of a project may result in segmentation unless restricted; first and second paragraphs sound inconsistent (multi-well projects). This separation sounds logical for gas ells where they are 40 acres apart, but is this true of all wells?
DRAL-4	p.16-1 - references in parens to numbers are not clear - what do they refer to?

I must confess I did not read the whole document, nor can I comment on it with any technical expertise, but it is pretty impressive.

GB:nw cc: Charlie Lockrow Bill Little

- DRAL-1 Chapter 3, "Major Conclusions on the Application of the State Environmental Quality Review Act to the Oil, Gas, and Solution Mining Law" is the summary chapter for the Draft GEIS. The final GEIS will contain a summary of the sort suggested.
- DRAL-2 Correction noted.
- DRAL-3 Spacing is not the primary criteria for the distinction of a multi-well project. In multi-well projects, several wells are drilled within a limited time and area, and the wells are operated as a unit or group for an extended period of time. .
- The numbers in parentheses are cross-references to chapters. DRAL-4

## RECEIVED

## MAY 4 1988

BUREAU OF RESOURCE MANAGEMENT & DEVELOPMENT

## MENORANDUM

## MAY 2 5 1988

TO: Greg Sovas

FROM: Robert H. Bathrick

SUBJECT: Draft Generic EIS Statement - Oil, Gas & Solution Mining Regulatory Program

I have only a couple of comments regarding the Draft Generic EIS:

DLF-1

1. In 6.6 D Public Lands, the paragraph referencing Reforestation Areas could be expanded to include the ECL authorization language permitting the leasing of these lands for mining purposes. This inclusion might allay comments that the quotation does not authorize exploration, etc.

DLF-2 2. The impact of the area used by well siting and access is significant in the removal of the forest resource from any one Reforestation Area. It is especially significant if several sites are developed. Hitigating measures to alleviate the removal of the forest resource should be explained. These could be: several well sites served by one access road, limiting well site area, concentrating several well heads at one site and other similar measures.

> Other problems or actions necessary to an individual site or sites covered by a single lease may be referenced specifically in the stipulations of the lease.

Director Torests

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Bot-/Town

MINERAL RESOURCES

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and all and the

DLF-1 This document does not apply to mining activities.

DLF-2

For many types of land resources, mitigation measures such as common access roads for several wells sites are similar and are detailed throughout the GEIS. We agree that a centralized drilling site is appropriate in environmentally sensitive areas (e.g. offshore wetland, old growth forests, and urban areas). Centralized drilling sites (well heads) would require directionally drilled wells which are much more expensive.

## New York State Department of Environmental Conservation

## MEMORANDUM

James Close, DHSR Regulatory Coordinator John E. Iannotti, Director, Bureau of Hazardous Waste Program Development Den E. Draft GEIS on the Oil, Gas and Solution Mining Regulatory Program

JUL 1 1 1988 DATE:

DHSR-1

TO:

FROM:

SUBJECT:

My staff has reviewed the Draft Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program. Our only comment is that this Impact Statement should explain how Parts 360 and 370 - 373 affect waste generated as a result of oil, gas and solution mining.

If you have any questions, please call Howard S. Brezner, of my staff at 7-3273.

4

DHSR-1

this

Oil, gas, and geothermal drilling and production wastes are excluded from Parts 360 and 370-373 regulations for solid and hazardous wastes. Regulation of drilling pits has been defered to the Division of Mineral Resources.

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JUL 12 1988

BUREAU OF RESOURCE MANAGEMENT & DEVELOPMENT

## MEMORANDUH

## June 30, 1988

TO: Gregory Sovas

FROM: Steve Browne

SUBJECT: Oil, Gas and Solution Mining DGEIS

Attached are Division of Fish and Wildlife comments on the Oil, Gas and Solution Mining DGEIS. Each of the three Bureaus, Wildlife, Fisheries and Environmental Protection, reviewed the document and prepared separate comments.

Please direct any questions or comments to me. Thank you for the opportunity to review and comment on this draft.

Supervising Wildlife Biologist

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Attachment SB:msk

# JUL 1 1988

DIVISION OF MINERAL RESOURCES

## RECEIVED

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BUREAU OF RESOURCE MAMACAMENT & DEVELOPMENT

## Bureau of Environmental Protection on the January 1988 Draft Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program

Overall this is a very good job. The recommendations for changes in policy and regulations are sound and should go a long way in eliminating environmental degradation and loss.

- DFWE-1 The Division of Fish and Wildlife particularly endorses the 150 foot setbacks from streams and feels that a similar provision for wetlands, regulated under Art. 24 and others, is equally appropriate.
- DFWE-2 Page 3-10: Something is missing. The last partial sentence on page 3-10 does not match up with the first partial sentence on page 3-11.
- DFWE-3 Page 5-35: The location of the Cayuga County Anomaly is not accurately described. It cannot be in Cayuga County near Cayuga Lake and also be between Penn Yan and Rochester.
- DFWE-4 Page 8-2: The last paragraph-on the Medina formation-does not belong in this section on Spacing and should be deleted.
- DFWE-5 Page 8-12: The reference to "State Game Refuges" in c.4 should be changed to "State Wildlife Management Areas." And, the last paragraph errs because there are several Wildlife Management Areas in the region; in fact, some have gas/oil leases and wells on them.
- DFWE-6 Page 8-45: In the last paragraph, change the word "functions" to "benefits" then quote the benefits listed in Art. 24-0105.7. The present list is merely a quote anyhow except for minor paraphrasing the addition of "habitat for some of the rare plants..." and the deletion of "sources of nutrients..."
- DFWE-7 Page 8-45: The statement "The Department allows oil and gas drilling activities in wetlands only when alternative locations are not available" should be emphasized by underlining, making it a lead sentence, or setting it apart as a separate paragraph. Wetlands, regulated or not, should be treated like agricultural lands with every effort being made to avoid them, make as small a pad or road as possible, and then only when alternative sites cannot be found.
- DFWE-8 Page 8-46a: Table 8.1 is not wetland classification. It is a part of the standards for wetland permit issuance from Part 665.7e. If you really want to include wetlands classification it is found at Part 664.5. If it is really the standard for permit issuance you intended to use, then you should include all of 665.7e to avoid misleading readers. Don't forget the reference to the table on page 8-46.

- DFWE-1 Support for the proposed 150-foot setback from public water bodies is noted. Protected wetlands already have a provision for a 100-foot buffer zone. We do not think it is appropriate for the oil and gas industry to be regulated to a greater extent than other industry activities which may impact resources to a greater degree.
- DFWE-2 The missing line is "on the road. Major changes in land use patterns, traffic, and the need for ..."
- DFWE-3 Correction noted. The anomaly peak is centered near the north end of Canandaigua Lake.
- DFWE-4 Subsurface well spacing is one of the major criteria for siting a well which is the subject of this chapter. Mention of the subsurface characteristics of the State's most common producing formation is appropriate.
- DFWE-5 "State Game Refuges" are more important from a visual viewpoint than "State Wildlife Management Areas" because they include things such as vantage points for viewing migrating waterfowl. There are no State Game Refuges in western New York. This information is from the Department's Division of Regulatory Affairs.
- DFWE-6 The suggested change in wording does not significantly alter the intent of the sentence.
- DFWE-7 Additional emphasis of the point made by this entire section that wetlands are given special consideration is not necessary.
- DFWE-8 Correction noted.

DFWE-9	Page	16-8: "Impactswaste fluid" please add "and clearing and
DFWE-10	Page	filling for well pads and access roads." 17-4: Add to list of location checks: "within 100 feet of a regulated wetland."
	<b>D</b> = = = =	17 16. The memory with estimation for the well semilation and

-2-

DFWE-11 Page 17-16: The proposed mitigation for the well completion and production phase is good; a big improvement in erosion and spill prevention.

- DFWE-9 The suggested addition is more technically correct. Add "and clearing and filling for well pads and access roads" at the end of the cited sentence.
- DFWE-10 Correction noted. Add "within 100 feet of a regulated wetland" under "Well Location Restrictions".

DFWE-11 Support for the proposed requirements is noted.



## New York State Department of Environmental Conservation

## MEMORANDUM

to: Froi Sub. DATI	M: Eric Frie HECT: Larry Bro GEIS on O E: June 6, 1	d wn il, Gas and Solution Mining 988
	I ha Coastal A	ve reviewed the sections of the GEIS pertaining to Significants and reas, and my comments (referenced by page number) are as follows:
DFWW-1	6-14.	Add the following sentence to the first paragraph under K. Significant Habitats: "Included also are rare animals, plants and natural communities as listed in the New York Natural Heritage database; as well as Significant Coastal Fish and Wildlife Habitats as described on p. 8-56".
DFWW-2	6-15.	Line 4, change as follows: Approximately 3,000 Significant Habitats have been identified to date, including some 1,200 deer winter concentration areas. In addition, the New York Natural Heritage database now has between 3,000 and 4,000 records.
DFWW-3	8-37.	J. Significant Habitats, Line 6: Change 1,000 to 3,000. Line 12: Reference should be Division of Fish and Wildlife.
DFWW-4	8-38.	I. Heronries, Line 5: Change "only" to "mainly".
DFWW-5	8-39.	3. Uncommon, etc. Plants. Line 12: Suggest deletion of sentence starting "Designation on the list,". It is incorrect as stated. Designation on the list protects plants on all lands only insofar as it prohibits disturbance without permission of the landowner.
DFWW-6	<b>8-56.</b>	2. Significant Coastal F & W Habitats, Line 11: Change to read: "DEC has completed an evaluation (NYS DOS, 1986). All of the recommendated areas except for those in New York City and along the St. Lawrence River have now been officially designated by DOS."
DFWW-7	16-6,7.	Significant Habitats. Add a sentence to read: "Also, for this reason it is important to check with the DEC- Regional or Central office for the most up-to-date significant habitat information at a proposed oil or gas site."

tam Supervising Wildlife Biologist Significant Habitat Unit

LPB:jp cc: D. Odell J. Moser

DFWW-1	Add "Included also are rare animals, plants and natural communities as listed in the New York Natural Heritage database; as well as Significant Coastal Fish and Wildlife Habitats as described on p. 8-56."
DFWW-2	Update noted.
DFWW-3	Update and correction noted.
DFWW-4	Change "only" to "mainly".
DFWW-5	Correction noted.
DFWW-6	Update noted.
DFWW-7	It would be more appropriate to add this information to Chapter 8. Chapter 16 summarizes adverse environmental impacts.

**CR-142** 

a ya Baik

## Bureau of Fisheries Comments on the Draft Generic Environmental Impact Statement On The Oil, Gas and Solution Hining Regulatory Program

The documents are extremely comprehensive and well written. Overall, the known and potential impacts to figheries resources are recognized and sufficiently considered. Recommendations for regulatory changes are presented clearly and appear reasonable and necessary for adequate environmental protection. The Bureau of Fisheries is particularly supportive of recommendations extending sufface water set-backs and requiring partial recommendation. The Bureau of Fisheries is particularly supportive of recommendations extending sufface water set-backs and requiring partial recommendation.

Historic Environmental Problems, page 4-7: "A recent example of environmental problems associated with salt solution mining/underground gas storage is the 1979 brine spill from an Atlantic Richfield storage basin into the East Branch Owego Creek at Harford. This spill resulted in a major fish kill in over 3 miles of stream involving the loss of an estimated 9,000 wild brown trout and brook trout. Restoration of this fishery took over three years and included a substantial investment of DEC staff time to reintroduce suitable wild trout stocks.

In recent years, there have also been chronic brine spills, resulting in fish kills, associated with the Allied Chemical Corporation salt mining operations in Onondaga County. The frequency of these spills prevented establishment of a trout fishery in Onondaga Creek despite the presence of otherwise excellent water quality and habitat.

We believe it is important to include these (and other?) recent examples of environmental disturbances for proper perspective on the continuing necessity of environmental safeguards. As is, the "Historic Problems" section leaves the impression that serious industry related impacts are a pre HWII phenomena.

There are many other sections of the GEIS where examples of environmental disturbances would provide perspective and credibility to the regulatory program.

Waterways/Waterbodies page 6-2 p .2: The discussion of water quality classifications needs clarification and reworking. Suggest a tabular format as follows: DFWF-1

Support for the proposed requirements is noted. The commentator's point that environmental impacts continue to occur is valid. The specific examples cited were not known to the Division of Mineral Resources staff when the Draft GEIS went to press.

DFWF-2

DFWF-1

Section the section of

"Waters in New York State are classified based on their designated best use in the interest of the public as required by Title 3 of Article 17 of the Environmental Conservation Law. Part 700 of Title 6 NYCRR identifies fresh surface water classifications in New York State as follows:

Classification Best Usage AA Source of water supply for drinking, culinary or food processing purposes and any other usages.

A B

С

D

Primary contact recreation and any other uses except as a source of water supply for drinking, culinary or food processing purposes.

The waters are suitable for fishing and fish propagation. The water quality shall be suitable for primary and secondary contact recreation even though other factors ray limit the use for that purpose.

2.

3

The waters are suitable for fishing. The water quality shall be suitable for primary and secondary contact recreation even though other factors may limit the use for that purpose. Due to such natural conditions at intermittency of flow, water conditions not conducive to propagation of game fishery or stream bed conditions, the waters will not support fish propagation.

A "T" in parenthesis after the AA, A, B or C classification indicates best usage includes the maintenance and growth of trout populations. A "TS" indicated use for trout spawning. The trout use classifications require higher dissolved oxygen concentrations. Each classification carries a specific set of standards for various water quality parameters. There are also standards for turbidity, color, suspended solida, oil and floating substances, taste and odor-producing substances, toxic wastes and deleterious substances that apply to all New York fresh waters."

Water quality, page 8-15: We strongly support the recommendation to increase the minimum sitting restriction to 150 feet from permanent surface bodies of water. This should serve to reduce stream siltation impacts and provide additional protection from spills.

Water quality, Springs, page 8-16: Spring flows and seepages are frequently critical to the maintenance of aurface water temperatures suitable for trout production. We strongly support the recommendation for set back restrictions and request that this be extended to springs with identified fisheries habitat value.

- DFWF-2 The text refers the reader to the proper citations for more information on the subject.
- DFWF-3 Support for the proposed requirement is noted.

DFWF-4 Support for the proposed requirement is noted. If a spring with identified fisheries habitat value is part of or adjacent to a public body of water, it would be protected by existing setbacks.

DFWF-3

DFWF-4

Stream Disturbance, page 8-29: Suggest adding: "undesirable siltation to downstream fish spawning and feeding areas", and "obstruction to fish passage" to list of deleterious affects.

DFWF-5

DFWF-11

DFWF-12

DFWF-6 Brine and Oil Tanks, page 8-41, 42: Brine spills can result in serious environmental problems. This topic seems to be treated too lightly in this section. Diking requirement would be appropriate where brine tanks are situated so that spillage can reach important fisheries habitat. This would be especially true where smaller streams with low flow volumes relative to storage capacity are involved. Perhaps this is best addressed via site specific permit conditions but it should be considered in the GETS.

DFWF-7 Production, page 10-1: We strongly support the recommendation requiring partial surface restoration upon cessation of drilling operations. This would serve to minimize erosion and stream siltation impacts and duration. In some situations, this could yield substantial fisheries benefits.

Volume II

- DFWF-8 Environmental Considerations, page 12-37: Reference to "A Pennsylvania Study" needs elaboration regarding the "h barrel" impact. Specifically, duration of 90% reduction in bottom fauna and length of stream section affected.
- DFWF-9 Salt Production Operations, page 13-15: Strongly support recommendation that operators be required to have a spill contingency plan emphasizing protection of freshwaters. DFWF-10

Road Spreading, page 15-11: Is there a need for DEC regulation regarding road spreading practices? This section implies that current operations are rather loosely controlled. Any recognized environmental problems should be alaborated and recommended changes in DEC involvement noted.

Adverse Impacts on Surface Maters, page 16-12: Under "Siting Impacts", omit first sentence. "Generally minor" is a relative term and siltation of fish spawning habitat can result in fishery losses affecting miles of stream for extended periods of time. From our perspective, this is a substantial impact.

Adverse Impacts on Surface Waters, page 16-14: Improper culvert size or installation can also create obstacles to or prevent fish passage to critical spawning or feeding areas.

5/10/88 PJF

3.

DFWF-5 These deleterious effects are covered under "loss of fish and aquatic wildlife habitat."

DFWF-6 An earthen dike around brine tanks such as is being proposed for oil tanks would not serve the same physical function of containing spills. The requiring of a cement lined diked area around small isolated brine tanks would be an excessive regulatory and maintenance burden. Diking could and would be imposed as a special permit condition when appropriate (e.g. brine tanks located where spillage could reach an important fisheries habitat or principal aquifer).

- DFWF-7 Support for the proposed requirement is noted. However, industry commentators have pointed out to us that because of the possibility of unforeseen delays caused by weather and other uncontrollable circumstances and events, a 60-90 day timetable might be more reasonable. Removal of pit fluids would still be required within 45 days.
- DFWF-8 The cited reference is listed in the bibliography.
- DFWF-9 Support for the proposed requirement is noted.
- DFWF-10 This section does not imply loose control; it states that several entities are involved in policing road spreading, with local governments having primary responsibility. Local government regulation of certain activities is a desirable goal. The task of detailing in the GEIS the environmental impacts of the activities regulated by the Division of Mineral Resources is large enough, without also detailing the impacts of activities outside of DMN's regulatory program.
- DFWF-11 The siting impacts on surface waters are minor because the siting setbacks from surface waters preclude siltation in most situations.

DFWF-12 Comment noted.



SUB-1

UNIVERSITY AT BUFFALO STATE UNIVERSITY OF NEW YORK Office of the Provisi JUL 5 1980 Undergraduate Education Stat Caree Nul Buffab New York Nar-(716) 436-241

## June 29, 1988

Robert S. Drew, Chief Administrative Law Judge NYSDEC, Office of Hearings, Room 409 50 Wolf Road Albany, NY 12233

### Comments on the Draft GEIS on the Oil, Gas, and Solution Mining Regulatory Program

I offer, for the record, some comments on the Draft GEIS. I have read and reviewed the publication several times as a member of the NYS Oil, Gas, and Solution Mining Advisory Board and have commented extensively on preliminary drafts of the GEIS with particular attention to the details of the text. Many of my earlier comments have been incorporated and all comments have been answered. At this time I do not wish to comment on the details but rather to discuss the overall document in relation to the oil and gas industries and in relation to disputes between the industries, government, citizens, and environmental interest groups. These comments are my own and not those of the Advisory Board.

Commenting on a GEIS involves, inevitably, commenting on the structure and practices of government because it is within the broad administrative practices of governments (including laws, regulations, and practices) that a GEIS is prepared. Clarity requires that the context for the document is clear and that the misperceptions of government by citizens are identified. The tone of the document should illuminate rather than obscure the issues and, as well, the document should be clearly grounded in time and place. I have had the opportunity to read and comment on many EISs and a few GEISs during the past few years. This GEIS is the clearest and most comprehensive that I have read. The context is directly stated for each of the chapters and it will function effectively as a GEIS. In no small measure the quality of the document is due to the interactive process between the DMR and the Advisory Board in the preparation of earlier drafts. As well the quality of the document reflects the quality of the industries which it is designed to support. This GEIS could not have been written until the regulatory and industry aspects were stable and mature. The GEIS looks thoughtfully towards the future with the chapters on the future of the regulatory program. The GEIS is well grounded in the present with its discussion of the geology, economics, and technical practices relevant for understanding the industry.

This document provides support for the continued growth of the industries while insuring that the broader interests of the citizens of New York State are protected. It codifies current practices and will simplify the issuance of drilling permits and determination of the special cases while meeting the requirements of SEQR. At the same time the GEIS supports the resolution of disputes which will inevitably arise around the activities of the

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## Draft GEIS on the Oil, Gas, and Solution Mining Regulatory Program June 29, 1988, Peter S. Gold

oil and gas industries. The support emerges from the comprehensive attention given to the geological, technical, and economic aspects. Ordinary practices are codified, a common vocabulary is used, and the past practices are evaluated. The result of this attention ought to be that disputes will be more directly and quickly resolved because the assumptions are on the table. There is now a single source for mediation and problem solving.

SUB-21

Earlier in this letter I mentioned the wide context of a G3IS because of its relation to all aspects of government. The "tone" of the document is critical in making it accessible. Generally, the GEIS seems appropriately sensitive to explaining the intricate web of regulation but in a few spots becomes 'too vague. For example, the discussion of visual impacts and noise impacts appropriately notes the SEQR mandate to consider such impacts and the temporary quality of the impacts, yet does not clearly seem to discuss the context for evaluating these impacts. It seems to say (but does not clearly say) that most drilling and storage practices are without impact and will not be regulated. It does not say that the hundred year history of drilling provides ample evidence for the protection of vistas in most cases. It does not clearly say that special cases only are of interest. This is mostly an issue of "tone" not substance.

Similarly, the exclusion of state lands, park lands and offshore drilling from this regulatory effort could be more clearly justified with an explanation of the intricacies of regulation and the requirements of other laws for it is those sites which will receive the most critical attention.

Similarly, the oil and gas industries have requested additional regulation of the water well drilling practices to reduce the possibility of contamination from oil and gas activities and to reduce their assumed liability in such cases. This issue might be more clearly discussed and attached to regulatory recommendations.

These issues aside, the GEIS amply conveys the interests and practices of sophisticated industries and regulatory practices. I think that it protects the resources of the State and will help the citizens of the State to regulate the industries. Equally, the GEIS will support the growth of the oil, gas and solution mining industries.

> Sincerely, |lla, Loo Peter S. Gold, Ph.D.

cc:Richard Brescia Toni Calloway Gregory Sovas SUB-1 Support for this document is noted.

SUB-2 As stated by the commentator, the visual and noise impacts from most oil, gas, solution mining and underground storage activities are minor and/or temporary. There may be some rare exceptions to this rule when a major project triggers SEQR thresholds where noise and/or visual impact mitigation might be imposed through permit conditions.

- SUB-3 The subject of leasing on State lands is excluded, but the regulation of oil and gas development activities on State lands is not. Offshore drilling was not included with the clear justification that this activity will not be occurring in the near future because of adverse economics. See page 18-8.
- SUB-4 We support the regulation of water well drillers. However, this GEIS can only cover our own regulatory program.

to be states

SUB-4

SUB-3

Honeoye Storage Corporation P.O. Box 376 Honeoye, New York 14471 716-229-5161

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June 30, 1988

Robert S. Prew Chief Administrative Law Judge N.Y.S. Dept. of Evironmental Conservation Office of Hearings Room 409 50 Wolf Road Albany, New York 12233-0001

### Dear Hr. Drew:

We welcome the opportunity to comment on the Draft Generic Environmental Impact Statement on the Oil, Gas, and Solution Wining Regulatory Program. The DEC staff should be commended for their efforts in the preparation of this document.

Enclosed please find comments on behalf of Honeoye Storage Corporation regarding particularly the underground gas storage sections of the Draft GEIS.

This document will have a profound and lasting effect on the oil and gas industry in New York. We urge your careful consideration of our concerns as expressed by these comments.

Thank you.

Sincerely,

John F. Ketlz

Vice-President

JFK:dr

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CC: Gregory H. Sovas (w/enc.) Division of Mineral Resources

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TJUL 6 1988

BUREAU OF RESOURCE MANAGEMENT & DEVELOPMENT

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## DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT, JANUARY 1988

### COMMENTS BY HONEOYE STORAGE CORP.

## June 30, 1988

GENERAL HSC-1

It is inappropriate for the Draft GEIS to include recommendations for changes to existing rules and regulations. <sup>1</sup> The purpose of the document is to review the current program for regulating the oil, gas and solution mining industry. It should not be, used as a forum for proposed and probably controversial new rules, regulations and mitigation measures.

HSC-21

The Draft GEIS makes considerable reference to contractual arrangements between operators and landowners. These arrangements are privately negotiated and not within the scope of state regulation or protection of the environment. In many years of dealing with landowners in relation to drilling, production and storage, we have found that they do not need, and in fact would not welcome, interference by regulatory authorities.

#### CHAPTER IV HISTORY

B. Oil and Gas History

4. Underground Gas Storage Fields

HSC-3

P. 4-3

The description of total storage capacity and amount of working gas and cushion gas in storage as of the end of 1986 could be misconstrued by those not familiar with storage operations. This should be clarified to show that the difference in total storage capacity (177.5 Bcf) and the sum of working gas (55.4 Bcf) plus cushion gas (85.5 Bcf) is not unused capacity but is, in fact, due to working gas withdrawn from the reservoir during the early part of the withdrawal cycle. See additional comment under Chapter XIV, Section I, page 14-25.

#### UNDERGROUND STORAGE CHAPTER XIV

B. Storage Site Selection and Formation Evaluation

#### HSC-41 8. 14 - 5 & 6

The reference to potential earthquake damages is included under Conventionally Hined Storage Caverns but the text

HSC-1 Many of the proposed changes to the rules and regulations are part of the existing regulatory program as guidelines and permit conditions. See Topical Response Number 5 on Reasons for Including Proposed Regulations in the GEIS.

HSC-2 Landowner/operator contracts are discussed in the GEIS for public information purposes. The fact that landowners are encouraged to contact DEC for information on environmental regulations that may affect their lease cannot be construed as DEC interference. However, in environmentally sensitive areas, the DEC can attach permit conditions as necessary regardless of the existence of private lease agreements. See Topical Response Number 6 on Surface/Minerals Owner Lease Conflicts.

HSC-3 Observation noted. Beginning with the 1987 gas storage report, the DMN staff calculated unused storage capacity by subtracting the volume stored from the total storage volume.

seems to be applicatle to all underground gas storage operations. This should be clarified.

Potential earthquake damage in New York State to a storage field in a depleted gas reservoir is so remote that the issue borders on the ludicrous. Even the State of California has never documented any damage to underground gas storage facilities from an earthquake (telephone conversation with Hr. Hefferd, Supervisor, California Division of Oil and Gas, Sacramento, on June 3, 1588).

C. Applying For An Underground Storage Permit

## HSC-5

Line 1, 1st sentence. This sentence attempts to describe how well pressures help to determine storage field boundaries. It is incorrect and misleading and should be deleted.

## HSC-6

<u>P. 14 - 10</u>

<u>P. 14 - 8</u>

Paragraph 2. The mandated application fees appear to be excessive. Perhaps the DEC should work toward a lowering of these fees to encourage and facilitate underground storage activities. The storage segment of the oil and gas industry is also subject to all other fees such as for drilling permits. Consideration should be given to the public interest since all of these costs are ultimately recovered from the consumer.

1. Operation of the Storage Facility

1.b. Segments of a Gas Storage Reservoir

HSC-7 | P. 14 - 25

Refer to comments under Chapter IV, p. 4-3. It is misleading to refer to "unused capacity" as is done here. Unused Capacity should be defined as that portion of the reservoir, if any, available for additonal storage when the storage field volumes are at their highest levels at the end of the injection cycle.

c. Operation of a Gas Storage Reservoir

HSC-8

<u>p. 14 - 29</u>

Paragraph 1, line 8. Reference is made to a technical report in the appendix which further describes monitoring of gas storage volumes. Please identify this report.

Page No. 2

HSC-4

The commentator is correct in stating that the potential for earthquake damage to a storage field in a depleted natural gas reservoir is much less than that for a mined cavern.

Assessment of the potential earthquake damages (as is suggested in the GEIS) is made on almost all projects in California. There has been no documented earthquake damage to underground storage facilities because the facilities are designed to mitigate that potential with such measures as downhole well safety valves, adequate flexure in surface connections and lines, and anchored storage tanks. In New York State the potential for earthquake related impacts is much lower than in California, but it is probable that a new storage project will require both a SEQR statement and public hearings. It is our experience that this issue must be addressed to allay public fears. The operator can avoid public concern and opposition to a proposed storage project by considering this subject before it is perceived by the public as an issue which has not been adequately addressed. See response to I-451.

HSC-5 Correction noted; this sentence will be deleted.

HSC-6 The storage fees are contained in legislation and were established to cover some of the costs borne by the State in the review of the project. These fees represent a small amount of a project's total cost.

HSC-7 See response to I-467.

HSC-8 This report was not included in the Appendix, but revisions to the text failed to reflect this exclusion. These sentences should have been deleted.

#### ECONOHICS CHAPTER XVIII

## D.3 Gas Storage Benefits

## p. 18 -13 & 14

HSC-9

HSC-10

HSC-11

Additional economic benefits from storage operations derive from their relative stability, continuity and long-term operations. Employment is stable, making a substantial contribution to generally rural areas where the fields are normally located. Indirect benefits inure in the area of local and state payroll and sales taxes. Construction and maintenance materials are purchased locally when feasible. Local governments and school districts are recipients of property taxes levied on real property owned by the storage field operators. Landowners are compensated, usually based on the number of surface acres within the storage field boundaries. In the case of depleted reservoirs, this compensation is in addition to royalties received as the gas and/or oil was sold during the producing phase of the. field.

## GLOSSARY OF TECHNICAL TERMS

Annular Space: Also the space between tubing and casing or wellbore

Pool: 1. Contains oil and/or gas

HSC-12 Strippers: Also refers to gas wells producing a small amount of gas (NGPA Section 108)

HSC-9 Comment noted. HSC-10 Add "between the tubing and casing or wellbore". HSC-11 Correction noted; add "and/or gas". HSC-12 Correction noted. See response to I-681.

Page No. 3

CR-151 · · · , a)

PENNZOIL PRODUCTS COMPANY

EXPLORATION AND PRODUCTION DIVISION + 54 BOYLSTON STREET + BRADFORD, PA 16701 + (814) 368-6142

#### A. L. RCHMOHD Dissis Hanager

July 6, 1988

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION Office of Hearings Room 409 50 Wolf Road Albany, NY 12233 JUL 1 4 1988 Office of NELGUINGS

F\_\_\_\_

ATTN: Mr. Robert S. Drew Chief Administrative Law Judge

Dear Judge Drew:

PPC-11

By this letter, Pennzoil Company wishes to express formal support for the comments submitted by the independent Oll and Gas Association of New York on the draft Generic Environmental Impact Statement on the Oll, Gas and Solution Mining Regulatory Program.

Representatives of Pennzoil were part of the committee which developed the IOGA comments and had extensive input to them.

Very truly yours,

PENNZOIL PRODUCTS COMPANY EXPLORATION AND PRODUCTION DIVISION

**CR-152** 

A. L. Richmond District Manager

ALR:ms

xc: Richard Brescia Gregory Sovas PPC-1

# The commentator's support for the Independent Oil and Gas Association (IOGA) submission is noted. Please refer to the response to that submission.

. . .

a subsidiary of PENNZOIL COMPANY

## National Fuel

## July 6, 1988

The Honorable Robert Drew Chief Administrative Law Judge New York State Department of Environmental Conservation 50 Wolf Road Albany, NY 12233

R. JUL 8 1988 OFFICE OF HELINEROS

RE: G.E.I.S. Comments.

Dear Judge Drew:

We of National Fuel Gas Supply Corporation and Penn-York Energy Corporation support the comments submitted by I.O.G.A. of New York on the Generic Environmental Impact Statement which was drafted by N.Y.S.D.E.C.

We enclosed additional comments by James. J. Pfeifle, a staff Engineer from National Fuel Gas Supply Corporation.

Mr. Pfeifle and myself were members of the study committee which drafted the comments submitted by I.O.G.A. of New York.

In addition to this support and these comments, we would like to encourage the D.E.C. to incorporate within the G.B.I.S. some regulations that would protect gas storage operator's rights. I enclose information on legislation from Michigan and Indiana.

Very truly yours,

Michael Lepton

R. Michael Sexton, Manager Gas Storage, Engineering & Administration

RMS/bjh

Enclosures

cc: J. R. Lockwood Mary Mietus (IOGA) J. J. Pfeifle J. I. Sharpless Ron Tansky Tom Thrasher

NATIONAL FUEL GAS SUPPLY CORPORATION/F.O. BOX SESI/ERIE PA HISIS/614 811-8000

## NATIONAL FUEL GAS SUPPLY CORPORATION Erie, Pennsylvania

July 6, 1988

TO: R. M. Sexton

FROM: J. J. Pfeifle

NF-11

NF-2

NF-3]

NF-41

NF-51

NF-6

NF-7

Listed below are my comments on the Draft GEIS Section 14 Underground Gas Storage:

 Requiring operators to plan for potential earthquakes is extreme as far as environmental impacts are concerned. National Fuel would not plan a storage field in any potential earthquake zone. (Page 14-6).

 Review of the State Geologist on the storage permit should be more of a cursory review. The technical opinion of the Operator's Geologist and the State's Geologist may differ, and it is hoped that this would not become a major problem in the review process. (Page 14-11).

3. Request a determination of what a major modification of a storage project is. (Page 14-11).

 Why are the ingredients of the mud system required? It is not part of the existing regulation for the drilling of any other wells. (Page 14-15).

5. The appearance of a storage facility is no more visually affected than any other industry in New York State. In most storage fields, the only visible items are the wellhead assemblies and bridle connections. (Page 14-22).

6. The gas loss section should be deleted in its entirety. It is a too simplific approach to a very complex problem. Presently the IRS is the lead agency for gas losses since a company must declare these as deductions. (Page 14-28).

7. It should not be required for an operator to get a storage abandonment peimit. Upon abandonment of the storage field, the gas will be withdrawn as if the field were a production field. The storage will not be completely abandoned until 30 or 40 years later. Therefore, requiring a review of the abandonment is redundant because the abandonment of the wells and facilities would be required when the field ceases production. (Page 14-36).

JJP/ljw

NF-1 The text suggests that the operator be required to assess the potential earthquake danger. In New York State this potential is low. See response to I-451.

NF-2 Review of proposed storage projects by the State Geologist is not cursory, and it is required under law [ECL 23-1301.1]. This required review has caused no problems to date.

- NF-3 See responses to I-22 and I-23.
- NF-4 Drilling mud is not routinely used in New York, but where it is used most commonly (e.g. drilling the surface hole in the unconsolidated sediments of aquifers) the DMN specifies a non-hazardous freshwater based mud type. This proposed requirement is not meant to restrict the mud type as is done for aquifer drilling. Information on the mud composition and disposal method is necessary for complete environmental assessment of a major project which is the likely classification of a new storage field under SEQR regulations. See response to I-462.
- NF-5 Compressors are also likely to have a visual impact. Visual assessment is required by SEQR. See response to I-464.
- NF-6 The Department of Environmental Conservation has the overall responsibility to monitor underground storage operations in the State. See response to I-470.
- NF-7 There are several reasons for this proposed requirement. The operational report and summary are necessary to determine the amount of native gas in place for protection of correlative rights. Storage rights can be and sometimes are leased independently of mineral rights. People can be forced to lease storage rights through condemnation proceedings, but still retain their rights to the native gas that is in place at the initiation of the storage project. The Department is also concerned about the reservoir or cavern integrity at abandonment, proper well plugging, and final surface restoration.

## BOARD of PUBLIC UTILITIES

ELECTRIC, WATER AND

DISTRICT HEAT DIVISION

MUNICIPAL BUILDING

P.O. BOX 700

JAMESTOWN, NEW YORK 14702-0700

OFFICE OF HEARINGS

(716) 483-7583

July 6, 1988

Mr. Robert Drew Chief Administrative Law Judge	REDERVED	
50 Wolf Road Albany, New York 12233-6500	JUL 8 1988	

Dear Mr. Drew:

We appreciate this opportunity to review and comment on the "Generic Environmental Impact Statement on Oil, Gas and Solution Mining Regulatory Program". As you know, considerable effort was made by the City of Jamestown, Board of Public Utilities in 1982 to promote greater safety standards for aquifer drilling. The positive results of those efforts were apparent in 1982 and are again reflected, for the most part, in the GEIS. Never-the-less several concerns remain that have significant implications on long term aquifer protection.

## BPUJ-1

The most significant threat to the Jamestown aquifer from oil and gas development activities are a general lack of adequate waste fluid disposal options available to the operators. At the present time, it appears disposal wells (3 in the entire state), road spreading (which should not be reviewed as a disposal activity), occasional acceptance of fluids at local sewage treatment plants, and out-of state facilities are the only options. With so few options, disposal short-cuts are inevitable and it is the long-term addition of waste fluids to the aquifer that remains a serious concern. This concern was expressed in 1982 and is reinforced here.

BPUJ-2 I

The suggested revision to permit requirements on page 10-11 of the GEIS to require operators to have an approved brine disposal plan prior to drilling a well is a positive step. However, it is strongly suggested this revision be expanded to include a required manifest system of waste fluids produced and disposal activities in aquifer areas.

Again we thank you for this opportunity to comment.

Respectfully submitted,

BOARD OF PUBLIC UTILITIES

R. James Gronquist, P.E. General Manager

CR-155

BPUJ-1 We agree that the lack of disposal facilities is a major problem and that this situation encourages disposal short-cuts. However, the siting of disposal wells and treatment facilities in New York State has been hindered primarily by adverse public opinion. The DEC will continue to prosecute operators caught illegally disposing of brine. DEC staff has closely examined the chemistry of New York brines with respect to their suitability for roadspreading. Some local governments such as Chautauqua County have by-passed New York State's efforts to ensure that the brines used for roadspreading are suitable, and have exacerbated the disposal problem for in-state producers by purchasing out-of-state brines for roadspreading.

BPUJ-2

A permit system for the transportion produced brines is a requirement under the Part 364 regulatory program which has been in place several years, and applies to transported production brine and other industrial waste from all areas of the State, not just those brines produced in aquifer areas.



#### STATE OF NEW YORK DEPARTMENT OF AGRICULTURE AND MARKETS 1 WINNERS CIRCLE - CAPITAL PLAZA ALBANT, NEW YORK 12235

ASSISTANT COMMISSIONER MARKETING AND PROMOTION SIR 457,0120

RECEIVED

OFFICE OF HEARINGS

Honorable Robert Drew Chief Administrative Law Judge Office of Hearings NYS Dept. of Environmental Conservation 50 Wolf Road Albany, NY 12233

<u>Re</u>: Draft Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program

July 6, 1988

Dear Judge Drew:

NYAM-1

I wish to thank you for the opportunity to review the <u>Draft</u> <u>Generic Environmental Impact Statement (GEIS) on the Oil, Gas and</u> Solution Mining Regulatory Program.

It is evident that a tremendous amount of constructive interdisciplinary effort has been put into the development of the three volumes comprising the current <u>Draft</u>. This Department's review generally concludes that it is comprehensive in its inclusion of the interrelationships of oil, gas and solution mining activities with the associated components of the environment. Chapter VI, "Environmental Resources," provides a sound base of information on components of the greater resource base which interrelate with the subject activities and which can be impacted unless the appropriate steps are employed to assess or mitigate such effects.

Ultimately, our greatest concern relative to the development and content of the final version of the GEIS is that it fully and capably enables the development and productive utilization of the subject finite resources (oil, gas and solution minerals) at the least possible short and long term expense of the surface resources and their utilization. In Table 3.2, page 3-9b of the <u>Draft</u>, major types of potential impacts from gas and oil site construction, drilling, production, plugging and abandonment are identified. That table's relatively low level of impacts ("none

Honorable. Robert Drew page 2 July 6, 1988

or minor") designated for interference with agricultural operations, erosion, burial, contamination brine or oil spill (affecting soil, crops, livestock or water), are delicately hinged on that table's supplementary explanation:

Minor interference with agriculture may occur during site construction and drilling. Major long-term interference unlikely with regulatory restrictions. Also topsoil loss or pollution could occur, but serious long-term impacts are unlikely because of remediation requirements.

The <u>Draft's</u> references to "interference unlikely with regulatory restrictions" and "impacts...unlikely because of remediation requirements" are the key which enables the GEIS designation of "none or minor" impact rather than "serious or major" impact concerning agriculture. In essence, the fullest capability of DEC to adequately review and assess each situation, as well as to proscribe such restrictions or requirements where warranted, is necessary.

Our review and subsequent cross referencing of <u>Draft</u> chapters III and VIII reveal a latently vulnerable aspect concerning the comprehensive environmental review and permitting of gas (and oil) applications relative to potentially affected agricultural lands. First, for background, I will note that the siting of a well and its associated access road have basic bearing on which portions of farmland will be affected. This can range from tillable cropland or rotation land and active livestock grazing areas to abandoned farmland, unmanaged woodlands or brushlots.

Generally, the least adverse impact to the viable agricultural resource base from well and access road siting occurs from a combination of warranted measures including the potential language of a lease, and permit requirements. Although Chapter VIII on pages 8-27 and 28 gives due consideration to "lease terms" and the acknowledgement of verbal requests of farm operators, the <u>Draft's</u> suggestion of a variety of worthwhile lease provisions which a landowner and lessee may (or may not) incorporate into a lease, may infer more provisions than are actually incorporated. Individual leases which are executed in such a manner may address and thereby help control some potentially long-term environmental impacts. In context, it should be noted that specific siting restrictions and road locations in a lease document are only potentials, depending on the individually appended concerns. They should not be interpreted NYAM-1

The DEC's comprehensive program of permit application review which consists of a specifically tailored environmental assessment questionnaire, multiple site inspections, site-specific permit conditions and reclamation timetables do adequately assure that environmental impacts are minimal. We consider our regulatory program to be quite solid and not "delicately hinged".

NYAM-2

Honorable Robert Drew Page 3 July 6, 1988

as uniform provisions sufficient for meeting the environmental resource concerns of agriculture. That is why the regulatory review, assessment and pre-drilling site inspection process and the ability to attach conditions to permits are all necessary.

In assessing this section of the <u>Draft</u>, however, it is important to refer directly to the statement at the end of item No. 6, (page 8-28):

Erosion, sedimentation <u>and general agricultural issues</u> (emphasis added) have been added to the Pre-Drilling Environmental Assessment Form so that these issues will be addressed on a consistent basis.

New York State Agriculture and Markets firmly supports that addition of the agriculture issues to the Environmental Assessment Form (see <u>Draft</u> Appendix 5) for the reason quoted above. The reviews and assessments undertaken with that improved form, prior to permitting, have appropriately included candidate sites and roads of one acre involving an agricultural area. When this portion of <u>Draft</u> chapter VIII concerning the Environmental Assessment Form (EAF) is cross referenced with statements about agriculture and acreage thresholds for an EAF, in chapter III, questions concerning ambiguity, reader interpretation, and potential administrative policy conflict arise. Beginning on page 3-2 of the <u>Draft</u> is a discussion on "SEQR Requirements."

This GEIS satisfies SEQR requirements for all these standard operations when they conform to the thresholds described in Table 3.1. However, permits for the following types of projects will continue to require detailed site-specific environmental assessments:

 Oil and gas drilling permits in Agricultural Districts if more than two and one-half acres will be altered including the access road.

On Draft page 3-8 under "Size of Project" is the following:

Ordinarily, physical disturbance for the drilling of an oil and gas well will affect a maximum of two acres, and many routine oil and gas wells encompass one acre or less. NYAM-2 Support for retention of our Environmental Assessment Form (EAF) which addresses agricultural issues is noted.

NYAM-3

Table 3.1 which explains SEQR thresholds (In Agricultural Districts, it is greater than two and one-half acres.) does not conflict with page 3.8 which explains that the physical disturbance necessary for drilling a well is usually below the two and one half acre threshold. Honorable Robert Drew Page 4 July 6, 1988

NYAM-4

The statements in chapter VIII page 8-28, regarding the agricultural items added to the EAF are highly warranted. However, when cross-referenced with the above noted statements in Draft chapter III, it suggests that the improved EAF will not be required as presented. Regardless of a change in the SEQR threshold for Type I projects being increased from 1.0 (one) up to 2.5 (two and one half) acres in an Agricultural District (see Draft page 3-3), New York State Agriculture and Markets maintains that a thorough review and assessment for potential impacts of siting and developing an access road and well in an agricultural area are extremely critical, and the means foraccommodating such reviews through an EAF must be continued at least at the level of 1.0 (one) acre, or even less, due to the special sensitivity of viable cropland, rotation land and grazing areas to the subject well development activities. The identification of such sensitivities is one of the things that this GEIS is all about. Again, summarizing the vulnerability of agriculture, it is not the issue of well size and access road size "within" farmland which is critical; but rather, it is the "component" of that farmland in which the site and road are ultimately located and used which will minimize or multiply the impacts to the viable cropland, rotation land and livestock areas.

## NYAM-5 |

## On pages 3-3 and 3-4 the Draft notes:

The threshold for an Agricultural District calls to question the need for further mitigating measures that may be needed beyond the current permit conditions. \* \* \* Furthermore the location of a well in an Agricultural District or other agricultural region does not mean that the well will be located on viable farmland. Some of the acreage in Agricultural Districts is unproductive, fallow, brushland or pasture unsuitable for growing crops at present time.

With exception only to the generalized reference to "pasture," which is equally deserving of precautionary review and adequate measures if developed as a well site. New York State Agriculture and Markets Department agrees that further measures for ensuring agricultural mitigation, including the minimization of sitings on the viable lands, are needed, beyond some of the current permit conditions and beyond the coverage of the CEIS. This is particularly relevant since the <u>Draft</u> in our opinion, is suggesting the abandonment of EAF information as a NYAM-4

1-4 The EAF in Appendix 5 is, and will continue to be, required for all wells, regardless of the number of acres disturbed. The additional environmental assessment referred to in Table 3.1 is the standard agency long form that would be required along with the Division of Mineral Resources EAF when SEQR thresholds are triggered.

NYAM-5 Support for our proposal to retain the EAF is noted.

Honorable Robert Drew Page 5 July 6, 1988

consistent approach concerning affected agriculture for all sites less than 2.5 (two and one-half) acres in size. Further, New York State Agriculture and Markets agrees that simply by locating a well within an agricultural district does not mean it will be located on the viable cropland, rotation land (and livestock areas). This leads to our suggestion that for the final GEIS to meet its basic objective as an acceptable and useful document of policy, direction and method, the areas of ambiguity and potential conflict in the narrated intent should be cooperatively resolved by the combined efforts of this agency and the Department of Environmental Conservation for purposes of endorsing a final GEIS. The importance of individual siting reviews and the fine-tuning of the ultimate locations is critically important. This need is made more evident when recognizing the <u>Draft's</u> statements counter to the evaluation of "cumulative impacts" (pages 3-9 and 10) in support of the mutual environmental exclusiveness of each well, independently. It is this Department's belief that any well site and access road development which could affect any of the above noted viable agricultural portions of farmland within an agricultural region should be reviewed in the manner provided for by the present EAF or one that is especially developed and applied. In addition, for any such areas, the respective items which are proposed in the Draft EIS either as "recommended mitigation practices" or "requirements" should be admitted and applied as requirements.

We feel strongly that these changes are necessary to help assure the environmental protection of the viable components of the agricultural segment of the resource base. If the Department of Environmental Conservation believes additional information is needed to clarify this approach we are prepared to assist in any way we can.

Sincerely,

Som D. Butches

Donald G. Butcher Commissioner

tr

AMO HOUGHTON

## Congress of the United States

July 5, 1988

House of Representatives

Fill Lived

JUL 8 1988 OFFICE OF HEARINGS

Robert S. Drew Chief Administrative Law Judge New York State Department of Environmental Conservation Office of Hearings 50 Wolf Road, Room 409 Albany. New York 12233

Dear Sir:

I have been contacted by a number of constituents who, directly or indirectly, are involved in the New York State oil and gas industry. They have voiced their concerns about the Generic Environmental Impact Statement (GEIS). I understand that the basic function of the GEIS is to assess the environmental impact of an entire regulatory program and to suggest changes that may be necessary to strengthen that program. I feel that it is worthy to take steps to guarantee a safe environment as well as honest business practices. I agree with you and understand your desire to introduce aspects of the GEIS which will ensure this. However, I believe that the DEC, as well as the EPA, have already taken such steps with existing regulations, and, therefore, the GEIS is unnecessary and Introduction.

MCAH-2

MCAH-1

After reviewing concerns from constituents and information from the DEC-DNR about the GEIS, it appears that such a proposal would do more harm than good for the industry, as well as for the economy. Many of the proposed regulations of the GEIS are already implemented by the DEC and the EPA, thus creating a waste of time and money. The additional regulations under the GEIS would only serve to unduly regulate this industry, creating further hardships by increasing costs and reducing production output. This could ultimately result in layoffs and unemployment, creating problems for the area economy. In fact, many of those involved in the industry feel that the introduction of the GEIS would mean the death of the oil and gas industry in New York State within five years.

As I stated before, I feel strongly about the well-being of this industry, as well as the economic well-being of this region. I'd like to think that we can work to help this industry, sawe it, and let it recover its existing reserves, instead of smothering it with overregulation. Considering the consequences that may develop from the introduction of the GEIS, I hope my concerns and the concerns of others are given serious consideration as the DEC-DMR reviews this proposal.

Sincerely,

AH/1gp

Houghton Member of Congress

WASHINGTON OFFICE 1217 LONGWORTH HOUSE OFFICE BU WASHINGTON, DC 20515 Phone: 12021 225-3151 MCAH-1 The GEIS is a necessary legal requirement. The GEIS was prepared by DEC in order to meet the legal requirements of the State Environmental Quality Review Act (SEQRA), Article 8 of the Environmental Conservation Law, requiring government agencies to analyze the environmental, social and economic impacts of their actions.

MCAH-2

It is the State's position that long-term environmental protection cannot be sacrificed for short term cycles of monetary gain or loss. The current hardships being suffered by the oil and gas industry are primarily the result of low oil and gas prices. Adverse economics are causing the death of stripper well production industry throughout the United States, and stripper wells are being abandoned by the thousands.

As mentioned many times in the GEIS most of the proposed regulations are part of the current regulatory program. These environmentally necessary requirements have been implemented as guidelines and permit conditions. A major exception to current implementation is the body of proposed regulations in Chapter 11 on plugging and abandonment. The proposed regulatory revisions to the plugging and abandonment requirements are critical for adequate environmental protection. New York State has about the least stringent plugging and abandonment regulations in the nation, and 15-foot untested cement plugs are not considered adequate by either EPA or industry experts.

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ALLEGANY COUNTY Office of FCONOMIC DEVELOPMENT

DANIEL 4. MeLAUGHUN Direttar

CR-162

	July 7, 1988
Mr. Robert S. Drew Chief Administrative Law Judge NYS Dept. of Environmental Conservation Office of Hearings 50 Wolf Road, Room 409 Albany, NY 12233	JUL 1 1 1388 OFFICE CF ALLEGA

## Dear Mr. Drew:

ACED-1

ACED-2

I am writing this letter to request that the New York State Department of Environmental Conservation-Division of Mineral Resources heed the requests of the New York State Oil and Gas Association as they apply to the Generic Environmental Impact Statement (GEIS). The purpose of the GEIS is to provide a set of regulatory guidelines for which the oil, gas and mining industry of New York State shall operate.

The contention of the members of NYSOGA is that if the GEIS is adopted without the input provided by its members, the industry will die in New York State. According to the experts in this industry, the regulations are inappropriate and impossible to comply with. It is my concern that if the industry is forced to cause operations in NYS, that hundreds of jobs will be lost due to a bureaucratic regulatory vehicle designed to cause disinvestment. It is also noteworthy, that the state has witnessed the mass exodus of over 300,000 jobs in the late 1970's and early 1980's due to an intollerable business environment which did not allow for competitiveness.

Currently, through the direction of Governor Cuomo and Vicent Tese, and the restructuring of the Department of Economic Development; New York State's philosophy is to provide a business environment for competitiveness reduced operating costs, and growth into the year 2000.

It is not my mission to cite examples of changes in the document to which the industry has already expertly testified. However, it is important that the DEC-DMR recognize that by implementing the GEIS document, a path is being laid for the demise of a very viable industry in New York State. It should be recognized that the industry is plagued by external forces which make it difficult to compete and survive. There should not be a state policy which augments the already ominous operating climate.

7 WELLS LANE . BELMONT, NEW YORK 14813 . 716-268-9229

ACED-1

Each comment received on the draft GEIS is thoroughly evaluated. Comments from the regulated community are given serious consideration, but the days of industry self-regulation have past. In addition to providing regulatory guidelines, the GEIS serves as public reference document and fulfills requirements mandated by SEQRA.

ACED-2 N di

New York State has never designed regulations to cause industry disinvestment. Many of the regulatory proposals made in the GEIS are already imposed as permit conditions and the majority of operators have been able and willing to comply. Moreover, many of the regulatory proposals made in the GEIS have industry support. The current oil and gas industry woes are due more to adverse economic conditions than to over-regulation. In addition, it is the State's position that long term environmental protection cannot be sacrificed for short term cycles of monetary gain or loss.

Page 2 Mr. Robert S. Drew July 7, 1988

I urge you to view the oil industry as a vital source of employment to the Southern Tier of Western New York and I suggest that the DEC-DMR do everything in its power to provide for a proper business climate in which the oil industry may survive.

New York State has made a great comeback in its industrial policy in the last four years. I am confident you would wish this resurgence to continue by supporting an industry that is begging for your help to survive.

Very truly yours,

Januel A. M. Laughlin Daniel A. McLaughlin Director

DMcL:dn

xc: Honorable Governor Mario Cuozo Commissioner Vincent Tese Honorable Senator Jess Present Honorable Assemblyman John Hasper Honorable Amory Houghton, Jr. Mary Merites, Director of IOSANY Gregory Sovas, Director NYS DEC Division of Mineral Resources

## PUBLIC HEARING, JUNE 14,1988, 1:00PM, WILLIAMSVILLE,NY

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PHLW-1 | 21

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MR. WILLIAMSON: My name is Larry Williamson. I am the Superintendent of District Operations for Pennzoil Company. We have fairly extensive holdings in the State of New York. Our district office is located in Pennsylvania.

At the current time, we produce approximately twenty percent of the oil produced in the State of New York. To produce this oil, we have approximately one hundred employees and contractors in the State of New York and economic activity that amounts to several million dollars a year.

First, I would like to compliment the DEC on the job that they did in preparing the Generic Environmental Impact Statement. It was a very large and difficult undertaking.

However, I do feel that it may have been aggravated somewhat by the inclusion within the scope of the Generic Environmental Impact Statement of a public educational function that Mr. Sovas just mentioned and also the proposal of extensive changes to the regulatory program. PHLW-1

CR-164

Providing the affected community with historical and educational information should foster a better public understanding of the industries we regulate. Public interest and concern were demonstrated by the extensive response to the GEIS scoping hearings; there was more input at this stage from the public than from industry. All government agencies, this Department included, are public servants and the educational functions of the GEIS are viewed as a public service.

Proposed regulations were included in the GEIS to meet SEQRA mandates, to provide a framework for informed public discussion, and to provide a complete assessment of the current regulatory program. The current program includes many permit conditions and guidelines that are being proposed as regulations. See Topical Response Number 5 on Reasons for Including Proposed Regulations in the GEIS.

PHLW-2 17 I also feel that the Department of Environ-18 mental Conservation erred in not adequately address-19 ing the comments submitted by the Oil, Gas and, 20 Solution Mining Advisory Board, comments that they 21 received some time ago. Many of the problems and 22 concerns that are expressed in these hearings could 23 have been resolved earlier had those comments been 24 addressed at the time that they were made originally. 25 Pennzoil has several concerns with the PHLW-3 Generic Environmental Impact Statement that I would 1 2 like to mention today. Our written comments will be 3 included with those of the Independent Oil and Gas 4 Association which will be received later, I under-5 stand.

PHLW-2

The over 600 individual comments received through the Oil, Gas, and Solution Mining Advisory Board on the preliminary draft GEIS were thoroughly evaluated by DMN staff. Changes were made to the text where warranted. Each comment received during this internal review process was individually listed and discussed in a 112-page response table that was distributed to the commentators.

## PHLW-3 See response to PPC-1.

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Pennzoil's specific comments included, first, water flooding. Water flooding is one of the categories of activity which the Generic Environmental Impact Statement specifically does not cover. It does address it. It does explain it fairly well. However, it is stated that a separate Environmental Impact Statement will have to be prepared for water flooding. I don't necessarily believe that this was necessary. I think that water flooding and several of the other excluded categories could have been adequately covered by the Generic Environmental Impact Statement.

I feel that the reason that they were not were primarily because of the use of old examples of environmental degradation caused by water flooding. The Department of Environmental Conservation did not take into consideration, or at least not adequately take into consideration the changes in the technology and the changes in the regulatory program which occurred since the water floods that they reviewed were originally developed.

Most of the water floods in New York State, of course, are very old. Most of them predate World War II. A few of them were done in the 1960s. The regulatory programs of today are completely different than it was when those floods were developed. Any environmental impact that they might have had would not really occur today, particularly not under the Federal Underground Ejection Control Program.

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**CR-166** 

PHLW-4 A new waterflood project could trigger SEQR thresholds. The requirement for an environmental assessment when SEQR thresholds are triggered is not a proposed requirement; it is already law.

> Basically, it is correct that modern technology and improved regulation have mitigated many of the adverse environmental impacts of waterfloods. However, a site-specific environmental assessment of any new waterflood project is necessary in order to evaluate possible negative environmental impacts which could be mitigated.

> The federal EPA UIC regulations do not supersede State regulations, and the EPA does not have adequate field staff to effectively ensure compliance with their rules.

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PTRLW-5		The second item that I wanted to talk
	13	about was the extensive discussion of access roads
	14	within the Generic Environmental Impact Statement.
	15	Activities, at least to the way that I would think,
	16	an activity and not the purpose of that activity will
	17	determine what environmental impact the activity has.
	18	It should also determine whether that is a specific
	19	activity under the mandates of the State Environmental
	20	Quality Review. It also determines the needs for
	21	regulation of that activity.
	22	The Generic Environmental Impact Statement
	23	seeks to impose extensive regulation on roads built
	24	by the Oil and Gas Industry even though those roads
	25	are identical to roads built by the timber industry
	1	or by the farmer or by a logger or a residential
	2	recreational developer. The roads are no different,
•	• 3	but yet only because those roads are part of an oil
	•	and gas operation the Generic Environmental Impact
	5	Statement seeks to regulate them and regulate them
	6	vather extensively. I might add

rather extensively, I might add.

PHLW-5

In some areas an access road affects more acreage than the well site itself. Access roads constitute part of the action to drill a well, and it is our responsibility to evaluate the environmental impact of the entire action, not just segments of it. See Topical Response Number 4 on Access Roads as Part of Project.


PHLW-6 Other industries with construction activities have requirements regarding the disposal of non-marketable timber and brush. Any State permitted activity occurring in a wetland or floodplain must comply with the same salvage and disposal guidelines as those imposed on oil and gas operators.

PHLW-7	17	The third category of items which gave
-	18	Pennsoil great concerns was the apparent imposition
	19	of the Department of Environmental Conservation into
	20	third party contracts, that is, contracts between
	21	the oil and gas operator and the mineral owner.
•	22	Whether these mineral owners choose to lease their
	23	land themselves or whether they purchased lands
	24	which already had a valid existing lease on it, does
	25	not give the Department of Environmental Conservation
	1	the right to enter into that contract to change any
	2	part of it. The Department of Environmental Con-
• ·	3	Servation has many vital environmental functions
1	4	which they must perform within the constraints of
	5	their budget and manpower. They certainly don't have
	6	the time to act as the Lone Ranger going out to save
	7	everyone from their own actions. Whether those
	8	actions are right or wrong on the part of either
-	9	party is not reason for the Department of Environment-
	10	al Conservation or other State agencies to enter
	n	into it.

PHLW-7 See Topical Response Number 6 on Surface/Mineral Owner Lease Conflicts.

## CR-169

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1.UN-0		Some of these items in the Generic
	13	Environmental Impact Statement which we feel that
1	14	the Department of Environmental Conservation is 🦈
	15	imposing itself on, where they have no business
	16	being, would be the taking of private property with-
	17	out compensation, not necessarily the oil and gas
	18	operator's private property. I refer to things such
	19	as demanding that the top soil be regraded over a
	20	
	21	want something else done with that top soil, that
	22	might be an admirable thing to do with it, but it is
	23	the farmer's top soil. He may want to sell it.
	24	Top soil currently sells for about ten dollars a ton.
	25	He may want to use that top soil for
	1	something else. He might want to put it on his
	2	garden or on the lawn of his home. If he can
	3	negotiate with the oil and gas operator to spread
	4	it for him, so much the better.
	5	It is certainly not the Department of
	6	Environmental Conservation's business to tell the
	1	former what he can do with that ton soil or taking of

CR-170

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aking of farmer wha ne the mineral owner's minerals or the oil and gas operator who has it leased. Some of the things within the Generic Environmental Impact Statement can make it either aconomically or technically impossible to recover that mineral.

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13	If this is the case, then under any other
14	acts of condemnation, the State has to pay for a
15	private property they take. There should be no dif-
16	ference here just because that property is top soil
17	or minerals. If they are taken away, either technic-
18	ally or economically the State must compensate them
19	for it:
20	As I mentioned earlier, many, many farms,
21	in New York State were nurchased

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ranches, et cetera in New York State were purchased subject to valid existing oil and gas leases. The surface owner today might not willingly enter into a lease that was valid when he bought that land. However, he did buy that land subject to the lease. No third party can interfere with that.

Now, the fouth and final area that Pennsoil had concerns about was actually rather a detailed one in which the Department of Environmental Conservation explained what activities in the future would require a permit, many of which don't currently require a permit, many of which the industry considers day to day routine operations, such things as well servicing where you do a casing repair or reset a packer or a string of tubing. These things are not permitable actions. They are simply day to day operations. Thank you. PHLW-8 See Topical Response Number 1 on Public Taking Without Compensation.

PHLW-9 Remedial operations which change the permanent wellbore configuration will require prior notification and approval of the Regional Minerals Manager. Notification and approval to alter casing is a regulatory requirement in most states. The State must have accurate information on the current wellbore status and be aware of any well alteration that could interfere with proper plugging and abandonment. Resetting the tubing and packer is not an operation which changes the permanent wellbore configuration.

1	MR. FOSTER: Thank you. I would just	
2	like to make a brief recommendation that the Depart-	1
3	. ment consider a fixed time for the confidential	
4	status of submitted drilling data. I believe that	
5	most producing states limit the confidential status	
6	of drilling data to periods on the order of six	
7	months to two years. I believe that New York State	
8	should be similar.	
9	This data would then be available on a	
10	walk-in basis easily accessible to everyone rather	
11	than a somewhat cumbersome application situation.	
12	I have no objection to a time period of one or two	
13	years as long as the operators know from the start	
14	what the rule is so that they should be able to	
15	protect their interests down the road.	
16	Hopefully this would benefit small oper-	
17	ators and consultants such as myself who do not	
18	generally trade data with larger companies. I be-	
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lieve that we need readily accessible data effective-

ly on a walk-in basis. That is all I have.

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The Department supports Mr. Foster's recommendation, and the Department has also sponsored legislative proposals to correct the currently cumbersome freedom of information access procedures.



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I think that another statement that I wanted to make is about correlative rights. When we over-regulate, we slow down activity and then the land becomes splintered and sold and making the lease acquisition near impossible. You can't get aunit together. Those minerals are gone forever. I make a statement that the correlative rights are lost forever. PHWH-1 Mr. 1 maki howe

Mr. Haker is correct in his statement that you cannot drill a well without making noise and that this noise is temporary. Under SEQR, noise impacts, however temporary, must be evaluated in an environmental assessment such as the GEIS.

PHWH-2 The Department supports simplification of the procedures for granting spacing variances under the conditions described by Mr. Haker. A recommended revision to the current rules and regulations is to give the Department greater flexibity in granting administrative spacing variances.

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DUNNIL O	20	
PRWIP3	~	One other thing or one other statement
	21	
		that I want to make is that there is not increased
	22	drilling activity going on in New York State T
	23	state, i source, young on in now lot state. I
		just got a letter in my office showing how many per-
	24	With wave applied for to the local states
		mite were applied for in the last month. There
		aren't any in Brie County. I have got five here.
	1	That is not a lot of antivity
		that is not a lot of activity.
	2	One of the reasons is the price of gas.
	3	
		The other is the over-regulations. So, I guess that
	4	is what I want to say.
	. 5	
FAWIF4	ľ	I drilled over one hundred wells up here.
	8	T deals use and a firm leadermore . T feel like a
		1 don't get calls from landowners. I feel like a
	17	Maytag repairman. Either I am doing something right
	8	
		or someone else is complaining too much.
• .	9	I think that the landowners can stick up
	10	
	<b>1</b>	for themselves. I think that a farmer is a pretty
	in .	and businesses. We descult read the Shate of Mary
		good businessman. ne doesn't need the State of New
	12	York to come in and over-regulate, because when he

rents out his field to a bean grower, for instance, what is then to prevent the State of New York to come in and regulate the guy leasing his land for growing of beans?

Therefore, I say that the oil and gas man is not being treated constitutionally fair because of the fact that he should be treated equally under the law. That is my statement. Thank you.

PHWH-3

The current slowdown in drilling activity has occurred nationwide and it is the result of adverse economics, not over-regulation. Environmental regulations do cost industry money, but environmental clean-up costs even more.

PHWH-4

We agree with Mr. Haker's statement that most landowners are capable of "sticking-up" for themselves. We believe that the farmer generally has the greatest expertise on land usage with respect to his own property.

PHWH-5

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**CR-174** 

The State does not regulate bean growing, but the State does regulate farming activities such as the application of pesticides. Any action requiring a discretionary State permit undergoes similar environmental reviews and is subject to restrictions. Oil and gas drillers are not treated unconstitutionally.

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1	MR. LUENSMAN: First of all, I would	[ 1	1	under certain conditions.
2	say to Mr. Sovas that I never seen an agency work		2	We strongly state that to use the word
3	as hard and as diligently as it has in this situa-		3	"municipal" is too restrictive because it means that
4	tion. I and the agency that I represent have been		4	you are dealing with a well with a particular type
5	continually encouraged to participate. It is very		5	of ownership. It doesn't necessarily relate to its
6	difficult sometimes to get the message across $s_0^1$		6	use and the number of people that it serves.
7	the message comes back in this testimony in some		7	The second very major point that we are
8	instances.	4	8	interested in is the fact that this Generic Environ-
9	I will not read the document. I have		9	mental Impact Statement took ten years to produce.
10	several documents if the news media is interested	1	0	I can understand the complexity of it. It suggests
11	in it, if there is any news media here, or any	. 1	1	the creation of additional rules and regulations,
12	other interested parties are interested in it. I	1	2	however. I would hope that we are not working on
13	have copies of my statement.	1	13	that particular time scale.
14	The most important issues that we are	2	14	The assumption as to the character of a
15	concerned about when I say "we", in this instance		15	lease as we read the document, it sounds like all
16	I mean the Chautauqua County Environmental Management	2 1 8	16	leases are yet to be negotiated. We have thousands
17	Council and my department, and I expect other	<u><u>v</u></u> 1	17	upon thousands of leases across the State of New York
18	agencies of the Chautauqua County government to be	1	18	some of them that are anchored with the land for
19	endorsing this statement, and its just recently been		19	several decades depending upon how they were drawn.
20	completed and our endorsement process takes a period	1 2	20	Many of the earlier leases that were created were
21	of time, but the most important things that we are	2	21	basically blank checks. The landsmen were out rep-
22	concerned about, one of them is on Page 3-3 that	ž ~ 2	22	resenting and trying to get the least possible cost
23	deals with the identification of Municipal Well	2	23	lease that they could.
24	receiving certain types of protection, particularly	CR-175	24	This is not to paint the whole industry

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the needs for an environmental assessment process

PHJL-1

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paint the whole industry black because I know that some members of the

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industry are very conscientious. There are some very blank check leases, however, many thousands of blank check leases in the files of county government. ... The next major issue, again, as we go through the document page by page, is on Page 824 where you talk about the tile drain system, but again dealing with the question of leasing and leases it could very well be that there is no protection for those types of systems.

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The issue of casing and grouting of the well is spoken to in our presentation. It includes Resolution 42-85 of the Chautauqua County Legislature.

Now, the last and possibly one of the most important issues that we have discussed time and time again is what we call the third-party innocent. This is a party that has leased nothing to anyone and because of the activities of the industry in the vicinity of their property, they may have had to have left their home. They may have to live with water that has changed its quality and its character -- I happen to be one of those victims -- by an illegal operation and not by a legitimate operation that was under regulation.

In some instances, they have sold their homes. In at least one instance that I have been

referred to, they sold their house for less than market value before the gas and oil activity took place in their community.

. These people have no interest in the gas and oil industry, but yet they have been affected by it. They receive no relief. There is no mitigation.

The Environmental Impact Statement proces demands an example of the impact and mitigation plan I don't see it from what we have heard at a number of hearings before the Department as to the thirdparty innocent. I believe that needs to be examined Due to the heat of the evening, I will leave the rest of the paper to stand on its own. Thank you very much.

PHJL-1 CR-176

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Please see the responses to Mr. John Luensman's written statement on behalf of the Chautauqua County Environmental Management Council.

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MR. KIDDER: My name is Rolland E. Kidder.

Kidder Exploration, Inc. is an independent natural gas drilling company located here in Jamestown, New York. We are pleased that after many years of work, we now have a Draft Generic Environmental Impact Statement and hope that it, or a variation of it, will be adopted by the Department in the days ahead.

The New York Independent Oil and Gas Association (IOGA) of which we are a member created a special committee to deal with the technical aspects of this document.

There are a couple of things that were in the IOGA comments that I wanted to allude to though. First, the issue of technical aspects of all business

To me this is one of the areas where the New York Independent Oil and Gas Association Advisory Board really ought to have a lot of input on. As far as I know, it had a lot of input in drafting the Department's regulations.

For example, grouting, what is it? What

does it do? What doesn't it do?

CR-177

What type of cement do you use? There is a lot of opinions inour business. What types of cement? What types of pipe? What depth of casing and so on and so forth?

I think that these are the types of technical aspects that can best be addressed at least through the input of the Advisory Board and hopefully with IOGA. We have pipelines and channels that can have an input.

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The Department of Environmental Conservation's Division of Mineral Resources works very closely with the Oil, Gas, and Solution Mining Advisory Board. This Advisory Board has industry members who are also members of the New York Independent Oil and Gas Association (IOGA). In fact, the Oil, Gas, and Solution Mining Law (ECL 23-0311) mandates that the majority on the Advisory Board be representative of the regulated industries. PHRK-2

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The other issue brought up in the IOGA comments and alluded to by Mr. Luensman is a question of leases. I think that the Department should realize, and those that are involved in the Division of Minerals do realize that oil and gas leases are a real property transaction between the operator and the landowner, that is, the lessee and the lessor. This document is entered into voluntarily.

I might say that as we got into the oil and gas drilling business in Chautauqua County that the landowners have become much more savvy on what is good and not good for themselves. Maybe in the early days people just signed leases and then ended up being clouded on their title. In recent days, landowners have become much more sophisticated. We don't have a current or a present problem.

My recommendation, one, if you want to do something with leases, if they should be canceled or illegal in some manner, and there have been proposed laws put in as to the change of the real property law in Albany which I think probably that is a better way to deal with it whether the lease is valid or not valid instead of trying to do it by over-regulation. I would like to focus my comments tonight on a couple of overall aspects of our business that maybe at least from our standpoint it is more important.

PHRK-2

**CR-178** 

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The Department concurs that a legislative initiative to deal with out-dated, illegal or inequitable leases is preferable to intervention by an environmental agency into real property transactions. First of all, the Draft Environmental Impact Statement recognizes that the Department of Environmental Conservation is to be the lead agency in regulating the oil and gas industry in New York. It is vital for the health of our industry that state primacy in the regulation of our industry continue.

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All major oil and gas producing states have provided statewide regulation for this industry. In Texas, the largest oil and gas producing state, this regulatory control was given in the 1930s to the Texas Railroad Commission.

The reason that it was given to the Texas Railroad Commission because it was the only Commission at that time with the staff and expertise to take on the job, but today still the Texas Railroad Commission regulates the oil and gas industry statewide in Texas. They have set down a lot of parameters for agencies like the Department of Environmental Conservation in New York State. PHRK-3

Please see the responses to Mr. Kidder's written statement on behalf of Kidder Exploration which corresponds to the remainder of his oral testimony.

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PHMP-1	23	DR. PANZARELLA: I am Dr. Marion		23	I came about this information when I went
1	24	Panzarella, 743 Palconer Street, Jamestown, New York.		24	to an old stamping ground, the Shumacker's, who
	25	I am Chairman of the Board of Public Utilities in	)	25	live in Levant. Mrs. Shumacker called me and said
	1	City of Jamestown.		1	that their water had more gas in it than ever before.
•	2	Many of you realize that we were very		2	That took place after a new well had been drilled.
• •	3	actively engaged some two years ago when our aquifer		3	So, you see, some people don't do a very good job
· · ·	4	was in danger of being contaminated by the gas and		14	of drilling wells.
	5	oil drilling in the area. Contamination by and		5	Also, the information came to me that in
	6	large has decreased significantly for a number of		6	the area of Ellington, many sources or many discover-
	1	reasons.	1 . 1	7	ies of radon gas existed. That is where a great
	8	First of all, the production of the wells		8	deal of drilling took place.
	9	has dropped.	· ·	9	So, therefore, we then began to look at
	10	Secondly, there has been better drilling.		10	this very seriously in our case. We sent samples
	11	For instance, the last gentleman who spoke, Mr.		11	or had samples sent to the Health Department.
	12	Kidder, he goes the extra mile to eliminate or to	•	12	There they found that we were well below the maximum
	13	try to eliminate chances of contamination.	•	13	contaminant level as far as the Jamestown water
	14	Since then we have sampled our water.	2	14	system was concerned.
	15	We have detected small amounts of radon. In the		15	However, we then snuck in a sample from
	16	past there has been no concern about that because	ŝ	16	the Shumaker place and we found that to be rather
	17	I don't think that we knew too much about it.		17	close to the maximum contaminant level. This leads
	. 18	However, my concern today is what has	L. H.	18	me to conclude that as you frac gas wells, you're
	19	the Department of Environmental Conservation done		19	opening up new channels for radon gas, the constant
	20	in order to get a better understanding or background	N R	20	decay of radon into the environment. It can be
	21	to lower the levels of radon that happen to be in	CR-180	21	very serious in some cases.
	22	the aquifar regions?			
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My question this evening is: What has the Department of Environmental Conservation done in order to research this new threatening contaminant? If anything, what can be done?

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I do know, however, as a result of the Exxon Restitution Fund for their overcharge for oil, there is money available for radon detection. I know that in this instance, we had to send our case in to Albany. In the meantime, the radon that is in the water does decay. You do not get a true testing so that the percentage of error is quite large.

9 My concern is before a new well goes in, 10 before a new gas well goes in, what responsibility 11 does the Department of Environmental Conservation 12 have to see that the contaminant of radon in the 13 water is at a certain point so that if fracing does 14 increase the amount of radon, I think that the 15 individuals or the municipality should be reimbursed 16 for the damage that might be done.

Presently, however, we have readings for our water wells. If there is any drilling done in the area, we know whether or not it will produce or is as a result of the drilling in our aquifer, otherwise an individual is really lost and has no background whatsoever in order to protect the condition of the well. Thank you.

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High levels of radon gas most closely correlate to the type of surficial material and geology. Higher levels of radon are not caused by oil and gas well fracture stimulation operations. The effect of these operations is limited to the producing formation adjacent to the wellbore at depths of a thousand feet or more below the surface. The Department of Health is the New York State Agency responsible for protecting homeowners from radon. For further information, contact their Bureau of Environmental Protection.

## PUBLIC HEARING, JUNE 16, 1988, 1:00PM, WELLSVILLE, NY

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MR. VAN TYNE: I am Arthur Van Tyne, President of the Independent Oil and Gas Association of New York.

Thank you for the opportunity to present my views about the GEIS document. We have already made a statement for the membership of IOGANY which was read into the record at your Albany hearing on June 6, 1988. We will also file with you a detailed listing of comments from our membership. These comments have been complied by a special committee of IOGANY.

In general, the Draft GEIS is a comprehensive and well written document. One can see that a lot of time and effort has gone into the preparation of this study. It certainly covers every aspect of oil and gas activity in New York, as well as many other aspects which we feel should not be the concern of the DEC. Our previous general comments, and detailed comments to be filed, have addressed these points.

We believe that the overall affect, and perhaps purpose, of a document such as this will be to increase the regulation of the oil and gas industry in New York. The industry has already agreed that certain facets of our activities probably have needed increased attention and perhaps some degree of regulation.

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**CR-182** 

We have cooperated with the DEC-DMR in setting up guidelines and regulations to handle these concerns and will continue to do so. However, the tone of the GEIS is to set the stage for increased regulation of every aspect of our activities.

The GEIS has been portrayed as a document which will save the industry a great deal of time and effort in not having to prepare a specific EIS for each well drilled. Be that as it may, it also opens the door for additional regulation in so many areas that the overall affect, in time, could be an increase in the time and effort needed by operators to abide by these regulations. This, of course, would also result in increased operating costs in New York.

Since the end of 1985, the oil and gas industry nationwide has been in a serious downturn. We in New York, as a microcism of the larger<sup>a</sup> industry, have suffered the same decline. Many operators have been, and continue to be, forced out of business. Prices for our products, oil and gas, are less than half what they were at their peaks and we don't see much in the way of increases for  $\hat{a}$ long time.

Indeed, production in New York is almost always of very low volume and most operators work very close to the margin of profit or loss. Any increase in costs brought about by additional unnecessary regulation will drive more people out of business. Now, in this climate, we are being overwhelmed by the prospect of regulation which a healthy industry would have difficulty coping with.

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It is in this light that we respectfully request that our comments about the GEIS be given serious consideration. We ask that changes be made in the wording, and intent, of this document so that, if possible, it can fulfill its purported intent of aiding the industry.

It appears that if the GEIS is approved as it now stands that the New York oil and gas industry, now at its lowest ebb, could be dealt a crippling blow from which it might not recover. It could make a textbook case of an industry overregulated to death. PHAVT-1 The GEIS was prepared to satisfy the legal mandate under SEQR which requires a governmental agency to examine its entire regulatory program. Many of the proposed regulations detailed in the GEIS are part of the existing regulatory program and are currently implemented through guidelines or special permit conditions. Most New York State operators have been willing and able to comply with the guidelines and permit conditions without curtailing their exploration and drilling programs beyond what would be expected because of current adverse economics. Any new regulations must be promulgated through the State Administrative Procedures Act (SAPA). Long-term environmental protection cannot be sacrificed for cycles of economic adversity and prosperity.

All comments received on the GEIS are given serious review and consideration. In addition, reasonable alternatives to DMN proposed regulations (those which will achieve the intended environmental goals) have been identified through this procedure for consideration during the rulemaking process.

Aiding the industry is a goal of the GEIS, but it is not the only goal. The Department and DMN are responsible to all the people of New York State for ensuring that the operations of the industries we regulate are carried out in such a manner that the environment, public safety, and correlative rights are all protected.

9	MR. HASKINS: Good afternoon. My name	1	9	The oil and use industry is being regulat
10	is Mark Haskins. I am here to represent Ebenezer		10	The off and gab industry is being togeta
	Oil Co., Inc., with production of oil and gas in			ed out of our right to produce resources we are
2	this area for over 70 years.			entitled to. Where does the danger to the communit
3	I am not going to get into specifics from		12	lie? Dollars! The Generic Environmental Impact
	the Canada Bruinsmental Tanact Chatanant contents	<b>K</b>	13	Statement opens up a whole new set of regulations t
	the Generic Environmental impact Statement contents,	2	. 14	will be too costly for the industry to comply with.
	but rather point out its dangers to the oil and gas		15	You will see less drilling activity to
	industry as well as the community.	9	16	explore for more reserves and increasingly less pro
	I would like to begin by quoting from	e T	17	duction. The oil and gas producers are taxed on
	Page 1 of the GEIS. "Aside from strictly environment-	NJ44	18	production. This means less tax dollars to your
	al concerns, DEC is responsible for preventing waste		19	County and State.
	of the State's oil and gas resources and protecting		20	With these newer, more extensive regula-
	correlative rights; that is, the right of any mineral		21	tions comes the threat of the operator walking away
	owner to recover the oil and gas resources beneath	LOAN	22	from his obligation to plug and abandon his wells i
	his land."		23	an ouri-commentally sound manner. Today's methods of
1	Currently, this is not the case. I		24	all environmentally sound mannet for over 70 years to
	believe the Department of Environmental Conservation		25	plugging warm has been ploven for over to years to
	has aided to the premature abandonment of oil and	<u> </u>	$\left(\begin{array}{c} -1 \\ 1 \end{array}\right)$	be sufficient. Under the Generic Environmental Impact
	gas reserves.		2	Statement proposal costs will increase and deter th
	Companies and individuals are being forced	-	3	responsible operator from any plugging at all.
	to permanently plug and abandon wells that are			Operators are getting tired of this.
	currently not economical to produce, but the situa-	~	5	For they will then their backs and lock their door
	tion of economics can turn around and the operator			soon they will tark their backs and rock that doe
	is out his entitled production. How much more does	00 40 5		The Department of Environmental Conservation Should
	the DFC expect us to take?	CR-184	1888 B	be to blame for this.

I would also remind both the DEC and the public here that there is over \$5 million annually now in payroll to workers in Allegany County in the oil patch. We don't need to see these people in the unemployment line.

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In closing, I would like to ask the repeated question: How much money has it cost so far to prepare this Draft Generic Environmental Impact Statement and couldn't it have been spent elsewhere more wisely to enhance energy reserves in New York State?

If possible, I would like to have an' answer to that question some time today. Thank you. PHMH-1

The Department has not caused the premature abandonment of oil and gas reserves in New York State. The average production for a stripper oil well in New York State is 1/4 barrel of oil per day. This is approximately one-twentieth of the economic producing limit in other states. (The economic limit is the point where operating costs exceed production returns.) One of the primary reasons that production has been sustained below levels that are economical in other states is the historic very low cost of regulatory compliance in New York. Even with no regulation (as was the case for the old oilfields of New York for many years) production rates eventually decline below a level which can be economically produced.

There are thousands of old wells in New York whose plugging and abandonment has been deferred well past that limit typically considered economical. It is not true that regulation is causing these old wells to be abandoned prematurely. Some oil and gas operators, who have profited from oil and gas production for many years, now wish to escape the legal responsibility and expense of properly plugging and abandoning their wells.

The Department recognizes the current adverse economic conditions facing the oil and gas industry. Regulations requiring proper plugging and abandonment of wells are not aimed at worsening the situation and causing operators to go out of business, as some have claimed. There are provisions in the regulatory program for obtaining legal shut-in status for wells that cannot now be economically produced, but which might be economically producible in the future when market conditions improve (6NYCRR 555.2 and pages 11-7 through 11-11 of the GEIS). There is no intention to eliminate these provisions or to use them to force operators to prematurely plug and abandon wells.

MR. GUNNER: Thank you, Judge. Good 19 afternoon, ladies and gentlemen. I am so happy to 24 20 be here in the Howell Library in Allegany County. 25 21 1 Those of you who have read this document 22 2 know my references here. 23 3 (Laughter) 24 4 I do have some comments and they are 25 5 philosophical in nature rather than particular to 1 6 the types of regulations that are proposed by this 2 7 document. I think that others have addressed those 3 8 issues in more detail, I believe, than I can. 4 9 First of all, I feel the reasons for and 5 10 purposes of the Draft Generic Environmental Impact 6 11 Statement should be specified in the document itself, 7 12 something which has not been done with sufficient 8 13 clarity. 9 14 The State Environmental Quality Review 10 15 Act (SEQRA) was enacted in 1976 for the purpose of 11 16 encouraging "productive and enjoyable harmony be-12 17 tween man and his environment". 13 18 14 15

CR-186

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PHWG-1

Environmental Conservation Law (ECL) Section 8-0101. The method chosen by the state legislators to meet this objective was in the form of a mandate to the state agencies and political subdivisions to administer their programs in accordance with the concerns voiced in SEQRA, as follows: "All agencies which regulate activities

... which are found to affect the quality of the environment shall regulate such activities so that due consideration is given to preventing environmental damage." ECL Section 8-0103(9).

Furthermore, "All agencies shall review their present statutory authority, administrative regulations, and current policies and procedures for the purpose of determining whether there are any deficiencies or inconsistencies therein which prohibit full compliance with the purposes and provisions (of SEQRA)."

As such, SEQRA essentially provides that state agencies such as the Department of Environmental Conservation's Division of Minerals (DEC-DMN) are to assess the activities conducted under their jurisdiction vis-a-vis the environmental impact and potentially damaging results of such activities.

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As it relates to DEC-DMN specifically, the SEQRA mandate is for an assessment of the environmental impact of and possible environmental damage resulting from activities conducted in drilling, operating and plugging oil, gas, storage and solution mining wells, at least to the extent these activities fall under DEC-DMN regulatory authority.

SEQRA provides for the preparation of environmental impact statements (EIS's) by agencies such as DEC-DMN on any actions under their jurisdiction which "may have a significant impact on the environment." ECL Section 8-0109(2). Emphasis is added heré to the term "action" and the term. "significant" since it is felt that the DEC-DMN Draft GEIS goes far beyond dealing with "actions" and "significant" impacts on the environment.

PHWG-1

The purposes of the GEIS are extensively discussed throughout the document and they are listed on page 2-2. The determination of "significant" and "non-significant" actions cannot be made without a complete discussion and assessment of the entire regulatory program.

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Under SEQRA, these EIS's are to be prepared so as to be "clearly written in a concise " manner capable of being read and understood by the public, (they) should deal with the specific significant environmental impacts which can be reasonably anticipated and (they) should not contain more detail than is appropriate considering the nature and magnitude of the proposed action and the significance of its potential impacts." ECL Section 8-0109(2).

Also, such EIS's are to be prepared so as to comply with the legislature's mandate that "social, economic, and environmental factors shall be considered together in reaching decisions on proposed activities." ECL Section 8-0103(7)

It is submitted that the DEC-DMN Draft GEIS does not follow the mandate of being clear and concise, that it deals with numerous hypothetical impacts that are insignificant and that it does not address the social and economic benefits attributable to the oil and gas industry but only emphasizes the alleged adverse environmental impacts of the industry. Over the past centur, the oil and gas industry has contributed very substantially to the social and economic wel-being of numerous citizens of the State and the public in general and it is anticipated that this will continue in the future, yet these facts have been totally ignored in the DEC-DMN Draft GEIS.

The Legislature approved in SEQRA that agencies should avoid duplication of BIS reporting wh feasible by combining or consolidating proceedings. ECL Section 8-0107.

In the case of DEC-DMN, this mandate was followed by the preparation of the Draft GEIS which constitutes a generic environmental impact statement designed to cover all oil, gas, storage and solution mining activity rather than requiring an EIS for each individual well or project.

This is a well conceived endeavor to the limited extent that the environmental impact or non-impact of drilling an oil or gas well is very much the same for most wells drilled and individual EIS's would be highly duplicative and wasteful of

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	industry resources.	
	It is not a well conceived endeavor,	1
•	however, in that DEC-DMN has attempted to go far	
	beyond their legislative mandate and authority in the	
	preparation of the Draft GEIS.	1
	II. THE DRAFT GEIS SHOULD SERVE A VERY	•
	LIMITED PURPOSE AS DEFINED IN SEQRA, Which is to assess environmentally "Sig-	•
	NIFICANT ACTIONS". INSTEAD, DEC-DMN HAS	
	DRAFT GEIS TO ESPOUSE THE ALLEGED VIRTUE OF NEW, MORE RESTRICTIVE, REGULATIONS AND	:
	ATTEMPTING TO EXPAND THE APPLICATION OF Existing regulations by innuendo. There	1
•	IS NO RATIONAL BASIS FOR THESE ADDITIONS And expansions except to perpetuate and	
	EXPAND THE DEC-DMN BUREAUCRACY.	
	It is quite important to emphasize that	
	EIS's in general and the Draft GEIS in particular are	
	only asked by SEQRA to address issues which involve	
	"actions" that may have a "significant impact" on	
	the environment.	
	"Action" is defined in SEQRA as including	
	only those activities or projects requiring the	
	issuance of an entitlement such as a permit by a	
	state agency. ECL Section 8-0105(4).	
	Specifically excluded from the definition	
•	of "action" are activities involving, among other	
•	things, "maintenance or repair involving no sub-	•
	stantial changes in existing structure or facility."	

PHWG-3

PHWG-2. Other commentators have praised the GEIS as being a clearly written document. The length is a result of its expansion to serve a public education function.

The environmental impacts of oil, gas, and solution mining activities and the existing and proposed mitigation measures are concisely summarized in Chapters 16 and 17.

The social and economic benefits attributable to the oil and gas industry are detailed in Chapter 18.

Mr. Gunner has misinterpreted and misapplied citations from Article 8-the State Environmental Quality Review Act. The citations used are appropriate for a site-specific EIS. The guidelines for preparation of a Generic Environmental Impact Statement can be found in 6NYCRR Part 617.15. "Generic EIS's may be broader, and more general than site or project specific EIS's and should discuss the logic and rationale for the choices advanced." See 617.15(4)(d).

See Topical Response Number 5 on Reasons for Including the Proposed Regulations in the GEIS,

ECL Section 8-0105(5).

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As such, it is submitted that SEQRA does not authorize or require review or regulation of pre-existing oil and gas operations or prospective operations except to the extent that DEC-DMN permits are required for particular activities. No doubt this protection was included in SEQRA to avoid the prohibition against ex post facto laws.

The Draft GEIS does not draw this distinction between new and pre-existing operations, however, and it appears that DEC-DMN would like statements and regulations promulgated under the guise of the Draft GEIS to be retroactive to operations commenced prior to enactment of SEQRA in 1976 or even prior to enactment of the Conservation Law in 1963.

DEC-DMN has consistently asserted that the power conferred upon them at ECL Section 23-0305(8)(d) to regulate operations means that the "existing pool" distinction has evaporated.

This is not true, however, since DEC-DMN has never enacted new regulations on notice and public hearing, as required, that would eliminate this distinction. The DEC-DMN, in not making this. distinction in the Draft GEIS, is attempting to

gloss over and eliminate the distinction ex post facto and confer upon themselves an ad hoc lawmaking power repugnant to the principle of due process of law contained in the state and federal constitutions. The Draft GEIS should not be used as a subterfuge in an effort to avoid lawful procedures in adopting new regulations and it is not the proper medium for espousing the virtue of proposed new regulations.

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PHWG-4

The preceding comment applies not only to the existing pool distinction but to the "other than existing pool" regulations as well.

Proposed new regulations have no place in the Draft GEIS and must be compiled in a separate document and adopted only after notice and public hearing.

SEQRA gives some authority for review of existing regulations but to propose regulatory changes within the Draft GEIS document only serves to confuse the issue. Assessment of "significant impacts" should not be posed in a manner so as to suggest that new regulations are necessary to avoid significant environmental impact.

Instead of assessing real and significant impacts in the Draft GEIS under current regulations,

PHWG-3 The law takes precedence over rules and regulations. Rules and regulations cannot convey any authority above that given in law or legislation. The Oil, Gas, and Solution Mining Law of 1981 clearly eliminated the distinction between old and new oil and gas fields, and the draft GEIS cannot draw any distinction between the old and new oilfields because that distinction has not existed since 1981.

The proposed regulations, many of which are part of the current regulatory program as permit conditions and guidelines, are critical to environmental protection and do have a place in this draft GEIS. See Topical Response Number 5 on Reasons for Including Proposed Regulations in the GEIS.

DEC-DMN has compiled a laundry list of hypothetical impacts upon the basis of which it hopes to have new

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PHWG-5 | 15

It is submitted that this is, in fact, a thinly-veiled effort to expand and perpetuate the DEC-DMN bureaucracy and that it has nothing whatever to do with real and significant potentialities for environmental damage.

Since many of the hypothetical environmental impacts upon which DEC-DMN predicates its goal of adopting new and more restrictive regulations are dealt with at length in other commentaries, attention will be focused here on several of the more glaring examples.

The first example is DEC-DMN commentary in the Draft GEIS on access roads. Roads have never been regulated under the ECL and to propose such a thing for oil and gas operators only is manifestly unfair. Building an access road may have some minimal impact on the environment, but if such impact is deemed by the State to be of significant proportions, then homeowners building driveways, farmers, loggers, and everyone else who builds a road must be subjected to the same restrictions. To do otherwise constitutes an invidious discrimination against those

CR-192

PHWG-4 It is not suggested through thinly veiled innuedo in the GEIS that revision of the current regulations is necessary to avoid significant adverse environmental impact. It is stated very clearly many times.

The proposed regulations are not based on hypothetical situations and/or impacts, but in response to documented cases of environmental pollution.

PHWG-6

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attempting to develop the oil and gas resources of the State.

Another example of DEC-DMN's hypothetical environmental impacts are visual and auditory impacts. Such things must be regulated uniformly and not on an industry basis. If drilling rigs or other oil and gas equipment truly pose a significant danger to the environment because they make noise, consequently requiring sound barriers to be constructed around them, then so too must bridges and highways have sound barriers during the construction phase.

Moreover, if visual and auditory impacts pose a significant threat to the environment, then it naturally follows that olfactory pollution must be also eliminated.

With respect to farming operations, an olfactory impact regulation could take the following form: "All pigs and cows must henceforward wear appropriate perfume so as not to offend the olfactory senses of the People of the State of New York."

The list goes on and on, but since others more qualified to do so have devoted substantial time and attention to the itemized treatment of the supposed environmental impacts of each stage of

PHWG-5

Under SEQRA, access roads are considered part of the project. The oil and gas industry has not been singled out for over-regulation. See Topical Response Number 4 on Access Roads as Part of the Project.

drilling and production activities, the foregoing comments will suffice as an illustration of the laundry list of hypothetical impacts prepared by DEC-DMN.

> III. DEC-DMN SHOULD NOT ATTEMPT TO INTERFERE WITH LANDOWNER-OPERATOR NEGOTIATIONS OR RIGHTS IN THE LEASING OR DEVELOPMENT PHASES OF OIL AND GAS OPERATIONS.

There are numerous references in the Draft GEIS to landowner/operator negotiations, all of which attempt to characterize operators as devious and evil and landowners as their innocent victims.

DEC-DMN should not make efforts to disturb the well-esatblished doctrines of the dominance of the mineral estate over the surface estage and the reasonable rights of development implicit to ownership of the OGM or a lease.

These doctrines have been established by the courts throughout this nation over the period of the last hundred years and they are very well-founded DEC-DMN should no more propose conditions on operators designed to protect the surface owner subsequent to the lease or purchase negotiation than they should propose that landowner royalties be reduced to protect the profits of operators. If DEC-DMN persists in this effort, they must offer just compensation to the affected lessees or OGM owners.

Under SEQR guidelines visual and noise impacts must be assessed. The PHWG-6 conclusion made in the GEIS as a result of that assessment was that for most routine oil and gas operations, the noise and visual impacts are minor and temporary. See Topical Response Number 2 on Visual Resources and Assessment Requirement.

**CR-194** 

PHWG-7 Providing information to the public on the factors and provisions that a landowner should consider before signing a lease cannot be reasonably construed as interference with landowner/operator negotiations. See Topical Response Number 6 on Surface/Mineral Owner Lease Conflicts.

PHWG-7

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	2	IV. CONCLUSIONS	))
PHWG-8	3	1. Rather than assess the existing regu-	
	•	lations regarding significant impacts to the environ-	
	5	ment, DEC-DMN is attempting to characterize most all	
	8	impacts of oil and gas drilling and development as	1
ļ	7	significant unless their new regulations are ehacted;	
PHWG-9	8	2. In their commentary in the Draft GEIS,	
	9	they are attempting to characterize their power to	
	10	attach conditions to drill permits for unusual	
	11	circumstances not encompassed in their regulations as	
	12	an ad hoc rule-making power which would allow them to	
	13	promulgate discriminatory rules for different oper-	
l	14	ators on a prejudicial basis;	
PHWG-10	15	3. They are attempting in their comment-	
	16	ary to avoid distinctions between pre-SEQRA and post-	-
	17	SEQRA activities just as they have attempted to	
	18	• enforce, their existing regulations as though there	
	19	were no "existing pool" - "other than existing pool"	
	20	distinction;	
PHWG-11	21	4. They are proposing that they should	
•	22	somehow be involved in arms-length lease or purchase	
•	23	negotiations to protect the lessor or surface owner	~
·	24	even though such an idea is highly repugnant to the	
	25	fundamental precepts of democratic capitalist	CR-195

society; and

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PHWG-8

The GEIS clearly states throughout the text that most impacts from oil and gas drilling and development are minor, temporary and/or insignificant under the current regulatory program.

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PHWG-9 DEC routinely attaches conditions to permits for all its regulatory programs (Wetlands, Stream Disturbance, SPDES), whenever, they are necessary to declare any action non-significant. These conditions are not applied prejudicially. In fact, many of them are standard and that is why they are being proposed for formalization into regulations.

PHWG-10 Clearly, it is not possible to apply SEQRA to actions which have occurred in the past. SEQRA applies to future or planned actions which now require a DEC permit. There is no distinction in the law between old and new pools.

PHWG-11 Statement of opinion is noted.

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PHWG-12 3

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5. All of the foregoing is done with the purpose of expanding and perpetuating their hureaucracy In support of this premise citation is made to the ~ suspected growth in staff and finances of DEC-DMN since its inception although industry has actually contracted. Actual figures are not available, however, since they are so reluctant to let anyone know how many taxpayer dollars they really are consuming. MR. HUNGERFORD: My name is Thomas E.

Hungerford. I am President of the New York State Oil Producers Association. We would like to offer the comments here as written.

The Association contends, and has long believed, that a Generic Environmental Impact Statement, or site specific environmental impact statement are not necessary for the protection of the environment and certainly not for the environmental impacts recited in the Generic Environmental Impact Statement.

The environmental impacts resulting from routine oil and gas operations are minimal and surely anyone who observes the lush vegetation and excellent water supplies in Western New York sees evidence of an undamaged area. This is true even in intensely drilled old oil areas which have been producing over one hundred years.

PHWG-12 Statement of opinion is noted.

PHTH-1

**CR-196** 

Mr. Hungerford's verbal testimony corresponds very closely to the written comments submitted by the New York State Oil Producers Association. Please see responses OPA-1 to OPA-20,

<ul> <li>that these hearings have been sparsely attended up</li> <li>to this point. So, therefore, I am delighted and</li> <li>thank you people for showing up as concerned citizens</li> <li>to this important meeting.</li> <li>I have been in the oil field supply</li> <li>business for 54 years. I have worked in Pennsyvlania,</li> <li>Illinois, Indiana and Kentucky, but except for</li> <li>three and a half years helping win World War II,</li> <li>most of my time has been spent in New York State,</li> <li>specifically Allegany County. That is spelled</li> <li>A-1-1-e-g-a-n-y.</li> <li>(Laughter)</li> <li>I comment today as a private citizen who</li> <li>is concerned about probable destruction of an</li> <li>industry that has contributed so mightily to the</li> <li>well being of our community. Oil production taxes</li> <li>have built most of our schools and highways.</li> </ul>		· · ·
<ul> <li>to this point. So, therefore, I am delighted and</li> <li>thank you people for showing up as concerned citizens</li> <li>to this important meeting.</li> <li>I have been in the oil field: supply</li> <li>business for 54 years. I have worked in Pennsyvlania,</li> <li>Illinois, Indiana and Kentucky, but except for</li> <li>three and a half years helping win World War II,</li> <li>most of my time has been spent in New York State,</li> <li>specifically Allegany County. That is spelled</li> <li>A-1-1-e-g-a-n-y.</li> <li>(Laughter)</li> <li>I comment today as a private citizen who</li> <li>is concerned about probable destruction of an</li> <li>industry that has contributed so mightily to the</li> <li>well being of our community. Oil production taxes</li> </ul>	9	that these hearings have been sparsely attended up
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13I have been in the oil field supply14business for 54 years. I have worked in Pennsyvlania,15Illinois, Indiana and Kentucky, but except for16three and a half years helping win World War II,17most of my time has been spent in New York State,18specifically Allegany County. That is spelled19A-1-1-e-g-a-n-y.20(Laughter)21I comment today as a private citizen who22is concerned about probable destruction of an23industry that has contributed so mightily to the24well being of our community. Oil production taxes25have built most of our schools and highways.	12	to this important meeting.
<ul> <li><sup>14</sup> business for 54 years. I have worked in Pennsyvlania,</li> <li><sup>15</sup> Illinois, Indiana and Kentucky, but except for</li> <li><sup>16</sup> three and a half years helping win World War II,</li> <li><sup>17</sup> most of my time has been spent in New York State,</li> <li><sup>18</sup> specifically Allegany County. That is spelled</li> <li><sup>19</sup> A-1-1-e-g-a-n-y.</li> <li><sup>20</sup> (Laughter)</li> <li><sup>21</sup> I comment today as a private citizen who</li> <li><sup>22</sup> is concerned about probable destruction of an</li> <li><sup>23</sup> industry that has contributed so mightily to the</li> <li><sup>24</sup> well being of our community. Oil production taxes</li> <li><sup>25</sup> have built most of our schools and highways.</li> </ul>	13	I have been in the oil field supply
<ul> <li>15 Illinois, Indiana and Kentucky, but except for</li> <li>16 three and a half years helping win World War II,</li> <li>17 most of my time has been spent in New York State,</li> <li>18 specifically Allegany County. That is spelled</li> <li>19 A-1-1-e-g-a-n-y.</li> <li>20 (Laughter)</li> <li>21 I comment today as a private citizen who</li> <li>22 is concerned about probable destruction of an</li> <li>23 industry that has contributed so mightily to the</li> <li>24 well being of our community. Oil production taxes</li> <li>25 have built most of our schools and highways.</li> </ul>	14	business for 54 years. I have worked in Pennsyvlania,
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<ul> <li>19 A-1-1-e-g-a-n-y.</li> <li>20 (Laughter)</li> <li>21 I comment today as a private citizen who</li> <li>22 is concerned about probable destruction of an</li> <li>23 industry that has contributed so mightily to the</li> <li>24 well being of our community. Oil production taxes</li> <li>25 have built most of our schools and highways.</li> </ul>	18	specifically Allegany County. That is spelled
<ul> <li>20 (Laughter)</li> <li>21 I comment today as a private citizen who</li> <li>22 is concerned about probable destruction of an</li> <li>23 industry that has contributed so mightily to the</li> <li>24 well being of our community. Oil production taxes</li> <li>25 have built most of our schools and highways.</li> </ul>	19	A-l-l-e-g-a-n-y.
<ul> <li>I comment today as a private citizen who</li> <li>is concerned about probable destruction of an</li> <li>industry that has contributed so mightily to the</li> <li>well being of our community. Oil production taxes</li> <li>have built most of our schools and highways.</li> </ul>	20	(Laughter)
<ul> <li>is concerned about probable destruction of an</li> <li>industry that has contributed so mightily to the</li> <li>well being of our community. Oil production taxes</li> <li>have built most of our schools and highways.</li> </ul>	21	I comment today as a private citizen who
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<ul> <li>well being of our community. Oil production taxes</li> <li>have built most of our schools and highways.</li> </ul>	23	industry that has contributed so mightily to the
25 have built most of our schools and highways.	24	well being of our community. Oil production taxes
	25	have built most of our schools and highways.

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MR. SCHAFFNER: Your Honor, I am told <u>ц</u>

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Energy people have been hard-working, tax-paying citizens, contributors to our society, not the Dallas types at all, and I will be sorry to have them disappear.

And they will disappear if the Generic Environmental Impact Statement as presented in, this second draft is approved. I have lived in Allegany County except for out-of-state work and Air Force Service since 1923. Oil has been produced in this county since 1879 and it is still a verdant place.

I find it hard to accept the Division of Mineral Resources claiming that ours is a disaster area, that they have a tremendous backlog of work to correct alleged disaster areas. I live here and I would be the first to protest any activity that would damage my environment, but over the long years this has not happened.

In their SEQRA, the Environmental Impact Statements are to be prepared so as to be"clearly written in a concise manner capable of being read and understood by the public".

Well, here is the second draft. Clearly written? Concise? Capable of being read and understood by the public? I don't think so.

Incidentally, the first draft which was

PHMS-1

The GEIS does not refer to the old oilfields as a disaster area. The GEIS does detail some of the current and historic practices that have resulted in environmental damage, but the document also points out that little of this damage is in evidence today.

**CR-198** 

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produced almost two years ago wasabout half the size of the second draft and it took almost an act of Congress to secure a copy.

Many of my colleagues have labored long and hard to review and comment on this draft. If their suggestions are not followed, the emergy <sup>1</sup>industry in New York will die an unnatural death.

My sources tell me that over 1 million taxpayer dollars have been spent so far on the Generic Environmental Impact Statement Study; so, therefore, Greg, let's spend another \$100,000 and get it right this time.

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My main concern is intensely practical. I refer to the loss of jobs in our area, the results of which I believe is our harsh regulatory climate. Regulation is acceptable, but not a police state!

Last December I prepared for our Congressman an informal study of jobs lost in the 34th Congressional District, jobs related to the energy industry. This report indicates that in the 18 months preceding December 1987, 178 jobs we lost and an estimated payroll of almost \$4 million.

A random sample of oil and gas operators in the Southern Tier, the 34th Congressional District indicated a drop in jobs and in payroll dollars in

CR-199

PHMS-2

The original GEIS outline was expanded to include those topics requested by both the pubic and industry at the scoping hearings. We believe the public is capable of reading and understanding this document. The GEIS draft referred to was the second draft which was distributed to the Oil, Gas, and Solution Mining Board for their technical review before distribution to the public. Review by the Advisory Board is part of the Department's internal review process. Copies of this draft were made and distributed without the Department's knowledge and consent. the last 18 months.

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I suggest that if one considers shut ~ down drilling rigs, service companies that have eliminated jobs, and other allied industries, the above figures could be increased by 100%. The ripple effect resulting from these job losses is troubling.

Certainly the depressed economic situation has had its effect on the energy-producing area, but I suggest that a large portion of these losses can be attributed to the draconian measures of the Environmental Protection Agency and the Department of Environmental Conservation.

In conclusion, we accept that the DEC people are God's children, too, and we must love them, but in their approach to our alleged problems they are wrong, wrong, wrong, as wong as whiskey for breakfast.

Now, are there any press people here besides Joan? Any press people? No. How about representatives of Houghton or Hoffstra? Good to see you. I have got some stuff for you, Gloria. Thank you very much. PHMS-3 Adverse market conditions for the United States' oil and gas industry have resulted in lost jobs and severe economic hardship nationwide, even in those states that are not undergoing regulatory reform. The oil and gas industry has not been singled out for increased environmental regulation. Because of increased awareness of pollution and its damaging effects, all segments of society, including other industries, private citizens, and local governments are experiencing restrictions and increased costs for environmental protection.

MR. PFEIFLE: My name is James J. Pfeifle. I work for National Fuel Gas. I did work as a storage engineer.

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.. What I would like to address is the specific Section 14 and the comments addressed there. One comment that I have is as to the regulation of an abandonment of a storage field. I feel that that is not part of the Department of Environmental Conservation's regulations because an abandoned storage field becomes a production field at that time and, therefore, the actual abandonment of the facilities may be thirty or forty years down the future. They can deal with the abandonment at that time.

The final thing that I have to say is about the gas loss provisions that they have addressed in there. I feel that that is a very simplistic approach to a very complex problem and that it should be deleted. Thank you. PHJP-1

Mr. Pfeifle's oral testimony corresponds very closely to the written submission from National Fuel Gas. Please refer to responses NF-1 to NF-7.

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MR. PLANTS: My name is Paul Plants. I would justlike to make a couple of comments. Pirst of all, as for my qualifications. I was born and raised on a dairy farm from which the mineral rights or the royalty rights had been sold. So, I was well aware of an environment long before the Department of Environmental Conservation, the Environmental Protection Agency, the Sierra Club, Greenpeace, Friends of Animals or any of the other ones were in existence.

I am still a beef farmer. I own and operate an oil lease in Allegany County. To me the statement that a drilling rig setting on a hillside is aesthetically impractical to the public, I think the public that they are talking about are the people that are driving around on taxpayer dollars in taxppayers' cars and on public assistance.

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I think that my second point is that if the Department of Environmental Conservation would like to expand their responsibility, I would suggest that they accept the responsibility of the injection wells in New York State and thereby relieving the operator of double indemnity because he has to bond two wells, one with the State and one with the Environmental Protection Agency because the EPA will not accept bonds that are currently used and endorsed by the Department of Environmental Conservation. Since it is impossible to plug a well twice, I submit that we are being unduly regulated in this area.

My last point is that if the Department of Environmental Conservation would accept this responsibility, it would return to the State a large chunk of taxpayer dollars. Thank you.

## PHPP-1 Statement of opinion is noted.

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The money put up for bond is not money given to the federal or State government. This money is held by the bonding company until the well is plugged and abandoned; it is then returned to the operator. The New York oil and gas industry declined to support State implementation of the UIC program in 1981.

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comment at another hearing last week where somebody commented that the government agencies are like bosse and they will only tell you what was wrong, but not what was right. That comment brought the house down. I can say that it is fairly easy in the State budgeting process to come up with time and fairly easy to come up with some aspect on printing costs because contract costs are recorded. As far as anything else, I am not sure that it would be possible to come up with an accurate answer.

JUDGE DICKERSON: I had a very interesting

You might get some ballpark answers. Just to lay it out fairly, you might get some approximations, but just to nail it down as you would or I would in our checkbook as to the closest dollar fifty or whatever, I don't know if it could be done. I don't know if it could be done. There are too many accounts involved.

MR. GUNNER: I think that is fair, Judge, as long as they are willing to make some effort to address the question.

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JUDGE DICKERSON: You have to go through the Freedom of Information Act request. I would encourage that you discuss it gently with the Department's staff.

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Sec. 15

Now, if there are any additional comments on the GEIS, we are going to keep the record open until July the 8th for second thoughts, afterthoughts or whatever. The last thing is, there will be one more session this evening at 7:00 p.m. back here at the Library. That is about it. I did see one more hand up.

MR. SCHAFFNER: Your Honor, very gently did I hear Greg Sovas say he did not know what the ...... cost was?

MR. GUNNER: Yes, you did, Mr. Schaffner. JUDGE DICKERSON: I gave a straight answer Exactly how much, who knows? By the same token, approximation I don't know. It is not something like you and I running a checkbook because there are too many accounts involved.

Whether that can be determined, whether it can be determined to the nearest buck or fifty bucks, I don't know. I am just telling you that there would **CR-204** be a lot of work involved in digging it out.

#### PHGCQ-1 The speculated \$1,000,000 cost for GEIS preparation far exceeds the actual preparation cost calculated by the Department.

The GEIS was prepared in-house by DMN staff. The estimated total cost, which includes the printing and distribution of the final GEIS is approximately \$275,000. Staff in the Program Development Section responsible for preparation of the GEIS do not work on it full time. In addition to the responsibility of keeping DMN in compliance with SEQRA, SAPA, and the State Coastal Zone Management (CZM) Act, they have other duties which include: regulation of underground gas storage and solution mining activities. coordination of State and Federal UIC program, and protection of New York State's interest under the federal Outer Continental Shelf (OCS) oil and gas leasing program.

#### PUBLIC HEARING, JUNE 16, 1988, 7:00PML WELLSVILLE NY

MR. SCHAFFNER: Yes.

JUDGE DICKERSON: Just give us your name again for the record.

MR. SCHAPFNER: Mike Schaffner from Bolivar. You were kind enough to allow comments and questions this afternoon. Thank you. I have a comment.

As you pointed out, this meeting was widely advertised, but yet I see no one or I have heard no one coming in here and complaining about their bad water and about the destruction of their property by the oil and gas industry. I find it strange unless these people do not exist.

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I have a question. The question was raised this afternoon, Greg, about the annual budget for your Department, the cost of the Generic Environmental Impact Statement. You said that you didn't know what that was. Am I permitted to ask you what is your annual budget for the Department?

JUDGE DICKERSON: I am not sure that we even know right now given the present budget situation.

MR. SCHAFFNER: I will be very helpful and tell you what it is.

JUDGE DICKERSON: Given what is happening

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Recorded in the DMN files for the 1985-1986 year were 125 complaints. Complaint investigations determined that 62 percent were related to oil and gas activities, 18 percent were found unrelated, and for 16 percent the problem causing the complaint was apparently temporary and disappeared before field staff could investigate. in Albany, I wouldn't bet on it.

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MR. SCHAFFNER: Well, this Greg Sovas is a great salesman because he asked for \$3.3 million. He got \$3.7 million. It is interesting how I came about this. Even your Department wouldn't tell our Assemblyman what these figures were.

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I invoked the Freedom of Information Act and this came from your people up there. Just for the record, \$3.7 million is a lot of dough of our dollars. Thank you.

(Applause)

JUDGE DICKERSON: Mr. Schaffner, let's be fair just so we understand each other given what is happening. I have only been reading it in the newspapers.

MR. SCHAFFNER: I read that, too. I read the newspapers.

JUDGE DICKERSON: In any event, we don't know what is happening. I am accepting information that you have provided.

MR. SCHAFFNER: This comes from their Department.

JUDGE DICKERSON: But that was before the recent revelations of the budget. We are \$900 million in the hole.

PHMS-5

The additional funds were added to the budget request for accounting purposes only. The oil and gas account funds designated for the plugging of hazardous abandoned wells are added and subtracted every year in the accounting books.

PHWG-13	14	MR. GUNNER: Yes, Judge. I am just			ND CUMMER, Okan Tudas you sold that
	15	wondering what is the procedure from here for	•	10	had to be accented?
	16	approval of this Diffe Generic Environmental Impact		11	JUDGE DICKERSON: Yes.
	17 18	Statement? JUDGE DICKERSON: As prescribed in Part		12	MR. GUNNER: Who does it have to be accept
. ,	19	617 and 6NYCRR and in Article 8 of the Environmental		13	by? JUDGE DICKERSON: By the Department. Now
	20 21	Conservation Law, basically in a nutshell and in		15	it depends who's the lead agency. Normally the lea
	22	compiled and considered; and then the Draft Environ-	2 2 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	16	agency has to make those determinations. This docu
	23	ment Impact Statement considered in light of those		18	layman's language, have to be reworked into a final
J .	25	comments. A Final Environmental Impact Statement		19	document. Only when that is done is that legal
•	1	Final Environmental Impact Statement is available.	j *	20 21	notice then published. MR. GUNNER: There is no more comment
	2	As I recall, although it doesn't directly		22	period then?
	4	apply in this case, it is very similar, but there is at least a ten-day waiting period before anything		23	JUDGE DICKERSON: Speaking very frankly,
	5	can be done about it after that notice is issued.	· ,	24	some agencies do allow an additional comment period The law does not, however, require it. I haven't
•	6	There will be a Notice of Availability and Comple-	•		
	. 8	tion of a final Environmental Impact Statement as prescribed in the law and rules.			
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found anything that recognizes an additional comment

period.

There is, as I said, a ten-day waiting period between the stice of availability of a Final Environmental Impact Statement and any action that can be taken. Whether that was built in to allow for comments or not, the law and the regulations are silent.

Some agencies will allow receipt of additional comments in that period of time. Some agencies don't. I can't call that shot ahead of time.

However, the law has the ten-day waiting period expressed but it is silent on the question of additional comments. I know that certain local agencies have said that they will accept additional comments on the Final Environmental Impact Statement during that period of time, but the law is silent on that.

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MR. GUNNER: Also, Judge, is a transcript of all of the Public Hearings going to be available before the deadline for written comments?

JUDGE DICKERSON: I hope so. However, I can't guarantee it. We will probably have it in that time period.

MR. GUNNER: How will this be obtained by

PHWG-13 Judge Dickerson has accurately responded to Mr. Gunner's question.

the members of the general public?

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JUDGE DICKERSON: Either directly through the court reporter as a purchase or as a mequest through the Department. It is a public record, Mr. Gunner.

MR. GUNNER: So, therefore, we don't have to pay the court reporter but we can request a copy from Mr. Sovas? I would like to request one now on the record, Judge.

JUDGE DICKERSON: I would suggest the following. Pirst of all, you can make your own deal with the court reporter for the extra copy. If you catch him tonight, it will probably be cheaper

Secondly, you can then request access to the transcript because it is a public document. However, you may not want to make a copy of the whole thing but just consult it and make copies of certain pages. I wouldn't buy the whole thing.

MR. GUNNER: My question is, Judge, whether or not we can actually get a copy at the Department's expense before we have to make our written comments?

JUDGE DICKERSON: Mr. Gunner, there is no way that you can get a copy of the transcript at the Department's expense. As I said, you can have access to the transcript at the Department.

HR. GUNNER: That doesn't seem to be fair, Judge. JUDGE DICKERSON: I am going to lay it out very directly. It is available to you and accessible to you.

We have another unfortunate situation where we used to provide copies of a limited number of pages free. If you want them now, you have to pay the copying price because that is the way that the government is doing business now. It is 25 cents a page.

I was trying to level with you and say look at it very carefully. I am sure that you don't want to copy my opening remarks at every hearing. You may want the last five or ten pages of comments. It is available to you. Don't buy the whole thing unless you want it.

MR. GUNNER: Thank you, Judge.

MR. PFEIFLE: Judge, I just have a question. JUDGE DICKERSON: Identify yourself for the record, please.

MR PFEIFLE: James J. Pfeifle, National Fuel Gas. Is there going to be a written response to all of the points raised, the comments raised? JUDGE DICKERSON: That should be included PHWG-14 Judge Dickerson has accurately responded to Mr. Gunner's question.

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by regulation in the Environmental Impact Statement. The practice is to require that the Final Environmental-Impact Statement by regulation incorporate the comments and the considerations given to you. Sometimes the Final Environmental Impact Statement grows a little bit. That is part of the process.

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Now, whether you are going to get an individual written letter back, I wouldn't guarantee it. The requirement is that the comments be addressed in the Final Environmental Impact Statement.

Now, that goes for any Environmental Impact Statement across the board whether the lead agency is the Town, County, City or the State.

I will get a little philosophical for about thirty seconds. The SEQR Quality Review process sort of forces attention to the comments. They have to be incorporated in the Final Environmental Impact Statement when it comes out.

MR. PFEIFLE: Thank you.

PHJP-2

#### Judge Dickerson has accurately responded to Mr. Pfeifle's questions.

#### D. RECOMMENDED CHANGES TO THE REGULATIONS PROPOSED IN THE DRAFT GEIS

The Department would like to thank all parties who actively participated in the draft GEIS review process by submitting comments and/or attending the public hearings. Public involvement, as required by law, provided insight and in some cases enlightened the Department staff on critical issues. The inclusion of the Department's responses to over 850 written and oral comments received from the public on the draft GEIS is critical to the successful completion of the final document.

The public's written and oral comments varied in content and opinion according to the impact of the issue on the individual commentator. The proposed operational recommendations were at the center of attention and triggered most of the controversy within the draft GEIS. In general, environmental groups and government agencies agreed on issues concerning increased regulation while industry commentators offered opposing viewpoints and possible alternatives.

#### 1. Controversial Operational Recommendations

Six operational recommendations presented in the draft GEIS generated the most controversy and received numerous comments. Because of the diversity and sometimes opposing nature of the comments, the following table was prepared to facilitate the review of these controversial operational recommendations. The table lists the pertinent issues and crossreferences the appropriate comments and responses contained in the Comment-Response Table.

#### **Operational Recommendation**

1) Information required on well plats submitted with drilling application.

#### Refer To:

page CR-17 (I-138), p. CR-19 (I-165), p. CR-53 (I-554), p. CR-75 (ENG-6 & 7), p. CR-94 (URH-2), p. CR-98 (URH-7), p. CR-130 (CCD-14)

2) Well setback requirements.

- 3. Pit construction, lining and maintanence.
- 4. Tank overflow/leakage prevention and control.
- 5. Site reclamation deadlines.

page CR-17 (I-136), p. CR-18 (I-156), p. CR-19 (I-165), p. CR-20 (I-166), p. CR-53 (I-552 & 553), p. CR-74 (ENG-5), p. CR-76 (ENG-9 & 10), p. CR-77 (ENG-13), p. CR-93 (URH-1), p. CR-96 (URH-5), p. CR-130 (CCD-13 & 16), p. CR-131 (CCD-20), p. CR-140 (DFWE-1), p. CR-144 (DFWF-3 & 4)

page CR-20 (I-168), p. CR-30 (I-291 to 296), p. CR-54 (I-572 to 574), p. CR-78 (ENG-14), p. CR-82 (ENG-35 & 36), p. CR-99 (URH-8), p. CR-111 to 113 (URH-23 to 25), p. CR-133 (CCD-31)

page CR-22 (I-192), p. CR-30 (I-298 to 300), p. CR-32 (I-319), p. CR-53 (I-560), p. CR-79 (ENG-20), p. CR-101 (URH-11), p. CR-105 (URH-16), p. CR-132 (CCD-27), p. CR-141 (DFWE-11), p. CR-145 (DFWF-6)

page CR-18 (I-145), CR-53 (I-555), p. CR-54 (I-579), p. CR-75 (ENG-8), p. CR-95 (URH-3), p. CR-130 (CCD-15), p. CR-141 (DFWE-11), CR-145 (DFWF-7)

6. Notification/approval requirements for changes in wellbore configuration.

page CR-33 (I-328), p. CR-116 (URH-28), p. CR-171 (PHLW-9)

The Department's responses to the public comments on the above issues reflect the position the Department will maintain while formally drafting revisions to the regulations.

2. Reevaluation of Regulations Proposed in the Draft GEIS

In some cases, the public input has presented reasonable alternatives to the Department's original recommendations which also meet the Department's resource management and environmental protection goals. This caused the Department to reexamine several of the draft GEIS proposals. Not all of the proposals reconsidered are among the controversial issues listed

above. Sometimes a single comment prompted the Department to consider a new approach. Listed below are the original recommendations with a brief discussion of the Department's reevaluation of each one.

 Original recommendation: Requirement that the plat accompanying the drilling application show the location of all private water wells of public record within 1,000 feet of the wellsite.

Department reevaluation: The Department's stringent drilling, aquifer, completion and plugging requirements make it extremely unlikely an oil or gas well drilled in compliance with the Department's regulations would impact a shallow water well over 1/10th mile away. A review of Department complaint records revealed that the most commonly validated impact from oil and gas drilling activity on private water supplies was a short term turbidity problem. This temporary problem usually occurred when oil and gas drilling activity was conducted close to the minimal existing 100' setback distance required between a private dwelling and the wellbore location. Since most water wells are located close to the dwelling served, this old requirement indirectly provides protection to some, but not all, private water wells. To address this issue directly, the Department's new proposed regulations contain a 150' setback between private water supplies and oil and gas wells.

It has been decided to recommend that the operator be required to only show the location of all private water wells within a distance of 660' from the wellbore. This distance was chosen because it is within the statewide legal spacing unit. This distance reflects both the review of the landowner water supply complaint records and the complaints by oil and gas operators about the difficulty

of finding information on private water wells outside the lease acreage. A permit is not needed to drill a private water well and water wells are not routinely recorded in public records. There are also numerous seasonal hunting and vacation cabins in the rural areas of western New York where most oil and gas drilling occurs.

The Department maintains that it is in an operator's best interest to determine the location and predrilling water quality of all private water supplies within 1000'. Should a landowner make a claim of damage, an oil and gas operator would have a difficult time proving his innocence. The Department has determined, however, that it is inappropriate to require undesired excessive efforts from operators for their own protection.

2) Original recommendation: Comprehensive pit liner requirements which included detailed specifications of minimum thickness, tear strength, tensile strength, low temperature cold crack, seam strength and pit construction techniques including pit orientation.

Department reevaluation: Pits for fluids used in the drilling, completion, and recompletion of wells should be constructed, maintained and lined to prevent pollution of surface and subsurface waters and to prevent pit fluids from contacting surface soils or ground water zones. Department field inspectors are of the opinion that adequate maintenance after pit liner installation is more critical to halting pollution than the initial pit liner specifications. Damaged liners must be repaired or replaced promptly. Instead of very detailed requirements in the regulations, the regulatory and enforcement emphasis will be on a general

performance standard for initial review of liner-type and on proper liner maintenance.

The type and specifications of the liner proposed by the well drilling applicant will require approval by the DEC Regional Minerals Manager. The acceptability of each proposed pit construction and location should be determined during the pre-site inspection. Any pit site or pit orientation found unacceptable to the Department must be changed as directed by the regional site inspector.

- 3) Original recommendation: A complete site reclamation timetable of 45 days. Department reevaluation: Industry commentators pointed out that because of the possible unforeseen delays caused by weather and other uncontrollable circumstances and events, a 60-90 day timetable would be more reasonable. However, because of the potential for leakage, pit fluid must be removed for proper disposal within a shorter required time period. Removal of pit fluids should still be required within 45 days of the cessation of drilling operations.
- Original recommendation: Notification/approval requirements for changes in wellbore configuration.

Department reevaluation: It is critical that the Department have accurate records of the existing condition of all wells under its regulatory authority. The Department agrees with industry's recommendation to limit the requirement for a permit to three actions: 1) redrilling or deepening any well, 2) plugging back and setting any type of a permanent plug and 3) converting a well. Other, more routine, actions which change the permanent wellbore configuration will not require a permit, but will require notification and approval of the appropriate DEC regional office. Those operations requiring prior notification will include,

but will not be limited to, the following:

- Perforating casing in a previously unperforated interval for the purpose of production, injection, testing, observation, or cementing.
- Milling out or removal of casing or liner.
- Running and cementing of casing or tubing.
- Drilling out any type of permanent plug.
- Running and setting and/or cementing an inner string of casing, liner, or tubing except after routine pulling operations.
- Setting any type of plug.
- Repairing damaged casing.

5)

<u>Original recommendation</u>: Plugging requirement specifying that an attempt must be made to recover uncemented casing and that in the event uncemented casing cannot be recovered from the hole, the casing must be perforated or ripped with cement squeezed or placed into the annular space.

Department reevaluation: A reasonable attempt must be made to recover uncemented casing from the wellbore in critical areas with multiple freshwater aquifers of differing water quality, but the recovery of old uncemented casing is very difficult and frequently unsuccessful. Unless specific conditions are known that would warrant continued efforts, only one conscientious attempt would be required. A minimal reasonable attempt to recover uncemented casing is the pulling of 120 percent of the casing's weight from the casing freepoint. In the event that uncemented casing cannot be retrieved, cement should be placed behind the uncemented pipe as specified by the DEC Regional Minerals Manager.

#### Exemption Areas Designated in the Old Oilfields

In DEC and USEPA designated exemption areas where it has been determined that the recovery of casing would not result in any incremental environmental benefit, the requirement to pull, rip, perforate and/or cement uncemented surface casing may be waived.

Exemptions from the DEC requirement to pull uncemented surface casing are available only in the heavily developed old fields where groundwater quality will not be compromised by the practice of leaving uncemented surface casing in place. Additionally, wells located in the less developed relatively newer oil fields having a single aquifer, not several freshwater zones of different quality, may also receive exemptions. In every case, the exemption request must be included with the plugging application and be subject to approval by the DEC.

#### 3. <u>Promulgation of New Regulations</u>

Inclusion of recommendations for revised regulations in the draft GEIS enabled the Department to meet the requirements of SEQR, stimulate public input and evaluate feasible alternative means of achieving its mandated objectives. The revised recommendations listed above will be incorporated into the Division's formal regulatory proposal. In compliance with the State Administrative Procedure Act (SAPA), there will be a public comment period and public hearings on all the proposed regulations. The Department appreciates the extensive comments it received on the draft GEIS and hopes for continuing public involvement in the regulatory promulgation process.

#### IV. ERRATA TO THE DRAFT GEIS

#### A. VOLUME I OF DRAFT GEIS

p. i Heading III - change "REIVEW" to "REVIEW"

p. ii Heading V.B. - change "Oil, Gas and Salt" to "Oil and Gas"

- p. x Line 5 change "11-3a" to "11-4a"
- p. xi Heading f change "11-21" to "11-22"
- p. xii Line 1 change "11-24" to "11-25"
- p. xiii Heading D change "Immissible" to "Immiscible"
- p. xvii Headings for Tables 15.3 and 15.4 move down to D.1
- p. 2 Line 1 change "Codes" to "Code"
- p. 3 2nd full ¶, line 4 change "sensivite" to "sensitive" and remove comma after "areas"
- p. 2-2 3rd full ¶, line 3 change "Administration's Prcoedures" to "Administrative Procedures"
- p. 3-3 Line 1 insert "supplemental" between "specific" and "environmental"
- p. 3-3 Line 8, no. 5 delete "major" and add to end of line "and major expansions of existing projects."
- p. 3-3 Line 11, no. 8 no. 8 should be changed to no. 9 and a new entry added that reads
   "8. Brine disposal well drilling or conversion permit (the permitting guidelines require a technical review equivalent to a supplemental EIS addressing the safety, environmental and technical issues)."
- p. 3-3 New no. 9 insert "regulated by the Oil, Gas and Solution Mining Law" between "project" and "not"
- p. 3-3 1st full ¶, line 3 insert "(1)" before "the disturbance"; line 4 delete "(1)"
- p. 3-5 Last line change "requiresed" to "required"
- p. 3-8 3rd full ¶ replace the 1st two sentences with "Because of the required setbacks of 660 feet from boundary lines and 1,320 feet from other wells, the statewide spacing of natural gas wells is generally a maximum of one well to 40 acres. However, the actual disturbance is usually less than two acres, as previously mentioned."

p. 3-8a

- Gathering
   <125 psi</li>
- >125 psi <1,000 ft.
- \*Minor Transmission
   >125 psi >1,000 ft.
   <5 mi. <6" dia.</li>
- \*Minor Transmission
   >125 psi >5 mi.
   <10 mi.</li>
- \*Transmission >125 psi >10 mi.
- Leasehold
- p. 3-10 Last line add "... on the road. Major changes in land use patterns, traffic and the need for ..."
- p. 3-9c The first line under Floodplains in the first column of table should read "loss of floodway adsorption capacity."
- p. 3-9c The key at the bottom of the table should read:

"KEY: 0 = None 0 = Minor 0 = Serious or Major"

- p. 3-9d The key should be corrected as above.
- p. 4-2 1st line change "900" to "600"
- p. 4-2 2nd line change "Dodd, Mead" to "Herrick."
- p. 4-5 3rd full ¶, line 3 change "Allegheny" to "Allegany"
- p. 4-5a Figure 4.3 switch #2 and #3 on the map and add a #6 in the upper right corner of Wyoming County. Add to the list "#6 Texas Brine Company, Wyoming."
- p. 4-9 Line 1 change "DEC to "Conservation Department"
- p. 4-10 Last full ¶, line 5 change "up to 40,000" to "over 50,000" line 6 - change "State" to "Department of Environmental Conservation."

- p. 4-10 1st full ¶, line 6 change "Aproximately" to "Approximately"
- p. 4-12 Last ¶, line 2 add "extensively" before "updated"
- p. 5-2 1st full ¶, last line change "Section 5.E" to "Section 5.D"
- p. 5-3 Line 4 change "living organisms" to "organic matter"
- p. 5-3 Heading B change "OIL, GAS AND SALT" to "OIL AND GAS"
- p. 5-4 1st full ¶, line 5 delete "permeable"
- p. 5-5 2nd full ¶, line 5 change "perfect spheres" to "perfect spheres of equal size"
- p. 5-11 Line 8 change "(Mcf/d)" to "(cf/d)"
- p. 5-15 Line 1 delete line
- p. 5-21 Line 7 "the Helderberg" should be changed to "equivalents of the Helderberg"
- p. 5-27 1st full ¶, line 7 delete phrase "Although no...since 1974" and start last sentence with "Future"
- p. 5-28 1st full ¶, line 3 change "Genesee" to "Geneseo"
- p. 5-35 "1st full ¶, line 7 change "Cayuga Lake" to "the north end of Canandaigua Lake"
- p. 6-14 Line 8 change "relagates" to "relegates"
- p. 6-14 2nd full ¶ add sentence at end "Included also are rare animals, plants and natural communities as listed in the New York Natural Heritage database, as well as Significant Coastal Fish and Wildlife Habitats as described on p. 8-56."
- p. 7-2 Line 2 change "projects's" to "projects"
- p. 7-2 Last ¶, line 3 change "probably" to "probable"
- p. 7-7 Last partial ¶, line 1 change "15" to "20"
- p. 7-8 Line 5 change "15" to "20"
- p. 7-8 Line 7 change "result" to "results"
- p. 7-8 1st full ¶, line 8 change "permitted" to "permitted"
- p. 8-1 Last line change "solution mining wells" to "solution mining or underground gas storage wells"

- p. 8-2 2nd full ¶, 1st line precede this sentence with the phrase "Because of required setbacks from property lines and other wells," and change "must be" to "are"
- p. 8-2 2nd full ¶, line 8 change "the 40 acre rule" to "current regulations"
- p. 8-2 2nd full ¶, last line- add "except along the Pennsylvania-New York State line where a 330' setback is in effect."
- p. 8-2 3rd full ¶ change "The 40 acre spacing rule" to "The general 40 acre spacing requirement"; add to the end of the paragraph, "The 40 acre figure is a 'rule of thumb' based on the area defined by the required setbacks."
- p. 8-5 3rd full ¶, line 6 change "accidential" to "accidental"
- p. 8-9 No. 3, line 2 change "58" to "69"
- p. 8-11 Last ¶, line 4 delete the apostrophe after "its"
- p. 8-13 1st full ¶, line 10 change "communication" to "communication" line 11 - change "8-49" to "8-54"
- p. 8-17 1st full ¶, line 6 change "distrubance" to "disturbance"
- p. 8-18 Line 4 delete "is"
- p. 8-21 2nd full ¶, line 4 change "additon" to "addition"
- p. 8-22 1st full ¶, lines 16-18 One sentence starting with "It is" should be in **bold type**.
- p. 8-28 1st full ¶, line 7 change "reclamation" to "reclamation"
- p. 8-31 Line 3 change "nmay" to "may"
- p. 8-31 2nd full ¶, line 4 insert "must" between "base" and "be"
- p. 8-35 Line 5 change "justificiation" to "justification"
- p. 8-39 Heading 3 change "Engangered" to "Endangered"
- p. 8-46a Change heading on Table 8.1 to "Summary of Freshwater Wetland Classes and Permit Standards"
- p. 8-50 Last line change "extentions" to "extensions"
- p. 8-54 3rd full ¶, line 2 change "tenatively" to "tentatively"
- p. 8-55 Line 10 change "encouragment" to "encouragement"

p. 8-56 2nd full ¶, line 9 - change "incrases" to "increases" Line 1 - change "New regulations require" to "Article 12 of the Navigation Law p. 9-8 requires" p. 9-18 1st full ¶, line 3 - insert "a" before "few" p. 9-18 1st full ¶, line 7 - change "ususally" to "usually" Last  $\P$  - delete sentence in bold type because this information has been required p. 9-21 since 1984 p. 9-30 Last ¶, line 4 - change "fradaulent" to "fraudulent" p. 9-32 1st full ¶, line 11 - change "Availability" to "Availability" p. 9-35 2nd full ¶, line 10 - change "earthern" to "earthen" p. 9-38 1st full ¶, line 7 - change "cadium" to "cadmium" p. 9-38 2nd full ¶, line 5 - insert "of" between "concentrations" and "heavy" p. 9-42 Line 5 - change "softner" to "softener" p. 9-45 2nd full ¶, line 5 - change "supression" to "suppression" p. 10-2 1st full ¶, line 3 - change "guages" to "gauges" p. 10-4 Line 6 - change "guages" to "gauges" Line 2 - change "up to five barrels a day" to "or decrease" p. 10-7 p. 10-9 2nd full ¶, line 2 - change "permability" to "permeability" p. 10-10 3rd full ¶, line 6 - change "suprisingly" to "surprisingly" p. 10-11 1st full ¶, line 6 - remove period after "timeframe" Last full ¶, line 2 - change "556.8" to "554.8" p. 10-12 p. 11-5 Last ¶, line 5 - change "abandon" to "abandonment" Heading C - change "Significant" to "Significant" and delete "Brackish" p. 11-20 p. 11-21 Line 3 - change "pluging" to "plugging"

- p. 11-21 2nd full ¶, line 3 change "significant" to "significant"
- p. 11-23 Last full ¶ change "severence" to "severance"

#### **B. VOLUME II OF DRAFT GEIS**

- p. 12-5 1st full ¶, line 8 the production potential quoted is higher than New York's and more representative of the most prolific oil producing regions
- p. 12-6 Last ¶, line 4 change "sulphate-based" to "sulphate-reducing"
- p. 12-7 Line 5 change "phosphanates" to "phosphonates"
- p. 12-9 1st full ¶, line 9 change "To date" to "In 1980" and change "has been" to "was"
- p. 12-9 Last ¶, line 3 add the reference "(Interstate Oil Compact Commission, 1955)"
- p. 12-11 1st full ¶, line 4 change "activitated" to "activated"
- p. 12-13 3rd full ¶, line 7 change line to read, "development, 75' below the deepest freshwater or 75' into bedrock, whichever is"
- p. 12-16 1st full ¶, line 5 change "additivies" to "additives"
- p. 12-23 Last ¶, line 2 move "(xanthan biopolymers)" to line 1 after "polysaccharides"
- p. 12-28 1st full ¶, line 5 change "van Poolen" to "Van Poollen"
- p. 12-28 No. 3 add the reference "(Van Tyne and Foster, 1980)" after each paragraph in this section
- p. 12-30 Lines 6 & 7 change "van" to "Van" and "associates" to "Associates"
- p. 12-31 No. 4, 1st 2 ¶ add the reference "(Van Tyne and Foster, 1980)" after each paragraph
- p. 12-36 3rd full **1**, line 3 change "\$1,000" to "\$500 to \$5,000"
- p. 12-41 No. 7, line 1 add "in the confining zone" after "fractures"
- p. 12-41 No. 7, line 4 change "lease" to "least"
- p. 12-44 1st full ¶, line 1 change "accidential" to "accidental"
- p. 13-3 Line 4 change "10" to "18" and "another 40" to "many more"

- p. 13-13 Line 6 delete "of" before "within"
- p. 13-22 Line 1 change "agressively" to "aggressively"
- p. 14-6 2nd full ¶, line 3 change "submitted" to "submitted"
- p. 14-7 Lines 2 & 3 change "reservior" to "reservoir"
- p. 14-8 Line 1 delete first full sentence starting with word "Since"
- p. 14-8 Line 4 change "reservior" to "reservoir"
- p. 14-9 Line 4 change "reservior" to "reservoir"
- p. 14-10 3rd full ¶, line 4 change "compatability" to "compatibility"
- p. 14-21 Last line change "compatability" to "compatibility"
- p. 14-23 Line 3 change "facility" to "facility"
- p. 14-23 Heading I change "FACILILTY" to "FACILITY"
- p. 14-25 2nd full ¶ delete ¶
- p. 14-26 2nd full ¶, line 9 change "availabe" to "available"
- p. 14-28 Line 5 change "reservior" to "reservoir"
- p. 14-28 Last ¶, line 6 change "reservior" to "reservoir"
- p. 14-29 1st full ¶ delete last two sentences starting with word "This"
- p. 14-31 2nd full ¶, line 3 change "campatability" to "compatibility"
- p. 15-6 2nd full ¶, line 7 change "Coopertive" to "Cooperative"
- p. 15-6 Last ¶, line 3 change "will" to "may"
- p. 15-17 1st full, line 10 change "inordinantly" to "inordinately"
- p. 16-8 Line 5 add "and clearing and filling for well pads and access roads" to the end of the sentence
- p. 16-24 Heading E change "UNDERGOUND" to "UNDERGROUND"
- p. 17-5 Letter g, line 4 change "one" to "two and a half"
- p. 17-9 Letter h, line 11 change "measureable" to "measurable".

p. 17-15	Letter 1, line 3 - change "convas" to "canvas"
p. 17-22	Lines 18 and 19 - change "Every effort" to "Reasonable efforts"
p. 17-25	Letter c, line 1 - change "enchanced" to "enhanced"
p. 17-26	1st line - change "earthern" to "earthen"
p. 17-26	Line 3 - change "environmental" to "environmental"
p. 17-31	Letter h, line 3 - change "Thie" to "This"
p. 18-5	Last line - change "compatable" to "compatible"
p. 18-10	Last line - change "intagible" to "intangible"
p. 18-12	Last ¶, line 2 - change "interruptable" to "interruptible"
p. 18-17	1st full ¶, line 2 - change "Appalachain" to "Appalachian"
p. 18-21	Last line - change "compatable" to "compatible"
p. 19-2	Heading B, line 3 - change "asthetics" to "aesthetics"
p. 20-1	Heading C, line 1 - change "irretreivable" to "irretrievable"
p. 21-4	2nd full ¶, line 4 - change "huundred" to "hundred"
p. 21-5	Heading C, line 2 - insert "extensively" before "updated"
Glossary	
p. 1	Annular Space - add the phrase "between the tubing and casing or wellbore" to the definition
p. 2.	Cable Tool - change "1 to 2 inch" to "5% to 1 inch"
p. 3	Cement Bond Log - change "local" to "locate"
p. 5	Add "Exploratory Well: A well drilled outside a proven productive area or horizon."
p. 7	Add "Infill Drilling: Drilling between known producing wells to better exploit the reservoir."
p. 7	Log - delete "a" before "certain"

- p. 9 Pool add "and/or gas" at the end of definition 1
- p. 12 Strippers add to definition "or 60 thousand cubic feet of gas per day."

#### References

- p. 4 Add "Interstate Oil Compact Commission, 1955(?) Secondary Recovery Operations in New York State to 1955."
  p. 11 Line 1 change "1984" to "1983"
  p. 11 Add "Van Tyne, Arthur M., 'New York' in H.G. Richards et al, 'Oil and Gas Developments in Northeastern States in 1966,' in <u>AAPG Bulletin</u>, Vol. 51, No. 6, 1967."
- p. 12 No. 16, line 3 change "2/22/83, 2/24/83" to "2/22/84, 2/24/84"

#### C. VOLUME III of DRAFT GEIS

#### Appendix #4

- p. 1 Last ¶, line 2 delete "warranty"
- p. 3 Line 9 change "has an implied covenant to develop" to "contains provisions to maintain it in force"
- p. 7 No. 1, line 1 change "consequences of condemnation" to "termination"
- p. 8 No. 4, line 1 change "Converants" to Covenants"
- p. 11 Line 3 change "should" to "may wish to" and after "legal counsel" insert "with expertise in oil and gas lease matters"





**Division of Mineral Resources** 

# DRAFT

# Generic Environmental Impact Statement On the Oil, Gas and Solution Mining Regulatory Program

JANUARY 1988

# VOLUME I

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New York State/Department of Environmental Conservation MARIO M. CUOMO, Governor THOMAS C. JORLING, Commissioner

# DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT On the Oil, Gas and Solution Mining Regulatory Program

January 1988

Gregory H. Sovas, Director Division of Mineral Resources 50 Wolf Road, Room 202 Albany, New York 12233-6500

#### ACKNOWLEDGEMENTS

#### Prepared By

Toni M. Callaway, Chief, Program Development Section Laura Snell, Mineral Resource Specialist III Bradley J. Field, Mineral Resource Specialist III Elizabeth M. Lowe, Mined Land Reclamation Specialist I Karin Verschoor, Mineral Resource Specialist II

#### Graphics

#### Clifford D. Richmond, Mineral Resource Specialist I Eric Vickerson, Summer Intern

Special thanks are given to the members of the NYS Oil, Gas and Solution Mining Advisory Board for their review of several early drafts as part of the Department's internal review process. At numerous meetings of the Board, discussions of the many issues took place, and suggestions for changes were made that improved the quality of the document.

Thanks are also given to the Division of Mineral Resources' Bureau of Oil and Gas Regulation, Region 8 and 9 staffs for thoughtful review, and to the Bureau of Resource Management and Development clerical staff, Valerie Danise and Teresa Savona for their diligent work effort.

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#### I. INTRODUCTION

The Department of Environmental Conservation (DEC) was created in 1970 to consolidate in a single agency New York's programs for protecting and enhancing the environment.

The Department has a vast range of responsibilities including control of air, water and land pollution, encouraging waste reduction and recycling, and managing fish, wildlife, forests, land, and mineral resources. In addition, the department administers the State Environmental Quality Review Act (SEQR), which requires that environmental impacts be considered when reviewing projects which require permits from the Department.

As part of the stewardship and management of the State's natural resources, DEC regulates the drilling, operation, and plugging and abandonment of oil, natural gas, underground gas storage, solution salt mining, brine disposal, geothermal and stratigraphic wells. The purpose of the regulatory program is to ensure that the activities related to these wells are conducted in an environmentally sound manner consistent with the legislative mandates found in Article 23 of the Environmental Conservation Law. Aside from strictly environmental concerns, DEC is responsible for preventing waste of the State's oil and gas resources and protecting correlative rights; that is, the right of any mineral owner to recover the oil and gas resources beneath his land.

New York State began regulating oil and gas activities with the passage of the first comprehensive legislation in 1963, which eventually was codified as Article 23 of the Environmental Conservation Law. Based on this law, rules and regulations were adopted under Parts 550 to 559 of Title 6 of the New York

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Codes of Rules and Regulations. Thus, both legislation and rules and regulations are in place to regulate the oil, gas and solution mining industries in the state.

Since the passage of the State Environmental Qualtiy Review Act in 1977, the Department has endeavored to establish a rational basis and consistent criteria for environmental review of DEC actions in matters of discretionary approval such as the granting of permits. The primary method of review for a broad regulatory program is the preparation of a Generic Environmental Impact Statement (GEIS) which is designed to be general and conceptual in nature. The goals of a GEIS are to assess the environmental impacts of an entire regulatory program and to suggest changes that may be necessary to strengthen the program.

The Department pursued the development of this GEIS for the State's onshore oil and gas regulatory program to show compliance of the existing regulatory program with the State Environmental Quality Review Act.

In addition, with the passage of new oil and gas legislation in 1981, the Legislature mandated that the State's authority for regulation of these industries should supercede all local regulation with the exception of taxation and local roads. Because of the supercedure issue and a need for public information, the Department has expanded this GEIS to be an information document to help the public and local governments understand the oil and gas industries in New York and how the DEC regulates these industries.

Further, because of the major overhaul of legislation in 1981, both new and amended rules and regulations are necessary. Thus, the GEIS has been expanded to include proposed regulations as well as suggested changes to existing regulations so that a full public discussion of all the issues can be accomplished in one document. It should be recognized, however, that

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regulatory changes can only be promulgated through a separate process dictated by the State Administrative Procedures Act.

Many of the primary issues and areas of concern covered in this GEIS were identified by the process known as "scoping". Through this process, the affected communities, agencies, public interest groups, members of the petroleum industry, and the general public were notified by DEC about the preparation of the GEIS and their comments were solicited through mailings and public hearings. A comprehensive outline of the GEIS was distributed to facilitate their review.

The comments submitted through the scoping process have been analyzed and the following major issues were identified:

- Impacts on water quality;
- Impacts of drilling in sensivite areas, such as Agricultural Districts, areas of rugged topography, wetlands, drinking water watersheds, freshwater aquifers and other sensitive habitats;
- Impacts caused by drilling and production wastes;
- Impacts on land use;
- Socioeconomic impacts;
- Impacts on cultural resources;
- Impacts on endangered species and species of concern.

This GEIS refers only to the present and proposed onshore oil and gas regulatory program. The statement does not review oil and gas leasing of State lands either onshore or offshore, nor further drilling that may occur in the waters of this State.

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#### **II. DESCRIPTION OF PROPOSED ACTION**

The purpose of this draft Generic Environmental Impact Statement (GEIS) is to review in a comprehensive manner the Department of Environmental Conservation's program for regulating the oil, gas, underground gas storage, and solution mining industries. This study is prepared according to the State's Environmental Quality Review Act (SEQRA), Article 8 of the Environmental Conservation Law, requiring government agencies to analyze the environmental, social and economic impacts of their actions. Under SEQRA, public review and participation in the development of the final GEIS is required and encouraged.

This draft GEIS is intended as a guideline for environmentally acceptable oil and gas drilling and development, solution salt mining, underground storage of gas, geothermal development, and drilling of stratigraphic and brine disposal wells in all of New York State. Significant beneficial and adverse environmental impacts of the above activities in New York State are addressed. Much of the information contained in this document such as the history, geology and historical industry practices is given as background for a better understanding of the subject, and most of this information never before has been compiled for distribution to the public and to local governments. Also covered are mitigation measures available to minimize negative environmental impacts, and adverse effects that cannot be avoided if the aforementioned activities continue. A review is made of viable alternatives to the State's regulatory program to minimize environmental effects of these regulated activities in New York State. Thresholds will be established under which the above listed activities can continue with minimal adverse environmental impacts. Basic permitting guidelines for the recently authorized regulation of geothermal, brine disposal and stratigraphic wells will also be proposed.

A generic environmental impact statement (GEIS) is used to evaluate the environmental effects of a program having wide application and is required for direct programmatic actions undertaken by a state agency. Since a GEIS evaluates the environmental impacts of a program of wide application, it can serve in part as an EIS for a specific site for those matters which are not unique to that site. Hence, in addition to reviewing the overall regulatory program, this draft GEIS also sets specific conditions and criteria for those actions which will require an additional detailed site specific environmental impact statement or assessment.

The purposes of this draft GEIS have been expanded to include the following:

- a definitive analysis and assessment of DEC's onshore regulatory program and applicability to the State Environmental Quality Review Act;
- 2. an information document for the public and for local governments to better understand the oil, gas, underground gas storage, and solution mining industries and how they are regulated by the State; and
- 3. a framework for major changes to the state's rules and regulations that need to be updated and modernized.

While the document includes suggested changes to existing rules and regulations and new regulations where needed, all regulation changes must be promulgated according to the State Administration's Procedures Act which requires a separate review and approval.

A great deal of effort has been expended to produce a working document that will serve as the basis for public discussion on the way in which the state regulates these industries and on how the process can be improved.

To be as effective a document as possible, public comment and discussion are encouraged and welcomed.

#### III. MAJOR CONCLUSIONS ON THE APPLICATION OF THE STATE

## ENVIRONMENTAL QUALITY REVIEW ACT TO THE OIL, GAS AND SOLUTION MINING LAW A. INTRODUCTION

When the State Environmental Quality Review Act (SEQR) became a law on August 1, 1975, New York became the twenty-second state with an environmental review law. SEQR is a process that introduces the consideration of environmental factors into the early planning stages of actions that are directly undertaken, funded or approved by local, regional and state agencies. By incorporating a systematic interdisciplinary approach to environmental review in the early planning stages, projects can be modified as needed, to avoid adverse impacts on the environment.

The fundamental purpose of SEQR as expressed by the Legislature is:

"...to declare a state policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and enhance human and community resources; and to enrich the understanding of the ecological systems, natural, human and community resources important to the people of the state."

The primary tool of the SEQR process is the Environmental Impact Statement (EIS). If it is determined that a proposed action may have a significant effect on the environment, then the Draft EIS is prepared to explore ways to minimize adverse environmental effects or to identify a potentially less damaging alternative.

SEQR is both a procedural and a substantive law. In addition to meeting procedural requirements, the law mandates that agencies act on the substantive information produced in the environmental review. This may result in project modification or project denial if the adverse environmental effects are overriding and adequate mitigation or alternatives are not available.

One of the primary purposes of this Generic Environmental Impact Statement (GEIS) is to clearly establish the basis for environmental review and approval of the DEC actions subject to the Oil, Gas and Solution Mining Law.

A Generic Environmental Impact Statement differs from the site or projectspecific Environmental Impact Statement by being more general or conceptual in nature and may be used to assess the environmental effects of:

(1) a number of separate actions in a given geographic area which, if considered singly may have minor effects, but if considered together may have significant effects;

(2) a sequence of actions, contemplated by a single agency or individual;

(3) separate actions having generic or common impacts; or

(4) an entire program or plan having wide application or restricting the range of future alternative policies or projects.

The GEIS and its findings should set forth specific conditions or criteria under which future actions will be undertaken. Site-specific impacts which have not been addressed adequately or analyzed in the statement may be subjected to additional review through the drafting of a supplemental EIS.

**B. SEQR REQUIREMENTS** 

As a result of review and recommendations in the GEIS, the permitting of standard, individual oil, gas, solution mining and gas storage wells, pursuant to the Oil, Gas and Solution Mining Law and its current regulations, in combination with casing and cementing permit guidelines or aquifer, wetland, and drinking water watershed permit conditions when applicable, is considered to be a non-significant action under the State Environmental Quality Review Act. This GEIS satisfies SEQR requirements for all these standard operations when they conform to the thresholds described in Table 3.1. However, permits for the following types of projects will continue to require detailed site-

specific environmental assessments:

- Oil and gas drilling permits in Agricultural Districts if more than two and one-half acres will be altered including the access road.
- 2. Oil and gas drilling permits in State Parklands.
- 3. Oil and gas drilling permits when other DEC permits are required.
- Oil and gas drilling permits less than 2,000 feet from a municipal water supply well.
- 5. New major waterflood or tertiary recovery projects.
- 6. New underground gas storage projects or major modifications.
- 7. New solution mining projects or major modifications.
- Any other project not conforming to the standards, criteria or thresholds required by the GEIS.

Most thresholds currently listed for Type I projects in 6 NYCRR Part 617 are not likely to be triggered by the drilling of oil and gas wells. The major thresholds that may be triggered by an application to drill are the disturbance of, or the (1) physical alteration of 10 acres or more, (2) the location of a well in an Agricultural District exceeding 25 percent of the threshold (2.5 acre), and (3) the location of a well for which the project size exceeds 25% of any threshold (2.5 acres) within or contiguous to any publicly-owned park land.

The threshold for an Agricultural District calls to question the need for further mitigating measures that may be needed beyond the current permit conditions. Erosion, sedimentation control, topsoil stockpiling, and reclamation of the site to agricultural use are currently considered in an application on agricultural lands within Agricultural Districts. The use of existing access roads, wherever possible, further limits disturbances in Agricultural Districts. Regulations for protection of groundwater resources

and setbacks are adequate irrespective of the location of a well in or outside of an Agricultural District. Therefore, the primary concerns deal with surface mitigation measures such as erosion control and the existing and longterm management of the land resources for agriculture.

In addition, where possible, the Department works with the operator and the landowner to locate the well site along existing roads and in close proximity to the access road. Such changes in drilling location are possible in most regions of the State. The objective is to restrict or minimize the disturbance of viable agricultural land for a well location. In many instances, lease conditions would allow the landowner to approve or reject a site; and though many leases were written without current landowner approval, most of these issues must be addressed in the Environmental Assessment Form submitted by the operator to DEC.

Furthermore, the location of a well in an Agricultural District or other agricultural region does not mean that the well will be located on viable farmland. Some of the acreage in Agricultural Districts is unproductive, fallow, brushland or pasture unsuitable for growing crops at the present time.

State parklands, and in particular the Allegany State Park, encompass large private holdings where oil and gas drilling has occurred for almost a century. The ownership of lands in Allegany State Park is complicated by the fact that there are totally separate public and private holdings of both the surface and mineral rights as well as the more complicated situation where these rights are split among two or more parties. Thus, some holdings of State parkland may include only the surface where another person owns the mineral rights.

The Department is currently developing a Memorandum of Understanding with

the State Office of Parks, Recreation and Historic Preservation (OPRHP) with respect to approvals of drilling permits within park boundaries. The Department has proposed that OPRHP be lead agency for SEQR for any applications for drilling permits within the park. The objective is to have the agency most knowledgeable about the parklands be the lead agency and limit the amount of disturbance in State parklands, recognizing the need for public access and safety.

Close cooperation and consultation are needed between OPRHP and DEC to carry out the respective mandates to protect the State parklands. The DEC and OPRHP have agreed to fully cooperate in the review of any and all applications within park boundaries.

#### C. PROPOSED SEQR DETERMINATIONS

Table 3.1 represents the general criteria against which each of the agency actions will be reviewed. The Table summarizes the various actions that DEC undertakes with regard to the Oil and Gas Regulatory Program and the environmental impact determination under the State Environmental Quality Review Act based on current regulation, special permit conditions and the discussions contained within the document.

#### D. FUTURE SEQR COMPLIANCE

Many of the current policies and permit conditions discussed in the GEIS are being proposed for incorporation into the rules and regulations. In general, permit conditions are added in the SEQR review process on a sitespecific basis to ensure that the drilling of a well, for example, will not be significant. As conditions become standardized, they must be promulgated as rules and regulations.

The filing of a GEIS including a SEQR findings statement can result in the Environmental Assessment Form (EAF) being eliminated. However, information being requiresed on the EAF must be incorporated into the drilling

## TABLE 3.1 PROPOSED SEQR DETERMINATION

Age	ncy Action	Environmental Impact	Explanation
a.	Standard oil, gas, and geothermal well drilling. permits (no other permits involved).	not significant	Rules and regulations and conditions are adequate to protect the environment. The GEIS satisfies SEQR for these actions.
b.	Oil and gas drilling permits in State Parklands.	may be significant	Site-specific conditions of State Parklands are not discussed in the GEIS. Further determination of significant environmental impacts is needed for State Parklands.
c.	Oil and gas drilling permits in Agricultural Districts.	may be significant	Rules and regulations and conditions are adequate to protect the environment. For most oil and gas operations in Agricultural Districts which utilize less than 2 ½ acres the GEIS satisfies SEQR. If more than 2 ½ acres are disturbed, this is a Type I action under 6NYCRR Part 617 and an additional determination of significance is required.
d.	011 and gas drilling permits in the Bass Island	not significant	Special conditions and regulations under Part 559 are adequate to protect the environment.
e.	Oil and gas drilling permit in Aquifers.	not significant	Rules and regulations and special aquifer conditions employed by DEC have been developed specifically to protect the groundwater resources of the State.
ſ.	Oil and gas drilling permits in proximity (less than 1,000 feet) from municipal water supply wells.	always significant	A supplemental EIS is required dealing with the groundwater hydrology, potential impacts and mitigation measures.
g.	Oil and gas drilling permits in proximity (between 1,000 and 2,000 feet) from municipal water supply wells.	may be significant	A supplemental EIS may be required dealing with the groundwater hydrology, potential impacts and mitigation measures. An additional site-specific assessment and SEQR determination is required.

# TABLE 3.1 (CON'T)

Age	ncy Action	Environmental Impact	Explanation
h.	Oil and gas drilling permits when other DEC permits required.	may be significant	An additional site-specific SEQR assessment and determi- nation needed based on the environmental conditions requiring additional DEC permits.
i.	Oil, gas, solution mining and gas storage well plugging permits.	not significant	Rules and regulations and special conditions discussed in the GEIS are adequate to ensure protection of the environment and groundwater resources for permanently plugged and abandoned wells.
j.	New waterflood or tertiary recovery projects.	may be significant	For major new waterfloods and new tertiary recovery projects, an additional site specific environmental assessment and SEQR determination are required. A Supplemental EIS may be required for new waterfloods to ensure integrity of the flood. Also, a supplemental EIS may be required for new tertiary recovery projects depending on the scope of operations and methods used.
k.	New Underground Gas Storage Projects or major modifications.	may be significant	An additional site-specific environmental assessment and SEQR determination is required. May require a supplemental EIS depending on the scope of the project.
1.	New Solution Mining Project or major modification.	may be significant	An additional site-specific environmental assessment and SEQR determination is required. May require a supplemental EIS depending on the scope of the project.
ω.	Spacing hearing.	not significant	Action to hold hearing is non-significant. A review and SEQR determination with respect to all other issues must be made before the hearing. Any permit issued subsequently will be reviewed on issues raised at hearing.
n.	Variance hearing.	not significant	Action to hold hearing is non-significant. A review and SEQR determination with respect to all other issues must be made before the hearing. Any permit subsequently issued will be reviewed on issues raised at hearing.

# TABLE 3.1 (CON'T)

Age	ency Action	Environmental Impact	Explanation
٥.	Compulsory Unitization Hearing	not significant	Action to hold the hearing is non-significant. A review and SEQR determination with respect to all other issues must be made before the hearing. Any permits subsequently issued will be reviewed on issues raised at hearing.
p.	Natural Gas Policy Act Pricing Recommendations.	none	Action results in only recommendations to Federal Energy Regulatory Commission; therefore action is not subject to SEQR.
q۰	Brine disposal well drill- ing or conversion permit.	may be significant	The brine disposal well permitting guidelines re- quire an extensive surface and subsurface evaluation which is in effect a supplemental EIS addressing technical issues. An additional site specific environmental assessment and SEQR determination is required.
r.	Stratigraphic well drill- ing and abandonment permit.	not significant	Permitting review and requirements are adequate to protect the environment.

application. Until the application for drilling oil, gas and solution mining wells is revised, the EAF will continue to be required along with a drilling application.

Upon final approval and filing of this generic environmental impact statement, the following will result:

- 1. No further SEQR compliance is required so long as site-specific projects subject to the Oil, Gas and Solution Mining Regulatory Program are carried out in conformance with the general conditions and thresholds for such site-specific actions in the findings statement;
- 2. An EAF must be submitted by the applicant and a negative declaration must be prepared by the Department if a proposed action is not addressed in the GEIS and the action will not result in any significant adverse environmental effects;
- 3. A supplemental environmental impact statement may have to be prepared if the proposed action is not addressed in the GEIS and if the subsequent action involves one or more significant adverse environmental impacts (items 1 through 8 on p. 3-3 would have to be reviewed in this manner), and
- 4. A supplemental findings statement must be prepared if the proposed subsequent action is adequately addressed in the GEIS but is not addressed in the findings statement for the GEIS.

#### E. PARAMETERS FOR FUTURE SEQR REVIEWS

For the purpose of future SEQR reviews that may be necessary for the oil, gas and solution mining permit applications, the following parameters are given for the description of a project, size of the project and lead agency status.

1. <u>Project</u> - Each application to drill a well is considered as an individual project. An applicant, applying for five wells, is treated the same as five applicants each applying to the Department individually because the wells may not be drilled at the same time or in the same area, or may not be drilled at all depending on the results of the first wells drilled.

The exceptions to this are proposed new or major expansions of solution mining operations, enhanced recovery or underground gas storage operations which require more than one well to be drilled. The environmental disturbance of even these multi-well projects can be mitigated by using common access roads and other measures. These multi-well projects would require further environmental assessment and/or supplemental environmental impact statement, should one be determined necessary.

The project application review for oil wells will include oil gathering lines and the adjacent tank batteries because no other agency has safety or environmental jurisdiction. The project application review for gas wells will not include gas pipelines or gathering lines because of the following:

(1) PSC has safety jurisdiction over all pipelines, even gathering lines;

(2) PSC has <u>siting</u> jurisdiction over all lines greater than 125 pounds per square inch operating pressure and greater than 1,000 feet in length;

(3) pipelines may never be built because of a dry well or lack of market;

(4) principals in well drilling and well and pipeline operation can be different;

(5) pipelines may not be built for years after a well has been drilled and completed;

(6) gathering lines often extend beyond lease lines, and local approvals may be necessary which would delay the drilling of the well for a line that may never be built;

(7) pipelines cannot be sized until the area has been fully developed;

(8) alternative production methods may be utilized for low yield wells;

(9) the Department has no jurisdiction over the siting of the pipelines unless an environmentally sensitive area such as a stream or wetland is disturbed which would require a DEC permit and the environmental impact of a pipeline could be mitigated by permit conditions in this situation. (see figure 3.1)

The above situations with respect to the uncertainties of a pipeline clearly are compelling reasons for separating the review of an application to drill from the review of possible pipelines.

2. <u>Size of Project</u> - The size of the project is defined as the acreage affected by development including the acreage disturbed for the drilling of the well, the access roads, the drill site, and any other physical alteration necessary. Ordinarily, physical disturbance for the drilling of an oil and gas well will affect a maximum of two acres, and many routine oil and gas wells encompass one acre or less.

Even though the spacing of natural gas wells is a maximum of one well to 40 acres, the actual disturbance is less than two acres, as previously mentioned. Additionally, it should be noted that the physical disturbance is temporary in nature. After the well is drilled and completed, the remaining area of disturbance for the producing well may be as small as 20 feet by 20 feet or 1/100 acre plus the access road if one is necessary for well maintenance.

3. <u>Lead Agency</u> - In 1981, the Legislature gave exclusive authority to the Department to regulate the oil, gas and solution mining industries:

"The provisions...shall supersede all local laws or ordinances relating to the regulation of the oil, gas and solution mining industries; but shall not supersede local government jurisdiction over local roads or the



FIGURE 3.1 - INTRASTATE PIPELINE JURISDICTION

FIGURE 3.1

rights of local governments under the real property tax law." (Section 23-0303(2))

Thus for the purposes of being the lead agency under SEQR, only the Department has approval or permit jurisdiction with regard to the granting of an oil and gas drilling permit with the exception of State Parklands. Therefore, DEC will be lead agency in most instances.

There could be exceptions to the lead agency determination based upon a local approval necessary for a floodplain or wetland permit, for example. However, the other criteria for lead agency specify that the lead agency should be the one that has the broadest governmental powers for investigation into the impacts and the greatest capability for the most thorough environmental assessment of the action. Therefore, these criteria would support the Department as lead Agency.

Thus, to the extent practicable, the Department shall actively seek lead agency designation, consistent with the general intent of Chapter 846 of the Laws of 1981 to establish the DEC as the primary regulator of the oil, gas and solution mining industries in New York State.

#### F. SUMMARY OF IMPACTS

A complete summary of impacts and mitigation measures to minimize the environmental impacts of the oil, gas, solution mining and underground storage activities which substantiate the SEQR recommendations in this Chapter is provided in Chapters 16 and 17. A brief summary of the environmental impacts from these activities with the regulatory program in place is summarized in Table 3.2. A summary of the potential cumulative, secondary and long term impacts of the regulatory program are provided below.

1. <u>Cumulative Impacts</u> - Cumulative impacts may be defined as two or more individual effects on the environment which, when taken together, are significant or which compound or increase other environmental effects.

## TABLE 3.2

## RESOURCE IMPACT SUMMARY

	S	lte	Drilli	ng and		Prod	luction		Pluggi	ng and
Environmental / Major Types ot Resources /Potential Impacts	Cons	truction	Compi	.etion	Ga	.9		)11	Abano	onment
	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
Surface Waters siltation and turbidity brine spill oil spill	<b>e</b> 0 0	0 0 0	• • 0	0 0 0	0 • 0	0 0 0	0 0 0	0 0 0	<b>0</b> 0	0 0 0
EXPLANATION	Some but l tion term curre	siltation ong term measures. impacts b ent regula	and tur siltatio An acc but this itory and	bidity po on is unl: idental is unlik d remedia	ossible, ikely wit spill of ely to oc tion requ	if site h the re oil or h cur or h irement:	is adjac equired e prine cou nave long s.	ent to s rosion d ild have term in	surface w control r serious npacts wi	aters, eclama- short .th the
Groundwater	1									
turbidity	•	0	0	0	0	0	0	0	•	0
brine spill	0	0	•	0	•	0	•	0	0	0
methane release	0	0	•	0	0	0	0	0	0	0
oil spill	0	0	•	0	0	0	•	0	0	0
EXPLANATION	Some shall would resul casin	turbidity ow ground reach th ting from ag and cem	from he water su le ground l inadequ menting r	avy equi pplies. water. ate casi cequireme	pment or It is un Oil, gas ng and ce nts.	drilling likely s or bring menting	g aurface surface a s polluti program	hole po pills of lon of g is unli	ossible i f brine o roundwate kely unde	n very r oil r r the new
KEY: 0 - None 0 - Minor 0 - serious or	major	********							•	

TABLE 3.2 (CON'T)

/	S	ite	Drilli	ing and	T	Prod	luction	·	Pluggi	ng and
Environmental / Major Types of Resources /Potential Impacts	Cons	truction	Compl	.etion	Ga	.9	0	<b>il</b>	Abando	onment
/	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
//				-		-	-	•	·	
Agriculture										
interference with agricultural operations	•	0	•	0	0	0	0	0	•	0
topsoil erosion, burial or contamination	•	0	•	0	0	0	0	0	0	0
brine or oil spill (soil, crops, livestock, water)	0	0	•	0	0	0	0	0	0	0
EXPLANATION	Minor drill Also unlik	interfer ing. Maj topsoil l cley becau	ence wit or long oss or g ise of re	h agricu term int collution emediatio	lture may erference could oc n require	occur d : unlike] :cur but :ments.	luring si ly with r serious	te const egulator long ter	ruction ; y restrig m impact	and ctions. s are
Historical Sites										
destruction of site	0		0							
visually defract from site noise disturbance	o	0	0	0	0	o	0	ŏ	•	0
EXPLANATION	Some durir immed	noise dis 1g site cc liately ad	turbance Instructi	and vis lon, dril to a hist	ual detra ling and oric site	iction we abandoni 3.	ould occu nent if a	r at a h well we	istoric : re permi	site tted
KEY: 0 = None = Minor • = serious or	major									

# TABLE 3.2 (CON'T)

nvironmental / Major Types of	S Cons	ite truction	Drilli Compl	ng and etion	Ga	Prod	luction	11	Pluggi	ng and onment
Resources /Potential Impacts	·									
	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Tern
· · · · · · · · · · · · · · · · · · ·									-	
destruction of site	0	•	0	o	0	0	0	0	0	0
EXPLANATION	Destr was n	uction of ot detect	a minor ed by th	archeolo e require	gical si d survey	te is un	likely b	ut possi	lble if t	he si
Significant Habitats			<b>-</b>			 				
disturbance	•	0	0	0	0	0	0	0		0
loss of individual species	•	0	0	0	0	0	0	0	Ó	l ō
damage or loss of habitat	9	0	0	0	0	0	0	0	0	0
EXPLANATION	Distu from	rbance, 1 site cons	oss of 1 truction drilled	ndividual and heav	species y equipm	and dament is p	age to a cossible	signifi if the s	lcant hab site is n	itat ot kn
	and a	WELL 19	4131204							
Floodplate	and a					 				
Floodplains	and a									
Floodplains loss of floodway adsorption cap soil erosion	and a	0	0	0	0	0	0	0	0	0
Floodplains loss of floodway adsorption cap soil erosion brine or other chemical spills	and a 9 9 0		0	0 0 0	0	0	0	0	0	0
Floodplains loss of floodway adsorption cap soil erosion brine or other chemical spills oil spill damage	and a 9 0 0		0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0
TABLE 3.2 (CON'T)

/ Environmental / Major Types of Resources /Potential Impacts	Site Construction		Drilling and Completion		Prod Gas		luction 011		Plugging and Abandonment	
//////////////////////////////////////	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
Freshwater Wetlands										
physical damage to vegetation and habitat	•	0	0	0	0	0	0	0	0	0
natural water flow interruption	0	0	0	0	0	0	0	0	0	0
brine spill	0	0	•	0	0	0	0	0	0	0
oil spill	0	0	•	0	0	0	0	0	0	0
increased access/overuse	Ŷ	0	•	0	•	0	0	0	0	0
	resto a reg	re or com ulated we	pensate, tland wi	there we	ould rare	ly be si gulatory	gnifican program	t enviro	onmental	damage
EXPLANATION State Lands interference with designated	and s resto a reg	re or com ulated we	pensate, tland wi	there we th the cu	ould rare urrent re	ly be si gulatory	o program	•		damage
EXPLANATION State Lands interference with designated uses or damage to State lands Coastal Zone	and s resto a reg	re or com ulated we 0	pensate, tland wi	there we th the co	ould rare urrent re 0	ly be si gulatory	o o o o o o o o o o o o o o	0		damage
EXPLANATION State Lands interference with designated uses or damage to State lands Coastal Zone interference with more important land uses	and s resto a reg Q	re or com ulated we 0	pensate, tland wi	there we that the co	ould rare urrent re	0	gnifican program 0	0	0 avor	damage
EXPLANATION State Lands interference with designated uses or damage to State lands Coastal Zone interference with more important land uses damage to coastal resources	and s resto a reg 0 0	o 0 0 0 0	pensate, tland wi	0 0 0	ould rare urrent re 0 0	0 0 0	0 0 0	0 0 0	0 avor	damage

/	Site		Drilling and		Production				Plugging and	
Environmental / Major Types of Resources /Potential Impacts	Construction		Completion		Gas		011		Abandonment	
1	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long
/	Term	Term	Term	Term	Term	Term	Term	Term	Term	Term
/							1			
Streams										
streambed and bank integrity	•	0	0	0	0	0	0	0	( •	0
siltation of aquatic habitat	•	0	0	0	0	0	0	0	•	0
brine spill in aquatic habitat	0	0	<b>e</b>	0	<b>•</b>	0	•	0	0	0
oil spill in aquatic habitat	0	0	0	0	0	0	•	0	0	0
		1	1			ļ	J			1
	curren	t remedia	tion and 	regulat	ory progr	am. 		<b></b>		
General Habitat Loss		1								
top soil loss	0	0	0	0	0	1 0	0	0	0	0
erosion and sedimentation	1 0	0	0	0	Ō	0	0	0	0	0
vegetation loss		0	Ō	o	Ō	0	0	0	0	0
							1		1	
	Some	erosion,	habitat	and vege	table los	s is in	evitable	but maj	or long	erm
EXPLANATIO	N Impac	ts are un	likely w	1th the	current r	eguiator	ry progra			
KEY: O = None 🛛 🏾 Minor 🐧 🖛 sertous o	r major									

## TABLE 3.2 (CON'T)

As discussed under the definition of a project, each application for an oil and gas drilling permit is normally treated as a separate project.

Most of the wells drilled are mutually exclusive from each other from an environmental point of view. This situation occurs because of spacing requirements to protect the correlative rights of landowners, spacing between wells to prevent waste of resources, and setback requirements designed to protect environmental resources and to ensure public safety. The exception to spacing occurs only in the old oil fields that have been discovered prior to 1981, because these fields have been developed to such an extent that spacing is impractical or unreasonable.

It is common practice to drill one exploratory well to ensure the economically recoverable resources before proceeding with the drilling of additional wells. Thus, an operator may apply for and receive permits for ten wells but may never drill the additional wells unless the first well is successful. However, in practice the operators usually do not apply for permits on multiple wells unless they are assured that the area is productive because of the high permit fees.

Operators cannot afford to pay for permits for wells that will not be drilled. Therefore, cumulative review is impractical and unnecessary when considering most oil and gas drilling because of the independent nature of each of the wells, i.e., no compounding of environmental significance, and the fact that the economics generally dictate a more cautioned approach of obtaining permits sequentially because of the high costs involved.

2. <u>Secondary Impacts</u> - Secondary impacts resulting from the Oil, Gas and Solution Mining Regulatory Program are few and usually minor, such as increased human activity and access to remote areas provided by the well access roads. Such a minor impact could be mitigated by placing a locked gate

public services as a result of increased employment opportunities are relevant SEQR considerations but no major changes will occur in these areas as a result of the oil and gas regulatory program.

3. Long Term Impacts - Long term impacts of <u>the Oil, Gas and</u> <u>Solution Mining Regulatory Program</u> would generally be positive when contrasted to the alternative of no regulation. The long term impacts include protection of the groundwater supplies, the availability of energy resources, the possibility of fuel-switching from coal or oil to cleaner burning natural gas, and the generation of State and local taxes, revenues to Landowners, and the multiplier effects of private investment in the State.

## IV. HISTORY OF OIL, GAS AND SOLUTION SALT PRODUCTION IN NEW YORK STATE

### A. INTRODUCTION

Oil, gas and salt have been recovered for a variety of uses in New York State dating back to the seventeenth century. Initial methods used to obtain these resources were very primitive. With the continuing need for these resources, more advanced methods have been developed to produce them and regulations have been adopted to be sure this production is conducted in an environmentally safe manner.

### B. OIL AND GAS HISTORY

### 1. Natural Seeps

Initially oil and gas were obtained from natural springs and seeps. There are natural hydrocarbon seeps in Allegany, Ontario, Cattaraugus and Yates counties (Herrick, 1949). Crude oil from some seeps was used for medicinal purposes and fuel by the Indians and early European settlers (Herrick, 1949). The Seneca Oil Spring in Allegany County is the earliest known oil seep in New York, and was reported in a letter written by a French missionary in 1627 (Herrick, 1949). As early as 1767 Indians traded oil from this spring at Fort Niagara (Herrick, 1949). Oil and gas wells have been drilled in New York State for over a century. In 1821, a shallow well was drilled at another famous seep, the Natural Gas Spring in the bed of the Canadaway Creek in Fredonia, and produced enough gas to light many of the village's main buildings for several years (Herrick, 1949).

### 2. Early Wells

In 1850's, Colonel Edward Drake from Pennsylvania, and James Miller Williams of Canada proved that a more dependable flow of oil could be obtained by drilling a well into the earth's surface (Herrick, 1949, and <u>Oil and</u> <u>Gas Journal</u> 10/22/84). The first recorded oil well in New York State

was drilled to a total depth of 900 feet in July 1860, in Allegany County, eleven miles north of the Seneca Oil Spring (Dodd, Mead, 1949). The first commercial oil well was drilled by the Hall Farm Petroleum Company near Limestone in Cattaraugus County in 1865 (Herrick, 1949).

### 3. 011 and Gas Production Trends

Oil production in New York State peaked in 1882 when 6,685,000 barrels of crude oil were produced, although occasional surges in production occurred as new pools were discovered and drilled (See Figure 4.1) (Kreidler, 1953). A series of Oriskany sandstone wells were completed beginning in 1930 which led to record natural gas production approaching 40 billion cubic feet of gas in 1938 (see Figure 4.2) (Kreidler, 1953).

The upward trend in oil and gas prices of the 1970's and early 80's made the State an increasingly attractive area for natural gas development. Only 110 wells were drilled in 1970 compared to the 488 new wells drilled in 1985. Even with the recent depressed market, industry still considered it worthwhile to drill over 300 new wells in 1986.

Production of natural gas in New York State rose to a recent peak of 34.2 billion cubic feet in 1986. This figure approaches the record production level of 1938 and is enough to supply New York consumers in the residential, commercial and industrial sectors with natural gas for about 23 days (NYS Energy Office, 1986). Natural gas produced in New York currently supplies about 5.6 percent of the State's needs and this level could equal 10 percent of the State's consumption within a decade, if economics improve.

New drilling and production is dependent on a number of forces, including the strength of the economy, prevailing interest rates and other factors, particularly natural gas and oil prices. Though current low prices discourage development, when the surplus created by artificially high prices of a few years ago is depleted, there are enough oil and gas reserves in New York State to





FIGURE 4.1 4-2a





FIGURE 4.2 4-2b keep this industry active for some time into the future. Currently, Chautauqua County is the State's leading natural gas county while Cattaraugus County leads in oil production.

### 4. Underground Gas Storage Fields

Underground gas storage fields were developed as a less costly alternative to expanding the pipeline system to meet the peak demand for gas during the winter months. Gas and liquefied petroleum gas (LPG) can be stored in depleted gas or oil reservoirs, aquifers, abandoned salt cavities, and mined underground caverns. Gas is injected into the storage reservoir during summer months when demand is low and supplies are readily available. The first underground gas storage project in New York was established in 1916 at the Zoar Field in Erie County (VanTyne, 1980). As of 1986, there were 21 underground gas storage reservoirs in New York State with a total storage capacity of 177.5 billion cubic feet. As of the end of 1986, 55.4 billion cubic feet of working gas and 85.5 billion cubic feet of cushion gas (required to maintain well pressure so that the working gas can be recovered) were in storage in these reservoirs (NYSDEC, DMN, 1987). Underground storage fields have been created in the Medina, Oriskany, Onondaga and Tully formations.

There are currently three LPG storage facilities in New York State with a total storage capacity of 108.1 million gallons. Only a portion of the total storage capacity, 25.6 million gallons, was in use at year end in 1986 (NYSDEC, DMN, 1987).

### C. SOLUTION SALT MINING HISTORY

### 1. Early Methods of Salt Extraction

Solution salt mining in New York State pre-dates oil and gas activity. In the early 1600's, salt was recovered by evaporating seawater from the Atlantic Ocean (Werner, 1917). Very little salt can be extracted by this

laborious process, and it was soon replaced when other sources were found onshore.

Salt springs were discovered along the shore of Onondaga Lake in the 1640's (Werner, 1917). These springs of strong natural brine were initially transformed into salt by boiling the springwater in large kettles and later by using solar evaporators (Werner, 1917).

As salt production increased, treaties were signed with the Indians to use the land. In 1788, the Onondaga Indians ceded all of their land to the State except for a tract retained for their residence (Werner, 1917). With this action, systematic salt production began and the State came to own all the salt-producing lands.

### 2. Establishment of Permanent Salt Production Industry in New York State

The Onondaga Salt Springs marked the beginning of a permanent salt production industry and was the main commercial salt operation in the country until 1878 (Werner, 1917). The salt works in Onondaga County were responsible for the settlement and growth of Syracuse and the surrounding area. Cayuga, Genesee, Livingston, Schuyler and Thompkins Counties also had some early salt operations. In addition, the salt industry fostered construction of the Erie Canal to improve transportation to markets in the rest of the country.

The Syracuse salt operation thrived for over a hundred years, but discoveries of rock salt in other counties and states, and improved production processes led to major changes in the Syracuse salt industry. With the discovery of rock salt in Wyoming County in 1878, wells were drilled into these salt deposits (Werner, 1917). Freshwater injected down the wells dissolved the salt and was pumped back to the surface as a concentrated brine. Produced this way, the brines were more concentrated than the naturally occurring salt springs, and marked the beginning of New York's solution mining

industry.

In 1828, over one million bushels of salt were produced and inspected in Geddes and Salina (Werner, 1917). After that time the salt works were continually improved and enlarged, as more and deeper wells were sunk, improved piping was installed, and numerous boiling blocks and solar evaporating vats were constructed. The number of salt production plants reached a peak in 1893 (Werner, 1917).

The National Salt Company of New Jersey was incorporated in 1899 and attempted to control the salt industry east of the Rocky Mountains; many plants in New York were subsequently purchased by this company (Werner, 1917). Today there are five solution salt mining operations in New York (see Figure 4.3). New York has continued to be a major producer of salt and has consistently been in the top three of salt producing states since the 1800's (Werner, 1917, Department of the Interior 1930-1984). In 1984, there were 1,675,000 short tons of salt produced in New York (see Figure 4.4).

### D. HISTORIC ENVIRONMENTAL PROBLEMS

In the 1800's, when agricultural development began in New York, early practices of clearing and settlement of the land had caused serious run off problems and siltation of streams in Allegheny County and throughout the Southern Tier. These practices led to an eventual economic and environmental decline and to the local "extinction" of many species of plants and animals.

Early oil and gas practices themselves caused some problems, particularly during the boom years. The problems were overcome in part by the replacement of wood by good steel for pipes and storage tanks. The prosperity from the early oil and gas industry boom also led to an improvement in the quality of life and to the development of municipal water systems and fire departments. Early regulations and programs adopted by New York State in the 1800's had a





bushel times 1.2445 and a short ton equals 2,000 pounds.

limited effect on the oil and gas industry because there was no uniform statewide enforcement. The State has adopted and enforced more comprehensive regulations to protect the environment from potential harm since the 1960's.

There are some examples in the literature of early environmental problems caused by the oil and gas industry. As much as 90 barrels of crude oil a day leaked from early oil tanks and were skimmed from behind a dam on the Little Genesee Creek and shipped to a Buffalo oil works (Herrick, 1949). In 1882, when the Cynthia Oil Works refinery was built in Bolivar Township in Allegany County, there were 10,000 barrels of crude oil in storage that was reported to have been salvaged by dippers from the Little Genesee Creek (Herrick, 1949).

Groundwater supplies in some instances were also contaminated by improperly cased holes, unplugged abandoned wells and other early well drilling practices. Though most of the recorded serious pollution incidences were attributed to early storage practices. In 1922, a pipe was driven 18 feet to obtain drinking water from a layer of buried gravel near a north Olean tank farm. When oil was recovered instead, it was discovered that the local drinking water was contaminated. A pitcher pump oil boom began when dozens of nearby landowners drilled such "water wells", and family members worked the pumps day and night to produce as much as five barrels of oil per day (Herrick, 1949).

In some instances, springs and other sources of water were also polluted by early oil recovery practices. Waterflooding, a technique developed in the early 1900's, was used when production declined in order to obtain additional oil from seemingly depleted wells. The reservoir rocks were filled with water to force out the remaining oil. As water was forced into an injection well, fluids in the reservoir rocks began to flow in the direction of an adjacent production well. When the injection process was not carried out properly, nearby water resources could be contaminated by the diverted oil, which flows

outward or upward in the absence of a confining rock bed, away from the injection well. For example, in 1939 a waterflood contaminated a spring in Peet Hollow which served as the main drinking water supply for the Town of Bolivar. The water supply had to be shut off and an alternate source found (Herrick, 1949).

Another technique introduced in the early 1900's to recover additional oil from wells was well torpedoing. Large amounts of nitroglycerin, a chemical explosive, were dropped into the wells to fracture the rock and theoretically create enlarged pathways through which the oil could flow toward the well (Herrick, 1949 and Watson and Benson, 1984). Environmental contamination resulted when too large an explosive charge was used. Oil would spray up the well and onto the land.

Fortunately, New York has a high average annual rainfall which dilutes small oil and brine spills to such an extent that surface pollution is usually temporary, assuming there are no cumulative impacts from continued spills. The high levels of annual rainfall recharge surface waters and flush-out shallow permeable aquifers at a high rate.

### E. NEW YORK STATE'S OIL, GAS AND SOLUTION MINING LEGISLATIVE HISTORY

1. Early History

In order to better organize and control the quality of solution salt production, and because of the increasing oil and gas activity in the 1800's and the need to conserve the oil and gas resources and to prevent unnecessary environmental damage, state legislation to regulate these industries was begun in the late 1800's. Solution salt mining legislation was first introduced to regulate the leasing of salt-producing lands. Beginning in 1797 and lasting for 100 years, the Legislature set up the Onondaga Salt Springs Reservation and leased land in 10-acre lots (Werner, 1917). Under this legislation the

lessee was required to produce ten bushels annually per kettle and to pay a 4 cent tax on each bushel of salt produced. Later legislation increased the tax to help finance the Erie Canal. In the 1820's certain portions of the reservation were sold and the Legislature adopted laws to remove impurities in the salt caused by careless and neglectful producers.

In 1850, the State Legislature passed an act to improve the quality of the salt manufactured in Onondaga County and to protect salt purchasers (Werner, 1917). At that time the salt was often damp and liable to cake. The act required that alum be used instead of quick lime to clear impurities from the brine used in making salt. This process removed magnesium-bearing impurities which adsorbed moisture and created a product which was drier, caked less, and contained less lime.

As early as 1865 legislation was enacted to control the location and amount of crude oil which could be stored, primarily to ensure public safety (Chapter 773 of the Laws of New York, Eighty-eighth session). In 1879, legislation was passed requiring plugging of abandoned wells to prevent freshwater contamination by oil and gas (Chapter 217 of the Laws of New York, 102nd session), but the 1879 legislation required no freshwater plug and had no strong enforcement mechanism. Amendments passed in 1882 did require a wooden freshwater and surface plug in addition to a zone plug. The 1882 amendment also levied a \$200 to \$500 fine and imposed a maximum jail sentence of one year on operators who abandoned a well without plugging it. This legislation had the unique enforcement mechanism of giving half of the fine collected to the informer of any violation (Chapter 64 of the Laws of 1882, 105th session). In 1933 legislation was adopted to allow leasing of state lands for oil and gas drilling (Added L. 1933 C.207, effective April 18, 1933).

In 1963 the State Legislature repealed all previous oil and gas

legislation and amended the Conservation Law to give DEC greater authority over wells drilled in the fields developed after 1963. The purpose of this law was to foster, encourage, and promote the development, production, and utilization of the natural resources of oil and gas in a manner that would prevent waste, increase ultimate recovery, and protect correlative rights of all the interests involved. This bill also reauthorized the leasing of state lands for oil and gas development, and set up procedures specifically designed for the oil and gas business. Although this new law gave New York little legal authority in the older fields, it did enable the State to obtain systematic geologic information and to require records identifying ownership of facilities. Existing fields at the time were largely depleted and were not subjected to many additional regulations. Most of the law's provisions applied to new exploration, development and production, and contained provisions regarding well spacing, wasting oil and gas, flaring gas, and protecting surface and groundwater supplies. The increased plugging requirements pertained only to new wells.

This law was amended in 1969, recodified in 1972, and again amended in 1973, 1974, 1977, 1978, 1981, 1984 and 1987. As amended, it is now titled the Oil, Gas and Solution Salt Mining Law and also provides for the regulation of underground storage of natural gas.

### 2. 1981, 1984 and 1987 Revisions to the Oil, Gas and Solution Mining Law

In 1981, Governor Hugh Carey proposed a series of reforms to the 1963 law to better manage the development of oil, gas and salt resources of the State. Agreement with legislative leaders on a compromise law was reached and that law became effective on August 26, 1981. The most important change in the law brought an end to the distinction between new and old field areas so that all oil and gas wells in New York State are subject to the same restrictions.

Other provisions of the bill include:

- a. Exemption from spacing requirements for oil fields discovered, developed and operated prior to January 1, 1981. It was recognized that these fields had been developed to such an extent that to apply spacing unit requirements would be unreasonable.
- b. Dramatic increase in the permit fee. A uniform \$100 fee is paid directly into an Oil and Gas Account for plugging abandoned wells and abating dangerous oil and gas related incidents. A variable depth fee of \$125 per 500 feet or portion thereof, to a maximum of \$2,625 is reserved for funding the regulatory program.
- c. Requirement that DEC promulgate new bonding regulations.
- d. Consolidation and strengthening the enforcement provisions. Criminal penalties for violations were added to ensure compliance with the law's provisions.
- e. Creation of an eleven member Oil, Gas and Solution Mining Advisory Board. Since the new legislation passed in 1981, the Department has made progress in meeting its legislative mandates given the resources available, but thousands of oil and gas wells were drilled in New York State before any comprehensive legislation was enacted to regulate drilling and production. It has been estimated that up to 40,000 wells were drilled prior to 1966 when the State first began keeping records. Aproximately 8,400 wells have been drilled from 1966 to 1985. The Division's top priority has been to ensure that any applications for wells to be drilled subsequent to the new law were drilled and completed in an environmentally sound manner. The problems posed by oil and gas drilling in the past represent an enormous backlog of work for the Department.

The 1984 changes to the Oil, Gas and Solution Mining Law increased dramatically the amount of financial security well operators are required to

obtain before drilling their wells. This amount is intended to more closely approximate the costs of well plugging and abandonment.

The 1987 amendments to the Oil, Gas and Solution Mining Law extend its scope to include geothermal, stratigraphic and brine disposal wells deeper than 500'. Neither geothermal or stratigraphic wells have been subject to any regulation or environmental review in the past. The specific inclusion of brine disposal wells clarifies DMN's existing authority to regulate their drilling and plugging. Operation of the disposal wells will continue to be handled under the Division of Water's State Pollutant Discharge Elimination System (SPDES) Permit Program.

### 3. Regulations Implementing the Oil, Gas and Solution Mining Law

The regulations implementing the Oil, Gas and Solution Mining Law, Parts 550 - 559 of Title 6 of the official compilation of the Rules and Regulations of New York State, address each aspect of the drilling, completion, production and plugging and abandonment of oil and gas wells.

Part 553 of the oil and gas regulations establishes state-wide spacing requirements for oil and gas wells to help protect mineral rights of well owners and to allow for the greatest ultimate recovery of oil and gas. Part 554 regulates drilling practices and reporting requirements. These regulations are designed to prevent pollution and migration of fluids from drilling operations, require notice of commencement of operation, etc. They regulate the testing of surface casing, the use of blowout preventers, the isolation of hydrocarbons encountered above the target depth, hole deviation in well drilling and multiple completions, and they provide for the collection of well completion reports, well logs and samples. Part 555 regulates the plugging and abandonment of wells. Part 556 refers to operating practices and 557 regulates secondary recovery and pressure maintenance. Part 558 restricts

the transport of oil and gas products from owners or operators in violation of the State's Oil, Gas and Solution Mining Regulatory Program. Part 559 regulations were adopted in April 1, 1986 and regulate the production and safety of oil and gas wells operating in the Bass Island trend.

The Department of Environmental Conservation can also add special permit conditions to wells located in areas needing extra environmental protection. Department staff also conduct pre-drilling site inspections as well as drilling, post-drilling and plugging inspections to be sure that wells are in compliance with the well permits. More detail on the regulatory program is provided in Chapters 8 through 14.

The State's oil, gas, solution mining and gas storage regulations have not been updated since 1972 and extensive regulatory revisions are needed. Environmental and safety hazards not addressed by the current regulatory program have been handled by special permit conditions imposed on wells drilled in such critical areas as freshwater aquifers or the relatively high volume, high pressure (high for New York) Bass Island trend. One of the major purposes of this generic environmental impact statement is to present the framework, justification and recommendations for essential regulatory changes to these industries in New York State.

# V. <u>NEW YORK STATE GEOLOGY AND ITS RELATIONSHIP TO OIL, GAS AND SALT PRODUCTION</u>

### A. <u>GEOLOGIC PROVINCES IN NEW YORK STATE</u>

## Adirondacks and Hudson Highlands: Igneous and Metamorphic Terrains

Geologic time is hard for most people to comprehend, and the profound changes which have occurred in the earth's landscape are hard to imagine. The rocks of New York State were formed over a period which extends over billions of years. The Adirondack Mountains were formed during a mountain-building event more than 1,000,000,000 years ago, while some deposits in western New York were left in the wake of melting glacial ice less than 10,000 years ago. The environments in which these rocks formed, and the geologic conditions which existed at the time they were deposited, determine if they will contain significant amounts of oil, gas, or salt.

The oldest rocks within New York State formed during the Precambrian Era, a period of time extending from 4 1/2 billion years ago to about 600 million years ago. Because of their great age, the Precambrian rocks seen today are only the eroded roots of ancient mountain chains, and form the basement upon which younger sediments were deposited. The Adirondack Mountains and the Hudson Highlands are exposed Precambrian basement forming southern extensions of the Grenville Province of Canada.

Since their formation, Precambrian rocks have undergone extensive change, or metamorphism, as they were buried at great depths, and subjected to intense pressures and elevated temperatures for long periods of time. From their origins as volcanic lavas, intrusions of molten or igneous rock, and sedimentary limestones and sandstones, these rocks have been changed by metamorphic processes which altered their chemical compositions and physical structures, and obliterated many of the clues to their beginnings. Metamorphosed igneous rocks have been converted to amphibolite, the most

widespread type of rock within the Adirondacks. Metamorphosed sedimentary rocks are extensively exposed in the Northwest Lowlands of the Adirondacks where they compose 80 percent of the bedrock, and along the eastern margin of the Hudson Highlands (Broughton, and others, 1976). Anorthosite, a comparatively rare type of rock consisting mostly of plagioclase feldspar, is found in few places on the earth's surface. Anorthosite underlies the Adirondacks' High Peaks region and its excellent exposure at Whiteface Mountain gives that locality its name.

The ohysical and chemical changes these ancient rocks have undergone have "cooked out" any oil or gas they once contained, unlike the younger, less deformed sedimentary rocks of western and central New York. Along a narrow zone in the eastern part of the state and beneath the Hudson Highlands, however, thin slices of metamorphic and igneous rocks have been thrust over the underlying sedimentary rocks. Recent improvements in geophysical techniques allow us to see beneath the severed slices and recognize that younger rocks lie beneath. The potential oil and gas reserves in these overthrust areas are still largely unexplored, and are discussed in more detail in Section 5.E.

### 2. Western and Central New York: Paleozoic Sedimentary Rocks

Although some evidence of early life is found in rocks more than three billion years old, living organisms became abundant and widespread about 600 million years ago. The time corresponding to the boundary between rocks containing few fossils and those with abundant fossils marks the beginning of the Paleozoic Era. The sea inundated the land many times during the Paleozoic Era, creating ideal conditions for preserving large numbers of marine fossils. The Paleozoic depositional record within New York State is nearly continuous. A period of uplift and erosion occurred during the Middle Cambrian, about 550

million years ago, and several mountain-building events occurred during the Middle and Upper Paleozoic Era.

The Paleozoic rocks of central and western New York State, with their abundance of living organisms, are ideal source rocks for the formation of oil and gas.

## B. <u>GEOLOGIC FACTORS WHICH DETERMINE THE EXISTENCE OF OIL, GAS, AND SALT IN</u> SEDIMENTARY ROCKS

Small quantities of hydrocarbons exist in all living things, from the simplest algae to the most complex organisms on earth. When organic debris is incorporated in muddy sediment and deposited in oceanic basins, oxygen is quickly depleted from the stagnant water. Normal processes of decay cease under these hostile conditions, and anaerobic bacteria begin to transform the large, complex organic molecules into fatty and waxy substances and other simpler compounds. As sediment is buried deeper, temperature and pressure increase, and organic decomposition continues. Over geologic time, bacterial activity may create a large range of gaseous, liquid, and solid organic compounds. Petroleum is the general name given to this complex mixture of hydrocarbons.

Under favorable conditions, large quantities of organic matter buried with sediment are transformed by slow chemical reactions into liquid and gaseous hydrocarbons. Although this process occurs more rapidly at elevated temperatures, too much heat destroys the organic precursors of petroleum so that only a thin carbon film remains. Over millions of years, fluids are squeezed out of muddy sediments by compaction, and migrate upward to fill the pore spaces or fractures of adjacent permeable beds. Limestones, dolostones, and sandstones commonly contain void spaces and these voids may become filled with migrating hydrocarbons and water. The low density of the migrating fluids causes them to rise to the highest possible level. If a porous bed

crops out at the surface these ascending fluids may form an oil or gas seep.

Several other conditions must exist before an accumulation of hydrocarbons becomes large enough to be of commercial interest. If an impermeable barrier such as a shale or siltstone layer lies above the reservoir rocks, large volumes of hydrocarbons may accumulate in a structure called a trap. Typically, faulting or folding will deform permeable beds to create structural traps. The crests of anticlines or domes will create structural traps if the proper sequence of source beds, permeable rocks and impermeable layers are found there. If structural deformation is too intense, however, the fractures may act as conduits, allowing the hydrocarbons to leak out. Stratigraphic traps may be produced by the conditions which existed at the time the sediments were deposited. If a porous sand pinches out in an updip direction, or a beach sand grades into a silty shale in the offshore direction, a stratigraphic trap may be formed. In addition, regional deformation must not be so intense or the rocks heated so strongly that only a carbon-bearing residue remains within the trap. The beds must remain buried so that the hydrocarbons do not seep out, and the pore spaces of the reservoir beds must not become clogged with late forming minerals.

If all these requirements are met, then hydrocarbons migrating from source beds may accumulate in porous reservoir rocks. Because hydrocarbons are less dense than water, they migrate upwards and float on top of the water within the pores of the rock matrix. As they collect within the trap, hydrocarbon species of different densities will separate into layers. Gas, being least dense, will collect in a zone nearest the surface above the oil, and water will saturate the zone below the oil at the base of the trap.

Geologists have discovered thousands of traps, but not all of these contain producible quantities of oil or gas. New York ranks 21st of 32 states

which produce commercially marketable gas, and 27th of the 31 oil producing states (Independent Petroleum Association of America, 1986-1987). The structural and stratigraphic traps in New York's rocks have yielded hydrocarbons for more than 150 years at numerous locations throughout the state.

### 1. Factors Which Affect Producibility

If all the requirements discussed previously are met, the reservoir may still not be of commercial interest. Several other factors will determine the likelihood that a particular reservoir will be commercially developed.

To evaluate a prospective oil or gas well, an engineer or geologist must first determine the porosity, the fluid and gas saturation of the interstitial spaces, and the permeability. Porosity is the total volume of void space within a unit volume of rock, expressed as a percentage. For instance, if perfect spheres are packed in a cubic arrangement, over 47 percent of the bulk volume is empty pore space. Compared to this theoretical maximum value, real oil and gas reservoirs have porosity values ranging from 3 to 35 percent. Clay particles or minerals which later form within the pore spaces after the rock is deposited, will reduce the initial porosity.

Permeability is a measurement of how "interconnected" the pore spaces are, and is expressed in units called darcies or millidarcies. A darcy is defined as the rate of flow in milliliters per second of a homogeneous fluid with a viscosity of one centipoise which passes through a porous medium of one square centimeter in cross section under a pressure differential of one atmosphere per centimeter of length. The permeability of a reservoir controls the rate at which fluids and gases can move through the interconnected pore spaces and thus, the quantity which can be recovered through a well. Some rocks, like shales, have very high porosities, but their low permeabilities make them poor oil and gas producers. Rocks with very low permeabilities are

known as tight formations.

The pore spaces of all sedimentary rocks contain some water which has remained since the time of deposition. Some connate water forms a thin film around the individual mineral grains, and typically occupies about 20 percent of the pore space. Because of the surface tension between the water and the mineral grains, the water is more immobile, and the rock is considered to be "water-wet." Some rocks are oil-wet but these are more rare. If a well is drilled into a water-wet rock which contains a sufficient volume of oil, the more tightly held water will remain in the reservoir and the oil will flow toward the wellbore. If the volume of water within the pore spaces is too great, the droplets of oil are physically separated and cannot flow easily. The relative saturation of both the wetting and nonwetting phases within the pore spaces of the potential reservoir are very important in determining its production potential.

The size, thickness, and lateral extent of the reservoir rock also determine the commercial potential of a reservoir. An oil-bearing blanket sandstone which is only 20 feet thick, but laterally continuous over several square miles may be a better production target than a 100-foot thick sand bar of limited areal extent. Within a specific area, the thickness of the productive zone, or thickness of pay, may be less critical to the overall producibility than the lateral extent of the reservoir.

#### 2. Economic Factors Affecting Producibility

Oil and gas exploration and development programs are capital-intensive, high risk ventures. Any risk analysis of drilling investments must consider the uncertainty of discovery and the economics of recovery. Uncertain economic trends in factors such as production allowables and fluctuations in price have major effects on drilling activities. Currently, natural gas

production is restricted in New York State because of the recent deliverability surplus. An additional 5-10 billion cubic feet of gas could have been produced in 1986. Volumes of proven reserves of crude oil and natural gas are increased only by exploration and drilling. These activities, which account for a major share of all production expenses, suffer during times of excessive supplies.

The market price is a critical factor influencing the supply of gas and oil because it reflects the demand for the resource and provides an incentive for exploring and developing marginal reserves. Oil and gas conservation practices beginning in the 1970's decreased the rate of demand and still affect the oil and gas market today. Low demand and high deliverability surplus has adversely affected the market in recent years. Declining prices of gas and oil, as much as 50 to 60 percent at the well head in 1986, have triggered a decline in permit applications and drilling activity.

The increase in Canadian gas imports has exacerbated the gas deliverability surplus and has also helped to keep prices down. Proposed changes in the federal tax structure could further reduce or remove incentives for national oil and natural gas exploration and production, and this will be unfortunate if oil and gas production decreases as expected by the end of the decade. The United States, and New York in particular, may again be importing greater and ultimately more costly foreign supplies of oil and gas.

The National Gas Policy Act of 1978 (NGPA) established maximum sale prices for one MCF of gas depending on the age of the well, the type of formation into which it is drilled, and its location. Deregulation occurred as of January 1, 1985 for onshore wells with NGPA section 102 determination (new onshore or offshore wells, or wells in new onshore reservoirs). Those wells producing from tight formations with the 107 determination (high cost gas wells) may be deregulated if they also meet 102 qualifications. Members

of the gas industry, however, have set various agreements and restricting conditions which cause variations in the price of gas, and under surplus conditions, many gas producers have not obtained the higher prices expected by deregulation.

New York State's crude oil is paraffin-based, and rates as premium Pennsylvania-grade oil for motor oil use. Producers of Pennsylvania-grade oil pay more attention to the lubricating oil market than to the market for fuels. Although oil price increases of the last decade produced increased activity levels, in 1983 Pennsylvania-grade oil sold for less than the black oils for the first time (OGJ, January 10, 1983). The current worldwide surplus of oil has caused prices in New York and northern Pennsylvania to drop 33 percent from their peak.

The motor oil market has been affected by motor oil additives which reduce consumption, and by automotive technology which increases the interval of time between required oil changes. The demand for quality lubricating oil remains high, however, and producers continue to look for ways to enhance production.

The lives of depleted wells have been extended with advances in technology. Improved methods of discovery and production of oil and gas have made additional reserves available. The investment in equipment per unit of production has increased because of inflation and deeper well depths, but the cost of extraction depends on the type of recovery method used. Usually, primary recovery using the natural reservoir energy has the lowest operating costs and requires minimum maintenance. Adding extraction equipment such as pumps cause the production expenses to increase. Secondary recovery which requires fluid injection demands even higher operating costs. Although wells in the Appalachian Basin produce less oil and gas than those in the southern

or western United States, they are less expensive to drill because they are not nearly as deep and the formation pressures are lower. However, the oil producing wells in the "Bass Island" area which still produce through primary recovery, have high operating costs due to special maintenance problems such as paraffin buildup and strict operating requirements imposed by the State.

Most operators worry about other economic factors which increase their costs and decrease their profits. Environmental concerns have added additional expenses for oil and gas operators as the State Environmental Quality Review Act (SEQRA) requires that environmental factors be taken into consideration. Since "Bass Island" regulations became effective on May 25, 1986, all wells operating in the "Bass Island" trend have strict reporting and testing requirements to adhere to and allowable production limits are also set to prevent waste and increase ultimate recovery within this complex structure.

Concern over the restoration of oil and gas drilling sites and plugging of abandoned wells caused the Department of Environmental Conservation to increase the financial security required from operators in January, 1985. In addition, new cementing requirements and brine disposal restrictions have increased drilling and production costs in New York State.

### C. PRODUCING FORMATIONS

Many geologic formations have produced oil and gas within New York State, some more abundantly than others. A stratigraphic chart for southwestern New York State is shown in Figure 5.1. Only those formations which have yielded oil or gas, or which may contain significant reserves will be discussed in this section. This discussion will begin with the oldest rocks of the Cambrian Period and continue to the youngest producing Devonian units.

### 1. Cambrian Period

The oldest rocks which have yielded small quantities of oil and gas in New York State are Upper Cambrian sandstones and sandy dolomites. They formed

### FIGURE 5.1

### STRATIGRAPHIC SECTION SOUTHWESTERN NEW YORK

PERIOD		GROUP	UNIT	LI	THOLOGY	FXPI ANATION
PENN		POTTSVILLE	OLEAN	0000	CLARTZ PERLE	
MSS.		POCONO	KNAPP	0.08	QUANTE PERLE, CONCOMENTE,	
	1	CONEWANGO		-> 254.	SHALE AND SANDSTONE	
	1	CONNEAUT	CHADAKON		SCALE AND SHITSTONE	
			UNDEFERENTIATED			SANDSTONE/SAND
		CANADAWAY	PERRYSBURG *		NOICH AND ADDITURE	
			JAVA		SHALE AND SETSTONE	GRAVEL/CONGLOMERATE
		WEST FALLS	NUNDA			
	1		RHNESTREET		MOLLACEOUS UNESTICAE	
Z		SONYEA	MODLESEX	0	SHILE AND SUISTONE	
<b>≦</b>		GENESEE	]		SHALE WITH MONOR SUJETONE	SHALE/CLAY
Z	<u>├</u>				LARSTONE WITH WINDE SUITSTONE	
3			TULLT	°	AND SANOSTONE	
DE	MIDDLE	HAMILTON	MUSCOW LIDLOWVILLE SKANEATELES MARCELLUS	9 Y	SHALE WITH MINOR SANDETCHE AND CONGLOMERATE	LIMESTONE/CHALK
			ONONDAGA		LINESTCHE	
	LOWER	TRISTATES	ORISKANY	•	SANDSTONE	
		HELDERBERG	RONDOLIT		LIMESTONE AND DOLDSTONE	
			AKRON	· <u></u>	DOLOSTONE	·
-	UPPER	SALINA	CAMELLUS SYRACUSE		SHALE, SLITSTONE, ANNYORITE AND HALITE	DOLOSTONE
₹		LOCKDOPT	VERNON	-		MITTER AND AND A
Ē		LUCAFURI	BOOVERTER		LINESTONE AND DOLDSTONE	
1			PONDEGLOT		SHALE AND SANDETONE	
あ	LOWER	CENTOR	RE TINK IS THOROLD		LINESTONE AND DOLDSTONE	ANNYORITE
		MEDINA	GRIMSBY WHIRL POCK		SANDSTONE AND SHALE	
ORDOVICIAN			QUEENSTON OSWEGO	•	SHALE AND SILISTONE	
	~ · · · ·		UTICA		WITH MINOR SANDSTONE	ATUS UT A
	MIDDLE	TRENTON- BLACK RIVER	TRENTON BLACK RIVER	•	LINESTONE AND MINOR DOLDSTONE	
	LOWER	BEEKMANTOWN	TRIBES HELL CHUCTANUNDA		LINESTONE	METAMORPHIC ROCKS
<u> </u>			UTTLE FALLS		QUARTE SANDETONE AND	
32	UPPER		GALJWAY (THERESA)	•	SANDSTONE;	*****
5 <u>~</u>	1		POTSDAM	· 225	AND SANDY DOLOSTONE; CONGLOMERATE BASE	IGNEOUS ROCKS
RECA	MBRIAN		GNEISS, MARBLE,	Santa 174	METAMORPHIC	1.01
			1	+ • •	2/ manual 2/ man	oGAS

HARLIDES ALAR, SANDYOND LST, CHINANY, BRADYOND 2ND, HARVESING RAN, SCO, FORT & ROBAN SHICLIDES BRADYOND SHR, HARVARY, CLARKINGLE, BRADY & PORTER, & RLIMER VALLET

MODIFIED AFTER VAR TYPE & COPLEY, 1988

of places. The large salt water flows, which frequently occur when wells penetrate these horizons, indicate that good porosity and permeability exist within these rocks. Gas production from the Potsdam is also reported in some early publications (Hartnagel, 1938, in Kreidler, 1953). Near Parish in Oswego County a well drilled 2,140 feet into the Precambrian encountered gas in the Potsdam with a measured pressure of 340 pounds per square inch (psi). Another well drilled 3,580 feet to the Potsdam near Warners in Onondaga County produced an initial flow of 100,000 cubic feet of gas per day (MCF/d) and had a pressure of 800 psi. In Clinton County, a well near Morrisonville reported a show of oil in the Potsdam Sandstone.

Recent seismic work has indicated the possibility of deep structural traps within the Theresa and Potsdam Formations. Robinson (1983) has estimated gas reserves within the Theresa in Onondaga County based on his analysis of log data from nearby Cayuga County. He believes that the Theresa contains significant reserves of gas within the updip pinchout of the Theresa. He places the downdip limit of the gas-oil contact south of Syracuse. Van Tyne and Copley (1983) report that small commercial quantities of gas have been produced from the Theresa at three places in western New York: in northern Chautauqua County near Lake Erie, in the City of Buffalo, and in northeastern Wyoming County.

Only recently has exploration begun to take place for the deeper Cambrian-Ordovician strata. Of the few wells that have been drilled, 90 percent have been in shallow drilling areas of relatively low pressure and high leakage where the Cambrian-Ordovician is exposed or is just below the surface. Only the recent advent of seismic technology has allowed exploration activity to begin for the deep structural traps that are potentially productive from the Cambrian-Ordovician carbonates. Some geologists and companies believe that the random drilling in the past has not adequately

accessed the hydrocarbon potential of the Cambro-Ordovician carbonates of the New York Southern Tier (Patenaude, 1986, personal communication #52).

### 2. Ordovician Period

Overlying the Cambrian sandstones and dolostones in New York State is a sequence of Ordovician deposits ranging up to 5,000 feet in thickness (Broughton and others, 1976). The geographic extent of the Ordovician limestones and dolostones is shown in the sketch map of bedrock in New York State shown in Figure 5.2. These rocks were deposited between 430 and 500 million years ago, and record the change in environment from a warm, shallow sea which existed at the beginning of the period, through the Taconic Orogeny, a major mountain-building episode which reached a climax at the end of the Ordovician.

The Beekmantown Group forms the lowest part of the sequence. Deposited during the Lower Ordovician, these rocks are composed almost entirely of limestone and contain no known oil or gas within New York State. Middle Ordovician deposits include the Trenton and Black River Groups. Upper Ordovician units are, in ascending order, the Utica Shale, the Lorraine Formation, the Oswego Sandstone, and the Queenston Formation. The changing composition or lithology of these Upper Ordovician deposits reflect the increasing volumes of clastic sediment shed from the growing Taconic Mountains in the east. Within the state, only the Trenton and Queenston Formations have produced any significant quantities of gas.

The Trenton formed in a wide, shallow sea which occupied a linear seaway along the eastern margin of North America. This seaway began to deepen in Middle Ordovician time, restricting the zone of limestone deposition to the western side of the basin. The Trenton is thickest along the axis of the basin in central New York, and thins to the east, where it grades into sandy



FIGURE 5.2 - ORDOVICIAN BEDROCK IN NEW YORK STATE

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silts and shales (the Austin Glen and Schenectady Formations), or black muds (the Canajoharie and Utica Shales). Trenton Limestone probably covered the peaks of the Adirondacks, and extended well north into Canada (Rickard, 1973). To the west, it interfingers with the limestone and dolostone shelf deposits of the Black River Formation.

The Trenton is typically a light gray or brown, finely crystalline, fossiliferous limestone which attains a thickness of more than 800 feet in central New York near Seneca County. The five members which compose the Trenton reflect its changing position from slope deposits with abundant clay and sparse fossil faunas, to relatively pure nearshore limestones containing cross-beds, horn corals, and trilobite fragments (Fisher, 1977).

The Taconic Orogeny began in Middle Ordovician time, as the proto-Atlantic ocean began to close from Newfoundland to the Carolinas. As the Taconic Mountains were formed in the east, a vast delta shed sediment into the wide shallow sea to the west. At its maximum extent the Queenston delta stretched well onto the midcontinent, and reached as far south as Virginia. Four major environments of deposition migrated westward as the Taconic highlands rose in the east: (1) deepwater gray muds with minor sand and silt (Whetstone Gulf and Frankfort Formations); (2) marine fossiliferous silts (Pulaski Formation); (3) sparsely fossiliferous white to tan quartz sandstones (Oswego); and (4) nonmarine, brackish, or continental red muds, silts and sands (Queenston Formation). By the end of the Ordovician, uplift had exposed almost the entire state above sea level. Some of the Ordovician deposits were then removed by erosion. This erosional surface or unconformity can be seen in the Niagara Gorge, where the Lower Silurian Whirlpool Sandstone rests directly upon Queenston Shale.

Although the Trenton has not been a major producing horizon within New York State, Trenton wells were first developed in the 1880's. The first

successful wells were drilled in the Sandy Creek and Pulaski Fields in Oswego County in 1888. The Pulaski Field produced between one and two BCF of gas until it was abandoned in 1946 (Drazan, 1984). Interest in the Trenton was revived with the discovery of the Blue Tail Rooster Field in Cayuga County in 1966. Initial testing of the discovery well, the Ripley No. 1, indicated an initial deliverability of 6,900 MCF/d and recorded an initial shut-in pressure of 1519 psi. Thirteen Trenton gas fields have been discovered to date in Oswego, Onondaga, Cayuga, Oneida, Lewis, and Wayne counties (Van Tyne and Copley, 1983).

Altogether about 400 wells averaging less than 1,000 feet in depth have been drilled in search of Trenton production. Initial production in Trenton wells is characterized by high gas flows which decline rapidly. Although known primarily for gas production, scattered Trenton wells have indicated shows of oil. Because the production rates from the older wells were based on naturally-occurring gas flows, modern techniques of well stimulation and better reservoir management could recover more of the resource in place. Recent estimates of Trenton reserves indicate that about 14.5 BCF of gas may remain to be discovered (Van Tyne and Copley, 1983).

Other Ordovician formations have produced minor amounts of gas in the past. The Oswego Sandstone overlies marine shales and sandstones below the Queenston delta deposits. Some geologists have suggested that where the Oswego sands were deposited in a nearshore environment, they may be thicker, cleaner and potentially productive (Henderson and Timm, 1985). The Lebanon Field in Madison County is thought to produce from a recently defined Oswego sand trend. In east-central and eastern New York occasional shows of gas have been reported from the Utica and Lorraine black shale sequences overlying the Trenton. Although no studies of potential reserves have been made, scattered farm wells in eastern New York have used gas from these rocks for local

farm wells in eastern New York have used gas from these rocks for local heating. The Queenston is a reddish-gray silty shale in western New York, but becomes sandier toward the east, nearer its source. In some places it grades upward into the Oswego Sandstone, and has produced gas in Cayuga, Ontario, and Seneca counties. Probable gas reserves for the Queenston in central New York are estimated to be 90 BCF (Van Tyne and Copley, 1983).

### 3. Silurian Period

The Silurian rocks of New York were deposited during a major period of inundation lasting from 430 to 395 million years ago. They reach their maximum thickness of 2,000 feet in south-central New York, and dip slightly to the south at less than one degree. A sketch map shown in Figure 5.3 shows the extent of Silurian rocks in New York State. The four groups comprising the Silurian sequence in New York are, in ascending order, the Medina, Clinton, Lockport, and Salina Groups. The thin Akron and Cobleskill Formations above the top of the Salina are Silurian deposits which are not accorded group status.

At the end of the Ordovician period, the Queenston delta reached its maximum extent and most of New York was above sea level. The lowest Silurian formation, the white to grayish-white Whirlpool Sandstone, was probably deposited on this relatively flat, eroded surface by wind and water. Known to oil and gas drillers as the "White Medina," it is a very fine- to coarsegrained quartz sandstone containing scattered shale pebbles and local concentrations of accessory minerals. Extensive secondary silica and rare zones of calcareous cement are present. The Whirlpool thins to the east from a maximum thickness of 25 feet in the Niagara Gorge. Although a few feet of Whirlpool Sandstone may be present in the subsurface at the northeastern edge of Erie County, it is absent in Genesee County. Gamma ray logs indicate that the Whirlpool probably extends about five miles into northwestern Wyoming
FIGURE 5.3 - SILURIAN BEDROCK IN NEW YORK STATE



County in the subsurface, where its maximum thickness is about 15 feet, but pinches out within a very short distance to the east. A few feet of Whirlpool may be present in western Wyoming County, but it also pinches out in Cattaraugus County along a line from Ashford to South Valley.

As sea level rose during the early Silurian, the white sands of the Whirlpool spread eastward, creating a blanket-like deposit across parts of western New York. In the deep waters to the west, mud and shale of the Power Glen Formation accumulated. Also known as the Cabot Head Shale, the Power Glen contains thin, scattered interbeds of grayish-white, fine-grained sandstone which may produce limited amounts of gas. The Power Glen is 36 feet thick in the Niagara Gorge, but thins to the east in the same manner as the Whirlpool.

As the rate of sediment shed from the Taconic Highlands in the east increased, the Grimsby Formation--the driller's "Red Medina"--was deposited. The sandstones and shales of the Grimsby Formation are characterized by hematitic, very fine- to medium-grained, grayish-red, pale green, and grayishwhite quartz sandstones interbedded with grayish-red and green shales. The Grimsby lies directly upon the Queenston in the area east of Erie County where the underlying Whirlpool and Power Glen units pinch out. The Grimsby is 52 feet thick in the Niagara Gorge, 65 feet thick in the Buffalo area, and increases to more than 100 feet in thickness near Avon in Livingston County.

The Grimsby and Whirlpool Formations were deposited in an environment of sandy strand plains and muddy shallow marine complexes which formed on the top of the Queenston sediments. Meandering streams drained a coastline of low relief, and sea level was quite shallow. Fossil clams, snails, and worm burrows, and sedimentary structures such as crossbeds, ripple marks and mud cracks are common in the Grimsby. Data gathered from modern gas well drilling

indicate that structure in the Medina Group appears to be limited to features of low relief, such as terraces, and minor thrust faults formed by deformation late in the Paleozoic Era.

To the east, the Grimsby-Queenston contact is less clearly defined because the sand content increases in the underlying Queenston. Gamma ray logs and well sample studies have not helped to define this contact, but the Grimsby appears to be 80 feet thick near Auburn in Cayuga County, 40 miles to the east. The Grimsby thickens to the southeast of Buffalo in Wyoming, Livingston, and Allegany counties. From a thickness of 75 feet in southwestern Wyoming County, it increases to more than 150 feet in southeastern Allegany County (Van Tyne, 1981).

Above the Medina, the rocks of the Clinton Group represent a transition from a shallow, nearshore environment to true marine conditions. Offshore, diverse faunas flourished in the warm, shallow sea. Clinton deposits commonly contain thin, extensive bands of hematite, a reddish iron ore, which have been mined in commercial deposits elsewhere in the Appalachians.

In western New York, the Grimsby is overlain by the Thorold, a five-to ten-foot thick grayish-white sandstone near the base of the Clinton Group. This unit marks the transition from the Medina Group to the overlying Clinton Group. The lithologic equivalent of the Thorold in the east is the Kodak Sandstone; both formations were probably derived from reworked Grimsby deposits. A small amount of gas has been produced from the Thorold in Ontario, Canada, west of Buffalo.

The sands, shales and limestones of the Clinton Group in New York State are not highly productive of oil and gas. Approximately 52 Clinton wells have been drilled in Oneida and Madison Counties, to depths ranging from 1600 to 3400 feet (Van Tyne and Copley, 1983). Some gas has been produced from sandy zones within the Clinton in Madison County where the Group thickens to contain

more shale and sandstone. Minor amounts of gas have also been produced from the Irondequoit Limestone in Erie County. Wells drilled near the towns of Tonawanda and Amherst encountered gas in small reef mounds in the Irondequoit.

Above the Clinton Group lie the limestones and dolomites of the Lockport Group. Honeycomb, chain, and tube corals built massive reefs in the warm shallow seas which existed during that time. The Lockport forms the cap rock at Niagara Falls, and at the Niagara Escarpment, a bluff on the south shore of Lake Ontario. In east-central New York, some gas production from the Lockport has occurred from stromatolite mounds, reef-like masses formed by an ancient algae.

The Salina Group forms a 1,000-foot thick sequence of red and green silty shales and evaporite salt deposits, which accumulated in a series of broad mud flats and isolated lagoons during late Silurian time. Sediment shed from a highland to the east formed the Bloomsberg delta, and a shallow arm of the sea toward to the west was isolated from normal marine conditions. The environment which existed there was similar to the Dead Sea or Utah's Great Salt Lake, and few living organisms could survive the harsh conditions. The massive salt deposits mined in New York, Pennsylvania, Ohio and Michigan were formed by precipitation from the supersaline waters of this isolated sea. In New York the four formations within the Salina Group are, in ascending order, the Vernon, Syracuse, Camillus and Bertie, and reflect the changing environments of deposition at this time.

The Vernon Formation can be divided into three parts which correspond to the Salina A, B, and C units defined in other states (Rickard, 1969). The lowest unit in the Vernon consists of red and green siltstones and shales and contains no salt beds. The gray and green shales in the central portion of the Vernon Formation contain from six to seven salt beds which attain an

aggregate thickness of about 75 feet west of Seneca Lake. The highest salt bed is 15 to 20 feet in thickness, and is mined at Retsof and through brine wells at Silver Springs in Wyoming County. Known as the Retsof salt bed, it appears to be the thickest and purest of the Vernon Formation salt beds. The uppermost of the three Vernon units grades from gray and green shale in the east to dolomite with thin anhydrite and salt beds west of Seneca Lake.

The basal portion of the Syracuse Formation consists of dolomite, clay, and evaporite minerals with several thin beds of salt. Three to five separate salt beds reach a maximum aggregate thickness of more than 80 feet in Schuyler and Steuben counties. The upper contact of the Syracuse Formation is placed at the highest salt bed in that formation, within the Salina F horizon. Upper Syracuse salt beds are solution mined at Watkins Glen at the south end of Seneca Lake, and from wells near Tully for the Solvay Process Division of Allied Chemical Company. F-horizon salts were formerly mined near Myers and from brine wells at Ludlowville. Gypsum within the F-horizon of the Syracuse Formation is mined in Erie, Genesee and Monroe counties.

The Camillus and Bertie Formations consist of green shales, anyhydrite, and dolostone interbeds and together reach a maximum thickness of almost 300 feet in northeastern Pennsylvania. Minable salts do not occur in either formation.

The target of the majority of the State's wells drilled during the last few years has been the Lower Silurian Medina Group. No commercial oil production has ever occurred from Medina rocks in New York, although both oil and gas are produced from equivalent sandstones in Ohio and Pennsylvania. Occasional small shows of light oil or condensate have been reported from a few wells in southwestern Chautauqua County (Van Tyne, 1981).

Gas exploration in the Medina Group is not entirely without risk, although 95% of the wells drilled are completed to production. Producing

depths of Medina wells vary from less than 1,000 feet in northern Erie and Genesee counties to over 4,500 feet in southern Cattaraugus County. Nonproductive areas may lie adjacent to, and may be surrounded by, productive areas. Gas occurs in scattered areas where the original porosity has not been destroyed by secondary silica cement and clay minerals. Scattered structures of low relief do enhance gas accumulation and production slightly, and several gas fields are located on structural terraces. Known as a low-permeability tight sand, the average in situ permeability throughout the pay zone is typically less than 0.1 millidarcy. The combination of low porosity and extremely low permeability account for low but stable gas production rates over periods up to 20 years for Medina wells. In addition, most Medina gas production qualifies for special pricing under the Natural Gas Policy Act (NGPA) provisions for tight sands (Section 107) (Van Tyne, 1981).

Most of New York's gas reserves are contained in Silurian deposits. Data to estimate Clinton Group reserves are scarce and, although the rocks cover a very large area, few wells produce from them. Recent estimates suggest that perhaps 20 billion cubic feet (BCF) of gas remains to be discovered in the Clinton Group (Van Tyne and Copley, 1983). Better data are available for estimating both Medina gas production and reserves. Total probable and possible reserves of Medina Group gas are estimated to be more than 2500 BCF, which represents 66 percent of the total probable and possible gas reserves for the State (Van Tyne and Copley, 1983).

# 4. Devonian Period

The Devonian rocks in New York State were deposited from 395 to 345 million years ago, and form one of the most fossiliferous rock sequences from this period in the world (Fig. 5.4). The standard reference section for Devonian deposits within the entire Appalachian Basin lies in New York.



FIGURE 5.4 - DEVONIAN BEDROCK IN NEW YORK STATE

Almost all of the State south of the Mohawk River and west of the Hudson River is underlain by Devonian rocks. The Devonian System in New York is represented by, in ascending sequence, the Helderberg Group, Tristates Group, Onondaga Formation, Hamilton Group, Tully Formation, Genesee Group, Sonyea Group, West Falls Group, Canadaway Group and Conewango Group. The youngest groups, the Canadaway and Conewango, occur only in western New York and the oldest, the Helderberg and Tristates Groups occur throughout New York.

By earliest Devonian time a land barrier to the east had eroded sufficiently to permit a fresh influx of seawater into the landlocked supersaline sea which persisted during the late Silurian Period. The decreased salinity produced an environment in which marine life was abundant, with almost unrestricted growth of carbonate-producing organisms such as corals and bryozoans. The earliest Devonian rocks in the Helderberg Group were deposited at this time, and contain well-preserved fossils of this early life. This thick sequence of limestone is prominently exposed as the Helderberg Escarpment southwest of Albany.

The Helderberg Group in central and southeastern New York may be divided into two formations: the underlying Rondout Dolomite and the Manlius Limestone. In the subsurface, the thin Rondout is commonly mistaken for, or considered to be part of the Upper Silurian Akron Dolomite. The combined Rondout and Akron are lateral equivalents of the Bass Islands Formation elsewhere. Through repeated use of this driller's misnomer, the Rondout and Akron have become known as New York's "Bass Islands Formation," and are considered to be the reservoir beds for the oil and gas produced throughout the Bass Island trend. This complex, faulted reservoir is discussed in detail in section 5.D.1. After deposition of the Helderberg Group the sea withdrew and the period of erosion which followed removed these early Devonian deposits in many places.

When the level of the sea rose again, the Oriskany Sandstone was deposited upon the eroded top of the underlying limestones. Near Oriskany Falls in Oneida County this sandstone is a white quartz sandstone, but it is more commonly light to dark gray in color. The Oriskany, part of the Tristates Group, is the only early Devonian formation which contains significant amounts of gas. It has also been used in manufacturing glass. The Oriskany Sandstone was deposited in a fluctuating shoreline of a rising sea but the distribution and thickness of the Oriskany Sandstone is very irregular, because erosion at the end of Oriskany time removed the sand from formerly high areas to the north. A thick interbedded sequence of sandstone. The environment in which the upper Tristates Group was deposited was so muddy and turbid that few marine organisms could survive.

By Middle Devonian time, New York State was covered by a warm shallow sea. In this environment the Onondaga Limestone was deposited, and contains well-preserved fossils, including reef-building corals, trilobites and the remains of primitive marine fish. In the eastern portion of the State, the underlying early Devonian rocks grade upward into the Onondaga without noticeable breaks, but in the western portion, the Onondaga Limestone rests disconformably on late Silurian rocks. Both oil and gas occur in the Onondaga Limestone in central and western New York, and some gas is produced from reefs which flourished along the margins of the basin.

Following the deposition of the Onondaga, a period of uplift and mountain building occurred. Known as the Acadian Orogeny, it was centered in the east, off the coast of what is presently New England. Thick sands and shales were deposited across New York, and the entire Middle and Upper Devonian sequence was probably formed as a series of coalescing deltas draining this eastern chain of mountains. Fan-shaped deposits of mud, sand and silt accumulated in

fresh or brackish water environments in the east, and spread out across the State to encroach upon and fill the sea lying to the west.

The base of the Hamilton Group of Middle Devonian age is marked by the Marcellus Formation. The first of several massive black shale formations of Middle and Upper Devonian age, the Marcellus will produce natural gas where it is sufficiently fractured to create a network of cracks, allowing the gas to migrate to the wellbore. The Marcellus Formation is the most strongly radioactive of the Devonian shales and is a good marker bed on gamma ray logs.

The remainder of the Hamilton Group is a series of gray shales, siltstones, sandstones, accumulations of shell debris, and flat pebble conglomerates. These rocks have abundant cross-bedding and ripple marks, and were deposited in shallow water near the margin of the continental shelf and in near-shore environments (Rickard, 1975).

A change in relative sea level in the west and central part of New York caused an abrupt break in deposition and a withdrawal of the sea to the west. In the west, the top of the Hamilton Group was exposed and partially eroded. In the restricted western basin which developed, iron-bearing nodules of pyrite and marcasite formed on the sea floor.

The Tully Limestone was deposited when the sea again rose to inundate the eroded surface of the Hamilton Group at the beginning of Upper Devonian time. The Tully Formation which is thickest near the central portion of this eroded plain, is absent in the east because of the deltaic deposition and thins toward the west because of subsequent erosion. The Tully Formation forms a continuous limestone deposit extending from Virginia to New York.

During the erosion of the Hamilton Group, and subsequent deposition of the Tully Limestone in Western and Central New York, normal deltaic deposition was continuing without interruption in Eastern New York. After the deposition

of the Tully, deltaic deposition resumed in the western part of the State.

The black muds of the Genesee Group lie above the Tully Limestone, and were deposited in a deep basin environment. With little wave activity to generate currents, much of the organic debris incorporated with the muds was preserved under the anaerobic (reducing) conditions which existed in the deep water covering western New York. The entire Genesee Group is composed of a series of black and gray shales, mudstones, siltstones, and muddy limestones, and represents a deltaic wedge migrating westward. As part of the Catskill Delta, the sedimentary units of the Genesee Group pinch out to the west. Underwater distributary channels, sediment fans, and local thinning of units due to upward movement in the underlying Salina salt deposits, also occur within the Genesee Group. Overlying the basal Geneseo black shales of the Genesee Group, is a zone of silty nodular limestone.

The Sonyea Group overlies the Genesee Group without interruption in the depositional record, and in turn is overlain by the West Falls Group. Both groups contain interbedded shales and siltstones and are similar to the Genesee Group.

Upper Devonian rock units are characterized by cycles of black shales and intervening gray shales, which are separated by great thicknesses of clastic sediment derived from the highlands to the east. These cycles were probably controlled by episodic Acadian mountain-building activity and subsidence along the young Appalachian Basin. The Middle and Upper Devonian sequences of interbedded marine and non-marine clastic sediments, and marine limestone beds, represent the interplay of these forces with changes in climate, to produce a changing sequence of rock types.

Rocks younger than Devonian occur only in scattered places along the Pennsylvania border. A quartz pebble conglomerate preserved near Olean records the brief return of the sea during Early Pennsylvanian time. During

the remainder of the Paleozoic Era, a rugged chain of mountains, the ancestral Appalachians, were formed. Although the Appalachian Orogeny produced folding and faulting in the eastern portion of the State, only regional uplift occurred throughout the rest of New York (Broughton, 1966).

The structural configuration of the Devonian strata above the Late Silurian salt beds changes significantly. Because salt is readily deformed and flows plastically under compression, it forms a poor base for overlying sediments. During the Appalachian Orogeny, Silurian strata were subjected to strong compression, as a collision between two continents destroyed the proto-Atlantic Ocean. These intense forces created a zone of decollement, or detachment, within these strata as the overlying sequence was thrust to the west, sliding over the weaker salt beds. Different styles of deformation occur in the rocks above and below the zone of detachment. The faults, folds and associated fracture systems formed during the Appalachian Orogeny have been of primary importance in trapping oil and gas in the overlying Devonian strata. The major oil and gas producing Devonian strata are detailed from oldest to youngest.

# a. Oriskany Sandstone Formation

The discovery of gas in 1930 in the Wayne-Dundee Field in Schuyler County, and other Oriskany development throughout the early 1930's, helped to bring New York's natural gas production to an all time high of over 39 billion cubic feet in 1939. The discovery well in this field was less than 2,000 feet in depth but had an initial open flow of 6,000 MCF per day at a pressure of 730 psi. Very high pressures and reservoir capacities are typical of Oriskany production. Many of the older depleted Oriskany gas fields, such as the Wayne-Dundee, are now used for gas storage. The porosity of the Oriskany sandstone averages only 7 percent but permeability is commonly quite high due

to fractures.

Thirty-six Oriskany gas fields have been discovered in New York (Van Tyne, 1981), and Oriskany wells are most productive in Allegany, Steuben, Yates, Schuyler and Chemung counties. The regional dip averages 40 to 50 feet per mile, but a series of anticlinal folds trending northeast to southwest in western New York, and east to west in central New York, are superimposed on the regional dip. Commercial Oriskany production is found in structural traps at the top of faulted anticlines, or along the updip limit where erosion has removed the Oriskany. The axes of the anticlines parallel the direction of the faulting in the central part of the State, but where the axial directions of the anticlines change from northeast to east, the faults appear to cut across the folds. Faulting associated with domes and anticlines makes the Oriskany more porous and productive in these areas.

Some gas fields also occur where the Oriskany pinches out updip to the north. Intergranular porosities average only 6 percent in these field and they are less productive than fields producing from the faulted and fractured anticlines. Although the pinchout boundary is difficult to locate, several fields have been found along it. The largest Oriskany pinchout field in New York lies in the Allegany State Park.

## b. Onondaga Limestone Formation

The Onondaga Formation is a fossiliferous, massive gray limestone. Porosity in this formation is either primary porosity preserved in fossil reef organisms, or occurs along fractures associated with faulting. A hiatus in the sedimentary record separates the Onondaga Formation from the underlying Late Silurian rocks in western New York, but no evidence for this gap exists in the eastern part of the state.

Good gas flows have been encountered in the Onondaga. Gas production has been scattered throughout western New York and was usually found by accident.

One early Onondaga well, drilled in Erie County in 1880, was reported to have an initial open flow of 25 million cubic feet a day.

Some good production has occurred where reef mounds in the basal Onondaga formed near the basin margin. The first productive reef field was discovered in the Cornell No. 1 well near Jasper in Steuben County in 1967. Other subsurface reefs, capped by overlying shales, have since been discovered elsewhere in Steuben and Cattaraugus Counties. The reefs are as much as 200 feet thick, and have excellent porosity and permeability, allowing the reservoir to be drained efficiently by few wells. Although no additional reef fields have been discovered since 1974, future discoveries along this trend are expected.

# c. Tully Limestone Formation

The Tully Limestone is a thin zone of gray-brown limestone which forms an important marker bed dividing the Upper and Middle Devonian rocks in New York. The Tully Limestone typically has low permeability except where intense faulting has created a network of interconnecting fractures.

Limited gas production has been found in the Tully, primarily in one small gas field in Allegany County. Some production potential exists in the Tully and other Upper Devonian limestone beds where faulting has created interconnecting fracture porosity and permeability.

#### d. <u>Devonian Black Shale Production</u>

The first natural gas well in the United States was drilled in Fredonia, New York, in 1821, and produced a few thousand cubic feet a day for over 35 years from Upper Devonian black shales. Low productivity but long well life characterize Devonian black shale production.

Gas in the Devonian black shales is trapped where it formed because of the low porosity and permeability of the rock matrix. Production can occur

only where fractures create pathways which allow the gas to migrate.

Five of the Devonian shales have been identified as potential gas producers and these are, in ascending order, the Marcellus Formation in the lower part of the Hamilton Group and the Genesee, Middlesex, Rhinestreet and Dunkirk Formations. Eight small Devonian shale gas fields exist in the State, although presently most are shut-in. Although none form large fields, the huge area underlain by gassy shales makes them a significant contributor to New York's resource base.

The first black shale gas field, the Lakeshore Field near Lake Erie, is still operating, but most of the gas production now comes from deeper Medina gas wells. The original development of the black shales took place during the 1880's and early 1900's when these wells were drilled to depths of 100 to 300 feet, and completed in the Dunkirk Shale of the Canadaway Group.

Three additional black shale gas fields, the Naples, Rushville and Dansville fields, were first produced in the late 1800's. In the 1900's, the Rathbone, Bristol, and Genegantslet shale gas fields were discovered. Although production from these last three fields was lower than production from the Lakeshore Field, they exhibit excellent fracture permeability, probably created by the loading and subsequent removal of glacial ice and overburden.

In 1976, the U.S. Department of Energy (DOE) began to evaluate the potential of Devonian shale gas in the Appalachian Basin under the Eastern Gas Shales Project. These studies attempted to develop improved methods for producing shale gas reserves toward a long term goal of increasing the ultimate resource recovery, enhancing local gas supplies, and lessening national dependency on foreign energy imports. Studies in this program found that the Devonian shales in western New York contained from 10.6 MCF of recoverable gas per acre-foot in the Rhinestreet Shale, to 16.3 MCF/acre-feet

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in the Java Shale (Van Tyne, 1980).

More recently, the Independent Oil and Gas Association of New York published their estimates of the Devonian shale gas reserves for the State. While admitting that the economic justifications preclude development on a massive scale at this time, the authors conclude that New York's shale gas reserve is 50 billion cubic feet (Van Tyne and Copley, 1983).

#### e. Upper Devonian Oil Producing Sands

Oil-producing Upper Devonian sands are concentrated in the southwestern part of the State along the northern Allegany Plateau province. Structurally, this province is a broad regional trough whose axis trends northeast to southwest, and forms the northern extension of the Appalachian Synclinorium. The prominent folds of the Appalachian Basin become very broad and gentle and die out in New York. Most of the oil in New York is produced from stratigraphic traps although the two largest oil fields, the Bradford and Allegany, are slightly folded. The location of oil pools is controlled primarily by changes in the environment of deposition, which effects porosity and permeability. Most of the Upper Devonian oil fields occur in Allegany, Cattaraugus, Chautauqua, and Steuben counties.

The Upper Devonian sands producing the most oil are the Chipmunk, Scio, Bradford Second, Penny, Richburg, Bradford Third, Clarksville, and Waugh and Porter. The Bradford Third may be laterally equivalent to the Richburg Sand, and extends over 400 square miles. These sands are mineralogically quite varied, and contain abundant, scattered lenses and channels. The Bradford Third Sand and other Upper Devonian sands are properly classified as finegrained graywackes or schist arenites based on their mineral composition and grain size.

Porosities and permeabilities in the main Upper Devonian producing zones

are good for New York, but quite poor when compared to other oil producing areas in the country. Richburg Sand porosity varies from 12 to 14 percent and the average permeability ranges from 3 to 10 millidarcies. The average thickness of the net production zone is 18 feet. Porosity in the Bradford Third Sand ranges from 11 to almost 18 percent, and permeability varies from 5 to 15 millidarcies. The net sand thickness of the Bradford Third ranges from 25 to 55 feet. The Chipmunk and Bradford Second Sands are fine-grained sandstones with average porosities of 22.5 percent and 16.1 percent respectively in the better fields.

The producing sand bodies commonly grade into shale near the boundaries of the sand body, or contain gas at the limits of oil production. The oil is typically high grade, paraffin-base oil with A.P.I. gravities ranging from 39° to 45°. The interbedded and underlying black and gray shales were probably the source beds for the oil.

New York's oil fields have had very long lives, and most were discovered prior to 1900. Although many are substantially depleted and economically marginal under current conditions, waterflooding and improved hydraulic fracturing techniques have extended their lives.

### D. OTHER AREAS OF OIL AND GAS INTEREST

Some areas have unknown or highly speculative potential for oil and gas production. The first discovery well in the highly productive "Bass Island" structure was drilled in 1981, yet many wells drilled today within the "Bass Island" fairway will not be productive within that horizon. The deep sedimentary strata beneath the eastern overthrust are still largely unexplored, and their production potential awaits testing by the drill.

## 1. "Bass Island" Trend

The complex "Bass Island" structure was discovered in 1978 when it was mapped as part of the U.S. Department of Energy's Eastern Gas Shales Project

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(Van Tyne, 1980). The map in Figure 5.5 indicates the location and extent of this trend in New York. Only after the Torrey No. 1 test well blew out and caught fire after encountering unexpectedly high gas flows above the Medina Formation, did the real nature of the reservoir become apparent. Several subsequent rig fires caused the DEC to impose strict safety requirements for "Bass Island" wells, including the use of blow-out preventers, and drilling through the target zones during daylight hours.

Production in this structure is found primarily in the Lower Devonian Onondaga Limestone, and Upper Silurian Akron and Bertie Dolomites. To local oil and gas operators, the Akron is known as the Bass Island Formation, the name of the laterally equivalent formation in Ohio and Michigan. Through repeated use, the structure became known as New York's "Bass Island" trend.

Two geological models of the "Bass Island" trend have been proposed. One model proposes that it is actually a series of thrust faults originating from a decollement, or detachment surface in the Vernon Formation of the Lower Salina Group. Detachment surfaces like this occur throughout the Allegheny Plateau, and are typically associated with intense deformation of the overlying rocks. Comparing maps of the areal extent of the dolomite and anhydrite beds within the Vernon Formation indicates that this fault zone corresponds to the updip pinchout of the salt beds. The "Bass Island" trend has been interpreted as the farthest expression of the Appalachian decollement within the continental interior of New York. A second model proposes that the "Bass Island" trend was created by density adjustments causing vertical movements within the sedimentary deposits above the salt which resulted in high angle reverse faults forming multiple horst-graben, or high-low, structures.

Electric logs can be used to trace this narrow zone of faults for at



FIGURE 5.5 "BASS ISLAND" TREND OIL AND GAS FIELDS

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least 60 miles across the state, extending into Pennsylvania toward the southwest and terminating in the northeast at the Zoar gas field in Erie County. Repeated stratigraphic sections on electric well logs indicate that the thrust faults originate in the Vernon Formation at the base of the sequence, cut upward at steep angles through the overlying rocks, and die out in the Hamilton Group shales. Vertical displacement along these faults ranges from only a few feet to more than 200 feet. Traps for oil and gas can occur at almost any level within a structure of this complexity: in the roll-overs of drag folds on the hanging walls of the faults, below permeability barriers which intersect the faults in the foot wall, or in zones of intersecting fractures. Unlike classical oil and gas reservoirs, the best production is found in the intersecting network of fractures and faults rather than the rock matrix itself.

Wells producing from the "Bass Island" trend, average 3,000 feet in depth, and may produce gas, paraffin-base crude oil, or both. Typical "Bass Island" open flow rates can be 600 bbls/d of oil, or 10 MMCF/d (million cubic feet per day), or both. However, production rates average 50 to 150 bbls/d of oil, and 100 MCF/d to 1 MMCF/d of gas, depending on the producing capability of each individual well. Development is spotty, with dry holes offsetting good producers in this complex, faulted structure. Recoverable reserves are estimated to be over 2 million barrels of oil (0il and Gas Journal, June 6, 1983), and from 40 to 60 billion cubic feet of gas (Van Tyne and Copley, 1983).

## 2. Eastern Overthrust

One of the largest and least explored areas potentially productive of oil and gas is the 60,000 square mile Appalachian overthrust (Fig. 5.6). As geologists learned to interpret the complex folding and faulting of overthrust belts and discovered numerous oil and gas fields in the western overthrust extending from Canada to New Mexico, they became increasingly interested in



the "barren" Appalachian overthrust.

The former edge of the proto-Atlantic shelf is roughly aligned with the New York-Vermont border. Oil and gas which form in the organic-rich deposits of the slope, continental rise, and basin margin, will migrate upward and be trapped in shelf edge sediments over time. Intense thrusting during the Taconic Orogeny of the late Ordovician and the Appalachian Orogeny in the Triassic transported the slope, rise, and basin margin deposits well to the west of their original location. Thick slices of impermeable shale and metamorphic rocks were thrust westward over the less metamorphosed and unmetamorphosed Paleozoic reservoir beds. Repeated many times, this creates an imbricate, or layered, sequence of older rocks stacked above younger, relatively undeformed basement rocks. An overthrust margin can be an ideal structure for trapping large volumes of oil and gas.

In the early 1980's several companies conducted seismic studies in the northeast, from northern Vermont to southern Pennsylvania. Improved geophysical methods allowed geologists to "see" through the older, overlying strata and evaluate potential reservoirs below. Meanwhile, deep overthrust wells drilled in Tennessee and West Virginia have been productive.

Although some shallow wells were drilled in Greene and Ulster counties in the early 1960's, New York's most recent deep test of the eastern overthrust was the Finnegan No. 1, drilled in 1983 by Columbia Gas Transmission Company. Located in Easton Township in Washington County, the well was more than 160 miles east of the nearest known production in Oneida County's Rome field. After drilling to 7,764 feet, the well proved to be a dryhole. Stating that data from the well indicated "limited potential for commercial quantities of oil and gas in the eastern New York area," Columbia plugged and abandoned the well in October, 1983 (Appalachian Basin Report, Petroleum Information Corp.,

March 9, 1984).

Columbia drilled a subsequent well, the Burnor No. 1, near St. Albans in Franklin County, Vermont, in 1984. After drilling to 6,969 feet at this location, the company also plugged and abandoned this well.

Although the most recent tests of New York's overthrust have been dry holes, a history of drilling many dry holes prior to discovery in the western overthrust suggests that more wells may be drilled in the near future.

### E. GEOTHERMAL RESOURCES

The temperatures underground (geothermal gradient) normally increase with depth at a rate of roughly 15°C per kilometer (km) or 10°F per 1,000 feet. However, certain geologic conditions can increase the temperature gradient creating a reservoir of natural heat close enough to the surface to make it economically recoverable. One of the best known examples is the Geysers geothermal area in California where the temperature in the producing zone reaches 500°F. The most likely source of this heat is a large siliceous igneous body located below the Clear Lake Volcanic field (Goff and Donnelly, 1977).

There are primarily low temperature geothermal resources in the eastern United States (below 212°F). According to the American Association of Petroleum Geologists (AAPG) 1979 temperature gradient map of the United States, two of the most prominent geothermal anomalies in the eastern U.S. are located in central and western New York (NYS Energy Research and Development Authority, 1983). Regionally, central and western New York consists of a sequence of flat-lying carbonates, dolomites and sandstones. The basal Cambrian age Galway (also called Theresa) and Potsdam formations are believed to possess the greatest potential for geothermal energy recovery in New York State (See 5.C.1 for detailed formation descriptions). These formations contain water bearing horizons which are heated by the Pre-Cambrian basement

beneath. The hot brine can be pumped out, the heat extracted and the waste brine returned to the reservoir.

In 1981, Hodge et. al., used revised temperature gradient maps, Bouger gravity maps and estimated heat flows from Silica geothermometry to confirm the existence of the two anomalies identified by the AAPG and better define their locations. The East Aurora anomaly is southeast of Buffalo and has a gradient estimated as high as 27°C/km or 24.6°F/1,000'. The Gayuga County anomaly is located between Rochester and Penn Yan. The center of this anomaly is near Cayuga Lake, and its geothermal gradient is estimated to be as high as 30°C/km or 26.2°F/1,000'. The authors attributed the high temperatures and negative gravimetric anomalies at East Aurora to a granitic pluton located near the top of the Pre-Cambrian basement. They concluded that the radiogenic heat from the granitic rocks in the Pre-Cambrian is the source of the thermal anomalies. More recently, Hodge contends that the anomalies result in part from hydrothermal convection in the fractured Pre-Cambrian basement rock (Hodge, 1983).

In 1982, New York's first geothermal well was drilled south of Auburn near the Cayuga County anomaly. The Auburn No. 1 encountered major geothermal water bearing zones in the Theresa and Potsdam formations at depths of 4,740' and 4,950'. The temperature of the water at the wellhead is in excess of 125°F, and it is used for space and domestic hot water heating requirements at Cayuga Community College and Auburn City Schools. This experimental well was sponsored by the New York State Energy Research and Development Authority (NYSERDA) as part of their ongoing geothermal research program.

#### VI. ENVIRONMENTAL RESOURCES

## A. INTRODUCTION

It is State policy to "conserve, improve and protect our natural resources and environment and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the State and their overall economic and social well being". The State's environmental resources require special attention in this regard because of their often fragile nature and their social and economic importance. Once these areas are significantly changed or altered, it may not be possible to return them to their original state.

The production of oil, gas and salt are a few of the many human activities with the potential for disrupting the environment. To date, the oil and gas industry has been concentrated in rural portions of New York. With the gradual depletion of hydrocarbon resources in established areas and areas of easy access, the search for hydrocarbons may extend to other parts of the State. When the search extends into areas with steeper slopes, wetlands or centers of higher population, greater conflicts may be encountered. The potential impacts on the State's environmental resources must be carefully considered when conducting oil, gas and solution salt mining related activities.

A broad background of the State's environmental resources is provided in the following sections along with legislative protections, other than SEQR, guarding these resources from potential impacts. These resources are discussed in the following order: waterways/waterbodies; drinking water supplies; public lands; coastal areas; wetlands; floodplains, soils, agricultural lands; intensive timber production areas; significant habitats; areas of historic, architectural, archeological and cultural significance; clean air; and visual resources. Chapters 8, 9, 10, 11, 12, 13, 14 and 15

contain more detailed analyses of the specific potential environmental impacts of oil, gas and solution mining development on these resources, as well as the mitigation measures required to prevent these impacts.

#### B. WATERWAYS/WATERBODIES

Water quality and quantity are major factors in determining the suitability of an area for human use. New York is blessed with an abundant supply of freshwater including 3.5 million acres of lakes, 70,000 miles of rivers and streams, and an average annual precipitation level of 40 inches. There are 17 watershed drainage basins which collect the State's water supply. With increasing population and development pressures, measures must be taken to ensure that quality water is available for drinking, as well as for recreational, municipal, commercial and industrial uses.

Waters in New York State are classified based on their quality, location and their best use in the interest of the public as required by Title 3 of Article 17 of the Environmental Conservation Law. Part 700 of Title 6 NYCRR identifies fresh surface water classifications in New York State as follows: AA and A classifications are for drinking water and culinary or food processing purposes; B waters are for bathing; C for fishing; and D waters are for industrial cooling or processing water supply. A "T" in parentheses after the AA, A, B or C classification indicates that the dissolved oxygen concentration of the water body is suitable for trout spawning. Title 5 of Article 15 of the Environmental Conservation Law prevents any person or public corporation from changing, modifying or disturbing the course of any stream classified as AA, AA(T), A, A(T), B, B(T), or C(T) or removal of sand and gravel or other materials therefrom without a permit from DEC.

Water quality levels of the State are controlled through the State Pollution Discharge Elimination System (SPDES) Law. This law regulates,

through a permit system, discharges into surface and groundwater of the State by specifying limited quantities of identified substances that can be discharged.

Rivers with outstanding natural, scenic, historic, ecological and recreational values can be preserved, protected and enhanced through the Wild, Scenic and Recreational Rivers Law. Over 1,200 miles of rivers have been designated as Wild, Scenic and Recreational Rivers in New York State - giving New York the largest system in the nation. Most sections of rivers designated under this Act are in the Adirondack Park.

#### C. DRINKING WATER SUPPLIES

Roughly, 34 percent of the freshwater consumed in New York State, serving 6.2 million people, comes from groundwater supplies (NYS Department of Health, 1981). In Upstate New York approximately one-third of this groundwater use, serving 2 million people, comes from private water wells (NYS Department of Health, 1981). The remainder of the State's water use comes from 324 reservoirs (NYS DEC Division of Water, 1985a) and from other surface water supplies. Surface water supplies include streams, rivers, lakes and reservoirs, as well as the watersheds that supply them. Groundwater supplies come from aquifers of varying sizes. A formation that can supply water in significant amounts is called an aquifer. Aquifers are usually composed of sand and gravel, but any porous and permeable formation that can supply water in significant amounts is called an aquifer (see Figure 6.1). Approximately 10 percent of Upstate New York's land area and all of Long Island is underlain by potential drinking water aquifers (NYS DEC Division of Water, 1985a). Many of the groundwater supplies in the western portion of the State are located in the same vicinity as oil and gas operations.

Draft Upstate and Long Island Groundwater Management Programs have been prepared by DEC's Division of Water. These documents review facts about

FIGURE 6.1

# Ground Water Aquifers and Their Uses



groundwater, describe the problems facing New York's groundwaters, summarize government programs which affect them and recommend management actions which federal, state, regional and local governments should take. Because of groundwater's relatively slow flow rates, contaminants introduced into an aquifer usually cannot be removed except over long periods of time. Hence, proper management is essential.

The draft plans identify two types of significant aquifers in New York State, primary and principal. Figure 6.2 shows that both types often coincide with the State's major stream valleys. This is because the sloping valley topography naturally funnels precipitation from large areas down into the valley, where highly permeable sand and gravel deposits can be found.

Primary and principal aquifers are defined by their level of use. Primary water supply aquifers are defined as highly productive aquifers presently being heavily utilized for public water supplies serving over 1,000 people. On Long Island, primary aquifers serve as the sole source of water for roughly three million inhabitants (NYS Department of Health, 1981). Principal aquifers are underground formations known to be highly productive or whose geology suggests abundant potential supply, but which are not presently heavily used for public water supply. The remaining sources of groundwater in the State are largely low-yielding and suitable only for relatively scattered individual household supplies. The U.S. Geological Survey has prepared detailed topography maps of 11 of the 19 primary aquifer areas. DEC has available, or will have available in the near future, detailed maps of the remaining 8 primary aquifers. In addition, regional aquifer maps at a scale of 1:250,000 are being prepared by the U.S.G.S. under contract with DEC and will be available by early 1987.

The State Sanitary Code sets the standards for public water supply



FIGURE 6.2 6-4a systems, water well construction, protection of underground and surface sources of drinking water and classifies community water system operations. This code is enforced by the NYS Department of Health.

State legislation has been adopted to prohibit certain incompatible uses over federally designated sole source aquifers. The federally designated aquifers in New York cover Brooklyn, Queens, Schenectady, Binghamton-Johnson City and all of Nassau and Suffolk Counties. The law defines incompatible uses as: 1) direct or eventual discharge to groundwater of hazardous waste or any other substance designated by the Department that may contaminate the groundwater, and 2) storage of any such substance in sole source aquifer areas. Implementing regulations have not yet been adopted by the State.

In accordance with the Federal Safe Drinking Water Act, an Underground Injection Control Program has been developed by the U.S. Environmental Protection Agency (EPA) to protect underground sources of drinking water from improper emplacement of fluids through injection wells. The EPA New York City Regional Office administers the program for New York State. This program went into effect June 25, 1984 with compliance required by June 1985. There are five classes of wells which are regulated by this program. Two of these classes of wells are associated with oil, gas and solution mining: 1) Class II wells are injection wells associated with oil and gas production and liquid hydrocarbon storage and 2) Class III wells are defined as special process wells used in conjunction with solution mining of minerals. Drilling permits, monitoring and completion reports, rework records and plugging and abandonment plans, required by EPA for these wells, are similar to those required by DEC under the State's Oil, Gas and Solution Mining Program.

Watershed rules and regulations may be adopted by the Commissioner of Health to protect any or all public water supplies, under Section 1100 of Article 11 of the Public Health Law. The policy of the Health Department is

to only enact these rules and regulations when a specific request is made by a water supplier (NYS DEC, Division of Water, 1985a). The supplier then drafts regulations in consultation with the local public health engineer. The regulations can protect against a variety of potential threats to the water supply.

#### D. PUBLIC LANDS

There are a wide variety of public lands owned by New York State. These public lands are used for wildlife management, recreation, and/or are preserved for future generations to enjoy in their natural state.

The largest public land holding is the State Forest Preserve which includes approximately 2,500,000 acres of Adirondack and 272,000 acres of Catskill Forest Preserve lands. These are the most strictly protected public lands in New York and are governed by Article XIV, Section I, of the State Constitution which provides that:

"The lands of the State, now owned or hereafter acquired constituting the Forest Preserve as now fixed by law, shall be forever kept as wild forest lands. They shall not be leased, sold or exchanged or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed."

The State also owns approximately 700,000 acres of State Forests outside the Adirondack and Catskill Parks managed by the DEC Division of Lands and Forests. Reforestation areas which comprise nearly 85 percent of the State Forest Lands are to be forever devoted to "reforestation and the establishment and maintenance thereon of forest for watershed protection, the production of timber and for recreation and kindred purposes..." The remaining 15 percent of State Forest lands outside the park are multiple use and environmental quality bond acquisitions.

Wildlife management areas cover another 170,000 acres in New York. These are managed by DEC's Division of Fish and Wildlife for conservation of animal and plant wildlife.

State Parkland is another major category of public lands in New York State. The Adirondack, Catskill and Allegany Parks are the largest and most important in the State. The Adirondack and Catskill Parks not only contain the State's Forest Preserve but also include substantial private lands. The Adirondack Park which is 40 percent publicly owned is approximately six million acres or the size of Vermont. The private lands of the Adirondacks fall under the administration of the Adirondack Park Agency, as provided for by the Adirondack Park Agency Act. All private lands are classified and a variance must be obtained from the APA or the local jurisdiction if an alternate use is desired for a particular area. The DEC's, Division of Lands and Forests manages the Forest Preserves and the Department of Parks, Recreation and Historic Preservation manages Allegany State Park and other State Parks exclusive of the Adirondacks and Catskills.

According to the State's Comprehensive Recreation Plan prepared by the New York State Office of Parks, Recreation and Historic Preservation, there are also 1,090,259 acres of local, state and federal recreational areas scattered throughout the rest of the State. Providing outdoor recreational opportunity for people is the primary focal point of the State's Park and Recreation Plan coupled with the recognized need to protect fragile land and water resources.

#### E. COASTAL AREAS

Coastal areas are sensitive because their proximity to water makes them attractive for numerous activities which may or may not be compatible. The Final Coastal Management Plan adopted by New York State under the Federal Coastal Zone Management Act (CZMA) sets the policy for activities taking place

in coastal areas including the Long Island shore, New York Harbor, Saint Lawrence River and Great Lakes coastlines and the Hudson River Estuary. New York's management program is intended to "promote the beneficial use of coastal resources, prevent their impairment, and deal with major activities that substantially affect numerous resources".

Any coastal project or activity which would normally require an Environmental Impact Statement or Negative Declaration under the State Environmental Quality Review Act, must also be consistent to the maximum extent practicable with the State Coastal Management Plan. An approved Coastal Assessment Form or Certificate of Consistency from the New York State Department of State is required. Consistency with a Local Waterfront Revitalization Plan must also be shown if a proposed action will be located in a community with an approved plan or one under review by the Department of State. Adoption of the local plans is authorized under the Waterfront Revitalization and Coastal Resources Act, Article 42, Executive Law.

#### F. WETLANDS

Wetlands are areas such as swamps, marshes or bogs which are either covered with water or have waterlogged soils. Wetlands are found in numerous shapes and sizes, and contain a variety of wildlife and vegetation including aquatic and semi-aquatic plants. They are found in many different places including edges of waterbodies, woods, in open fields or on farmland.

Wetlands are invaluable resources for flood control, erosion control, wildlife habitats, open space and protection and cleansing of water resources. For these reasons, many problems can arise if wetlands are disturbed. Dangerous flooding could occur if wetlands are filled in because these areas normally absorb extra water. In addition, waters which are protected and cleansed by wetlands may become contaminated if the wetlands are eliminated.

Specific State protection of freshwater and tidal wetlands is provided by Articles 24 and 25 of the Environmental Conservation Law. These Acts require mapping of wetland areas and the establishment of permitting procedures for activities proposed in wetland areas. Under the Freshwater Wetlands Act, all freshwater wetlands over 12.4 acres in size are regulated as well as smaller wetlands of unusual local significance. Local governments may assume jurisdiction for implementing the Freshwater Wetlands Regulations if they enact the proper local legislation and show the technical and administrative capability to manage the program. In addition, if a proposed project would involve the filling of a wetland, a federal permit may also be required pursuant to section 404 of the Federal Clean Waters Act of 1977, as amended.

# G. FLOODPLAINS

Floodplains are lowland areas which serve to carry extra water when a rainstorm, melting snow or other phenomena cause streams or rivers to swell above their normal banks. Though normally dry, these areas are actually a part of the waterway and are needed to hold excess water after conditions such as heavy rain or thawing occur. Severe loss of life and property can arise when development takes place in these areas. The primary flood problem areas in New York State are found in the Allegany, Chemung, Susquehana, and Lower Hudson Drainage Basins.

The Federal Emergency Management Administration, authorized by the National Flood Insurance Act of 1968, has identified a "100 year flood line" along shorelines, downstream segments of creeks and around embayments which border sensitive flood prone areas. The 100 year floodline is the calculated water surface elevation having a one-percent chance of being equaled or exceeded in a given year as a result of a flood. Local communities that have flood prone areas are developing long term flood management programs, with the assistance of DEC and the federal government. Adoption of programs meeting

National Flood Insurance Act standards enables them to purchase flood insurance.

For communities which have not qualified or are not participating in the federal program, regulations were adopted by DEC to meet the minimum standards of the Act (6NYCRR Part 500). These regulations require that a permit be obtained from DEC before any project commences in a flood prone area.

## H. SOILS

New York contains a wide variety of soil types. Due to the glacial origin of the majority of the State's soils, it is common for land parcels of 50 to 150 acres to contain three to five different soil types. The diverse characteristics of the soils on a parcel have a direct influence on their natural suitability for different uses of the land. For example, soils with a low lime content may not be suited to certain agricultural crops and cannot adequately neutralize acid substances introduced in the environment. Thin, sandy, or droughty soils and soils on steep hillsides are susceptible to erosion. Wet soils cannot support permanent structures without special precautions.

Figure 6.3 shows the lime content of New York soils. Most New York soils have a low to very low lime content. Figure 6.4 illustrates a variety of other soil limitations in New York including those that are droughty, shallow, stony, wet or located on hillsides or more mountainous terrains. As the map shows, the diversity and interspersion of soils in the State makes it difficult to generalize about the susceptibility of soils to any one type of activity.

The USDA Federal Soil Conservation Service has mapped and described in detail the soil types of each county. County Soil and Water Conservation Districts (SWCD's) provide soils data and administer the State Conservation


Department of Agriculture & Markets



Compiled in 1976 by M.G.Cline and R.L. Morahall, Cornell University Experiment Station

Planning Law for the majority of the State's private land resource. SWCD's can also assist in choosing sites for particular activities to minimize impacts. Most counties had detailed soil surveys done in the 1960's - 80's. Depending on the county, however, data may also be available from the 1920's and/or 1930 - 1950's.

In addition to data available through the soil surveys, the New York State Land Classification System (LCS) ranks the natural capability of every soil type throughout the State for agricultural production. The LCS is a ready source to identify prime agricultural soils (soil groups 1 - 4), midrange agricultural soils (soil groups 5 - 7) and marginal to poor soils (soil groups 8 - 10).

#### I. AGRICULTURAL LANDS

Agricultural production is vitally important in New York since 33 percent of the State's land resources are devoted to farm ownership and \$2.8 billion in farm commodities are produced annually (Blot, 1985, personal communication #4). In addition, there are roughly 4,000 agricultural service firms, and close to a total of 1,500 farm equipment dealers, farm supply companies, and handlers of raw farm products (Blot, 1985, personal communication #4). There are also nearly 160 producers of agricultural chemicals and firms manufacturing farm and food product machinery. The 1977 Census of Business Industry indicates that there are 175,200 workers employed in New York's food processing industry (Blot, 1985, personal communication #4). The value added by the manufacture of food and kindred products was \$3.3 billion and the value of shipments was \$8.9 billion (Blot, 1985, personal communication #4).

Variations in topography, soil type and other factors result in a wide range of natural capabilities of the State's agricultural lands. Significant investments of private as well as public time and dollars have gone into improving New York State's agricultural land resource. This includes



## THE FOURTEEN AGRICULTURAL REGIONS OF NEW YORK STATE



### FIGURE 6.5 continued

Erie-Ontario Plain - Contains generally level topography, many highly productive soils, and a long growing season, due to the Great Lakes, which are compatible to intensive and specialized agriculture.

Western Plateau - Contains broad hills and shallow valleys, many medium-textured acid soils and widespread agriculture throughout the region.

<u>Central Plain</u> - This is the second largest agricultural region in New York State containing good to excellent agricultural land. Its terrain ranges from flat to rolling and it soils are ideally suited to modern agriculture with their naturally high pH, fertility and good water holding capacity.

Oneida Plain - Contains good precipitation, a growing season better than much of New York State, and a favorable topography for agriculture.

Escarpment Country - Contains primarily medium to fine textured soils with high pH levels.

<u>Plateau Country</u> - This is the largest agricultural region in the State containing plentiful rainfall and a coolcontinental climate. Its valley farms generally have good topography soil and length of growing season, while the uplands have a shorter, cooler growing season. Areas too steep for farming or which lack a favorable variety of soils remain in forest.

<u>Mohawk-Hudson Plain</u> - Contains mostly sandy, gently rolling lands, soils that are either predominately dry due to excessive natural drainage or wet depending on seasonal fluctuations and low to medium natural fertility and pH requiring ongoing maintenance.

<u>North Country</u> - Contains a wide range of soils and topography, and a climate that is somewhat more rigorous than in other regions with its cold winters and cool growing seasons; with some modifying effects from the St. Lawrence lowlands and the Champlain Basin.

Black River-Mohawk - Contains a cool, high-moisture, continental climate and a topography generally suited to modern agriculture.

Delaware <u>Hills</u> - Contains a contrasting topography of upland valleys and hills. Areas that are too steep for agriculture remain in forest.

<u>Hudson Hills</u> - Although variations in topography and soils occur throughout the region, the long growing season, good rainfall and consolidated management of interspersed soil-types are highly favorable to support the region's agriculture.

Catskill Poothills - Contains predominantly shallow, stony and infertile soil with a naturally low pH level and small scattered areas of good soil and good topography.

Hudson Basin - The terrain is generally favorable for agriculture and the climate is characterized by a long growing season and good precipitation.

Lower Rudson - Long Island - Agriculture is mostly confined to eastern Long Island. This area contains the State's longest growing season due to its ocean dominated climate, with mild to moderately cold winters and warm summers.

improving soil productivity, improving soil moisture capability, establishing soil retention systems and improving drainage systems.

Agricultural lands are sensitive to alterations and they are not easily converted back to agriculture once they are transformed directly through development or by the secondary impacts of development. Temporary nonagricultural uses of agricultural land may result either in permanent adverse impacts in extreme cases, or temporary adverse impacts depending on safeguards and land restoration measures that are applied.

As illustrated in Figure 6.5, the State can be divided into 14 different agricultural regions based on the distinctive land forms and soils in each of these areas. The Central Plain and part of the lower Hudson-Long Island regions contain some of the best natural conditions for agriculture, though portions of other areas with applied management techniques are comparable in a variety of commercial agricultural production activities.

Much of the agricultural land in New York State is included within an Agricultural District as authorized under the New York State Agriculture and Markets Law, Article 25AA. At the end of 1985, there were 416 Certified Agricultural Districts in 49 counties encompassing just over 8.5 million acres of land. Districts are created by county government in response to farmer landowner petition. The Department of Agriculture and Markets certifies that each district is consistent with the law and overall state purpose. The benefits of establishing districts include: 1) constraints on regulations that could hinder farming, 2) requirements that State Agencies adopt policies to encourage and support farming, and 3) special review of public funding and land acquisitions in Agricultural Districts. The law also provides a mechanism allowing eligible farmland to be assessed according to its agricultural productivity value.

The Soil and Water Conservation District Law requires landowners of farms and woodlands greater than 25 acres in size to prepare a Soil and Water Conservation Plan. These plans carefully identify soil types and other natural features of the land and provide management alternatives to reduce or eliminate the occurrence of environmental degradation under the intended land use objectives of the landowner.

According to the State Environmental Quality Review Act, zoning changes affecting 25 or more acres of land in an Agricultural District or a project or an action involving the physical alteration of two and half or more acres of land in an Agricultural District are Type I actions. Type I actions are more likely to have an environmental impact and therefore require a more thorough environmental assessment and possible preparation of an environmental impact statement.

#### J. INTENSIVE TIMBER PRODUCTION AREAS

Forest lands cover a major portion of the State. As of 1982, approximately 59 percent of New York, or 17.7 million acres of land, supported some kind of woody plant growth (NYS Department of Agriculture and Markets, 1982). Forest lands have a vital role not only for the timber production industry, but also in watershed protection, screening and absorbing major forms of air pollution and retarding soil erosion. Soil erosion in forested areas is ten times slower than the average rate of erosion from all lands in the State. Forested areas are also the location of major outdoor recreation sites including hiking trails and campgrounds.

State forest cover is most dense in the Adirondack Park and the areas of the State bordering the Park to the north and northwest. However, the greatest intensity of timber harvesting is in Essex, Warren, Saratoga and Fulton counties which harvest over 10 cubic feet of wood per acre per year and in Clinton, Washington, Hamilton, Herkimer, Lewis, Montgomery, Delaware,

Wyoming, Chautauqua, and Cattaraugus counties which harvest 6 to 10 cubic feet of wood per acre per year (NYS DEC Division of Lands and Forests, 1981). No timber production takes place on the Forest Preserve lands in the Adirondack and Catskill regions because of the protection provided them by Article XIV of the State Constitution.

Population and economic growth have a major effect on the amount of forested areas because of increased competition for space and increased demand for forest products created. Competition for space also relagates intensive timber production to lands with the greatest restraints for other uses: too infertile, wet or steep for agriculture; too steep or poorly drained for residential development; or too inaccessible for manufacturing of industrial goods. The DEC Division of Lands and Forests is preparing a final Strategic Plan for Forest Resources in New York State.

#### K. SIGNIFICANT HABITATS

Significant habitats are defined by DEC as areas which "provide some of the key factor(s) required for survival, variety or abundance of wildlife, and/or for human recreation associated with such wildlife". Examples of significant habitats include areas containing endangered or rare species, high concentrations of wildlife, concentrated migration routes, urban open space of value as wildlife habitat, uncommon land forms, unusual vegetative associations that support unusual wildlife, and areas containing features critical to a particular species such as deeryards, nesting areas and spawning areas.

Fish and wildlife habitats are highly susceptible to environmental changes. Human activities such as stream flow diversions, excavation, filling, drainage, vegetative clearing and construction can have a significant effect on habitat and therefore on the wildlife it can sustain. DEC is

therefore identifying, documenting and mapping significant habitats across the State so that this information is available when important decisions need to be made about activities in an area that might be considered significant. Approximately 1,000 habitats have been identified for protection.

Endangered, threatened, rare and exploitably vulnerable species in significant habitats can be protected in a number of ways. The State's Endangered Species Act requires the listing of species meriting protection which should not be picked or removed from their native habitat. The State's Freshwater Wetlands Law can protect rare plants growing in wetlands. The northern wild monkshood and small whorled pogonia are endangered and threatened plants, respectively, protected by the U.S. Fish and Wildlife Service. When federal funds are spent on projects in New York that may affect these two species, it is within the power of the federal government to withhold funds until these plants are afforded protection. The New York State Natural Heritage Program also has an extensive list of rare plants found in New York that is constantly updated to reflect new information. In addition, acquisition of fish and wildlife areas through the Environmental Quality Bond Act, the State Nature and Historic Preserve Trusts, and nonprofit groups is another way these areas are protected.

The SEQR review process also requires an analysis of the impacts of a project on wildlife habitats and a review of alternatives before a final decision is made on development. In addition, SEQR allows local agencies to designate an area that has an exceptional or unique character as a critical environmental area (CEA). Designation of a CEA is subject to public review and comment and proposed activities in CEA's are treated as Type I actions under SEQR.

# L. AREAS OF HISTORIC, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL SIGNIFICANCE

Areas of historic, architectural, archeological and cultural importance are considered valuable because of the link they provide to our past. Once these areas are destroyed, they can never be replaced.

The State is actively identifying, evaluating and protecting cultural resources that are significant in American history, architecture, archeology and culture. Part of this is accomplished through buying these areas outright through the State Nature and Historic Preserve Trusts or protecting areas by nominating and having them accepted on the National or State Registers of Historic Places as provided for by the National Historic Preservation Act of 1966 and the State Historic Preservation Act of 1980. Areas listed or eligible for listing on the National or State Registers, or included on the State Inventory must receive special consideration before they are disturbed or impaired. Under the State Law, it is the responsibility of every State agency, to the fullest extent practicable and consistent with other provisions of the law, to avoid or mitigate adverse impacts to properties registered, inventoried or deemed eligible for listing on the State Register by the Commissioner of Parks, Recreation and Historic Preservation. There are roughly 2,320 total nominations representing 54,000 properties for the National Register of Historic Places located throughout New York and 35 historic sites owned and operated by the State (LeFrank, 1987, personal communication #41).

#### M. CLEAN AIR

New York has made significant progress in improving our air quality and now meets the federal ambient air standards for most areas of the state. The only primary non-attainment areas are: 1) New York City metropolitan area for ozone and carbon monoxide, 2) Syracuse for carbon monoxide and 3) Buffalo for

total suspended particulates. The control of toxic air emissions and the long range transport of pollutants which cause, among other problems, the Northeast's acid rain, are air pollution problems gaining increasing attention.

Although some point sources are responsible for large quantities of ambient air pollution, much of this pollution comes from the accumulation of emissions from numerous minor sources such as cars and small commercial and industrial operations. Ozone, pervasive throughout the Northeast corridor, is one such pollutant. It is formed when hydrocarbons from a variety of sources mix with oxides of nitrogen in the presence of sunlight.

Toxic emissions are also being controlled by New York State's air pollution regulations. Emissions control equipment must remove a minimum of 99 percent of human carcinogens and other toxic substances designated high risk by the Department of Health. Lower emission controls are allowed only when the currently available technology cannot reach the 99 percent removal level.

#### N. VISUAL RESOURCES

Visual aspects of the environment, both man-made and natural, have an important environmental resource value. However, because their value cannot be precisely defined, a degree of subjectivity exists about the importance of certain visual resources.

On a macro scale, the State has a number of important natural and manmade visual resources. Natural visual resources of high quality include most of the rural portions of the State and particularly the Adirondack and Catskill Parks, the Hudson River Valley, the Southern Tier and Great Lakes regions.

On a smaller scale, visual impacts can be identified based on the degree of compatibility a proposed project has with the existing environment, whether

or not it enhances or degradates the visual appearance of the area, and the length of time a particular visual impact will be in existence. The visual impact of proposed actions is gaining increasing attention statewide and DEC is in the process of developing aesthetic compatibility standards and regulations. VII. NEW YORK STATE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM A. INTRODUCTION

Article 23 of the Environmental Conservation law gives DEC the responsibility of regulating oil, gas and solution mining operations in New York State. To carry out the provisions of the law, the Department has adopted regulations on:

- drilling, completion, operation, plugging and abandonment of all oil, gas and solution mining wells and reclamation of the surrounding area
- secondary recovery of oil (waterflooding)
- underground storage of gas
- voluntary and compulsory integration and unitization of adjacent interests
- oil and gas drilling and production waste fluid disposal

The goal of the Oil, Gas and Solution Mining Regulatory Program is to prevent environmentally damaging drilling, operating and plugging practices. Rules and Regulations 6 NYCRR 550 through 559 require well drilling, casing, stimulating, completing, producing and plugging techniques designed to prevent pollution, waste, escape, migration and commingling of oil, gas, brine and fresh water.

Another purpose of the Regulatory Program is the conservation of oil gas and salt that might otherwise be wasted. This was a predominant concern of the Legislature when the law was first enacted in 1963. Mandated drilling, producing, and storage techniques greatly reduce accidental waste of resources. Spacing orders, voluntary and forced lease integration and pool unitization are all programs designed to conserve oil and gas and to increase their ultimate recovery. They make maximum use of the natural circumstances of accumulation and discourage unnecessary development effort and expense. Permit programs for gas storage and supplementary recovery projects produce

similar benefits by assuring adequate planning for and review of each projects's need, suitability, technical design and mode of operation. In addition, maintenance of accurate and current drilling, operating and production records measure the efficacy of these conservation programs.

Another important provision of the Oil, Gas and Solution Mining law is the protection of correlative rights of all parties including landowners, mineral owners and lessees, and the general public. Spacing orders, voluntary and compulsory lease integration and pool unitization are all actions undertaken by the Department to protect correlative rights. When properly designed, each of these actions not only conserves resources but also contributes to the equitable allocation of benefits. When appropriately combined, they ensure that all interests receive compensation commensurate with the proportion of the undeveloped resource they own or lease. Spacing regulations and orders protect adjacent interests from untoward drainage. Lease integration provides all interests with an opportunity to participate in resource development, and pool integration allocates a share of that resource to each participant proportionate to their interest.

#### 1. Administrative Procedures

The regulatory program covered in this GEIS is not restricted to regulations contained in 6 NYCRR 550 through 559. It also includes the administrative procedures that are essential to ensuring compliance with the regulations.

a. <u>Permit Conditions</u> - Permit conditions require operators to undertake mitigation measures. The conditions are based on statute, regulations, and an assessment of probably adverse environmental impacts and are tailored as needed to individual wells. Permit requirements are intended to assure that applicants are aware of their obligations and that they

understand the Department's environmental policies.

b. <u>Inspections</u> - can be carried out anytime during the life of the well. They are done before the permit is issued, when the well is being drilled and post-site inspections are made after drilling is complete. Inspections are also made while the well is being plugged to guarantee regulations are being followed.

c. <u>Reporting Requirements</u> - Operators are required to file reports informing the Department of the procedures they actually followed in: 1) drilling and completion, 2) any remedial or workover changing the permanent well construction, and 3) plugging and abandonment. The information submitted in these reports can be checked against the regulations and permit requirements that applied to the well. Failure to submit reports or submission of fradulent reports is legally punishable.

In requiring current organizational reports from all persons engaged in the oil, gas and solution mining business, the Department is able to identify the owners and operators of all facilities and to communicate directly with parties responsible for ongoing field operations.

In the case of resource conservation, the Department can evaluate how well correlative rights are being protected through analysis of accurate and current production records collected from industry.

d. <u>Enforcement</u> - Operators who fail to comply with regulations, permit conditions, or Department Orders are subject to enforcement actions and fines. DEC can shut down operations at any well at any time with good cause. Enforcement actions may be taken by DEC Foresters, Conservations Officers, the Bureau of Environmental Conservation Investigation (BECI), DMN program staff or Regional Attorneys.

#### B. DRILLING PERMIT APPLICATIONS AND THE REVIEW PROCESS

#### 1. Preliminary Procedures

Prior to applying for a permit, an operator must file an Organizational Report (Form 85-15-012) with the Division of Mineral Resources office in Albany. Organizational Reports indicate who the responsible parties are in a company and where they can be contacted. The operator must also post a Well Plugging and Surface Restoration Bond or some other form of financial security that the Department can use to properly plug and abandon a well, if necessary.

Financial security is required for any unplugged well, active or inactive, for which the Department issued:

- permit to drill, deepen, plug back or convert, on or after October 1, 1963; or
- acknowledgement of a notice of intention to drill, deepen, plug back, or convert on or after June 5, 1973.

The level of financial security required is determined by the number and depth of unplugged, oil, gas, solution mining, gas storage, brine disposal, geothermal, or stratigraphic wells the operator owns:

- wells less than 2,500 feet require \$2,500 per well on a sliding scale up to a maximum of \$100,000
- wells between 2,500 feet and 6,000 feet require \$5,000 per well on a sliding scale up to a maximum of \$150,000

The regulations allow the Department to adjust either the type or level of financial security required under special circumstances, such as for unusually deep wells (greater than 6,000 feet) or wells that may pose unusual environmental hazards. By requiring well-plugging and surface-restoration bonds, and by allowing the Division to take temporary possession of abandoned but improperly plugged wells, these regulations help to insure that abandoned wells will no longer be allowed to pollute soil, ground and surface water, or

to become a fire, explosion or physical hazard.

#### 2. Permit Application

Once an operator has an approved Organizational Report and adequate financial security on file with the Department he must submit in triplicate, an Application for a Permit to Drill, Deepen, Plug Back or Convert a Well subject to the Oil, Gas and Solution Mining Law (Form 85-12-005). The application must be sent to the appropriate regional office accompanied by: 1) the proposed drilling program, 2) a plat, 3) the permit fee, and 4) an Environmental Assessment Form (EAF).

The drilling program must be submitted for approval with the drilling permit application. The drilling program should include the proposed casing, cementing, completion testing and stimulation procedures. These procedures are all considered part of the action to drill a well under SEQRA.

It is understood that specific details of casing, cementing, completion, testing, and stimulation programs are subject to revision in response to variable geologic conditions which can only be determined after the well has been drilled. The Regional permitting DMN manager must be notified and informed of any substantive change to the originally proposed drilling, casing, cementing, completion testing or stimulation program. Approval of the Regional permitting DMN manager is required for changes resulting in revision to the permanent wellbore configuration proposed in the drilling permit application.

A Plat is a survey map which shows the proposed well location, the boundaries of the lease or unit containing the well and information about other nearby wells. The plat must be drawn to scale and certified as to correctness by a licensed land surveyor or civil engineer.

The permit fee that must accompany the application is based on depth of

the well. The fee starts at \$225 for a well less than 500 feet deep and increases \$125 per 500 feet of well depth.

The Environmental Assessment Form (EAF) that must accompany each permit application is a two-section form. Section A requires a description of the physical setting of the proposed project including the site of the well, pits, access road and staging area. Operators must answer questions on the general character of the land (slope, soil type, vegetation), land use (residential, commercial, agricultural) and indicate the size of each of these areas that will be disturbed.

Section B requires operators to describe the procedures they will follow in constructing the wellsite and access road and developing the well. They must indicate, among other things, how water will be supplied for the drilling operations, how long the rig will be on site, how wastes will be contained and disposed of and their site reclamation plans.

The aforementioned administrative and permitting requirements apply and will be required for geothermal, brine disposal and stratigraphic wells. For geothermal and brine disposal wells, the technical drilling, casing and cementing, completion, and plugging and abandonment requirements will be the same as described in later chapters of this GEIS for oil and gas wells. The techniques used to drill, complete and abandon geothermal and brine disposal wells and the resulting impacts from the above activities are not significantly different from those of oil and gas wells.

Stratigraphic wells differ greatly in type and purpose. Thus, the stratigraphic well technical requirements for the above activities will be determined on the basis of the site-specific drilling permit application. In addition, the permit application for stratigraphic wells should also contain a proposed plugging and abandonment plan or an alternate use proposal. This is necessary because of the relatively short life of a stratigraphic well; in

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most cases the well is plugged very soon after it is drilled. A total review of the well can thus be conducted and site specific factors can be taken into consideration.

#### 3. Application Processing

After the office receives the application, it is reviewed for completeness, logged in, and assigned both a permit number and an API number. The application then goes through a review process that includes an on-site inspection, technical review by DEC Division of Mineral Resources staff, DEC Division of Regulatory Affairs staff and other Government Agency staff if needed.

If other permits are required, such as Freshwater Wetlands Permits, Floodplain Permits (local or state) or, Stream Crossing Permits, the Drilling Permit cannot be granted until the other permits are issued.

Using the plat, the EAF and the information gathered from the Pre-Site Inspection, the proposed project is reviewed for its potential impacts on a number of environmental resources including but not limited to: surface waters, watershed areas, municipal water supplies, primary aquifers, agriculture, stream disturbance, erosion and sedimentation, historic and archeologic resources, significant habitats, floodplains, freshwater wetlands, state lands, coastal areas. Staff also check to make sure the proposed well location meets the minimum setback requirements for streams, surface bodies of water, other wells, public roads, private residences and public buildings or areas. Finally, a review of the technical aspects of the well is made to ensure that proper casing and cementing techniques will be used during drilling and completion.

The Department has 15 days to review and analyze the pertinent environmental data and to determine if it may have a significant environmental

impact. If the Department finds that it does not possess sufficient information to make a determination on the environmental significance of the project, the Department may request the applicant to supply additional information. Once this information is received, the agency must make its determination within 15 calendar days. If DEC determines that the proposed operations will not have a significant effect on the environment, the Department makes a "negative determination" which result in the issuance of a negative declaration. A negative declaration is often given for a permit which contains conditions requiring the applicant to conduct mitigative measures to minimize environmental impacts.

If after review of all relevant data, the Department finds that the project may cause a significant environmental impact, the Department will issue a "positive declaration". Issuance of a positive declaration indicates that the project may pose a significant environmental impact, as described in Part 617 of the State Environmental Quality Review (SEQR) Act Regulations, and therefore requires that a draft Environmental Impact Statement (EIS) be prepared. The Finding Statement prepared by the Department at the end of the EIS process would be used to determine whether or not project will be permited and if so, under what conditions, if any.

One purpose of this GEIS is to address the conditions for acceptable oil gas, solution mining, gas storage, geothermal, brine disposal, and stratigraphic well activities. Also addressed are the circumstances under which an additional site specific environmental review, such as a supplementary EIS, might be necessary.

#### C. PHASES OF WELL DEVELOPMENT

There are five major phases in the life of a well: (1) Siting and Construction, (2) Drilling, (3) Completion, (4) Production and (5) Plugging and Abandonment. Within this overall scheme, variations exist in both the

procedures followed and the potential environmental impacts from the well. For example, a typical gas well and an oilfield waterflood injection well may be drilled in much the same manner, but are operated differently and have different potential environmental impacts.

Chapters 8 through 11 focus on the five major phases of well development. Each chapter outlines:

- the procedures followed in that stage of a well's life

- the potential environmental impacts of those procedures

- the regulatory measures in place to prevent those environmental impacts Suggested improvements to the Regulatory Program are also included based on staff analysis of program needs.

Additional information is given in Chapters 12 through 14 on the variations in procedures, potential environmental impacts and regulatory measures that apply to:

- oilfield waterflood operations (ch. 12)

- solution mining operations (ch. 13)
- underground storage operations (ch. 14)
- interagency coordination concerning brine injection and disposal and oil spill investigations (ch. 15).

- brine disposal well permitting and operational guidelines (Appendix 7). The regulatory changes discussed in Chapters 8 through 14 are only proposals. Comments on these proposals, as with <u>all parts</u> of the GEIS, are both welcomed and encouraged.

#### VIII. SITING OF OIL AND GAS WELLS

#### A. INTRODUCTION

An operator must have a permit before site construction and drilling can commence. To obtain a permit, he must submit an application giving detailed information on the proposed well. The drilling permit application review process is one of the Department's primary tools in preventing environmental damage from oil and gas operations.

Many of the potential negative impacts of oil and gas development hinge on the location chosen for the well and the techniques used in constructing the access road and well site. The negative impacts are comparable to those of any moderately sized construction site. Clearing of vegetation and temporary dust, noise and exhaust fumes from heavy equipment are the primary negative impacts. A substantial portion of staff time is devoted to reviewing this stage of oil and gas development.

Before a drilling permit can be issued, DEC staff must ensure that the proposed location of the well and access road complies with the Department's spacing regulations and siting restrictions. Many siting set-back restrictions are already in regulatory form. Other siting restrictions are issued as permit conditions aimed at minimizing potential environmental impacts of oil and gas development operations. See Figure 8.1 for the layout of a typical drilling site.

#### B. WELL SPACING

Most of the siting restrictions on the location of wells are based on environmental and/or safety considerations. However, well spacing regulations are based on geologic and engineering data and considerations.

Well spacing specifically refers to the area of the subsurface hydrocarbon reservoir that will be drained by the well. (Well spacing regulations do not apply to solution mining wells). The area drained by a

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single well depends upon the characteristics of the oil or gas producing formation. Most oil and gas formations in New York State are being drained by wells spaced from 1 to 160 acres.

Proper spacing is necessary for the maximum efficient and economical recovery of oil and gas and to protect the correlative rights of landowners, well operators and others with a financial interest in the wells. Maximizing the recovery of oil and gas resources is essential if the Nation is to decrease its energy imports.

1. Statewide Spacing

Most wells must be spaced according to the statewide 40 acre spacing rule unless they are in a field subject to a spacing order or other spacing regulations. The exception to spacing regulations occurs only in the old oil fields which were discovered prior to 1981 because these fields had been developed to such an extent that spacing was impractical or unreasonable. Spacing of any future waterfloods proposed for any new oil field areas would be covered in the site specific environmental assessment required for new waterfloods. Under the 40 acre rule a well can be no closer than 1,320' from any other well completed in the same producing formation. Also wells can be no closer than 660' from any boundary line of the lease, consolidated or pooled leases, or unit to which the well belongs.

The 40 acre spacing rule was temporarily adopted statewide based on the physical characteristics of common gas producing formations nationwide.

The Medina, the state's most common gas producing formation, is a low permeability, low porosity "tight sand" with limited, but stable gas production rates. Naturally, not all of New York State's oil and gas producing formations actually have the same physical characteristics nor is the Medina uniform statewide. Promoting efficient well spacing for optimum

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recovery of oil and gas is of concern to the Department. In the future more staff time will be dedicated to evaluating the State's oil and gas producing formations and reviewing historic production trends. Specific regulations and orders will be issued based on the results of these studies.

#### C. SITING REGULATIONS AND POLICIES

Once it has been determined that the proposed well location complies with the applicable spacing regulations and orders, DEC staff are required to check and ensure that the well location is at least:

- 100 feet from a private dwelling.

- 75 feet from the traveled part of a public road.

- 150 feet from a public building or area.

Staff also check to determine if the proposed <u>well</u> and <u>access road</u> locations are:

- within 50' of a surface water body.

- within a drinking water watershed.

- within 2,640' of a municipal water supply.

- over a primary or principle aquifer.

- in an Agricultural District or on other agricultural lands.

- within 50' of a stream protected by the Stream Disturbance Program.

- in an area subject to erosion.

- in/or near an historic or archeologic site.

- in/or near a significant habitat.

- within 100' of a floodplain.

- within 100' of a freshwater wetland.

- on State lands, State Parklands or other government properties.

- within a coastal zone area.

Variances from any of the above setback restrictions can be given upon request after appropriate public notice and review. A hearing must be held if

any objections to the variance are recorded.

The potential environmental impacts that these siting constraints address are discussed on the following pages.

#### D. PUBLIC SAFETY AND WELL SITING

The restrictions on the placement of wells near private dwellings and public buildings, roads or areas were adopted to protect the public from the safety hazards of oil and gas operations. Siting of wells too close to areas used for public assembly would unnecessarily expose them to possible accidental injury. In addition, the surface restrictions help protect the public from far less common, but potentially far more serious accidents, such as blowouts, well fires and major spills.

#### 1. Public Safety/Other Well Site Facilities

The 75, 100 and 150 foot well surface setback restrictions also indirectly influence the siting of pipe racks, compressors, the dog house (which serves as a temporary office and crewshed) and other well site facilities that are usually located next to the well for practical reasons. However, pits, separators, tank batteries and other objects can be located some distance from the well. As a supplement to the existing regulations, Department staff can use their general powers under SEQR to limit the placement of pits, tanks and other well site facilities too close to private dwellings, and public buildings, roads or areas. The option is rarely exercised because few wells are actually drilled at the minimum distances allowed in the surface restrictions. Geology largely dictates the actual siting of a well. Also, landowners may restrict well locations during the leasing process to protect their home, barn or other important areas. Most conflicts in this respect occur on leases sold by previous owners, where current owners do not have these options or when the landowner failed to get

his desired land use restrictions in writing.

Landowners should be aware that the Department can order restoration of environmental damage that occurs, regardless of whether it is addressed in the lease provisions.

Recent changes in the Public Service Commission's (PSC) gas pipeline safety code (16 NYCRR Part 255) also discourage the placement of wells less than 150 feet from a residence. Gathering lines installed closer than that to an existing residence or place of public assembly must comply with more expensive increased transmission line standards. The discrepancy between DEC's requirement of 100 feet between wells and homes and PSC's 150 foot restriction for gas gathering lines connected to such wells provides further reason for increasing the magnitude of DEC's surface restriction. It is recommended the DEC's siting restriction be increased to 150 feet for private dwellings and provide them protection equal to that for public buildings.

When pits, tanks and other well site facilities are sited too close to private dwellings and public buildings, roads or areas, several different types of problems can result:

- accidental overshot of waste fluids being discharged to a pit could injure people or damage buildings, roads or public areas.
- accidential explosion of an oil tank (as occurred in the spring of '84) could injure people and damage buildings, roads or public areas in the vicinity (Olean Times Herald, 1984).
- a pit fire associated with a well blowout could pose an even greater risk to the public than the well fire itself if the pit is less than 100 feet from a private dwelling, public road, building or area.
- lack of fencing around pits can be a safety hazard in populated areas for people in general, but particularly for children, pets and farm animals.
- dust from air drilling operations can coat vegetation and cause air

quality problems for people in the vicinity. However, dust washes off quickly and its relatively high pH can mitigate some of the effects of acid rain on vegetation (Yarosz, 1986).

Although Department staff are aware of the importance of protecting public safety, there is a chance that the above mentioned siting concerns have been overlooked on occasion because existing procedural requirements do not take them into account. The existing regulations do not require that the plats accompanying each permit application show the proposed location of pits, access roads, tanks, etc., a survey of these items is not required, but it is recommended the proposed location of the above drill site details be sketched on the plat accompanying each permit application.

2. Noise, Visual and Air Quality Impacts

Although the surface siting restrictions are basically safety oriented, they also serve to lessen noise, visual and air quality impacts associated with drilling rig operations. Their effectiveness in reducing these impacts depends in part on the presence of natural and man-made barriers in the buffer zone that can block sights and sounds.

a. <u>Temporary Noise, Visual and Air Quality Impacts</u> - The equipment and facilities involved in well drilling operations can be large enough to be seen from a considerable distance. Drilling rigs vary in height from 30 feet for a small cable tool rig to 100 feet or greater for a large rotary, though the larger 100 foot rotary drilling rigs are not commonly used in New York State. Typically rigs used in New York are, with reference to the number of connected joints of drill pipe the rig can hold, either "singles", roughly 40 to 45 feet tall or "doubles", roughly 70 to 80 feet tall.

The study of visual impacts is a relatively new field, therefore no literature exists on the visibility of rigs. Reference to a study of the

visual impacts of high voltage transmission towers indicates that the <u>maximum</u> visibility threshold of an 80 foot tall double rig would be less than two miles (Jones and Jones, 1976). In reality, the rigs visibility threshold would be much less due to: 1) undulations in topography, 2) vegetation and other obstructions that would screen sight of the rig and 3) the fact that the transmission towers (on which the two mile figure is based) are much wider at the top than drilling rigs. Transmission towers are also permanent features of the landscape, while drilling rigs are temporary.

Once drilling starts, the length of time a rig and its associated equipment will be on site depends on the type of rig used and the depth of the well. A cable tool rig generally takes 3 to 8 weeks to drill a well. It is not uncommon, however, for a cable drilling operation to stretch on to half a year or more because some operators run their rigs only on evenings and/or weekends. Although drilling can take much longer with cable tool rigs, their visual impacts are more minor due to their relatively short height, 25 feet to 35 feet, and lack of auxiliary equipment. Most wells in New York State, however, are drilled by rotary rigs in less than a week, though drilling can extend two weeks or longer.

Aside from rigs there are also several smaller features of the well site whose visibility will depend more upon local topography, vegetation, etc. Like the rig, they are present for relatively short periods of time and their visual impacts are minor.

#### Cable-tool and Rotary Rigs

Pits - one pit to hold rock cuttings, drilling mud and brine, must be constructed at each well site unless a tank is installed. A backup reserve pit is also sometimes required. The pits are generally no larger than 25 feet by 50 feet, and must be lined to prevent the

escape of fluids.

- Construction equipment bulldozers, backhoes, and other types of construction equipment needed to prepare the well site and access road will be present for short periods.
- Trucks drilling crew with support staff vehicles as well as larger service trucks for logging, cementing, hydro-fracturing, perforating, delivery, etc., will be on the drilling site from time to time.

#### Rotary Rigs Only

- Compressors there are usually 2 to 5 compressors at a rotary rig well site. Each compressor is roughly 15 feet to 20 feet long and is sometimes mounted on trailers. As a general rule, the deeper the well, the larger the number of compressors.
- Pipe racks there are usually 2 to 4 pipe racks per well, each roughly
  10 feet wide by 30 feet long. Number of pipe racks will depend
  partly on depth of well.
- Dog house which serves as a temporary office and crewshed, may be as much as 30 feet or longer, usually about 8 feet high and no more than 8 feet wide so it can be carried on a trailer.

Mud logging unit - a truck mounted unit approximately 8 feet wide, 10

feet high and 25 feet to 35 feet long may be present.

Drilling rigs and the auxiliary equipment listed above are not aesthetically compatible with private dwellings and public buildings or areas. The degree of incompatibility is a subjective matter influenced greatly by individual perception. Overall, however, it is agreed that drilling operations, like road building, sewer line excavation, and other necessary construction activities, are not visually appealing. Fortunately, most visual and noise impacts are temporary as are the associated diesel fumes and dust from construction equipment.

This list below, from the United States Environmental Protection Agency (USEPA) data, gives some estimates on noise levels that might be generated on an average drillsite in New York:

Subject	Noise Level Ranges (dBA)* at 50 feet		
Rotary rig with capacity of 150,000 pounds and 400 horsepower	95 - 105		
Trucks	82 - 94		
Backhoes	72 - 94		
Tractors	75 - 95		
Concrete Mixing	75 - 88		

For comparison, the following list of familiar activities and places is given:

Subject	Noise Level Ranges (dBA)
Quiet residential	40
Average residence daytime activities	50
Typical office	60
Ordinary conversation	65

\*dBA is a measurement of noise levels (decibels) with special equipment

that selectively filters sound similar to the human ear.

The following "rules of thumb" are helpful for understanding noise levels.

- An increase of 3 (dBA) is the smallest increase that can be perceived by the human ear.
- 2. dBA levels are logarithmic in nature, so a 10 dBA increase is double the perceived loudness.
- 3. The nighttime sound level in quiet rural New York where most oil and gas drilling occurs is about 30 dBA (Vessels, 1986, personal communication **#**58).
- 4. An  $L_{dn} = 55$  dBA is identified by the USEPA as an outdoor noise level which will protect the public health and welfare with an adequate margin of safety. The day/night equivalent sound level ( $L_{dn}$ ) is a weighted equivalent for a 24-hour period with 10 dBA added to equivalent sound levels at night.

Noise levels from a point source can be estimated from a formula that expresses noise attenuation as a logarithmic function of receptor distance. For noise propagation calculations, it is assumed that the noise level is reduced by 6 dB for each doubling of distance from 50 feet away from the noise source. The calculation does not include attenuation due to barriers, vegetation or the influence of other factors such as relative humidity, wind, and noise levels at different frequencies.

$$N_{D} = N_{SO} - \frac{6dB \times \log (D/50 \text{ feet})}{\log 2} \text{ or } 20 \times \log \left[ \frac{D}{50} \right]'$$

where:

N<sub>D</sub> = noise level decibels (dB) at distance D from source N<sub>SO</sub> = noise level decibels (dB) at 50 feet from source D = distance from noise source

To determine the additional attenuation for typical New York vegetation (tall grass and shrubs) subtract 3 to 4 dB per 100 feet. Hills and trees also act as sound barriers and an additional 5 to 20 dB could be subtracted. Pneumatic mufflers and sound barriers which might be added as special permit conditions for drilling in high population density areas could reduce noise another 15 to 50 dBA.

The USEPA in 1977 gave the following criteria for determining the relative impacts of noise level increases:

0	less	thar	15 c	1BA	-	considered to be a "slight" increase which is noticeable, but less than twice as loud as background.
o	5 to	15 d	IBA		-	considered to be a "moderate increase which would be experienced as being approximately twice as loud as the background.
0	Great	er t	han	15	dBA –	considered to be a "significant" increase in noise level.

Most of the information on noise levels was adapted from the FEIS for the Niachlor Project (1985).

People living in close proximity to a drilling site (from 150 to 1,000 feet) may experience moderate to significant noise impacts during the 5 to 10 days it takes to drill a well.

b. Longer-Term Noise and Visual Impacts - After the well is drilled, the extent of the subsequent activities at the site that could cause visual or noise related disturbances to surrounding areas will depend largely on whether the well is a producer or a dry hole. If it is a dry hole, the site will be reclaimed. This will involve some final use of, and noise from, construction equipment, resulting in a temporary increase in noise impacts. Although no timetable exists for site reclamation, pits must be reclaimed within 45 days after the cessation of drilling operations. A site reclamation timetable of 45 days is suggested for future regulations. Extensions can be granted by the Regional Minerals Manager for reasonable cause, such as seasonal weather conditions.

After site reclamation, the only lasting visual impacts from drilling a dry hole may be moderately long term changes in landscape contours and vegetation caused by well site and access road clearing and construction. This may be particularly noticeable in otherwise heavily forested areas, but there is no permanent visual impact at about 40 percent of the well reclamation sites. Figure 11.2 shows one of the largest drilling rigs used in New York State and the drill site after reclamation.

If the well is capable of commercial production, the drilling rig may remain on site for a few more days to complete the well or a smaller production rig can be moved in. There may be some delay between the drilling of a well and its' completion. After the well is completed, most of the site is reclaimed. All that will remain at a producing gas well site will be an assembly of wellhead valves (known as a Christmas tree) approximately 4 feet

high, a slightly shorter gas meter, a dehydrator, a separator and a brine storage tank if necessary. Some operators bury their brine storage tanks so they are not visible. Most of the equipment operates at very quiet noise levels. Figure 8.2 depicts a typical producing gas well site.

Some producing oil well sites need more equipment to function properly. A well pump, separator and/or heater treater and tank battery may be needed to separate water from the oil. In the old oilfields, however, this equipment is usually consolidated in a centralized area since the wells are closely spaced. Neither separators, heater treaters or tank batteries present noise problems but, if pumps are required, there may be some noise associated with their operation depending on the type used. After the water is separated, the oil and water are stored on site in tanks to await transport.

In rare cases, oil or brine production tanks may be large enough to have significant visual impacts. Some operators do camouflage the tanks by painting them green to blend in with the surroundings. Installation of screening or moving the tank location are other alternatives which might be used as mitigation measures if a well was in the area of an important visual resource.

After the gas or oil well stops producing, it must be plugged and abandoned and the well site reclaimed. The long term visual impacts of the reclaimed site will be the same as those discussed above for a dry hole.

c. <u>Visual Resources of Statewide Significance</u> - The most important visual resources in New York State are: 1) National Parks, 2) State Forest Preserves, 3) National or State Wild, Scenic and Recreational Rivers, 4) State Game Refuges, 5) National Wildlife Refuges, 6) National Natural Landmarks, 7) National or State Historic Sites and 8) State Parks.

The first four categories do not occur in New York State's oil and gas producing region (Husek, Peyne, Sanford, 1986, personal communications #36,



The Moonbrook County Club No. 1, located at the edge of the golf course fairway, is a good example of the typical size of a gas production well site. The well was drilled in October 1979. In summer, the 3' tall separator is barely visible from the golf course because of the surrounding vegetation.

54, 63). There are only two National Wildlife Refuges and nine National Natural Landmarks in the State's oil and gas producing region and most of these are included under DEC's Significant Habitats Inventory (National Registry of Natural Landmarks, 1983-86) and (Wright, 1986, personal communication, #73). Of the 400 plus National or State Historic Sites within the region, the vast majority are in populated areas that are unlikely to experience oil and gas activity (National Register of Historic Places, New York State Listings, 1979-86). Where a proposed activity might have a negative visual impact on an historic site, DEC will add mitigating conditions to the permit as appropriate.

There are roughly 25 State Parks within the State's oil and gas producing region. DEC is prohibited from leasing State Park Lands [ECL 23-1101(1)(b)] but some oil and gas drilling activity does occur in Darien Lake, Selkirk Shores and Allegany State Parks where the Office of General Services acting for the New York State Office of Parks and Recreation had undertaken leasing programs in the past. Visual impacts of proposed oil and gas activities within viewing distance of other State Parks will have to be considered on a case-by-case basis during the permit review process. For example, visual screening of production facilities might be necessary for a well directly across from a State Park entrance (Benas, 1986, personal communication #2) (See Section 8.M.2 on page 8-49 for additional information on State Park drilling permits).

d. <u>Summary of Noise and Visual Impacts</u>- The only significant noise impacts from oil and gas development activity are confined to the brief well drilling and completion stages. Short term visual impacts from well drilling and completion activities vary greatly depending upon rig height, topography, vegetation, extent of support facilities and distance to viewer. Over the 30
year producing life of a typical gas well, the visual impacts will be minimal because of the small scale of the equipment involved. Typical oil well production is approximately 30 years also, but the visual impact may be greater because more production equipment is needed. Only in the relatively rare instances where large oil and/or brine holding tanks are needed (example - Bass Island trend) is there a possibility of significant long term visual impacts.

The wording of the existing surface restriction regulations does not address the siting of well site production facilities with respect to private dwellings and public buildings, roads or areas. However, landowners and Department staff can restrict the siting of well site facilities through lease conditions or permit conditions under special circumstances.

### E. WATER QUALITY

Pollution of surface and groundwaters is strictly prohibited by the State Oil, Gas and Solution Mining Law. Protection of water quality is the most important concern in regulating oil and gas development. Proper drilling, casing, production and plugging procedures are the primary water quality safeguards. However, careful siting of oil and gas wells provides essential back-up protection in case of an accident.

During the pre-drilling site inspections conducted for every well permit application, DEC staff check the proximity of the proposed oil and gas operations to surface water bodies and municipal water supplies to ensure water quality protection.

Anyone wishing more information on detailed water quality standards, tests and regulations are referred to Article 17 of the Environmental Conservation Law and 6NYCRR Parts 700 to 705.

# 1. Surface Waters

It is difficult to formulate rules regarding the width of a buffer zone

needed between oil and gas wells and surface water bodies. Topography, vegetation and other surficial features will strongly affect the adequacy of a buffer zone. In general, however, the existing 50 foot surface restriction does not provide adequate protection in case of an accident. The land within a 50 foot radius surrounding surface water bodies often slopes downhill toward the water. Even on a very gentle slope, pollutants such as spilled oil or brine can travel 50 feet to a stream or lake in a matter of minutes giving well site personnel little time to respond. The lack of response time will be even more acute on steeper slopes, particularly if the vegetation between the well and the surface water body was cleared during well site preparation.

Another weakness in this surface restriction stems from its exclusive focus on well siting. Under the present regulations, mud pits and reserve pits can be dug directly next to surface waters, although this is very unlikely because they must be adjacent to the well. Pits must have an impermeable lining and be large enough to contain all fluids. In spite of these precautions, accidental leaking and overflow has occurred. Storage tanks, oil-water separation ponds and other potential sources of pollution can also be sited directly next to surface waters under existing regulations. Although Department staff often place conditions on permits or give instructions to operators limiting the siting of these facilities, the topic should be addressed on a more consistent basis. It is recommended the minimum siting restriction on the proximity of wells and associated production facilities to permanent surface bodies of water be increased to 150 feet. A waiver of this and most other siting and spacing restrictions can be given following the exception request, public notice and hearing procedures detailed in 6NYCRR Part 553.

### 2. Springs

Springs are not included in the well siting restrictions for surface water bodies but they do warrant protection. Springs supply the sole source of drinking water to many private homes. They also supply water to wetlands, streams and ponds. Springs and other near surface water supplies are more easily disturbed by construction activities than deeper groundwater supplies. Turbidity is the most common impact of site construction operations on springs. However, such impacts are usually temporary in nature providing the operator adheres to sound reclamation practices.

Department staff are aware of the importance of springs and often protect them through conditions on permits. It is recommended the surface water setback restriction be applied to springs which are used for a domestic water supply.

# 3. Municipal Water Supplies

In some instances siting of an oil or gas well in the vicinity of a water supply is effectively precluded by municipal ownership of lands surrounding the water well or reservoir. Oil and gas development will not occur in such areas unless the municipality elects to lease the land. Where the municipality does not maintain a buffer of public land around the water supply, both the siting of an oil or gas well and the potential environmental impacts will depend partially on the type of water supply involved. Should a successful legal challenge be made against siting restrictions, municipalities not maintaining a buffer zone might be required to compensate affected mineral rights owners.

a. <u>Surface Municipal Water Supplies</u> - Approximately one-fourth of the municipal systems in the State are supplied by surface waters. These municipal reservoirs are protected by the same minimum setback requirements that apply to all surface water bodies. However, the existing 50 foot well

setback requirement may not provide adequate back-up protection for surface waters in case of an accident. In addition, no regulatory restrictions exist on the placement of pits, tanks or other potential sources of pollution directly next to surface waters. Department staff are aware of the importance of municipal water supplies and place conditions on the permit to restrict the siting of oil and gas facilities. It is recommended the minimum siting restriction on the proximity of wells and associated production facilities to surface municipal water supplies be increased to 150 feet.

Erosion and sedimentation concerns are more consistently handled. An erosion and sedimentation control plan must be prepared for every proposed oil and gas well in the watershed of a drinking water reservoir. The Department then requires specific erosion and sedimentation control measures through conditions in the drilling permit. The siltation of any stream or water body due to ground distrubance may constitute a violation of water quality standards.

b. <u>Municipal Water Wells</u> - In the past, oil and gas wells have been drilled within 1,000 feet of municipal water wells. However, Department staff were aware of the importance of municipal water supplies and could place conditions on a drilling permit to restrict the siting of oil and gas wells, pits, tanks and other potential sources of pollution near municipal water wells. In addition, affected local governments are notified whenever a drilling permit application is received for an oil or gas well within 2,640 feet of a municipal water well. This procedure was added in 1982 at the behest of local governments concerned about the impact of oil and gas development activities on their water supplies. As of February 1985, the Commissioner made a decision to require that a Draft EIS be submitted with the permit application for any well within 1,000' of a municipal water

well and proposed well locations less than 2,000' from a municipal water well must be treated as a SEQR Type 1 action likely to require an EIS.

Site construction operations rarely impact groundwater supplies except when a surface water has a direct is hydrological connection to groundwater supply. Even then, intrusion of pollutants from surface waters is rare for a number of reasons: 1. surface contamination is easily recognized and can be corrected before groundwater is affected, 2. surface waters will dilute contaminants, and 3. the communication channels from surface waters to groundwaters provide a natural filtering network.

In general, groundwater is especially vulnerable to pollution because water flows much more slowly through the small rock pores underground and substances introduced into an aquifer may remain a long time before they are flushed out. Breakdown of pollutants is also inhibited by the absence of oxygen and normal surface weathering processes. In addition, groundwater pollution is generally not as quickly detected as surface pollution. Therefore, a corroded well casing could leak gas, oil and/or brine into groundwater for several years before these substances would be detected in a water well. However, the very low fluid levels in most producing wells in New York make it unlikely that fluids from the producing zone will be able to rise high enough to pollute groundwater horizons. The sensitivity of groundwater to pollution and the necessity of potable water supplies to survival, highlight the importance of careful drilling, casing, cementing, and plugging and abandonment procedures.

c. <u>Primary and Principal Aquifers</u> - During the permit application review process, Departmental staff check whether the well will penetrate one of the State's primary or principal aquifers. Primary aquifers are highly productive aquifers already heavily used for public water supplies. Principal aquifers are underground formations known to be highly productive or whose

geology suggests abundant potential supply, but which are not heavily used for public water supply at the present time. Wells drilled in primary and principal aquifers are subject to special supplementary permit conditions that have been in effect since November 1982. The Commissioner revised these permit conditions based on comments received at the December 19, 1984 public hearing on aquifer drilling in Jamestown, New York. Although the principal aquifers in New York have not been completely delineated and mapped, where they are identified, aquifer conditions are imposed.

The quality of the casing and cementing job on a well is of prime importance in protecting groundwater from gas, oil, brine or other substances in the wellbore. Therefore, the special aquifer conditions require a State Inspector to be present for the cementing of the conductor, surface and production casing. In addition, the freshwater string must be set a minimum of 100 feet into bedrock. A calculated 50 percent excess cement must be used and the cement must be grouted down from the surface if circulation is not achieved. The aquifer permit conditions are described in greater detail under the appropriate drilling steps.

Contamination of especially shallow aquifers can result from any penetrating structure such as improperly constructed water supply wells, mine shafts, and pilings for bridges and buildings.

### 4. Public (Community and Non-Community) Supplies

"Community water system" means a public water system which serves at least five service connections used by year-round residents, or regularly serves at least 25 year-round residents. "Public water system" means either a community or non-community system which provides piped water to the public for human consumption, if such system has at least five service connections or regularly serves an average of at least 25 individuals daily at least 60 days

out of the year. Such term includes: (1) collection, treatment, storage, and distribution facilities under control of the supplier of water of such system and used in connection with such system, and (2) collection or pre-treatment storage facilities not under such control which are used in connection with such system.

The Department of Health (DOH) does enforce guidelines and standards for Community and Non-Community water supply systems. There are approximately 8,800 Non-Community systems. There are three times as many Non-Community as there are Community water supply systems. The construction guidelines for Non-Community systems are not as stringent as for Community systems. Non-Community systems are distinguished from Community systems in part by a noncontinuous water supply use. Restaurants, gas stations, grange halls, camps and schools usually come under the Non-Community designation. Community and Non-Community water supply systems and other private wells for any properties subject to permit under the State Sanitary Code are reviewed for compliance with the location, construction and protection criteria in <u>Rural Water Supply</u>. Additional similar criteria are used in the review of larger, community water system wells approved pursuant to Part 5 of the State Sanitary Code. In those cases, design standards are contained in the DOH's Bulletin 42,

# Recommended Standards for Water Works.

Once a well is constructed, if the property is under code supervision by DOH, the operation is expected to comply with the applicable code section. Again, <u>Rural Water Supply</u> is used as guidance if construction flaws are detected, or if a well must be abandoned and a new one drilled. Other cases in which <u>Rural Water Supply</u> standards are applied include when a county passes a Housing Code pursuant to Part 21 of the State Sanitary Code, or adopts Subpart 5-2 of the Code, or investigates a public health nuisance complaint involving a well under Part 8 of the Code.

In addition, service requests from a family involving their own well or drinking water, or for review of housing conditions for institutionalized residents (group homes) or welfare recipients for another agency are often conducted by local health units.

Some local governments choose not to enforce the uniform code for new construction. In these cases, the responsibility falls to the county, or to the Department of State if the county also fails to enforce the code. In additon, many localities enforcing the code still do not recognize their responsibility to enforce <u>Rural Water</u> Supply

The differences in the water quality standards for Non-Community water and Community systems, listed in Part 5 of the State Sanitary Code, are minor. Operators of Community systems must sample for water quality at least quarterly. Operators of Non-Community systems are not required to monitor as frequently, and the agents for which there are maximum contaminant levels are fewer. Operators of Non-Community systems are still expected to provide safe water and to make notification when they do not so monitor.

No specific regulations exist under Article 23 of the Environmental Conservation Law to protect Non-Municipal Community water supplies over that given to other privately owned water wells, but the Non-Municipal Community systems listed in the DOH atlas are given a closer review, and depending on the size may be treated as a municipal water supply. All water wells are protected by the drilling, casing and cementing guidelines and the aquifer drilling permit conditions. Privately owned Non-Municipal Community and Non-Community water systems have many protections, but not the same protection given to municipal water supplies under the current requirements.

# 5. Private Wells

No surface restrictions exist in the siting of an oil or gas well near a

private water well and operators are not required to show water well locations on the plats accompanying their permit applications. However, the restriction on siting of an oil or gas well within 100 feet of a private residence may also affect the distance to the water well. Water wells may be located almost anywhere, but they are usually in close proximity to the residence they serve.

Although private water wells considered individually are of less significance than municipal wells, they are equally sensitive to groundwater pollution. In fact, they may be more vulnerable to pollution problems because there are no standard statewide water well construction requirements. Water well casings are not always grouted and extended above ground. Thus they can serve as a vertical collection conduit for surface pollution. In addition, the ground surface surrounding water wells is not always built up to drain surface waters away from the well. For these reasons, a 150 foot setback from private water wells is recommended unless the water well owner approves a smaller setback. Additionally, the plat accompanying the drilling application should show the location of all private water wells of public record within 1.000 feet of the wellsite. In New York State, private water wells usually become a matter of public record when a property sale or transfer has occurred. Concerned citizens should check with the local officials about the possibility of including their water wells in the property descriptions maintained for tax purposes. It is recommended that written landowner approval be required for a waiver of the restrictions proposed for private water wells and springs used as a domestic water supply. It should be noted that water well pollution problems have sometimes been wrongly attributed to oil and gas drilling activities. The actual source may be such things as naturally occurring shallow gas, road salting or other causes.

### F. AGRICULTURE

During the pre-drilling site inspections conducted for every well permit

application, Department staff check whether recommendations or permit conditions are needed to mitigate the impacts of oil and gas activities on agricultural operations. Agriculture is a major industry in New York State, both in land use and monetary terms. Sixteen and one-half percent of the State's total land area is devoted to growing crops and another 6.76 percent to pasture. In 1984, the agricultural activities on these lands contributed \$2.8 billion to the economy (NYS Dept. of Agriculture and Markets, 1982b). Because of the importance of agriculture to this State and the predominately rural setting of oil and gas operations, potential conflicts between these two industries deserve extra consideration.

Special attention is focused on proposed oil and gas development activities that fall within Agricultural Districts. Under the Agricultural District Law (Agriculture and Markets Law, Article 25), all State Agencies must modify their administrative regulations and procedures to encourage the maintenance of commercial agriculture. Therefore, 6NYCRR Part 617 defines any activities disturbing more than 2.5 acres of land in Agricultural Districts to be Type I Actions under the State Environmental Quality Review Act. (The land disturbance threshold for Type I actions is generally set at ten acres). Type I Actions are more likely to require the preparation of an EIS than other actions and are also more likely to involve review by more than one governmental agency. Operators drilling wells or laying pipelines in Agricultural Districts are very careful to limit the disturbed area, and even wells outside Agricultural Districts rarely disturb more than 2.5 acres.

Although there are special environmental reviews required for agricultural areas in Agricultural Districts, under the proposed regulatory program careful consideration will be given to environmental impacts in <u>all</u> agricultural areas.

### 1. Drainage Systems

The construction of access roads and well sites and/or the travel of heavy equipment over them can damage tile drainage systems. This is a serious problem because artificial drainage systems have been installed on over a half million acres of farmland in the State at considerable public and private expense (NYS Dept. of Agriculture and Markets, 1982b).

When a drainage system is damaged, excess soil moisture conditions return and the farmer is faced not only with the cost and labor of repairing the system, but also an annual income loss from smaller harvests. A farmer can also be faced with similar difficulties if the placement of a well or access road interferes with the naturally existing drainage (NYS Dept. of Agriculture and Markets, 1982a).

### 2. Bisection of Fields

Another major conflict concerns the unnecessary bisection of fields when alternate well and access road locations exist. The placement of either a well or access road in the middle of a field removes viable farm land from production and interferes with basic farming operations such as plowing, planting, fertilizing and harvesting. Bisection of fields may also interfere with future plans to install drainage or wheeled irrigation systems (NYS Dept. of Agriculture and Markets, 1982a).

Adequate reclamation of well sites and access roads that have been sited in the middle of a field can also be a problem. Placement of a heavy rig and the repeated passage of large trucks can compact the soil in the field to the point where plant roots cannot penetrate it. Paraplowing can mitigate much of the damage caused by soil compaction (Blot, 1986, personal communication #4). In some cases bisection of a field is necessary because of spacing requirements. However, in many instances access roads can be planned according to existing and future land use needs.

# 3. Site Restoration

Prompt and adequate restoration of well sites, access roads and other areas disturbed by oil and gas operations can also be a problem. At the simplest level, failure to smooth out deep ruts at abandoned well sites interferes with movement of farm equipment. Formation of sinkholes in poorly reclaimed drilling or reserve pits is a more serious concern because of the danger such holes pose to humans, livestock and farm equipment. Livestock have been injured by ingesting or entangling themselves in the trash, and expensive farming equipment has been damaged by debris caught in moving parts (NYS Dept. of Agriculture and Markets, 1982a).

Although no formal policy exists, Department staff generally discourage on site trash burial and recommend that it be taken to a landfill. When trash has been buried on site, the burial depth has sometimes been too shallow to prevent damage to plow blades and/or re-emergence of the trash at the surface through frost action (NYS Dept. of Agriculture and Markets, 1982a). Because of complaints concerning burial of trash and pit liners which have a tendency to work their way back to the surface and interfere with farm operations, it is recommended the permit holder be required to have landowner approval to bury either trash or the drilling pit liner.

Damage to plow blades has also occurred when they collided with casing left in the ground. The Department recommends that the well casing must be cut down below plow depth during plugging and abandonment in agricultural areas. The safe buffer depth is now specified as 4 feet below the surface of the ground.

Another major concern in the agricultural community is restoration of the natural soil profile. During access road and well site construction, the land is usually stripped to bedrock or the hardpan clay zone to avoid erosion and

sedimentation problems and provide adequate support for heavy equipment. The topsoil that is removed should be stockpiled for later use. Mixing of topsoil with the subsoil below it during either site clearing or restoration will seriously hinder crop production (NYS Dept. of Agriculture and Markets, 1982a). The Seneca County Soil and Water Conservation District has estimated that reduced crop yields may be expected for 20 years or more when the topsoil location is reversed with the subsoil and buried below the plant root zone (Cool, 1982, personal communication #14). Therefore, it is recommended that topsoil stockpiling and redistribution during site reclamation be required in all agricultural areas. Additional measures such as paraplowing where compaction has occurred are also recommended.

Crop yields may also be affected when a site is restored with soils that have been contaminated with oil, gas, brine or other waste fluids. Brine and oil contamination of soil is a serious problem that can inhibit crop production for years unless prompt restoration is made (NYS Dept. of Agriculture and Markets, 1982a). (See Figure 8.3).

4, Water Supply

Contamination of water supplies used for livestock, irrigation and other agricultural purposes is also a concern to farmers. Over the years, oil and gas operations have been suspected in several water pollution incidents. However, the source of these water pollution problems is often difficult to determine, especially without accurate information on the original quality of the water supply. In addition, it is difficult to prove the exact cause of livestock illness or mortality without extensive testing (Lacey, 1983, personal communication, #43).

Farmers are also concerned about the location of drilling pits in or near pastures (NYS Dept. of Agriculture and Markets, 1982a). Drilling pits containing brine can be an nuisance because stock may be attracted to the

# FIGURE 8.3 RESTORED SITE OF BLOWOUT AND PRODUCTION RECORD HOLDER



The Lipari No. 1 located on the millside above the Josephson wells (Fig. 8.6 and 8.7) was permitted in 1981 with no special conditions. Although drilled within the Bass Island Corridor, the Department had not yet developed drilling conditions for the formation.

Large volumes of oil and gas entered the wellbore during drilling. Two attempts to control the well failed and the well "blaw-out". A third attempt succeeded, but not before an extensive fire and oil spill occurred. Approximately three acres of land were affected by the oil spill and fire. However, as evidenced by Pig. 8.7, the affected land is again under cultivation. Prudent clean-up operations protected the surrounding land and water resources. The site presently shows no evidence of a non-routine incident of this magnitude.

As seen in this figure, the Lipari No. 1, presently recovers oil and gas through an artificial means of energy (i.e. pumping). However, for two months this well was the most productive well ever in New York, producing at rates approaching 2,000 barrels of oil per day. Natural energy depletion and paraffin problems have substantially reduced this well's capacity to produce. This well was included in the Bass Island Summary Abatement Order.

salt. Fencing around pits is rare because of their temporary nature.

5. Lease Terms

Some of the above mentioned problems regarding drainage, bisection of fields, and livestock safety are best addressed by contractual arrangements between the landowner and the lessee because the landowner is most familiar with the details of his farming operations, such as the exact location of his drainage systems and his future plans for the farm. For guidance, the New York State Soil and Water Conservation Committee has recently developed a suggested addendum to oil and gas leases to help farmers deal with these and other problems (State Soil and Water Conservation Committee, 1983). Additionally, the Farm Bureau and the District Attorney's office have also published a Bulletin to aid the landowner (Cornell University, 1982). Soil and Water Conservation District staff are also reporting increased cooperation by the oil and gas industry in recognizing agricultural concerns. (Lacey, 1983, personal communication #43).

Often farmers designate where they want wells and access roads to be located. Although oil and gas companies usually honor landowners verbal requests, inclusion of siting restrictions in the lease document is the best means of protecting farming operations and other landowner concerns. Landowners also may request that a road be built in a specific location for their future use as a farm road, logging road, etc. In these cases the road will not be reclaimed. Landowners are cautioned to carefully review the proposed contractual lease terms because the Department can intervene only when environmental damage or regulatory violations have occurred. Leases also sometimes include the following provisions related to well and access road siting and preparation (State Soil and Water Conservation Committee, 1983):

- require fencing of well site and disturbed areas during and after

construction to prevent injury to livestock.

- compensation for damages to land, crops, fences, trees, buildings, springs, water wells, ponds, livestock or other property.
- timing of construction so as to provide for minimal impacts on the soil profile (e.g., construction during summer months) and minimum interference with plowing, planting or harvesting of crops.
- repair of damaged conservation practices (drainage systems, ditches, etc.)
- restrictions on use of landowner's water supplies.
- require removal or burial of drill site trash and debris
- require a gate on access road to prevent escape of livestock or unauthorized entry.

# 6. DEC Permit Conditions

Although most of the potential conflicts between agriculture and oil and gas operations should be handled during the leasing process, DEC's regulations are also important in preventing problems. As a result of both the permit application review and pre-drilling site inspection processes, DEC staff may attach conditions to permits requiring:

- adoption of erosion and siltation control measures
- stockpiling of topsoil for use during site reclamtion
- timetable for site reclamation
- the movement of wells and/or access roads to the edge of fields where

they will interfere less with farming operations.

Erosion, sedimentation and general agricultural issues have been added to the Pre-Drilling Environmental Assessment Form so that these issues will be addressed on a consistent basis.

### G. STREAM DISTURBANCE

During the pre-drilling site inspections conducted for every permit

application, Department staff check whether the proposed well or access road location is within 50 feet of a protected stream. If so, a Stream Disturbance Permit may be required. Physical alteration of the bed or banks of a stream can cause [6NYCRR Part 608.2(c)(2)]:

- danger of flood

- loss of fish and aquatic wildlife habitat
- irregular variations in water velocity
- water level and/or temperature change
- unreasonable and unnecessary erosion of soil
- increase in water turbidity

To prevent problems like those listed above, the change, modification or disturbance of the bed or banks of any protected stream [Class AA thru C(T)] is prohibited without a Stream Disturbance Permit from the DEC Division of Regulatory Affairs. Construction of dams and other impoundments, removal of sand or gravel, placement of fill and building of docks are all covered under the permit program. The most common activity related to oil and gas development that might require a Stream Disturbance Permit is the construction of an access road across a stream.

1. Streambanks

Some minor stream erosion and temporary stream siltation is inevitable during the access road construction; however, Stream Disturbance Permits contain conditions that effectively minimize these problems. During the stream ford construction, rock and soil cannot be pushed into the stream when breaking through stream banks. Excavated soil also cannot be stored at locations on top of stream banks where it could erode into the stream or cause banks to collapse. In addition, all existing stream bank vegetation must be left undisturbed except at the actual crossing site. Immediately after

completion of the project, all disturbed stream banks must be graded to meet existing adjacent topographic conditions, seeded with a perennial grass mixture and mulched with hay or straw. Seed and mulch must be re-applied as necessary until a vigorous vegetative cover is established. Sometimes the operator is also required to install water bars, cross ditching and staked hay bale filter barriers on the access road where silt and suspended soils could otherwise reach a stream or pond. The described erosion control measures must be adequately maintained until well production is complete.

### 2. Gathering Lines

Some of the major negative impacts which can occur as a result of pipeline installation are loss of vegetation, disruption of scenic vistas, disruption of the natural soil profile, increases in erosion in sensitive areas, and increases in sedimentation at stream crossings and in wetlands. Pipeline installation can temporarily disrupt traffic at railroad and highway crossings. Pipelines and the associated compressor stations can also have negative noise impacts on people living in proximity when no noise mitigation measures are taken.

Often gathering lines cross streams or other environmentally sensitive areas. Before the gathering lines were regulated, such lines could simply be suspended across the stream where exposure to the elements, flood debris, and possibly vandals, could damage them. For example, several years ago a break in a gathering line crossing a trout stream to a storage tank spilled oil that remained in the stream for several years (Cooper, 1983, personal communication #15). The Department now has siting jurisdiction of gas gathering lines in environmentally sensitive areas such as wetlands and stream crossings and both safety and siting jurisdiction over oil gathering lines. To protect streams from such accidents, the Department now requires that collector lines be buried adjacent to the access road crossing. Open trenches down the stream

bank must be backfilled immediately after pipeline installation to prevent the entry of silt and suspended solids into surface waters from rain induced flows. The Department nmay also require that any steel casing/oil line entrenchment across the stream be carried out during low water conditions and expeditiously completed within a maximum 24 hour period.

The Public Service Commission (PSC) has safety jurisdiction over gas gathering lines and the PSC specifies minimum burial depths. The specifications required by PSC for gathering lines have been included in Appendix 6.

# 3. Culverts and Sills

A culvert is sometimes installed to channel the stream beneath the access road. As an alternative, a sill may be constructed flush with the stream bottom to allow the vehicles to drive through shallow water. Depending upon the type of stream crossing the Department requires, the culvert base be emplaced on or slightly below stream bed elevation. Only clean gravel (with minimum soil) may be used as fill around the culvert to minimize entry of silt and suspended solids into the water. Both the up and downstream sides of the culvert structure usually must be riprapped to prevent damage from erosion. When used, riprap generally must be entrenched at least 18 to 20 inches below the stream bed.

# 4. Fill and Filter Fabric

Filter fabric is often required in access road construction to decrease the amount of fill needed and minimize impacts on the stream. Whether filter fabric is used or not, placement of fill to construct the access road must always be kept to the absolute minimum necessary to enable passage of heavy equipment and to prevent impounding of flood waters. All fill must meet permit specifications and be obtained from State approved sites. When filter

cloth underlayment (geotextile) for the sill is used it must be of appropriate bearing strength to support the weights of the heaviest equipment expected to be used in the well drilling operation.

5. General

The following types of general conditions may also be included in the Stream Disturbance Permit:

- the use of equipment in the stream, except at the authorized crossing site is strictly prohibited. No gravel shall be removed from any stream for access road and/or well site construction or maintenance without prior approval from the Department.
- the stream shall not be crossed during or immediately after a storm which may cause high water conditions or flooding.

6. Aquatic Habitat

Protection of fish and aquatic habitat is one of the primary goals of the Stream Disturbance Permit program. The Permit conditions outlined above are generally effective in preventing stream siltation. However, during fish spawning periods when stream water quality is of special importance, work on the bed or banks of a stream may be restricted.

### H. EROSION AND SEDIMENTATION

During the pre-drilling site inspection conducted for every well permit application, Department staff check whether recommendations or permit conditions are needed to prevent erosion and sedimentation problems from oil and gas drilling activities. Clearing vegetation from well sites and constructing access roads disturbs the soil and leads to accelerated soil erosion. Soil erosion and sedimentation are more likely to occur when: 1) a site is prepared during the wet season, or 2) an inordinate amount of precipitation washes out the site.

Soil is an essential natural resource. Yet when soil from access roads

and well sites is deposited in nearby water bodies, it becomes a pollutant. Stream siltation can temporarily elevate the level of suspended particulates in the water, reduce light penetration and lower the rate of photosynthesis and primary productivity of the aquatic community. In addition, pesticides, herbicides, viruses, pathogens, toxic metals, fertilizers, and other plant nutrients absorbed or adsorbed onto fine grained soil particulates may become biologically available to organisms in the water column or on the substrate. The biological and chemical oxygen demand of the suspended material may also remove dissolved oxygen from the water and deplete the supply available to fish and other aquatic life (Ertugrul, 1982). Sediment loading of water bodies can also (NYS DEC, Division of Water, 1985):

- smother fish eggs laid in bottom gravels.
- destroy fish habitat by covering up rock rubble. If the sediment contains a high proportion of silt/clay particles the damage to the habitat will be irreversible without mechanical removal of the sediment.
- destroy or cover invertebrates, vegetation, and detritus on which fish
  life depends.
- clog stream channels, fill lakes and ponds, and reduce reservoir capacity.
- damage water distribution systems.
- degrade water for human consumption, interfere with disinfection, mask pathogenic organisms and increase water filtering and treatment costs.
- detract from recreational use of water.
- increase flood levels of water bodies.

The above problems can be alleviated by good erosion control planning and increasing the setback restrictions as recommended.

1. Wells and Drinking Water Reservoirs

Pre-drilling site inspections have been conducted for every well permit

application since 1982 when money from the higher permit fees authorized by the amended Oil, Gas and Solution Mining Law made it possible to support additional inspection staff. At about the same time, a policy was also implemented requiring operators to submit complete erosion and sedimentation control plans for wells to be drilled in the watershed of a drinking water reservoir.

As a result of the inspections and/or plans, DEC requires adoption of specific erosion and sedimentation control measures based upon the topography, soils and vegetation of the well site and access road area. Such measures are generally very effective provided they are carefully planned, installed and maintained. Common erosion and sedimentation control measures that might be required by conditions attached to a well drilling permit include diversion ditches (to control surface runoff) filtration strips, sediment barriers, road culverts, cross drains, sediment ponds, seed and mulch and grading.

2. Other Wells

Review of erosion and sedimentation control plans for wells in drinking water reservoir watersheds has generally increased staff awareness of these types of concerns. Accordingly, conditions regarding potential erosion and sedimentation problems are often added to drilling permits for oil and gas wells in other locations. These issues and many more are covered in the Environmental Assessment Form (see Appendix 5) which must be submitted by the operator with the drilling permit application.

Some of the natural resources that may be affected by erosion and sedimentation are listed on the Inspection Form. For example, DEC staff must check whether the proposed well or access road location is within 50 feet of a surface waterbody or 100 feet of a freshwater wetland. However, a 50 foot buffer between a well and a lake or stream is not an adequate indication of the potential for sedimentation problems. Depending upon the local

topography, eroded sediments can travel much farther than 50 feet. In addition, the average area cleared around the well is approximately 100 feet x 100 feet outside of Agricultural Districts and the site could extend up to the water's edge, leaving disturbed, erosion-prone soils directly next to the waterbody. This is further justificiation for extending the buffer zone between a proposed well and a surface water body.

# I. HISTORIC/ARCHEOLOGIC SITES

During the review of every well permit application, Departmental staff check whether the proposed oil and gas activities will disturb any areas of historic or archeologic significance. The New York State Historic Preservation Act of 1980 requires that all State agencies prevent adverse impacts on the State's historic and archeologic resources.

1. Historic Sites

There are several hundred historic sites in New York State listed on either the State or Federal Registers. Areas listed or eligible for listing cannot be disturbed or impaired. The sites currently listed range from individual buildings, to farms of more than 50 acres, to entire villages (Ross, 1983, personal communication #60).

To date, no conflicts have been recorded between oil and gas drilling related activities and a site on either Register. In the event a well is proposed in the vicinity of an historic site, the Department will base its determination regarding issuance of the permit on individual circumstances. Possible conditions which might be required for a permit include:

- visual screening of operations.

- setback requirements greater than existing minimums (private home 100', public building or area 150').
- restriction on times of operation, for example not during the tourist

season, museum hours, etc.

- landscaping reclamation requirements.

2. Archeological Sites

The State Office of Parks, Recreation and Historic Preservation (OPRHP) has identified over 1,000 archeological sites in the western and central parts of the State which may be eligible for listing on the State Register. In order to protect sites from "arrowhead poachers" OPRHP's archeological maps are very general in nature. Site locations are indicated only by one mile wide circles or squares (Kuvic, 1983, personal communication #39) (See Fig. 8.4).

Most of the archeologic sites are of Indian origin, with a significant proportion of them concentrated along water bodies. The sites range in size and importance from a single fire pit to entire villages. As the inventory is expanded, more sites from the colonial period may be added (Kuvic, 1983, personal communication #39).

Since archeologic sites are generally difficult to detect by their surface appearance, they are more likely to be damaged by oil and gas activities than other historic structures. Even if artifacts are salvaged during construction, removal from their original location and disturbance of the site will destroy much of their value. Archeologists need to study the relative position of artifacts to surrounding bones, rocks, soil, etc., to determine their age and more about the lives of the people who used them (Kuvic, 1983, personal communication #39).

Before a permit can be issued for any oil and gas activity within one of the mapped one mile wide circles or squares, the proposed project must be reviewed for its archeological impacts. Normally this would involve forwarding the permit application to OPRHP for review. However, in recognition of the time constraints involved in drilling activities, operators





SOURCE: New York State Archeological Site Locations, 1981 New York State Office of Park Recreation & Historic Preservation

may have an independent archeological survey conducted instead and submit the results with their permit application. Survey costs generally range from \$500 to \$1,500, though the cost may increase if something of archeological worth is found. Figure 8.5 summarizes the archeologic review process.

The presence of archeological artifacts at a site does not necessarily preclude a permit from being issued. Recovery of archeological data from the affected area may be sufficient to satisfy the requirements of the State Historic Preservation Act (Kuvic, 1983, personal communication #39).

### J. SIGNIFICANT HABITATS

During the review of every drilling permit application they receive, DEC's Division of Regulatory Affairs (DRA) staff check whether the proposed oil and gas activities will disturb flora or fauna of special concern. Since its inception in 1975, the State Significant Habitat Inventory has been a useful tool for protecting important fish and wildlife resources including rare, endangered and threatened species. Approximately 1,000 significant habitats have been identified so far statewide and work continues on expanding the inventory (Brown, 1984, personal communication #6).

Significant habitats are defined as areas which "provide some of the key factor(s) required for survival, variety, or abundance of wildlife, and/or for human recreation associated with such wildlife." Examples of significant habitats include (NYS DEC, Division of Lands and Forests, 1980):

- areas containing endangered or rare species.

- high concentrations of wildlife.

- concentrated migration routes.

- urban open space of value as wildlife habitat.

- uncommon land forms.

- unusual vegetative associations that support unusual wildlife.

# FIGURE 8.5 ARCHEOLOGIC REVIEW PROCESS



The following steps must be taken after the Division of Regulatory Affairs determines a proposed oil or gas well location is within an archeologically sensitive area.

- STEP 1: DEC notifies applicant that location is within an archeologically sensitive area. Applicant is given option of: a) having the proposed location reviewed by the Office of Parks, Recreation and Historic Preservation (OPR) or b) hiring a qualified consultant to do an archeologic survey.
- STEP 2a: If applicant elects OPR review, a map of the proposed well location must be sent to OPR.
  - Note: <u>Advantages</u> after OPR review, the cost of an archeological survey may not be necessary. <u>Disadvantages</u> - review process could take 30 to 45 days and OPR may determine a site survey is still necessary.
- STEP 2b: If the applicant elects to hire a consultant, the applicant must have the consultant notify OPR with the results of the survey.
- STEP 3: OPR will issue approval or disapproval within 30 to 45 days.
- STEP 4a: If final approval is given by OPR, the drilling permit can be issued.
- STEP 4b: If final approval is not given by OPR, the drilling permit cannot be issued. Applicant may be required to move proposed location or have survey performed.
  - Note: Approval by OPR can be in either written or verbal form.

- areas containing features critical to a particular species such as deeryards, nesting areas and spawning grounds.

The majority of the Significant Habitats in or near existing oil and gas fields fall into one of the following categories:

1. Heronries

The Great Blue Heron nests in colonies ranging in size from 2 to 400 nests. Individual sites are important to the birds' survival. There are only 90 to 100 known heronries in the entire State (Brown, 1984, personal communication #6). The noise and activity associated with oil and gas operations could pose a threat to heronries only during the nesting season which extends roughly from early April until the end of July. The exact distance needed between a well and a heronry to ensure the nesting birds are not disturbed is uncertain. Heronries are known to exist near railroad tracks and other noisy locations, and it may actually be more important that the oil and gas operations remain out of the birds' visual contact. Therefore, the Department sets the minimum distance between wells and heronries on an individual basis allowing for local topographic features, density of vegetation and a margin of safety (Cooper, Taft, personal communications, #15 and 65).

### 2. Deer Wintering Areas

Deer wintering areas are by far the most prolific type of significant habitat existing in the State's oil and gas producing region (Cooper, Jurczak, Taft, personal communications, #15, 37, 65, and 66). There are several hundred wintering areas ranging in size from one to 600 or 700 acres. The hemlock and pine softwood trees provide protection from the elements as well as food in the form of woody browse. These areas are vital to the deer's survival, especially during harsh winters (Cooper, Jurczak, 1984, personal communications #15 and 37).

As needed, DEC staff may require the relocation of a proposed access road or well site to prevent either destruction of softwood cover or disturbance of the herd by drilling during winter months. Relocation may also be required because of the indirect, but potentially more serious, impacts resulting from creation of new access routes into the wintering areas for snowmobiles, dogs and hunters (Cooper, 1984, personal communication #15).

Replanting of conifers in disturbed areas is occasionally also used as a mitigation technique (Jurczak, 1984, personal communication #37).

### 3. Uncommon, Rare and Engangered Plants

There are no records to date of a conflict between oil and gas drilling operations and a rare plant community. There are, however, a wide variety of rare, endangered and uncommon plant habitats in the general vicinity of the State's existing oil and gas fields. Although it is difficult to generalize, most of these plant communities have survived either because they are not easily accessible or restrictions have been placed on their use. Once damaged, re-establishment of these delicate plant communities would generally be slow, if not impossible. Therefore, the best technique for mitigating oil and gas drilling related impacts is complete avoidance of the plant habitat.

Aside from the listing of the plant habitats in the Significant Habitats Inventory, many of the plants involved are also on the New York State List of Protected Plants (ECL 9-1503). Designation on the list, however, only protects plants on public property.

Some of the significant plant communities occurring in wetlands may receive some additional protection under the State's Freshwater Wetlands Law depending on whether the wetland is over 12.4 acres or has been designated a unique wetland regardless of its size. (See 8.L for additional information). K. FLOODPLAIN

During the pre-drilling site inspections conducted for every permit application, Department staff check whether a State or Local Floodplain Permit is needed [ECL Article 36]. Floodplains are the lowland areas along streams, rivers, ponds and lakes which carry extra water when heavy rain, melting snow or some other phenomena causes a waterbody to overflow its normal banks. Property damage and other problems can arise when development of any type takes place in these areas.

To help alleviate problems in floodplains, Congress passed the National Flood Insurance Act in 1968. To benefit from the insurance breaks offered by the national program, local governments must develop long term flood management plans and issue permits for activities in floodplains. If the local government does not exercise its option, the State must handle the permitting for that area.

Under the national program the Federal Emergency Management Administration has been working on mapping 100 year floodplain boundaries. Due to funding problems, however, fewer than half the eligible communities have received or expect to receive the data from the federal government. Therefore, floodplain maps are being developed on a municipal basis for these communities.

During the pre-drilling site inspections, DEC staff must check whether the well or access road will be within 100 feet of a floodplain boundary. If the proposed well location is in a community that has its own floodplain program, the community will be notified of the permit application. Whether State or local authorities issue the floodplain permit, the following concerns should be addressed when siting a well in or near a floodplain:

1. Mud or Reserve Pits

Wherever possible, mud pits should be located on the side of the well most distant from the water course and the well site should be graded to

direct surface run off and accidental spills into the mud pit. Floods can destroy or weaken pit effectiveness in a number of ways. Floodwaters may seep through or completely wash away the retaining walls and float the liner away from the sides. If the flood is high enough, it may crest the pit and flush out the contents. Even a minor flood, which does not breach the river bank, could cause a rise in the water table on a floodplain which might float the liner out of a mud pit. Although contamination of the floodwaters by pit fluids is a concern, the high volume of floodwaters usually involved should dilute the pit wastes sufficiently to prevent harm. Contamination of groundwater and accidental leakage of waste fluids from a flood damaged pit are of greater concern.

2. Brine and Oil Tanks

The operator may elect to install one or more tanks at a well site to collect brine and/or oil. Since such tanks are usually associated with the production phase, they are one of the more permanent features of a well site. Brine from drilling operations usually goes to the mud or reserve pit. However, the Department has the authority to require installation of tanks for handling drilling brines also.

Tanks on well site locations generally range in size from 12 to 200 barrels (one oil field barrel = 42 gallons). The only significant difference between oil and brine tanks is that the latter are usually lined to prevent salt water corrosion. The Department does require that oil holding tanks in primary aquifer areas be surrounded by a dike capable of retaining 1½ times the capacity of the tank. The dikes are usually formed of compacted earth and may also be lined with an impermeable material. It is suggested the regulations be amended to require dikes around all oil storage tanks in the future, regardless of their location.

Flood damage to tanks can result from collisions with uprooted trees or other flood debris. Floodwaters may also float a tank off its foundation possibly causing the tank to collide with other objects along the way. Damage to collection and distribution lines connected to a tank is also a concern if the well is flowing. Brine from a damaged tank probably will not cause serious environmental problems provided the leak occurs while the floodwaters are present to dilute it. Brine leaks after the floodwaters have receded could be more serious.

Unlike brine, oil will not be "diluted" by the floodwaters. It may spread out on the water surface and travel a substantial distance or it may be deposited in a suffocating layer. Although fresh oil floats on water, weathered oil may sink to the bottom after the turbulent water conditions associated with flooding have passed. The most likely natural resources to be damaged by oil from a tank are:

- the surface water body the floodplain is associated with and any flora or fauna living in or near the waterbody,
- wetlands in the floodplain (for more information on the potential environmental impacts of oil on these natural resources, see section on wetlands).

To prevent the types of problems described above, the Department requires that all brine and oil tanks in floodplains be securely anchored in place in accordance with the plan entitled "Deadman Tie Down - Liquid Storage Tank". A deadman is a buried anchor, steel piling, concrete plug or timber, to which a guy wire is attached. The deadman used for anchoring must be buried a minimum of three feet below ground level.

### 3. Other Tanks

Portable tanks, called Baker tanks, may also be installed at a well site to temporarily store such things as fresh water, completion fluids, workover

fluids and spent frac fluids. These square tanks generally rest horizontally on a skid which allows them to be moved more easily. In fact, a single tank may be employed for a number of uses in different locations around the well site over a relatively short period of time. Tanks may also be rented from a supply company as needed. Under such conditions, they are rarely anchored in place like the permanent brine and oil storage tanks.

Fresh water is not a pollutant and its accidental release into the environment is not a significant concern. Completion fluids, workover fluids and spent frac fluids are potential pollutants so adequate containment is required.

Although floods can occur year round, they are most common during the snow melt/spring rain season. Local weather stations regularly issue flood watches or warnings as needed. In the event of a flood warning, an operator should have time to secure or remove temporary storage tanks.

### 4. Brush Debris

The brush pile remaining from clearing of the access road and well site would be one of the first things to be swept away by a flood. Depending upon local topography, the brushy debris could block the access road, hinder well site operations or do damage farther downstream. To prevent this, the Department attaches the following conditions to permits for wells in floodplain areas:

- 1) merchantable tree parts shall be salvaged for lumber, if possible.
- non-merchantable tree parts and brush debris be salvaged for use as firewood, or
- 3) winnowed and securely anchored to form a brush pile (anchors are necessary to prevent downstream flood debris damage), or
- 4) buried on site under 2 feet of soil.

### 5. Erosion/Topsoil

As previously mentioned, erosion is a topic that must be addressed in construction of access roads and well sites. It is a particular concern in floodplains because of the strong erosive power of moving flood waters. For example, if the stock pile of topsoil that has been saved for later site reclamation is within the floodplain, it may be lost downstream. Although the issue of topsoil protection is not addressed in Floodplain Permit conditions, the Department prohibits drilling during flood season and requires that adequately sized culverts be installed under the access road to provide proper drainage and water flow within the flood hazard area. This permit condition

# 6. Bulk Supplies

Bags of drilling mud materials, cement, additives and other supplies may be stored on site until they are needed. The most common storage places are wooden pallets or a small shed known as a mud house. Because the supplies are normally stored on platforms and protected from rain, etc., severe flooding is one of the few ways they might accidentally enter the environment in large quantities.

# 7. Accidents

The chances of just about any type of accident occurring are greater when movements of personnel and equipment are hampered by flood conditions. Therefore, the Department prohibits drilling or construction activities on floodplains during flood or high water season.

### L. FRESHWATER WETLANDS

"Freshwater wetland" is a general category that includes such diverse habitats as mossy bogs, cattail marshes and swamps of mature trees. They are all characterized, however, by the presence of shallow waters or waterlogged

soils that support distinctive communities of aquatic or water-tolerant plants. During the pre-drilling site inspections conducted for every well permit application, Department staff check whether the well, access road or any other associated oil and gas facilities will be within 100 feet of a freshwater wetland.

Under the Freshwater Wetlands Act, it is State policy to preserve, protect and conserve freshwater wetlands and the benefits derived therefrom [ECL 24-0103]. Therefore, a Freshwater Wetlands Permit is required for any oil and gas activities within 100 feet of any wetland <u>12.4 acres or larger</u>. Such permits may also be required for smaller wetlands of unusual local or statewide significance. Mineral Resources staff may also add conditions to well drilling permits to protect wetlands <u>under 12.4 acres</u> based on the responsibility of State agencies to promote efforts which prevent or eliminate damage to the environment. The Department allows oil and gas drilling activities in wetlands only when alternate locations are not available. The basic policy of impact mitigation for wetlands is avoid, restore or compensate (Riexinger, 1986, personal communication *#59*).

Although all wetlands cannot be credited with equal environmental importance, viewed as a group they perform many essential functions [ECL 24-0105.7]:

- flood and storm control by the hydrologic absorption and storage capacity of wetlands vegetation and soils;
- wildlife habitat by providing breeding, nesting and feeding grounds and cover for many forms of wildlife, including migratory waterfowl and rare species such as the bald eagle and osprey;
- protection of subsurface water resources, provision for valuable watersheds and recharge of ground water supplies;
- recreation by providing areas for hunting, fishing, boating, hiking, bird

watching, photography, camping and other uses;

- pollution treatment by serving as biological and chemical oxidation basins;
- erosion control by serving as sedimentation areas and filtering basins, absorbing silt and organic matter and protecting channels and harbors;
- education and scientific research by providing readily accessible outdoor biophysical laboratories, living classrooms and vast training and education resources;
- open space and aesthetic appreciation by providing often the only remaining open areas along crowded river fronts and coastal Great Lakes regions; and
- habitat for some of the rare plants on the New York State List of Protected Plants.

At the most elemental level, construction of access roads and well pads in wetlands can be expected to destroy vegetation and displace wildlife. The actual extent of the environmental impacts from oil and gas activities will vary with type of activity, type of wetland and conditions placed on the permit. Wetland classifications are given in Table 8.1. These classifications help identify the relative value of wetlands. The topics that should be considered in reviewing a permit application for a well in or near a wetland are outlined below.

#### 1. Interruption of Natural Drainage

Construction of access roads and well pads in or near wetlands changes

the existing contours of the land. The changes often interrupt surface runoff patterns and may also interfere with the natural flow of waters in the wetland. Depending upon local conditions, these changes could result in such things as:
# Class I Wetlands 1,2,3

Class I wetlands provide the most critical of the State's wetland benefits, reduction of which is acceptable only in the most unusual circumstances. A a compelling economic or social need that clearly and substantially outweights the loss of detriment to the benefit(s) of the Class I wetland.

Class III Wetlands 1,2,3

wetland benefits, the loss of which is according Class III wetlands supply of which is acceptable only after the exercise of caution and discernment. A permit shall be issued only if it is determined that the proposed activity satisfies an economic or social need that outweighs the loss of or detriment to the benefit(s) of the Class III wetland.

Class II Wetlands 1,2,3

Class II wetlands provide imporant wetland benefits, the loss of which is acceptable only in very limited circumstances. A permit shall be issued only permit shall be issued only if it is determined that the proposed activity satisfies a pressing economic or social need that clearly outweighs the loss of or detriment to the benefit(s) of the Class II wetland.

Class IV Wetlands 1,2,4

Class IV wetlands provide some wildlife and open space benefits cited in the act. Therefore, wanton or uncontrolled degradation or loss of Class IV wetlands is unacceptable. A permit shall be issued for a proposed activity in a Class IV wetland only if it is determined that the activity would be the only practicable alternative which could accomplish the applicant's objectives.

The proposed activity must be compatible with the public health and welfare.

<sup>2</sup>The proposed activity must be the only practicable alternative which could accomplish the applicant's objectives and must have no practicable alternative on a site that is not a freshwater wetland or adjacent area.

<sup>3</sup>The proposed activity must minimize degradation to, or loss of, any part of the wetland or its adjacent area and must minimize any adverse impacts on the functions and benefits which that wetland provides.

<sup>4</sup>The proposed activity must make a reasonable effort to minimize degradation to, or loss of, any part of the wetland or its adjacent area.

- an increase or decrease in the water level in all or part of a wetland with possible permanent change in flora, fauna and benefits that the wetland provides.
- diversion of water to areas adjacent to wetlands possibly creating temporary soggy soil conditions, new wetland areas, water in basements, etc.
- erosion of topsoil, washout of access roads, etc.

Problems like those above have been mitigated by attachment of permit conditions requiring that adequately sized culverts be installed under the access road to provide proper drainage and flows within the wetland. The routing of flowing water and runoff around the well pad can also be handled by a similar permit condition.

#### 2. Flooding

Water levels in wetlands can vary with the season, and flooding of the access road and/or well site may occur. When movements of personnel and equipment are hampered by high water, there is an increased chance for accidents. Therefore, drilling permits for wells in wetland areas sometimes contain a condition prohibiting drilling or construction activities at a well site during periods of the year when either it, or its access road, is inundated by flood waters. A permit condition may also require an operator to carry out all work during dry periods of the year as expeditiously as possible.

The placement of fill for construction of the access road and well site must generally be kept to the absolute minimum necessary and in some cases bank run gravel is specified. However, to protect the well site from high water, the Department may instruct the operator to build it up.

3. Erosion and Sedimentation

Clearing vegetation from well sites and constructing access roads in any setting disturbs the soil and leads to accelerated erosion. In addition to possible deterioration of the access road and well site, problems may also result from deposition of the eroded sediments in or near the wetland. Small quantities of eroded materials generally will not cause any significant problems. However, the potential does exist for burial of wetland vegetation with possible permanent change in a portion of the wetland. Sedimentation of water bodies associated with the wetland may also be a concern.

These problems can be effectively mitigated by the runoff, erosion and siltation conditions attached to permits similar to those for wells in drinking water reservoir watersheds. Such permit conditions are also used for protecting wetlands but not on such a consistent basis. Operators have sometimes been required to install water bars, cross ditching and staked hay bale filter barriers on the access road where silt and suspended solids might otherwise reach a stream, pond, or wetland.

#### 4. Brush Disposal

Depending upon individual circumstances, large piles of brush and other woody debris may be created during well site and access road clearing. Brush piles left behind in a wetland may alter wetland characteristics or be visually incompatible with the surrounding vegetation. In addition, loose brush may cause damage downstream if the wetland is flooded. However, some DEC wildlife staff support brush piles as temporary feed areas for deer and a habitat for squirrels, chipmunks, birds and other small animals.

To prevent problems, operators are required to salvage merchantable tree parts for lumber if possible. If salvage is not possible, they must be disposed of. Non-merchantable tree parts and brush debris must be (1) salvaged for firewood, (2) disposed of at an approved landfill site, (3) buried on-site under 2 feet of soil, (4) chipped to provide a ready mulch for

erosion control, (5) winnowed and securely anchored to form a brush pile (anchors are necessary to prevent downstream flood debris damage). Open burning of brush and debris is prohibited.

None of these disposal options should cause any environmental damage to the wetland, with the possible exception of option #3. However, the permit condition is usually worded to require brush debris burial in previously disturbed areas only.

# 5. General Permit Conditions

There are also several general conditions that may be attached to permits for oil and gas related activities that are aimed at minimizing the area disturbed:

- disturbance to the wetland and its adjacent area shall be strictly limited to the work area identified in the site plan.
- the permittee and/or any project contractor(s) are prohibited from operating equipment in any other portion of the wetland or its 100 feet wide adjacent area without obtaining prior written approval.
- the storage of construction equipment and materials shall be confined to the project work site and/or to upland (non-wetland) areas more than 100 feet distant from the wetland boundary.
- the placement of fill, trees, brush and construction debris within any portion of the wetland (outside the project area identified in the site plan) is strictly prohibited.
- placement of fill to construct or upgrade the access road/well site shall be kept to the absolute minimum.
- filter cloth underlayment (geotextile) shall be used for the access road and drilling pad and it shall be of appropriate bearing strength to support the weight of the heaviest equipment expected to be used.

- access roads shall incorporate low spots and/or adequately sized culverts as necessary in construction to provide proper drainage and flow within the wetland.
- installation of brine and water lines and electrical conduit shall take place at the same time and be accomplished in one operation without delay between construction phases. The operation shall be completed during low water conditions within a maximum 48 hour period.
- within 30 days after completion of the well, top soil shall be graded over the well site to recreate as nearly as possible the previously existing topography. A mulch of hay or straw shall be applied to the graded area.
- all disturbed areas shall be seeded immediately upon project completion.
  - 6. Creation of Replacement Wetland

Creation of new wetland habitat is required by the Division of Regulatory Affairs for any substantial wetland loss that will result from access road or well site construction. The operator is required to excavate pot-holes or a level-ditch pond (approximately 150 feet long) to create new shallow water emergent marsh areas. Replacement is generally on an acre for acre basis, though adjustments may be made according to the "value" of the wetland destroyed. The policy aims for replacement of lost value more than lost acreage (Riexinger, 1986, personal communication \$59). All such habitat improvements must be constructed at locations adjacent to or near the well sites and access roads. They also must be within and/or adjacent to the disturbed wetlands, and constructed in accordance with DEC specifications and/or US Department of Agriculture Soil Conservation Service specifications with DEC concurrence. (See Fig. 8.6 and 8.7) All mitigation measures must be completed within a set time period; usually 30 days from the commencement of well drilling is the time period specified. Informal extentions are routinely

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# FIGURE 8.6 - WETLAND PERMIT CONDITIONS AND MITIGATION POND



The Josephson No. 2 well was subject to the requirements of Aquifer and Bass Island pennit conditions. Furthermore, this well conformed to the requirements set forth in the Preshwater Wetland Pennit No. 90-81-0045B.

In addition to the 15 general requirements, 14 supplemental conditions were included on this permit. The highlights of the conditions for this well are as follows:



- 1. Construction of mitigation ponds at locations approved by the landowner and DEC staff.
- 2. Drilling prohibited during flood or high water seasons.
- 3. Culverts must be installed where appropriate.
- Wellsite shall be seeded with a mixture of redtop, roughstalk bluegrass and ryegrass, at a rate of 10 pounds per acre.
- 5. Filter cloth, shall be installed under the wellsite and access road and be of appropriate strength to support the weight of the heaviest equipment expected to be used during well drilling operations.

This well was drilled in November, 1982. The access road and wellsite, supported by filter cloth and gravel, cost approximately \$109,000.00. This access road, however, services three other wellsites. A mitigation pond shown above was constructed approximately 100 feet from the well site. Natural vegetation grows within 20 feet of the wellsite.



The Josephson No. 3 is located in a Class I Wetland. Like the Josephson No. 2 it was subject to Aquifer, Bass Island and Freshwater Wetland Permit conditions. One stipualtion unique to the Josephson No. 3 was that the site remain unseeded to encourage the growth of indigenous vegetation. As seen in the background, the wetland supports native vegetation as little as 30' from the wellsite. About 30 deer were sighted driving to the well on the day this photo was taken. The access road for this site is merely an extension of the road used for the Josephson No. 2 well. This photo was taken in March 1986 before the trees budded. given for just cause such as adverse weather conditions.

The operator is sometimes specifically required to use soil from the mitigation ponds and ditches as (1) access road fill, (2) top soil cover on access roadway shoulders, (3) top soil cover over the well pad during site restoration, (4) dikes for temporary settling basins and mud pits, and/or (5) to create small mounds or hummocks where prior approval has been granted.

The mitigation program emphasizes habitat for waterfowl and fur bearing mammals. As a general rule, the more shallow water areas in a wetland, the better it is for these types of wildlife. Therefore, both the potholes and level ditch ponds can be no more than 3 feet deep (Taft and Jurczak, 1984, personal communication #66).

Differences between the newly created wetland areas and the wetlands cleared for drilling activities should be considered. A shallow water emergent marsh is only one of many types of wetlands and is not strictly an equivalent substitute for a swamp with mature trees or a peat bog. It will not necessarily provide replacement habitat for all the plants and animals destroyed or displaced by the drilling activities. Nor will it always provide the same benefits. For example, a marsh on a lake that serves as a fish breeding ground cannot be adequately replaced by a "land locked" marsh. Although creation of new habitat for waterfowl and fur bearing mammals is a desirable goal, consideration of other wetland types and benefits is incorporated into the mitigation program.

7. Increased Access

Construction of an access road in or near a wetland can, in some cases, enhance the wetland's value. Increased public access could be beneficial in wetlands that provide areas for hunting, fishing, boating, hiking, bird watching, photography, camping or other recreational uses. It could also be

helpful in areas used for education and scientific research.

Negative impacts may also result from increased recreational and other uses of wetland areas that have been made more accessible. This possibility should be carefully considered before issuing a drilling permit for wetlands that either provide habitat for particularly sensitive species or perform an extremely vital ecological function.

#### 8. Pit Location

Mud and reserve pits are sometimes sited within 100 feet of a freshwater wetland depending upon local topography, availability of alternate sites and Regional Policy. (Saturated soils generally prevent placement of pits <u>directly in</u> wetlands). Although there are strict regulations regarding their construction, pits do occasionally leak or overflow (Deitz, 1983, personal communication #16) and (Jurczak, 1984, personal communication #37). The salt and other chemicals in pit fluids can contaminate soil or water and kill wetland vegetation. If soil contamination is severe enough, it may even prevent future plant regrowth.

For example, in 1982, brine from a gas well destroyed 13 acres when an operator deliberately discharged brine down a ditch directly into a wetland. The operator had to pay a significant penalty, but recovery of the wetland has been slow. The landowner recently received a Freshwater Wetlands Permit to clear dead trees from three acres of the affected area. Fortunately, no discharges like this have occurred since the Department acquired more staff and has increased the frequency of drilling inspections.

Damage to wetlands has also occurred when discharged brine or frac fluids have overshot the pit and run into a wetland. Reoccurence of such problems has been effectively prevented by recent use of a permit condition requiring that pits be located on the side of the well site most distant from wetlands, whenever possible.

#### M. STATE LANDS

During the review of every well permit application, Department staff check whether proposed oil and gas activities are on state lands and require a State Lands Permit or are on lands under the jurisdiction of the Office of Parks and Recreation. Oil and gas drilling on DEC controlled State lands occurs primarily on State Reforestation and Game Management areas where land use conflicts and disruption or recreational activities will be minimal.

# 1. State Lands Permits

State Lands Permits are temporary revocable permits issued for activities on State Lands under DEC control to protect the lands and ensure that their designated use will continue unhindered. The permits are usually not required for oil and gas drilling activities on State leases because lease stipulations generally satisfy permit concerns (Beil, 1983, personal communication #1).

A recently issued policy formalized DEC's land use guidelines for these and other State lands (Grant and Doig, 1984). State Forests, Wildlife Management Areas, Reforestation Areas, Tidal Wetlands, Multiple Use Areas and Unique Areas will be managed to maximize public benefits, including:

- perpetuation of unusual and fragile ecosystems, and habitats.

- enhancement of natural resources.

- provision of opportunity for outdoor recreation and education.

- production of wood, fuel, minerals and other materials.

- contribution to faunal food webs and other ecosystems.

- watershed protection.

- generation of income to the State.

Pre-eminent land uses, identified as such either in law or by the Department, will be given first priority and all other uses that are compatible with it will be encouraged. Unique areas, wetland wildlife management areas and

highly productive reforestation areas near significant markets are likely to have pre-eminent uses. Upland wildlife management areas, multiple-use areas and some reforestation areas probably lack a single pre-eminent use and the combination of uses will be adopted which best serves the broad public interest in natural resources.

To help achieve these goals, each Regional Supervisor for Natural Resources will prepare a management plan for the State lands in his Region. Although no schedule for these plans has been set, once they are in place they may affect future oil and gas development activities on State lands.

#### 2. State Park Lands

Although DEC is generally responsible for oil and gas leasing of State lands, the Oil, Gas and Solution Mining Law specifically prohibits the agency from leasing State Park lands [ECL 23-1101.1(b)]. The Office of Parks, Recreation, and Historic Preservation (OPRHP) in the past, however, did conduct its own parkland leasing program with the help of the Office of General Services.

In a Draft Memorandum of Understanding (MOU) with DEC, OPRHP has tenatively agreed to take lead agency responsibility under SEQR for all oil and gas drilling activities on State Park lands. Under the (MOU) if implemented, DEC will immediately notify OPRHP whenever a permit application is received for oil and gas drilling on State Park lands.

#### N. COASTAL ZONE

Proposed oil and gas activities in the State's coastal areas must be consistent with the New York State Waterfront Revitalization and Coastal Resources Act (WRCRA) which requires a balance between economic development and preservation of the State's unique coastal resources (Executive Law Article 42 Sections 910-920) The related State Coastal Zone Management Plan provides guidance in achieving this goal through 44 general policies that

address a wide range of coastal related concerns, such as (U.S. Dept. of Commerce, 1982):

- protection of significant coastal fish and wildlife habitats.
- protection of scenic resources of statewide significance to the quality of coastal areas.
- preferential siting of water dependent uses and facilities on or adjacent to coastal waters.
- expanded recreational use of fish and wildlife resources in coastal areas through increased access.
- encouragment of construction of new, or improvement of existing, onshore commercial fishing facilities.
- protection of coastal freshwater wetlands and the benefits they provide.
- expanded public access to water related recreation resources and facilities.
- restoration, revitalization and re-development of deteriorated waterfront areas.

As is evident from the sample above, it would be difficult to achieve 100 percent implementation of all 44 policies because of the many competing demands for the State's limited coastal areas. The landward boundary of the coastal area covered by the Plan is generally 1,000 feet from the Lake Erie shore, although it is cut to 500 feet or less in many places where development is heavy or a major road or railway closely parallels the coast. In other areas it has been extended several thousand feet inland to include such things as State lands or significant tributary valleys (U.S. Dept. of Commerce, 1982).

There are no specific restrictions on siting of oil and gas wells in

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coastal areas in the State CZM Plan. However, all proposed wells that fall under SEQR Unlisted and Type I categories must be consistent with the CZM Plan to the maximum extent practicable before a DEC well drilling permit can be issued (6 NYCRR 617.5(d)). Since there are currently no oil and gas activities on the SEQR Type II list, <u>all</u> proposed wells in "coastal areas" are subject to consistency review.

#### 1. Local Plans

Local governments within the "coastal zone" have the option of adopting their own Local Waterfront Revitalization Program (LWRP). Depending upon local interests, the plans may be limited in scope or address the entire range of topics covered in the State CZM Plan. The local plans may also be more restrictive than the State Plan and may prohibit development activities at specific sites. Several Lake Erie communities have local CZM programs in the preliminary stages.

# 2. Significant Coastal Fish and Wildlife Habitats

Under WRGRA, the Department of State has the authority to designate significant fish and wildlife habitats in coastal areas which have been identified by DEC. Under WRCRA's regulations (19 NYCRR Part 602) a habitat is significant if it: (a) is essential to the survival of a large portion of a particular fish or wildlife population; (b) supports populations of species which are endangered, threatened or of special concern; (c) supports populations having significant commercial, recreational, or educational value; and (d) exemplifies a habitat type which is not commonly found in the State or in a coastal region. Also, the significance of certain habitats incrases to the extent that they could not be replaced.

Using these criteria, DEC is currently completing an evaluation of habitats along the State's 3,200 miles of shoreline and has recommended that DOS designate a number of qualifying habitats (NYS Dept. of State, 1986).

# O. "CRITICAL ENVIRONMENTAL AREA"

The regulations under SEQR provide for establishment of "critical environmental area" designations to certain sensitive environmental areas. This designation would put the area on a "Type I" list, meaning that any state or local agency unlisted action would be more likely to be significant and require an environmental impact statement.

"Critical Environmental Area" (CEA) means a specific geographic area designated by a state or local agency, having exceptional or unique characteristics that make the area important (6 NYCRR 617.2(j)).

To be designated, the CEA should have an exceptional or unique character covered by one or more of the following: a benefit or threat to public health or safety; a natural setting of habitat or aesthetic significance; social, cultural, historic, archeologic, recreational or educational purposes; or an inherent ecological, geological, or hydrological sensitivity to change (6 NYCRR 617.4(i)). Designation of a CEA must be preceded by a written public notice and hearing (6 NYCRR 617.4(h)). IX. DRILLING PHASE: DRILLING, CASING AND COMPLETION OPERATIONS A. INTRODUCTION

After the well and access road have been sited and constructed, as described in the previous chapter, the operator moves in a rig and starts the drilling phase of operations.

Prior to the commencement of drilling operations, a person who has been issued a drilling permit must notify by certified mail any local government and any landowner whose surface rights will be affected by drilling operations [ECL 23.0305-13]. This notification is required to those whose property may be potentially affected by drilling activity and so that local jurisdictions are aware of activity taking place in their areas. This notification should be required at least five business days prior to the beginning of drilling operations and local jurisdictions should be notified through the clerk of the county, city or town, and village whose land will be physically affected.

DEC must be notified in writing or by telegram prior to starting actual drilling operations under the current regulatory program [6NYCRR Part 554.2]. This provision is necessary so that the Department is aware of, and can monitor activity provided for in the permit as necessary. It is recommended that these regulations be revised so that notification take place a minimum of 24 hours in advance by telephone.

The permit must be <u>prominently posted</u> at the drill site and the permit expires if drilling operations do not begin within 180 days [6NYCRR Part 552.3(c)]. It is recommended that this regulation be revised so the 180 day time period can be extended to 12 months. An effective time period for each permit is needed. If too much time elapses before drilling begins, the environmental conditions under which the permit was granted may change; however, 180 days is not sufficient in some cases for industry coordination and scheduling.

#### 1. Drilling Rigs

The majority of wells in New York State are drilled with rotary rigs. (Figure 9.1). The rig gets its name from the rotational motion of the drilling bit which grinds through rock. Cable tool rigs are an older, less common type of rig that chip rock to a powder by raising and dropping a heavy bit in the bore hole. (Figure 9.2).

Rotary rigs are larger and faster than cable tool rigs and can also drill to greater depths, yield a smoother well bore, and diminish the time water sands are exposed to the drilling process. Cable tool rigs are sometimes favored when there are no pressing time constraints and the operator wishes to save money. Their use, however, is restricted to relatively shallow wells (generally less than 2,000').

The remainder of this chapter focuses on rotary rig operations. However, additional information on cable tool rigs is given when significantly different procedures are involved and/or different regulations apply. Special permit conditions for wells drilled through primary aquifers or in the Bass Island trend are also explained.

2. Drilling Fluids

Drilling fluids must be used when drilling wells with a rotary rig. The fluids are pumped down the drill string, out through holes (jets) in the drill bit and up the wellbore. The moving fluid cools and lubricates the bit and removes the rock cuttings that would otherwise collect at the bottom of the wellbore.

There are four basic types of drilling fluids used in New York State: air, freshwater, brine and mud. Operators select a drilling fluid based on: 1) its compatibility with the rock formations being drilled through, 2) need to control downhole pressures and 3) cost. Air is the most frequently used drilling fluid in New York State. It is fast and economical, but cannot be

# FIGURE 9.1 TRUCK MOUNTED ROTARY

**DRILLING RIG** 





used when excessive pressures or amounts of water are encountered. Freshwater may be selected when air cannot provide sufficient pressure to control the well. Air or fresh water based drilling fluid is required by the Department when drilling through freshwater aquifers.

Brine (salt water) is sometimes employed as a drilling fluid because of the physical and chemical characteristics of the rocks that are being drilled through. For example, a fully saturated brine must be used when drilling through rock salt to prevent the rock from dissolving and rapidly enlarging the borehole.

Though drilling mud is the most common drilling fluid in the country, it is used infrequently in New York State because it is not needed due to low subsurface pressures. Mud ingredients are expensive and the use of mud slows the drilling rate thereby increasing drilling cost. Mud is sometimes also difficult to dispose of properly. In New York State, mud is generally used only in specific instances such as spudding (starting) wells or drilling the surface casing hole through thick shallow gravel deposits. It may also be needed and used when unusually high formation pressures or volumes are encountered.

The changing conditions encountered as the well gets deeper frequently require changes in the properties of the drilling fluid. The fluid can be altered as needed by the addition of special chemicals. These chemicals include such things as surfactants, foaming agents, corrosion inhibitors, weighting materials, fluid loss control additives, and bactericides.

3. Casing and Cementing

A good casing and cementing program is essential to protect groundwater quality and provide well control. From the operator's viewpoint it is also essential to the future production potential of the well.

Casing is heavy metal pipe that is used to prevent the borehole from caving in. Once the casing is cemented into place it also plays an important role in preventing fluid migration and protecting freshwater aquifers. Three strings of casing are normally set in New York State wells. A short conductor casing at the top of the well keeps soil, sand and gravel from sloughing into the borehole and filling in the well. A small diameter surface casing is set inside the conductor casing and extends beneath the deepest freshwater zone to protect it from contamination. In some instances, an additional casing string, called an intermediate string, is necessary because of a lost circulation zone or other hole problems. The last string, known as "production casing" extends the full length of the well and is used to carry hydrocarbons from the producing horizon to the surface.

# 4. Drilling Safety Considerations

Injuries to oil and gas field service employees occur at about twice the rate as for general industry employees and, of this group, oil and gas drilling workers are exposed to even greater dangers due to the nature of this type of work (U.S. Dept. of Health and Human Services, 1983). The Federal Occupational Safety and Health Administration (OSHA) has proposed rig safety regulations for drilling operations, but as yet, it does not have requirements for routine drilling operations. Therefore, it is important for drilling operators, in the absence of strict guidelines, to ensure that drilling activities are conducted in a safe manner. A sound safety program helps guard against drilling accidents which could cause environmental damage as well as injure employees. A good safety program also has the added benefits of lower insurance rates, lower maintenance costs, fewer employee benefits claims, less lost production or productivity, and fewer legal fees and settlements.

Some of the most common accidents associated with drilling have to do with working the slips, tongs, catlines, and elevators which are used to

handle the drill pipe, and other heavy drilling equipment. Slippery rig floors and cable breaks also contribute to accidents. Injuries to the derrickman are common either from falling or being hit by swinging objects. Uncommon accidents include catastrophic events such as blowouts or the collapse of the derrick or mast.

Employee training programs are an important component of accident prevention. Accidents are also reduced when employees are trained properly, well oriented, motivated and retained to become career oil field staff. Training of staff should include information about basic principles of a well drilling operation: 1) the safe work operations and hazards associated with the job, 2) purpose and operation of drilling equipment, 3) Hydrogen sulfide detection and safety equipment as well as emergency procedures, 4) fire protection and control, 5) emergency escape procedures for employees working on the derrick mast or in confined spaces, and 6) information about personal protective equipment.

Many drilling sites are located in rural areas of New York. Therefore, it is advisable to post first aid and emergency procedure information in a conspicuous place should these be needed in the case of an accident. First aid equipment, appropriate telephone and/or radio numbers, an arm and leg splint, a heavy blanket and a stretcher are recommended to be on hand in case of an emergency.

Employee clothing should be well fitted (not loose) and include long sleeves and pant legs. It is also advisable that employees not wear jewelry, that hair be short or tied-back, and safety shoes, hard hats, goggles, face shields for welding, safety glasses and/or hearing protection be worn as needed. Employee protection against falls also needs attention. Measures such as safety belts, lifelines and lanyards of suitable strength, safety nets for

work areas more than 25' off the ground and ladders in place of "riding" climbing devices should be installed to safeguard workers in the event of a fall.

Precautionary measures for the drill site would include proper lighting for working at night, and the prohibition of flame heaters in doghouses or outbuildings. Drill sites need to have no-smoking area designations and fire and explosion protection equipment. Firefighting equipment needs to be on hand. DEC currently requires a blowout prevention plan from all operators in the Bass Island trend. Responsibilities of individual employees in such an event are to be posted in the doghouse. In addition, the local fire department must be called in the event of a blowout. It is also recommended that operators make regular operating tests of blowout preventers and conduct kick response training in order to be prepared in the case of an accident. Where blowout preventers are required, they should be actuated and tested with rig air or another approved method before drilling out the shoe of the surface casing.

Other precautionary measures to guard against fires or other accidents include proper grounding of derricks or masts, electric cords and receptacles from lightning and static electricity, use of appropriate containers and portable tanks for handling combustible liquids, use of cleaning materials that have a flash point greater than 100°F, and locating fuel storage tanks some distance, such as 50' to 75', from a wellbore.

Routine inspections, testing and maintenance of rig components also help avoid accidents from drilling operations. Daily inspections should include all functional operating mechanisms, the drill string weight indicator, air or hydraulic system parts for deterioration or leakage, bending of hooks, hoist or load attachment chains, rope slings, and rope reeving. Periodic inspections should also be conducted of bails, elevator links, upper side hook

saddles, A-leg pins, housing, and hoisting mechanisms. Drilling equipment tests might include load tests of repaired or altered rigs, and operating tests of new and/or altered hoisting equipment. Adjustments and repairs should be done promptly and equipment maintained to the manufacturer's specifications.

The Department's regulatory program addresses some safety concerns. These are primarily oriented towards oil wells and operations. The existing regulations require the following:

- a. The operation of any well, lease or unit shall be such as to keep each well location and unit installation free of rubbish, debris, dead grass, brush, weeds, and other flammable material. In addition, all waste oil shall be disposed of in a manner which will not create a fire hazard [6NYCRR Part 556.4(b)].
- b. At the Department's requirement when it deems it necessary to protect life, health, or property, the owner or operator must construct around any storage tank or other tank an earthen dike having a capacity of at least one and one-half times the capacity of of the tank it surrounds. This dike must be continuously maintained; and the reservoir it creates must be kept free of vegetation and water [Part 556.4(c)].
- c. At any time when oil or gas is lost from wells or pipelines, receiving tanks, storage tanks or receiving and storage receptacles and creates a fire or pollution hazard or exceeds 100 barrels of oil in aggregate, or 3 million cubic feet of gas in aggregate, the DEC regional headquarters must be notified within five days after the event. A report of remedial measures being taken to correct the situation must also be given to DEC [6NYCRR Part 556.4(d)].

New regulations require that any loss or spill of oil or gas from pipelines and gathering lines, receiving tanks, storage tanks or receiving or storage receptacles must be reported to the DEC's Division of Water, Bureau of Spill Prevention and Response. Their Hot Line phone number is 1-800-457-7362. The Division of Mineral Resources will retain jurisdiction over spills and leaks at the wellhead. The appropriate Regional Minerals office should be notified immediately of any wellhead leak of more than one barrel of oil. It is also recommended that the Department's regulations reinforce further the need to conduct safe operations by stating that the owner or operator must perform all operations in a safe and workmanlike manner and must maintain all equipment in a safe condition for the health and safety of all persons and for the protection of the well, lease, or unit and associated facilities. Additional language for the regulations should direct the owner or operator to immediately take all necessary precautions to control, remove or otherwise correct any health, safety, environmental, or fire hazard and only personnel who are trained and competent to drill and operate wells be used in well drilling operations. Oil and gas well drillers must be registered in New York State.

#### **B.** CONDUCTOR CASING

Conductor casing is the short string of casing (20' to 40') set at the very top of the well to keep surficial sediments (soil, sand, gravel, etc.) from filling the wellbore. In locations where the sediments are unusually soft, the conductor casing can also support some of the wellhead load.

When the hole for the conductor casing is drilled, a lightweight mud is generally used as the drilling fluid to help hold the wellbore open. In most cases because of the difficulty of drilling in loose surficial deposits, the conductor casing is simply driven into the ground. The conductor casing has normally been cemented only when the conductor hole was drilled or cementing

was required as a permit condition. The general practice of driving casing into the ground leaves little clearance for cement between the pipe and the material it penetrates. Since February 6, 1985, however, operators using a conductor string in primary aquifers, have been required to cement the conductor casing to prevent the possible downward flow of pollutants, along the outside of the casing to freshwater zones.

If the conductor casing is set in a drilled hole, it must be cemented in place before drilling can continue. The operator must calculate the amount of cement needed to fill the space between the conductor casing and borehole wall and use at least that amount in the cementing job. For wells drilled in principal and primary aquifers, operators are required to use a calculated 50 percent excess in cementing the conductor casing. If circulation to the surface is not achieved, even with the excess cement, then the operator must grout cement down from the surface to achieve a complete cement bond. Grouting is done by inserting a thin piece of tubing known as the macaroni or spaghetti string between the borehole and the outside of the conductor casing. Cement is pumped through the string until the space is filled with cement.

When the conductor casing is driven and there is no clearance around the outside of the pipe, the operator must grout from the top of the casing to form a protective cement pad around the conductor if this casing string is not recovered when surface pipe is run. The pad must have a minimum diameter of three feet, minimum thickness of six inches at the casing and a minimum thickness of four inches at the outer radius. The pad must also slope <u>away</u> from the casing in all directions to further ensure that surface pollutants do not enter the subsurface at the top of the conductor casing.

Drilling of the well below the conductor casing cannot resume until the cement has been allowed to set. Operators usually wait 8 to 10 hours for the

cement to harden, though the process can be accelerated with special additives. Depending on weather conditions, 8 to 10 hours may be insufficient to harden. Failure to wait until the cement is dry can disrupt the bond between the cement and the casing and provide a conduit for pollutants.

#### C. SURFACE CASING

The primary functions of the surface casing are to provide an anchor for well control equipment, prevent water zones from flooding the wellbore and protect freshwater zones from contamination by gas, oil, brine, drilling fluid or any other substances that may be present in the wellbore (Figure 9.3). Operators must cement enough surface casing to contain any pressure on the blowout prevention equipment that may be encountered further downhole. This requires that the surface casing be set into competent bedrock. Existing statewide casing regulations adopted in 1966 require that casing be set below the deepest potable freshwater level [6NYCRR 554.4(b)]. The length of the surface casing is generally between 300' and 500', though a survey of Well Completion Reports shows individual instances of shorter as well as longer casing lengths.

Cement in the annular space around the surface casing restricts the movement of fluids between formations as well as between formations and the surface. In terms of protecting groundwater resources, adequate annular cement jobs help prevent the contamination of fresh groundwaters.

Most operators run surface casing in their wells. However, current regulations allow them to eliminate the surface casing if the production casing is cemented from total depth to the top of the well in areas where the pressure characteristics of the subsurface formations have been reasonably well established by prior drilling experience [6NYCRR 554.4(a)]. With the exception of the Bass Island trend, which wasn't discovered until 1981, the producing formations in New York State are generally well known and have low



Cementing a well helps accomplish the following:

- o Bonds and supports the casing.
- o Restricts fluid movement between formations, e.g., to prevent contamination of fresh water zones o Protects casing from shock loads by hydrocarbons or salt water.
- o Protects casing from corrosion due to subsurface mineral waters and electrolysis from the outside.
  - when drilling deeper.
- o Seals lost circulation or thief zones.

\*figure taken from paper by Charles George, Ronald Faul, Halliburton Services, Duncan, Oklahoma - Cementing Techniques for Solution Mining Wells and Salt Storage Domes: The State-of-the Art - Symposium Proceedings Salts and Brines '85.

> FIGURE 9.3 9-10a

formation pressures. Therefore, surface casing can be omitted from many wells under the existing regulations. However, as a practical matter this is rarely done because the surface casing is required for freshwater protection and well control. It is recommended this practice be restricted to areas where it has been proven no subsurface pressures or freshwaters exist.

When surface casing is utilized, existing regulations require that it be cemented from below the deepest potable freshwater zone to the top of the well. The drilling of the well cannot resume until the cement has been allowed to set in accordance with prudent current industry practice. Operators usually wait 8 to 10 hours or longer for the cement to set or harden, though the process can be accelerated with special additives.

Inadequate cement jobs can result from the industry's tendency to rely on a standard "recipe" of cement weights and additives. This is a particular problem when shallow shale gas is encountered behind the surface pipe. The gas "cuts" the wet cement, creating micro-annular channels that allow surface leakage of gas behind the casing. In addition, many New York operators do not follow the general industry practice of reciprocating (rotating or moving) the pipe during cementing operations which, though not as important for air drilled holes as it is for holes drilled with mud, provides for a more even distribution of the cement. Pipe cannot be reciprocated if cement baskets are used. Many operators also feel centralizers interfere with or are damaged by reciprocation, however, use of more substantial centralizers could avoid that problem.

During the waiting-on-cement (WOC) time, there should be <u>no</u> activity on the rig, such as installing the blowout preventer and picking up or laying down drill pipe and collars. Any jostling can disturb the cement.

If there is any question about the adequacy of the cement job, the

operator may be required to run a temperature and/or cement bond log and/or do expensive remedial work. The order to run the log may be given by the State Inspector present during the cementing operations or during a routine well drilling site inspection. Site inspections are conducted at least once during the drilling of every well to determine if all the conditions of the permit are being followed. The inspections usually occur after the surface casing is set but before the production string is cemented except in primary or principal aquifers where inspectors are required to be on location during the cementing job on the surface casing. Inspection staff pay particular attention to the depth of the surface pipe and whether cement circulation was achieved. They also check the wellbore diameters listed on the driller's records. This information will be required for every well when a new version of the Completion Report Form is issued in the near future. It is needed to compare the size of the annular space against the number of sacks of cement used to seal it off.

Since November, 1982, operators drilling in primary aquifers have had to comply with detailed surface casing requirements. An 8 5/8" freshwater string (surface casing) had to be set a minimum of 450', or 100' into bedrock, whichever was greater. The cement for the surface casing had to be circulated back to the surface using a calculated 50 percent excess and the casing had to have a minimum bursting pressure of 1,800 psi. A State Inspector had to be present during the surface casing cementing operation and the cement had to contain lost circulation material to help ensure adequate cementing results. A minimum of two cement baskets and centralizers had to be run at appropriate intervals during the surface casing cement jobs to help guarantee a sound cement job. Gentralizers center the casing in the wellbore and cement baskets are used where the weight of the cement column might break-down the formation. The Bass Island permit conditions also require cement baskets and centralizers

for cementing the surface casing but specify only that an "appropriate" number of them be used.

In the event cement circulation is not achieved, cement has to be grouted down from the surface (or squeezed) to form a complete cement bond around the casing.

# 1. Recent Revisions

As a result of public comments made at a hearing on December 19, 1984, the casing and cementing requirements in the aquifer permit conditions were revised in February, 1985. The changes will remain in effect until the final Generic Environmental Impact Statement (GEIS) on Oil, Gas and Solution Mining is published. After the EIS has been reviewed and comments have been received, the Department will decide whether the revisions should be retained as is or whether other aquifer permit conditions are needed.

As of February, 1985, the 450' specification on the permit conditions has been dropped and all surface casing in primary and principal aquifers must be set a minimum of 100' into bedrock unless shallow gas is present. The pipe used for the surface casing must be either <u>new</u> API graded pipe with a minimum burst pressure of 1,800 psi or <u>reconditioned</u> pipe that has been tested to 2,700 psi. If reconditioned pipe is used, an affidavit that the pipe has been tested must be submitted to the State Inspector <u>before</u> the pipe is run. The length of the advance notice given the Department prior to cementing the surface casing has been increased from 4 to 8 hours and the permit condition has been reworded to stress that the cementing may <u>not</u> commence until a State Inspector is present.

# 2. Further Revisions

The Department has significantly strengthened its regulatory requirements for oil and gas wells drilled in primary and principal aquifers, but potable

groundwater, outside of the major aquifers, is found throughout the State.

Over two million people in upstate New York are served by private water wells and many of these wells are in small isolated or bedrock aquifers (NYS DEC Division of Water, 1985). Because of numerous complaints involving oil and gas in water wells in these areas, the Department has made an extensive review of existing cementing and casing practices for both oil and gas wells.

In the review on drilling and completion practices for oil and gas wells, the Department found some drilling and completion practices deficient with respect to long-term protection of groundwater with a high degree of certainty.

The revised casing and cementing guidelines are designed to mitigate and alleviate the following problems:

1. potential gas and fluid migration into groundwater;

2. gas channeling through cemented annuli;

3. migration of fluids from one stratum to another;

4. repressurization of old oil field areas by natural gas wells drilled to deeper horizons; and

5. ensuring the long-term integrity of oil and injection well

completions to preclude future problems.

The new cementing guidelines were implemented April 1, 1986.

# SURFACE CASING

1. The diameter of the drilled surface hole shall be large enough to allow running of centralizers in recommended hole sizes.

2. Surface casing shall extend at least 75 feet beyond the deepest fresh water zone encountered or 75 feet into competent rock (bedrock), whichever is deeper. However, the surface pipe must be set deeply enough to allow the BOP stack to contain any formation pressures that may be encountered before the next casing is run.

3. Surface casing shall not extend into zones known to contain measurable quantities of shallow gas. In the event that such a zone is encountered before the fresh water is cased off, the operator shall notify the

Department and, with the Department's approval, take whatever actions are necessary to protect the fresh water zone(s).

4. All surface casing shall be a string of new pipe with a mill test of at least 1,100 pounds per square inch (psi). Used casing may be approved for use, but must be pressure tested before drilling out the casing shoe or, if there is no casing shoe, before drilling out the cement in the bottom joint of casing. If plain end pipe is welded together for use, it too must be pressure tested. The minimum pressure for testing used casing or casing joined together by welding, shall be determined by the Department at the time of permit application. The appropriate Regional Mineral Resources office staff will be notified six hours prior to making the test. The results will be entered on the drilling log.

5. At least two centralizers shall be run on surface casing. The minimum spacing requirement is one per one hundred-twenty feet. Cement baskets shall be installed appropriately above major lost circulation zones.

6. Prior to cementing any casing strings, all gas flows shall be killed and the operator shall attempt to establish circulation by pumping the calculated volume necessary to circulate. If the hole is dry, the calculated volume would include the pipe volume and 125% of the annular volume. Circulation is deemed to have been established once fluid reaches the surface. A flush, spacer or extra cement shall be used to separate the cement from the borehole fluids to prevent dilution. If cement returns are not present at the surface, the operator may be required to run a log to determine the top of the cement.

7. The pump and plug method shall be used to cement surface casing. The amount of cement will be determined on a site specific basis and a minimum of 25% excess cement shall be used, with appropriate lost circulation materials, unless additional excesses are specified by the Department.

8. The operator shall test or require the cementing contractor to test the mixing water for ph and temperature prior to mixing the cement and to record the results on the cementing ticket.

9. The cement slurry shall be prepared according to the manufacturer's or contractor's specifications to minimize free water content in the cement.

10. After the cement is placed and the cementing equipment is disconnected, the operator shall wait until the cement achieves a calculated compressive strength of 500 psi before the casing is disturbed in any way. The WOC time shall be recorded on the drilling log.

11. When drive pipe (conductor casing) is left in the ground, a pad of cement shall be placed around the wellbore to block the downward migration of surface pollutants. The pad shall be three feet square or, if circular, 3 feet in diameter and shall be crowned up to the drive pipe (conductor casing).

WHEN REQUESTED BY THE DEPARTMENT IN WRITING, EACH OPERATOR MUST SUBMIT CEMENT TICKETS AND/OR OTHER DOCUMENTS THAT INDICATE THE ABOVE SPECIFICATIONS HAVE BEEN FOLLOWED. THE CASING AND CEMENTING PRACTICES ABOVE ARE DESIGNED FOR TYPICAL SURFACE CASING CEMENTINGS. THE DEPARTMENT WILL REQUIRE ADDITIONAL MEASURES FOR WELLS DRILLED IN ENVIRONMENTALLY OR TECHNICALLY SENSITIVE AREAS (I.E. PRIMARY OR PRINCIPAL AQUIFERS).

THE DEPARTMENT RECOGNIZES THAT VARIATIONS TO THE ABOVE PROCEDURES MAY BE INDICATED IN SITE SPECIFIC INSTANCES. SUCH VARIATIONS WILL REQUIRE THE PRIOR APPROVAL OF THE REGIONAL MINERAL RESOURCES OFFICE STAFF.

#### INTERMEDIATE CASING

Intermediate casing string(s) and the cementing requirements for that casing string(s) will be reviewed and approved by Regional Mineral Resources office staff on an individual well basis.

# PRODUCTION CASING

12. The production casing cement shall extend at least 500 feet above the casing shoe or tie into the previous casing string, whichever is less. If any oil or gas shows are encountered or known to be present in the area, as determined by the Department at the time of permit application, or subsequently encountered during drilling, the production casing cement shall extend at least 100 feet above any such shows. The Department may allow the use of a weighted fluid in the annulus to prevent gas migration in specific instances when the weight of the cement column could be a problem.

13. Centralizers shall be placed at the base and at the top of the production interval if casing is run and extends through that interval, with one additional centralizer every 300 feet of the cemented interval. A minimum of 25% excess cement shall be used. When caliper logs are run, a 10% excess will suffice. Additional excesses may be required by the Department in certain areas.

14. The pump and plug method shall be used for all production casing cement jobs deeper than 1500 feet. If the pump and plug technique is not used (less than 1500 feet), the operator shall not displace the cement closer than 35 feet above the bottom of the casing. If plugs are used, the plug catcher shall be placed at the top of the lowest (deepest) full joint of casing.

15. The casing shall be of sufficient strength to contain any expected formation or stimulation pressures.

16. Following cementing and removal of cementing equipment, the operator shall wait until a compressive strength of 500 psi is achieved before the casing is disturbed in any way. The operator shall test or require the cementing contractor to test the mixing water for ph and temperature prior to mixing the cement and to record the results on the cementing ticket and/or the drilling log. WOC time shall be adjusted based on the results of the test.

17. The annular space between the surface casing and the production string shall be vented at all times. If the annular gas is to be produced, a pressure relief valve shall be installed in an appropriate manner and set at a pressure approved by Regional Mineral Resources office staff. WHEN REQUESTED BY THE DEPARTMENT IN WRITING, EACH OPERATOR MUST SUBMIT CEMENT TICKETS AND/OR OTHER DOCUMENTS THAT INDICATE THE ABOVE SPECIFICATIONS HAVE BEEN FOLLOWED.

THE CASING AND CEMENTING PRACTICES ABOVE ARE DESIGNED FOR TYPICAL PRODUCTION CASING CEMENTINGS. THE DEPARTMENT WILL REQUIRE ADDITIONAL MEASURES FOR WELLS DRILLED IN ENVIRONMENTALLY OR TECHNICALLY SENSITIVE AREAS (I.E. PRIMARY OR PRINCIPAL AQUIFERS).

THE DEPARTMENT RECOGNIZES THAT VARIATIONS TO THE ABOVE PROCEDURES MAY BE INDICATED IN SITE SPECIFIC INSTANCES. SUCH VARIATIONS WILL REQUIRE THE PRIOR APPROVAL OF THE REGIONAL MINERAL RESOURCES OFFICE STAFF.

RECOMMENDED CENTRALIZER-HOLE SIZE COMBINATIONS

Centralizer Inches	Size Minimum Inc	Hole Size Mi hes	nimum Clearance Inches
4 1/2	6	1/8	1 5/8
5 1/2	7	3/8	1 7/8
6 5/8	. 8	1/2	1 7/8
7	8	3/4	1 3/4
8 5/8	10	5/8	2
9 5/8	12	1/4	2 5/8
13 3/8	17	1/2	4 1/8

Note: (1) If a manufacturer's specifications call for a larger hole size than indicated in the above table, then the manufacturers specs take precedence.

(2) Check with appropriate regional office for sizes not listed above.

When a well has surface casing that is set at the proper depth and the above guidelines are followed, the only impacts that might occur from drilling in very close proximity to a waterwell are turbidity and temporary loss of the supply. Turbidity and water supply disruption can occur while drilling the surface hole before the protective surface casing is set. When an aquifer is penetrated, the disturbance allows unconsolidated sediments to enter a water supply and create offset turbidity, but only if a subsurface channel of

sufficient porosity and permeability in close proximity is present.

If the surface hole is drilled with the proper drilling fluid, a filtercake will develop and isolate the wellbore. With a filtercake, only minor turbidity a maximum of few feet into a permeable aquifer could occur from the infiltration of the drilling fluid. Cement can also filtrate into permeable aquifer zones if adequate lost circulation material is not used during cementing operations. The majority of these situations are temporary, and ususally correct themselves in a short time. In isolated cases, uncased water wells can cave-in or permeable water channels can be intercepted and rerouted, adversely affecting a water well's quality and quantity of water. In rare cases, the drilling of a new water well may be required.

#### D. WELL CONTROL

A blowout is an uncontrolled intrusion of fluid (oil, gas, water) under high pressure into the wellbore. The ability of casing to withstand pressure is affected by the grade of steel, thickness of the casing and the setting depth. The casing must be able to withstand unexpected high pressure formations or a pressure kick and the high pressure surges encountered when a well is shut-in to control a threatened well blowout.

#### 1. Blowout Preventers

Blowout preventers (BOP's) have been required since September 1982 on all wells drilled in New York State. Exceptions are granted only if the operator submits a written request for a waiver showing that: 1) the well is not a rank wildcat, 2) the well is neither in or near the Bass Island trend, 3) there has been no prior history of blowouts within a one mile radius, 4) some sort of pressure diverting device will be used on the well to control high pressures. A waiver is never given to wells drilled under aquifer permit conditions.

Blowout preventers are manually or hydraulically operated devices installed at the top of the surface casing to seal off fluids coming up the wellbore. (See Figure 9.4). Within the blowout preventer there may be a combination of different types of sealing devices. Pipe rams contain two metal blocks with semi-circular notches that fit together around the outside of the drill pipe when it is in the hole. Blind rams contain two rubberfaced metal blocks that can completely seal off the hole when there is no drill pipe in it. Annular or "bag" blowout preventers contain a resilient packing element which expands inward to seal off the hole with or without drill pipe. Each BOP assembly must contain 1) both blind and pipe rams or 2) a bag or annular preventer, so it can function effectively with or without drill pipe in the hole.

The BOP is flanged and bolted to the spool which is flanged and bolted to the casinghead. The casinghead is welded to the top of the surface casing. If this weld or any other connections in the BOP stack are not sound, the BOP system can fail, resulting in loss of well control, possible damage to the rig, fire and/or loss of life.

To ensure that the BOP will be ready in any emergency, the Bass Island permit conditions stipulate that the BOP cannot be dependent on rig hydraulics for its actuation energy source. If the rig power system fails or the rig area is too dangerous to enter, the BOP can then be operated from a separate power source a safe distance away.

In the Bass Island trend all of the control lines connected to the BOP must be made of high pressure tubular steel with flanged connections. All BOPs have both a choke line and a kill line. The choke line goes to the choke manifold which is an assembly of high pressure flanged pipe fittings with several lateral outlets controlled by manual and/or automatic valves. When activated, the choke manifold assists in maintaining sufficient back pressure


Blowout prevention equipment is placed at the top of the well casing and includes one or more devices for closing off the well. Typical examples are:

<u>Annular preventers</u> - equipment containing a packing element which, when activated, will extend into the well-bore and around the drillpipe to form a pressure-tight seal. These are usually used when pipe is in the hole.

<u>Blind rams</u> - a closure mechanism containing two metal blocks which can be closed together hydraulically to seal off the hole. These are usually used when no pipe is in the hole. Blind rams can seal with pipe in the hole by crushing the pipe.

<u>Pipe rams</u> - are similar to blind rams except the metal blocks contain semi-circular notches on the closing edges so that, when the rams are drawn together, they fit around the drillpipe to seal off the well. Pipe rams are used when pipe is left in the hole. in the wellbore to prevent any further formation fluid intrusion. The well fluid can then be diverted from the BOP stack to the reserve pit or the mud conditioning area thus relieving wellbore pressure. This allows the operator to pump kill fluid (heavy fluid to hold the well pressure) into the wellbore. The line that diverts fluids to the pit is known as the flow or "blooie" line. In the Bass Island trend, the blooie line must be constructed of T + C (thread and collar) tubular goods with a working pressure of at least 1,500 psi. In addition, the choke line connection to the wellhead must be flanged for extra strength. The Bass Island conditions were placed in final regulations May, 1986.

During the well drilling site inspections conducted on every well, DEC staff routinely check whether a blowout preventer is in place if required. They also check to make sure the flow or blooie line is secured to keep it from whipping around or dismantling in the event of a kick (pressure surge). On Bass Island wells <u>all</u> the pipes and lines must be staked and chained down because of the high pressures or volumes that could be encountered in drilling.

The choke manifold assembly on wells in the Bass Island trend must be flanged and installed no less than 25 feet from the wellhead. The setback is required to allow the crew to continue to use the manifold when the rig area itself is not safe. To help safely control the kick or blowout, the choke manifold assembly cannot contain elbows or T's in its lines, either at the wellhead, or before the choke. The choke line must also be welded from the flange spool to the choke assembly. Certain threaded, flanged and bolted connections are also allowed but the Department will not accept dresser sleeves.

The kill line extends from the mud pumps to the BOP stack and is usually attached to the BOP directly opposite the choke line. In the event of a kick

or blowout, drilling fluid adequate to control flow can be pumped directly through the kill line into the wellbore to overcome the intruding fluids. While drilling in the Bass Island trend, at least 300 barrels of kill fluid must be on site and ready for use if needed. Additionally, appropriate amounts of weighting material and lost circulation material must be on site to aid in well control. To pump the kill fluid in case of emergency, operators must have redundant mud pumping equipment connected to the well in the form of a stand-by service company pump truck or a secondary mud pump.

Almost all operators test their blowout preventers for leaks after installation. Usually the test pressures are only 300 or 400 psi. In the Bass Island Trend and other sensitive areas, however, the Department requires the BOP to be tested to a minimum of 1,000 psi before the surface casing cement can be drilled out. The test pressure is applied to the wellbore through the kill line or the kelly. The pressure is stabilized and the rams, lines, valves, etc., in the BOP are individually tested for leaks by watching for pressure changes at the choke manifold gauge. DEC must be notified eight hours prior to the test so a State Inspector can be present. If the Inspector is not on location at the agreed to time, then the test may continue with the witness' name and the results of the test being noted on the drillers log.

During the BOP test the surface casing is also pressure tested to 1,000 psi. Although the surface casing must be able to withstand 1,800 psi, pressure testing of casing prior to installation is not a requirement. The Completion Report, Notice of Intention to Plug and Abandon, and the Plugging Report that operators submit to the Department should contain information on the casing's grade and weight which directly affect its pressure rating. Inclusion of such information on drilling permit applications forms which are being revised, will allow Division of Mineral Resources (DNN) staff to review the adequacy of the casing program ahead of

### time and require changes if needed.

### E. PRODUCTION CASING

A third string of casing is often set in the well for gas or oil to flow through. It is generally about 4 1/2" in diameter and 1,000' to 4,500' long, depending on the depth of the well. The production hole is usually drilled on air instead of water. Air drilling is generally preferred by operators because it is faster, cheaper and produces smaller quantities of waste. In addition, some oil and gas formations are water sensitive and their producing capabilities can be damaged by contact with water.

While drilling the production hole in Bass Island wells, operators are required to take a number of special precautions because of the potential for relatively high pressures and volumes that have caused a number of blowouts in the past. Most productive areas and formations in New York State have lower than normal (defined as hydrostatic) subsurface pressures. The operator must provide the drilling company with a well prognosis indicating where problem formations such as the high pressure Onondaga may occur, with appropriate warning comments and a listing of emergency duties. Prior to penetrating the Onondaga and associated fractured and faulted formations, the driller must install a new air head rubber in the rotating head. The air head rubber is a device that seals the wellhead at the spool. The rubber, which prevents leakage of gas up the casing, can wear out as the well is drilled. Prior to penetrating the Onondaga, the local fire department must also be notified of the well's location and the potential hazards involved. This requirement can be waived if the company has its own DEC approved firefighting equipment and personnel on standby. To help decrease chances for accidents, every effort must be made to penetrate the Onondaga during daylight hours. In addition, the operator or his designated representative must be on site during the

penetration of the Onondaga to handle any problems that may arise.

Operators are required to cement the production casing in all wells to a sufficient height above the production zone to prevent any movement of oil, gas or other fluids around the exterior of the casing [6NYCRR Part 554.4(d)]. Compliance with this regulation is generally achieved by cementing the casing from the bottom to 100' above the production zone, though exceptions to this are known. Some operators cement the production string from top to bottom as a standard practice.

Wells drilled in the Bass Island trend that are completed in the Medina instead of the Onondaga formation (several hundred feet above the Medina) also have more of their production casing cemented. If there are no hydrocarbon shows in or above the Onondaga and its associated fault zones, the production casing must be cemented back a minimum of 100' above the Onondaga. However, if hydrocarbon shows are encountered, this minimum is increased to 300'.

### 1. Annular Pressure

Because of high annular pressures exhibited by many wells drilled in the Jamestown Aquifer area and the difficulty of monitoring annular pressures, it is proposed that all future oil and gas wells in primary and principal aquifers be cemented from total depth to the surface. In special cases where extensive surface or intermediate casing is set below the required depth, permission may be granted to cement the production casing 50 feet into the surface casing or intermediate string instead of to the surface. Division personnel have had several meetings with service companies, operators, and the Oil, Gas and Solution Advisory Mining Board to formulate cementing procedures and guidelines that will mitigate this problem. It is now required that all existing aquifer wells be vented or produced with limited back pressure so as to not break down the formation at the shoe of the surface (freshwater protection) casing. The Department may approve in some areas annular

production of shale gases with an annular pressure relief valve set below hydrostatic pressure.

### 2. Completion and Testing

After the casing is set, the well must be completed. Prior to completion the well may be stimulated and production tested.

Generally some kind of production test is made to determine the productivity of a well. There are various kinds of tests made such as drillstem tests, bottom-hole pressure tests, potential tests and productivity tests. For a drill-stem test, special tools are run into the well on the drill pipe. Packers isolate the zone to be tested and fluids from the zone flow through the testing (recording) tools into the drill pipe where they are trapped by a system of valves. The fluid sample and recording devices are then withdrawn from the well for examination. The bottom-hole pressure test measures the pressure in the production zone when a specially designed pressure gauge is lowered into the well. A potential test is a measurement of the oil, water and/or gas a well will produce in a 24 hour period under fixed conditions. A productivity test determines the effects of different flow rates on the flowing bottom-hole pressure. The well is produced at several rates and at each rate the bottom-hole pressure is measured.

Sometimes an extensive testing program is conducted prior to completing a well to production. This is especially true for wildcat wells. As many as 20 or 30 zone tests may be conducted on a wildcat well. The testing and evaluation time may take several months and may involve alternate stimulation and testing. Flaring may also be allowed upon approval of the Regional Minerals Manager. It is recommended that notification of the Regional DMN manager be required prior to any significant changes or time extensions of the originally proposed well testing program, and approval of revisions to the permanent wellbore configuration (casing and cement) proposed in the drilling

### permit application is required.

Open hole completions are the simplest. Instead of running the full length of the wellbore, the production casing is set just above the producing formation. Open hole completions cost less but can present problems. The production interval is much more difficult to selectively stimulate, excessive gas or water production can be difficult to control, and the well may require more frequent clean-outs.

In most new wells in New York State the casing extends the full length of the well and the casing is perforated across the producing zone(s). The holes in the production casing are made with a perforating "gun" that is lowered down the well to the producing zone. The gun pierces the casing with bullets or special shaped explosive charges. The cost of perforating long production zone intervals in this manner may be expensive. Good log interpretations are also critical in determining the correct intervals to perforate. Gas and water zones can be eliminated by selectively perforating and perforated casing completions give operators much better control over stimulation operations. Since most wells in New York State must be stimulated to produce, perforating is the preferred completion method.

### F. STIMULATION

Permeability is the ability of a fluid to flow through a porous medium or formation and it is measured in Darcys. All other characteristics being equal, the higher the permeability, the higher the flow rate of gas or oil from the formation into the wellbore. Most of New York State's oil and gas bearing rocks are noted for their unusually low permeability and must be "stimulated", usually by acidizing and/or hydraulic fracturing, before wells drilled into them can produce.

Wells in New York State are usually stimulated in one or two stages. The first stage involves pumping 7 to 15 percent inhibited hydrochloric acid into

the producing formation. The acid will dissolve and enlarge the pore spaces in carbonate bearing rocks and increase the rocks' permeability. Full acid matrix treatment is restricted predominantly to Bass Island wells. However, a light acid treatment is usually given to every Medina well before it is stimulated to clean the carbonate based cement out of the perforations in the production casing. After being spent, the 250 to 500 gallons of acid that were injected at the perforations are returned to the surface with the other waste fluids when the frac job is completed.

### 1. Water-Gel Fracs

Water-gel fracs are the most common stimulation technique. Twenty to eighty thousand gallons of fluid are injected into the producing formation under high pressure. Approximately 20 pounds of gel are added to every thousand gallons of water. The gel increases the water's viscosity allowing it to carry from 40,000 to 100,000 pounds of sand down the well. Surfactants are also used at the rate of one gallon per 1,000 gallons of water to reduce surface tension. In shallow oil wells, these stimulation operations usually use less than 5,000 gallons of water and only 4 - 6,000 pounds of sand per stage.

Hydraulic fracturing is accomplished by pumping the frac fluid into the formation under high pressure and at a rate faster than the fluid can leak off into the rock. The fluid pressure must build up sufficiently to overcome the rock's compressive strength and the overburden and hydrostatic pressures. In New York the pressure required is usually 2,000 to 3,500 psi. The rock then fractures along a plane perpendicular to the minimum compressive stress. In most areas the minimum stress is horizontal and a vertical fracture results. As injection continues, the fracture grows in width as fluid pressure works against the elasticity of the formation. Once sufficient frac fluid has been injected to open the fracture wide enough, a proppant such as sand is added to

the fluid and carried into the fracture to hold it open after pumping ceases. The word fracture evokes an image like a shattered piece of glass. This is not correct for sedimentary rocks which are elastic in their behavior at depth. The hydraulically induced fracture would close back up without a trace unless propped open by sand. The size of the fracture is also self limiting because the rate of fluid and pressure leak off grows exponentially as the surface area of the fracture increases.

Often the well clean-up after a hydraulic fracturing job must be assisted with coiled tubing and nitrogen. When the frac fluid flows back or is pumped back out of the well, the sand remains behind to "prop" the fractures open. The propped fractures create higher permeability avenues for movement of gas or oil from the formation to the wellbore.

To help maintain the producing formation's permeability, small amounts of chemicals are typically added to the frac fluid. Bactericides are sometimes utilized to prevent the growth of sulfate reducing bacteria that could clog the rock's pore spaces. Additives are also used to prevent clay particles or iron precipitates from plugging off the formation.

2. Foam Fracs

Foam fracs were gaining in popularity a few years ago, but have fallen into some disfavor. The foam contains nitrogen, and pipeline companies in some areas of New York have asked operators to cease using the foam when too much nitrogen, which has no heating value, started appearing in their gas pipelines.

Because of the nitrogen, foam fracturing systems contain only 20 to 40 percent liquid. The low water content makes foam useful for treating clay bearing formations. Hydration or swelling of the clays on contact with the water can plug off production. Foam systems also have a higher viscosity than water-gel systems and therefore can transport larger amounts of sand. Foam

systems are also lighter than water-gel systems and the reduced hydrostatic head enhances well clean-up after stimulation. In addition, foam systems produce considerably less waste fluid because of the lower proportion of water used.

### 3. Flowback

After the stimulation fluids are pumped underground, the well may be shut-in for one to two hours. Some of the inhibitors, stabilizers and other chemicals added to the stimulation fluid require a period of contact with the formation to perform their functions. When the stimulation fluid is allowed to flowback out of the well, it can occur in one of three ways. Usually a valve on the production string is opened and the stimulation fluid travels from the flow line to a pit. Sometimes this method provides insufficient control over the operation and a large volume of the pressurized stimulation fluid by-passes the pit and sprays into the surrounding areas. Wastes from water-gel fracs can cover the ground and vegetation. Surfactants, foaming agents and gels in both the foam and water-gel wastes can cause moderate to high Biochemical Oxygen Demand (BOD) problems if they enter surface waters (Moody & Associates, 1982-83). The breakdown of these chemicals can remove oxygen from the water to the point where fish and other aquatic organisms are killed. If breaker compounds are added to the initial frac fluid makeup, the problem is lessened. Uncontrolled, high pressure frac fluid returns containing sand, can rip through vegetation, abrade paint off cars, and cause erosion.

The flowback of wastes from rock matrix acid treatments presents different types of problems. The volume of acid used should be carefully calculated so that the carbonate in the producing formation will neutralize the acid as it dissolves. Because of the difficulty in calculating the

correct acid volume and other technical problems, the acid waste returned to the surface may not be completely "spent". Fortunately, acid wastes from perforation cleanup operations are generally too diluted by the volume of the frac fluid to be a concern.

The second flowback method involves installation of a choke on the wellhead. The choke reduces the flow to a manageable degree and allows the returned stimulation fluid to be efficiently directed to the pit. Although this method is generally better, internal sand erosion and failure of the choke can and occasionally does occur. In such instances, a controlled flowback can suddenly become unmanageable resulting in erosion of the pit, discharge of the stimulation fluid onto the ground and other potential problems.

The third flowback method involves the return of the fluid to a tank. Tanks have been steadily increasing in use and are now employed in about 50 percent of the flowback operations. This technique captures practically all of the spent stimulation fluid and enables the operator to determine the volume of fluid that has been returned to the surface. Some operators are reluctant, however, to flowback into tanks for safety reasons. The high pressure of the fluids and abrading action of the sand can eat through metal and cause mechanical failures. Cleaning sand out of the bottom of the tank can also be a time consuming chore.

DEC's existing policies do not specify any one of the three flowback methods. However, a site where stimulation fluids are improperly contained is subject to enforcement action and penalties.

### G. COMPLETION REPORTS AND WELL LOGS

Within 30 days after the completion of a well, the operator must file a Well Drilling and Completion Report. The report shows: 1) the size and depth of the casing set, 2) casing grade and weight, 3) the number of sacks of

cement used on each string of casing, 4) the method used for cementing and 5) the estimated top of the cement. In addition, details are given on the type of logs run, the position and number of perforated zones, the type of well stimulation performed, and the results of the initial flow test. The report must also be accompanied by well logs and any other information the Department may require.

A major part of the form is the "Record of the Formations Penetrated". It shows the name and depth of the rock formations encountered in drilling the well. If the exact formation names are not known, rock descriptions are given. Room is also included on the form for reporting: 1) the depths at which any shows of oil or gas were encountered, 2) any measurements or estimates of their volume, 3) the depths at which any quantities of fresh, salt water or sulphur water were found and 4) if possible, an estimate of the producing capacity of these zones. This information has been so rarely included on the Completion Form, that DEC is considering additional regulations to ensure compliance. As part of the aquifer permit conditions, the operator must keep a record of all water producing zones and report them on the Completion Form. This information is now required throughout the State. The information is needed to make sure freshwater producing zones have been adequately protected and it may also be helpful in solving any future problems that might develop with the well.

Because of non-compliance by oil and gas operators in furnishing all the information requested in the Well Drilling and Completion Report (form 85-15-7), it is suggested that enforcement action be taken not only for submission of a fradaulent or false report but also for the repeated submission of an incomplete report which does not have all the information requested. Completion Reports are now being returned for missing information.

### H. WASTE HANDLING AND DISPOSAL

### 1. On Site Waste Handling

Proper handling of wastes generated during drilling is one of the most important steps in preventing pollution of land and water resources. With the exception of the rock cuttings from the wellbore, most of the wastes generated are in liquid form and must be stored on site in pits or tanks.

### 2. Pit Construction

At least one pit must be present at each drilling site to hold waste fluids unless one or more large tanks have been installed. The size of the pit varies with the depth of the well, type of drilling fluid, amount of formation water likely to be encountered, site logistics and the type of rig used. Pits must be constructed with sufficient room to hold any precipitation. Small pits, which are more common with cable tool rig operations, can be as little as 8' wide by 20' long. Most pits have dimensions of approximately 25' x 50' though they can be larger. Pit depths range between 3' and 10'.

A bulldozer is generally used to excavate the pit below ground level and to build compacted earthen embankments around the perimeter of the pit. The presence of large rocks, vegetation or other debris in the earthen dikes can interfere with soil compaction and make the dike more likely to fail. The slopes of both the inside and outside faces of the embankment can also affect the stability of embankments and the use of slopes that are too steep will make them more susceptible to slumping and erosion.

The best type of pit construction will vary with well location. For example, pits are required to be at grade when located on floodplains or in wetlands but an excavated pit is most stable in bedrock areas. The condition of the pit is always checked during site inspections and repairs are ordered for breaches in pit integrity. Operators may be fined if the repairs are

inadequate or if they do not proceed with requested repairs in a timely manner.

It is recommended that a condition be added to drilling permits limiting the angle of the drilling blow-back pit walls to less than 45° when appropriate as determined from the pre-drilling site inspection. This requirement would greatly decrease the chances for pit wall collapse except in areas where pits are excavated in unconsolidated sediments. Once a pit wall collapses it is usually impossible to repair the liner. There can be disadvantages to beveled pits, however. A pit with slanted walls needs a larger area than one with vertical walls and this will necessitate a larger drilling pit and site. In addition, the increased ease of fitting a liner to the slanted surfaces may be offset by the difficulties in handling a larger liner. Availabililty of a large one piece liner may also be a problem. (See 9.H.3).

3. Pit Liners

Although the existing regulations do mention clay and hardpan as options in pit construction, the Department has consistently required that all earthen temporary drilling pits be lined with sheets of plastic before they can be used. Clay and hardpan are both low in permeability, but they are not watertight. They are also subject to chemical reaction with some drilling and completion fluids. In addition, the time constraints on drilling operations do not allow adequate time for the percolation tests which should be performed to check the permeability of a clay lined pit. Liners for large pits are usually made from several sheets of plastic which should be factory seamed. Careful attention to sealing the seams is extremely important in preventing groundwater contamination.

Waste fluids are often discharged under pressure and the impact can

dislodge or rip the liner. Such problems can be lessened if the operator submerges the flow or discharge line below the surface of the pit fluids. However, if frac fluids under high pressure are discharged to a pit, a submerged discharge line may tear or dislodge the liner. Additionally, many drilling contractors monitor the wells drilling progress by observing flow line returns. Orienting the pit longitudinally to the flow line or installing a flow line baffle or placing heavy canvas or a plywood sheet at the point of impact can significantly reduce damage. Tanks or beveled pits may be required to contain frac blow-back. It is recommended that one or more of these actions be taken. Liners can also be punctured by trash and debris thrown into the pit. If Department staff notice trash in a pit during a site inspection, they require the operator to remove it.

Although it is not currently regulated by the Department, liner thickness is one of the major factors in whether it becomes torn during use. Ideally, all liners should be made of Hypalon, PVC or an equivalent plastic and meet certain minimum thickness and strength criteria. Liners currently used in New York State are as thin as 6 mil, but liner thickness is only one criteria of overall strength. See Table 9.1 for a comparison between New York State's proposed standards and the standards specified in other States. The Department suggests that these minimum standards for pit liners be required by regulation. Fit standards, like all other proposed standards, can and will be changed with evolving technology.

Several factors were taken into consideration when these pit liner standards were formulated. They include the relatively short time period that New York pits are in use, approximately one week of drilling plus 45 days, and the financial burden on operators. Liner installation practices should include proper preparation of the pit's bottom surface, handling of the liners, and leaving slack in the liner to lessen strain at critical points.

## TABLE 9.1

# PIT LINER SPECIFICATIONS

LINER PROPERTIES	місніда N <sup>1</sup>	LOUISIANA	NEW YORK PROPOSAL	
Thickness	20 mi1 <sup>2</sup>	10 mil average		
Specific Gravity	1.20			
Minimum Tensile Properties (each direction); a. Breaking Factor b. Biongation at Break c. Modulus (force) at 100 percent Elongation	46 lb./in. width or 2,300 lb./sq. in. 300 percent l8 lb./in. width or 900 lb./ sq. in.	90 1bs. (Grab Method)  	65 lbs, (Grab Method)	
Low Temperature Cold Grack	-15°F		-15°F	
Dimensional Stability (each direction, percent max. change)	5 percent			
Resistance to Soll Burial (120 day soil burial, percent max. change) a. Breaking Pactor b. Elongation at Break c. Modulus at 100 percent	5 percent 20 percent 20 percent			
Seam Strength	80% of Original Material <sup>3</sup> (Breaking Factor)	50 lbs.	80% of original material <sup>3</sup> (Breaking Pactor)	
Maximum Number of Pinholes	l pinhole/10 sq. yd.			
Volatile Loss (percent loss max.)	0.9 percent			
Maximum Water Extraction	35 percent			
Tearing Strength		25 lb.	50 lb. (Graves Tear)	
Bursting Strength		140 lb./sq. in.	***	

1 Michigan Standards taken from Standard No. 54, Unsupported Flexible Membrane Liners, National Sanitation Foundation.

<sup>2</sup> Liner does not have to be 20 mil thick if it meets or exceeds all the other specification for virgin 20 mil polyvinylchloride (PVC) as shown in the table. Use of liners other than 20 mil virgin PVC requires written approval by the Supervisor prior to use.

3Seams must be factory installed.

TABLE 9.1 9-33a Liner manufacturers have stressed that even their better liners can be adversely affected by poor installation practices. A properly installed thinner liner can often outperform a thicker, more costly liner which has been improperly installed.

Liner seams should be factory installed to insure integrity. It is also very important that the edges of liners be firmly anchored in place. Liner slippage is one of the most common reasons for pit leakage and also one of the most easily corrected. Liners can be anchored simply by mounding dirt over the edges of the plastic. Beveling pit walls to less than a 45° angle can also greatly decrease the chances of liner slippage.

In areas with significant fluctuations in groundwater levels, liner slippage can be more of a problem. If the water table rises above the bottom of the pit, the groundwater may float the liner out from under its anchoring. This is more likely to be a problem in low lying areas such as floodplains. Siting of pits is not specifically addressed in the oil and gas regulations. However, pits in or near freshwater wetlands and floodplains need other DEC permits where pit location can be specified as a permit condition. In addition, DEC staff can restrict the location of pits under general oil and gas regulations prohibiting pollution.

### 4. Pitless Drilling

Recent research on pitless drilling in the Allegany National Forest indicates this technique may be desirable for shallow, air drilled, Devonian wells in heavily forested areas. In pitless drilling, the drill cuttings, dust and associated brine are discharged directly to the land surface adjacent to the rig. However, the low quantity of brine typically associated with shallow Devonian wells kills fewer trees than clearcutting an area for a drilling pit. In addition, the calcium and magnesium from the drill cuttings

reduces the pH of the forest floor. Regrowth and flora diversity in drill cuttings discharge areas were found to be greater than that of the surrounding forest, one to two years later (Auchmoody, 1986 and Yarosz, 1986).

### 5. Tanks

Tanks may be temporarily installed on site to hold waste fluids generated during drilling, stimulation or completion. Tanks can completely replace pits, though they are most often used in conjunction with pits to keep brine separated from other waste fluids that cannot be disposed of by roadspreading. For example, in the past operators have elected to store spent stimulation fluids in the tank and the briny wastes produced during drilling in the pit.

Leaks from tanks can cause severe problems depending upon their location, capacity and contents. The most frequently used safety precaution is the construction of an earthen dike around the base of a tank to contain any accidental spills. Under existing regulations, operators are required to surround all permanent <u>oil</u> storage tanks with an earthen dike capable of holding one and one-half times the tanks' capacity where there is a chance an oil spill would result in contamination of surface or groundwaters [6NYCRR Part 556.4(c)]. The space within the dike must be kept free of vegetation, water or oil and the earthen embankment may have to be lined to maintain slope stability and integrity of the earthern embankment in loose unconsolidated soil areas.

Waste storage tanks in floodplains are a special concern. Floodwaters can move a tank off its foundations, and break the tank or the flow lines connected to it, resulting in a spill. A state or local Floodplain Permit is required to install a tank and any other well site facilities in a floodplain. As part of the permit, the operator may be required to anchor the tank to prevent problems.

### 6. Waste Fluids

Environmental impacts from leakage of tanks or pits can vary considerably. Any of the following combination of waste fluids may be involved, depending on the stage of drilling operations at the time of the accident.

a. <u>Brine or Freshwater Drilling Fluid</u> - Most wells in New York State are drilled on compressed air. If formation water does not occur naturally in the well, a small amount of fresh water is sometimes added at the blooie line to control dust. Surfactants and small quantities of additives are also regularly added to the well during drilling. Soaps are also sometimes added to maintain circulation when water intrusion becomes a problem.

The components of greatest environmental concern in the waste fluids from drilling are the chlorides (salt), trace metals and surfactants.

b. <u>Drilling Mud</u> - Drilling mud may be a simple clay in water suspension or it may also contain special additives to control its viscosity, pH, and other properties. Although it is not commonly used in New York State except when drilling the surface hole, most wells in the United States are drilled with fresh water or brine based drilling mud or fluid.

Used drilling mud is not as likely to be sent to the pit as other waste fluids. It is often reconditioned and employed again on another well to save money. When used drilling mud is present in waste fluids, the mud components of greatest environmental concern that might be present are chromium and sodium chloride.

c. <u>Completion Fluid</u> - A completion fluid is any air, brine, fresh water or mud drilling fluid that has been specifically selected for drilling or completing the target formation. The selection of a chemically incompatible completion fluid can seriously damage the target formation and

prevent it from producing oil or gas. As with all other drilling fluids, the chlorides, heavy metals and surfactants are the major concerns in completion fluid wastes.

d. <u>Acid</u> - If the target formation is a carbonate rock, such as limestone, it may be treated with acid (usually 15 percent hydrochloric) to increase production. The acid dissolves some of the carbonate cement in the rock, thereby increasing the spaces for the oil and gas to flow through. During the process the acid is "spent" or neutralized. The waste fluid, however, can still be slightly acidic when it enters the pit.

Small amounts of acid (250 to 500 gallons) are used in all Medina wells to clean up calcareous cement around the perforations. The spent acid remains in the well during the fracing procedure and is brought to the surface in greatly diluted form with the stimulation wastes.

e. <u>Frac Fluid</u> - Most wells in New York need to be fraced (pronounced fracked) before then can produce economic quantities of oil or gas. The frac fluid base may be brine, freshwater or oil.

Gelling agents are often added to the frac fluid to make it viscous enough to carry sand or some other proppant into the producing formation. Other chemicals similar to those used in drilling fluids are also added. The components of greatest environmental concern in the spent frac fluid are the gelling agents, surfactants, and chlorides. Spent acid will also be in frac fluid if the operator elected to combine acidizing and fracing into one operation. Frac fluids are often stored in a separate tank instead of the pit to simplify later waste disposal procedures.

f. Formation Water/Production Fluid - Most sedimentary rocks are formed by the deposition of sand and other sediments in water bodies, such as the ocean. During rock formation, some water (connate water) is trapped

inside the rock's pore spaces. When a well is later drilled into the rock, some formation water may be released and mix with the drilling fluid present in the wellbore. It is usually the largest component of pit waste fluids. The volume of formation water a particular well produces will depend on the rock characteristics and the operator's drilling practices. High chloride levels (150,000 to 250,000 mg/l Cl) and heavy metal concentrations are the major concern in these wastes.

Produced fluids from the shallow Devonian shales have barium levels from 620 to 786 mg/l and strontium levels from 1,030 to 5,330 mg/l (Moody and Associates, 1982-83). The produced fluids from the Medina sand have concentrations of barium, which range from .40 to 9.65 mg/l, strontium levels from 1,074 to 1,640 mg/l and lead concentrations from 2.8 to 6.0 mg/l (Moody and Associates, 1982-83). Trace amounts of copper (.48 mg/l), zinc (1.08 mg/l), nickel (2.2 mg/l), boron (14.8 mg/l), cadium (.44 mg/l) and chromium (.41 mg/l) have also been detected in Medina produced waters (Moody and Associates, 1982-83).

Formation water is also pumped from the well during the production stage. Pits must be closed within 45 days after the cessation of drilling operations. However, if production starts within those 45 days, some of the produced fluids may be deposited in the pit. In addition to chloride and low concentrations heavy metals, the production fluid may also contain small amounts of corrosion inhibitors, bactericides and other additives used.

g. <u>Precipitation</u> - Depending upon the season of the year, the pit may contain a large amount of rainwater, which will dilute the concentration of chlorides and other elements in the waste fluids.

### 7. Environmental Impacts

As mentioned previously, it is extremely difficult to predict the exact composition of the wastes that might be involved in accidental leakage or

overflow of pits or tanks. However, certain components in the wastes that could pose environmental problems have been identified. For the most part, the environmental presence and impacts of these wastes are short term and local. The extent of the impacts in a specific instance will depend on the composition of the waste, the volume spilled, the natural attenuating capabilities of the soil, proximity of sensitive resources, and the success of cleanup operations.

a. <u>Chlorides</u> - Few tests on chloride levels in oil and gas drilling pit wastes in New York State are available. However, chloride analyses were published on 73 pits in Pennsylvania's northwestern gas fields, which are geologically similar to New York's. The chloride concentrations in the pits containing mixed waste fluids (drilling fluid, formation water, stimulation fluid and precipitation) ranged from a low of 5.0 mg/l to a high of 37,500 mg/l. The average chloride concentration was 3,551.8 mg/l. (Moody and Associates, 1982-83). (mg/l and ppm are equivalent measurements of concentration).

Although these figures are useful, they should not be relied on completely for predicting chloride associated environmental impacts of pit or tank leakage. The tests were conducted after the wells had been stimulated and precipitation had fallen. Chloride levels of 100,000 mg/l and higher have been found in drilling pits.

In almost <u>all</u> cases, a single accidental leak from a pit or tank will not pose a threat to ground or surface drinking water quality because of dilution by purer water. However, it has been documented that chloride levels in both ground and surface waters will increase in areas subjected to frequent and prolonged additions of chloride, whether it be from road salting or chronic contamination by chloride bearing wastes. There are no economical treatment

methods presently available for removal of large scale chloride contamination. Citizens are encouraged to report any leaks, so the Department can order timely repairs.

New York State's public drinking water standard for chloride is 250 mg/l which is the salt taste threshold of sodium chloride in water for some people. If the cations are calcium or magnesium, chloride levels as high as 1,000 mg/l may not be detectable from taste. However, the sodium found in combination with chlorides at concentrations below the taste threshold can be a serious problem for individuals with high blood pressure or heart problems.

For additional information on the potential impacts of sodium chloride on plants and soils, see page 9-41 in section 9.H.7.d.

b. <u>Surfactants</u> - Surfactants are surface active substances that are commonly used during both drilling and stimulation procedures. Depending upon the type and amount used, surfactants can control the emulsification, aggregation, dispersion, interfacial tension, foaming, defoaming, wetting, etc., of drilling or stimulation fluids. The composition of surfactants varies greatly, but they all have a base such as methyl alcohol, isopropanol, ethylene glycol or isobutanol, as well as other organic compounds common to detergents.

The major problem associated with waste fluids containing surfactants is their moderately high Biochemical Oxygen Demand (BOD) (Moody and Associates, 1982-83). Aerobic bacteria that feed on the organic compounds in surfactants break them down to simpler more environmentally acceptable compounds such as carbon dioxide and water. During the process, however, the bacteria lower the level of dissolved oxygen in the water. Therefore, the accidental contamination of surface waters with wastes containing surfactants can place oxygen stress on aquatic life and cause fish kills. The degree of the impact will be partly dependent on the age of the wastes at the time of the accident.

If the surfactant breakdown process has already had time to occur in the pit, accidental leakage of the wastes into surface water will not cause a serious problem.

c. <u>Gelling Agents</u> - Gelling agents added to frac fluid thicken it so it can carry sand or other proppants into the target formation. A common natural gelling agent is guar gum. Guar is a leguminous plant whose ground endosperm swells and disperses in water. Both guar gum and other gelling agents, such as carbohydrate polymers, give frac waste fluids a high BOD. Some gelling agents have enzymes or other compounds added that speed up their breakdown and help alleviate BOD problems (Moody and Associates, 1982-83).

d. <u>Heavy Metals and Other Drilling Pit Components</u> - Heavy metals are present in natural hydrocarbons and associated waters in small but measurable quantities because ancient and modern aquatic (usually marine) plants and animals from which petroleum is ultimately derived, selectively uptake and concentrate these metals from seawater. The chemical composition of waste fluids from drilling, stimulation and production of deep gas wells in northwestern Pennsylvania given in Table 15.2 should also be representative of the waste fluids from the geologically similar gas wells operating in New York State. The wastes have measurable amounts of many heavy metals such as strontium (Sr), barium (Ba), lead (Pb), magnesium (Mg), manganese (Mn), copper (Cu), zinc (Zn), aluminum (Al), iron (Fe), nickel (Ni), cadmium (Cd), boron (B), chromium (Cr), and cobalt (Co) (Moody and Associates, 1982-83). Most of these substances can pose an environmental threat to drinking water, aquatic life and/or vegetation if they are added to an area in sufficient quantity over a long period of time.

Over 2 million of the state's citizens are served by small private water wells which draw from low-yielding till and bedrock (NYS DEC Division of

# TABLE 9.2 - QUALITY STANDARDS & GUIDELINES FOR COMMONLY FOUND INORGANIC CHEMICALS

All units in mg/l(milligrams per liter) =	ppm(parts	per	million)
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CONTAMINANT METALS	(a) <sup>*</sup> <u>NPDWR</u>	(b) <sup>*</sup> NYSDOH PART 5	(c) <sup>*</sup> NYSDOH <u>GUIDELINES</u>	(d) <sup>*</sup> NYSDOH PART 170	(e) <sup>*</sup> NYSDEC PART 703
Arsenic Barium Cadmium Chromium (Cr <sup>+6</sup> ) Copper Iron Lead Manganese Mercury Selenium Silver Sodium Zinc	0.05 1 0.01 0.05 1 0.3 0.05 0.3 0.002 0.01 0.05  5	0.05 1 0.01 0.05 1 0.05 0.31 0.002 0.01 0.5  5		0.05 1 0.01 0.05 0.2  0.05  0.05 0.01 0.05 20 0.3	0.025 1 0.01 0.05 1 0.31 0.025 0.3 0.002 0.02 0.02 0.05
NON-METALS					
Chloride Flouride Nitrate Sulfate	250 2.2 10 250	250 2.2 10 250	  	250 1.5 10 250	250 1.5 10 250

<sup>1</sup> Combined concentration of Iron and Manganese shall not exceed 0.5 mg/l.

- \*Sources
  - (a) USEPA, National Interim Primary Drinking Water Regulations, 40 CFR Part 141.
  - (b) NYSDOH, 10 NYCRR Part 5, Public Water Supplies, 6/30/81.
  - (c) NYSDOH, Guidelines for Organics in Drinking Water:
  - (d) NYSDOH, 10 NYCRR Part 170, Sources of Water Supply, 8/16/71.
  - (e) NYSDEC, Ground Water Classifications, Quality Standards, and Effluent Standards and/or Limitations, 6 NYCRR Part 703, 9/1/78.

Adapted from Table II-6, <u>Draft Upstate Groundwater Management Plan</u>, New York State Department of Environmental Conservation, Division of Water, January, 1985. Water, 1985). Unrelated to oil and gas development, many of the bedrock water wells in some areas of southwestern New York are also high in some of the metallic cations identified above. Citizens with shallow bedrock water wells are advised to have analysis done on their water. Most of these metallic cations can be readily removed by a water softner.

Many of the water complaints received by the Department and thought to be related to oil and gas operations are found unrelated to these activities. The typical contamination sources in rural areas are usually localized and are best controlled and prevented when individuals understand how groundwater works, what potential sources of contamination might threaten their own or neighboring wells, and what to do to prevent contamination. Citizens who are interested in further information on groundwater protection and the health effects of substances in their drinking water are referred to the National Academy of Sciences study, <u>Drinking Water and Health</u>, Vol. I-VI, 1977-1984 and DEC's Draft Upstate New York Groundwater Management Program. Water Quality Standards and Guidelines are given in Table 9.2. These guidelines have safety factors of a hundred to a thousand incorporated.

Predicting the environmental impacts of heavy metals is difficult because of their complex interactions with soils and water. As soil pH decreases, heavy metal mobility increases, which in turn affects the likelihood of ground water contamination and uptake of the metals by plants (NYS DEC Division of Solid Waste, 1982). In research on heavy metals in sewage sludge it was found that landspreading could safely be accomplished if the soil's pH was maintained above 6.5 (NYS DEC Division of Solid Waste, 1982). In portions of New York State, however, soil can have a pH of 5 or lower (NYS Department of Agriculture and Markets, 1958). Ion mobility can also be affected by alkalinity, soil cation exchange capacity, level of organic matter, soil water saturation and other chemicals present (Miller, 1978). Sodium, boron,

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9-42
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cadmium, copper and nickel are the metals that could pose the most serious threats to plant life (Winkler, 1985, personal communication #72). Plants require several micronutrient elements for their normal growth. For example zinc, copper and iron act as fertilizers when present in small amounts (Winkler, 1983, personal communication #72). However, excessive amounts of zinc or copper can reduce plant yields or cause their death (NYS DEC Division of Solid Waste, 1982).

The high sodium chloride levels present in the production brine wastes (31,100 to 417, 000 mg/l) are the most serious threat to plant life. Such excessive concentrations of sodium chloride osmotically inhibit the ability of plants to absorb water (Miller, 1978). Therefore, spillage of brine or other waste fluids high in sodium chloride almost always kills vegetation and sterilizes the soil. However, recent research indicates the soil's plant toxicity is short lived due to the northeast's high rainfall and rapid leaching of the sodium and chloride salts. In addition, the brine has high concentrations of calcium and magnesium which have the beneficial effect of increasing the soil pH. Increase in soil pH helps combat the effects of acid raih and increase plant species diversity in the Northeast (Auchmoody, 1986).

Plant uptake is also a concern because it is the metal's primary route into animal and human food chains. Cadmium is the most likely metal to pose a threat to human health through plant accumulation (NYS DEC Division of Solid Waste, 1982). It is particularly dangerous because of its severe effect on the kidneys. However, experimental data indicate that zinc, which is also present in the waste fluids, may compete with cadmium in plant uptake. In addition, the zinc-cadmium ratio in body organs may deter cadmium's poisonous effects on the human body (National Academy of Sciences, 1977).

The high (250,000 mg/1) total dissolved solids (TDS) level of the pit

wastes could pose a major threat to aquatic life if they spilled into a stream. The combined effect of the TDS levels from the dissolved sodium, calcium, magnesium and chloride alone, could result in fish-kills, deformation of fish larvae and fry and other problems (Newell, 1985, personal communication #49). For this reason, the Department checks not only well setbacks, but pit setbacks from streams and lakes.

### 8. Waste Disposal

Waste fluids cannot be stored at the drilling site indefinitely. Within 45 days after the cessation of drilling operations, waste fluids must be removed from the pits and tanks and disposed of in an environmentally acceptable manner [6NYCRR Part 554.1(c)(3)]. Under no circumstances may operators fill in a pit before removing waste fluids. The Department occasionally grants extensions to the 45 day limit based on circumstances beyond the operator's control. The most common reasons for extensions are winter weather and the seasonal road weight limits imposed by local governments that prohibit passage of heavy brine hauling trucks during the spring thaw.

Injection wells are the most environmentally acceptable disposal option under DMN regulatory authority. Currently there are three permitted brine disposal wells located in New York. A proposed Memorandum of Understanding (MOU) between DMN and DEC's Division of Water specifically prohibits an operator from injecting waste fluids in, above or immediately below a primary ground water aquifer, such as the Jamestown Aquifer. Although none exist at the moment, a commercial "deep well" disposal unit could be safely built in an aquifer area provided it met stringent requirements. The well would have to be constructed to the standards of both DEC and the U.S. Environmental Protection Agency's Underground Injection Control (UIC) Program. A geological and engineering report would have to be approved by DEC's Bureau of Water Facilities Design in the Division of Water. A SPDES permit from the Division

of Water would also be required which would spell out the strict conditions under which the well would have to operate. The general State brine disposal well permitting guidelines are detailed in Appendix 7. In addition, a federal permit would be required under the UIC program.

Most of the brine wastes produced during drilling and production operations are disposed of by spreading on dirt roads for dust control or on highways for deicing. Brine spreaders must have a Solid Waste Haulers Permit pursuant to 6 NYCRR Part 364 from DEC's Division of Solid Waste. They must also have permission from the local government(s) where the brine waste spreading is to occur and limits are set by local governments on how much and how often brine can be spread.

The concentrated brine which is most useful for road spreading is produced by deep gas and Bass Island wells. The chemical composition of this brine is detailed in Table 15.3. Except for higher concentrations of some metallic cations, the produced brine is similar in chemical composition to commercial road salt and has similar deicing and dust supression properties (Moody and Associates, 1984). New York State is one of the largest users of road salt. If produced brine, which is less expensive for local governments, were not used, more commercial road salt would be used. According to the Draft Upstate New York Groundwater Management Program, "deicing salt can be a potential threat to groundwater but it should not be considered a "hazardous material" in the Class of petroleum and industrial chemicals. The threat to groundwater quality in Upstate New York from the use of deicing compounds on highway surfaces is considered to be measurable but much less significant than the threat posed by improper storage. The threat to public health and the environment must also be carefully weighed against the safety of highway users" (NYS DEC Division of Water, 1985a). However, the spreading of brine and road salt can cause groundwater quality problems in some local situations.

Specifically, chloride contamination of private drinking water wells has occurred in locations where wells are located close to highways. Where problems have been found, the shallow depth of the wells, poor siting and construction (e.g. relatively direct surface drainage into the immediate vicinity of the well) are usually contributing factors. Therefore, local governments should take special care when spreading road salt or brine in such areas.

The remainder of the wastes produced during drilling operations are disposed of at special, industrial treatment plants in Pennsylvania and Ohio or other out-of-state disposal facilities. On occasion, a local sewage treatment plant may elect to accept drilling wastes if they will not upset the plant's operations. In fact, some sewage treatment facilities need a certain amount of brine for their operations. Should oil and gas development continue in New York State, more local brine disposal wells and industrial waste treatment plants will be necessary because of the very high transportation costs to out-of-state disposal facilities.

### X. WELL COMPLETION AND PRODUCTION PRACTICES

### A. INTRODUCTION

After drilling is completed, the operator assesses the well's production potential. Usually logs are run to determine whether the well is capable of producing commercial quantities of oil or gas. Should the log interpretation be positive, the well will be completed and stimulated. If the well cannot be produced, the site will be restored and the well plugged and abandoned in accordance with the Department regulations. The completion rate of 85 to 95 percent for New York State gas wells is much higher than other states. However, most New York State wells are economically marginal from the national perspective.

### B. PRODUCTION

After the well has been stimulated, a production wellhead is installed, the completion rig is removed. Producing wells and their associated facilities usually cover only 10 to 15 percent of the original drillsite. The existing regulations do not address the need for partial site reclamation between the drilling and production phases of a successful well. Operators are only required to remove waste fluids from drilling pits within 45 days after the cessation of drilling operations. Conscientious operators also immediately reclaim the other portions of the wellsite that are not needed to support production operations so the land can be returned to productive use. Any portion of the well site not needed for production equipment should be regraded as much as is feasible, so it is similar to the adjacent terrain. The topsoil that was set aside earlier should be replaced and vegetation should be re-established to stabilize the soil. If this partial reclamation is not undertaken, soil erosion and other associated problems may continue throughout the producing life of the well (30+ years) and have serious long term impacts on land and soil resources. It is recommended that partial

surface restoration after the cessation of drilling operations and disposal of drilling fluids within 45 days after the cessation of drilling operations be required for all wells.

### 1. Gas Well Production

The production wellhead on gas wells is also called a Christmas tree. The Christmas tree is approximately 3' to 7' tall and consists of a series of fittings, valves and guages that provide control over the wellbore at the surface. The gas produced at the wellhead may contain light hydrocarbons, water vapor, sediment and other impurities. Since pipelines cannot accept gas with these impurities it must be treated. There are several types of equipment for treating gas, but separators with catalytic heaters and/or inline waterdrip separators (desiccant dryers) are the kinds most common in New York State. The separator moves the gas through a series of extractors and into the gas line. Water and any other <u>liquids</u> accumulate at the bottom of the unit through gravity. Figure 10.1 represents a standard producing gas well.

Water in the gas in <u>vapor</u> form can also cause problems. As gas moves from the wellhead into the separator, its pressure drops. The drop in pressure causes the gas to expand which results in a drop in temperature. If the gas temperature drops to freezing, ice and/or distillates can clog the lines.

To prevent this, some operators suspend a vessel containing 5 to 15 gallons of methanol (antifreeze) over the wellhead so the methanol can drip into the production line and prevent freeze-ups. This system is less sophisticated, but is cheaper to install than a separator with a catalytic heater. The small catalytic heaters are usually positioned near the regulator or valves on the separator. Occasionally, operators will have to use a larger



### FIGURE 10.1 - STANDARD PRODUCING GAS WELL

<sup>1</sup>However, the surface pipe must be set deeply enough to allow the BOP stack to contain any formation pressures that may be encountered before the next casing is run.

2 Or 100<sup>1</sup> above the shallowest hydrocarbon zone, whichever is greater.

FIGURE 10.1

unit, known as a heater treater, for a high volume well. A heater treater warms the gas before it goes into the separator instead of just heating key parts of the unit.

Some operators prefer glycol gas dehydrators which approach the problem from a different angle. Instead of using heat or antifreeze to prevent water from freezing, the dehydrator completely removes the water.

After the water and other impurities are removed, the gas is sent through a meter and into the pipeline. The installation, operation and safety of gas pipelines is under the control of the New York State Public Service Commission which has detailed environmental regulations. DEC has regulatory control of gathering lines (less than 125 psi) which cross environmentally sensitive areas such as wetlands and protected streams. Gathering lines are non-Article VII lines but all non-Article VII lines must still comply with PSC safety regulations 16 NYGRR Part 255. The PSC has no jurisdiction over the oil gathering lines in New York State because none of them are high pressure (greater than 200 psi) or could be considered transport lines (going off the lease to distribution centers). Most of the oil in New York State is trucked or piped from stock tanks on the lease or central storage tanks to the refinery. DEC has safety and environmental jurisdiction of the oil gathering lines which transport the oil from individual wells to the production storage tanks located on or in close proximity to the lease.

a. <u>Potential Environmental Impacts of Gas Production</u> - Underground leakage of gas from the wellbore can be due to a poor cement job, insufficient casing, corrosion or a combination of other causes. When it does occur, however, it is often recognized by a build-up of pressure in the annulus. Operators are required to cement the production casing far enough up the wellbore to prevent the migration of any fluids and gases. However, if the operator failed to notice a minor gas bearing zone above the producing

formation, cement might not seal it off. If not cemented off, the gas could migrate into the wellbore and increase the annular pressure.

A build up in annular pressure can be prevented by venting the annulus to the atmosphere and bleeding off the pressure. Some operators leave the annulus open continually which could raise minor air quality concerns. Some operators have installed pressure guages on the gas well annulus to monitor unwanted pressure build-ups. The annular pressure should not exceed the "normal" pressure gradient of the formation at the bottom of the surface pipe in the gas well. The following simplified formulas can be used to estimate the amount of gas pressure build-up which could occur in the annulus below the shoe of the surface casing before the formation at the shoe would be subject to breakdown.

f = P + K (Po - P)P = Gp DPo = S D

Where:

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D = depth
f = fracture or formation breakdown pressure
Gp = pore pressure gradient
K = fracture gradient stress ratio
     K is approximately equal to <u> 7</u> horizontal vertical stress ratio
                                    1-2/
\mathcal{V} = Poisson's ratio; \mathcal{V} = .3 Middle and Upper Devonian Shales in New York
Po = total overburden pressure
P = formation pore pressure
S = total overburden gradient
Given:
D = 450 feet
Gp = 433 psi/ft. (freshwater)
K = .42 to .43 (very low ratio in rigid fractured rocks)
S = 1.0 \text{ psi/ft.} (average)
     Po = (1.0 \text{ psi/ft}) (450 \text{ ft})
     Po = 450 psi
     P = (.433 \text{ psi/ft}) (450 \text{ ft})
     P = 194.8 psi
f = 194.8 + .42 (450 - 194.8) = 302 psi
Once gas escapes from the wellbore, under certain geologic conditions it
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can travel considerable distance either laterally or vertically and through natural fractures reach the surface or infiltrate a water zone. Gas in an aquifer can enter the water wells which tap it. The presence of gas in a water well presents a safety hazard. The gas can accidentally be ignited at the water tap or it can build-up inside the house in explosive quantities.

Methane, commonly known as marsh, sewer, natural or cooking gas, is a colorless, odorless and tasteless gas which is highly combustible. Methane is also slightly soluble in water and it becomes explosive in air at 5 to 15 percent by volume (NYS Department of Health, 1985).

According to the New York State Department of Health, it has not been demonstrated that methane in drinking water produces any adverse health effects, but if water containing methane flows into a storage tank or poorly ventilated area such as a shower, adequate ventilation should be provided to prevent an explosion. However, explosion is not the only hazard associated with methane. Methane is an oxygen replacing asphyxient and if it is present in high concentrations, there is a danger of suffocation due to lack of oxygen (NYS Department of Health, 1985).

Methane is a natural metabolic by-product of the bacteria which live in the intestinal tract of most animals and many insects. The primary source of methane released into the atmosphere is biological, although urban areas also contribute to methane emissions mainly through the leakage of natural gas from utilities, cars, transmission lines, etc. The non-biological sources of methane account for the release of 30 to 60 megatons per year but this is only 8 to 15 percent of the total emitted to the atmosphere; biological emissions account for the remaining 85 to 92 percent (Science News, 1985).

Gas pollution of air and ground water is sometimes mistakenly blamed on gas wells. Gas that occurs naturally in wetlands, landfills and shallow
bedrock has also been known to seep to the surface and/or contaminate water supplies. The highly fractured Devonian shale formation found throughout western New York, is particularly well known for its shallow gas pockets. In his 1966 report on the Jamestown Aquifer, Crain explained that natural gas could occur in any water well in the area "which ends in bedrock or in unconsolidated deposits overlain by fine-grained confining material. Depth is not of primary importance because pockets of gas may occur in the bedrock at nearly any depth." As an example he cited a water well that reportedly produced 9.5 million cubic feet of gas per day when it was first drilled. The gas flow declined rapidly and was unmeasureable after several days. This report concurs with the observations of members of the oil and gas industry who have drilled through minor gas bearing zones in the vicinity of this aquifer. Wetlands and landfills are also possible sources of methane contamination of groundwater. Depending on the amount of organic matter in the wetland or landfill, the depth of burial, time of burial and several other factors, sizeable quantities of gas can be generated. In fact, methane recovery wells have been drilled in at least three landfills in New York State for energy production, and methane has to be vented from many others (Phaneuf, 1987, personal communication #55).

<u>Produced Brine</u> - During gas well production, small quantities of formation water are brought to the surface with the gas. The separator removes the brine from the gas and sends it to a storage tank or brine pit. Operators in the past were allowed to use brine pits in association with gas wells for brine storage and disposal. Brine pits are not environmentally acceptable and are no longer permitted by the DEC or the Federal Environmental Protection Agency which considers them brine disposal wells. All existing brine disposal pits are scheduled for elimination within 3 years from June 1984. When production begins, the well may produce less than one barrel of



FIGURE 10.2 10-6a brine a day and frequently none. As the well gets older the volume of brine may increase up to five barrels a day. Large quantities of brine that must be disposed of also result from occasional maintenance operations such as swabbing. Most of this brine is disposed of by road spreading. Brine from the production stage poses the same kind of environmental concerns associated with formation water produced during drilling operations.

### 2. Oil Well Production

The equipment necessary for oil production is different from that for gas production. The production equipment on oil wells typically includes a pump, (Figure 10.2), a separator, and stock tanks.

Paraffin can be a major problem for New York State producers because it exists at a relatively high level in the oil. When the paraffin separates out of the oil it can plug the target formation, reduce production and clog equipment. Paraffin clogs in the small underground plastic flow lines attached to oil wellheads have also been known to cause the lines to rupture and leak. Therefore, paraffin treatment chemicals may have to be injected into the well as part of the production process.

When oil is produced from the reservoir it usually has brine and gas associated with it. Before the oil can be sold it must be treated. Most operators in New York State use a stock tank to separate the produced oil and water. The gas is drawn off the top of the separator and water and oil are drawn off the bottom. The brine and oil mixture is sent to a stock tank where it is separated gravitationally. The brine is then recycled for waterflood injection or stored for later disposal. The oil is periodically pumped out of the stock tank to central storage tanks and to the purchaser's refinery.

a. <u>Potential Environmental Problems of Oil Production</u> - Oil and brine can migrate from wells which do not have integrity. If the problem is

due to a failure in the unbing or production string, losses in pressure and production volume will indicate remedial action is required. If migration is from an uncemented hydrocarbon bearing formation behind pipe, the problem can be detected by annular inspections. If the annulus is opened and the zones have sufficient pressure, oil and/or brine may flow to the surface. However, most formations in New York do not have enough pressure to bring a column of fluid to the surface. Instead, a column of fluid will develop to a specific height above the pressure formation. When the pressure exerted by the column of fluid equals the pressure of the producing formation, a static equilibrium develops. The depth of this subsurface fluid column could rise to the depth of a freshwater zone, cad if the freshwater zone is not protected by surface casing, the oil or brine fluid column can enter the freshwater zone. Under these conditions, the source of contamination may not be recognized especially if this occurs in an improperly abandoned well. Fortunately, this situation is unlikely because of very low pressures in most producing formations.

The wells in the Bass Island trend are the only large volume oil wells in New York State. Because of their recent age and the strict conditions under which they were drilled and are operated, oil spills from these wells are rare.

Although oil spills are not common, when they do occur it is a serious problem because of the detrimental environmental impacts and the persistence of oil in the environment. Oil spills on surface waters are deleterious to aquatic life and can cause a fire hazard. As oil weathers, it sinks, and may kill benthic fauna and permanently alter the substrate.

The Department's existing regulations requiring a 50' buffer between wells and surface water bodies also provides some protection to surface waters. Although the existing regulations do not address the siting of storage tanks and other possible sources of oil pollution, DEC staff has the authority place

restrictions on these well site facilities through permit conditions. For example, operators are required to install dikes around all oil storage tanks. The diked area around these tanks must have sufficient capacity to retain a minimum of 1 1/2 times the tank volume. If an operator consistently has a problem with tank leakage or overflow, the Department can apply special permit conditions requiring the tank to be equipped with fluid level controls which will actuate an automatic shutdown of wells producing into the tank and prevent tank overflow. Fluid level monitoring and an automatic shut-down system may be specified as a permit condition or mitigation of a potential hazard in environmentally sensitive areas. These controls can prevent spills if the truck that empties the tank is delayed by impassable roads or other causes.

In addition to its impacts on surface water quality, oil is also a concern to vegetation, soil and ground water quality. A coating of oil on vegetation can seriously damage or kill it. It can also cause longer term environmental damage by sterilizing the soil. A heavily oil saturated surface layer may come to resemble asphalt over time and effectively sterilize the soil for decades.

Overall downward movement of the oil is affected by: 1) oil composition, 2) soil permability, and strarification, 3) rate and duration of the spill. As oil moves downward through soil, some of it is adsorbed on soil particles and remains behind. In most spills, the volume of the oil is insufficient to reach the water table and the oil remains trapped in the soil (American Petroleum Institute, 1980). However, as rainwater later percolates through this zone, soluble oil components such as benzene, xylene and toluene (BTX) may still be flushed into the water table (American Petroleum Institute, 1980).

Crude oil varies in composition from state to state and even field to field. In general, however, BTX makes up roughly 2 percent of the crude oil produced in New York State (Oliphant, 1984, personal communication #51). Benzene is the most soluble of the three components and also the one considered to be the most dangerous. Benzene is a known carcinogen (U.S. Department of Health and Human Services) with a definite cumulative action (NYS DEC Division of Water, 1983c). Daily exposure to benzene by ingestion or inhalation of concentrations of 100 mg/l or even less will usually cause health problems if continued over a protracted period of time (NYS DEC Division of Water, 1983c).

Solubility of a compound is generally considered to be one of the major indicators of a pollutant's potential for groundwater transport (Vershueren, 1983). However, several factors can affect both the form and solubility of benzene, xylene and toluene once they enter the groundwater system.

All three compounds are subject to biotransformation by micro-organisms that may be found in soil and groundwater (Wilson and McNabb, 1983). The occurrence and extent of the transformation will depend on the type and numbers of micro-organisms present, the availability of the other nutrients they need, and the level of oxygen present (Wilson and McNabb, 1983). The initial concentration of the aromatics can also be suprisingly important. At low concentrations (roughly 10 ug/1) an organic pollutant may not be present in sufficient quantity to enrich the microbes that could feed on it. At concentrations of 1,000 to 10,000 ug/1, microbe metabolism of the pollutants can entirely deplete the oxygen and/or other nutrients that are needed (Wilson and McNabb, 1983).

The solubility of benzene, xylene and toluene can be greatly altered by subsurface conditions, resulting in an increase or decrease in their rate of groundwater transport. For example, the solubility of benzene decreases with

increasing water salinity (American Petroleum Institute, 1978 and 1980). In contrast, the solubility of benzene and other aromatics can increase whenever two or more water soluble organic compounds are present.

When an oil spill does have sufficient volume to reach the water table, it will spread out in a layer and begin to move in the direction of groundwater flow (American Petroleum Institute, 1980). As the oil travels through the soil and down to the water table it is still subject to environmental weathering and degradation which is slow in reference to the human timeframe. (Ertugrul and Harkness, 1982). An oil spill may occur suddenly or a small leak may develop undetected. Slow, unsuspected leakage over a long period of time is probably the most harmful, since extensive damage may occur before it is noticed (American Petroleum Institute, 1980). Depending upon local conditions, oil polluted water may travel underground for 20 years before it enters a water well. Appendix 3 contains a generalized oil spill transport model.

<u>Produced Brine</u> - Brines produced in association with oil in western New York contain sodium, chloride and roughly the same types of heavy metals found in gas field brines. Small amounts of benzene, xylene and toluene may also be present in oilfield production brines. The production brines are typically disposed of by direct discharge under a SPDES permit or road spreading under a Part 364 Waste Haulers permit. A suggested revision to permit requirements, in primary and principal aquifer areas is to require operators to have an approved brine disposal plan prior to drilling a well.

<u>Air Quality</u> - The most common air quality problems, during the well production phase, originate from oil stock tanks. Distillates and fumes escaping from stock tanks can often be recognized by offset landowners or by anyone frequenting the area. The existing regulatory program does not specifically address the siting of production facilities. However, adoption

of the proposed 150' setback from residences should help decrease these air quality impacts.

## 3. Production Reports and Conservation of Resources

Operators must submit annual production reports so the information is available to government and industry for planning purposes. In addition, the information is needed to check the gas-oil ratio of wells producing both types of hydrocarbons. The gas-oil ratio is one indication of whether the operator is following wasteful production practices. If the gas which supplies the reservoir transport energy is depleted too quickly, the oil in the reservoir may end up trapped in the rock. Therefore, the Department can regulate the production rate which is dependent on the well's gas-oil ratio to prevent waste of the State's non-renewable natural resources.

Though provisions exist under the current regulatory program [6NYCRR Part 556.8] to require a notice of intention for other operations such as deepening plug back and conversion operations, the requirement has been ignored to some extent because of confusion with regard to interpretation of the exclusions given to any work conducted in the existing production zone. It is critical that the Department have accurate records of the existing condition of all wells under its regulatory authority. For this reason, it is recommended that a notice of intention and a permit be required from the Department for any operation that will in any manner alter the casing, permanent configuration, or designated use and status of a well. It is not the intention of this recommendation to require a permit for routine well servicing. Notification and possible permit will be required for the following actions:

- perforate casing in a previously unperforated interval for the purpose of production, injection, testing, observation or cementing
- redrill or deepen any well

- mill out or remove casing or liner

- run and cement casing or tubing
- drill out any type of permanent plug
- run and set an inner string of casing or liner
- run and cement an inner string of casing, liner or tubing
- set any type of permanent plug (bridge, cement, sand, gravel, gel, etc.)
- repair damaged casing by means of cementing, placing a casing patchs swaging etc.

The only action of those listed above that would require a permit fee would be the deepening of a well because Department financial security requirements are based on well depth.

## XI. PLUGGING AND ABANDONMENT OF OIL AND GAS WELLS

### A. INTRODUCTION

The plugging and abandonment of oil and gas wells is an operation that is critical for the protection of underground and surface waters. Proper plugging procedures must be followed to effectively block the migration of oil, gas, brine and other detrimental substances into freshwater aquifers. The infiltration of water into oil and gas reservoirs must also be prevented to avoid damage to these resources.

State law requires operators of most oil, gas and solution mining wells in New York State to maintain financial security with the Department to ensure that the wells are properly plugged and abandoned after their economic life is over. Financial security requirements were substantially increased in 1985 to more closely match the actual costs of plugging operations.

An owner, which means the person who has the right to drill into and produce from a pool, may not transfer his plugging and abandonment responsibilities by surrendering a lease [ECL 23-0305.8e]. These requirements are the owner's responsibility and are assumed at the time a well is permitted for drilling. However, these responsibilities may be transferred upon the agreement of parties involved. DEC must approve the transfer, and the transferee must show financial security for his/her well plugging responsibility. A prescribed transfer form is available from the Department.

Wells are commonly plugged either because they are dry holes or they have ceased to produce economic quantities of oil or gas. A well may also be plugged if severe problems are encountered during drilling. The Department may also order a well plugged because of environmental or safety problems. From an engineering standpoint, the purposes of plugging are to: 1) prevent the mixing of fluids from different geologic levels, 2) prevent the flow of

fluids from pressurized zones to the surface, and 3) maintain pressure integrity in the individual subsurface intervals. Since the entire wellbore is a potential channel for fluid movement, wells must be plugged with cement at several locations. Under most conditions the intervals in between cement plugs should be filled with a heavy mud or other approved fluid. In general, cement plugs are placed: 1) at the ground surface, 2) above and across all oil and gas zones, 3) atop casing stubs if any casing strings are recovered and 4) across the base of the surface casing or below the base of the freshwater zone. No contiguous annular spaces are allowed to remain. When uncemented casing is left in the hole, it must be ripped or perforated and have cement squeezed into the annular space behind it.

Once the well is plugged, the site must be reclaimed by removing equipment and grading the surface to match the surrounding areas. In agricultural areas, the casing must be cut off below plow depth (approximately 4 feet). The topsoil cover must be replaced and the site must be seeded to re-establish vegetation.

## B. PLUGGING REGULATIONS

### 1. Old Plugging Regulations

Though New York State has had laws requiring the plugging of oil and gas wells since 1879, operators were not required to obtain a state permit before they could plug and abandon a well until 1966. Until the State's Oil and Gas Law was amended in 1981, wells <u>drilled in fields</u> that had been <u>discovered prior to October 1, 1963</u> could be legally abandoned with seasoned wooden plugs. Wells <u>drilled in fields</u> that were <u>discovered after</u> <u>October 1, 1963</u> were subject to much more stringent regulations requiring cement plugs. Wells abandoned before comprehensive state regulation have been

wooden plugs. Although operators used wooden plugs or other techniques in good conscience, many old abandoned wells have caused serious localized environmental problems.

### 2. Existing Plugging Regulations

Title 6, Chapter 5, Subchapter B Part 555, Sections 1-6 of the New York State Department of Environmental Conservation (DEC) regulations deal with the plugging and abandonment of oil and gas wells.

These regulations are not very specific or comprehensive, but the 1981 amendments to the Oil, Gas and Solution Mining Law gave DEC broader power to regulate the industry. Until new regulations are written, it has been the Department's policy to add specific safety and environmental conditions to individual plugging permits as needed.

### 3. Summary of the Existing Plugging Requirements

Current regulations specify that a cement plug be run from total depth to a minimum of 15 feet above the shallowest producing zone, and/or a cement plug of at least 15 feet on top of a bridge placed above each formation from which the production of oil and/or gas has been obtained in the vicinity. If any casing is left in the ground, a plug of at least 15 feet must be placed at the bottom of the casing; and another 15 foot plug must be placed at the top unless the casing extends to the surface. Also, if any casing extending below the deepest potable fresh water is removed, a 15 foot plug must be placed in the open hole approximately 50 feet below the deepest potable water. All the intervals between plugs must be filled with a heavy mud, "gel" or approved fluid. Fluid is required so that there is sufficient hydrostatic pressure exerted to exceed any zone pressures found in the well, and thus prevent the movement of other fluids into the wellbore. All casing extending to the surface must be capped in a manner that will prevent the migration of fluids and not interfere with soil cultivation. (See figure 11.1 for further

explanation).

### C. MUDDING THE HOLE

The combination of properly placed cement plugs and mud in the wellbore can be a more effective method of permanently abandoning a well than a rigid column of cement from total depth to the surface which could develop a microannulus with hydration and time. A <u>natural bentonite mud</u> is the best mud for abandonment because it has good gel-shear strength. It also is less likely to separate with time and leave a water column suspended above the mud or "gel" solids. It is recommended all portions of the hole not plugged with cement be filled with a clay base mud with a minimum density of 8.65 ppg and a gel-shear strength (10 min.) of 15.3 to 23.5 lbs/100 sq. feet. Exceptions to this requirement will be reviewed on a field area basis.

### D. PLUGGING METHODS

There are several plugging methods used to abandon wells.

- 1. Dump bailer
- Pumping or siphoning through tubing or drill pipe (Balance Method)
- 3. Mechanical bridge

Briefly, the first method consists of lowering a dump bailer containing a measured amount of cement down the hole where the cement is released when the bailer hits a bridge plug previously set at the desired depth. This plugging method requires a minimum of equipment. Therefore, where the access road and well location are restricted, plugging the well with a dump bailer may be preferable. The second method involves running tubing into the hole to the desired depth and pumping through it, a measured amount of cement. The cement is then partially displaced out of the tubing by pumping mud, water or other approved fluid behind the cement slurry. When the level of cement outside the



Permit conditions can be used in modify or add to individual well-plugging requirements in order to address special conditions. Special requirements apply to Base tyland & equifier wells that are not detailed in this diagram. Also variations exist in Fields estabished helers 1963. However, the parging requirements for all of these wells are required the same. Usually the lower perties of the Production Casing & pert of the Conductor & Surface Casing is left in the ground, in most cases it is difficult & expensive to remove all of the casing from the well. tubing is equal to that inside, the pipe is slowly pulled from the cement slurry. Both the pumping through tubing and the dump bailer methods of setting plugs are subject to contamination which can keep the plugs from sotting. A small dump bailer plug can be contaminated by the presence of mud or other fluids even in a static hole, and if the well has not been adequately killed, a plug pumped through the tubing can be contaminated by the movement of borehole fluids or gas bubbles channeling through the plug. The most commonly used techniques for plugging wells are the mechanical bridge method and the balance method. The mechanical bridge method is the most common method used to plug oil wells, and the balance method is the most commonly used method to plug gas wells.

In the mechanical bridge method, a bridge plug is set in the hole or casing just above the zone or formation to be plugged. A bridge plug is a type of mechanical packer which is generally permanent though some are retrievable. Once the bridge plug or packer forms a bridge across the well, sealing off the well below, cement is placed on top of it.

A variation on the balance method consists of filling the borehole with mud or "gel" and spotting cement plugs at the desired depth. Small volume cement plugs set by all of these methods can be contaminated by mud, fluid movement or gas. For this reason, an increase in plug length and/or tagging the location of critical plugs is recommended.

Occasionally, an operator finds it cost effective to abandon a shallow gas or oil well by using bullhead or braden head squeeze techniques to pump the entire wellbore with cement. This method can save time and the only equipment that is needed are cement pump and bulk trucks and a water source. An operator choosing this abandon method should add a small percentage of bentonite to the bulk cement to reduce dehydration and shrinkage which might create a micro-annulus.

## E. ADDITIONAL PLUGGING REQUIREMENTS

Sometimes casing is recovered from the well before abandonment. When casing is to be recovered, the top of cement in the annular space is determined by running a cement bond log or some other free point indicator such as a strain gauge. Once the top of cement has been determined, the casing is cut above that depth and removed from the hole. Then either a bridge plug is set (mechanical method) or a cement plug is pumped in (pump and plug method). If the pump and plug method is used, the operator is required to run an extra quantity of cement to compensate for possible loss of cement in the casing-hole or casing-casing annular space below the cut. Unless the operator can document conditions such as a major lost circulation zone, extreme corrosion or partial casing collapse, etc., which would make uncemented surface casing. In the event uncemented casing cannot be recovered from the hole, it must be perforated or ripped and have cement squeezed or placed into the annular space.

## 1. Site Reclamation

Site restoration is an essential step in the abandonment process for mitigating surface environmental impacts associated with oil and gas development. Failure to adequately restore a site can lead to severe soil erosion and siltation of surface water bodies. These impacts result in the return of less productive land to agriculture, wildlife habitat and other productive uses.

After the well has been plugged, the casing cut below plow depth in agricultural areas, and equipment and debris removed, the site must be restored as soon as is reasonably possible to its original condition. The mouse hole, rat hole and any other excavations made during drilling or

production must be filled. In some cases, the wellsite must be bulldozed or otherwise shaped similar to the adjacent terrain. To prevent potential erosion problems, operators are required to avoid creating undue elevations in the ground surface.

Although it is not specifically required in the regulations except in Agricultural Districts, operators are encouraged to set aside all topsoil removed during site construction so it can be replaced when the well is abandoned or the well site is restored after drilling. Mishandling of topsoil usually results in poor or sterile soil conditions which restrict revegetation of the area. Operators are required to seed the site to establish new vegetation and hold the soil in place when there is a potential for severe erosion damage. Figure 11.2 depicts a well site during drilling and after proper reclamation.

## 2. Potential Delays in Plugging and Abandonment

a. <u>Shut-in</u> - For practical reasons, wells do not operate continuously throughout their producing life. Production is commonly shut-in several times a year for routine repairs or maintenance. Production may also be suspended if a market for the well's oil and/or gas is temporarily unavailable. The potential exists, however, for extending a routine shut-in of operations into an excuse to abandon a well without going to the expense of properly plugging it. To prevent such abuses, the regulations prohibit operators from shutting-in wells capable of commercial production for more than one year without specific permission from the Department.

Upon written application by the owner or operator, demonstrating sufficient good cause, the Department can administratively grant a one year extension. Additional extensions may be granted if the need can be substantiated. Once the period of lawful shut-in ends, the owner or operator must begin producing the well or permanently plug and abandon it.

# FIGURE 11.2 - WELL SITE AFTER PROPER RECLAMATION



<u>EEFORE</u> - Columbia's Finnegan No. 1 well was spudded on July 22, 1983 in the rural countyside of the Town of Easton, Washington County. Because of its greater depth (7,764') than most New York State wells, both the rig and its support facilities were larger than usual. This is an aerial view. This wellsite was barely visible from the ground because of all the trees.



<u>AFTER</u> - As shown in this photo taken roughly 2 1/2 years after the well was plugged, no signs remain of the extensive drilling operations. Division of Mineral Resources, petroleum engineer, Richard Arieda is standing directly over the old well location.

b. <u>Temporary Abandonment</u> - Delays in operations may also occur during the drilling and completion stages of the well. It is not uncommon for work to be suspended while logs, core samples and other data are analyzed to see if completion of the well is warranted. Economic factors may also lead operators to delay perforating and hydraulically fracturing a potentially good well. Service companies charge for time and mileage, making it cheaper to wait and have several wells in one area perforated and stimulated at the same time.

As with the shut-in of producing wells, the accepted temporary delays in drilling and completion can be abused to avoid the expense of properly plugging and abandoning a non-commercial well. Therefore, the existing regulations prohibit the owner or operator from temporarily abandoning a new well for more than 90 days unless the Department grants an extension. The Department can administratively grant extensions for a reasonable time period.

c. <u>Detection of Illegal Delays in Plugging</u> - During a shut-in or temporary well abandonment the operator is still responsible for compliance with all Department regulations, including those requiring submission of Well Drilling and Completion Reports and Annual Well Status and Production Reports. Illegally shut-in wells can be found by reviewing the Annual Production Reports. Temporary abandonment of wells for more than 90 days may be indicated by lack of a Well Drilling and Completion Report for a well that is believed to have been drilled. The ongoing computerization of these records will allow the Department to more easily detect operators violating the temporary abandonment or shut-in regulations.

# 3. Compliance

To ensure compliance with the plugging and abandonment regulations, the Department relies on a combined system of applications, permits, reports and

inspections. When an operator decides to plug a well, he must first submit a Notice of Intention to Plug and Abandon to the Department. The form requires information on both the condition of the well and the proposed method of plugging. Information must be given on the number of feet of casing in the well, casing size and weight, and the amount of casing to be left in the hole. Details must also be given about the types of plugs and filling materials, their proposed setting depths and vertical length.

Based upon a review of the information submitted, the Department may issue a permit for the proposed plugging program as submitted. Changes may be required in some proposals to ensure that subsurface fluid migration does not occur. In this case, the permit is then issued with conditions attached to it.

To allow the Department the opportunity to inspect the plugging operations, the operator must specify the date and time at which the well is to be plugged. DEC Regional Offices also require 48 hours advanced notice by mail or telephone prior to commencement of plugging operations. If the Inspector is not present at the designated time, the operator may proceed. Generally, a State inspector is on location during most or all of the plugging procedure. The inspector monitors the type, quantity and quality of materials used and has authority to require additional procedures he or she thinks necessary to ensure a sound plugging job. Site restoration is also inspected shortly after the completion of the abandonment operations to ensure compliance with regulations.

In an emergency or where compliance with the notification procedure set forth in the regulations will cause undue hardship, the owner may verbally notify the Department of his intention to plug and abandon; and the Department will acknowledge the notification verbally. The prescribed forms must then be sent in as promptly as reasonably possible and the Department will furnish a

plugging permit.

The owner or operator of an oil, gas or solution mining well must immediately notify the Department office that issued the plugging permit of any non-routine incident. Such incidents include sustained gas or fluid flows and lost circulation zones which occur during plugging or replugging operations that may affect the health, safety, welfare or property of any person. The Department requires the owner and operator to record data that may be of subsequent use for adequate evaluation of a non-routine incident.

Within 30 days after plugging a well, the owner or operator is required to file a signed Plugging Report with the Department. Complete details of the plugging and abandonment operation must be given, including verification that: (1) equipment and debris have been removed, (2) the pits and excavations have been filled (3) the casing has been cut below plow depth where appropriate and (4) the well site has been restored.

As a measure to help ensure that wells are properly plugged and abandoned, the Department may, if necessary, enter, take temporary possession of, plug or replug, and abandon any deserted idle well whenever the owner neglects or refuses to comply with any of the provisions of the regulations. The Department's plugging and abandoning or replugging and abandoning is at the owner's expense; and the owner must hold harmless the State for all accounts, damages, costs, and judgements arising from the plugging and abandoning of the well.

a. <u>Temporary Abandonment</u> - Site inspections are also performed prior to authorizing legal temporary abandonment status for a well. In addition, the well's casing and cementing records are reviewed and partial well site restoration is required before temporary abandonment status is granted. These steps are taken to ensure that the well is mechanically sound

and will pose no threat during the temporary abandonment period.

b. <u>Shut In Wells</u> - Current regulations only address the temporary shut-in of wells capable of being produced on a commercial basis. It is recommended that the temporary shut-in regulations be amended to include all wells regardless of commercial potential.

### F. SUGGESTED FUTURE PLUGGING REGULATIONS

The effectiveness of a cement plug in preventing fluid migration is influenced by: 1) the condition of the mud or drilling fluid in the hole; 2) the volume of water used in mixing the cement and the type of cement and; 3) the technique used for placing the plug. Unfortunately, it is common for cement plugs to not set properly because of contamination by mud or gas while the cement is wet. The most common problem affecting cement plug integrity is the quantity of water used to make up the cement slurry. Excess mix water and the incorporation and infiltration of mud or other substances in the cement affects setting properties, and can result in a cement plug which lacks integrity. Gas migrating up through the plug while it is wet can also create a path for future fluid migration after the plug is set. Dehydration, or normal water loss by the cement as it sets can result in micro-annular channels.

Therefore, it is recommended that the plugging requirements for wells be amended. The Notice of Intention to Plug and Abandon must be submitted to the Department with the complete proposed abandonment procedure. The proposed abandonment procedure will be reviewed before a permit is issued. Special conditions above and beyond the following proposed regulatory requirements may be required by the Department should special circumstances warrant it.

In areas where the environment will not be further compromised (Compelling justification, e.g. old oil field areas where hundreds of wells are located on which there are no records), an operator may petition for an

exception to the proposed plugging and abandonment requirements. For an exception to be granted, it would have to be demonstrated that no existing residence or freshwater aquifers would be impacted.

Because downhole conditions are different in the shallow depleted sands (i.e., formations with extremely low pressure and fluid content) of the old oilfields and in the deeper gas and Bass Island formations, different abandonment requirements are proposed. In addition, the operator is given several options for proper abandonment of a well. Many of these options will allow cement plugs of shorter length if the operator will guarantee the location of the plug by tagging the plug location for a DEC witness. Shorter plug lengths and other abandonment options are proposed for the old oil field areas in order to allow these wells to be abandoned with the equipment such as dump bailers and A-frame hoists that these operators currently use. It is hoped more wells will be plugged under these requirements than if the plugging requirements necessitated the use of a larger rig and service companies which could require large expenditures for access roads that might cost more than the actual well plugging costs. The DEC may require that the location and/or hardness of any plug be checked by re-entering the well and tagging it. Plugs of primary concern to the DEC are the critical producing zone plug and the freshwater protection or surface casing shoe plug.

## 1. Old Oil Field Abandonment Requirements

Some of the old oil field areas have good potable water, others do not. Most of the wells in the old oil fields have open hole completions. Many of these wells were drilled with cable tools and most have uncemented surface casing which was installed not only to protect freshwater zones but to allow cable tool drilling to continue. It is very difficult to make drilling progress in a fluid filled wellbore with a cable tool drilling rig because the

percussion action of the chisel bit is dampened when it hits water. So in the old oil field areas where most of the wells were drilled with cable tools, surface casing set below the deepest water zone is not necessarily a good indicator of the location of the deepest potable water zone. Fortunately there is only one water zone or aquifer in most of the old oil field areas, and almost all of the water zones in this area of the state have direct continuity to surface infiltration. But where multiple zones exist, they usually have varying degrees of potability. The deeper water zones are usually more mineralized and may be unsuitable for domestic use. Behind uncemented surface casing, these zones can commingle with more potable shallow zones. For this reason, it is proposed that an attempt be required to pull uncemented surface casing or plug the annulus by ripping or perforating a minimum of two joints and placing cement across this interval.

Some of the areas which had high levels of activity and pollution have been cleansed over time because of the flushing action of the very high rainfall and groundwater recharge rate in New York State. Under the new proposed plugging requirements, water quality in the old oil field areas should improve with time.

a. <u>Production Zone Plugging Requirements</u> - In a typical old oil field producing well with an open hole completion, three primary options for plugging the production zone are available:

Option 1: Place cement through the production zone.

Option 2: Place sand and/or gravel through the production zone.

Option 3: Place an impermeable sealing bridge plug above the production zone.

Regardless of the option selected, a cement plug must be placed above the production zone. Whether or not a plug location tag is required, will depend on the plug length.

- If the calculated cement plug length is at least 50 feet, no tag of the plug location will be required.

- If the calculated cement plug length is the minimum of 25 feet, a tag of the plug location will be required.

b. <u>Injection Zone Plugging Requirements</u> - Most waterflood injection wells in the old oilfields are completed with tubing on a flood packer which has 20 to 50 feet of cement on top. The plugging requirements for injection wells shall be the same as for producing wells except with regard to sealing the injection zone. There are two options available for plugging these wells which are detailed below:

- Option 1: This option is required for wells in which the USEPA has jurisdiction. Set a plug (blind packer) in the injection tubing at packer depth, sever the injection tubing above the original cement and remove. Place a cement plug in the wellbore from the severed tubing to 50 feet above, with a calculated excess for tubing infill.
- Option 2: This option can be used when EPA does not have jurisdiction (e.g. old injection wells which have not been active since 1982). Set a plug (blind packer) in the injection tubing at packer depth. Place a minimum of 25 feet of cement inside the injection tubing with a macaroni string. Sever the injection tubing and remove. Place a minimum of 25 feet of cement in the wellbore above.

c. <u>Abandonment Fluid Requirements</u> - If the operator can verify that the interval between the producing zone and the surface casing shoe has no brackish water or Devonian shallow gas zones, the requirement of an abandonment fluid can be waived. Verification will consist of drilling log

records, electric or other geophysical log interpretation, fluid level monitoring, Division of Water studies and/or other geologic reports on the field area.

If this interval is not dry, the hole shall be filled with a gelled fluid or water as specified in the permit issued by the Regional Minerals Manager. Minimum requirements for the gelled fluid are a density of 8.65 ppg (pounds per gallon).

d. <u>Uncemented Surface Casing Plugging Requirements</u> - If an old oil well has tacked or uncemented surface casing, an attempt must be made to pull the surface pipe unless the operator submits documentation for a variance. A supporting bridge plug or impermeable sealing packer should be placed 25 feet below the shoe of the surface casing prior to any attempt to remove the casing. If all of the surface casing is recovered, a 50 foot plug across the former surface casing seat shall be placed. The plug location must be tagged after an appropriate WOC time unless it is placed on an impermeable sealing packer which has been weight tested prior to the cement plug placement. Testing will consist of setting down a weight with the tubing that is equivalent to the calculated weight of the cement plug.

All water bearing and/or fluid loss zones between the shoe plug and surface shall be sealed with cement and any remaining open hole intervals shall be filled with gel or as specified in the permit.

In the old oil fields, the minimum length of the cement surface plug shall be 15 feet.

e. <u>Plugging Requirements for Uncemented Surface Casing Recovery</u> <u>Failure</u> - When attempts to pull uncemented surface casing have been only partially successful, the operator is given several options for properly sealing the surface casing stub. After placing 50 feet of cement across the surface casing shoe as detailed previously, the operator has the following

options:

- Option 1: Place cement from the top of the casing shoe plug to a minimum of 25 feet above the casing stub with a calculated cement excess for any annular fill-up.
- Option 2: Fill the casing stub with gel or water as specified and set a cement plug inside the casing a minimum of 25 feet below the stub to 25 feet above with a calculated excess for annular fill-up.
- Option 3: Spot the gel in casing stub as specified and set a 25 foot cement plug in the open hole above the stub or set a 25 foot cement plug on a supporting bridge plug or impermeable sealing packer. Place a minimum of 25 feet of cement on top of the plug.

After plugging the surface casing stub, any water bearing or fluid loss zones in the remainder of the hole must be sealed with cement, and all interplug intervals filled with gel. A minimum of 15 feet of cement is required at the surface in all old oil wells.

If uncemented surface casing cannot be recovered, proper abandonment of this portion of the hole will be as follows:

- 1. Place a minimum of 50 feet of cement across the surface casing shoe.
- Determine the depth of unbonded pipe and perforate or rip a minimum of two joints of casing immediately above the depth of unbonded pipe or the shoe plug whichever is lower, or
- perforate above the depth of unbonded pipe, and attempt to establish circulation and squeeze cement into the surface casing - hole annulus.
- If there are cement returns to the surface, spot gel into the casing and place the surface plug.
- 5. If the casing wellbore annulus is so tight as to prohibit the

establishment of circulation and cement returns to the surface or the equipment, casing condition and/or wellhead configuration prohibit the attempt, two options are available:

- Option 1: Place cement from the casing shoe plug to 25 feet above the ripped or perforated joints. Appropriate WOC time and a tag of the plug location is required. The remaining interval must be filled with gel and a 15 foot surface plug placed.
- Option 2: Plug the entire wellbore from the shoe plug to the surface with cement.

f. <u>Cemented Surface Casing Plugging Requirements</u> - If an old oil well has cemented surface casing, the proper plugging requirements will be as follows:

- Place a cement plug from 25 feet below the surface casing shoe to 25 feet above. A tag of the plug location will be required unless it is set on a previously weight tested packer.
- Fill the remaining interval with gel or as specified in the permit, and place a 15 foot surface plug.
- 2. Gas Well Plugging Requirements

Most gas wells in New York are deeper and are completed differently than oil wells in the shallow Devonian sands. Title 6, Chapter 5, Subchapter B, Part 554.4, requires that if production casing is run, it shall be cemented by a pump and plug or displacement method with sufficient cement to circulate above the top of the completion zone to a height sufficient to prevent any movement of oil, gas or other fluids around the exterior of the production casing. Thus, gas wells usually have cemented surface casing and partially cemented production casing. Wells completed in a Primary or Principal Aquifer

where the State requires both casing strings be cemented to the surface are an exception.

For proper abandonment, the entire perforated zone or producing interval should be plugged with cement in a well with partially cemented casing. The current practice of allowing a bridge plug capped with cement at the top of the producing zone can be fallible in a cased hole where the top and/or quality of the cement behind the casing is unknown. Under certain conditions, fluids from the former producing zone could still migrate up the wellbore casing annulus if the original cement job on the production casing was inadequate. The placement of cement across the producing zone will decrease the chances of this occurring because the weight of the column of cement across the zone will push some cement through the perforations into the production zone. Under special circumstances, a bridge plug capped with cement at the top of the zone will be allowed, such as when the production interval is a fracture or lost circulation zone known to take fluids. Other circumstances warranting exception will be reviewed on an individual basis. Because of their greater depth, gas wells are usually plugged through tubing by the balance method. With this method, as cement slurry is displaced through tubing into a fluid filled hole, a certain amount of mixing occurs. Most operators use a calculated excess to compensate for cement lost to mixing when they plug by this method. This is another reason why greater plug lengths are recommended for gas wells.

a. <u>Production Zone Plugging Requirements</u> - For the typical Medina gas well completed with partially cemented production pipe, the following options for properly sealing the production zone are available:

Option 1: Set a cement retainer above the perforated zone and squeeze the volume of cement calculated to fill the hole below. Place

50 feet of cement on top of the retainer (no plug location tag required).

- Option 2: Place cement from T.D. across the producing zone to 50 feet above the top perforation (plug location tag may be required).
- Option 3: (Available only when the production zone is a lost circulation zone or other special circumstances). Set a cast iron bridge plug or other sealing packer above the producing zone, and cap with 50 feet of cement (no plug location tag required).

b. Uncemented Production Casing Plugging Requirements - As part of

the plugging process, operators are required to rip or perforate any uncemented casing left in the hole, and squeeze cement through the openings into the open annular space. However, it is difficult to make certain that the cement is completely distributed in the annular space, and that this conduit is fully plugged. Therefore, it is recommended that an attempt be made to recover uncemented production casing below the shoe of the surface casing.

When the surface casing is cemented below the deepest potable water, and no hydrocarbon or significant brackish water zones occur behind uncemented pipe, casing recovery will be at the operator's discretion, but as stated previously, it is strongly recommended that uncemented casing be pulled. The following options are suggested for properly plugging a well with uncemented production casing.

- Option 1: Recover casing above the determined depth of unbonded pipe. Place a cement plug of 50 feet across the stub, 25 feet below and 25 feet above, with a calculated excess for annular fill up.
- Option 2: Recover production casing no higher than 25 feet below the surface casing shoe. Place cement from 25 feet below the stub

to 50 feet above the surface casing shoe with a calculated excess for annular fill-up.

Option 3: If the uncemented casing is not recovered, it must be perforated at least 50 feet below the shoe of the surface casing, circulation established, and sufficient cement squeezed to fill the annulus. One hundred feet of cement must also be placed inside the pipe across the surface casing shoe.

### c. Plugging Requirements for Hydrocarbon or Signficant Brackish

Water Zones Behind Uncemented Casing - Current regulations, Part 555.5, sections 1 and 2, require that wells be capped or plugged in such a manner as will prevent the migration of fluids. In addition, the regulations require that the wellbore be filled with cement from total depth to a minimum of 15 feet above the top of the shallowest formation that has produced hydrocarbons in the vicinity, or alternatively, each hydrocarbon zone be plugged by the placement above each zone of a cement topped bridge plug.

In essence, the above sections require that all formations containing hydrocarbons or fluid with sufficient volume and pressure to migrate be sealed. A zone behind uncemented pipe will not be properly sealed by the placement of cement inside the casing alone. Thus, revision of the current regulations is necessary. The following options are recommended for properly plugging a zone behind uncemented casing.

Option 1: Perforate the production pipe below the annulus producing zone, and squeeze sufficient cement into the annulus to cement above the zone. Place a cement plug within the casing across the annulus producing zone to 50 feet above.

Option 2: Recover the casing below the annulus zone and plug with cement from 25 feet below the stub to 50 feet above the annulus

producing zone.

For hydrocarbon and brackish water zones in open hole, the following pluging options are recommended:

- Option 1: Place cement from total depth to 50 feet above the shallowest hydrocarbon/brackish water zone.
- Option 2: Plug across each hydrocarbon/brackish water zone to 50 feet above each zone with cement. Spot gel in all inter-plug intervals.

d. <u>Junk-in-the-Hole Plugging Requirements</u> - "Junk-in-the-hole" is a generic term which defines any debris, obstruction, or lost equipment existing in a well. "Junk-in-the-hole" poses a significant problem when it is located above the producing formation in a well. Remediation techniques are employed to retrieve or displace the junk and restore access to the producing zone. When these measures fail and the well is rendered unproducible, the wellbore must be plugged and abandoned.

To ensure adequate plugging of the well when the producing zone is isolated below "junk-in-the-hole", alternate plugging procedures must be followed. It is recommended that the operator be required to set a cement retainer (a cement retention packer) above the junk and attempt to squeeze sufficient cement to fill the hole volume from total depth to the top of the junk. An additional 50 feet of cement is to then be placed on top of the cement retainer.

e. <u>Plugging Requirements for a Well with Uncemented Production and</u> <u>Surface Casing</u> - A wellbore cannot be properly sealed with cemented pipe inside uncemented casing or two strings of uncemented pipe in place. Therefore, an effort must be made to recover the production pipe below the shoe of the surface casing, including milling out the pipe. After the production pipe is removed, procedures to properly plug uncemented surface

casing and to protect the freshwater intervals will follow those given for runcemented surface casing in old oil wells except for the plug lengths. A 100 ft. surface casing shoe plug, 50 ft. in and 50 ft. out, and a 50 ft. surface plug will be required.

f. <u>Plugging Requirements for a Well with Cemented Production and</u> <u>Surface Casing</u> - Completing a well with both the surface and production casing cemented to the surface may cost an additional \$1,500 to \$3,000, but the well will be much easier and cheaper to properly abandon. After the producing zone and any hydrocarbon or significant brackish water zone above the producing zone have been plugged, and the wellbore filled with an approved fluid, a 100 foot plug placed inside the production string across the surface casing shoe is recommended as an additional freshwater protection measure.

g. <u>Surface Plugging Requirements</u> - It is recommended that the minimum length of the surface plug in gas wells be extended from 15 feet to 50 feet.

3. <u>Application to Other Wells Regulated by the Division of Mineral</u> <u>Resources</u>

The recommended plugging requirements apply not only to oil and gas wells but also to injection disposal wells, solution mining, geothermal, and stratigraphic test wells with modifications as appropriate.

### G. SUMMARY OF THE PROPOSED REGULATORY REQUIREMENTS

1. General Abandonment Requirements

Cement plugs shall be placed in wells across all oil, gas and fluid zones, across all casing stubs, below the base of the freshwater zone or across the surface casing shoe, and at the ground surface. Intervals between plugs shall be filled with a heavy mud or other approved fluid.

# 2. Hole Fluid

a) Intervals not occupied by cement shall be filled with an approved fluid as specified by Regional Minerals Manager. Gelled fluid minimum requirements are density equal to 8.65 ppg with a 10 minute gel-shear strength of 15.3 to 23.5 ibs/100 sq. feet.

b) Abandonment fluid requirement can be waived in the shallow Devonian oil fields by Regional Manager if the operator submits documentation which verifies that the interval between producing zone and surface casing shoe is void of even minor fluid or hydrocarbon zones.

3. 011 and Gas Zone Plugs

a. <u>Oil Wells</u> - Place either cement or sand/gravel through production zone or set in impermeable sealing bridge plug above the zone. An additional 50 feet of cement shall be set above with no tag required or place 25 feet of cement and tag.

b. <u>Gas Wells</u> - (1) Squeeze cement producing zone through cement retainer set above perforations or place cement from T.D. across producing zone. (2) Gap with an additional 50 feet of cement. (3) For a lost circulation zone or other special circumstances, a cast iron bridge plug/sealing packer shall be set above the producing zone and capped with 50 feet of cement. Tagging of these plugs may be required.

4. Injection Zone Plugs

a) A blind packer shall be set in the injection tubing at flood packer depth.

b) USEPA jurisdiction. (1) Sever injection tubing above original cement and remove. (2) Cement shall be placed in the wellbore 50 feet above point of tubing severence, including excess for tubing infill.

c) Non-USEPA jurisdiction option. (1) Place 25 feet of cement in tubing.
(2) Sever tubing and remove. (3) Place 25 feet of cement in wellbore above.

### 5. Other Oil and Gas Zones

All zones containing hydrocarbons or fluid must be sealed with cement.

a. <u>Zones in Open Hole</u> - Place cement plugs across each zone to 50 feet above and spot gel in all inter-plug intervals or place cement from T.D. to 50 feet above shallowest zone.

b. <u>Zones Behind Uncemented Casing</u> - Recover casing below the zone and place cement from 25 feet below the casing stub to 50 feet above the zone or perforate and squeeze the zone and place cement within the casing across the zone to 50 feet above.

### 6. Junk-in-the-Hole

When the producing zone is isolated below the junk, a cement retainer shall be set above the junk and sufficient cement shall be squeezed to seal the producing zone below. An additional 50 feet of cement shall then be placed atop the retainer.

## 7. Surface Casing Shoe Plugs

a. <u>Uncemented Casing</u> - (1) 0il Wells. Cement plug shall be 50 feet across the casing shoe or the former casing seat. This plug shall be set on top of a supporting bridge plug or impermeable sealing packer. (2) Gas Wells. A 100 foot cement plug across the shoe shall be placed.

b. <u>Cemented Casing</u> - (1) Oil Wells. A 50 foot cement plug shall be placed across casing shoe and shall be tagged if not set on a weight tested packer. (2) Gas Wells. A 100 foot cement plug shall be placed across casing shoe.

### 8. Casing Recovery

Unless the operator has documented the need or advisability for a variance, a conscientious attempt shall be made to recover uncemented casing. If uncemented casing cannot be recovered, it must be perforated or ripped and

have cement squeezed or placed into the annular space or filled to surface with cement.

a. <u>Surface Casing - Partial Recovery</u> - (1) The surface casing stub shall be sealed with 50 feet of cement, 25 feet in and 25 feet out or shall be capped with a sealing bridge plug/packer with 25 feet of cement on top. (2) Excess cement shall be used to account for annular fill-up and all water bearing or fluid loss zones above the stub shall be sealed with cement. All inter-plug intervals shall be filled with an approved fluid.

b. <u>Surface Casing - No Recovery</u> - Surface pipe shall be ripped or perforated and fluid shall be circulated through the annulus. (1) If circulation can be established, cement shall be squeezed into the surface casing annulus. (2) When squeezing cannot be accomplished due to annular restrictions casing condition or the wellhead configuration, either the entire wellbore from the shoe plug to the surface shall be filled with cement or cement shall be placed from the surface casing shoe plug to 25 feet above the ripped or perforated joints, and a tag of this plug shall be required.

c. <u>Production Casing with Cemented Surface Pipe</u> - Uncemented production casing shall be recovered no higher than 25 feet below the surface casing shoe or perforated below the surface casing shoe and sufficient cement squeezed to fill the annulus. If the casing is recovered, a 50 foot cement plug shall be placed across the stub, 25 feet in and 25 feet out. As with all stub plugs, excess cement shall be placed to account for annular fill-up.

d. <u>Production Casing with Uncemented Surface Casing</u> - Every effort shall be made to recover the production casing below the shoe of uncemented surface casing, including milling out the pipe. Gas wells with uncemented surface casing shall be plugged according to procedures outlined in 4(a)(b) with the exception that a 100 foot cement plug across the former surface casing shoe will be required.
#### 9. Surface Plugs

Minimum cement plug lengths shall be as follows:

a) Oil Wells - 15 feet.

b) Gas Wells - 50 feet.

#### H. SUMMARY OF ENVIRONMENTAL IMPACTS OF PLUGGING AND ABANDONMENT OPERATIONS

The plugging and abandonment of oil and gas wells is critical to environmental protection and no negative long term environmental impacts result when proper plugging and abandonment procedures are followed.

Deficiencies in the accepted well plugging practices of previous decades have caused serious localized oil, gas and/or brine pollution in some areas of New York State. Oil in underground sources of drinking water, with its carcinogenic components and long term residence in ground water, has the potential to cause negative impacts.

Vegetation and ground disturbances are the primary short term impacts associated with plugging and abandonment operations. These may occur when equipment is moved on site and the site is restored. Depending on the well location, short term minor surface and ground water turbidity and siltation are possible but not likely impacts. The long term impacts resulting from plugging activities are beneficial.

The plugging and abandonment requirements in the Department's existing regulatory program have improved the protection of ground and surface waters, but there are deficiencies in the existing regulations that could, in certain well plugging situations, allow environmental problems. Adoption of the recommended more stringent plugging requirements will eliminate these deficiencies while giving oil and gas operators plugging options tailored to wells of different type and construction. Figures 11.3 through 11.12 show the proposed plugging requirements with the options given for different wells and plugging situations.

### PLUGGED OIL WELL WITH AN OPEN HOLE COMPLETION AND TACKED SURFACE CASING: ALL CASING RECOVERED



#### PLUGGED OIL WELL WITH AN OPEN HOLE COMPLETION AND TACKED SURFACE CASING: PART OF THE SURFACE CASING LEFT IN THE HOLE



### PLUGGED OIL WELL WITH AN OPEN HOLE COMPLETION AND PARTIALLY OR TOTALLY UNCEMENTED SURFACE CASING: ALL SURFACE CASING LEFT IN THE HOLE



#### PLUGGED INJECTION WELL WITH AN OPEN HOLE COMPLETION AND TACKED SURFACE CASING: UNABLE TO RECOVER SURFACE CASING OR SQUEEZE



#### PLUGGED INJECTION WELL WITH AN OPEN HOLE COMPLETION AND TACKED SURFACE CASING : PART OF THE SURFACE CASING LEFT IN THE HOLE



#### PLUGGED GAS WELL WITH A LOST CIRCULATION ZONE AND PARTIALLY CEMENTED PRODUCTION CASING: COMBINATION STUB PLUG AND SURFACE CASING SHOE PLUG



FIGURE 11.8

### PLUGGED DUAL COMPLETION WELL WITH THE PRODUCTION CASING RECOVERED FAR BELOW THE SHOE OF THE SURFACE CASING: SURFACE CASING CEMENTED TO THE SURFACE



# PLUGGED GAS WELL WITH PARTIALLY CEMENTED PRODUCTION CASING: ALL CASING LEFT IN THE HOLE



PLUGGED GAS WELL WITH JUNK IN THE HOLE



## DRY HOLE GAS WELL WITH BRACKISH WATER AND UPPER NON-COMMERCIAL GAS ZONE



FIGURE 11.12 11-26j

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**Division of Mineral Resources** 

## **DRAFT** Generic Environmental Impact Statement

# On the Oil, Gas and Solution Mining Regulatory Program

JANUARY 1988

# VOLUME II

Chapters 12-21

Glossary

References

New York State/Department of Environmental Conservation MARIO M. CUOMO, Governor THOMAS C. JORLING, Commissioner

#### XII. <u>OLD OIL FIELD WATERFLOOD OPERATIONS AND</u> ENHANCED OIL RECOVERY POTENTIAL

#### A. INTRODUCTION

Substantial emphasis has been placed on secondary and enhanced oil recovery techniques in recent years. Research in enhanced oil recovery advanced because of higher exploration costs, increased demand for petroleum products, and decreased replacement of domestic reserves.

Usually, only 5 to 30 percent of a reservoir's original-oil-in-place (00IP) can be recovered by primary production. As much as 30 percent more of the OOIP may be recovered by supplementing primary energy with secondary recovery techniques. In selected reservoirs, an additional 30 percent of the OOIP may be recovered by application of tertiary or enhanced oil recovery processes.

Primary production accounted for approximately 7 percent recovery of the OOIP in New York State's old oil fields. Secondary recovery by waterflooding has resulted in an average recovery of an additional 14 percent of the OOIP. Waterflooding in the old oil fields has continued to the present. Twentyeight percent of 1986 oil production in New York is attributed to this technique.

During initial field development, the operator strives to recover as much oil and gas as possible during the primary stage of production by efficiently utilizing the reservoir's natural energy to drive oil through the rock pores and into the producing wells. This natural energy results from: 1) the downward expansion of gas overlying the oil (gas cap drive); 2) the expansion of gas in the oil (solution gas drive); 3) water intrusion into the oilbearing zone from an aquifer (water drive) and; 4) the force of gravity (gravity drive). In many reservoirs, all four drive mechanisms may be present, but only one or two recovery mechanisms will dominate. During the

life of a reservoir, shifts in recovery mechanisms may occur. For example, a volumetric reservoir under solution gas drive may shift to a gravitational drive after the natural pressure is depleted.

The purpose of this chapter is to examine the various methods of enhanced oil recovery and their impacts in New York State.

#### **B. DEFINITIONS**

The literature concerning oil recovery methods employed after primary production has different definitions for secondary and tertiary recovery operations. Some authors restrict "Enhanced Oil Recovery" to the tertiary mode while others consider it to include both secondary and tertiary recovery. Others view secondary operations involving water or gas injection in conjunction with any additives, chemicals or other gases, as tertiary techniques. For the purpose of this text, the terms secondary and tertiary will apply to the order in which an operation is conducted rather than any actual characteristics, and the term enhanced recovery will include all recovery methods other than those dependent on a reservoir's internal energy.

Specific rock and reservoir properties must be defined prior to discussing enhanced recovery methods. Ideally, these properties are determined from data gathered during the drilling and primary production phases. However, it should be noted that most oil wells in New York predate the use of sophisticated petroleum engineering data gathering and analysis techniques.

During or immediately after the drilling of a well, core samples may be obtained and well logging operations are conducted to analyze the pay zone. These initial tests provide the engineer with enough information to determine whether the well should be completed or plugged and abandoned. Specific information which is later used to evaluate the application of enhanced recovery methods is also gathered at this time. The following physical data are essential for such an evaluation:

1. Permeability - is the ability of the rock to allow fluid movement through its interconnected pores. For reservoir analysis, the following terms are derived from permeability:

- a. effective permeability is determined for a given fluid at a saturation less than 100 percent and is the fluid conductivity of the porous media at a given saturation where other fluids are present.
- b. absolute permeability is the permeability of a rock that transports a <u>single</u> fluid at 100 percent saturation. This term is most useful when determining rates of production or injection.
- c. relative permeability is the ratio of the effective permeability to the absolute permeability.

2. Porosity - is that fraction of the rock volume occupied by pore space.

3. Saturation - is the percentage of pore volume occupied by a specific fluid such as gas, oil or water.

4. Wettability - is the tendency of one fluid to spread on or adhere to the rock surface.

5. Fluid viscosity - is the ability of a fluid to resist flow. The less viscous a fluid, the greater its mobility. (Typical viscosity of the light oil produced in New York ranges from 2 to 6 centipoise with corresponding gravities of 37° to 43° API.)

6. Original-oil-in-place - is the portion of the total pore volume occupied by oil at initial conditions and is determined volumetrically from analysis of cores and logs.

7. Recovery factor - is the percentage of original oil in place which can be recovered by the application of a specific recovery mechanism.

Although other significant parameters are involved, the above information

is the basic data necessary for an evaluation of the potential for enhanced recovery.

During the primary production phase, other reservoir characteristics are evaluated which include the following:

- Homogeneity of reservoir is the degree of consistency in a reservoir. The homogeneity can be approximated by analyzing well interference tests, production and pressure histories, core data and logs, and other petrographic and stratigraphic information.
- Dip is the average angle of inclination from horizontal of the strata in a reservoir.
- 3. Diffusivity is the determination of the rate at which a fluid will readjust in response to a pressure disturbance in the reservoir.

Although these factors are important, dip and diffusivity are not commonly considered in New York due to the relative maturity and horizontal nature of the State's oil reservoirs.

The best method for determining the feasibility of a full scale enhanced recovery operation is the pilot project. Especially useful in undeveloped areas, a pilot project is a mini-operation designed to assess the performance of the enhanced recovery technique before large quantities of capital are committed to a full scale project. The location of the wells is chosen to best represent the majority of the reservoir. The operating condition of the pilot wells must be closely monitored for an accurate evaluation of the project.

The information derived from a pilot is used to better evaluate the following:

- 1. Incremental oil recovery
- 2. Optimum pattern configuration
- 3. Saturation distributions

- Areal sweep efficiency the ratio of the volume swept at any time to the total volume subject to intrusion.
- 5. Mobility the ratio of the permeability to viscosity with a single fluid in reservoir. When one fluid is displaced by another, the mobility ratio is defined as mobility of the <u>displacing</u> fluid to that of the <u>displaced fluid</u>.

#### C. WATERFLOODING

#### 1. General

When the economic limit of a field under the primary stage of production is reached, a determination must be made as to the future production potential of the field. The application of one or more enhanced recovery techniques may be warranted based on reservoir characteristics and past production performance. Although waterflooding is the most commonly applied secondary recovery method, other enhanced recovery techniques utilizing miscible fluids, chemicals, or heat may be applied based on the characteristics of the reservoir rock and fluids. A production potential of 1,000 - 2,000 barrels per acre-foot is a generally accepted minimum yield for initiation of a waterflood. Oil price, water availability, construction costs, drilling and/or workover costs, etc., will also affect the ultimate feasibility of the project.

The amount of oil displaceable by water can be determined from relative permeability data and core testing. Typical sandstones can be flooded to a residual oil saturation of 10 - 40 percent. Carbonate reservoirs, which may have extremely complicated pore geometries, can have much lower displacement efficiencies. In sandstones, the residual oil saturation to waterflooding is also governed by the interfacial tension at the oil/water phase boundary.

Absolute permeability and homogeneity in the pay zone and the mobility

ratio of the oil and water are critical to sweep efficiency. However, injection well locations and completion methods are also important.

After deciding to initiate a waterflood operation, the operator will choose a well pattern. The majority of waterflood operations in the U.S. utilize the "five-spot" waterflood configuration. Figure 12.1 indicates this and other flooding patterns.

The five-spot pattern offers quick response and good sweep efficiency, and it conforms well to existing spacing patterns. Variations may be advantageous to specific recovery operations. Generally, peripheral and line drive injections offer better recovery efficiencies in formations with extreme structural relief. Also, peripheral or line drives may use less water than pattern floods.

Once the optimal pattern has been determined, the operator must consider injection well completions, the quality, quantity and availability of water, water treatment, injection equipment, storage facilities, operating pressures, and the mechanical condition and maintenance of the injection and production wells.

Injection wells can be drilled or converted from existing production wells. Converted wells should undergo a thorough testing program to ensure integrity.

Water disposition is a crucial consideration in any waterflood project. After securing its availability, the operator must design the treatment and water handling facilities.

Water retrieved from freshwater sources can contain large amounts of oxygen, suspended solids and bacteria which require treating. Injection water should be protected from the atmosphere and injected immediately after filtration. Anaerobic sulphate-based bacteria that must be eliminated are often found in produced waters. Knowledge of the injection and formation



Source: <u>Reservoir Engineering Aspects of Waterflooding</u>, Society of Petroleum Engineers Monograph, 1971.

water is essential to avoid such precipitates as iron oxide, iron sulfide, calcium carbonate, calcium sulphate, and barium sulphate. Sulphate precipitates are insoluble and are the most damaging but these precipitates can be prevented through the use of polyphosphates, phospate esters and phosphanates.

Operators must also treat the injected fluids to avoid reservoir plugging, shale swelling, and corrosion of surface and down-hole equipment.

There are two types of injection systems; open and closed. In the open system, water is obtained from surface waters or fresh water wells. In the closed system, produced water is recycled and re-injected. The water may be treated chemically and by aeration and sedimentation processes before injection although some operators attempt to keep all dissolved constituents in solution. Fluids used in the open system require more treatment than the closed system.

Operation of an injection system requires a comprehensive operating and maintenance program. Regular inspections of the wells and the surface production facilities must be conducted. Water quality and corrosion control are particularly important.

Inspections of injection wells should include, but are not limited to: 1. temperature, flowmeter and radioactive tracer surveys when casing, packer and/or tubing leaks are suspected. 2. annular pressure checks, 3. wellhead pressure surveys to monitor injection pressure and formation plugging, and 4. caliper logging to ensure tubing integrity.

Following is a discussion of waterflooding operations in New York State including an overview of the Department's existing regulatory program.

#### 2. Waterflooding In New York

Water injection was legalized in New York in 1919, after the primary

energy in most of the existing fields was depleted and prior to the formulation of engineering concepts and studies relative to water injection. This does not mean that current waterflood operations do not adhere to sound engineering principles; in fact, these fields prompted the early detailed engineering studies on waterflooding.

The oil bearing sands currently being waterflooded in Allegany, Steuben and Cattaraugus counties meet the criteria for good waterflood candidates. A typical core in an Allegany County field might show a reservoir with good upper and lower permeability barriers and no water encroachment. The pay zone is approximately 16 to 22 feet thick with 11 to 15 percent porosity. Oil gravity is 41° to 44° API, and oil saturation is approximately 65 to 75 percent. Studies have shown that fields with these characteristics are good waterflooding prospects. There are many oil sands in New York which do not have adequate porosity and permeability for a successful waterflood.

The oil fields in western New York reached peak primary production in 1882 and all time low production in 1912. A sharp decline in primary production and low primary recovery are typical of solution gas drive reservoirs when natural gas is produced in an uncontrolled manner with the oil thereby dissipating the natural reservoir energy. This had occurred by 1912 when each well averaged only 1/8 to 1/10 barrel of oil per day and it was estimated only 7 percent of the original oil in place had been recovered (NYS Geological Association, 1957). Figure 12.2 shows those oil fields which are being waterflooded.

Waterflooding was discovered accidentally prior to 1907 when the leaking of freshwater through faulty casing into the oil sand of a pressure depleted reservoir resulted in a production increase in offset wells. When the cause of the production increase was recognized, a practice of purposely making "leaks" in the casings of other wells began (NYS Geological Association, 1957). The first documentation of the perforation of casing for water



12-8a

injection dates back to 1911. A random conversion of oil wells into water input wells followed. Water injection proved successful in increasing production where pressure maintenance by gas injection had failed in New York.

There are approximately 25 active waterflood operations in New York. These are concentrated in Allegany, Cattaraugus and Steuben counties. Approximately 316,000 barrels of oil were produced in 1985 from secondary recovery operations in New York State. The number of waterflooded production wells is estimated to be 2,050; the number of injection wells reported was 1,745. The five-spot is the most common pattern found in New York's waterflooded oil fields. It is estimated that the correct number of producers and injectors in waterflooded fields is 20 percent higher than the number reported. To date, incremental waterflood production has been estimated at 14 percent of original oil in place (Van Tyne, and Foster, 1980). An estimated 8,059,000 barrels of oil could be recovered from the currently developed enhanced recovery operations in New York's old oil fields.

a. <u>Historical Waterflood Operations</u> - Prior to development of the Medina Formation, practically all drilling operations in New York State were conducted in the oil fields of Cattaraugus, Allegany and Steuben counties. Considerable advancements in methodology have occurred since the inception of drilling for hydrocarbons in New York. A historical perspective is offered due to its impact on present day technologies, environmental problems and the State's regulatory program.

Input and production wells were basically drilled in the same manner, from the 1920's through the 1950's. The accepted practice was to drive a 10 inch hole through the unconsolidated surface deposits and set 8 inch pipe. A 7 5/8 inch hole was then drilled through the freshwater horizons down to 300 or 500 feet. Six and five-eights or seven inch casing was set but not often cemented to surface. A 6 1/4 to 6 inch hole was then drilled through the

producing formation to a total depth of approximately 600 to 2,000 feet. Drill cuttings of the pay zone were saved and compared to electric logs (if any) to determine the "shoot" zone (NYS Geological Association, 1957).

An early form of fracturing or stimulating a well, "the shot" was intended to break-up or fracture the producing formation to increase the rate of production or injection. Wells were shot with liquid nitro-glycerin which was lowered into the hole in thin metal containers to a point opposite the producing formation. An average shot would use 3 quarts of nitroglycerin per foot of producing formation and was detonated by a "squib" or "go-devil" containing two fused sticks of dynamite (NYS Geological Association, 1957). Before detonation, the well was filled with water to prevent the blast from expending itself up the hole.

Stimulation methods have improved in effectiveness and safety over the years so that nitroglycerin is rarely used for fracturing in the oil and gas fields today. However, nitroglycerin may be a more effective stimulation technique in certain shallow reservoirs with very close spacing. The transition from nitroglycerin to other stimulation techniques evolved from the negative impacts related to nitroglycerin stimulation such as increased potential for wellbore and formation damage.

While some long-time oil producers still endorse nitroglycerin stimulation, such techniques have drastically declined over the past 10 - 15 years. Evidence of this decline is best demonstrated by the fact that only one company now services New York's oil producing area and by the completion reports submitted to the Department from operator's engaged in step-out, infill, and perimeter drilling in waterflood areas.

Completion of a water injection well usually consisted of running 2 inch tubing on a packer to just above the producing formation where it was cemented

with approximately 20 sacks of cement (NYS Geological Association, 1957). The tubing was then connected to a water injection plant and each well or injector station was equipped with a meter to monitor the amount of injected water.

Production wells were basically completed in the same manner except that the tubing was not usually run on a packer or cemented. If the producer was to be pumped, a pump barrel was run on the tubing and a pump plunger inserted with sucker rods. The rods were activitated by either a single well jack or by jacks connected to a central power unit (NYS Geological Association, 1957).

Water for the flooding came mainly from both shallow and deep freshwater wells. Some produced brine was also recycled for injection.

Air lift jet pumps were used on the water wells in the early days of waterflooding but these were soon replaced by turbines, submersible pumps and sucker rod pumping jacks. The air lift pumps injected large amounts of dissolved oxygen into the water while the other pumps do not inject oxygen into the system, thereby reducing pitting and corrosion.

Filtered and treated water was stored in water tanks before gravitating to triplex positive displacement pumps. The pumps provided the pressure necessary for injection, usually 0.5 to 1.3 pounds per square inch per foot of depth or 800 - 1,300 psig surface pressure. The average rate of injection was 1/2 barrel of water per day per foot of sand (NYS Geological Association, 1957).

Annular gas was flared-off or utilized to run engines and furnish heat on the lease. The oil and water were piped through 2 inch lines to a gravity separator where the oil was siphoned into wooden stock tanks for sale. The water was sent to settling ponds before being discharged into surface streams. Gas from the separator was returned to the lease gas line system or flared. Standard stock tanks were 10 feet high by 10 feet in diameter and held 140 barrels (NYS Geological Association, 1957).

At the start of a waterflood, mostly oil and gas are produced. Oil production peaks when the oil bank which is pushed ahead of the injected water reaches the producing well (see Figure 12.3). Water breakthrough occurs soon after and increases until it is no longer profitable to produce the well. The well is then plugged and abandoned. Many of the wells in the old fields were not plugged properly by modern standards. It was common for the operator to recover salvageable equipment and leave wells unplugged due to changes in the 1919 plugging and abandonment statutes which allowed a well to remain unplugged if it had potential use as a water injector.

Some of the historical drilling and completion methods described in this section are still common practices in the oil fields today. DEC is aware of the problems associated with these practices and their potential impact on the environment. Considerable effort by the Department is being concentrated in this area to formulate environmentally sound and economically feasible strategy.

b. <u>Current Waterflood Operations</u> - Current practices for drilling waterflood production and injection wells closely resemble those used to drill wells in past years in the old oil fields except that surface casing is now required to be cemented at least 75 feet below the lowest fresh water zone.

Waterflood well drilling activity peaked in the years immediately following the legalization of waterflooding in 1919. This increased activity continued through World War II but then began to decline and fluctuate through the mid 1960's in response to market conditions. During the oil crisis of the 1970's, increases in waterflood drilling activity were observed with peaks occurring in 1974, 1977 and 1978.

<u>Drilling</u> - Presently, most of the drilling activity in waterflood areas is peripheral expansion of existing operations. Waterflood operators direct much of their activities to production, plugging and abandonments, step-out drilling of production wells and conversions of production wells to injectors.



FIGURE 12.3 12-12a Both air rotary and cable tool rigs are used in waterflood drilling operations. The decision is based on operating costs, time constraints, or operator preference. Since the formations in New York's waterflood areas are usually 600 to 2,000 feet deep and are practically depleted, with low pressures, either method can adequately meet drilling needs.

<u>Casing and Cementing</u> - As mentioned previously, wells drilled in the old oil fields were cased and cemented utilizing the available technology at that time. However, many of today's problems are the result of that technology. Conductor pipe was generally driven in for hole stabilization, and surface pipe would then be set below any high rate water zones. This pipe was rarely cemented. If cement was used, minimal amounts would be grouted from the top and/or displaced from the bottom of the hole. Using minimal cement was a common practice for cable tool operations, since cable tool drilling does not create torque on the surface pipe. As rotary rigs became more popular, greater amounts of cement were required to prevent erosion of the formation at the casing seat and disassembly of the casing from the torque of the rotary action. Still, the casing was rarely cemented to the surface.

The Federal UIC Program, enacted in the Safe Water Drinking Act of 1974, required that operators cement the surface pipe of all injection wells from the casing seat to the surface. Many operators responded by cementing the surface strings of their injection and production wells (realizing that the producing well may be converted to an injector in the future). As DMN met initial staffing requirements in 1982, the cement requirements for gas well development, of 450 feet of casing or 100 feet into bedrock, whichever is greater, were applied to the old oil fields with slight modifications of casing depth. Less surface casing was approved on an individual basis.

By 1983, oil field operators were required to cement their water strings

to the surface, unless good cause could be demonstrated to waive the requirement.

Today, operators run anywhere from 300 to 500 feet of 7-inch surface pipe depending on the depth of the deepest freshwater zone. In most areas of the State, bedrock and potable water zones are very near the surface, hence adequate protection is realized. Another problem associated with cementing in the oil fields of southwestern New York is a sporadic "thief" or lost circulation zone. Where present, this zone is highly fractured and permeable, and cement is lost. In some areas the lost circulation zone appears as a small cavern caused by drilling disturbance. The following methods are used to cement "thief zones":

- a. Set surface casing above the "thief zone" and isolate the remaining wellbore with cement or a packer so that annular fluids will not be lost.
- b. Set surface casing through the "thief zone" and add appropriate lost circulation material to the cement in order to plug off the zone.
- c. If the zone is close to the surface, DMN may approve, on an individual basis, the circulation of cement to this zone instead of to the surface. The operator must demonstrate that there is no chance of migration into freshwater zones.

Procedures a and c require DMN approval as does any alternate plan of action.

The most commonly used method in industry today for cementing the surface casing is the pump and circulate technique. However, approximately 70 percent of the surface casing cement jobs in New York's waterflood fields utilized other methods such as the displacement or grouting technique.

The displacement method requires the appropriate amount of cement to be placed in the hole prior to setting the surface pipe. After the cement is placed in the hole, surface casing is run into the hole with a plug on the

end. As the casing moves through the cement, cement is displaced around the pipe. Water is continually added to the casing to prevent it from floating.

Grouting is accomplished by pumping cement from the surface through smaller diameter tubing placed down the annular space. However, blockage or bridging can occur up hole which would require remedial cement operations.

Pumping and circulating as specified in Chapter 9 is the most common and effective method for cementing operations. Here surface casing is installed, and the cement is pumped down the pipe followed by a plug and water which displaces cement up around the surface pipe. The plug and water prevent backflow and floating of the casing.

The production and injection string is usually 1 1/2 to 2 3/8 inch tubing which is run from the surface to total depth. This tubing is either set on a packer, and/or cemented above the producing zone in the injection wells.

<u>Stimulation</u> - As mentioned previously, hydraulic fracturing (hydrofracturing) is more commonplace than nitroglycerin stimulation. Hydrofracturing applies energy at a slower and more controlled rate to the formation, minimizing formation damage.

Generally, one or more zones need to be stimulated and a multi-stage stimulation is performed. Sometimes these zones must be notched to accept stimulation fluids. Notching is accomplished by running 1 1/2 inch pipe which contains a special end nozzle. This pipe is suspended in the hole with the nozzle opposite the deepest production zone. Sand and air are then pumped down the hole and ejected out the nozzle which is oriented 90° from the bottom of the pipe so that the air and sand are directed toward the sand face. As the sand is forced out the nozzle, the pipe is rotated to create a 360° notch into the production zone. After the first notch is completed, the pipe is moved to the next higher zone and the process begins again, until all the

notches have been formed.

After notching, the zones are hydraulically fractured, usually, in one of two ways. The less commonly used method employs a "straddle packer". This packer has two rubbers and is run-in on 3 inch tubing so that the rubbers straddle the lowest notch. The packer is then set and pressurized water and sand with small amounts of additivies, surfactant, acid and/or foam are forced through perforations in the pipe between the rubbers and into the formation. Fracture pressures range from 1,500 to 3,500 psi with pressures occasionally exceeding 4,000 psi. After the fracturing is complete, the straddle packer is moved uphole to the next higher notch and the process is repeated.

The more common method involves an injection of fracture fluids down a 3 inch pipe set on a single rubber packer. The hole is filled with pea gravel to just below the upper most notch and the packer is set just above the notch and the zone is then treated by the same fracturing procedures. After the fracture is complete, the pea gravel is cleaned out to the next lower notch and the process is repeated.

<u>Completion</u> - After the well is stimulated, most injection and production wells are completed open-hole with the tubing end just above the waterflooded horizon.

Injection tubing is hung from the surface and set on packers and cement or sometimes by cement alone. Frequently, operators will cement from the bottom of the string to approximately 100 feet above. When leaks occur in the casing or tubing, the operator runs a 1-inch macaroni string with a pack-off element which serves as the injection string and the tubing becomes a form of casing.

Production wells are completed in a similar manner as injection wells except that 2 3/8 inch tubing is hung from the surface by a tubing head and remains suspended in the borehole. If the well is to be pumped, a pump barrel

is run on the tubing and a pump plunger is inserted with sucker rods. The tubing to borehole annulus remains open from total depth to surface where it connects to a gas line. As long as the surface casing is cemented from below the freshwater zones to the surface and the formations above the producing horizon are impermeable, this completion method is environmentally acceptable.

A few operators set the production tubing with cement, but this method can result in gas interference and gas locking of the pump. Other operators do not run surface casing but do run 4 or 6 inch production casing and cement this string to the surface.

<u>Production</u> - The majority of producing wells are pumped by a single well jack (a type of pumping unit) or by jacks connected to a central power unit. Produced fluids are piped through 2 inch lines to a gravity separator where oil is piped into stock tanks for sale. Figure 12.3 indicates a typical arrangement for a waterflood production project.

When produced gas is available in sufficient quantities, it is piped to specific areas on the lease to run engines and to heat tanks or it may be given to landowners for domestic use. Gas is also collected from the tubing borehole annulus and entered into the lease gas line system. When the gas cannot be efficiently utilized by one of these methods, the gas is vented.

<u>Brine Disposal</u> - Produced brines commonly contain chemical constituents indigenous to the produced hydrocarbons and the formation. They usually have high concentrations of chlorides and trace concentrations of heavy metals. Aromatics such as benzene, toluene, xylene and related compounds can also occur at detectable levels in the brine. However, the produced brines associated with the waterflooded fields in New York are very dilute after 70 years of waterflooding with freshwater.

Produced water from the separators is either discharged into surface

waters or stored in tanks or earthen pits prior to disposal into surface streams or removal for road spreading. Less commonly, the brine is trucked to a waste treatment plant for disposal. Holding pits or settling ponds are more widely used than holding tanks. The Department requires earthen pits to be lined with an impermeable material to contain the brine and prevent infiltration into groundwater. Effective March 1, 1985, a moratorium was placed on future unlined separator ponds. Such ponds must be replaced by storage tanks or lined with an impermeable material as verified by percolation tests.

A State Pollution Discharge Elimination System permit must be received from the Department's Division of Water, prior to any discharge or disposal of waste fluids into surface waters (See Chapter 15 for additional information).

<u>Conversion</u> - When a producing well is converted into an injection well, the well is said to be "worked-over". A workover rig is usually nothing more than a scaled down, easily-transportable mast and hoist. Many workover rigs in New York consist of a large truck with welded mast for pulling tubing. During workover of the well, the pump, sucker rods and tubing, if necessary, are pulled and the well is cleaned out to total depth.

Most waterflood projects are initiated in old oil fields where many wells were drilled prior to promulgation of environmental regulations. It is required that DEC and the United States Environmental Protection Agency (EPA) be notified when a production well is converted into an injection well. Severe environmental problems, particularly contamination of potable water, have occurred in the past when operators have proceeded with conversion of old wells without the necessary evaluation of conversion procedures and potential environmental impacts which are made during the permitting process. DEC staff review the proposed casing program and determine if any unplugged abandoned wells are in close proximity to the proposed injection well.

c. <u>Injection Operations</u> - A general "rule of thumb" for waterflooded fields in western New York is that 10 to 15 barrels of injection water are needed to recover one barrel of oil. Sale of pressurized water between facilities is a common practice among New York operators.

<u>Injection Water</u> - Freshwater from drilled water wells or recycled brine from the lease separator can be used for injection water. Water supply wells for the floods are completed in either shallow gravel deposits, 20 to 50 feet deep, or in bedrock, 100 to 300 feet deep. The water from the gravel zone is chemically less stable and more corrosive than the water from the deeper source wells, which contains no dissolved oxygen. The shallow water source wells, however, produce 50 to 150 gallons of water per minute while the deep water source wells produce 30 to 85 gallons per minute (NYS Geological Association, 1957).

Produced water or brine is sometimes recycled and reinjected into the formation although this is not a common practice in New York's oil fields. The local brine requires extensive chemical treatment and filtration prior to injection and contains more impurities than freshwater.

<u>Chemical Treatment and Filtration</u> - Prior to injection, the water is analyzed for dissolved oxygen, free carbon dioxide and pH range. Tests are also conducted to determine the presence and amount of sulfates, iron, manganese, alkalines, chlorides, silica, calcium, magnesium and total solids. The size of the settling tanks and the chemical treatment necessary are determined from these analyses.

Chemicals such as coagulates, caustic materials and chlorine may be added to remove heavy minerals, raise the pH from 6.5 to 8.4 and prevent bacterial growth which can plug the formation and cause the failure of a waterflood. After chemical treatment the water is sometimes filtered through sand, or sand

and gravel filters. If high quality water is required, diatomaceous earth filters are used. Anthracite coal filters were used extensively in the past to remove heavy metals, foreign particles and bacteria, and are still used in some fields today. Sometimes, the water is also chemically treated after filtration with corrosion inhibitors, sequestering agents and additional bactericides.

Injection Pressure and Rate - After chemical treatment and filtration, the water is either stored in tanks prior to injection or injected directly from the filters. Pumps provide the pressure necessary for injection. Injection pressures for the low permeability oil sands in New York are high. If injection pressures exceed the fracture pressure of the formation, which varies from .92 to 2.4 psi per foot of depth or 1,500 - 4,000 psi at the formation face for New York oil sands, the injection fluid could be lost to other formations and possibly break through into overlying freshwater aquifers through propagated or existing fractures.

A step-rate test which is relatively simple, inexpensive and fast, can be used to estimate formation fracture pressure. The results of a typical step rate test for a New York injection well are shown in Figure 12.4. These tests define the maximum injection pressure that can be approached without fracturing the reservoir rock and must be considered as an integral part of any waterflooding operation.

<u>Monitoring of Injection Wells</u> - Monitoring of injection wells to determine the rate and pressure of injected water and to detect leaks and possible migration is important. Rate and pressure recorders or meters are normally installed on each injection pump and flowmeters or pressure recording hook-ups are installed on input wells. However, not every injection well in the waterflooded fields is equipped with a flowmeter or pressure gauge. Current regulations require each operator of a waterflood project keep records


and submit an annual statement showing the volumes of fluid injected and produced and the injection pressures.

#### 3. Plugging and Abandonment

Past plugging practices, although undertaken with good intention, were primitive by today's standards and may ultimately cause significant environmental problems. The earliest abandonment method consisted of pulling casing and depositing debris rock, wooden plugs, or waste metal, etc., in the hole. Later, as waterflooding became more widespread and injection pressures increased, such holes required a better sealant for successful operations. Setting plugs of seasoned timber on top of bridges made of debris was an accepted method of plugging until the late 1960's. By the 1970's, the timber plugs used for abandonments were set at specified depths and topped with cement to seal off producing formations and protect groundwater.

Early records are scarce. DMN is trying to gather information on the location and plugging procedure of abandoned wells in order to prevent further contamination and to pinpoint specific problems. Many thousands of improperly plugged and abandoned wells may exist in western New York. These wells are likely a primary contributing factor to some of the current environmental problems.

Waterflood injection and production wells are plugged in the same manner as other oil and gas wells in New York. Operators must receive a permit from DMN prior to commencing any plugging and abandonment operations. Existing requirements are that 15 foot cement plugs be set: 1. above injected formations, 2. above any producing formation, 3. below the surface casing shoe and, 4. at the surface. In addition, the intervals between the plugs must be filled with mud or another approved fluid to stabilize the hole and prevent

fluid migration.

Some of the following enhanced recovery methods have been used on a limited basis in New York State. Other methods are untested in New York but may have future application. A brief description of the application in New York will be discussed immediately after each section.

#### D. GAS INJECTION AND IMMISCIBLE DISPLACEMENT

1. General

Gas is sometimes injected into an oil zone or its gas cap to improve recovery. This gas may consist of flue gas, lease gas, or inert gas. The injected gas can serve as a displacement fluid or as a mechanism to restore and maintain pressure in the reservoir.

Gas injected into a gas cap helps maintain reservoir pressure and enhance gravitational forces which displace oil downward to producing wells (Latil, 1980). This is referred to as a pressure maintenance operation. Gas injected directly into the oil zone is called dispersed gas injection or immiscible displacement (Interstate Oil Compact Commission, 1983). In theory, the gas flows radially from the injectors, displacing oil toward the producers. The decision to inject gas is often based on the availability of sufficient supplies of inexpensive gas. Recycled produced gas is sometimes used, but reservoir pressure will continue to decline and a supplemental supply of gas must eventually be secured.

Gas requires very little, if any, treating and it can be injected at high rates into a minimum number of injection wells. It is a poor displacing fluid, however, because of its low viscosity.

Gas injection for pressure maintenance is most efficient in crestal wells of reservoirs with a steep anticlinal structure. If the reservoir has enough vertical relief, such that gravity segregation of the reservoir fluids can occur, then incremental oil recovery by gas injection can equal that of a

water drive operation.

Historically, dispersed gas injection or immiscible displacement projects rarely recover more than 5 percent of the OOIP. Variations in vertical permeability and the high mobility ratio between oil and gas usually results in gas channeling or over-ride of the oil and thus reducing incremental oil recovery.

New York's oil fields are classic examples of poor candidates for gas injection because they are horizontal structures with no gas cap.

# 2. New York's Gas Injection Operations

Gas injection was the first method of enhanced recovery tried in New York. The gas was injected while a producer was placed on a vacuum which increased the pressure differential between the injection and production well. Only a slight oil production increase was realized utilizing this method.

The following three sections deal with what many feel are true enhanced or tertiary recovery methods - chemical, thermal, and miscible. These enhanced oil recovery processes offer a great potential for further oil production from selected reservoirs meeting the appropriate screening criteria.

#### E. CHEMICAL RECOVERY METHODS

Chemically enhanced recovery methods involve the addition of chemicals to injection water which alters fluid properties and/or interfacial tension conditions such that more oil is produced. Chemical methods involve the use of polymers, surfactants and alkaline solutions.

1. Polymer Flooding

The principal types of polymers used are polyacrylamides, polysaccharides and ethylene polyoxide (xanthan biopolymers) (Latil, 1980). Polyacrylamides and biopolymers are used more commonly. Dilute polymer solutions remain highly viscous and are used to increase the viscosity of the displacing fluids.

This in turn lowers the mobility ratio between the oil and injected solution, thus improving sweep efficiency and increasing incremental oil recovery (Interstate Oil Compact Commission, 1983).

Table 12.1 lists the screening criteria for EOR candidates utilizing existing technology. Theoretically, polymer flooding can be applied to a wide range of reservoir conditions. The limit on formation brine salinity is imposed because polyacrylamide solutions degrade when exposed to salts. Biopolymers are less sensitive to salts but require meticulous filtering and protection from bacteria.

# 2. Surfactant Flooding

Surfactant flooding involves the injection of multiple slugs containing chemicals which lower the oil/water interfacial tension. The mobilized oil is then carried out of the reservoir as an emulsion. In 1932, experiments with soap solution injections were conducted in sands located in Pennsylvania which also extend into New York. These original tests initiated the research on surfactant flooding.

A surfactant flood begins with injection of a saline water pre-flush which conditions and displaces the formation water to protect the surfactant solution. Surfactant injection is followed by a polymer slug for mobility control during displacement.

Generally, surfactants are petroleum sulphonates derived from crude oil which have high interfacial activity and are readily available (Latil, 1980).

The criteria used for screening potential surfactant flood candidates are detailed in Table 12.1. The more successful surfactant floods have been conducted in low-salinity, low-temperature, sandstone reservoirs having moderate-to-high permeabilities.

# TABLE 12.1 SCREENING CRITERIA FOR EOR CANDIDATES

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		OII Properties			Reservoir Characteristics					
	Grevity •API	Viscosity (cp)	Composition	Oil Saturation	Formation Type	Net Thickness (ft)	Average Permeability (md)	Depth (11)	Temperature (°F)	
Gas Injection Mothods	8									
Hydrocarbon	>35	<10	High % of C <sub>2</sub> — C <sub>2</sub>	>30% PV	Sandstone or Carbonate	Thin unless dipping	N.C.	>2000 (LPG) to >5000 (H.P. Gas)	N.C.	
Nitrogen & Flue Gas	>24 >35 for Na	<10	High % of C, — C,	>30% PV	Sandstone or Carbonate	Thin unless dipping	N.C.	>4500	N.C.	
Carbon Dioxide	>26	<15	High % of C <sub>3</sub> — C <sub>12</sub>	>30% PV	Sandstone or Carbonate	Thin unless dipping	N.C.	>2000	N.C.	
Chemical Flooding	•									
Surfactant/ Polymer	>25	<30	Light inter- mediates desired	>30% PV	Sandstone preferred	>10	>20	<8000	<175	
Polymer	>25	<150	N.C.	>10% PV Mobile oil	Sandstone preferred; Carbonate possible	N.C.	>10 (normally)	<9000	<200	
Alkaline	13-35	<b>&lt;200</b>	Some Organic Acids	Above Waterflood Residual	Sandstone preferred	N.C.	>20	<9000	<200	
Thermal					•					
Combustion	<40 (10-25 normally)	<1000	Some Asphaltic Components	≫40-50% PV	Sand or Sandstone with high porosity	>10	>100*	>500	>150 preferred	
Steamflooding	<25	>20	N.C.	>40-50% PV	Sand or Sandstone with high	>20	>200*	300-5000	N.C.	
N.C. Not Critical "Transmissibility -20 md ft/cp "Transmissibility -100 md ft/c	5 50				porosity					

Source: "Technical and Economic Criteria for Selecting Methods and Materials for Enhanced Oil Recovery (or Why CO2 Fills the Bill in the Permian Basin of New Mexico and Texas)", <u>Interstate Oil Compact Commission Committee Bulletin</u>, vol. 26, no. 2, December 1984.

TABLE 12.1 12-24a

## 3. Alkaline Flooding

Alkaline or caustic flooding is similar to surfactant flooding except that the oil/water interfacial tension is reduced by the neutralization of the acids in the crude oil. Chemicals commonly used for this process are sodium carbonate, sodium silicate, and sodium hydroxide (National Petroleum Council, 1984). Although caustic flooding appears simple and inexpensive to apply, the mechanics involved are complicated.

The reservoir conditions suitable for alkaline flooding are shown in Table 12.1

Alkaline flooding and displacement processes are not completely understood but successful application of this process is restricted to formations with higher permeabilities than those found in New York. Present studies are directed toward understanding the mechanics of the system and improving the process by adding polymers and/or co-surfactants.

#### 4. New York's Chemical Drive Projects

Chemical processes have not been attempted on a large scale in New York. In 1972-73, a micellar-polymer project was conducted in Allegany County. The chemical solutions used were provided by Marathon Oil Company which patented the name Maraflood when using these fluids for enhanced recovery. Although no additional oil was recovered, this test did provide valuable injectivity information.

In 1971, a micellar-polymer injection test of the Chipmunk Formation was performed in Cattaraugus County. The micellar slug was injected successfully but injection of the polymer into the low permeability New York oil sands proved difficult. The results of this test were inconclusive.

### F. MISCIBLE DISPLACEMENT METHODS

Miscible flood processes utilize a solvent as the displacing fluid to reduce the oil/water interfacial tension. The solvent can be alcohol,

ketones, carbon dioxide, petroleum gas, refined hydrocarbons, liquified natural gas or inert gas (Interstate Oil Compact Commission, 1974). The most common miscible drive techniques use high pressure gas or miscible hydrocarbons.

# 1. High Pressure Gas Injection

High pressure gas injection involves the use of hydrocarbons or inert gases (Latil, 1980). Carbon dioxide (CO<sub>2</sub>) and nitrogen (N<sub>2</sub>) are the most widely used inert gases for high pressure miscible drive.

 $CO_2$  is applicable to reservoirs with a wide range of characteristics as shown in Table 12.1.

Even at operating pressures less than that needed for miscibility, CO<sub>2</sub> injection can provide an effective recovery mechanism. Oil viscosity is reduced and displacement is achieved by a process similar to solution gas drive.

The main disadvantage of using  $CO_2$  is its low viscosity, which promotes "fingering" and early gas break-through in the production wells. Slugs of water are normally injected to reduce "fingering". Also, highly corrosive carbonic acid is formed when  $CO_2$  mixes with water. Corrosion protection is necessary and can be cost prohibitive.

Despite discovery of large volumes of natural  $CO_2$  in close proximity to major displacement projects, the recent decreases in the price of crude oil may affect the status of  $CO_2$  flooding. Under specific reservoir conditions,  $N_2$  flooding would be the next best cost effective miscible drive mechanism.

Nitrogen can be used to miscibly displace high gravity reservoir oil provided that the system pressure is usually more than 5,000 psia. The process is best applied to steeply dipping reservoirs containing high gravity oil where a gravity stabilized process can be used.

The drawbacks of miscible nitrogen injection are similar to those of CO<sub>2</sub> flooding. Specifically, nitrogen reacts with formation water which results in the formation of highly corrosive nitric acid. These disadvantages must be evaluated carefully against anticipated increased production.

# 2. Miscible Hydrocarbon Displacement

Displacement with miscible hydrocarbons is achieved by utilizing hydrocarbon based gases in one of three processes. These are known as the miscible slug, enriched gas, and high pressure lean gas processes (Van Poolen and Associates, 1980).

During the miscible slug process, a solvent is introduced into the formation between the oil contact and its impermeable confining zone. As the injection proceeds the solvent slowly invades the oil bearing formation in a downward fashion mobilizing the oil-in-place. The solvent slug is then followed by a less expensive mobility slug of natural gas or gas and water to displace the oil.

Since solvent is usually more expensive than oil, economics dictate that utilizing a solvent slug process must be accomplished by a "recovery and recycle" method. Reservoirs with a confining impermeable zone and a steep dip can be flooded with reasonable assurance that the solvent can be recovered.

The enriched gas process consists of injecting a slug of natural gas primed with ethane, propane and butane, followed by a slug of lean gas or lean gas and water. This process requires high pressure which can limit the type of reservoirs available for flooding of this nature.

The high pressure lean gas process is similar except only lean gas (methane) is injected and the miscible components are transferred from the oil to the gas which forms a miscible bank. As detailed in Table 12.1, miscible hydrocarbon displacement is applicable to formations containing oil with highly volatile components. Like the enriched process, high reservoir

pressures (3,000 to 4,500 psi) are required. Oil gravities must be greater than 40° API and reservoir depth must be in excess of 5,000 feet for the lean gas process (van Poolen and Associates, 1980).

Miscible hydrocarbon displacement is a proven, feasible process with application to many reservoirs and fluid types. It is limited, however, to high pressure, light oil systems which necessitates its application relatively early in the producing life of most reservoirs. The technique also suffers from high solvent costs and poor oil/solvent mobility ratios (van Poolen and Associates, 1980).

# 3. New York's Miscible Drive Projects

As with chemical flooding, miscible drive projects have been minimal in New York. During the 1950's, three tests were conducted in Allegany and Cattaraugus Counties. The first test, conducted in 1950-51, consisted of injecting under 1,000 psi pressure, gaseous and liquid CO<sub>2</sub> followed by water into the Richburg sandstone. A similar test was also conducted in Allegany County in a different township. In both cases, slightly higher oil recovery was realized with increases in water injectivity rates. The third test, in Cattaraugus County, was conducted in the Bradford third sand with inconclusive results.

From 1962 to 1965 another miscible drive attempt was made in New York. Injection took place in the Richburg sandstone in Allegany County. The test consisted of injecting slugs of gasoline,  $CO_2$ , and water. Approximately 2,789 barrels (117,138 gallons) of gasoline were injected into the formation followed by 855 tons of  $CO_2$ . No significant incremental oil was recovered from a well located 225 feet away.

## G. THERMAL RECOVERY METHODS

Thermal recovery methods include cyclic steam injection, continuous steam

injection or steam flooding, and in-situ-combustion. Field application of these methods is second only to waterflooding.

Thermal recovery techniques are used to add heat to the reservoir thus lowering the viscosity of the oil by increasing its temperature. The less viscous oil is then more easily displaced to the producing wells. Reservoirs with viscous oil or tars are best suited to thermal processes.

# 1. Steam Flooding

Steam flooding is somewhat analogous to waterflooding since displacement of the oil is accomplished by condensed steam (Interstate Oil Compact Commission, 1974). Figure 12.5 shows a simplified arrangement of a steam injection system.

The main advantage of steam injection is the wide variety of reservoirs capable of sustaining a steam drive as detailed in Table 12.1 (Van Poollen and Associates, 1980). Two limiting factors are maximum reservoir depth of 3,000 feet and formation thickness of 20 feet or more.

Steam flood operations are generally conducted on one to three acre spacing utilizing a five spot pattern or a line-drive configuration. However, seven and nine spots are also used in cases where the oil is extremely viscous.

The major drawbacks of steam flooding are the large amounts of high quality water required, restriction to depths of less than 3,000 feet, and high fuel consumption per barrel of oil produced.

#### 2. Cyclic Steam Injection

Cyclic steam injection also known as steam stimulation, steam soak or huff and puff, is an established method of enhanced oil recovery (National Petroleum Council, 1984).

The steam stimulation process involves the injection of up to 20,000 barrels of steam in a producing well over a one to three week period. The



Source: Improved Oil Recovery, Interstate Oil Compact Commission, 1983.

well is then allowed to "soak" for a number of days before being returned to production. The injection, soaking and production of the well is known as a cycle which is usually repeated every 12 to 15 months. As many as 15 cycles can be applied to one well, but production efficiency will generally diminish from cycle to cycle. The steam stimulation process will recover less total oil per well than a steam flood operation, but it is less expensive (van Poollen and associates, 1980). Steam stimulation can be effective in less homogenous reservoirs because a flood front need not be established.

# 3. In-Situ-Combustion

In-situ-combustion or fire flooding utilizes air injection to supply oxygen to a burning front in the reservoir. When air injection begins, the oil near the injection well oxidizes. If the oil oxidizes rapidly, it will ignite spontaneously and begin to burn. If the oxidation is slow, a heater is placed in the hole and the oil is ignited. Once the oil is ignited, injected air will cause the burning front to move out through the reservoir and away from the injection well. Combustion gases flow ahead of the front and are produced with oil and water (National Petroleum Council, 1984).

The heat produced at the front vaporizes formation water and develops a steam zone ahead of the front (National Petroleum Council, 1984). This steam displaces much of the heavy oil leaving relatively low oil saturations to be burned as the fire front progresses.

The practical guidelines for initiating any in-situ-combustion project are outlined in Table 12.1.

Air is injected at rates sufficient enough to maintain a burning front in the reservoir. Typical fronts advance at .125 to 0.5 feet per day (Interstate Oil Compact Commission, 1983).

Disadvantages of in-situ-combustion include inefficient vertical sweep in

thick formations and loss of heat to adjacent formations.

# 4. New York's Thermal Drive Projects

From 1957 to 1958, a thermal project was conducted on the Richburg sandstone in Allegany County. The test consisted of an in-situ-combustion pilot utilizing a 2 1/2 acre five spot. Although ignition attempts began in August 1957, ignition was not attained until August 1958. Ignition was sustained for 37 days, but a combustion front was not achieved. The test ended after an explosion occurred upon injection of a fuel mix. No incremental production results were observed.

During the Mid 1960's, two steam flood projects were conducted in Cattaraugus County in the Chipmunk sandstone. After two years of high pressure steam injection, the projects were deemed uneconomic and were abandoned. However, some additional oil was recovered from these projects.

In 1982, a cyclic steam operation was attempted in Allegany County. A thruster was placed on the wellhead and hydrogen peroxide  $(H_2O_2)$  and small volumes of ammonia derivatives were injected under high temperature (1,200°F) and pressure (2,200 psi). Theoretically, at bottom hole conditions the  $H_2O_2$  would convert to water  $(H_2O)$  and oxygen  $(O_2)$  with oxygen providing the catalyst for increased temperature, which would then convert the water to steam.

Despite pre-test optimism, the many problems encountered during the test resulted in its failure. Cement plugs were displaced in offset abandoned wells, a compressor truck's pump overloaded and failed, and the formation was overpressured which may have propagated existing fractures. Production rates were initially high but then declined rapidly.

At the time of the 1982 test, the operator contended that the methodology was stimulation and not enhanced oil recovery. In either case, conditions were imposed on the operator administratively since few specific regulations exist

for stimulation or enhanced oil recovery operations.

Clear consistent regulatory guidelines for such an operation may have circumvented some of the problems associated with this project. Although the administrative action achieved its goal, case-by-case procedures must be replaced by regulations.

# H. EXISTING REGULATIONS

Sections 557.1 - 557.4 of the New York State Department of Environmental Conservation regulations govern secondary recovery and pressure maintenance operations. Injection and production wells utilized in these operations must also conform to Parts 550 through 556 of DEC's regulations which govern organizational reports, bonding, drilling and plugging of oil and gas wells and operating practices. Amendments to the Oil, Gas and Solution Mining Law passed in 1981 are being addressed by adding specific safety and environmental conditions to individual drilling and plugging permits until new regulations are promulgated.

# 1. Permit Application for Secondary Recovery Projects

The existing regulations require that the owner or operator of any lease or unit must file an application and receive a permit from the Department prior to conducting any secondary recovery or pressure maintenance operations [6NYCRR Part 557.1 (a)]. When the regulations governing secondary recovery and pressure maintenance operations took effect in 1966, those projects in place at that time did not have to file for a permit. They are, however, subject to other Department regulations. Prior to granting a permit, DEC staff evaluates potential environmental impacts which may result from the proposed operation. The application must include, but is not limited to: a. A neat, legible plat drawn to scale must accompany the application and must identify the following:

- location of the lease, group of leases or unit containing the proposed project;
- 2. location of the proposed intake well or wells;
- location of any major surface facilities pertinent to the proposed project;
- identification of offsetting leases and names of offsetting operators;
- 5. locations, surface elevations and production zones of all drilling and existing oil and gas wells, abandoned wells and dry holes in the group of leases or unit containing the proposed injection well [6NYCRR Part 557.1(b)(5)].
- b. A summary of the proposed operations along with a forecast of the anticipated rate of development of the area within the project [6NYCRR part 557.1(b)(1)].
- c. The name, description and depth of the formation for which the operations are proposed [6NYCRR Part 557.1(b)(2)]. Copies of logs of any existing well to be used for input or any available information relative to the geology of the area [6NYCRR Part 557.1(b)(3)].
- d. A tabulation showing recent gas-oil ratios and oil and water production tests for each of the producing oil and gas wells [6NYCRR Part 557.1(b)(6)].
- e. A statement outlining what secondary recovery or pressure maintenance operations are proposed including the injection medium to be used, its source and the estimated amounts to be injected daily [6NYCRR Part 557.1(b)(1)].
- f. A description of the casing program of existing or proposed input wells along with the proposed method for testing the casing seat(s) [6NYCRR Part 557.1(b)(4)].

The Department must review casing programs to determine that sufficient quantities of good quality casing and cement will be utilized in new input wells. Casing programs of existing wells must be reviewed to ascertain that casing integrity is maintained.

Geologic studies of the area using structure and isopach maps and cross sections are very important for a comprehensive evaluation of an injection project. These studies can reveal local faults and fractures which penetrate the targeted formation and the overburden. These geologic features may provide conduits for migration of oil and brine into freshwater aquifers, particularly if reservoir pressures are increased sharply as a result of high injection pressures. Currently DMN has very little geologic information on the old fields being waterflooded.

The current regulations require that only gas-oil ratios, oil and water production tests and descriptions of casing programs be submitted with the application.

# 2. Offsetting Leases

The permit application must also include a list of names and addresses of the offset operators and a statement that each offsetting operator was sent a copy of the application by registered mail [6NYCRR Part 557.1(b)(7)(c)]. The Department must hold the application for 15 days before issuing a permit unless it involves the unit operation of a pool. Within this 15 day period, if any offset operator files a written protest with just cause or the Department declines to issue the permit, a public hearing must be scheduled to review the application. If there is no objection by an offset operator or the Department within the 15 day period, the application will be approved and a permit issued [6NYCRR Part 557.1(d)]. The 15 day waiting period is not required if the application is accompanied by the written consent of the

operators of all the offsetting leases or units and if the Department has no objection [6NYCRR Part 557.1(e)].

## 3. Integration and Unitization

If the proposed secondary recovery or pressure maintenance operations will involve the unit operation of a pool or any part of the pool which has been or is proposed to be subject to an integration and unitization ruling by the Department under Title 9 of Article 23 of the Environmental Conservation Law (Section 79 of Article 3-A of the Conservation Law prior to recodification), the application must also contain:

- A statement or graph showing the rate of anticipated oil and gas production;
- b. A statement showing the value of the estimated additional oil and gas production will exceed the estimated cost of the operations;
- c. Evidence that 60 percent or more of the interests of the owners and 60 percent or more of royalty interests have approved the proposed operations [6NYCRR part 557.1(f)].

In addition, the Department shall not adhere to the 15 day waiting period but shall promptly schedule a public hearing [6NYCRR Part 557.1(g)].

When a pool is operated as a unit, several owners have economic interests in the operations of the pool. Advantages and disadvantages of secondary recovery operations versus the rights of minority interests must be weighed and reviewed to determine if it is in the best interests of at least 60 percent of the owners.

Any drilling, casing and completion operation must conform to existing regulations in <u>Part 554, Drilling Practices and Reports</u>. Section 553, which establishes spacing requirements, may affect future waterflood operations since oil fields discovered before 1981 are excluded from these provisions. All of New York's current waterflood projects were in operation prior to 1981,

which excludes them from these spacing requirements.

# 4. Federal Underground Injection Control Regulations

All secondary recovery and enhanced oil recovery injection wells are classified as Class II wells under the Federal Underground Injection Control Program (UIC). The Federal UIC program for New York State is administered by the Environmental Protection Agency (Region II).

All existing Class II wells are authorized by rule for life and must comply with financial responsibility, mechanical integrity, and operational and reporting requirements by June 25, 1985, and every five years thereafter. Operators of new Class II wells must file an application which includes well or field history, an abandonment plan and financial responsibility bonds, and must receive a permit prior to injection. Refer to Chapter 15 for a summary of UIC regulations governing Class II wells.

Many operators of existing Class II wells are currently plugging and abandoning these wells rather than conforming to UIC requirements. Additional costs associated with compliance, as much as an estimated \$1,000 per injection well per year for monitoring, have made it uneconomical to continue operation.

# I. ENVIRONMENTAL CONSIDERATIONS

New York's old waterflooded fields have produced oil since before the turn of the century. Air, gas and water have been injected since the early 1900's and wells were drilled and abandoned, usually in good-faith, by operators using "state-of-the-art" techniques. However, many past practices as well as the current practices of some operators have contributed to localized contamination of surface and groundwaters, air and soil. Local residents are primarily affected by the contamination and have endured health problems and various inconveniences associated with this pollution.

Contamination problems in the old waterflooded fields can result from:

- Improperly abandoned or unplugged wells which provide conduits for oil or brine into aquifers or surface waters.
- 2. Improperly cased and cemented production and injection wells which also provide conduits for oil or brine into aquifers or surface waters:
- 3. Disrepair of wellheads, pump jacks, or surface flow lines, which allows oil or brine to migrate from the surface and percolate into aquifers;
- 4. Discharge of excess water and filter backwash into surface waters;
- 5. Discharge from tanks and separators into surface waters; and
- Discharge into surface waters and infiltration into groundwaters from unlined pits.

Several cases of surface contamination have been documented in the old waterflooded fields in the past 10 years. Some surface streams and creeks including classified trout streams have permanent oil films caused by run-off from abandoned wells and leaking production equipment. Produced water discharges into surface waters can also contain crude oil constituents which contribute to contamination. Large tree kills and damage to wetlands caused by oil and/or brine spills have also been documented.

Numerous studies have been conducted on the effects of oil spills into surface waters and onto the ground surface. A Pennsylvania study states that an oil spill as small as 1/2 barrel of crude oil into surface waters will reduce the bottom fauna population below the spill by 90 percent (Pennsylvania Department of Environmental Resources, 1985). Downstream effects vary with stream volume and gradient. A two year study of Pennsylvania streams reports that samples of bottom gravel and sediment showed that significant quantities of oil and grease from past surface discharges had permeated deeply into the stream substrate and would affect aquatic life and fauna for many years.

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Nature does recover, however. Many of the streams in Pennsylvania which were used as open conveyances for crude oil at the turn of the century are now excellent trout streams (personal communication, Pennzoil, 1986).

Crude oil contamination of groundwater aquifers has been documented in several of the old waterflood field areas. In one instance, it was reported that 8 feet, or 12 gallons, of crude oil was floating on top of the water in a domestic water well. In the proximity of many of the old field areas, groundwater has an oily taste and odor. High levels of benzene, toluene and xylene, soluble constituents of crude oil, have been detected in domestic water wells causing serious health concerns to local residents.

Benzene, toluene and xylene poisoning can occur even from inhalation of the vapor or absorption through the skin. Toluene and xylene are suspected carcinogens and benzene is a known carcinogen. Benzene is one of fourteen pollutants found by the Environmental Protection Agency to be so toxic that the ambient water concentration should be zero for potable water. Department of Environmental Conservation rules and regulations establish effluent limitations for discharges into freshwater aquifers and prohibit the discharge of any detectable level of benzene into potable waters. Samples of one domestic water well taken during a complaint investigation showed levels of benzene as high as 134 mg/l (milligrams per liter).

Many of the environmental impacts associated with waterflooding and all enhanced oil recovery methods are essentially extensions of those encountered during routine primary recovery operations. There are, however, other impacts specifically associated with deployment of enhanced recovery techniques. These impacts are the result of injection under pressure of liquids or gases to mobilize and displace oil. Table 12.2 details the environmental and safety hazards associated with EOR chemicals and Table 12.3 lists some of the other

# TABLE 12.2 COMMON USAGE OF ENHANCED OIL RECOVERY (EOR) CHEMICALS

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Chemical	Primary Uses (non-EOR)	Production	Maximum Concentration Expected in EOR (ppm)	Maximum Concentration Expected In Handling (%)
Polymers				
Polyacrylamides	Food additives.	50 million lb/yr	5,000	80
Polysaccharides (Xanthan Gums)	Food additives. Cosmetics. Emulsifier.	40 million ib/yr	5,000	80
Surfactants				
Petroleum Sulfonates	Detergents.	600 million lb/1966	100,000	95
Synthetic Sulfonates	Industrial & household.	8 million 1b/1966	100,000	95
(Alkylaryl Sulfonates)	Detergents.			
Alkaline Agents				
Sodium Hydroxide	Chemical & metal processing. Paper & pulp manufacture.	9.6 million tons/197	5 50,000	50
Solium Carbonate	Industrial processes.	8.7 million tons/197	9 20,000 ·	
(Soda Ash)		· · · · · · ·		
Sodium Silicate	Chemical manufacture. Adhesives, soaps, fireproofing.		20,000	38

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# TABLE 12.2 (CON'T)

	<u>Chemical</u>	Primary Uses (non-EOR)	Production	Maximum Concentration Expected in EOR (ppm)	Maximum Concentration Expected In Handling (%)
Bioc	ides				
	Acrolein	Chemical manufacture (acrylic acid and esters) Biocide.	38,500 tons/1979	150	-
	Formaldehyde	Chemical manufacture (resins). Biocide.	3.0 million tons/19	150	37
	Dichlorophenols	Chemical intermediate. Industrial and agricultur products.	- -	150	-
	Pentachlorophenol	Almost 100% usage as wood preservative. Biocid	18,200 tons/1975 le.	150	-
0xyg	en Scavengers				
	Sodium Hydrosulfite	70% dye industry. 18% pulp & paper industry	50,000 tons/1975 7.	20,000	90
	Hydrazine	Solar Flux. Industrial water treatment. Rocket f	- uel.	20,000	98
Othe	rs				
_	Butanols	Industrial solvent (surface coatings). Chemi manufacture.	237,000 tons/1976 Lcal	40,000	99
	Isopropyl Alcohol	Chemical manufacture. Solvent, medical, and cos	881,000 tons/1972 smetic.	-	99

Reference: Enhanced Oil Recovery, National Petroleum Council, June 1984.

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# TABLE 12.3HAZARDS OF ENHANCED OIL RECOVERY CHEMICALS

Chemical	Major Hazard(s)	Other Hazard(s)	NIOSH*	IDLH **	Comment
<u>Polymers</u> Polyacrylamides	Monomer impurity may be a neurotoxin.	Dust accumulations may be explosive. May cause allergy.	N/A	N/A	Low hazard.
Polysaccharides (Xanthan Gums)	Impurities in com- mercial xanthans may be irritants or allergens.	Dust accumulations may be explosive May cause allergy.	N/A	N/A	Low hazard.
<u>Surfactants</u> Petroleum Sulfonate	Some constituent or impurities may be carcinogens.	Irritating to tissues. Plammable	N/A	N/A	Low to moderate hazard
Synthetic Sulfonate (Alkylaryl Sulfonates)	Impurities potential carcinogen.	lrritating to tissues.	N/A	N/A	Low to moderate hazard.
<u>Alkaline Agents</u> Sodium Hydroxide	Severely corrosive to tissue.		2 mg/m <sup>3</sup>	200 mg/m <sup>3</sup>	High hazard. Avoid inhalation, ingestion, & eye/skin contact.
Sodium Carbonate (Soda Ash)	Severely corrosive to tissue.		N/A	N/A	Moderate to high hazard. Avoid inhalation, inges- tion, & eye/skin contact.
Sodium Silicates	Irritant to tissues.		N/A	N/A	Moderate to high hazard. Avoid inhalation, inges- tion, & eye/skin con.act.

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# TABLE 12.3 (CON'T)

Chemical	<u>Major Hazard(s)</u>	Other Hazard(s)	OSHA- NIOSH*	<u>IDLH</u> **	Comment
Biocides Acrolein	Inhalation toxicity	Irritant. Fire hazard.	0.1 ppm	5 ppm	Moderate to high hazard. Avoid in- halation, inges- tion, & eye/skin contact.
Formaldehyde	Irritant to membranes.	Potential carcinogen.	3 ppm (5ppm ceiling) (10 ppm peak)	100 ррт	Moderate to high hazard. Avoid in- halation, inges- tion, & eye/skin contact.
Dichlorophenols	Aquatic wildlife toxicity.		N/A	N/A	Moderate to high hazard. Avoid in- halation, inges- tion, & eye/skin contact.
Pentachloropenol	Toxicity to organisms. Potential carcinogen, mutagen teratogen.	Persistent in environment.	0.5 mg/m <sup>3</sup>	150 mg/m <sup>3</sup>	High hazard. Avoid inhalation, inges- tion, & eye/skin contact
Oxygen Scavengers Sodium Hydrosulfite	Spontaneous combustion.	Irritant to tissues.	N/A	N/A	Moderate hazard.
Hydrazine	Explosive.	Corrosive to tissue	l ppm	80 ppm	High hazard. Avoid inhalation, inges- tion, & eye/skin contact.

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# TABLE 12.3 (CON'T)

Chemical	Major Hazard(s)	Other Hazard(s)	NIOSHA-	IDLH**	Comment
Others Butanols	Plammable.	May be irritant to tissues.	100-150 ppm	8,000- 10,000 ppm	Low to moderate hazard.
Isopropyl Alcohol	Flammable.	Irritant to respira- tory tract.	400 ppm	20,000	Low hazard. Do not take internally.

\*OSHA-NIOSH as found in 29 CFR 1910.1000 as of January 1, 1977.

\*\*IDLH--"Immediately Dangerous to Life or Health." Maximum level from which one could escape within 30 minutes without any escape-impairing symptoms or any irreversible health effects. From "Respiratory Protection Reference Document for Chemical Hazards." Standards Completion Program. N/A -- Not Available.

Reference: Enhanced Oil Recovery, National Petroleum Council, June, 1984.

common uses of EOR chemicals and the concentrations that would be expected in an EOR project. The need for injection wells, lines and facilities causes additional impacts on the environment. Some impacts may be:

- Expanded land use through more extensive field development including more wells, roads, injection lines, and facilities.
- 2. Extended duration of land use.
- Increased emissions of pollutants from additional injection and production facilities.
- Increased potential for pollution of surface and underground sources of drinking water by injected fluids.

Increased land use results from drilling infill wells, laying new transmission lines, building injection and chemical processing plants, and expanding production facilities. These land use impacts are generally confined to existing field boundaries but their duration may be extended from a few years to several decades by tertiary recovery operations.

Increased air emissions can be generated from steam generators used in thermal processes, from internal combustion engines used to drive gas compressors for miscible processes, from chemical mixing stations for chemical processes, and from additional gas and production processing facilities. Accidental spills and releases of chemicals and gases can result in nonroutine air emissions.

Environmental regulations require that the mechanical completion of all injection wells be designed to prevent loss of injected fluids to any part of the wellbore other than the intended injection zone. Failure to adequately complete wells can lead to pollution of subsurface drinking waters by injected nitrogen, natural gas, CO<sub>2</sub> and other chemical solutions.

Specific environmental impacts attributable to each enhanced oil recovery

process must be addressed during the environmental assessment and permitting process.

# J. PROPOSED REGULATIONS

The Department believes modification of the regulations dealing with waterflood procedures and operations is required. Not all of these regulations can be directed at current fields and projects but do encompass present activity in New York where applicable. However, as with any revision of regulations, care must be exercised to ensure comprehensive environmental protection under reasonable terms for existing operations. Recommendations for revision of current regulations and reasonings for such revisions are as follows:

- 1. For new waterflood and tertiary recovery projects and major expansions of existing projects, an additional site specific environmental assessment and SEQR determination are required. Preparation of a site specific supplemental environmental impact statement may be required prior to submittal of an application for any new enhanced oil recovery operation or major expansion of an existing project.
- 2. Detailed geologic and engineering studies shall be submitted with the application for an enhanced oil recovery project. These reports shall include evaluations of porosity, permeability (effective, relative and absolute), thickness, areal extent of reservoir, fracture gradient, reservoir temperatures, fluid saturations, and fluid properties. Casing inventories of all existing and planned wells, monitoring data, and the results of any injection tests shall also be included.
- 3. More explicit regulations will be drafted concerning conversion of wells for enhanced recovery purposes. Filing requirements are necessary for the DMN to effectively evaluate the integrity of those wells to be converted.

- 4. Spacing criteria will be established by regulation for all new fields which could be influenced by future enhanced oil recovery operations.
- 5. Fluids from "flowback" operations shall be contained. This requirement will increase environmental protection and the degree of safety involved in many stimulation practices.
- Injection wells will have to be monitored under the Federal UIC program. This will also satisfy the State's requirements.
- 7. Injection pressures shall be such as to not propagate fractures. Pressures are limited by the UIC regulations and must also be approved by DMN. The maximum reservoir injection pressure shall be verified by a step-rate pressure test on at lease one injection well in each new project in areas where the maximum injection pressure has not been verified to the satisfaction of the DEC. This requirement parallels the UIC requirements and contributes to groundwater protection.
- 8. Any unlined earthen ponds or pits designed to hold enhanced oil recovery system byproducts must be eliminated if it is determined that environmental damage is occurring. This includes those pits belonging to peripheral operators under the influence of the flood. For new projects, such fluids shall be stored temporarily in watertight tanks or lined impermeable ponds or pits for subsequent disposal.
- 9. Plugging and abandonment methods, cement requirements, and disposal methods in the old oil field areas will be required to adhere to those regulations set forth for oil and gas operations.
- 10. Reporting of produced fluids (oil and water) will be required on the annual production report. Such information assists the DMN in

determining disposal options for produced fluids and ensures that operations are being conducted properly.

11. A chemical analysis of at least one sample of injected and produced water, respectively, will be required on an annual basis for each project. The minimum analysis shall consist of the following parameters: ph, sodium, chloride, specific conductivity, calcium, magnesium, iron, sulfates and total dissolved solids.

Most of these recommendations parallel EPA's UIC program requirements. The reported information required by these proposed regulations combined with existing field inventories and annual reports will greatly improve the ability of the Department to protect the environment, increase safety, protect correlative rights and avoid future potential environmental hazards.

# K. FUTURE ENHANCED OIL RECOVERY PROJECTS

Waterflooding will probably continue to be the prevalent oil recovery mechanism in New York's older oil fields in Allegany, Cattaraugus and Steuben counties. Step-out and infill drilling will continue as long as profitable recovery rates are realized. There are several oil producing fields in New York that currently produce without waterflooding. The Busti field, Farmersville Pool, Bass Island Trend and Cattaraugus County's Five Mile Pool, may be viable candidates for future enhanced oil recovery operations. However, since the Busti and Five Mile Pools have low formation permeabilities and the Bass Island trend is so structurally complex, enhanced oil recovery projects in these areas would not be feasible until the reservoir is better understood.

As oil prices increase, some time in the future, projects that once appeared or now appear unattractive may become practical. As mentioned in the discussions relative to chemical, miscible and thermal drive operations, reservoirs must meet specific screening criteria. The oil fields (excluding

the Bass Island fields) in New York have low permeabilities and porosities. There is generally no water encroachment or original gas cap and primary recovery is from solution gas drive. Other general parameters include depths of 800 to 2,000 feet, reservoir temperatures of 70 - 100°F, low dips and structural relief and heterogeneous producing sands of 10 to 35 feet thickness with little or no fractures. Such parameters rule out many chemical drive mechanisms. Miscible recovery methods do appear to have potential for incremental oil recovery in New York's oil fields. Thermal methods may also have some future in New York. However, detailed engineering studies and pilot projects must be undertaken prior to initiating such projects.

Some of the enhanced recovery processes may be adaptable to the Bass Island trend with its complex structure but until more is known about the reservoir, a discussion of applications would be speculative.

Chemical and miscible tests have been conducted on sands in Pennsylvania which are similar to those sands found in New York. Recovery experiments of this nature contribute important information which can be utilized in considering such tests in New York.

## L. CONCLUSIONS

The purpose of this chapter is to describe the basics of enhanced oil recovery methods and how they relate to New York's oil and gas program. Enhanced oil recovery techniques are very complex and their application is reservoir specific. Oil recovery predictions based on laboratory experiments and mathematical modeling results are not always achieved in the field.

Chemical, miscible, and thermal methods have at one time or another been attempted in New York. However, waterflooding is the State's most utilized method of enhanced recovery. Waterflooding has brought direct and indirect economic rewards to hundreds of individuals and industries. However, these

rewards have been offset to some degree by environmentally unacceptable impacts brought on by such operations.

Since the waterflood process was discovered by the accidential discharge of groundwater into an inadequately abandoned well, it might be perceived that this method is environmentally unsound. Although present day environmental protection techniques far exceed previous methods, continued improvements in existing waterflood areas are needed to ensure safety and the protection of human health and the environment.

Enforcement in the waterflood and old oil fields will be given top priority by the Department. New and existing regulations, especially those concerning casing integrity, will be thoroughly enforced.

Brine pits will be phased out and permits for surface discharges under SPDES restricted. Improperly plugged and abandoned wells need to be identified and properly plugged since they can act as conduits for migration of oil and brine into freshwater aquifers. The Department will actively pursue a program to eliminate this major environmental problem.

Elimination of unlined storage pits and surface discharges and regular maintenance of pipelines, stock tanks and wellhead equipment would immediately improve situations now causing surface pollution in the old oilfields being waterflooded. Improved production practices and the assurance of the integrity of the cement, casing and injection strings of the wells in combination with adequate disposal plans, controlled road discharges and/or permitted disposal wells, would greatly assist in preventing pollution.

Future enhanced oil recovery projects will have to meet more stringent conditions than those projects started prior to regulations. Certainly a site specific environmental impact statement must be required before the initiation of a new enhanced oil recovery project. An overall awareness of possible hazardous impacts should prevent any environmental damage. Future operations

will be meticulously scrutinized by the public and government agencies alike.

The outlook for enhanced oil operations is contingent on numerous variables. The price of oil, regulatory requirements, environmental considerations and reservoir characteristics are the major parameters that affect enhanced oil recovery projects. A favorable combination of these factors and an educated private and public sector should stimulate both environmental protection and future growth.

#### CHAPTER XIII. SOLUTION SALT MINING

## A. INTRODUCTION

Salt exists in subsurface formations covering a major portion of south central and western New York. This salt is found in salt beds consisting of horizontal layers of salt usually sandwiched between layers of shale, dolomite and anhydrites. It is estimated that 8,500 square miles of New York State are underlain by salt beds of potential commercial thickness (Kreidler, 1957). These salt beds are part of the Lower Salina Group which includes the Vernon (B) and Syracuse (D, E, F) Formations (Rickard, 1969). The Salina Salt Basin extends across western Pennsylvania, northern West Virginia, eastern Ohio and a large portion of Michigan (Schock, 1985). (See Figure 13.1).

The Salina Group outcrops in an approximate ten mile wide band extending due east in New York from just north of Buffalo passing just north of Rochester, through Syracuse and ending at the southeastern edge of Herkimer County (Rickard, 1969). No beds of rock salt are found in the exposed Salina strata because the salt has been leached out by groundwater. The Salina increases in depth and thickness in a southerly direction in New York funnelling into Cattaraugus, Allegany, Steuben and Chemung counties (Rickard, 1969). Here the top of the salt zone may be located at 3,000 feet below the surface. In Chemung County the salt beds are 1,300 feet thick. The regional dip of the Salina Group is slightly west of south at a rate of 30 to 50 feet per mile (Kreidler, 1957).

Initial recoveries of salt in New York State were obtained from the ocean and later from salt springs located near Syracuse (Werner, 1917). Since the late 1800's most of New York's salt production has come from rock salt by a recovery process called solution mining (Rullen, 1973). This process involves injecting freshwater into the salt beds through wells which are drilled in a



fashion similar to oil and gas wells. Once the salt is dissolved, the resultant brine is brought to the surface for evaporation or chemical manufacturing. There are five solution mining operations in New York State which produce salt from approximately 80 active wells. Approximately 10 new wells are permitted annually in New York and similar numbers are temporarily or permanently abandoned. This chapter will discuss the solution mining process and the existing and proposed State program to regulate the environmentally sound development of the State's salt resource. There are few. specific citations to solution mining in the old regulations which were issued in 1966 and updated in 1972. In general, the provisions relating to permit applications, drilling, completion, production and plugging and abandonment contained in the oil and gas regulations, 6NYCRR Parts 552 to 558 have been applied to solution mining, when appropriate. The provisions contained in Section 23-0305.9 of the Oil, Gas and Solution Mining Law give DEC the authority to do so. The major recommendation contained in this Chapter is that the oil and gas regulations, 6NYCRR Parts 550 to 558, be revised to include solution mining wells, where appropriate, as well as to add certain requirements specific to solution mining.

On June 24, 1984, solution mining wells in New York also became subject to the U.S. Environmental Protection Agency's Underground Injection Control (UIC) Program with compliance to be enforced within one year. Solution mining wells are classified as Class III wells under this program. The federal program is summarized in Chapter 15.

## B. CHOOSING A WELL SITE AND APPLYING FOR A DRILLING PERMIT

Before salt production can begin, a well must be drilled to the salt beds. A drilling site must be carefully selected which will allow the most economic recovery of the resource while causing a minimum of adverse environmental impacts.

Solution mining operations in New York have a long productive life and most of the new salt wells are proposed in close proximity to sites which have been in existence for a number of years. Texas Brine began their operations in Dale over 10 years ago and expects to operate for another 40 years. Morton Salt Company in Silver Springs and Allied Chemical in Tully have been in operation for 100 years and Cargill Salt Company and International Salt of Watkins Glen commenced operations in the late 1800's. Therefore, the environmental considerations for most new solution mining well proposals do not substantially change, although the cumulative impacts of each new well may pose new concerns.

Before a well can be drilled, deepened, plugged back, converted or reconverted for exploration or production, a permit must be obtained from the Department of Environmental Conservation. The permitting process provides the main opportunity for DEC to review the environmental aspects associated with solution salt mining. A standard permit application must be completed and contain the name and address of the well owner and well contact person, well location data, proposed well data, and details about the production interval, casing string and cement job.

The application for a permit must also contain a neat legible plat (map) which has been certified by a licensed land surveyor or civil engineer showing the proposed well location. The plat provides the information necessary for complete analysis of each drilling permit application. This map allows DEC to identify potential environmental problems such as violations of surface restrictions or well spacing requirements or if the site is located on or near an environmentally sensitive area. The plat requirement in the current regulatory program regarding the pool and spacing unit is directed towards oil and gas wells, and would not apply to solution mining. **Specific requirements**
for solution mining well plats need to be addressed in future regulations. It is recommended that these plats include the boundaries of the property under the owner's control, the location and API well identification number of each well on the property, the area proposed to be affected by solution mining, and the location of roads, surface water drainages, groundwater depth, buildings, significant landmarks and topographic features in the affected area.

The scale of the plat needs to be large enough to allow adequate resolution of details. The scale of the plat for solution mining wells needs to be specified in the regulations. A suggested scale for this plat is one inch equals six hundred feet or less for wells that are spaced at least 1,320 feet from each other or one inch equals 400 feet or less for wells that are spaced less than 1,320 feet from each other.

#### C. PERMIT FEE

A permit fee must also be submitted with the solution mining permit application. The amount of this fee is the same as that for oil and gas wells. The existing regulations require a \$20 permit fee. However, the current regulations do not yet reflect the changes made in the 1981 amendments to the 0il, Gas and Solution Mining Law which requires fees ranging from \$225 to \$2,725 depending on the depth of the well. The increased permit fee was adopted by the Legislature in 1981 to more adequately cover the costs associated with the administration of the oil, gas and solution mining program. The Department's new regulations need to reflect this change in the Law.

## D. FINANCIAL SECURITY

Before a well is permitted, an owner or operator must also secure funds in the form of a surety bond, personal bond or other comparable financial security to offset well plugging and surface restoration costs in the event

that an owner fails to carry out these requirements. The amounts vary depending on the depth and number of wells to be drilled. Most, if not all solution mining wells are less than 2,500 feet deep in New York State. This financial security remains in effect until the plugging and surface restoration of applicable wells takes place.

In 1984 the State Legislature adopted new financial security requirements for oil, gas and solution mining wells which are significantly higher than they were in the past. The financial security provisions of the new Law more closely approximate the costs to properly plug and abandon a well. This will have positive environmental affects by ensuring that the proper amount of financial security is available for adequate plugging and abandonment of wells.

#### E. DEC REVIEW OF PERMIT APPLICATIONS

Before approving a permit application, DEC conducts an environmental, technical and administrative review of the drilling application. During the environmental review, DEC checks to see if the proposed well is located in an environmentally sensitive area and examines drilling, casing and cementing programs during the technical review. The administrative review ensures that all SEQR requirements have been met and coordinates the review of other Department permits necessary for the project. Special conditions may be added to the permit to ensure the drilling program is technically and environmentally acceptable.

Siting requirements and pre-drilling site inspections conducted for solution mining wells are similar to those for oil and gas wells with some exceptions due to the differences between an oil and gas reservoir and a salt cavity and the way in which these resources are recovered. For this reason, state-wide spacing and unitization regulations only apply to oil and gas

wells. However, the surface restrictions in the existing regulations apply to all oil and gas, and solution mining wells.

Aside from the potential disturbance of a larger land area, the procedures followed in approving a location for an access road and well site for solution mining are similar to those for oil and gas wells. The environmental considerations discussed in the oil and gas siting section that also apply to solution mining include: the distance from fresh water wetlands, floodplains, municipal and non-municipal community water supplies, public streams, rivers or other surface bodies of water, erosion and sedimentation potential of the project, and potential impacts on agricultural activities. DEC must also consider the use of tree and brush debris from land clearing and the effect of the project on endangered or threatened species, significant habitats and other fish and wildlife of special concern. Other items that require a similar review as that for oil and gas wells are the impacts of the well on areas of historic or archeologic significance, coastal lands, state lands, or lands under the jurisdiction of OPRHP. In addition, the proximity of the well to any private dwelling, travelled part of any public road and underground mining operations must also be considered. See the siting and pre-drilling site inspections under the oil and gas section for further information.

A major element in the siting of a solution mining operation is availability and accessibility of a freshwater source for dissolving the subsurface rock salt. A large quantity of freshwater is needed for solution mining. Solution mining operations in New York utilize water from drilled freshwater wells, local surface water supplies, purchased water, or any combination of these three options. If a stream bed is a source of freshwater for solution mining, it should contain a high enough water level so that the water withdrawal will not disrupt the life of the stream. An Article 15

Stream Disturbance Permit must be obtained before withdrawing water from protected streams for solution mining. Operators in New York often use an alternate source when surface water withdrawal creates low water levels in the stream. The Oil, Gas and Solution Mining Law gives DEC the authority to regulate the efficient use of ground and surface waters in solution mining [ECL 23.0305.9(b)]. It is recommended that this authority be reflected in the regulations.

The siting of pipelines must also be considered if water needs to be shipped to the site or the brine product transported some distance to a manufacturing location by pipeline. The Public Service Commission does not regulate brine transport lines. DEC and other agencies may become involved in the siting of these pipelines for solution mining operations through the SEQR process, if they cross a stream, wetland, or archeological or historic sites. Further restrictions on siting depend upon arrangements between brine operators, landowners, and local jurisdictions whose property the proposed pipeline may cross. DEC has the authority to regulate the siting and integrity of brine pipelines under the Oil, Gas and Solution Mining Law. It **is recommended that this be clearly identified in the regulations.** 

The State's regulations need to further specify that solution mining be conducted in such a way that the outer extent of the cavern created by such mining does not affect property outside the boundary line of the lease, integrated lease, or unit in which solution mining is being developed. A specified distance is needed to protect the rights of adjacent landowners and ensure against any environmental impacts on adjacent lands. It is suggested that this distance be at least 150 feet, but should be reviewed on a case-by case basis due to varying geological and operating conditions. Certain companies in New York have their wells setback as much as 500 feet from boundary lines.

An Organizational Report Form must be filed with DEC before any drilling can begin. This standard form must be updated within 10 days of any changes in the organization of a company.

#### F. PREPARING FOR DRILLING OPERATIONS

Before drilling operations can begin, operators who have received drilling permits must first notify DEC, local governments and adjacent landowners [ECL 23.0305.13]. The procedures and time periods for doing so are the same as those for oil and gas wells. These requirements contained in the Law need to be reflected in the regulations for solution mining.

Operators must be sure the drilling and casing program will be such as to prevent pollution and the migration of fluids from one stratum to another. The Oil, Gas and Solution Mining Law further states that the drilling and casing of wells must be done in accordance with the rules and regulations of the Department to prevent escape of oil, gas or brine or water out of one stratum into another; the pollution of fresh water supplies by salt water and other contaminants; and blowouts, cavings, seepages and fires [ECL 23.0305.9].

The casing and cementing programs adopted for a well are the most important aspects of a drilling operation to prevent fluid migration from one subsurface stratum to another and the pollution of surface and subsurface resources. This is checked by DEC as part of the permitting process.

## G. DRILLING SAFETY CONSIDERATIONS

The Department's regulatory program addresses some safety concerns for oil, gas and solution mining drilling operations. A sound safety program helps guard against drilling accidents which may cause further environmental damage and danger to employees. The safety program considerations for drilling a solution mining well are similar to those for oil and gas well drilling. See the oil and gas drilling section for more information.

#### H. DRILLING SOLUTION SALT MINING WELLS

The drilling of a solution mining well is similar to that of an oil and gas well except most solution wells are shallower and require smaller rigs. Rotary rigs or cable tool rigs are used for drilling in New York. The existing regulations establish separate requirements for each type of drilling rig. In addition, the regulations and cementing guidelines issued in March 1986, establish the required minimum depths and cementing requirements for conductor, surface, intermediate and production casing. These requirements and guidelines have been applied where appropriate to solution mining wells through permit conditions. The regulations and guidelines should be revised to state that these requirements apply to solution mining. See the oil and gas well drilling section for more information on these drilling requirements.

DEC conducts drilling and post-drilling inspections to monitor permit compliance and to ensure that the environment is being adequately protected. Corrective action may be required if problems are detected. Regions 8 and 9 utilize inspection forms to document site conditions of the wells located in their respective regions.

Often a second companion well is drilled for salt production in New York. A two-well or multi-well method of producing solution salt is now common practice. The two well system allows for greater flowrates and brine concentrations and is not as subject to corrosion. The last single salt well derrick owned by Cargill Salt Company and located on the main street in Watkins Glen, is being established as an historic landmark (Marshall, 1984, personal communication #45). The single well method began in the late 1800's, and included a string of wrought iron casing, some type of pumping device and tubing (Callaway, 1986, personal communication #9). The casing was not cemented in place but it was occasionally galvanized or wrapped to prevent corrosion. Freshwater was pumped into the wellbore to dissolve the salt, and

then compressed air was injected down the same wellbore to force the brine to the surface. (See Figure 13.2). Air lift was necessary due to the lack of a seal behind the casing.

In the two well system, one well is used as an injection well for inserting freshwater into the salt bed and the other as a production well for extracting the dissolved salt. (See Figure 13.3). This is sometimes referred to as gallery solution mining. Most of New York's solution mining operations have been in existence for a number of years and in many instances the salt cavities have merged. In these cases, the inside wells along a row of wells are plugged and only the two end wells are used for injection and production.

### I. SALT COMPLETION OPERATIONS

If the drilled well(s) are determined to be adequately situated for salt production, the wells are completed. Completion procedures for solution mining wells are similar to those for oil and gas wells. Although different types of casing cement, fracturing techniques and some variations in the design of the producing well may be used.

Largé horizontal stresses can develop in salt zones and shear off wells that lack enough structural strength. In addition, solution salt wells are highly susceptible to corrosion. For these reasons, special types of cements are usually employed by solution mining operators and often the surface, intermediate (if used) and production casings are cemented to the surface with the required calculated volume of cement plus 20 to 100 percent excess. Through permit conditions the Department requires: 1. conductor casing be set in competent bedrock and grouted in conjunction with surface casing, 2. surface casing extend 75' below the freshwater level or 75' into bedrock, whichever is deeper and 3. surface casing be cemented back to the surface. If there are no cement returns, then a 3-D bond log may also be required to





check the quality of the cement job. Many operators also cement the intermediate and production casing back to the surface and set a smaller tailpipe at the base of the production string or production tubing which is often installed on a packer. (See Figure 13.4).

Drilling fluids need to be completely removed from the wellbore with mud flushes and/or spacers before the well is cemented. In addition, cement must be chosen that adheres to the casing, wellbore and salt formation. Salt formations can be more effectively cemented with salt slurries. Freshwater slurries applied to salt formations bond poorly since the water leaches away the salt at the interface. Cementing handbooks describe the levels of salt that should be added to the cement under various conditions. Three cement additives of special application are: 1. a chemical that gels on contact with brine, 2. hollow inorganic spheres that lighten the slurry with little sacrifice of strength and, 3. nitrogen-foamed cement (George, et. al., 1985).

When two separate wells are used for the production process, completion work includes connecting the two wells by fracturing if these wells have not already merged from previous production. Two different completion methods are commonly used; these are cased and open hole. In the cased hole completion, the casing is set through the salt section and perforated for stimulation. In the open hole completion, the casing is set just above or into the salt section and a short tail pipe is run. Cased hole completions are preferred by some operators for greater control when fracturing.

The most common method used to establish communication between the injection well and the production well is to hydrofracture the salt with freshwater or brine under high pressures, of up to 2,400 pounds of pressure (Marshall, 1984, personal communication #45). Brine is used until communication is achieved. Freshwater is then used to prevent closure stresses from healing the fractures and so that the solution cavity can be



FIGURE 13.4

13~11a

developed. One of the first such frac jobs done in New York was in Watkins Glen in approximately 1957 (Jacoby, 1961).

Wells to be hydrofractured may first be notched at the depth and in the direction of the desired fracture so as to direct the inclination and direction of the fracture (Haimson, 1974). (See Figure 13.5). A notch is a voided out area extending into the salt. Notches serve to develop stress fields at the wellbore different from those of a smooth-walled cylinder when the fluid is pressured-up, thus causing the fracture to initiate from the notch.

In salt zones, horizontal fractures usually result due to the rock properties of salt zones, which can have a poisson's ratio as high as .5 (dimensionless) (Allen and Roberts, 1982). Therefore, the horizontal matrix stress can be equal to the vertical matrix stress because of the plastic response of salt to overburden pressures.

The success of a frac job depends on the geology of the salt formation, the well location, and the design of well completion and fracturing sequence. A thorough geological investigation is the key to success in formations disturbed by folding, faulting or other discontinuities. Wells are now usually cored and logged by operators in order to better understand the local geology, the probable directional response to hydraulic fracturing and as an aid in locating future salt wells.

After the cessation of drilling operations, drilling fluids should be disposed of within 45 days and partial surface restoration should be made. Erosion problems can occur if the site is not properly restored. Diversion and drainage ditches and culverts both around the location and along access roads can help prevent erosion problems if built into the well site preparation plan. Partial surface restoration includes disposal of fluids



(a) A sharp-edged notch with fluid pressure distribution.
(b) The leading edge of an extension fracture showing stretching and rupture of rock grain bonds as the fracture advances due to the "wedging" action of the fluid.



Fracturing which had previously been done through perforations is initiated by more precise notching, resulting in near perfect fracturing and rapid lowpressure connections.

References = Aughenbaugh, N.B. and M. William Pullen, "Directional Hydrofracturing," in <u>Third Symposium on Salt Vol. 2,</u> Northern Ohio Geological Society, Inc. 1966. (top figure).

> Haimson, Bezalel C., "Well Communication in Salt Pormations," in <u>Pourth Symposium on Salt Vol. 2,</u> Northern Ohio Geological Society, Inc., 1974. (bottom figure).

used or encountered while drilling; the backfilling of all mud pits, earthen water tanks, and auxiliary holes; removal of equipment; and regrading and seeding of the entire area disturbed while drilling. The restoration of the site helps prevent erosion and prepares the site for regrowth. It is recommended that partial surface restoration after the cessation of drilling operations and disposal of drilling fluids of within 45 days after the cessation of drilling operations be required for solution mining wells as for oil and gas wells. See the oil and gas section for more information.

Within 30 days after the completion of a solution mining well, a completion report must be filed with the Department. This notification aids the Department in monitoring the drilling program. The completion report includes general well information on drilling, coring, well logs, casing, final completion, treatment or stimulation, initial production, pre-completion tests and a record of the formations penetrated. It is recommended that completion report filing requirements on solution mining wells be specifically cited in regulation.

DEC conducts a post-drilling inspection to be sure drilling and completion operations were properly conducted. The access roads, well site restoration, and wellhead and production equipment are all checked by Regional staff. Additional corrective action may be required if any problems are encountered.

#### J. SALT PRODUCTION OPERATIONS

Wellhead attachments, storage tanks, associated surface equipment, and pipelines are installed to prepare the well for production. The well is also connected to a source of freshwater for the salt dissolving process.

For the production stage of solution mining, as with drilling and completion, pollution of the land and/or surface or ground water in connection with solution mining is prohibited [ECL 23-0305.9]. Generally, additives are

not added to the fresh water used for dissolving the rock salt which reduces potential environmental problems associated with this mining process. However, well casings, pipelines and storage tanks are highly subject to corrosion due to the high salt content of produced brines. Without adequate prevention measures, this corrosion can lead to leaks and spills. Major problems may result if brine leaks onto land or into surface or groundwater. Chloride contamination can inhibit plant growth for a long time and cause fish kills if spilled into surface waters. If sodium chloride enters an aquifer, there are no economically feasible methods to remedy the situation in any reasonable period of time. The existing regulatory program gives DEC authority to monitor the condition of wells, pipelines and storage tanks. **This authority should be reinforced in the regulations and exercised through permit conditions as needed.** 

Well casings can be protected using cathodic measures on production wells. Cathodic protection at 2 to 3 volts will retard the movement of electrons and thus slow down the rate of corrosion. DEC can also check for leaks in the casing, tubing or packer by monitoring the annulus pressure. Suspected fluid movement through vertical channels can be determined by several logging methods such as noise, radioactive tracer and spinner surveys. Some methods are more sensitive than others and the investigation methods chosen must be tailored to each situation.

Companies need to carefully monitor the condition of pipelines used to transport produced brine to storage areas and to distant locations. Sections of pipelines that have become excessively corroded need to be replaced. One company in New York keeps their pipeline oxygen free and cleans it every 2 to 3 weeks with a pig to guard against corrosion. Pigs have rubber cups and scrubber brushes with the same dimensions as the pipeline in order to clean it of built-up depositions and oxygen. Cathodic protection can also be used on

sections of the pipeline. Some pipelines contain flowmeters to detect leaks which automatically close pipeline valves to prevent major spills (Woodward-Clyde Consultants, 1985). It is recommended pipelines crossing roads and streams have thicker walls and concrete coating for added protection. It is also recommended that operator's be required to have a spill contingency plan with an emphasis on freshwater protection in the event a pipeline leak occurs.

Corrosion of storage tanks for brine must also be kept under control by cathodic protection or by the use of corrosion resistant storage tanks. DEC Division of Water has published a report entitled, "Recommended Practices for Underground Storage of Petroleum" which can be applied in part to brine storage. The report explains how cathodic protection can help minimize deterioration and corrosion of a tank which is exposed to corrosive conditions. This is achieved by supplying an electric current to the structure which is greater in strength and opposite in direction to the flow of current which causes corrosion. For example, if steel is exposed to corrosive soil, it would normally emit a current and corrode over time. When a sacrificial anode is connected to the tank electrically (via wires), the anode produces a stronger current that flows to the tank, and the anode, not the tank, corrodes.

Brine storage tanks in New York are generally made of steel, fiberglasslined steel or reinforced fiberglass. Reinforced fiberglass tanks may contain cable wrapped through its side walls to give it strength for holding large quantities of brine. All tanks should be factory tested under pressure to ensure competency. Corrosion on the interior of tanks can be lessened when the tanks are kept filled to capacity which prevents oxygen from entering the tank and reacting with the brine to cause corrosion. Operators in New York who utilize this method claim it is responsible for steel tanks, with a

capacity of 200,000 gallons or more, lasting over 30 years (Marshall, 1985, personal communication #44).

#### K. CONTROLLING THE SHAPE OF THE SALT CAVITY DURING PRODUCTION

It is important to carefully plan the production program for a salt bed in order to guard against potential ground subsidence problems, sink holes and mud boils. The geology of the well location must be studied and carefully analyzed in order to determine what size cavity can be safely developed in a particular area. If the size of the cavity becomes too large or extensive and exceeds the tensile strength of the overlying rocks, ground collapse will occur. (See Figure 13.6). Subsidence can also cause fractures in the overlying strata which may form channels for the movement of brine into ground freshwater supplies. Additionally these fractures can provide channels for the movement of surface waters into salt cavities, causing further solution and subsidence. This creates uncertainty about the future stability of the land and may make it unsafe to build on or use this land for other purposes for some time in the future. There is concern about subsidence from solution mining operations in New York, particularly for shallower salt beds, older brine fields, and areas where the over-burden is structurally weak.

According to the Solution Mining Research Institute, cavities formed in bedded salt, "are frequently extensive in the horizontal dimensions and in mature stages of development are frequently obscured by rubble". The cavity may actually be a fluid filled void in the salt and overlying rock beds, sometimes fully occupied by the insoluble residue and caved material from overlying beds. The cavity may also feather out to nothing in random directions controlled by such variables as dip of confining bed, natural fractures, etc. Sometimes several beds are dissolved in the same system forming stacked cavities.

The shape of the cavity formed from solution mining operations can be

# FIGURE 13.6 SCHEMATIC ILLUSTRATING HOW SUBSIDENCE



(A) Stress Envelope Rising Upwords Caused by Time-dependent Brittle Failure, (B) Chimney Concept of Sinkhole Development.

Reference:

Serata, Shosei, "Utilization of Stress Envelopes in Design of Solution Cavities," <u>Pourth Symposium on Salt</u>, Northern Ohio Geological Society, Inc., Cleveland, Ohio, 1974. predicted and controlled to a certain degree depending on:

- the well casing and tubing arrangement
- injection and withdrawal patterns (production and injection wells can be altered so that a more uniform shape is formed)
- flow rates (volume and rate of injection)
- chemical and physical characteristics of the formation
- height of the water in the cavity
- salt concentration
- salt solubility

In a single well system, the variables will cause either a round or morning glory shaped cavity. The morning glory shape is a cavity with a large unsupported roof. Non-vertical holes, an obstruction or an opening, crack or crevice in the salt can change the shape of the cavity. Certain techniques are available to check the size and shape of a cavity such as sonar tests. Surface reflection seismic profiles can locate the areal extent and depth of underground solution mining cavities. When uncertainty exists, these tests may be employed as another measure to monitor against subsidence or catastrophic collapse.

Several operators in New York voluntarily utilize subsidence monitors for guarding against land collapse. These monuments are built at least 4 feet into the ground with an outer casing to protect against frost heaving. See Figure 13.7 of a subsidence monument employed by Texas Brine Corporation in Dale, New York. These monuments are surveyed periodically to observe changes in elevation. Subsidence is known to have occurred at several of the solution mining sites in New York State. It is recommended that subsidence monitoring be required for all operations and that operations be halted if subsidence occurs which may cause significant adverse environmental impacts.

# **TEXAS BRINE CORPORATION**



#### L. METERING OF SOLUTION MINING PRODUCTION

The metering or measurement of brine produced by solution mining and the maintenance of the records from each cavity or group of cavities is required until wells in the cavities have been abandoned and plugged [ECL 23.0305.9]. These records must be furnished to DEC upon request. The Law states that DEC cannot release these reports for publication or make them available to the general public without the consent of the producer. These requirements of the Oil, Gas and Solution Mining Law should be specified in the regulations.

## M. METHANE GAS

Bedded salt in New York generally contains little gas, although, methane gas has been encountered in the solution mining process by at least one operator in New York (Griffin, 1984, personal communication #30). Accidents have occurred when explosive concentrations of this gas have built up in the sheds protecting the wellhead and pump. These sheds should be vented to help protect against methane build up in areas where it is known to occur. N. BRINE DISPOSAL

The existing oil, gas and solution mining program contains provisions for the proper disposal of production brines. These provisions have more relevance to the oil and gas program than to solution mining.

There is little or no waste generated from the solution mining process itself. Additives are not usually mixed in the fresh water used for solution mining and the salt obtained from New York's salt beds is often 99 percent pure. However, the processes associated with extracting the salt from the brine or the use of the brine for chemical manufacturing produces some waste products. After freshwater has been cycled several times through the solutioning process, some salt impurities such as calcium, magnesium, chlorides and sulfates will accumulate. A SPDES permit must be obtained from the Department to discharge this effluent into surface waters and/or

groundwaters so that safe levels of discharge are maintained. The DEC Division of Water issues these SPDES permits. Solution mining operators in New York must also receive approval from the Department and EPA to dispose of salt impurities (mainly chlorides and sulfates) into inactive solution mining cavities or into a porous formation. The Marcellus Shale can be used as a disposal zone where natural fracturing has created porosity and permeability.

Cargill Salt Company is currently operating one active disposal well for recycled wastewater which is injected into an old salt gallery with the overflow going into the Marcellus formation (see Figure 13.8) (Sevenker, 1984). No sulfate precipitation problems have occurred as yet in the Marcellus formation. The disposal rate is 30 gpm which equates to 43,200 gallons per day or 1,028 barrels a day.

An application for the disposal of brine by subsurface injection must be approved by the Department [6NYCRR 556.5(b)(2)] and EPA. At the same time the application is submitted, the operators of all leases or units offsetting the lease or unit on which the input well is or will be located must also be notified [6NYCRR Part 556.5(b)(2)]. The Department will hold the application for ten days. If neither the Department nor any of offsetting operators express concerns then the application will be approved. If there are concerns, then a public hearing is scheduled [6NYCRR Part 556.5(b)(2)]. It is suggested that the ten day waiting period specified in the regulation be extended to 15 days.

#### O. MONITORING WELLS

Monitoring wells, which are wells drilled into freshwater aquifers solely for observation, may be used to check for the movement of brine from a salt cavity into drinking water supplies. For the most part, monitoring wells have not been required in New York because the existing solution mining

## FIGURE 13.8 CARGILL SALT BRINE WASTEWATER DISPOSAL WELLS



operations are not located near any primary or principal aquifers. In addition, monitoring wells generate the same plugging and abandonment concerns as production wells. However, it might be necessary to require monitoring wells in areas with freshwater or subject to subsidence or catastrophic collapse. The regulations should be revised to specifically state that DEC may require monitoring wells when solution mining operations are adjacent to high yield freshwater aquifers.

#### P. EARTHQUAKES

There has been some research conducted on the possibility of injection from nearby salt mining operations increasing subsurface pore pressures and causing a reactivation of existing faults. The research conducted to date is not altogether conclusive but suggests that zones astride known faults which have been associated with seismic activity in the past should be identified. According to a January 1984 report of the Northeastern U.S. Seismic Network Bulletin No. 30 of Seismicity of the Northeastern United States, there were no earthquake epicenters detected during the period October 1975 to March 1983 in New York's solution mining areas.

## Q. TEMPORARY ABANDONMENTS AND SHUT-INS

When a solution mining well is no longer utilized, it must be permanently plugged and abandoned. There are certain exceptions built into the existing regulations for temporary abandonment or shut-in of oil and gas wells. The existing regulations specify time periods for allowable temporary abandonment and shut-in and procedures to extend these allowable periods should it be necessary. It is recommended that these regulations be revised to include a specific citation to solution mining wells. The oil and gas drilling section has more information about these procedures.

#### R. PERMANENT PLUGGING AND ABANDONMENT

All wells must be permanently plugged and abandoned and have proper surface restoration once they are no longer being used for production or injection and the allowable time periods for a temporary abandonment or shutin have expired. Proper plugging and abandonment of wells is an important step for complete protection of the environment. As with oil and gas wells, plugging responsibilities must be undertaken before a lease is abandoned. It is recommended that it be stated in regulation as it is in the Law that plugging responsibilities for solution mining wells cannot be transferred without the agreement of parties involved and the approval of DEC.

The potential environmental impacts of improperly plugging and abandoning solution mining wells are similar to those for oil and gas wells. However, the absence of oil and gas and the existence of a large subsurface void generate concerns different than those created by unplugged oil and gas wells. Continued entry of freshwater from rain or other forms of precipitation into an unplugged salt cavity could cause further salt dissolution leading to uncontrolled cavity growth. Subsidence and possible groundwater contamination may result, depending on the natural direction of fluid movement and the location of surface recharge areas. Plugging solution mining wells is extremely important in order to halt continued subsurface deterioration. In the extreme case, unplugged wells could make the land unfit for a variety of purposes because of instability and render surface and groundwater supplies unsuitable for drinking, agricultural, recreation, and other uses due to salt contamination.

A large percentage of the solution salt wells developed over the past 100 years have not been properly plugged and abandoned causing serious environmental concerns. In addition, there are approximately ten solution salt wells which cease production annually. These wells must be properly

plugged and abandoned. The Department will agressively pursue operators of these wells to ensure that the wells are properly plugged and abandoned.

Portions of the Department's well plugging and surface restoration requirements are applicable to solution mining. These include the depth of cement around various formations in the wellbore, the location of cement plugs, the treatment of the intervals between cement plugs and materials to replace any casing drawn from a well. Surface restoration requirements contained in the current regulations for oil and gas wells are also used for solution mining wells. These regulations require the owner to fill any pit or other excavation which has been created to facilitate drilling or production of a well. The oil and gas regulations also require operators to make a reasonable effort to smooth the surface adjacent to the well and restore the vegetation so as to place the surface in a condition similar to the adjacent terrain. Surface restoration requirements can be waived if it can be demonstrated that no hazard will result and the landowner has signed the appropriate release. The oil and gas well plugging and abandonment section discusses all of these requirements. It is recommended that the regulations be revised so that the application of these surface restoration requirements to solution mining is cited.

Operators in New York often plug solution salt wells by first placing a bridge plug near the bottom of the wellbore although the current regulations allow a brush bridge plug to still be used. Some sections of the casing may be perforated and squeezed with extra cement as needed. Other operators may only perforate and cement squeeze the casing near the base of the wellbore, around the Marcellus and Oriskany or other similar formations, and from 200' to the surface. The casing is usually cut below plow depth. It is recommended that the plugging requirements proposed for oil and gas wells be applied to solution mining with some modifications to reflect special

conditions presented by solution mining wells such as specifying a cast iron bridge plug or supporting bridge of other approved material be set in the wellbore above the solution cavity prior to plugging the well.

Before plugging operations can begin, operators must first notify DEC and obtain a plugging permit. Under extreme circumstances, an agreement regarding plugging operations may be obtained before an operator plugs a well, followed by required paperwork. A Department representative makes every attempt to attend the plugging operations and/or inspect the plugging job when completed, as for oil and gas wells. It is recommended that the standard notification and plugging permit requirements be incorporated in regulation by a citation to solution mining wells.

Non-routine incidents that may occur during the plugging operations that might affect the health, safety, welfare or property of any person must be reported to DEC in the same fashion as that required for oil and gas wells. It is recommended that the non-routine incident reporting requirement be included in the regulations for solution mining operations.

Within 30 calendar days after the plugging of any well, the owner must file with the Department a plugging report on the form prescribed. This form and the procedures for filing the report are the same as those for oil and gas wells. It is recommended that the regulatory program require operators of solution mining wells who cease operations, submit with their final abandonment report a map of the location and extent of the salt cavities developed. In addition, the location of any subsidence bowls, sink-holes, mud boils or other phenomena created or suspected to have been created as a result of the solution mining operation should be detailed on this map. It is extremely important that this information be detailed so that future uses of the land can be appropriately accommodated.

#### A. INTRODUCTION

The storage of natural gas in underground facilities in New York State is done to meet the cyclic demand for energy by the consumer while providing a continuous market for produced gas. Gas is injected into the storage reservoir during the warmer months when consumer demand is low and it is withdrawn during the peak winter heating season to supplement the existing supply. Figure 14.1 details consumer energy demand on a seasonal basis. Natural gas can be stored in depleted gas reservoirs, aquifers, depleted oil reservoirs, and solution mined salt caverns. Liquefied Petroleum Gas (LPG) is stored by producers to meet fluctuating or variable demand while distributors use storage facilities to supply customers with a constant supply. Largescale consumers of LPG benefit from bulk storage by ensuring themselves of a constant supply during times of shortage. LPG is stored in solution mined salt cavities, conventionally mined caverns in impervious rock, and confined porous reservoirs.

Presently in New York State there are 21 natural gas storage and three LPG storage facilities in operation as shown in Figure 14.2. All of the natural gas storage fields utilize depleted gas reservoirs most commonly found in the Medina and Oriskany sandstones. The oldest natural gas storage facility is the Zoar Field in Erie county which was started in 1916 (Van Tyne and Foster, 1980). Depleted gas fields are the popular choice for storage projects because the reservoir properties that were favorable for production are also favorable for storage. They are in close proximity to existing transportation facilities and most old reservoirs offer a large potential storage volume. Of the three existing LPG storage facilities, two are in abandoned salt cavities. The third and newest project utilizes a mined storage cavern. The following sections detail the underground storage of





natural gas and LPG as it pertains to the environment in terms of the existing and proposed State Regulatory Program.

#### B. STORAGE SITE SELECTION AND FORMATION EVALUATION

#### 1. Depleted Gas Reservoirs

As mentioned previously, all 21 natural gas storage facilities in New York State utilize depleted or partially depleted gas reservoirs. A typical gas storage reservoir is shown in Figure 14.3. Site location is dictated by the existing reservoir location. This usually affords the operator access to transportation facilities as well as any operational or idle wells. The feasibility of the proposed storage site is evaluated using data obtained from previous operations. This data includes gas reservoir volume, initial and current reservoir pressure, aquifer influence, potential operational pressure, and expected gas deliverability.

The geology of the proposed storage area is studied carefully to assess the feasibility of controlled gas storage and withdrawal. The gas reservoir limits are defined including the reservoir boundaries and the trapping mechanism which allowed original gas accumulation. Because of the high cost of initiating a storage project, only larger capacity fields with above average porosity and permeability are considered (Van Tyne and Foster, 1980). For example, Oriskany sandstone reservoirs are well suited for storage because they can be operated at high pressures which allows larger gas input into a fixed volume. They may be drained by fewer wells and have relatively well defined boundaries.

The preliminary testing program for proposed storage in a depleted gas reservoir usually consists of obtaining well head pressures from existing wells. This aids in discerning the reservoir limits as well as defining the current reservoir pressure. Normally, no new wells are drilled during this



phase.

#### 2. Solution Mined Salt Cavities

Two of the three current LPG storage facilities in New York State are in salt cavities created by solution mining operations. The salt is contained in beds which results in an irregular cavity shape as shown in Figure 14.4. See the chapter on solution mining operations for a discussion of this process including the State's Regulatory Program. Site selection of a proposed storage facility depends upon the salt cavity location. Some flexibility does exist as the operator may create a salt cavern in a more desirable location, but the additional expense can be prohibitive.

The salt cavity must be at a depth sufficient enough to balance the vapor pressure of the product being stored (Marks, 1983). This ensures safe operation of the cavity at maximum pressures without the danger of leaks and gas migration out of the structure.

Since the data obtained from previous operations is sufficient for evaluation of the storage cavity, no new wells are drilled during this phase.

## 3. Conventionally Mined Storage Caverns

The newest LPG storage project in New York State is the mined storage cavern at Watkins Glen operated by Texas Eastern Products Pipeline Company. This facility became operational in 1984. Since the ideal cavern storage rock is an impervious granite, shale, or a deep salt bed with no permeability, a storage site is chosen based on the existence of these formations. Figure 14.5 is a cross-section of typical mined storage cavern. Specifically, the potential cavern formation must be at a sufficient depth to control the vapor pressure of the stored substance, it must be areally extensive so as to allow storage of commercial quantities of product, and it must be almost homogeneous with no secondary permeability or communicating fractures (Marks, 1983).

In order to adequately assess the potential storage rock, test wells are

FIGURE 14.4 CROSS SECTION OF A SALT CAVITY



# FIGURE 14.5 CROSS SECTION OF A MINED STORAGE CAVERN



drilled and conventional core samples are recovered from the storage rock and the surrounding formation. If the cavern proves favorable for storage, these wells will either be converted for injection/withdrawal or pressure monitoring or they will be plugged and abandoned. Current State regulations require that a permit must be obtained from the Department of Environmental Conservation before a well can be drilled, deepened, plugged back, or converted for the purpose of oil and gas production, input, storage or disposal [6NYCRR Part 552.2].

Since there are currently no State laws or regulations governing the drilling and abandonment practices associated with test wells, it is suggested that the new regulatory program contain provisions for including this type of well in the permitting process. A test well category will be added to the existing DEC permit application form to coincide with the new test well regulations. Proposed test well drilling would then fall under the DEC review process which would ensure that the State's approved drilling and abandonment practices are followed. See the section of the text entitled, New York State's Oil, Gas and Solution Mining Regulatory Program for more details concerning the permit application, permit fees, financial security, and the DEC review process.

The formation sample obtained during the coring process is then tested to determine its storage feasibility. Data are reviewed and correlated from several test wells. The testing program usually consists of the following:

a. Immersion tests - core material from the proposed storage formation is submerged in a sample of the gas or LPG storage product as well as a sample of water. After five days, the core material is inspected for any deterioration. If some breakdown or change in the core rock is observed, the formation would not be recommended for
storage.

- b. Rock Quality Designation (RQD) This method is used to determine the overall integrity of the formation. Core recovery is the amount of cored rock that is physically recovered from the formation as a percentage of the interval that was actually cored. RQD is a modified core recovery percentage in which only those pieces of solid, unfractured core over four inches long are counted as recovery. Zones of core loss, highly weathered sections, and short pieces caused by shearing, jointing, or faulting are not counted because they reflect adverse rock properties.
- c. Visual inspection of the core material for secondary permeability such as interconnected natural fractures.
- d. Determination of the rock's horizontal permeability to the stored substance, it's effective porosity, and it's unconfined compressive strength.
- e. Injection Testing usually done to evaluate fractures in the formation rock. The test consists of observing the water lost to the formation from a static water column in the test well bore.

The next step in the site formation evaluation process for all types of storage situations involves assessing the earthquake potential of the proposed storage area. Damage to cemented casing, tubing and wellhead equipment caused by ground motion could lead to potentially dangerous gas leakage. A large enough earthquake could conceivably cause enough damage to an underground storage cavern to place offset mining operations in jeopardy. If migration should occur, there is a danger of miner asphyxiation, mine explosions, or escape of gas into the atmosphere. The following section dealing with storage permit procedures will address offset operations and their implications in more detail.

Fortunately, earthquakes severe enough to cause damage are very rare in New York State. Nevertheless, it is suggested that operators be required to address the potential earthquake dangers associated with their particular storage situation in the environmental assessment made prior to approval of a new storage field. This should include a review of earthquake incidences in the storage area noting any surface or sub-surface damage. The potential earthquake risk and potential dangers should be detailed along with mitigation plans.

An underground storage feasibility report is usually prepared at this stage which summarizes the findings obtained during the testing and evaluation of the proposed storage project. This report is then submitted to the DEC in order to start the permitting process for the storage facility.

#### C. APPLYING FOR AN UNDERGROUND STORAGE PERMIT

Significant amendments were made to the Oil, Gas and Solution Mining Laws in 1981 concerning the underground storage of gas. The new regulations will reflect these changes to the law. The procedures for obtaining an underground storage permit state that no underground reservoir shall be devoted to the storage of gas, or liquefied petroleum gas unless the prospective operator of such storage reservoir shall have received from the Department, after approval in writing of the State Geologist, an underground storage permit which shall be in full force [ECL 23-1301.1]. The permit application is required to include the following:

- A map showing the location and boundaries of the proposed underground storage reservoir.
- A report containing sufficient data to show that the reservoir is adaptable for storage purposes.
- 3. An affidavit signed by the operator to the effect that he has

acquired by grant, lease or other agreement at least 75 percent of the storage rights in said reservior and in the buffer zone established to protect the reservior as approved by the Department, calculated on the basis of surface acreage; and such affidavit shall also set forth that the applicant will agree as a condition to the issuance of such permit that it will thereafter within a reasonable time either acquire by negotiation, or file and proceed with condemnation proceedings to acquire, any outstanding storage rights in the remaining reservoir and buffer zone acreage.

4. Such other information as the Department may require.

The operator will have previously filed an application with the Federal Energy Regulatory Commission for a certificate of public convenience and necessity pursuant to Section 7(c) of the Natural Gas Act. This certificate authorizes the operator to construct and operate certain facilities fc<sup>-</sup> the storage of natural gas or LPG. A site specific EIS is also submitted L FERC at this time. More information on federal regulation of gas storage projects can be found in the appendix. State law requires that buffer zone acreage be acquired along with that needed for storage purposes because the exact limits of any reservoir cannot be precisely defined. Therefore, a transition zone is needed to protect the reservoir from offset operators and vice-versa. The Oil, Gas and Solution Mining Law has been amended to state that the buffer zone is that area outside and surrounding the underground gas storage reservoir which the Department approves as appropriate to protect the integrity of the reservoir, no part of which shall be more than 3,500 linear feet from the boundary thereof [ECL 23-0101.1]. The new regulations will incorporate this amendment.

The boundaries of a gas storage reservoir are estimated using volumetric calculations, subsurface geologic studies, and by correlating wellhead

pressures from wells throughout the field. Since the approximate storage pressure of the reservoir is known from gas production histories, pressures at wells significantly below that level would indicate the outer limits of the reservoir. The buffer zone regulation for a gas storage reservior is similar to a spacing order for an oil and gas well. By identifying and leasing storage rights to a buffer zone, the operator has some protection from gas operations on offsetting leases. Some gas storage reservoirs are in blanket sands such as the Medina which are relatively continuous with little structural control. Offset gas operations could conceivably deplete a storage reservoir in such a sand very easily if no buffer zone were required.

The buffer zone requirement does not have quite the same application to storage in abandoned salt cavities or mined caverns. Wells offsetting a salt cavity or a mined cavern would not be completed in the storage formation due to lack of virgin gas in a salt bed or an impervious shale or granite. There are, however, some dangers associated with offset underground mining operations. Underground blasting may cause fractures in the storage cavern or cap rock allowing gas leakage to the surface, water table, or into the mine creating a dangerous, toxic situation. The DEC requires that operators give notice to persons engaged in underground mining operations of the commencement of any phase of oil or gas well operations which may affect the safety of such underground mining operations [ECL 23-0305.8(j)]. Due to the site specific nature of storage operations, the distance from underground mining operations within which notification will be required will be established via permit conditions. This requirement will apply to all operations associated with underground storage in abandoned salt cavities and mined caverns.

The November 1981, Oil, Gas and Solution Mining Legislation specifies

requirements and procedures for acquiring storage leases. As mentioned previously, the operator must submit an affidavit when applying for a storage permit that attests to the acquisition of at least 75 percent of the storage rights in the reservior and buffer zone. This requirement ensures safe, efficient operation of the storage facility. The operator then has up to two years after the first injection of gas to secure the remaining twenty-five percent storage rights [ECL 23-1303.3].

This seventy-five/twenty-five percent acquisition law was structured as such by the State so that storage facilities could be brought on line relatively fast in times of projected gas supply shortages. By needing only seventy-five percent of the storage rights initially, the operator is not delayed by lease acquisitions and can therefore concentrate on bringing the facility on stream. If the remaining twenty-five percent storage rights necessary for activation, operation, or protection of the storage reservoir and its buffer zone cannot be acquired after reasonable effort within the aforementioned two year period, the operator has the power to secure such rights under the applicable provisions of the eminent domain procedure law [ECL 23-1301.1]. Before filing a suit for acquisition proceedings, the operator is required to file a map with the Department detailing the location, boundaries, and surface acreage of the reservoir and buffer zone [ECL 23-1303.2].

The powers of eminent domain are granted in the case of underground storage so that the needs of the State's energy consumers can be met. When shortages arise due to excessive energy demand during the winter heating season, the ability to augment supplies of natural gas or LPG from underground storage facilities is vital to the State. These laws ensure that a storage facility deemed structurally and operationally safe by the Department will be installed without delay so as to better serve the public.

Prior to enacting acquisition proceedings against landowners, every attempt is made to lease storage rights by negotiation or voluntary agreement. The Department may grant extensions to the two year lease requirement for additional negotiations, if necessary. In addition to the storage value of any property being leased, the value of any commercially recoverable native oil and gas in place must also be considered [ECL 23-1303.5]. This provision also holds true for salt rights.

The Department's underground storage permit application review process is initiated upon receiving the previously discussed maps, reports, affidavit, and other data from the proposed storage project operator. An application fee of ten thousand dollars for a new underground storage project or five thousand dollars for a modification of an existing storage facility is required with the permit application [ECL 23-1301.5(a)(b)]. A modification to an existing storage project would be an expansion of the boundaries of the storage reservoir or an increase in the maximum storage pressure. It is suggested that this definition of a storage project modification be specified in regulation.

As detailed previously, the Oil, Gas and Solution Mining Law requires the operator to submit a map, a reservoir report, a leasing affidavit, and any other project specific information. This technical data is used by the Department to assess the feasibility and environmental compatability of the proposed storage project.

It is suggested that the new regulations specify that the following information be submitted when applying for a storage permit:

 Project location information including the county and town, the field or pool name, and a map detailing the boundaries of the reservoir and buffer zone.

- 2. A geologic description of the reservoir. This should include the type of formation, its porosity and permeability, the geologic trap, and the original saturations.
- 3. The controlling factors on the lateral extent of the reservoir.
- 4. A brief history of the development of the reservoir. This should include estimates of the original gas in place, historic production, and remaining native gas.
- 5. The original reservoir pressure of the reservoir and the expected maximum operating storage pressure.
- Estimates of cushion gas and working gas volumes and expected well and field deliverabilities.
- Compressor Requirements the number of compressors needed, their total horsepower, and a location map.
- 8. Other data that may be required by the Department

The technical information submitted should also contain well status reports and the lease acquisition affidavit attesting to the operator having secured storage rights for at least seventy-five percent of the reservoir and buffer zone. As mentioned previously, the technical information is reviewed by the State Geologist who then submits to the Department his/her approval in writing. Offsetting oil and gas activity is also reviewed at this time in order to assess the storage project's impact on offsetting operations or vice versa. A copy of the EIS submitted to FERC will also be required when applying for a state storage permit. A major modification to an existing project will require a SEQR determination and a supplemental EIS may have to be prepared.

A precise well status report is presently not required by the Department but some type of well information is usually solicited from the operator during the review period. As part of the new permit application process, a

detailed well review will be required. The following information should be contained in the well report:

- All wells (including API number and operator) within the reservoir, buffer zone, and surrounding acreage as deemed appropriate by the Department. A map showing these locations should also be submitted.
- A breakdown of the wells by operational status such as active, idled, or abandoned.
- A detailed history of each well including the condition of casing and tubulars, the well's workover record, and all well logs.
- 4. Wellhead pressure history for all wells.
- 5. The planned disposition of any test wells drilled for the purpose of evaluating the project's feasibility. A permit must be obtained from the Department for conversion of any oil and gas well [6 NYCRR Part 552.2].
- 6. Any other information as required.

In the case of storage in depleted reservoirs, the competency of the formation and its structure are usually well known. However, such fields are likely to have many wells drilled either to or through the reservoir under consideration and the field may also be bordered by several abandoned wells. An up-to-date, complete well assessment record is essential for the Department to determine the operational feasibility of the proposed storage project. Improperly abandoned wells or wells with corroded or collapsed casing could allow gas migration to the water table or the surface. Corroded casings may need to be lined or permanently plugged. Incorrectly abandoned wells should be reopened and properly cemented. The State must obtain positive assurance that all wells are or can be made mechanically tight.

The underground storage permit shall be granted within ninety days of

application unless the Department finds that the application and the information submitted with it do not meet the aforementioned requirements. The Department may revoke or suspend any storage permit for failure to comply with any of its provisions [ECL 23-1301.2]. The laws and the proposed regulations as previously discussed concerning permitting, shall not apply to underground storage projects placed in operation prior to October 1, 1963 and so long as such operation is not abandoned [ECL 23-1301.3]. No permit issued by the Department shall be construed to diminish or impair the jurisdiction of the Public Service Commission with respect to regulation of the manufacture, transportation, distribution or sale of gas [ECL 23-1301.3].

The Department also requires that every operator file an annual report detailing the status of the storage project. This report should highlight any change in the size or shape of the reservoir and buffer zone (in terms of surface acreage), the total capacity and working capacity of the reservoir, and any other engineering, geological, or operational data that may be requested by the Department [ECL 23-1301.4]. This last item will include updates to the data presented in the technical information section of the proposed permit application form. The yearly operations reports are reviewed and compared with previous years' data in order to assess the efficiency, operational stability, and environmental soundness of the storage project.

The main concerns of the Department are the controlled confinement and the safe injection and withdrawal of the natural gas or LPG. Over-injection of product could cause erratic increases in the reservoir or buffer zone boundaries while a sudden decrease in the reservoir storage pressure would most likely be due to a leak of some kind. Both situations would require immediate action to protect the environment as well as the safety and the rights of offset landowners.

#### D. CONSTRUCTION OF THE STORAGE SITE AND ACCESS ROADS

The size of underground gas storage reservoirs in New York State ranges from 280 acres to 10,800 acres but the surface area disturbed during site construction rarely exceeds 80 acres. Most of the disturbed acreage is located in a central area where the compressors and distribution system are situated along with one or more injection/withdrawal wells. Access roads and the remaining well sites make up the balance of the overall storage site.

For underground storage in depleted gas reservoirs or abandoned salt cavities, the majority of the well sites and access roads are already in place due to previous operations. The siting and construction requirements for access roads and well sites for new wells and for the central area are the same as for conventional oil and gas wells. Refer to the section of the text pertaining to the siting of oil and gas wells under New York State's Oil, Gas and Solution Mining Regulatory Program.

Access roads and the central site have to be scrutinized more closely when pertaining to underground storage in a mined cavern. The conventional mining of a storage cavern large enough for commercial storage of product creates vast quantities of waste rock that must be disposed. It can be stored at the site and reclaimed or it can be transported to an approved disposal site. On-site disposal and reclamation will necessitate the disturbance of a larger land area while the transportation of mined debris will require that access roads be more rigorously designed. This situation will be explained in more detail in the following sections, including the proposed State regulations and mitigation techniques.

#### E. DRILLING OF A MINED CAVERN MAIN SHAFT AND AUXILIARY WELLS

Although it offers a more efficient, easily controlled and monitored storage environment, a gas or LPG mined storage cavern nevertheless must be carved out of solid rock at depths usually greater than 400 feet. To

accomplish this, a central mining shaft measuring between eight and nine feet in diameter is drilled and cased to the top of the storage formation. After the casing cement has set (usually 48 to 72 hours), drilling is resumed down through the interval to be excavated. This main shaft is then used for transporting personnel and equipment underground and for removing the excavated rock (Fenix and Scisson).

The potential environmental impacts associated with the drilling and completion of this large diameter shaft are only slightly different than those for regular oil and gas wells. This stems from the use of mud during drilling operations which acts as a lubricant for the drill bits and drill pipe. It also brings rock cuttings to the surface as they are broken away by the drill bit. Since almost all wells in New York State are drilled with air rather than a lubricating substance such as mud, the current regulations do not provide direction for its removal and disposal. The drilling mud is usually a water-based clay mixture which is not hazardous to the environment. The mud may become polluted during drilling operations by contacting salt water bearing formations or by the addition of chemicals which are used to control the drilling process. Since the main shaft is relatively shallow and it does not penetrate any oil or gas formation, the mud system should remain relatively clean and non-hazardous.

It is suggested that the ingredients of the mud system and the proposed disposal method be included in the feasibility report submitted to the DEC with the underground storage permit application form. After assessing the impact of the drilling mud on the environment, the Department will then issue a disposal plan to the operator. If the mud is determined to be clean and non-hazardous then disposal can be accomplished by spreading and tilling the mud into the soil. A hazardous mud will have to be transported to an approved

waste site.

Several one foot diameter auxiliary shafts are also drilled to provide ventilation during mining operations. These shafts are usually converted for injection/withdrawal or pressure monitoring after the cavern is completed. The proposed procedures for drilling and completing these shafts are evaluated by the Department during the review of the storage permit application. This ensures that safe and environmentally sound drilling and completion practices are followed. A permit is required for the conversion of these ventilation shafts to injection/withdrawal wells [6NYCRR 552.2].

Excavation of the cavern can usually begin after the main shaft and ventilation shafts are in place.

#### F. EXCAVATION OF A MINED STORAGE CAVERN

Most storage caverns are mined in sections using the highly developed "room and pillar" method (Marks, 1983). Work progresses by drilling and blasting horizontal tunnels into the rock and then benching downward. By utilizing only 50 percent of the rock in place for permanent roof support, this technique allows for maximum storage per acre (Fenix and Scisson). The LPG storage capacity of the Texas Eastern products Pipeline Company's Facility at Watkins Glen, New York is the State's largest at approximately 50.6 million gallons (NYSDEC, DMN, 1986).

The rock debris created by the mining process is transported to the surface for disposal via the main shaft. The environmentally sound treatment and disposal of this waste rock is a primary concern of the Department. The mined material can be disposed of on-site thus creating a waste rock area, it can be transported off-site for disposal at a waste facility, or it can be sold as aggregate or fill.

#### 1. On-Site Disposal Of Mined Material

The size of the waste rock site at the storage facility depends on the volume

of the cavern being excavated. Waste rock sizes within the pile range from very fine particles to rock fragments greater than twelve inches in diameter. The permeability of the waste rock pile will be high immediately following completion but will decrease over time as fines migrate and plug the voids between rock fragments. The potential environmental hazards associated with the waste site stem from the flow of water through the rock pile which transports sediment to surrounding lowlands and streams. The effects of sediment runoff are detailed in the Siting of Oil and Gas Wells section.

Usually run-off contact with the waste rock is minimal and limited to rock at the periphery of the pile. The sediment loads from the waste rock site will be high for the first few years but are expected to lessen as settling occurs and as the pile becomes vegetated. To accelerate reclamation where appropriate, seeding and/or mulching of the waste rock pile in conjunction with the application of lime or fertilizer will be required via permit conditions.

The excavated rock will also cause increased dust emissions. The intensity of this air disturbance will depend on the time of year, the type and amount of excavated material, and the control measures used. Normally, impacts from dust are localized and of short duration. Mitigation techniques such as water spreading on the rock pile will be required should the dust become excessive.

#### 2. Off-Site Disposal Of Mined Material

Disposal of waste rock at an off-site facility will result in increased traffic on local routes and access roads for the duration of the excavation period. Regular servicing of the storage site during operation will also lead to higher than normal traffic levels. Surface requirements for the access roads should therefore be upgraded to handle the increased loads.

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Increased impacts from noise, exhaust, and dust emissions are associated with the increased traffic. The impact from noise is dependent upon public exposure to the routes as well as the proximity of the site to the wildlife population. Noise levels will be monitored and any reports of excessive or disturbing noise will be handled expeditiously by the Department. Exhaust impacts will be discussed with the installation of compressor stations in a later section.

Additional environmental impacts are associated with the possible use of generators at the site to provide illumination and power to the mined cavern. The temporary increases in noise and exhaust emissions could be of sufficient volume to warrant specific mitigation measures. Refueling of generators (if gas or diesel fired), transport vehicles, and heavy equipment and discharge of crankcase oil and other lubricants at the site does impose potential environmental and safety hazards. Leaks of liquid fuel from on-site storage tanks could contaminate local habitat and water supplies. The potential also exists for explosions and fires which would endanger wildlife and workers. There are State and EPA regulations governing the stationary storage of fuel if the tank is 1,000 gallons or more, while transporting the fuel is regulated by the Department of Transportation. There are no requirements if storage is less than 1,000 gallons. Site specific pollution problems will be mitigated via storage permit conditions and inspections.

Once the cavern is completed and the mined material has been disposed, a final testing program is implemented consisting of a cavern pressure test using compressed air to test the integrity of the cavern. The compressed air is injected into the cavern until a pre-specified test pressure is reached. The cavern is then shut in and allowed to stabilize for 24 to 48 hours. Pressure readings are then collected hourly to determine if the cavern is tight. The resulting pressure history is evaluated in terms of incremental

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pressure changes and final cavern stabilized pressure. If these values do not conform to tolerance levels, then the cavern is re-entered and inspected to determine if remedial work is warranted. After cavern testing is completed, the site is readied for the installation of permanent storage operation equipment. Normally, ventilation shafts are converted for injection/withdrawal but sometimes new wells must be drilled. The following sections detail the drilling of wells and the installation of compressor stations in preparation for actual storage operations.

#### G. DRILLING OF STORAGE WELLS

The number of wells needed for storage depends on whether the storage reservoir is a mined cavern, an abandoned salt cavity, or a depleted gas sand. Natural gas or LPG storage wells are used for injection, withdrawal, and reservoir pressure monitoring and maintenance.

Storage in depleted gas fields will utilize a larger number of wells than storage in a salt cavity or mined cavern. Depleted gas sands such as those in the Medina Group are blanket-type sands that are areally extensive with dynamic boundaries that must be constantly monitored. Gas injection and withdrawal is done at several points within the reservoir to ensure maximum utilization of the sand. The boundaries of a salt cavity or mined cavern remain fixed and the open void volume of a cavity or cavern usually only requires one or two injection/withdrawal points.

The optimum number of wells required for successful storage operations in a depleted gas sand is determined during the reservoir evaluation phase as previously discussed. Idled wells from previous operations are usually converted for storage use when feasible. These wells must be mechanically tight with adequately cemented casing and sound wellhead equipment. The aforementioned storage permit application will include an existing well report

so that the Department can review the condition of these wells. In most cases, new storage wells are drilled in conjunction with the conversion of several existing wells. A permit must be obtained from the Department for any new wells or well conversions [6NYCRR 552.2(a)].

In 1985 there were 841 operating gas storage wells in New York State. Seven hundred forty-nine wells were used for input and withdrawal of gas while the remainder were used for observation and pressure maintenance (NYSDEC, DMN, 1986). The number of wells needed for injection and withdrawal is dependent upon the working pressure of the reservoir and the desired deliverability rate. These topics will be discussed in more detail in upcoming sections.

Storage projects in abandoned salt cavities also utilize wells remaining from previous operations if they can be made mechanically sound. Since leftover wells from solution mining operations are usually few in number, additional wells are drilled to meet the gas deliverability obligations of the storage facility. There are currently nine operational wells for storage of LPG in abandoned salt cavities in New York State (NYSDEC, DMN, 1986).

For mined storage caverns, the major factor in determining the number of wells needed is the desired gas deliverability rate. Numerous reservoir pressure observation wells, common to depleted gas sand storage projects, are not required because of the fixed storage volume of the cavern. Three to four injection/withdrawal wells and possibly one observation well are normally all that is required. Cavern storage wells are prepared for injection/withdrawal in some cases by converting existing mine ventilation shafts and test wells. A new permit must be obtained from the Department for conversion of these wells for injection/withdrawal purposes [6NYCRR 552.2(a)].

Once the storage wells are in place and completed, the facility is readied for gas or LPG injection by installing the compressors and the distribution system. There are presently four operational wells used for LPG

storage in mined caverns in New York State.

#### H. INSTALLATION AND OPERATION OF COMPRESSOR STATIONS

Compressors are needed for storage operations because a) storage in depleted gas fields is conducted at pressures approaching original formation pressure and b) gas may need to be compressed for transmission in high pressure transmission lines. The bank of compressors or compressor station is usually centrally located at the site within close proximity to the gas transmission system.

The number of compressors needed for the particular storage operation is determined during the reservoir evaluation phase prior to applying for an underground storage permit. Total horsepower requirements are estimated by determining the approximate horsepower needed to inject and withdraw gas at maximum rates given the pressure of the reservoir, the number of injection/withdrawal wells, and the desired deliverability rates. The number of compressors needed to supply the calculated horsepower is then installed. The reciprocating compressor is most commonly used in the gas industry because it is designed for a wide range of pressures and capacities. Centrifugal compressors are also commonly used although they do not have high pressure capabilities. In New York, most compressors are driven by natural gas engines.

There are several environmental concerns associated with compressor installation and operation. Transporting and installing the compressors at the central site will cause only temporary visual and noise disturbances. More long term impacts will occur however, from the operation and maintenance of the compressors. The storage requirements of the reservoir will dictate the size and number of compressors needed which in turn will determine the degree of the site's environmental compatability. The bank of compressors is usually

situated on an acre or more of land which has been graded and surfaced. Various utility tie-ins, control panels and outbuildings are located at the site which also serves as the connection point for the wellhead distribution system and the gas transmission lines.

The appearance of the storage facility is considered part of its environmental impact because of the high aesthetic value of the State's natural resources. The most visually affected areas would be those containing population centers, historic landmarks, state parks, or declared conservation areas.

Due to the site specific nature of visual impacts, provisions for diminishing significant visual impacts associated with compressor location will be recommended as conditions to the storage permit. Visual screens colored so as to blend with the surroundings may be installed around the perimeter of the site. Locating the compressors amid trees and shrubs would also reduce their unsightliness. When existing vegetation is sparse, new vegetation could be planted around the site.

The environmental impacts on air quality from exhaust emissions due to compressor operation can be estimated based upon the type of equipment used, the hours of operation, and the air conditions. Degradation of the air quality is not a primary concern however, because of the relatively small amount of emissions associated with construction and operation of underground gas storage facilities.

The impacts from the noise generated by the bank of compressors is dependent upon public exposure to the storage site. The size of the land area, the distance to the nearest resident, the prevailing winds, and other factors must be considered. Storage permit conditions will specify when muffler devices for the compressor exhaust will be required to minimize the noise from the compressor site. Screens or vegetation may also be installed

#### at the site to offer some degree of sound reducing capability.

The overall environmental impact from installation and operation of a storage facillity compressor station will be assessed for each individual site during the storage permit application review period.

#### I. OPERATION OF THE STORAGE FACILILTY

After the wells have been drilled and the compressors installed, the storage facility is ready to be brought on-stream. As mentioned previously, gas or LPG is injected during the summer months when consumer demand is low and it is withdrawn during the peak demand winter heating season. The storage field must be able to deliver the peak gas volumes on a daily basis while providing the seasonal volume necessary to supplement the existing winter supply. Since gas is injected and withdrawn on a cyclic schedule, reservoir pressure is controlled within an operating range which is dependent upon the type of reservoir and its depth. The storage cycle pressure range is based upon the safe upper limit of pressure, the flow capacity of the wells, and the compressor requirements for gas injection and withdrawal.

#### 1. Depleted Gas Reservoirs

a. <u>Reservoir Pressure</u> - For depleted gas reservoirs, the upper limit of storage pressure is related to the reservoir discovery pressure which is usually in the range of 0.43 to 0.52 psi/ft. of depth (Ikoku, 1980). The maximum storage capacity and deliverability can be increased by operating the storage facility at pressure levels above the discovery pressure. Since pressures approaching 1.0 to 1.2 psi/ft. of depth could fracture through confining beds and lead to uncontrolled migration of fluids through the porous rocks, the maximum pressure rarely exceeds 0.65 psi/ft. of depth with good caprocks although 0.70 psi/ft. of depth has been used safely in the field (Ikoku, 1980). The lower pressure limit is usually set high enough to

overcome water intrusion at lower pressures while maintaining sufficient flow capacity for the wells.

The following table details the pressure characteristics for the Medina and Oriskany Sandstone reservoirs that comprise 19 of the State's 21 gas storage fields.

	Medina	Oriskany
Average Depth (ft)	2,423	4,551
Average Discovery Pressure (psig)	820	2,002
Gradient (psi/ft)	0.34	0.44
Maximum Operating Pressure (psig)	779	2,012
Gradient (psi/ft)	0.32	0.44
1985 Maximum Average Operating Pressure (psig)	724	1,729
Gradient (psi/ft)	0.30	0.38

Gas storage operators have fixed their maximum storage reservoir pressure at or near the average discovery pressure for Medina and Oriskany reservoirs. The actual field-wide operating pressure will vary during the year as gas is injected and withdrawn. Pressure surveys taken in the fall will reflect maximum conditions because of the injection of gas during the summer. Springtime surveys will reveal low pressure due to gas withdrawal for the winter heating season. The maximum average operating pressure gradient as reported in 1985 for the Medina and Oriskany was approximately 0.30 psi/ft. and 0.38 psi/ft., respectively.

b. <u>Segments of a Gas Storage Reservoir</u> - Most natural gas storage reservoirs can be divided into four basic segments as detailed in Figure 14.6. Cushion gas is a gas reserve which is required to maintain reservoir pressure at a base level to provide adequate gas deliverability rates throughout the withdrawal season. The total cushion gas volume is comprised of injected gas from external sources and native gas that was in place at initiation of storage operations. Cushion gas is also known as base gas and is part of capital investment (Ikoku, 1980). It is normally held permanent within the reservoir and is not available for delivery. In times of energy emergency

### FIGURE 14.6 SEGMENTS OF A GAS STORAGE RESERVOIR

T = TOTAL RESERVOR CAPACITY TVS = TOTAL VOLUME OF GAS IN STORAGE RESERVOR SG = STORED GAS (excludes all notive gas) C = CUSHION GAS



however, portions of the cushion gas may be withdrawn. From 20 to 75 percent of the cushion gas will be recovered at abandonment of the facility, depending upon reservoir heterogeneity (Ikoku, 1980).

The gas that is injected and withdrawn seasonally is called working gas. Also known as top or circulating gas, it is that portion of the total storage gas that is available for delivery.

The unused capacity is that portion of the reservoir presently underutilized but available for additional storage. It is mainly a function of operating pressure although the reservoir characteristics of the storage formation will also dictate ultimate gas storage volumes.

From an economic standpoint, it is desirable to have as much working gas capacity as possible in the storage reservoir for delivery to the consumer. The volume of working gas will be limited, however, by the amount of cushion gas needed to maintain the pressures required for adequate gas deliverability during peak demand periods. The following table shows the volumes and percentages of working gas, cushion gas, and unused capacity for the 21 natural gas storage projects in New York State (as of 12/31/85) (NYSDEC, DMN, 1986).

	Totals (MMCF)	Percent
Cushion Gas	85,403	48.4
Working Gas	53,072	30.1
Unused Capacity	38,080	21.5
Total	176,555	100.0

c. <u>Operation of a Gas Storage Reservoir</u> - The overall operation of a natural gas storage facility is dependent upon two critical factors - the total volume of gas that will be required during the peak demand heating season and the daily delivery rates for that volume. The seasonal fluctuations in gas demand stem from the two-part gas requirements of the domestic gas consumer. The fixed load gas is that volume needed to run

appliances, water heaters, clothes dryers, etc. This load remains fairly constant throughout the year. The space heating gas is that used in furnaces, heating stoves, etc. This load fluctuates tremendously thus requiring a backup supply system such as that offered by underground gas storage (Borland, 1957).

The space heating gas demand is determined by the utilities by studying gas consumption in relation to U.S. Weather Bureau reports of the market area. The average domestic gas consumer starts to use gas for space heating purposes when the average daily temperature drops below 65°F (Borland, 1957). Each degree below 65°F in the average daily temperature is called a degree day deficiency. An average daily temperature of 60°F would result in 5 degree day deficiencies.

Studies of past year's gas consumption yield an average consumer gas requirement expressed in terms of cubic feet of gas per day for every degree below 65°F. This value is multiplied by the number of degree day deficiencies in an average winter and the number of gas consumers to determine the total space heating load requirement for a particular market area. There is a variation of about 20 percent from the average figure for gas requirements during extremely cold or warm winters. The peak gas demand on a daily basis is calculated in the same manner from the degree day deficiency of the coldest days during the winter. These estimates are then made availabe to the wholesale gas suppliers so that they can determine optimum gas storage volumes and peak supply rates (Borland, 1957).

Given the peak market demand from storage on a seasonal and daily basis, the total well and compression requirements are determined for minimum investment and operating expense (Katz, et. al., 1958). Enough injection and withdrawal wells are drilled to provide the needed flow capacity from the field.

During the gas withdrawal season, a storage field often produces a volume of gas equal to approximately one-half of its initial content in only three to four months. Because rapid decreases in reservoir pressures will occur, shutin pressure observation wells which reflect the pressure in the bulk of the reservoir are required to ensure safe and efficient operation of the reservoir. These pressure monitoring and observation wells are located throughout the storage reservoir to better represent field-wide pressure conditions. Specific observation wells are also located near the boundaries of the storage reservoir or near any area where pressure fluctuations and/or gas migration may occur.

The monitoring wells are usually converted from old gas wells but new wells will usually be required for specific observation purposes as detailed above. By monitoring and gathering storage reservoir pressures on a routine basis, estimates of the gas volume in storage can be made. For volumetric gas reservoirs with no water encroachment and negligible water production, the relationship between gas production and reservoir pressure can be expressed as a straight line as shown by the following graph.



P = reservoir pressure (psig)
Z = gas compressibility factor @ pressure P
Gp = cumulative gas production (MMSCF)

This relationship can be used to determine the behavior of a gas storage reservoir by plotting storage reservoir pressure versus gas volume in storage. First, the theoretical performance line must be constructed which is based on the maximum and minimum operating conditions of the reservoir. Prior to initiation of storage operations, the reservoir is in a depleted state with an unrecoverable amount of gas in place at a specific pressure. Cushion and working gas are then injected until the reservior reaches its storage capacity with a corresponding peak static reservoir pressure. If volumetric reservoir behavior is assumed, a straight line between these two points will yield the storage reservoir's pressure/volume relationship. The following graph details these points.



P = reservoir pressure (psig) Z = gas compressibility factor @ pressure P Gs = gas volume in storage (MMSCF) b = base, or depleted reservoir conditions Note: Expanded definitions and additional theory are included in the appendix.

At Pt. 1, Gs is given by the base gas (Gb) at pressure Pb. At Pt. 2, Gs is the base gas plus the added cushion and working gas which corresponds to a maximum static pressure. During the course of storage operations, fixed amounts of gas are injected to and withdrawn from the working volume. Plotting the pressures associated with the changes in volume should yield estimates of reservior storage behavior. Gas losses from the storage reservior are indicated when the storage pressure term (P/Z) falls below the volumetric line after a given amount of gas is injected or withdrawn from storage. An estimate of the amount of gas "lost" from the reservoir can be estimated from the performance graph as illustrated below.



For the case of gas storage in the presence of a strong water drive, the encroaching water will diminish the amount of reservoir pore volume available for storage. This in turn causes the storage pressure to remain falsely high for a given volume of gas in storage. The theoretical pressure/volume equations and the calculation procedures for storage in a water drive reservoir are similar to those for dry storage reservoirs except that water production and water influx are accounted for. This discussion concerning the monitoring of gas storage volumes is based on the technical report included in the appendix. More precise definition of the equations and calculations involving gas storage can be found in this report.

These calculations are not intended to pinpoint the gas losses from the reservoir but rather to qualify the storage project in terms of efficiency and environmental safety. Inefficient storage operation will result in lost

revenue for the operator and decreased taxes to the State. Losses may also be significant enough to limit the gas supply during peak demand conditions. In addition, the environmental problems associated with unchecked gas migration can be better defined and mitigated by identifying problem storage projects.

#### 2. Mined Caverns And Abandoned Salt Cavities

Storage pressure requirements are somewhat different for mined caverns and salt cavities than for depleted gas reservoirs. Presently, caverns and cavities are used exclusively for LPG storage in New York State, although Brooklyn Union Gas Company is considering a natural gas storage cavern project in New York City. The absolute minimum reservoir pressure must be sufficient enough to overcome the vapor pressure of the product. At lower pressures, vapors would accumulate in the reservoir which would then be compressed as more product were added. If the temperature of these compressed vapors was to increase, a dangerous situation could arise. Caverns and cavities selected for storage operation are therefore usually at a depth great enough to offset the stored product's vapor pressure based on a gradient of .43 psi/ft., of depth.

Since the reservoir depth is designed to control vapor pressure, the actual minimum operating pressure is selected based on the designed minimum deliverability of the facility. For salt cavities this pressure must also be sufficient to control integrity by preventing salt intrusion. The maximum reservoir pressure for both types of reservoirs is usually limited by that pressure that would cause uncontrolled product migration from the storage reservoir by overcoming the geostatic forces acting on the cavern or cavity. The following table summarizes the operating parameters for the three active LPG storage facilities in New York State.

Western	Bath	Texas		
Energy	Storage	Eastern		
Cortland	Steuben	Schuyler		
2,900	2,946	460		
1,100	1,000	105		
.38	.34	.23		
20,000	34,846	50,568		
0	12,483	31,333		
3	6	4		
	Western <u>Energy</u> Cortland 2,900 1,100 .38 20,000 0 3	Western         Bath           Energy         Storage           Cortland         Steuben           2,900         2,946           1,100         1,000           .38         .34           20,000         34,846           0         12,483           3         6		

Whereas over 800 operating wells are required for the State's 21 natural gas storage projects in depleted gas reservoirs, only 13 are utilized for injection and withdrawal of LPG. This is mainly due to the high product deliverability offered by cavern or cavity storage compared to depleted gas fields.

#### 3. Regulation Of Storage Operations

In regulating the State's storage industry, the Department is responsible for ensuring the safe and efficient operation of storage facilities while monitoring their environmental compatability. Of primary concern are the annual changes in product storage volume and the year-end storage balance as a percentage of total reservoir capacity. Gas or LPG migration to surrounding formations could result in problems for offset operators while decreasing the effectiveness of the storage facility to augment energy supplies.

The condition of storage and monitoring wells in terms of casing and tubular corrosion as well as wellhead equipment is also very important to the Department. Improperly cemented or corroded wellbores would offer a direct path for product leakage to the water table or the surface thus causing significant environmental damage or public safety problems. Surface leakage of gas or LPG in close proximity to compressors or other surface equipment could cause explosions and extensive damage.

The existing law states that storage operators must submit a status report before December 31 of each year which summarizes that year's storage activities [ECL 23-1301.4]. It is suggested that new regulations specify that the report be submitted by March 1 to allow operators time to assemble and assess their storage data. The report includes the following:

- a. Any change in the estimated size in surface acreage or shape of the reservoir and the buffer zone.
- b. The total capacity of the reservoir.
- c. The working capacity of the reservoir.
- d. Any other engineering, geological or operational data that may be requested by the Department.

Additional data required on the existing Operator's Annual Natural Gas Storage Report form includes reservoir discovery pressure, maximum storage pressure, and average field pressure; number of operating and observation wells, number of wells with casing failures or leaks, and number of wells surveyed for corrosion. Similar information is included on the Operator's Annual LPG Underground Storage Report.

This data is used by the Department to identify those storage projects that may be operating negligently or inefficiently. It is recommended that regulations be formulated to identify specific infractions as deemed important by the Department and the mitigation techniques that will be required to rectify or alleviate them. Following are some specific infractions and possible solutions that will be addressed.

a. Unauthorized expansion of the storage reservoir as shown by the maximum storage volume or storage balance exceeding the reservoir's total capacity. If the Department allows this expansion after reviewing the ramifications, then a storage capacity modification

fee of five thousand dollars will be assessed pursuant to ECL 23-1301.5 as amended by the 1984 Session Laws.

- b. Operating at a maximum field pressure which exceeds the approved design pressure. The Department will require that a sufficient volume of gas or LPG be withdrawn from the storage reservoir to lower the pressure to acceptable levels.
- c. Refusal to submit corrosion testing data on storage wells. Upon request, the operator will have to prove to the Department that all storage wells are in good mechanical condition in lieu of corrosion studies.

In addition, the annual report form will be amended to include the actual amounts of cushion gas and working gas that make up the year-end storage balance.

Although an underground storage permit as issued by the Department is in force indefinitely, some storage projects may be abandoned due to inefficient operation or a decrease in market demand.

#### J. ABANDONMENT OF UNDERGROUND STORAGE FACILITIES

Because of the constant need for increased energy supplies during the winter heating season, the abandonment and dismantling of an underground storage facility is a rare occurrence. The average age of the 21 natural gas storage projects currently operating in New York State is 30 years. Most recently, the International Salt I and II LPG storage facilities were depleted and shut-down at the end of 1984.

The Department is primarily concerned with the proper abandonment of wells, the proper clean-up and restoration of disturbed surface areas, and the status of the abandoned storage reservoir.

#### 1. Well Abandonment

For well abandonment in depleted gas sands, the rules and procedures are the same as for regular oil and gas wells. See the section dealing with the plugging and abandonment phase of well operations for details on the State's proposed abandonment regulatory program.

It is recommended that new regulations include specific abandonment procedures pertaining to wells in mined storage caverns or abandoned salt cavities. An adequate seal must be fabricated to isolate the well bore from the cavity or cavern so as to limit transferral of fluids, debris, etc., to or from the reservoir and adjacent formations. This could be accomplished by placing a permanent packer in the casing at the top of the storage formation and spotting a quantity of cement on top of the packer.

#### 2. Site Restoration

The existing oil and gas legislation states that the premises of previous storage operations shall be placed in a condition which does not constitute a menace to the present or future health or safety of persons, or safety or value of property [ECL 23-1305]. If an operator fails to meet his obligations as determined by the State, the Department may act to place the premises in satisfactory condition with the operator being liable for the cost. Reclamation procedures for clean-up of compressor sites, buildings, access roads, etc. will be specified as permit conditions. Restoration of well sites will be governed according to the regulations pertaining to well abandonment.

Environmental impacts from reclamation procedures will consist of temporary noise and dust emissions as sites are graded and cleaned. Short term increases in traffic on access roads and local routes will be realized as compressors are removed and equipment is transported. The planting of trees and shrubs may be required to restore the area to original conditions.

#### 3. Reservoir Abandonment

The final status of the storage reservoir at the time of abandonment of storage operations is of utmost concern to the Department. Presently, there are no regulations governing reservoir abandonment procedures or documentation practices. A reservoir cannot be abandoned like a well or location, but its status can be assessed and reported. It is suggested that operators be required to submit an operational report summary when storage operations are terminated at the facility. This report should contain the following information:

- A brief history of storage operations including start-up and termination dates along with dates of significant events or changes in operations.
- b. Initial fluids in-place and total volumes cycled through the reservoir.
- c. Final fluids remaining in the reservoir at abandonment including the amount of native gas, if any.
- d. Operating pressure summary over the life of the project. A final abandonment pressure survey will be required.

e. Any other information that the Department may require.

The existing oil and gas legislation states that all gas and LPG that has been reduced to possession and has been lawfully injected into a storage reservoir, shall remain the property of the injector, his heirs, successors, or assigns [ECL 23-1307.1]. This does not include native amounts of gas or LPG that existed in the reservoir prior to initiation of storage operations unless rights to the native gas have been secured by lease or acquisition. The operating pressure summary will be used to assess the integrity of the reservoir, cavity, or cavern. A particular problem area exists concerning abandonment of a salt cavity or mined cavern after withdrawal of storage

fluids. Mined caverns are designed to support themselves regardless of fluid volumes in storage so that collapse of the abandoned cavern is highly unlikely. Leaching water into the cavern over time may cause some sloughing which could compromise the cavern's integrity. Natural disasters such as earthquakes might also pose problems. Since caverns are constructed in relatively shallow bedrock, collapse of the cavern could cause subsidence problems at the surface.

An abandoned salt cavity is far more likely to suffer sloughing or collapse of some kind because of the stratified nature of salt beds. Since layers or "ledges" of insoluble rock occur in most bedded salt deposits, creation of a solution cavity will cause the ledges to become undermined (Piper, 1970). The caving-in of these rock layers will cause a debris pile to accumulate in the cavity as shown in Figure 14.4. Since the salt formations used for storage in New York State are at an average depth of 2,900 ft., pollution of freshwater formations is highly unlikely. Nevertheless, the Department will review salt cavity abandonments to determine if specific mitigation plans are required. Filling the cavity void with foamed cement, saturated brine, or other slurry materials may be warranted.

#### 4. Underground Storage Abandonment Permit

In order to ensure complete review of storage reservoir abandonment operations by the Department, it is suggested that new regulations require that an underground storage abandonment permit be obtained by the operator. The Department's permit review process will consider reservoir abandonment techniques if needed, as well as surface restoration procedures to be followed. It is recommended that the application for the abandonment permit will be in the form of an abandonment summary filed by the operator containing the following information:

- A map detailing the final reservoir and buffer zone boundaries.
   Access roads, compressor site(s), and well locations will also be shown.
- b. The reservoir abandonment report as discussed previously.
- c. Any other information as required by the Department.

A large amount of emphasis will be placed on abandonment of a storage project because of the potential long term effects of storage operations on the environment and local communities.

#### CHAPTER XV - INTERAGENCY COORDINATION: BRINE DISPOSAL, UNDERGROUND INJECTION AND OIL SPILL RESPONSE

#### A. INTRODUCTION

This Generic Environmental Impact Statement addresses regulation of the oil, gas and solution mining industries by the Division of Mineral Resources under Article 23 of the Environmental Conservation Law and supporting regulations. However, the Division of Mineral Resources (DMN) is not the sole regulator and decision maker for oil and gas operations in New York State. A number of aspects of oil and gas development are subject to regulation by other state, local and federal government agencies. Additional agencies may have an indirect role in the regulation of these operations. In addition, some issues in which DMN does not have a primary role in regulation are discussed in this chapter because of the close relationship with the DMN's own regulatory functions.

This chapter focuses generally on interagency coordination with local governments, and specifically on coordination with other agencies regarding brine disposal, underground injection and oil spill prevention and clean-up. Many detailed aspects of these direct and indirect relationships with other programs are described in previous chapters. Table 15.1 summarizes the roles of various agencies in the regulation of oil, gas, solution mining, and brine disposal operations in New York State.

#### B. LOCAL GOVERNMENT

New York's Oil, Gas and Solution Mining Law specifically supersedes all local laws or ordinances relating to the regulation of the oil, gas, solution mining, and brine disposal industries, but reserves to local governments jurisdiction over local roads and the rights of local governments under the Real Property Tax Law. This provision of the law was enacted because of legislative concern that a patchwork of conflicting local ordinances

# TABLE 15.1

## OIL, GAS, SOLUTION MINING, AND BRINE DISPOSAL INTERAGENCY COORDINATION

	AGENCY										
						Local					
	DMN	DE	<u></u>	DSHW	220	Agoncy	LOCAL GOVE.	EPA	PERC	Согра	Coast
New Wells	2001	Pigi								<u></u>	<u></u>
Drilling	•	-	-	-	-	-	-	-	-	-	-
Stream Protection	-	•	-	-	-	-	-	-	-	-	-
Wetlands	-	•	-	-	-	-	*	-	-	•	-
Flood Plain	-	•	-	-	-	-	*	-	-	-	-
Site Restoration	٠	-	-	-	-	-	-	-	-	-	-
Production Walls											
Taxation	-	-	-	-	-	-	•	-	-	-	-
Woll Plugging	•	-	-	-	-	-	-	-	-	-	-
Production Operations	•	-	-	-	-	-	-	-	-	-	-
NGPA Price Determinations	0	•	-	-	-	-	-	-	٠	-	-
Injection Wells											
Enhanced Oil Recovery	•	-	-	-	-	-	-	٠	-	-	-
Brine Disposal	0	-	٠	0	-	-	-	•	-	-	-
Underground Gns Storage	•	-	-	-	-	-	-	-	•	-	-
Solution Mining	٠	-	-	-	-			•	-	-	-
Wall Plugging Class II & III	٠	-	-	-	-	-	-	٠	-	-	-
Pipelines											
Gathering Linea	0	-	-	-	٠	-	-	-	-	-	-
Stream Protoction	-	•	-	-	-	-	-	-	-	-	-
Wetlands	-	•	-	-	-	-	•	-	-	•	-
Plood Plain	-	•	-	-	-	-	•	-	-	-	-
Intrastato Pipelinos	-	-	-	-	•	-	-	-	-	-	⊸.
Interstato Pipelinos	-		-	-	-	-	-	-	• •	-	-
Fluid Disposal											
Road Spreading	-	-	-	0	-	-	•	-	-	-	-
Stream Discharge	-	-	•	-	-	-	-	-	-	-	-
STP Diaposal	-	-	•	-	-	-	•	-	-	-	-
Complaint Rasponse											
Initial Response	0	-	-	-	-	•	-	-	-	-	-
Follow-up on Oil & Gas Complaints	٠	-	-	-	-	0	-	-	-	-	-
Oil Spill Rasponsa (oil walls)	0	-	•	-	-	-	~	٠	-	-	•

Primary Role
O Secondary Role

- No Role

\* Role pertains in cortain circumstances

----
regulating oil, gas and solution mining might otherwise result, and because of legislative recognition of the need for technically sound regulation which would be difficult for individual local governments to achieve. At the same time, the Legislature recognized the need for coordination between State and local levels of government. For example, the law requires each person granted a drilling permit to give notice by certified mail to any affected local government prior to the commencement of drilling operations. This prior notice is also required to be given by certified mail to any landowner whose surface rights will be affected by drilling operations.

Certain aspects of the permit review process can directly involve local governments as described in Chapter 8. These include the issuance of wetlands permits and floodplain permits where local governments have asserted legal jurisdiction under State law. The use of local roads by oil and gas equipment is also regulated by local governments, as exemplified by weight limits placed on local roads during the spring thaw.

Chapter 869 of the Laws of 1985 amended the Real Property Tax Law in regard to taxation of oil and gas properties in New York State. Under this legislation, effective in 1986, the Department is required annually to submit information to real property tax directors on oil and gas production and on oil and gas well drilling permits for the preceding calendar year. Information provided to local governments is similar to that contained in the Department's annual Oil and Gas Production Report.

#### C. COMPLAINT RESPONSE

Due to the extent of the Department's regulatory responsibilities, the DEC receives a broad range of complaint reports on environmental problems. Among the types of complaints received are those that may be related to oil and gas activity. The appropriate agency for responding to complaints,

however, depends on the nature of the problem. Table 15.2 details New York Laws and Regulations related to oil, gas, solution mining, and brine disposal activity.

#### 1. Water Supply Problems

The DOH enforces guidelines and standards for community and non-community water supply systems in New York State. A community water supply system is defined as a system that serves at least five service connections used by year-round residents, or regularly serves at least 25 year-round residents. There are approximately 3,400 community water supply systems, of which approximately 1,800 serve municipalities, with the remainder serving mobile home parks, apartments/condominiums and residential institutions. The federal Safe Drinking Water Act (SDWA) also establishes requirements for municipal water supplies, including establishment of drinking water standards and a program to protect aquifers that are sole sources of public water supplies. The SDWA Amendments of 1986 support state ground water quality management programs, including support for establishment of state wellhead protection programs. These measures will help to assure protection of public water supplies.

The great majority of the state's population is served by community water supplies, but some two million persons in upstate New York rely on individual groundwater supplies for their water. New York State Health Department regulations (10NYCRR 75) establish standards for individual household water supply and sewage disposal systems. These regulations provide that individual sewage disposal systems be designed and constructed in accordance with the "New York State Health Department Waste Treatment Handbook - Individual Household Systems" and that individual water supply systems be designed and constructed in accord with the DOH bulletin "Rural Water Supply." The two are closely inter-related from a public health perspective. To the extent that these

## NEW YORK STATE LAWS AND REGULATIONS RELATED TO OIL, GAS, AND SOLUTION MINING

Activity <u>Subject</u>	Authorizing Legislation	Regulations	
Regulation of Oil, Gas and Solution Mining Drilling and Production	Environmental Conservation Law (ECL) Article 23, Titles 1 to 13, Title 19	6 NYCRR Part 550-559	
State Environmental Quality Review Act (SEQRA)	ECL Article 8	6 NYCRR Part 617-618	
State Pollutant Discharge Elimination System (SPDES) Permits	ECL Article 17, Title 7-8	6 NYCRR Part 750-758	
Oil Spill Response and Cleanup	Navigation Law Article 12	6 NYCRR Parts 610-611 17 NYCRR Part 30-31	
Waste Hauler Permits	ECL Article 27, Title 6	6 NYCRR Part 364	
Protection of Freshwater Wetlands	ECL Article 24	6 NYCRR Parts 662-665	
Protection of Water	ECL Article 15, Title 5 and Article 70	6 NYCRR Part 608	
Floodplain Protection	ECL Article 36	6 NYCRR Part 500	
Archeological and Historic Site Protection	State Historic Preservation Article 14	9 NYCRR Parts 428	
Regulation of Intrastate Pipelines	Public Service Law (PSL) Article 7 and PSL Section 66	16 NYCRK Part 255	

documents are followed they provide a measure of security, particularly with regard to bacteriological contamination, for the homeowner.

There is no legal mandate at the State level which requires approval of individual household systems. Compliance with the standards is accomplished through County sanitary codes, local building codes, but in most areas it is voluntary. "Rural Water Supply" standards are enforced by DOH for private wells under limited conditions: 1) Residences where social services pays the rent; 2) A temporary residence of three or more units with ten or more people (summer camps, mobile home parks, etc.); 3) New construction as part of the Building Construction Uniform Code.

The intensity of programs to regulate on-site sewage disposal varies among areas. Some counties have very active programs and very stringent requirements, while programs in other areas are non-existent except for response to nuisance complaints resulting from faulty sewage disposal systems.

Public Health Law, Article 11, Title 2 and ECL, Article 17, Title 15 also provide a mechanism for review and approval of water supply and wastewater disposal systems within realty subdivisions. A subdivision is defined as any tract of land which divided into five or more parcels for sale or for rent as residential lots or residential building plots. This program, administered by the State District Health Offices or local health departments having jurisdiction, requires the submission of realty subdivision plans for review and approval. Compliance with this program is enforceable by law and is the responsibility of the local health office having jurisdiction.

The diversity of jurisdictions having authority over local water supplies complicates the response to complaints about water supplies, including those complaints that complainants believe are related to oil and gas activity. Water supply complaints occur statewide and take many forms, including taste

and turbidity problems, water quantity problems, contamination by salt, gasoline and other chemicals, and problems with natural gas in water wells. All of these problems, including natural gas in water supplies, occur statewide and are not restricted to areas with oil and gas development. The lack of mandated approval for individual water supply system construction also complicates complaint investigations. The DOH and most county health departments will not sample well supply systems with substandard construction because poor construction can facilitate the movement of contaminants into water supplies, and water quality in these systems dramatically change in response to conditions such as recent precipitation.

The initial response to water supply complaints is best handled by the appropriate local health office, which has expertise in dealing with water supply problems. Formal procedures have been developed by the Department of Health's Buffalo office, under which local health units will respond to and investigate initial complaints on oil and gas operations to determine if the complaint is oil and gas-related and to provide determinations of possible public health problems. If the complaint is determined to be oil and gas related, it is referred to the appropriate Regional DMN staff for further investigation and resolution. It is expected that these procedures will provide increased coordination between the Division of Mineral Resources and local health units, and facilitate solution of problems.

However, these procedures apply only in three counties. Elsewhere, no formal mechanism exists for coordination of complaint investigations with local health units.

To better protect the integrity of individual water supplies, the DEC Upstate Groundwater Management Program recommends the enactment of a State Water Well Construction Code and legislation for the licensing of water well drillers.

#### 2. <u>Oil</u> and Gas Well Drilling and Production

This chapter describes the regulatory jurisdiction of the Department of Environmental Conservation for oil, gas, solution mining and brine disposal well drilling and production. Complaints regarding these activities are handled by the DEC Division of Mineral Resources, through the appropriate DEC regional office. Problems concerning stream protection, wetlands and flood plains are the responsibility of the DEC Division of Regulatory Affairs (DRA), again through the appropriate DEC regional office.

Problems related to leases and lease interpretation are generally not within DEC jurisdiction. The New York State Attorney Generals' Office has published a booklet, "Guide for Landowners Selling Oil and Gas Leases", for landowners who are considering leasing their land for oil and gas development; a key recommendation is that landowners consult an attorney before signing a lease. Cornell Cooperative Extension has also developed a slide show that is available through local Coopertive Extension agents that provides information for landowners on the lease process.

#### 3. Pipelines

The Department of Public Service regulates natural gas gathering lines and intrastate gas pipelines, as described in Chapter III. Complaints regarding this aspect of development are handled by Department of Public Service inspectors.

#### D. BRINE DISPOSAL

Environmentally-sound disposition of brine from oil and gas wells is a significant and increasing environmental issue. As New York State's active oil and gas wells mature, increases in volumes of brine production will occur. The brine consists of highly saline water that was trapped in place in the oil and gas reservoir rocks. At present, the acceptable alternatives for brine

disposal are limited. Allowable alternatives include road spreading, discharge to surface waters through permitted facilities and underground injection. In the future, it is anticipated that greater use will be made of underground injection and advanced technology treatment options.

#### 1. Road Spreading

For decades, salt has been utilized by state and local governments in road and highway maintenance operations for ice control, dust control and road stabilization. Large amounts of salts are used during the winter for ice control, particularly in western New York. For example, in the winter of 1981/82, the New York State Department of Transportation alone used over 55,000 tons of salt in the counties in DEC Region 9 (Chautauqua, Cattaraugus, Erie, Niagara, Wyoming and Allegany counties).

Two specific salts are widely used in highway maintenance operations, sodium chloride (NaCl) and calcium chloride (CaCl<sub>2</sub>). Sodium chloride is used more extensively in snow and ice control operations because of its lower cost. However, calcium chloride has several specific advantages over sodium chloride, both in snow and ice control operations and as a dust control and road stabilization agent. The lower freezing point of a calcium chloride solution is a particular advantage during extremely cold weather in removing ice and snow from highways. Calcium chloride is also significantly more hygroscopic, that is, able to absorb water from the atmosphere when humidity is greater than 29 percent. When used on dirt roads, calcium chloride's moisture-absorbing properties help to suppress dust and maintain stable road surfaces. Sodium chloride will not absorb water from the atmosphere until the humidity is greater than 80 percent and thus it is significantly less effective for dust control. Because of cost considerations, however, mixtures of sodium and calcium chloride are typically used in highway operations.

Brines from oil and gas wells in New York State typically contain both

sodium and calcium chloride although the composition of the brines varies according to their source. Brines and other fluids are generated during the drilling, completion and production of oil and gas wells. As discussed in Chapter 9, fluids produced during drilling and completion operations may be stored temporarily at the well site but must subsequently be properly disposed of in accordance with State regulatory requirements. The characteristics of drilling and completion fluids are such that they are not well-suited for use on roads because of variable concentrations of salts due to dilution with freshwater, rainwater and fluids from other operations.

Most production brine in New York comes either from shallow oil wells or from deep gas wells. The characteristics of the brines from these wells differ significantly as shown in Tables 15.3 and 15.4. Because of the long history of waterflooding operations in New York State shallow oil wells, the concentration of brine in shallow oil production waters has been significantly diluted with time. Production fluids from deep gas and Bass Island wells, on the other hand, have extremely high brine concentrations. Table 15.5 from a Pennsylvania study compares the chemical characteristics of commercial road salt, undiluted shallow oil brine and deep gas brine.

The characteristics of gas well brines are sufficiently similar to those of commercial road salts to make them attractive to local highway departments for use in road maintenance operations. Additional factors stimulating their use are the relatively low cost of brines and the need by producers for a means to properly dispose of these fluids. Until recently, towns have used commercial salts for such maintenance operations, but oil and gas brines have been utilized increasingly as a substitute at a substantial monetary savings. An estimated 90 percent of all brine produced in gas and new oil fields in New York State is now hauled off site and spread over roads for dust and ice

## TABLE 15.3 BRINE CHEMICAL CHARACTERISTICS FROM NEW YORK PRODUCING ZONES (Using Chemical Analyses Graded Fair or Better Quality)

### Fair or Better Grade: Mass Balance $\pm 1000-10,000$ milligrams/liter and Cation/Anion Balance $\pm 0-100$ millieguivalents/liter

Barrana (Ma /I )	Potsdam <u>Theresa</u>	Queenston	Medina	Oriskany	Bass <u>Island</u>	Upper Devonian <u>O11</u> Zones
rarameter (Hg/L)						
Sodium (Na)	76,712	73,500	69,893	45,457	60,750	36,367
Calcium (Ca)	31,256	36,603	37,124	33,684	56,400	16,467
Magnesium (Mg)	3,499	2,887	2,766	5,168	3,160	2,733
Strontium (Sr)		0				107
Barium (Ba)	750	0				8
Potassium (K)	3,367	1,124		1,307		71
Iron (Fe)	17	195	676	215	18	189
Manganese (Mn)	0		84		0	7
Chloride (Cl)	183,701	187,418	181,298	145,442	203,000	92,167
Bromide (Br)	1,417	1,120	1,721	1,687		860
Sulfate (SO,)	18		736	57	180	619
Bicarbonate <sup>4</sup> (HCO <sub>2</sub> )	89		25	203	50	0
Iodine (I) 3	8.50	11.00	18.00	10.00		200.0
Lithium (Li)	54.0					
Trace Metals						.74
Hydrocarbons						107.50
Measured TDS	300,763	298,358	292,121	231,836	323,500	156,267
Calculated TDS	299,187	302,869	292,727	232,743	323,558	149,582
IONIC RATIOS						
Na/Ca	2.47	2.01	1.89	1.42	1.08	2.24
Ca/Mg	9.75	12.76	15.90	6.93	34.17	6.04
Mg/K	1.07	2.64		4.00		47.03
Cl/Br	142.84	255.07	102.49	104.86		104.60
No. of Analyses	9	2	8	4	2	3

# TABLE 15.4

BRINE CHEMICAL CHARACTERISTICS FROM NEW YORK PRODUCING ZONES (Using All Acceptable Chemical Analyses)

Minimally Acceptable Grade: Mass Balance  $\pm 10,000-40,000$  milligrams/liter and/ or Cation/Anion Balance  $\pm 0-100$  milliequivalents/liter

	Potsdam Theresa	Queenston	Medina	Oriskany	Bass Island	Devonian <u>Oil Zones</u>
Parameter (Mg/L)						
Tarameter (18/2/			(0.511	60 250	53.671	36,642
Sodium (Na)	78,364	73,500	63,511	37 351	38,615	15,199
Calcium (Ca)	30,965	36,603	29,885	57,331	5.059	2,418
Magnesium (Mg)	3,389	2,887	2,/10	120	875	107
Strontium (Sr)		0	1,049	120	1	8
Barium (Ba)	750	0	17	200	3 146	71
Porassium (K)	3,398	1,124	1,450	1,329	5,140	146
Iron (Fe)	17	195	346	218	7	5
Manganese (Mn)	0		65		171 160	89.558
Chloride (Cl)	185,724	187,418	157,251	1/3,6/6	1 / 2 2	836
Bromide (Br)	1 503	1,120	1,874	2,682	1,422	716
Sulfate (SO)	16		346	264	103	10
$B_{1}$	78		54	114	00	147 33
Jodina (T)	9.67	11.00	15.60	8.25		
Idente (I)	109.50			129.00	22 00	74
Trace Metals	29.50		37.17	17.70	22.07	73 45
Wideocarbone			264.17		2,022.4/	145 067
Nyurocarbons	304,406	298,358	264,381	280,269	270,701	145,007
Calculated TDS	302,625	302,869	257,384	280,326	270,961	143,433
IONIC RATIOS						
<u> </u>			2.16	1 93	1.45	2.48
Na/Ca	2.55	2.01	2.10	7 55	14.39	6.33
Ca/Mg	9.96	12.76	11.00	10.13	1.81	47.03
Mg/K	1.02	2,64	2.00	82 09	111.94	114.85
C1/Br	136.08	255.07	83.10	02.07	•	
		.,	67	10	10	5
No. of Analyses	10	Ζ.				

# **TABLE 15.5**

### CHEMICAL CHARACTERISTICS OF COMMERCIAL ROAD SALT, SHALLOW OIL BRINE, AND DEEP GAS BRINE (mg/I)

Parameter mgl	Commercial Road Salt	Shallow Oil Brine	Deep Gas Brine
Chloride (Cl)	120,000	51,170	148,380
Sodium (Na)	59,500	26,208	61,003
Ċalcium (Ca)	1,090	10,115	29,880
Potassium (K)	532	442	2,608
Strontium (Sr)	0.16	139	1,400
Barium (Ba)	0.01	8.9	89
Lead (Pb)	1.48	1.5	2.68
Total Dissolved Solids	200,800	82,383	240,158
Magnesium (Mg)	210	1,282	4,240
Manganese (Mn)	0.28	5.7	76
Copper (Cu)	0.25	0.15	2.4
Zinc (Zn)	0.13	0.09	1.24
Aluminum (Al)	0.91	0.45	3.1
Iron (Fe)	2.08	42.3	171
Nickel (Ni)	1.9	1.92	2.66
Cadmium (Cd)	0.28	.007	0.65
Chromium (Cr)	0.11	0.11	0.29

Source: The Feasibility of Utilizing Production and Other Oil and Gas Well Fluids as Dust Palliatives and Deicers; Moody and Associates, December 1984 control. The majority of brine used in road spreading in New York is derived from deep gas well production; the diluted brines from the old shallow waterflooded oil fields are not used.

Hauling of brines for use on roads is regulated by the DEC Division of Solid and Hazardous Waste (DSHW) under 6 NYCRR Part 364, under which any person who desires to transport any type of industrial waste must first obtain a permit. Oil and gas drilling and production brines are considered industrial waste and, as such, are subject to the requirements of Part 364 for transportation and use.

Brine may be spread on paved and unpaved roads under Part 364 permits, but approval from the locality is required on the permit application. A standard condition for these permits is that the applicant must receive written approval from the highway superintendent or the town supervisor before road spreading salt brine. All oil must be separated from the brine solution and a spreader bar or similar spray must be used with the proper application rate to eliminate runoff. Spreading must also be confined to daylight hours.

Most permitted brine spreading is done by commercial haulers or by oil and gas company haulers. Spreading of brine for shoulder stabilization or ice control is generally performed by the town, and some towns utilize their own resources to spread brine for dust control on unpaved roads. DEC records for 1986 show that statewide approximately 13 million gallons of brine were transported by 18 permitted haulers, 4 of which were municipalities. This is equivalent to some 16,000 tons of dry highway salt, in comparison to the 55,000 tons of salt used in DEC Region 9 just by the New York State Department of Transportation in the winter of 1981/82; counties and towns also used substantial amounts of road salt. Towns which receive brine under Part 364 permits are shown in Figure 15.1. Since 1985, there has been a 40 percent increase in the municipalities which will accept production brine.



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The use of brine in road spreading presents problems as well as benefits. As noted above, only some fluids produced from oil and gas wells are suitable for use on roads. Drilling and stimulation fluids are often not suitable for use on roads because of their variable concentrations of salts that result from dilution with freshwater, rainwater and fluids from other operations. The seasonal nature of road spreading also presents problems for oil and gas operators as an efficient means of disposing of oil and gas fluids. The imbalance between production and use on roads means that brines must either be stored between periods of use or alternative disposal means found.

Road spreading also presents potential environmental problems from improper application. Although the chemical properties of oil and gas brines are similar to those of commercial salts, the fact that brine is in liquid form presents potential problems of runoff and spills if the brine is not properly applied. Ideally, 0.4 gallons per square yard of 34 percent calcium chloride solution should be spread for optimal dust control on unpaved roads, but the brine must be applied in two applications, once in the spring at .3 gallons per square yard and once in the summer at .1 gallons per square yard. A 34 percent calcium chloride solution is supersaturated. New York brines are much less concentrated and the number of applications needed for dust control is 2.5 times that for a 34 percent solution. The application frequency needed can also be increased by temperature, precipitation, and traffic levels.

Studies have shown that calcium chloride-laden brines used as road agents should be applied a minimum of two or three times per season at approximately equal intervals, with subsequent applications depending on traffic volume, ambient temperature, precipitation and road material characteristics.

Deep well gas brine is also sometimes used for ice control. The high concentrations of salt in the brine, combined with the significant proportion

of calcium chloride to sodium chloride, means that production brine has a freezing point of as low as -6°F. As a consequence, it may be suitable for use as an ice control agent, although its liquid form presents the potential problem of runoff during application and of refreezing to form a slippery surface. In addition, solid granules are thought to be more effective in penetrating through the ice to break the ice bond with the pavement.

Under the Part 364 permits, the local governments have primary responsibility for determining optimal application rates, although the permits include a standard condition requiring the use of spreader bars or similar sprays to eliminate problems of runoff. Likewise, determinations of frequency of use and specific roads for application are the responsibility of local government. The DMN, in cooperation with the regional Solid Waste staff and the Conservation Officers, inspects waste haulers for compliance. Other units, including DEC Forest Rangers and Foresters, as well as police agencies, town officials and the general public also play important roles in policing this activity. Excessive application, discharge of unpermitted materials, unpermitted discharges, illegal times of discharge and excessive rates of discharge should be reported to the Division of Solid and Hazardous Waste for enforcement action.

#### 2. Discharges to Surface Waters

Water quality management in New York State began in the 1950's, long before most other states recognized that water pollution was a problem, and is now carried out within the national framework of the Water Pollution Control Act of 1972, as amended, which establishes national goals for water quality.

A major provision of the federal law was establishment of the National Pollutant Discharge Elimination System, under which federal permits are required of all parties who propose to discharge pollutants into the state's surface waters. The law provides for delegation of the program to the states, and all permits in New York State are handled by the Department of Environmental Conservation's Division of Water (DW). The State Pollutant Discharge Elimination System (SPDES) covers all existing and future discharges both to surface waters and ground water in the State.

Point discharges of oil and gas-related fluids may be allowed under SPDES permits, provided that water quality standards are not violated. Permit conditions for such discharges include limitations on total dissolved solids (TDS) levels (for oil and gas-related fluids, these are primarily salts) and on oil and grease discharge limitations. SPDES permits for oil and gasrelated operations are primarily confined to surface discharges from secondary oil recovery operations. Most of the brine produced in New York State is the dilute brine associated with waterflooding operations. Chapter 12 of this GEIS provides further discussion of secondary oil recovery operations. Since SPDES permits are issued through the Division of Water, inspections are normally conducted by Division of Water staff. However, DMN personnel routinely inspect oil leases and refer questionable discharge operations to the Division of Water or enforce applicable Division of Mineral Resources regulations.

Another method of disposal for oil and gas production fluids is processing at a sewage treatment facility. Discharges of such facilities are regulated under SPDES permits, and must meet permit conditions for TDS levels and other criteria. A Part 364 permit is required for the hauler transporting brines to a sewage treatment plant.

The discharge of oil and gas waste products into a sewage treatment plant is a relatively unexplored disposal method in New York State. One major concern is the potential disturbance of the biological balance required to properly operate such a facility. However, a small concentration of brine is

needed for effective plant operation and the substantial dilution of oil and gas fluids in the overall flow of materials through the plant makes treatment feasible without upsetting the plant's operation or discharge requirements.

One plant in western New York accepts gas brines on a limited basis. Use of this technique at sewage treatment plants is dependent on specific local circumstances, particularly on potential sensitivity of the treatment processes to salt concentrations and on TDS discharge limitations for the receiving surface waters.

#### 3. Underground Injection

The use of underground injection as a disposal technique has been widely used in a number of states for disposition of oil and gas-related fluids. The technique involves the drilling of a well and injection of fluids into formations hundreds or thousands of feet below the surface. With proper technical safeguards, such fluids can be safely injected into receiving formations and prevented from migrating into other zones, particularly groundwater. In many cases these fluids are returned to their original formation.

However, the use of this technique for disposal of hazardous wastes has been discouraged in New York, although it has been widely used in other areas, particularly Louisiana and Texas. As noted above, New York was one of the first states in the nation to recognize the importance of protecting both surface and underground water quality, particularly sources of public water supplies, and to enact legislation to protect these supplies.

A SPDES permit from the DEC Division of Water is required for any commercial injection disposal well in New York State. The Division of Mineral Resources provides technical assistance in the review of permit applications and provides facility inspections as necessary. Drilling of the well or conversion of the well to an injection well requires a DMN permit. In

addition, a federal Underground Injection Control (UIC) permit is also required for an injection well in New York State (see discussion of UIC program in next section). Other permits that may be required include a Part 364 hauler permit from the Division of Solid and Hazardous Waste.

Detailed guidelines for New York State brine disposal well permitting and the requirements for the surface and subsurface technical review are given in Appendix 7.

The primary environmental consideration in approval of an injection well permit application is the protection of groundwater resources through the prevention of movement of injected fluids into or between underground sources of drinking water (USDW).

A USDW is defined by federal regulations as an aquifer or its portion:

- 1) (i) which supplies any public water system; or
  - (ii) which contains a sufficient quantity of groundwater to supply public water system; and

(A) currently supplies drinking water for human consumption; or

(B) contains fewer than 10,000 mg/l total dissolved solids; and

2) which is not an exempted aquifer.

Protection is achieved through stringent controls on the casing and cementing of the injection well. Permit conditions also involve pressure limitations on injection as well as monitoring and reporting requirements. A technical consideration for the applicant is the ability of the injection formation to accept fluids. Most formations in New York State are relatively "tight" and do not readily accept injected fluids. The operator must take this into consideration in designing an injection well. Further, a variety of treatment techniques may be required to ensure that the injected fluid will not plug the receiving formation and prevent further injection.

At present, one injection well in Chautauqua County has been given both a SPDES and federal UIC permit. There are additional federally permitted brine disposal wells in Steuben and Livingston Counties, and state and federal action is pending on several additional brine disposal wells.

#### E. FEDERAL UNDERGROUND INJECTION CONTROL PROGRAM

The federal Safe Drinking Water Act was enacted in 1974 in response to growing concerns over the need to protect the nation's sources of drinking water. Unlike New York, many states did not regulate activities which could contaminate or otherwise endanger underground sources of drinking water. A major element of the Safe Drinking Water Act is the Underground Injection Control (UIC) program.

The federal UIC program is administered by the Environmental Protection Agency (EPA) under Section 1422 of the Safe Drinking Water Act. However, the Act was designed to encourage each state to act as the primary implementing and administering agent for the federal requirements.

The UIC program was developed to control underground injection by specifying construction and monitoring requirements for injection wells. Therefore, this program includes injection for the purposes of both <u>disposal</u> and <u>recovery</u> operations. Of prime concern is the protection of the nation's underground sources of drinking water (USDW) from fluid injection below the ground surface. Under this program, no injection into a USDW can be authorized if it results in the movement of a fluid contaminant that adversely affects the health of persons. The definition of injection wells extends even to a pit or hole used for waste discharge when it is deeper than it is wide.

The UIC program divides injection wells into five classes:

- Class I injection of industrial, hazardous, and municipal wastes beneath the deepest stratum containing a USDW.
- 2. Class II disposal of fluids which are brought to the surface in

connection with oil and gas production, enhanced recovery of oil or gas, or storage of liquid hydrocarbons.

- Class III injection of fluids used for the extraction of minerals, including solution mining of salts.
- Class IV injection of hazardous wastes into or above USDWs. Class IV wells are prohibited at 40 CFR Section 144.13.
- 5. Class V all wells not incorporated in Class I-V. Typical examples of such wells are air conditioning/cooling water return wells, storm water drainages, recharge wells, abandoned water wells, and service station dry wells.

There are no wells the State would consider Class I wells in New York State, as State policy has not encouraged the use of underground injection as a disposal method for hazardous waste. Class IV wells are banned nationwide under the UIC program. There are thousands of Class V wells which are currently being inventoried.

In 1986, there were some 1,651 injection wells reported in use for secondary oil recovery (Class IIR) in New York State and some 80 active and over 200 inactive solution salt mining wells (Class III) in New York State. These Class IIR and Class III wells are regulated in New York State by the Division of Mineral Resources under the Oil, Gas and Solution Mining Law. Class IID brine disposal wells require permits from both the Division of Mineral Resources and the Division of Water through the SPDES program, in addition to the federal UIC permit required for any new or converted injection well.

#### 1. Primacy under UIC

As mentioned above, the Safe Water Drinking Act was intended to encourage states to accept responsibility for the UIC program. States endeavoring to

implement and administer this program must demonstrate to EPA that their regulatory program is consistent with and as stringent as the UIC program defined in federal regulations (40 CFR 124, 144, 146, and 147). States accepting responsibility for the UIC program must periodically furnish documentation to EPA that summarizes program activities, identifies any violations and violators and makes recommendations for program redirection. Adopting responsibility for this program is known as accepting "primacy."

New York State has not accepted primacy for the UIC program. New York State already regulates underground discharges through the SPDES program. After considerable study, both in-house and through an independent consultant, State officials in 1982 concluded that assumption of primacy would not provide significant benefits to the State of New York. This decision was based on the fact that implementation of the UIC program would have only a minor impact on enhancing the protection of New York's groundwater resources, as New York's approach to groundwater protection is more restrictive than the UIC program. Furthermore, the costs of implementing and operating the program were seen to be inordinantly high considering the fact that no additional environmental benefits would accrue to New York State. Federal funds, if available at all, would cover only a small fraction of the cost of the program.

New York State's decision not to accept primacy for the UIC program places the responsibility for administration of the program on the EPA. As a consequence, the Environmental Protection Agency Region II office directly implements the UIC program in New York State, and they are involved in overseeing activities which are also regulated by the Division of Mineral Resources and the Division of Water. The DEC is now in the early stages of developing a Memorandum of Agreement on plugging and abandonment requirements with EPA for coordination with the UIC program in New York. This Agreement will be designed to improve coordination and communication, and where

possible, prevent overlapping or duplication of effort and conflicting requirements.

#### 2. UIC Program Requirements

Because of its broad scope, the federal Underground Injection Control program is large and complex. The following discussion summarizes key aspects of the federal UIC program for New York State that relate to the regulation of oil, gas and solution mining activities by the Division of Mineral Resources and other State agencies. As mentioned previously, the DEC did not petition and has no intention in the future to petition for primacy. Details of the UIC program are specified in federal regulations, 40 CFR Parts 124, 144, 146 and 147.

The UIC program contains a general prohibition on any activity that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation or may otherwise adversely affect the health of persons.

Injection activities may be authorized either by rule or by permit; authorization by rule allows certain existing injection activities to continue without having a permit, if the activities are in compliance with UIC program requirements. Existing Class II enhanced recovery wells are authorized by rule for the life of the project, contingent on compliance with casing and cementing requirements within three years and all other requirements within one year. Existing Class III wells are also authorized by rule, but all Class III wells were required to be permitted by June 25, 1985 for continued legal operation. However, the EPA administrator may require any well authorized by rule to obtain a permit.

a. Procedural Requirements

The federal UIC program establishes a number of procedural and technical requirements. The procedural requirements are largely intended to provide EPA with information needed to determine whether injection activities are in compliance with program requirements. Operators are required to submit to EPA an inventory of their injection wells subject to the federal program. Operators are required to monitor the nature of the injected fluid with sufficient frequency to provide information that is representative of its characteristics. This monitoring must be accomplished at least once within the first year. In addition, observation of the injection pressure, flow rate and cumulative volume must be recorded monthly for enhanced recovery operations and weekly for produced fluid disposal. Operators of Class I, II, and III wells are also required to demonstrate the mechanical integrity of the wells at least once every five years. Operators are required to submit periodic reports on the results of all monitoring.

The UIC program establishes financial security requirements to ensure the proper plugging and abandonment of injection wells. EPA has some flexibility under the federal law and regulations as to the types of financial security it will accept. There is some overlap between federal financial security requirements and those of New York State under the Oil, Gas and Solution Mining Law. This overlap affects only those wells among the approximately 1,651 active injection wells in New York that were not "grandfathered" by the New York State law, and it is estimated to be 150 to 200 wells. Many of the injection wells in New York are exempt from State financial security requirements, but DEC and EPA are initiating discussions which may further minimize the problem of overlap and double bonding.

Additional requirements relating to proper plugging and abandonment are that operators prepare a plugging and abandonment plan for their injection wells, that operators notify EPA of the conversion or abandonment of a well at

least 45 days before plugging and abandonment and that the operator submit a plugging and abandonment report after plugging a well. To ensure proper tracking of well ownership, operators are required to notify EPA of transfers of ownership of wells.

#### b. <u>Technical Requirements</u>

The federal UIC program establishes a large number of detailed technical requirements for new injection wells. These requirements cover the construction, operation and plugging and abandonment of wells in order to prevent fluid migration into underground sources of drinking water.

The construction requirements for injection wells take into account the depths to the injection zone, depth to the bottom of underground sources of drinking water, estimated injection pressures, casing specifications and hole size. Existing Class II wells do not have to comply with these construction requirements if some form of regulatory control was in place at the time the well was drilled and if it can be proven by mechanical integrity testing that the well injection will not result in fluid migration to an underground source of drinking water.

Mechanical integrity testing of injection wells is a major emphasis of the UIC operational requirements. An injection well has mechanical integrity if 1) there is no significant leak in the casing, tubing or packer, and 2) there is no fluid movement into an underground source of drinking water through vertical channels adjacent to the injection wellbore. The federal regulations specify a number of accepted methods to determine mechanical integrity. However, completion techniques historically used in secondary oil recovery operations in New York State and elsewhere in the Appalachian Basin do not lend themselves to easy determination of mechanical integrity. Operators in New York have asked EPA to consider alternative methods of

testing for mechanical integrity on a regional basis.

Currently, accepted methods to evaluate leaks and mechanical integrity are:

- 1) monitoring of annulus pressure;
- 2) pressure test with a liquid or gas;
- 3) records of monitoring showing absence of significant changes in the relationship between injection pressure and injection flow rate for the following Class II enhanced recovery wells:
  - a) existing wells completed without a packer but with available data from a pressure test provided that one pressure test is performed when the well is shut down if shutting-in the well does not cause a significant loss of oil or gas.
  - b) existing wells constructed without a long string casing but with surface casing which terminates at the base of the fresh water zone as allowed by local geological and hydrological features, provided the annular space is visually inspected. The Director of EPA will prescribe a monitoring program to verify the absence of significant fluid movement from the injection zone into USDW.

4) radioactive tracer surveys (received approval 9/18/87).

One of the following methods must be used to determine the absence of significant fluid movement: 1) results of a temperature or noise log; 2) cementing records demonstrating the presence of adequate cement to prevent such migration (Class II, or III where the nature of the casing precludes the use of logging techniques); or 3) the Director of EPA may allow alternate tests to demonstrate mechanical integrity only in response to individual formal application.

Operators in New York have the option of using an inexpensive mechanical

integrity test, identified as the water-in-annulus test. This test was developed especially for wells without long string casing but with surface casing set through the water table aquifer, a common construction method in New York. The water-in-annulus test was approved temporarily by EPA in July 1984. Modifications to the test have been accepted and were published in the <u>Federal Register</u>. Because of completion practices, this method of testing is the only one many operators in New York's old oil fields have to verify mechanical integrity, but this testing is not acceptable to some EPA Washington, D.C. administrators. On July 14, 1987, EPA notified operators that water-in-annulus mechanical integrity test had only a one-year extension. In addition, it is approved only for existing wells in Allegany, Cattaraugus and Steuben counties of New York and selected counties in Pennsylvania.

Pressure limitations on injection are another major part of the UIC program. The purpose of these limitations is to prevent the initiation of new fractures or propagation of existing fractures in the confining zone adjacent to underground sources of drinking water. These requirements apply to both Class II and Class III wells, but Class III wells are subject to a further limitation on pressure designed to prevent fracturing in the injection zone, except during well stimulation.

The injection pressures originally specified in federal regulations for New York State caused considerable concern for existing Class II waterflood oil recovery operators, as they were significantly lower than the pressures needed for economically successful secondary recovery, due to the low permeability of the waterflooded oil sands. In response to these concerns, EPA has established alternative procedures for determining maximum injection pressures for enhanced recovery operations. Numerical standards have been established by EPA based on data provided by operators of injection wells, and will be published in the <u>Federal Register</u>. An operator wishing to use an

alternative maximum pressure higher than these standards must demonstrate to EPA that the confining layer will not be fractured and that migration of fluids into underground sources of drinking water will not occur.

The UIC program provides for certain exemptions to the general prohibition on injection into aquifers (definitions for exemptions are found in 40 CFR 146.4). An aquifer may be exempted if: 1) it does not currently serve as a source of drinking water and will not serve in the future, 2) it is hydrocarbon or geothermal energy producing, 3) it is situated at a depth or location which is economically or technologically impractical for usage, 4) it is contaminated to the point that it is economically or technologically impractical for usage, 5) it is located over a Class III well area subject to subsidence or collapse and/or 6) the total dissolved solid content is more than 3,000 but less than 10,000 mg/l and is not reasonably expected to serve as a public water supply system.

The only exempt aquifers in New York State are oil-bearing formations with a long history of waterflooding operations (Bradford 1st, 2nd, and 3rd sands and the Chipmunk and Kane formations). Ironically, the only reason that these aquifers must be specifically exempt from the UIC program is that waterflooding with freshwater for many years has brought their total dissolved solid levels below the 10,000 mg/l limit which is the upper threshold of the definition of a USDW in the UIC program. Injection into these aquifers is properly allowed as they have never and will not in the future serve as underground sources of drinking water in New York State.

#### 3. <u>UIC Coordination</u>

As noted earlier in this chapter, DEC and EPA Region II are in the process of developing a Memorandum of Agreement to facilitate interagency coordination. However, permits and regulatory programs will remain in place. Permits to drill, convert and/or operate injection wells are required by the

Division of Mineral Resources, Division of Water (for disposal wells), and EPA. Injection wells presently in existence must conform to the Division of Mineral Resources' and EPA's regulations. Inspections and enforcement can be carried out separately by any one of the three agencies. Financial security for operational liability, plugging and abandonment will be required by both the Division of Mineral Resources and EPA. Furthermore, permits to plug and abandon are also required by both the Division of Mineral Resources and EPA.

It must be noted that New York State's new requirements which became effective April 1, 1986 for well construction techniques are at least as stringent and often times more restrictive than UIC regulations. Such operations have been defined throughout the text of the GEIS. This overview of the UIC program should be used as a summary only and specifics should be derived from Title 40 of the Code of Federal Regulation.

#### F. OIL SPILL RESPONSE

#### 1. New York State Responsibilities

On April 1, 1978, the New York State Legislature adopted the Oil Spill Prevention, Control and Compensation Program, Article 12 of the Navigation Law (Chapter 845 of the Laws of 1977). This law provides for the prohibition of oil spills, the clean-up of spills that occur, the compensation of victims of oil spills and the licensing of petroleum facilities and vessels. Amendments effective October 13, 1985, transferred oil spill powers, duties and obligations from the Department of Transportation to DEC.

Under this law and provisions of the Environmental Conservation Law, DEC has the lead role in spill prevention and response, which may be shared with other agencies under their own legislative mandates, such as police and fire officials who have pre-emptive emergency authority over people and property. Department of Health officials become involved in incidents requiring

evacuations or in any incident likely to affect public health. This would include water quality incidents, particularly those likely to affect drinking water quality. The type of response to a given spill depends on the amount and type of spilled material, its accessibility, the severity of the spill, the type and sensitivity of the resources affected and the urgency of protecting life and property.

Under the law, leaks and spills must be reported within two hours of their discovery. DEC has a 24-hour hotline that can be used for such reporting. The number of the hotline is 1-800-457-7362. Information about the spill is then relayed to the appropriate DEC regional office representative in the Division of Water. Because of the regulatory control exercised by the DEC Division of Mineral Resources over the oil and gas industry, this Division is usually notified initially by operators when oil or brine spills occur on oil, gas or solution mining well sites. Depending on the severity of the problem, additional notifications might be made to federal contact points such as the U.S. Environmental Protection Agency, the National Response Center, the U.S. Coast Guard, or the State Emergency Management Office might be notified to implement the State Disaster Plan.

If the party responsible for the spill is unwilling to take responsibility for containment and clean-up of a spill, the State can take the initiative through the use of standby contractors. Contractors for accidents involving oil spills are obtained through use of the NYS Oil Spill Fund. Fund amounts are recovered later through appropriate legal action against the violator.

Disposal of spilled materials must be conducted in an environmentally sound manner and all disposal areas for spilled materials must be permitted by DEC. Waste haulers must be licensed and use approved disposal areas.

At the completion of the clean-up efforts, a form describing the time,

location and extent of the spill and remedial measures taken must be completed and submitted to the Division of Water.

#### 2. Federal Responsibilities

Federal law splits responsibilities for oil spill prevention and clean-up between the Coast Guard and the Environmental Protection Agency, under two separate pieces of legislation. A Memorandum of Understanding between EPA and the Coast Guard defines each agency's responsibility.

In general, the EPA regulates all non-transportation facilities. This includes onshore and offshore fixed and mobile oil drilling and production facilities, storage facilities and other associated facilities. The Coast Guard regulates those structures regarded as transportation-related facilities, including any onshore or offshore terminal facility used for the purpose of handling or transferring oil in bulk to or from a vessel, as well as storage tanks and the appurtenances for the reception of oily ballast water or tank washings from vessels. As defined in the MOU between EPA and the Coast Guard, practically all of New York State oil and gas producing facilities would be regulated by EPA, rather than by the Coast Guard.

Under CFR 40 Part 112, EPA regulates all facilities related to drilling, production, storage, gathering, processing, refining, transferring, distributing, or consuming oil and oil products which could damage any navigable water with a discharge of oil. Certain facilities are excluded from these regulations, including facilities which have: 1) aggregate capacities less than 1,320 gallons of oil, provided no single container holds more than 660 gallons and 2) a total storage capacity of 1,000 barrels (42,000 gallons or less of oil and such capacity is buried underground).

The definition of "navigable waters" under the federal program is very broad. It includes those waters defined by the Federal Water Pollution

Control Act and tributaries of such waters; any interstate waters; any intrastate lakes, rivers and streams which are utilized by interstate travelers for recreational or other purposes; and any intrastate lakes, rivers or streams from which fish or shellfish are taken and sold in interstate commerce. This broad definition, in conjunction with the fact that most New York oil fields are located near a tributary stream or a river, places these facilities under federal jurisdiction. One important element under Section 112 is the authority for EPA to mandate the preparation and implementation of a Spill Prevention Control and Countermeasure Plan (SPCCP). Operators of facilities under EPA jurisdiction are required to prepare a SPCCP on standard forms and maintain it on file at the operator's premises, although the SPCCP must be available to EPA upon reasonable request.

The requirements for a complete SPCCP for oil and gas operators in New York include the following:

- Any aboveground facility which has encountered one or more spills within a 12-month period prior to the effective date of this part must submit a written description of each spill, corrective actions and plans to prevent reoccurrence.
- 2. The plan should include predicted directions, rates of flow and total quantities of oil discharged during a major failure.
- Containment and diversion structures shall be provided and include dikes, berms, curb, culverts, booms, sorbent material and sumps.
- 4. If such structures listed in item 3 are impractical, the owner or operator must clearly demonstrate so and provide: 1) a strong contingency plan and 2) a written commitment of manpower, equipment and materials required to cope with an oil discharge.
- Other items of discussion include, but are not limited to: 1)
  facility drainage; 2) bulk storage tanks; 3) facility transfer

operations; 4) oil production facilities such as bulk storage tanks, separators and tank batteries; 5) facility tank car and tank truck loading and unloading; 6) oil drilling and workovers; 7) inspections and records; 8) security and 9) personnel training and spill prevention procedures.

The Division of Mineral Resources presently requires all permit applications for oil wells to have the federal SPCCP attached. This requirement ensures that the operators have taken adequate steps to prevent and contain any oil spills which may occur on their facilities.

The federal regulations specify reporting requirements for operators in the event of an oil spill. These reporting requirements are in addition to those imposed by New York State law. Although the federal reporting requirements include spill volume criteria, the Department recommends that operators contact all affected agencies regardless of the spill size.

#### XVI. SUMMARY OF ADVERSE ENVIRONMENTAL IMPACTS RESULTING FROM OIL, GAS, SOLUTION MINING AND GAS STORAGE OPERATIONS

#### A. INTRODUCTION

This chapter summarizes the adverse environmental impacts from oil, gas, solution mining and gas storage operations. Analysis of the impacts on each resource will focus on normal operations conducted in accordance with Regulatory Program requirements. In addition, the potentially significant environmental impacts of accidents such as spills, leaks and blowouts will also be covered.

In assessing the impacts of proposed oil, gas, solution mining and gas storage activities, both long and short term impacts must be considered. Distinctions must also be made between impacts from single wells and less common multi-well projects such as underground gas storage fields. As previously defined, siting includes the planning, preparation and initial construction of a well site and access road. (See 8) Operations include drilling, completion, stimulation, reclamation, production, maintenance, and plugging and abandonment of a well. (See 9, 10, and 11)

The impacts on most environmental resources are very similar for all types of oil, gas, solution mining and gas storage operations. Therefore much of the discussion on the environmental impacts of standard oil and gas operations also applies to the other operations particularly with respect to siting and drilling activities. For other resources, however, the impacts from primary oil and gas wells, (See 8, 9, 10, and 11) waterflooding, (See 12) solution mining (See 13) and underground gas storage (See 14) must be addressed individually.

#### B. STANDARD OIL AND GAS OPERATIONS

For purposes of this section standard oil and gas operations will include any procedure relevant to rotary or cable tool drilling methods, and

production operations which do not utilize any type of injection to facilitate the recovery of oil.

Most environmental resources are protected through siting restrictions and permit conditions. For example, streams can be protected through permit and siting restrictions on oil and gas wells near them. (See 6.B, 8.E.l, 8.G-H) Important groundwater supplies, agricultural lands, significant habitats, floodplains, freshwater wetlands, state lands and coastal areas can also effectively be protected through permit and siting restrictions. (See 6.C-G, I, K, and 8.E, F, J-N) Land, vegetation, and air, on the other hand, are everywhere and the utility of a siting restriction approach is limited. (See 6.H, J, M)

Noise and visual impacts will also occur wherever these operations are located. However, the significance of noise and visual disturbances is directly related to the presence of people and/or sensitive resources in the area. (See 6.N and 8.D.2) Therefore, these topics will be covered as warranted.

#### 1. Adverse Land Impacts

The majority of the industry's activity centers on drilling individual oil and gas wells for primary production. (4.B.3)

Oil and gas operations vary in the amount of land used, their effect on local topography and volume of soil disturbed during construction operations but generally access road and site construction disturb less than two acres of land. Because of the minimum 40 acre spacing required for most new wells, impacts on landscape and soil resources are usually minor from the regional perspective. (See 6.H and 8.B)

a. <u>Siting Impacts</u> - Impacts associated with siting operations, are directly related to the location, size and contour of the well site. The impacts are virtually the same as those for other earth moving and

construction operations. (See 8.A) The three main concerns are erosion, sedimentation and vegetation loss or damage. (See 6.H and 8.G-H) Compaction may also be a major concern in agricultural areas (See 8.F.2)

Erosion and sedimentation result largely from inadequate site preparation, such as poor grading or failure to install erosion control measures. (See 8.H) Some erosion and sedimentation is unavoidable when a site is constructed on or into a hill or slope but erosion and sedimentation can be controlled through efficient reclamation operations. (See 10.B and 11.E.1)

Vegetation losses are unavoidable. (See 8.A) Nearly every site must be stripped to the hardpan clay zone to avoid more severe erosion and sedimentation problems. Long-term vegetation losses on a site are most severe when an operator fails to properly segregate topsoil from other excavated material. An increasing number of operators have realized the importance of topsoil preservation over the last three to five years. As a result, revegetation of well sites has improved. (See 8.D.2.b, 8.F.3, 10.B and 11.E.1)

Potential long term impacts from soil erosion are a serious concern. (See 8.H) Topsoil takes hundreds of years to form and its loss can have serious long term impacts on the land's ability to support crops and other vegetation. (See 8.F.3) Persistent erosion can also result in significant changes in the landscape.

Under the existing Regulatory Program, erosion control measures are only specifically required for wells in watersheds of drinking water reservoirs. (See 6.B and 8.H.1) Permit conditions addressing erosion control during construction can be applied to wells outside the watersheds, when they are needed. (See 8.H.2)

The potential for accelerated rates of erosion continues long after the

construction activities are completed. (See 10.B) The current regulations do not specifically require that the topsoil be set aside and redistributed, or that disturbed areas be seeded and mulched except where other DEC permits are required in environmentally sensitive areas, such as Agricultural District lands or wetlands. (See 6.F, 6.I, 8.F.3 and 8.L) Therefore, the adequacy of the site reclamation plan is sometimes left to the operator's discretion and/or the provisions of the lease agreement. (See 9.F.5) Failure to skim off and set aside the topsoil layer can result in its burial during site reclamation, effectively sterilizing surface soils. (See 8.F.3, 11.E.1)

b. Operational Impacts - The existing regulations also do not address the need for partial site reclamation between the drilling and production phases of a successful well. Producing wells and their associated facilities usually cover only 10 to 15 percent of the original drill site. (See 10.B.1, 10.B.2) Operators are only required to remove waste fluids from drilling pits within 45 days after the cessation of drilling operations. (See 9.H.8) Conscientious operators immediately reclaim the pits and the other portions of the well site that are not needed to support production operations so that the land can be returned to productive use thus preventing soil erosion. If this partial reclamation is not undertaken, soil erosion and other associated problems may continue throughout the producing life of the well (30+ years) and have serious long term negative impact on soil and land resources. (See 6.H, 8.H, 10.B)

c. <u>Fluid Handling Impacts</u> - Negative environmental impacts on soil resources can also result from accidental spills of oil, brine or other materials involved in drilling and production of oil and gas wells. Depending upon the type and amount of material spilled, the contaminated soil may be unable to support vegetative growth. Brine and other waste fluids high in salt can kill vegetation and retard growth for years. (See 9.H.7.a) Similarly,

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oil spilled on the ground surface can kill plants and retard new growth. (See 10.B.2.a)

### 2. Adverse Impacts On Other Environmental Resources

The potential environmentally negative impacts on agriculture, significant habitats, floodplains, freshwater wetlands, state lands, coastal areas, air quality, social and cultural resources, archeological resources and flora and fauna are summarized below.

a. <u>Agriculture</u> - <u>Siting Impacts</u> - The major negative impacts on agriculture are damage to soil resources and long term occupation of agricultural lands by non-agricultural activities. (See 6.H-I and 8.F)

Lands in Agricultural Districts are less likely to suffer serious negative impacts because proposals affecting Agricultural Districts are subject to more detailed environmental review under SEQR. However, a substantial portion of the State's agricultural lands still lie outside these districts. Siting of oil and gas wells and their associated facilities can have serious long term impacts on agricultural operations. Construction may remove viable farm land from production, bisect tillable fields and interfere with basic farming operations. (See 8.F.2) Construction of access roads and well sites can also damage tile drainage systems or interrupt natural drainage. (See 8.F.1) Lease agreements between the landowner and the operator should, but do not always, address these problems. (See 8.F.5)

Damage to topsoil during the construction phase can take three forms: compaction, burial or erosion. (See 6.H, 8.F.3 and 8.H) Topsoil may be buried beneath sterile subsoil either during construction and/or reclamation procedures. (See 8.F.3, 10.B and 11.E.1) It may also be lost through erosion that starts through poor siting and construction techniques. (See 8.A and 8.H) These negative impacts are most likely to occur outside of Agricultural

Districts and watersheds of drinking water reservoirs where erosion control measures are not required on a consistent basis. (See 8.F and 8.H.2)

Operational Impacts - Impacts on agriculture from drilling are generally related to handling waste fluids. (See 8.F.3-4 and 9.H) The high salt content of most waste fluids can kill vegetation and retard growth for years. (See 9.H.6.a,c,e-g and 9.H.7.a) Mildly acidic wastes can also contaminate soil and increase mobility of heavy metals. (See 9.H.6.d. and 9.H.7.d) Wastes are generally stored on site in pits or tanks prior to final disposal and operators are required to have sufficient storage capacity on site to handle them. (See 9.H.1-5) Accidental spills sometimes occur, especially in the immediate vicinity of the holding pits. (See 8.D.1 and 9.H.2-3) The extent of the impacts on soil resources and agricultural operations will depend on the composition of the waste, the volume spilled, the natural attenuating capabilities of the soil, and the success of cleanup operations. (See 9.H.6-7)

Open access to an unreclaimed well site can also adversely affect livestock who may wander out of their pasture and onto the site. Livestock illness or death can result from ingestion of waste fluids. (See 8.F.4-5)

Impacts on agriculture from production operations are generally related to the long term use of agricultural lands for non-agricultural purposes, from short-term site construction activity and from accidental spills of oil or production brines which may contaminate the soil resource. The land occupied by the well, access road, and production facilities may not be available for agricultural uses for several decades. (See 10.B)

b. <u>Significant Habitats</u> - Significant habitats are areas which "provide some of the key factor(s) required for survival, variety, or abundance of wildlife, and/or for human recreation associated with such wildlife". (See 6.K and 8.J)

Negative impacts from oil and gas activities on significant habitats are uncommon because the habitats are relatively small and scattered. Inventorying of significant habitats is an ongoing project so the possibility exists that a sensitive and ecologically important area will be unknowingly disturbed. (See 6.K, 8.J and 8.N.2)

c. <u>Floodplains</u> - Floodplains are the lowland areas along streams, rivers, ponds and lakes which carry extra water when heavy rain or melting snow causes a waterbody to overflow its normal banks. Property damage and other problems can arise when development of any kind takes place in these areas. Well siting and construction in floodplains destroys vegetation and changes the topography which can interfere with the water carrying capacity of the floodplain. (See 6.G and 8.K) Removal of vegetation from floodplains can lead to erosion and sedimentation problems. Erosion could be particularly severe during a flood resulting in sedimentation of adjacent waterbodies. (See 8.K.5)

Flooding is likely to occur sometime during the producing life of a well located on a floodplain. If the floodwaters reach the well site, oil and production brine tanks will usually be held in place by their anchors. (See 8.K.2-3) However, debris carried by the flood could conceivably rupture a tank, and spilled oil carried by floodwaters could result in damage over a significant area. (See 8.K.4 and 10.B.2.a)

d. <u>Freshwater Wetlands</u> - Wetlands smaller than 12.4 acres are not covered by the provisions of the Freshwater Wetlands Law unless they have unusual local significance. The addition of conditions to drilling permits to protect smaller wetlands is done on a sporadic basis depending upon the known value of the wetlands and the availability of alternate sites. (See 6.F and 8.L)

Construction of access roads and well sites in wetlands results in

destruction of vegetation, changes in landscape and water levels, and loss of plant and animal habitat. (See 8.L.1-4) These alterations in turn can negatively affect the ecological balance of wetlands and the benefits they provide. (See 8.L pp 8-41, 8-42) Impacts from drilling oil and gas wells in or near wetlands are generally related to handling of waste fluids. Accidental discharges of these waste fluids to wetlands can kill trees and other vegetation, sterilize the soil and permanently affect the nature of the wetland habitat. (See 8.L.8)

e. <u>Coastal Lands</u> - Impacts of oil and gas activities on coastal lands will vary greatly depending upon the exact nature of the coastal area involved. For example, even minor visual disruption near coastal wetlands or popular recreational areas may be regarded as an extremely negative impact. On the other hand, in coastal farming areas, topsoil loss and other agricultural concerns may be the most important negative impacts. (See 6.E and 8.N)

Because of the many competing water-oriented uses of coastal lands, the State Legislature passed the Waterfront Revitalization and Coastal Resources Act (WRCRA). WRCRA requires maintenance of a balance between economic development and preservation of the State's unique coastal resources. Policies for maintaining this balance are detailed in the State Coastal Zone Management Plan and individual Local Waterfront Revitalization Plans. All proposed oil, gas and solution mining activities must be consistent with these plans. Therefore, any potential negative impacts of proposed oil, gas and solution mining wells on coastal resources will be fully considered before a decision is made on issuing a permit. (See 6.E and 8.N)

f. <u>State Lands</u> - Oil and gas drilling on DEC controlled State lands is primarily restricted to State Reforestation and Game Management areas where land use conflicts and disruption of recreational activities will be minimal.

(See 6.D and 8.M) Environmental impacts on State lands are controlled through temporary revocable State Lands Permits in areas not covered by oil and gas leases. Permit conditions are not usually required on State Leases because stipulations are written directly into the lease which address environmental concerns and ensure that the primary designated use of the State Land will continue unhindered. (See 8.M.1)

The New York State Office of Parks, Recreation and Historic Preservation (OPRHP) serves as the lead agency for SEQR Review of drilling permits under a Memorandum of Understanding with DEC. Therefore, when drilling permit applications are received for wells in State Parks, they are forwarded to OPRHP. This system ensures that any negative impacts of oil and gas development on State Parklands will be handled by the State Agency most familiar with the Park system. Current statute prohibits any future leasing of State Parklands. (See 6.D and 8.M.2)

g. <u>Air Quality</u> - Most air quality impacts associated with oil and gas, solution mining and gas storage operations are usually short-term and minor. (See 6.M) The primary air contaminants that may occur are: 1) oil distillate from production facilities, (See 10.B.2.a) 2) airborne dust from construction activities and/or traffic on unstabilized access roads, (See 8.D.1) 3) diesel fumes from equipment operation (See 8.D.2) and 4) uncommon accidental uncontrolled flows of methane and  $H_2S$ . (See 9.A.4 and 10.B.1.a)

Dust and exhaust fumes from heavy equipment are the most common air quality impacts that occur from siting. Like most other small construction sites, the associated dust and exhaust fumes are short term and limited in areal extent. (See 8.A and 8.D.1)

In the worst situation where an accident results in an uncontrolled natural gas flow, air quality can be very negatively impacted. Uncommonly

small amounts of hydrogen sulfide (H<sub>2</sub>S) have been noted during drilling in New York. (See 9.A.4) Both situations pose extreme health and safety hazards. Such releases must be controlled immediately. Gas releases are generally regarded first as an immediate safety concern, with the philosophy that once the safety situation is corrected, health and environmental hazards can be evaluated. (See 10.B.1.a)

The most common air quality problems, during the well production phase, originate from oil stock tanks. Distillates and fumes escaping from improperly vented stock tanks are readily recognized by offset landowners or by anyone frequenting the area. (See 10.B.2.a)

Venting of wells which is only allowed in the old oil field areas where gathering of the limited associated gas is not economic, will cause localized degradation of air quality. (See 12.C.2.b) Gas leaking from wellheads can cause safety concerns if trapped in an enclosed area. (See 10.B.1.a)

h. <u>Social and Cultural Resources</u> - People are the primary social and cultural resource in the vernacular of environmental impact statements. This section covers direct impacts on people. Siting of wells too close to areas inhabited or frequented by people unnecessarily exposes them to possible accidental injury. Although no problems have been recorded to date, staff analysis of the existing siting restriction on wells near private dwellings shows that the residents and their property might not be adequately protected by a 100' buffer in the event of a well blowout or fire. (See 8.D)

Compared to the drilling phase, the safety concerns associated with production are relatively minor. For this reason, the siting of production equipment is not covered under the existing surface restrictions. However, in heavily populated areas and/or areas frequented by children, the Department can require that access to the site be restricted. For example, fencing around a pump jack may be required for a well on school grounds. Restricting

access to production equipment may also be necessary to prevent vandalism. Although such instances are rare, vandals tampering with the valve on a production tank have been credited with an oil spill that reached a nearby river. (See 8.D and 10.B)

Production facilities can have long term visual impacts. The visual impacts from gas wells are generally minor because of the small size of gas production facilities. (See 6.N, 8.D.2.b and 10.B.1) The storage tanks associated with oil wells, however, can be visible for a considerable distance. The extent of the visual impacts in a particular instance would depend on the size of the production tank, its proximity to nearby residences, public buildings, areas or roads, surrounding land uses, local topography, type of vegetation, and the presence of man-made objects that serve as visual barriers. (See 6.N, 8.D.2.b and 10.B.2)

Noise impacts from production facilities are generally minor but drilling operations are quite noisy. Drilling operations usually continue 24 hours a day, so people living in close proximity can be very uncomfortable. Fortunately most wells are drilled within a week, and rig sound proofing or restricted drilling hours could be added as special permit conditions under special circumstances. (See 8.D.2.a-b)

i. <u>Historic and Archeologic Resources</u> - Impacts on historic sites from construction of the access road and well site are generally very minor. Depending upon the individual circumstances, DEC may require a change in the proposed well location, visual screening of construction activities, or restrictions on hours of operation. (See 6.L and 8.I)

The impacts of construction activities on archeologic resources are more serious. Since archeologic sites are generally difficult to detect by their surface appearance, they are more likely to be damaged during construction.

Even if artifacts are salvaged before excavation begins, removal from their original location and disturbance of the site will destroy much of their value. Even with safeguards, it is possible for an archeologic site to escape detection until construction actually begins. When this occurs, conscientious operators cease construction and notify the Department of their discovery. (See 8.I.2)

j. <u>Flora and Fauna</u> - Impacts on flora are similar to those described under land impacts. Impacts on specific flora vary greatly. When a mature tree is removed, certainly it will take decades to replace it. Conversely, natural field vegetation, such as goldenrod, ragweed, queen-anne's lace and tiger lily, will replenish itself within one growing season. Endangered or protected species of flora are often located in rugged and/or sensitive terrain areas such as stream banks, wetlands or gorges. Protection of such flora is stipulated in the permits for wetland or stream crossing construction activity. (See 8.G and 8.L)

Fauna are temporarily displaced during every facet of oil and gas operations except production. Drilling, completion, reclamation, maintenance and plugging and abandonment operations require heavy equipment and manpower. Heavy equipment agitates wildlife, forcing the wildlife to relocate. During the production phase of a well, on site activity is minimal and wildlife such as deer, turkey, rodents, reptiles and amphibians are quite often seen near the well site. Permanent disruption of fauna/habitat is rare due to the small size of the site after reclamation. (See 6.K and 8.J)

3. Adverse Impacts On Surface Waters

a. <u>Siting Impacts</u> - Impacts on surface waters from routine oil and gas activities are generally minor. (See 6.B, 8.E.l, 8.E.3.a) Most siting impacts are short term or temporary in nature and can be mitigated or avoided. However, the potential exists for adverse impacts when conducting operations

near surface waters. Most impacts on surface waters from siting operations occur during the initial construction period of the well site and access road. (See 8.A) The major concerns are turbidity, sedimentation and erosion. (See 8.G-H)

Sedimentation by eroded soils is the most serious surface water quality concern during the well site construction phase. While turbidity is often a short term problem, if the conditions responsible for erosion and subsequent sedimentation persist, or become more intense, continued turbidity will occur. Serious soil erosion and sedimentation are more likely to occur when: 1) a site is prepared during the wet season or, 2) an inordinate amount of precipitation washes out the site. (See 8.H)

On a large scale, sedimentation and turbidity may reduce the oxygen in surface waters which in turn may have a significant effect on resident flora and fauna. Heavy sedimentation can adversely affect spawning grounds and, in extreme cases, re-route a stream. The affected bodies of water often require mechanical assistance, such as dredges, filtering devices, etc., to correct the problem. (See 8.H) Surface waters most sensitive to siting impacts are reservoirs and their feed streams. Heavy sedimentation in a watershed can lead to a shutdown of a public water supply. When these potential problems are recognized prior to permitting, specific requirements are stipulated on the permit, thereby averting or minimizing impacts. (See 8.H.1-2)

Lack of adequate erosion and sedimentation controls and negligence or accidents are the major sources of detrimental turbidity conditions. Examples of three major types of negligence and their possible consequences are:

	Condition	Result
1.	Improper culvert pipe size	Allows stream to back-up, washing the bank soil into the stream
2.	Poor site or access road preparation	Allows sediment to escape from site into a body of water
3.	Substandard workmanship	Improper culvert installation allows a stream to washout embankments and flow around the culvert pipe carrying eroded soil

b. Operational Impacts - There are few adverse impacts on surface waters from drilling operations conducted in accordance with regulatory requirements but accidents, such as spills of drilling waste fluids can have serious water quality impacts. (See 9.H.6-7) Increases in chlorides, heavy metals and organic compounds as well as changes in pH can occur. Depending upon the concentration of the waste fluids and the characteristics of the receiving waters, a fish kill may also occur. Adoption of the proposed increase in the 50 foot siting setback on wells near surface water bodies will lessen the chances of negative impacts should a spill occur. (See 8.E.1) Accidents cannot be forecasted. However, accidents and their impacts can be minimized through sound engineering techniques, strict adherence to safety precautions and prompt remedial action, when necessary. (See 9.A.4)

Drilling waste pits if not properly sized or constructed can overflow or cave-in allowing fluids to escape. An adequately sized pit can also overflow due to inordinate amounts of precipitation, lack of sufficient means of diverting surface runoff, sudden winter thaws or an encroaching water table (reducing the pit's capacity). (See 9.H.1-3)

Completion operations are conducted after the hole has been drilled. (See 10.A) Improper containment of the frac fluid is the most common source of pollution in the completion phase. If fluids are not properly handled, surface waters may be adversely affected by run-off from spills containing the

chemicals used in the fracturing process. (See 9.F)

Site reclamation, by definition, is a restoration process. Improper reclamation techniques can lead to pit overflows and accelerated erosion due to poor grading and/or lack of seed and mulch. (See 8.F.3, 10.B and 11.E.1) All of these conditions can degrade surface water quality.

c. <u>Fluid Handling Impacts</u> - Surface water impacts associated with production are largely the result of accidental leaks of production lines or overflows of brine and oil tanks. (See 8.G.2, 10.B.2) Accidental spills of oil or production brines can result in potentially serious water quality impacts if the spill reaches the surface water body. Like drilling waste fluids, production brines, can cause fish kills and localized, short term changes in water quality. (See 9.H.6.f, 9.H.7.a, 10.B.1.a, 10.B.2.a) Spilled oil can have greater environmental impacts because it can be transported large distances on surface waters and persists in the environment. Waterfowl and other wildlife downstream from the spill can be "oiled" and die of exposure. Vegetation and soils along the banks of the waterbody may also be subjected to long-term oil contamination. In addition, weathered oil which will sink to the bottom of a waterbody can negatively affect benthic organisms and become permanently entrained in the substrate. (See 8.K.2 and 10.B.2.a)

Another, less common, occurrence associated with production are those wells from which fluids leak and contaminate local surface waters. (See 10.B.1.a and 10.B.2.a) Well maintenance operations can also have an impact on surface waters in the form of brine spills. These are usually the result of the maintenance crew's failure to contain fluids during "flowback" or "swabbing" operations. (See 9.F.3)

### 4. Adverse Impacts On Groundwater

Groundwater protection is a major focus of the Department's Regulatory

Program because over one-third of the State's drinking water is currently supplied by groundwater. (See 6.C, 8.E.2, 8.E.3.b-c, 8.E.4) Groundwater is also much more vulnerable to contamination than surface waters. Dilution of pollutants in surface waters is aided, to varying degrees, by the volume of the waterbody and its rate of flow. However, water moves much more slowly underground, inhibiting mixing and dilution of contaminants. Breakdown of pollutants is also inhibited by the absence of oxygen and normal surface weathering processes. (See 8.E.3.b)

a. <u>Siting Impacts</u> - Siting construction operations rarely impact groundwater supplies except when a surface water is hydrologically connected to a groundwater supply. Even then, intrusion of pollutants from surface waters is rare for a number of reasons: 1. surface contamination is easily recognized and can be corrected before groundwater is affected, 2. surface waters will dilute contaminants, and 3. the communication channels from surface waters to groundwaters provide a natural filtering network. Near surface groundwaters, such as springs are the most commonly impacted groundwater supplies. Turbidity most commonly results when siting operations disturb a spring. However, such impacts are usually temporary in nature providing the operator adheres to sound reclamation procedures. (See 8.E.2)

Siting oil and gas wells in primary aquifers and/or near municipal water supply wells can increase the chances for contamination of important groundwater supplies. Therefore, special restrictions are placed on these wells. (See 6.C, 8.E, 8.E.3.b-c)

b. <u>Operational Impacts</u> - Potential groundwater impacts associated with standard oil and gas operations are interrelated and complex. When groundwater contamination is discovered, and its source determined and corrective actions applied, the problem can still persist for years. Parameters such as the type of pollutant, aquifer characteristics, the

specific source which contributed to the problem, and the nature of the problem itself all play important roles in the duration of contamination.

Turbidity can occur, while drilling the surface hole. When a groundwater supply is penetrated, disturbance can allow sediments to enter the water supply and create offset turbidity if a subsurface channel of sufficient porosity and permeability is present. If the surface hole is drilled with a proper drilling fluid, a filtercake will develop and isolate the wellbore and only minor turbidity could occur from filtration of the drilling fluid a few feet into a permeable aquifer. Cement can also filtrate into permeable aquifer zones if adequate lost circulation material is not used during cementing operations. The majority of these situations are temporary, and usually correct themselves in a short time. In isolated cases, water wells can cave-in or permeable water channels can be intercepted and re-routed, adversely affecting a water well's quality and quantity of water. In serious cases, the drilling of a new water well may be required. (See 9.C)

Adverse impacts on groundwater due to stimulation operations are usually the result of improper fluid handling. Where prudent measures are taken to contain flowback fluids and/or maintain pit integrity, problems are rare. However, contaminants may percolate into groundwater supplies if stimulation fluids are not contained. (See 9.F and 9.H) The shallower the waterbearing formation the greater the pollution potential from surface disturbances and contamination.

Several negative influences on groundwater supplies can appear during the production phase of a well. The majority of these problems are actually the result of inadequate drilling or casing and cementing operations which do not manifest themselves until the later production stage of the well. (See 10.B.2.a)

The majority of negative groundwater impacts can be attributed to inadequate cementing procedures on the surface (freshwater protection) casing. (See 9.C) Other problems, such as gas channeling through the cement before it has set, can produce micro-annular fissures or cracks which create a conduit for gas and other pollutants to escape from the formation and migrate directly to the surface and/or into a potable water supply. (See 6.C, 8.E, 9.C)

When the production casing cementing operations are inadequate, gas will enter the uncemented annular space or channel through micro-annular cracks caused by shrinkage of the cement as it sets and be detectable at the surface. (See 9.C, 9.E) Lack of cement across a gas bearing formation can lead to pressure increases in an unvented annulus which in turn may cause breakdown of shallower formations and allow the gas to migrate into other zones of lower pressure, some of which may be water bearing. Since gas follows the path of least resistance, depressurization of the gas at the surface through venting can alleviate this problem. (See 10.B.1.a)

Oil and brine can also migrate from wells which do not have integrity. If the problem is due to a failure in the tubing or production string, losses in pressure and production volume will indicate that remedial action is required. If migration is from an uncemented hydrocarbon bearing formation behind pipe, the problem can be detected by annular inspections. If the annulus is opened and the zones have sufficient pressure, oil and/or brine may flow to the surface. However, most formations in New York do not have enough pressure to bring a column of fluid to the surface. Instead, a column of fluid will develop to a specific height above the pressured formation. When the pressure exerted by the column of fluid equals the pressure of the producing formation, a static equilibrium develops. The depth of this subsurface fluid column may equal the depth of a freshwater zone and if the freshwater zone is not protected by surface casing, the oil or brine fluid

column can enter the freshwater zone. Under these conditions, the source of contamination may not be recognized especially if it is from an improperly abandoned well. (See 10.B.2.a)

c. <u>Fluid Handling Impacts</u> - Additional groundwater impacts can result from the spiklage of produced fluids. The majority of spills are the result of storage tank failures. Leaks, valve malfunctions, improper maintenance and vandalism are other spill sources. Oil contamination of groundwater as a result of surface spills will occur when they are not cleaned up and there is sufficient time and volume for the oil to percolate. (See 10.B.2.a) Shallow groundwater supplies such as springs can be impacted quite severely by a nearby oil or brine spill. (See 8.E.2)

#### 5. Plugging and Abandonment Impacts

When plugging and abandonment of oil and gas wells is done properly, there are no major adverse environmental impacts. There are minor impacts such as dust and exhaust fumes from heavy equipment, (See 8.D.2.a) but these negative impacts can be mitigated by speedy and adequate site reclamation. (See 10.B and 11.E) Plugging and abandonment operations only impact surface waters (See 6.B and 8.E.1) when existing reclamation regulations are not followed. Ongoing sedimentation problems may occur if site restoration is delayed or disregarded. (See 8.H)

The well plugging stage is a crucial one in terms of groundwater quality protection. (See 6.C, 8.E.2, 8.E.3.b-c, 8.E.4, 11.A and 11.H) Potential impacts on groundwater are related to plug location, plug length and plug integrity. Overall, the Department's regulation of plugging and abandonment procedures minimizes the chances of groundwater pollution. However, recommendations have been made to improve plugging procedures and further reduce the chance of groundwater pollution by oil, gas, brine or other

contaminants. (See 11.F-G)

Since the entire wellbore is a potential channel for fluid movement, wells must be plugged with cement at several locations and the intervals in between must be filled with an approved fluid. (See ll.A) These plugging requirements are generally considered sufficient to protect groundwater quality. However, accurate plug placement is difficult to ensure unless the well is re-entered to tag the plug after it sets to check its location. (See 11.F.1.a, 11.F.1.d, 11.F.1.f, 11.F.2.a, 11.G.3.a-b, 11.G.4.b, 11.G.8.a) Inadequate plugging and abandonment of oil and gas wells can cause severe environmental problems. Migration of well fluids into permeable zones can occur if 1) plugs are not set at correct intervals, 2) inadequate size plugs are used, 3) improper cement is used for plugs and 4) inadequate fluid is placed between the plugs. (See 11.A, 11.B.3, 11.C, 11.F-G) "Weak" plugs can also result from cement contamination excessive mix water, and gas channeling. (See 11.D and 11.F) If any of these problems occur, the current required 15' length of the cement plugs does not provide sufficient groundwater quality protection.

Well fluids which migrate and escape from improperly plugged and abandoned wells pose the same negative potential impacts as a well with uncemented oil and gas zones. (See 9.C, 10.B.l.a, 10.B.2.a, 11.A) Adequate plugging and abandonment of wells is the most critical operation for long-term environmental protection.

### C. ENHANCED OIL RECOVERY IMPACTS

# 1. Siting and Operational Impacts

Enhanced oil recovery operations require more intense land use than standard oil and gas operations. Oilfield waterflood operations generally involve a minimum of five wells (4 injector wells and 1 producer). However, most waterflood permit applications are for the addition of individual wells

to existing fields and projects. The five-spot pattern can be extended into a new area with a single well by converting nearby wells to injectors or producers, as needed. (See 12.C.1)

From a regional perspective, waterflood operations have some unique considerations. Waterflooding is presently confined to the State's old oil fields where development dates back to the 1800's. (See 5.C.4.e and 12.C.2) Because of historic drilling practices in these areas, the old wells are closely spaced (roughly 2½ to 5 acres per well) making 40 acre spacing for new wells impractical. (See 8.B.1 and 12.C) Therefore, new waterflood wells are more densely spaced than primary oil and gas wells and continued development of waterflood operations can be expected to have more noticeable localized land use impacts. (See 12.C.1 and 12.I)

In addition to erosion, sedimentation and vegetation damage associated with any construction, New York waterflooding operations have other unique impacts. There are many brine discharges from separator ponds which empty either directly into a stream or across a stretch of land to a stream. Impacts from these discharges include vegetation damage, potential contamination of soil, minor erosion, and stream habitat pollution. (See 12.1)

Other potentially significant adverse impacts include soil contamination from oil leaking from stock tanks and wellheads. (See 10.B.2.a) Land-use losses occur more frequently due to the higher concentration of well sites, access roads, injection facilities, separator ponds, tanks and pipelines required for waterflooding. (See 12.C.1 and 12.I)

# 2. <u>Surface and Groundwater Impacts</u>

The major impacts from EOR operations are those related to groundwater. (See 6.C, 8.E.2, 8.E.3.b-c, 8.E.4) All of New York's waterflood areas were

established prior to regulation and many of the wells still in use are over 50 years old. (See 4.B and 5.E) Most wells have inadequate cement or no cement at all, which provides a conduit for pollutants to enter potable water supplies. The old casing in these wells routinely fails due to age and exposure to a corrosive environment. (See 4.D and 12.C.2.a)

Of most concern, are the locations of thousands of unknown deserted or abandoned wells which may or may not have been properly plugged. (See 11-A and 12.C.3) An improperly plugged well will provide a conduit for pressurized fluids to migrate and endanger water supplies. (See Chp. 11 and 10.B.2.a) Waterflooding increases the potential for groundwater quality impacts because it provides pressure to areas which no longer have sufficient pressure for production or fluid migration (See 12.C.2.c) and most waterflood wells are older in age and were drilled and completed to less stringent standards. (See 12.C.2.a) In addition, most of the unplugged, unmapped abandoned wells are located in the State's old waterflooded areas. (12.C.3)

Impacts on surface waters from site construction, drilling and plugging and abandonment of waterflood wells are the same as those for primary oil wells. (See 6.B, 8.E.1, 8.G-H, 9.F.3, 9.H.6-7, 10.B.2.a, 11.A, 11.E.1) The major differences in impacts are attributable to the production phase when production brines are discharged to surface streams under a SPDES Permit. Impacts from discharges to surface waters are minimized by the conditions in SPDES permits regulating waste composition and discharge rate but minor increases in chlorides, oil, grease, as well as benzene, xylene and toluene levels may occur in the immediate vicinity of the discharge point. Significant localized effects on the quantity and quality of aquatic life have been observed. (See 9.H, 12.C, 12.I, 15.D.2)

#### D. SOLUTION MINING IMPACTS

There are five solution mining facilities currently operating in New York

State and wide variations exist in their number of wells (4-170), and the acreage mined, owned or held under lease (1,000 to 4,000 acres). Like waterflood operations, solution mining operations are usually developed in phases and permit applications are generally submitted for one or two wells at a time. (See 13.A)

### 1. Siting and Operational Impacts

Aside from the potential disturbance of a larger land area, siting impacts of solution salt mining wells are essentially the same as standard oil and gas wells. However, production operations have different potential environmental impacts. Spills which impact surface water, groundwater, and land (including flora and fauna), are more likely to occur because of the corrosive nature of the product (large volumes of highly concentrated brine). (See 13.N-O) Accidental leaks of concentrated brine can kill vegetation, percolate into groundwaters, contaminate the soil and retard growth for a long time. (See 9.H.7.a) Corrosion of casing is also of concern, since groundwater resources potentially can be adversely impacted. (See 13.I-J)

Land subsidence is another major concern resulting from solution salt mining operations. Land subsidence can have long term impacts on land use. Solution mining creates large underground systems of cavities and if the location and extent of these cavities is not carefully controlled, the overlying formations become unsupported and ground subsidence may occur. More severe subsidence will occur when the overlying bedrock is thin between the salt formation and the surface. The subsidence can fracture the bedrock above the cavern and form channels for the movement of brine into fresh ground water supplies. Subsidence problems can create "mud boils", damage surface structures, and seriously impact the economic value of the land. (See 13.K)

Subsidence and its secondary impacts may go undetected because the

existing Regulatory Program does not require monitoring of ground elevation for solution mining operations. Some operators, however, have voluntarily undertaken extensive monitoring programs. (See 13.K)

## 2. Surface and Groundwater Impacts

Impacts on surface waters from site construction, well drilling and plugging and abandonment are similar to those for oil and gas wells. (See 6.B, 8.E.1, 8.G-H, 9.F.3, 9.H.6-7, 10.B.1.a, 10.B.2.a, 11.A, 11.E.1) If a brine spill does occur, the chances of chloride contamination of a nearby surface waterbody are higher because of the large volumes of highly concentrated brine present at solution mining operations. (See 9.H.7.a)

The impacts of solution mining wells on groundwater (6.C, 8.E.2, 8.E.3.bc, 8.E.4) are significantly different from oil and gas wells because of the: 1) general absence of hydrocarbon production, 2) the large volumes of highly concentrated brine involved, (See 9.H.7.a and 13.N-O) 3) the strongly corrosive nature of brine (See 13.I-J) and 4) the greater tendency for land subsidence over solution mining cavities. (See 13.K)

Subsidence may cause fractures in the subsurface strata which provide channels for the movement of brine into underground freshwater supplies. Subsurface fractures may also be a conduit for the movement of freshwater into salt cavities leading to further cavity growth and subsidence. (See 13.K)

Negative impacts on groundwater are also associated with deserted, unplugged wells. (9.H.7.a, 11.A and 11.H) Without proper plugging, freshwater from rain and surface run-off can also enter into old solution cavities and increase cavity size with resulting further subsidence and groundwater contamination. (See 11 and 13.Q-R)

#### E. UNDERGOUND GAS STORAGE

### 1. Siting and Operational Impacts

From an environmental perspective, underground hydrocarbon storage

impacts differ only slightly from standard oil and gas operations. (See 8, 9, 10 and 11) Since less brine is handled, the potential for this type of pollution is smaller. Land use losses increase because of production equipment installations such as manifold stations, compressor units and pipelines. (See 14.H)

There are currently 21 underground natural gas storage operations in New York State. The storage reservoirs vary in size from 280 to 10,800 acres including their buffer zones. (See 4.B.5 and 14.A) The average storage reservoir has approximately 40 wells. Drilling and installation of production facilities for 40 wells involves a direct land disturbance of roughly 15 to 30 acres out of the total land area held by the storage facility. (See 14.D)

New York has one mined cavern used for storage of liquified petroleum gas (LPG). The greater construction activity results in large temporary land-use impacts because of the land needed to store excavated material which is later sold or disposed of. Mined storage caverns, though relatively uncommon, may present special problems for landscape and soil resources. The large volume of mined rock excavated from the cavern may be disposed of on site where it can cause significant changes in topography. (6.H, 6.N, 14.B.3, 14.E-F)

Because of the magnitude of the land area disturbed by storage fields, they can have adverse impacts on the landscape. (See 14.D, 14.H, 14.J.2) In addition, storage fields may remain in operation indefinitely, making consideration of their long term impacts on landscape and soil resources especially important. These potentially adverse impacts will vary considerably depending upon the proposed location of the storage field. For example, long and short term impacts from siting a storage facility in a heavily populated area would differ greatly from use of a location encompassing prime agricultural lands or an unpopulated forest area. (See

6.I-J, 8.F) A detailed environmental review of proposed facilities is required by both New York State and the Federal Energy Regulatory Commission. As a result of these reviews, changes in the facility siting and adoption of specific mitigation measures can be required to minimize negative impacts. (See 14.C, 14.H and Appendix 1)

Erosion and other localized impacts on landscape and soils are generally minimal because of strict State and Federal controls on storage field construction, operation and abandonment. (See 6.H, 6.N, 8.H, 14.C-D, 14.H, 14.J.2 and Appendix 1) Potential impacts on soil resources from accidental spills are also low because large quantities of pollutants (oil, brine, etc.) are not stored on site.

### 2. Surface and Groundwater Impacts

Impacts on ground and surface waters from gas storage wells are similar to those for other gas wells except that there is less brine production associated with gas storage wells. (See 6.B-C, 8.E, 8.F.4, 8.G-H, 9.F.3, 9.H.6-7, 10.B.1.a, 10.B.2.a, 11.A, 11.E.1 and 11.H)

If the excavated rock from a mined storage cavern is disposed of on site, water leaching down through the debris may carry high sediment loads which could negatively impact adjacent surface waters. (See 14.F.1)

# 3. Socio-Economic Impacts

Major impacts from underground hydrocarbon storage operations are associated with social-economic issues. A landowner's mineral rights for a storage horizon can be condemned by eminent domain if a lease agreement is not reached between the landowner and operator. However, the operator must prove to the State of New York that the storage is in the public interest. (See 14.C)

A positive impact, associated with this operation, is the availability of a secure reliable energy supply during peak demand periods and/or crisis

situations. (See 14.C and 18.B.6)

### F. CONCLUSION

It is evident that impacts associated with mineral resource recovery are many and diverse. Some impacts are potentially significant while others are not.

It is important to recognize that adverse impacts can be mitigated. For example, the impacts on surface waters or flora and fauna may be the direct result of land use. Therefore, proper management of the land would serve to reduce the potential for associated impacts. Additionally, impacts associated with an operation in a archeologically sensitive area or Agriculture District will differ greatly from those in a wooded area, wetland, or flood plain.

Current regulations alone do not adequately mitigate the potential adverse impacts to the environment. Revision of current oil, gas and solution mining regulations, strict but consistent enforcement and an educated public and private sector are required for proper management of New York's mineral resources. (See 17)

### XVII. SUMMARY OF MITIGATION MEASURES

The preceding chapter covered the significant environmental impacts from oil, gas, solution mining and underground gas storage operations. This chapter summarizes the mitigation measures required for all phases of oil, gas, solution mining, enhanced recovery, and underground storage operations. Mitigation measures are made up of the following segments:

- Oil, Gas, and Solution Mining Law;
- Regulations in 6NYCRR Parts 550 to 558;
- Administrative procedures;
- Conditions contained in other environmental permits;
- Special conditions or guidelines issued by the DEC;
- Proposed regulatory changes and additions.

Existing and proposed mitigation measures will be presented as they pertain to the aforementioned operations.

#### A. ADMINISTRATIVE REVIEW PROCESS

### 1. Existing Mitigation

- a. Administrative Procedures. The regulatory program outlined in this GEIS is not restricted to Regulations 6NYCRR 550 through 558 and the Oil, Gas and Solution Mining Law. It also includes the following procedures necessary for ensuring regulatory compliance.
  - Conditions attached to permits requiring operators to undertake mitigation measures.
  - Inspections that can be conducted at any time during the life of a well.
  - Enforcement actions that can be taken including fines that can be levied against operators who fail to comply with regulations, permit conditions, or Department Orders.

- b. Pre-application requirements for drilling permits.
  - Organizational Report. This report must be filed with the Division before an operator can apply for a permit.
    Financial Security. Operators must post a Well Plugging

and Surface Restoration Bond or some other form of financial security that the Department can use to effectively plug and abandon a well, if necessary.

- c. Permit Application. A permit must be obtained from the Department in order to drill, deepen, plug back or convert a well. The permit application must be accompanied by the following:
  - A plat map that shows the proposed well location, the lease or unit boundaries, and other nearby wells.
  - A permit fee based on the depth of the well. Fees start at \$225 for a well less than 500 feet deep and increase by \$125 per 500 feet of well depth.
  - An Environmental Assessment Form (EAF) which details the physical setting of the proposed well and the procedures that will be followed in constructing the well site and developing the well.
- d. Application Fee. An application fee of ten thousand dollars for a new underground storage project or five thousand dollars for a modification of an existing facility is required.
- e. Application Processing. The following steps are taken as the permit application is reviewed.
  - The application is assigned a permit number and an API number.

- Drilling site inspections are conducted.
- Technical reviews are conducted by DEC Division of Mineral Resources, DEC Division of Regulatory Affairs, and other government agency staff if needed.
- f. Environmental Significance. The Department makes a determination as to the environmental significance of the proposed well within 15 days.
  - A "negative declaration" is issued when the proposed operations are determined not to have a significant effect on the environment.
  - A "positive declaration" is issued when the project may pose a significant environmental impact. An Environmental Impact Statement (EIS) must then be prepared by the operator.

# 2. Proposed Mitigation

a. Permit Application. A proposed drilling program will have to be submitted for approval with the drilling permit application.
The drilling program should include the proposed casing, cementing, completion, testing and stimulation procedures.
These procedures are <u>all considered part of the action to drill</u> a well under SEQRA.

### B. SITING OF WELLS

- 1. Existing Mitigation
  - a. Statewide 40 Acre Spacing Rule. A well can be no closer than:
     1320 feet from another well completed in the same formation;
    - 660 feet from any lease, pool, or unit boundary line unless the boundary line is the New York-Pennsylvania

border. In that case, the set back is 330 feet. (S) Exceptions to the 40 acre rule are those wells drilled for oil in oilfields discovered prior to 1981. The Department also grants variances and issues spacing orders as warranted.

- b. Well Location Restrictions. DEC staff check to ensure that the well location is at least:
  - 100 feet from a private dwelling
  - 75 feet from the traveled part of a public road
  - 150 feet from a public building or area.
- c. Well and Access Road Restrictions. DEC staff check if the proposed well or access road location is:
  - within 50 feet of a surface water body
  - within a coastal zone area or a drinking water watershed
  - within 1000 feet of a municipal water supply whereby a site specific EIS is required. If between 1000 to 2000 feet, an EIS may be required.
  - in an area subject to erosion
  - in or near a historic or archeologic site
  - on State lands, State parklands, or other government properties.
- d. Stream Disturbance Program. If the proposed well or access road is within 50 feet of a protected stream, a Stream Disturbance Permit is required. Typical permit mitigation measures are:

restrictions on the location of stream crossings
strict specifications for constructing access road and

gathering line crossings

- erosion control requirements
- reclamation requirements.
- e. Floodplains. If the proposed well or access road is within
   100 feet of a floodplain, a Floodplain Permit is required.
   Possible mitigation measures include the following:
  - removal of brushy debris
  - well and access road location restrictions
  - permit conditions specifying size and number of culverts
  - anchoring of tanks.
- f. Freshwater Wetlands. If proposed well or access road is located within 100 feet of a freshwater wetland that is over 12.4 acres or has unique local significance, a Freshwater Wetlands Permit is required. Mitigation measures include:
  - special permit conditions covering seasonal construction,
     well site specifications, vehicle movement, brush
     disposal, pit location, and gathering line placement;
  - creation of replacement wetland on roughly an acre for acre basis.
- g. Agricultural District. If the planned well or access road is located within an Agricultural District, special permit conditions may be issued including:
  - total disturbance area limited to one acre;
  - adoption of erosion and siltation control measures;
  - ~ relocation of the planned wells and/or access roads to reduce interference with farming operations.
- h. Significant Habitats. Specific mitigation measures may be required to prevent negative impacts on habitats by the

proposed well or access road. Permit conditions may include the following:

 relocation of the proposed well and access road to prevent disruption of the habitat;

- restrictions placed on time of operation;

- i. Primary and Principal Aquifers. Siting of wells and access roads within these critical areas has prompted the special permit conditions that will be covered under drilling mitigation. The Department also requires that oil holding tanks in primary aquifer areas be surrounded by a dike capable of retaining 1½ times the capacity of the tank.
- j. Erosion and Sedimentation. Erosion and sediment control programs are required as conditions to drilling permits for wells located within the watershed of a drinking water reservoir.
- k. Historic Landmarks. In the event a well is proposed in the vicinity of an historic site, the Department may attach specific conditions to the drilling permit which may include:
  - visual screening of operations
  - setback requirements greater than existing minimums
  - restrictions on time of operation
  - landscape reclamation requirements.

# 2. Proposed Mitigation

 a. Siting restrictions. New well setback distances are proposed as follows:

150 feet from public and private buildings or dwellings
150 feet from permanent surface water bodies and surface municipal water supplies.

- 150 feet from a private water well without written landowner approval.

- 150 feet from springs used for a domestic water supply

- b. Plat Map. The plat submitted with the drilling permit application will show the proposed location of pits, tanks, and other well site facilities as well as the location of private or public buildings, roads, or areas, and all water wells of public record within 1,000 feet of the proposed well site.
- c. Reclamation Schedule. A drilling site reclamation timetable of
  45 days is proposed.
- d. Topsoil Conservation. It is proposed that stockpiling and redistribution during site reclamation be required in all agricultural areas. The following specific procedures are recommended:

- strip-off and set aside topsoil during construction

- protect stockpiled topsoil from erosion and contamination
- cut well casing to a safe buffer depth of 4 feet below the surface
- paraplow the area before topsoil redistribution if compaction has occurred
- redistribute topsoil over disturbed area during site reclamation.
- e. Trash burial. It is recommended that the permit holder be required to have landowner approval to bury trash or the drilling pit liner.
- f. Dikes. Dikes will be required around all oil storage tanks, regardless of their location. The dike's capacity must be  $1\frac{1}{2}$ times the tank's total storage volume.

### C. DRILLING PHASE: DRILLING, CASING, AND COMPLETION OPERATIONS

- 1. Existing Mitigation
  - a. An operator holding a valid drilling permit must notify by certified mail any affected local government and any landowner whose surface rights may be affected by drilling operations.
  - b. The DEC must be notified by telegram or by telephone prior to start-up of drilling operations.
  - c. The drilling permit expires if operations are not undertaken within 180 days of issuance. The permit must be posted at the drilling site.
  - d. Well locations, units or leases shall be kept free of all flammable material and waste oil shall be disposed of in a nonhazardous manner.
  - e. Recently adopted regulations require that any loss or spill of oil or gas from pipelines and gathering lines, receiving tanks, storage tanks or receiving or storage receptacles must be reported to the DEC's Division of Water, Bureau of Spill Prevention and Response. Their Hot Line phone number is 1-800-457-7362.
  - f. If oil or gas is lost during production, transportation, or storage in volumes exceeding 100 barrels of oil or 3 million cubic feet of gas, the DEC regional headquarters must be notified immediately. A complete report must be submitted within five days.
  - g. Conductor Casing. If the conductor pipe is driven into the ground, the operator must grout cement from the top of the casing and form a protective pad sloping from the wellbore. If the casing is set into a drilled hole, it must be cemented in

place.

- h. Surface Casing. The new cementing guidelines adopted on April
  1, 1986 require the following:
  - Surface hole must be large enough to allow running of centralizers.
  - Surface casing must extend at least 75 feet below deepest fresh water zone encountered or 75 feet into bedrock, whichever is deeper. The surface pipe must be set deep enough to allow the BOP stack to contain formation pressures encountered before the next casing is run.
  - Surface casing shall not extend into zones known to contain measureable quantities of shallow gas. Department approval is required for exceptions to this requirement.
  - Surface casing shall be new pipe rated at a minimum of 1,100 psi. Exceptions must be approved by the Department.
  - At least two centralizers must be run on surface casing.
     Minimum spacing is one centralizer per 120 feet. Cement
     baskets must be installed above major lost circulation
     zones.
  - All gas flows must be killed prior to cementing any casing strings. The operator shall attempt to establish circulation with returns to the surface. If the hole is dry, the calculated volume would include the pipe volume and 125 percent of the annular volume. A flush, spacer or extra cement shall be used to separate the cement from the borehole fluids to prevent dilution. If cement returns are not achieved, the operator may be required to run a

log to determine the top of the cement.

- The pump and plug method must be used to cement surface casing. A minimum of 25 percent excess cement shall be used with appropriate lost circulation materials.
- The cement mixing water must be tested for pH and temperature prior to mixing. The results must be recorded on the cementing ticket.
- Preparation of the cement slurry must be according to specifications in order to minimize the free water content in the cement.
- The casing must not be disturbed in any way until the cement achieves a calculated compressive strength of 500 psi. The WOC time shall be recorded on the drilling log.
- The cement pad surrounding drive pipe (conductor casing) must be three feet square or, if circular, three feet in diameter.
- Intermediate casing string(s) and their cementing requirements will be reviewed and approved by Regional Minerals staff on an individual well basis.
- j. Production casing.
  - Production casing cement must extend at least 500 feet above the casing shoe or tie into the previous casing string, whichever is less. It shall also extend at least 100 feet above any oil or gas shows prevalent in the area.
  - Centralizers are required at the base and at the top of the production interval if casing extends through that interval. One additional centralizer per 300 feet of cemented interval is also required.

- A minimum 25 percent excess cement must be used. When caliper logs are run, 10 percent excess will suffice.
- The pump and plug method must be used for all production casing cement jobs deeper than 1,500 feet. If the pump and plug technique is not used, the operator shall not displace the cement closer than 35 feet above the bottom of the casing. If plugs are used, the plug catcher shall be placed at the top of the deepest full joint of casing.
- The casing must be of sufficient strength to contain any expected formation or stimulation pressures.
- The casing must not be disturbed in any way until the cement achieves a calculated compressive strength of 500 psi.
- The cement mixing water must be tested for pH and temperature prior to mixing. The results are to be recorded on the cementing ticket and/or the drilling log.
   WOC time shall be adjusted based on the results of the test.
- The annular space between the surface casing and the production string must be vented at all times. If the annular gas is to be produced, a pressure relief valve shall be installed and set at a pressure approved by Regional Minerals staff.
- k. Well Drilling Site Inspection. A routine inspection is conducted by Department staff at least once during the drilling of every well. The inspection usually occurs after surface casing is set but prior to cementing of the production string.

- Blowout preventers (BOP's) are required on most wells drilled in New York State.
- m. Flowback of well stimulation fluids onto the ground subjects the operator to enforcement actions and penalties.
- n. A Well Drilling and Completion Report must be filed within 30 days after completing.a well.
- o. Drilling Pits. The Department requires as a permit condition that all well site earthen pits be lined with an impermeable material before they can be used. Pit condition is always checked during well site inspections.
- p. Waste fluids must be removed from pits and tanks and be disposed of in an environmentally acceptable manner within 45 days after the cessation of drilling operations.
  - q. Primary Aquifers. Special permit conditions and orders have been formulated for operations conducted within primary and principal aquifer areas.
    - The surface hole must be drilled on air or freshwater fluids.
    - Specific casing and cementing criteria exist involving conductor pipe, surface casing and the production string.
       Use of cement baskets above known lost circulation zones, lost circulation material, centralizers and excess cement is also required.
    - State Inspectors must be present during surface and production string cement jobs. Remedial work such as cement grouting at the surface or running of cement bond logs may be ordered.
    - All fluids must be maintained on-site and properly

disposed of after drilling operations have ceased. Holding tanks must be installed if the well is a producer for containment of brine and other produced fluids.

- All existing aquifer wells must be vented or produced with limited back pressure on the casing. New wells must have the production string cemented to the surface.
- Operators must complete the "Record of Formations Penetrated" and note the depth of all water producing zones on the Completion Report.
- r. The Bass Island Trend. Special permit conditions which pertain to operations in the Bass Island trend are:
  - detailed surface casing requirements;
  - specific blowout preventer (BOP) requirements addressing the type of BOP, its installation and actuation source. Choke manifolds, flowlines, kill fluid availability, mud pumping capability, and testing procedures are also specified;
  - safety requirements regarding the penetration of the Onondaga formation include providing the drilling company with a well prognosis indicating where problem formations such as the Onondaga may occur with appropriate comments and a list of emergency duties, requiring the presence of a company representative on-site, and providing for advance notification to local fire departments.

#### 2. Proposed Mitigation

a. The operator will be required to notify DEC by telephone 24 hours in advance of starting actual drilling operations.
- b. Notification to affected landowners and local governments will be required atleast five business days prior to the beginning of drilling operations.
- c. The 180 day permit expiration date will be able to be extended to 12 months by application for extension.
- d. Amendments to existing safety regulations will be proposed to reinforce further the need to conduct operations in a safe, workmanlike manner and to keep equipment and facilities in safe condition.
- e. Installation and pressure testing of blow out preventers should be done prior to drilling out the shoe of the surface casing. It will also be recommended that operators routinely test their blow out preventers and conduct kick response training in order to better prepare their personnel in the case of an accident.
- f. Additional language for the regulations might also include that the owner or operator immediately take all necessary precautions to control, remove or otherwise correct any health, safety, environmental, or fire hazard. Also, only trained and competent personnel should be used to drill and operate wells.
- g. All future oil and gas wells drilled in primary and principal aquifers will have to be cemented from total depth to the surface.
- h. Inclusion of all information relating to casing weight and grade will be required on the drilling permit application form.
- Omission of surface casing will only be allowed in areas where it has been proven that no subsurface pressure control is needed and no freshwater exists.
- j. Enforcement actions will be increased against operators who

repeatedly file fraudulent or incomplete Completion and Well Drilling Reports.

- k. Comprehensive pit liner requirements will include the following:
  - minimum thickness = 10 mil.
  - minimum tear strength = 50 lbs.
  - minimum tensile strength = 65 lbs.
  - low temperature cold crack =  $-15^{\circ}F$
  - seam strength = 80 percent of original material. Seams must be factory installed.
  - lining shall not begin until a proper base has been prepared to accept the liner. Base material shall be free from angular rocks, roots, grass and vegetation. Foreign materials and protrusions shall be removed and all cracks and voids shall be filled to make a uniform surface.
- 1. It is recommended that the drilling pit be oriented longitudinally to the flow line or that a flow line baffle be installed or that a plywood sheet or piece of heavy convas be placed at the point of impact to reduce damage to the pit.
- m. The Division of Mineral Resources will retain jurisdiction over spills and leaks at the wellhead. The appropriate Regional Minerals office must be notified immediately of any wellhead leak of more than one barrel of oil.
- o. Notification and approval of the Regional DMN manager will be required prior to any significant changes or time extension of the originally proposed well testing program.

#### D. WELL COMPLETION AND PRODUCTION PRACTICES

# 1. Existing Mitigation

- a. The Department can place restrictions on a well's producing gas-oil ratio (GOR) if it is determined that the reservoir's production energy is being depleted too quickly.
- b. Annual Production Reports are required from operators which summarize the past year's activities.
- c. DEC staff may place restrictions on well site facility operations through permit conditions.

# 2. Proposed Mitigation

- a. It is recommended that surface restoration and disposal of drilling fluids commence within 45 days after the cessation of drilling operations for all wells.
- b. In primary and principal aquifer areas it is suggested that operators be required to have an approved brine disposal plan prior to drilling a well.
- c. If a history of storage tank overflow has developed, authority exists under SEQR to require that tanks located be equipped with fluid level monitors capable of shutting down producing wells to prevent overflow of the tank.
- d. A notice of intention and a permit will be required from the Department for any operation that will in any manner alter the casing, permanent configuration, or designated use and status of a well. This includes the following:
  - perforate casing in a previously unperforated interval for the purpose of production, injection, testing, observation or cementing
  - redrill or deepen any well
  - mill out or remove casing or liner

- run and cement casing or tubing
- drill out any type of permanent plug
- run and set an inner string of casing or liner
- run and cement an inner string of casing, liner or tubing
- set any type of plug (bridge, cement, sand, gravel, get, etc.)
- repair damaged casing by means of cementing, placing a casing patch, swaging etc.

# E. PLUGGING AND ABANDONMENT OF OIL AND GAS WELLS

- 1. Existing Mitigation
  - a. State law requires that well operators maintain financial security with the Department to ensure that the wells are properly plugged and abandoned. An owner cannot transfer plugging and abandonment responsibilities by surrendering a lease. They may be transferred by agreement of the parties involved only after approval by the department.
  - b. Operators must submit a Notice of Intention to Plug and Abandon with the proposed abandonment program prior to initiating plugging operations.
  - c. For all abandonments, the Department requires that plugs be placed at the following locations:
    - from total depth to a minimum of 15 feet above the deepest producing zone;
    - at least 15 feet above each potentially productive
       hydrocarbon bearing formation;
    - 15 feet at the bottom and the top of any casing left in the hole. Any unrecovered uncemented casing must also be

ripped or perforated and have cement squeezed into the annular space.

- All intervals between plugs must be filled with a heavy mud, gel or other approved fluid.
- e. Wells capable of commercial production cannot be shut-in for longer than one year without specific permission from the Department.
- f. Temporary abandonment of a well cannot exceed 90 days without a Department granted extension.
- g. The Department office that issued the permit must immediately be notified of any non-routine incident occurring during plugging operations.
- h. After the well has been plugged, the casing must be cut below plow depth in agricultural areas, the equipment and debris removed, and the site restored to its original condition.
- i. Within 30 days after plugging the well, the owner or operator is required to file a Plugging Report with the Department which includes a signed statement affirming the accuracy of the information provided.
- j. The Department may, if necessary, enter, take temporary possession of, plug or replug any abandoned well whenever the owner refuses to comply with the provisions of the regulations. The cost of the Department's abandonment operations will be the owner's responsibility.

# 2. Proposed Mitigation

a. When a Notice of Intention to Plug and Abandon is submitted to the Department, it will have to be accompanied by the complete proposed abandonment procedure.

- b. The recommended plugging requirements apply not only to oil and gas wells but also to injection disposal, solution mining, geothermal, and stratigraphic test wells with modifications as appropriate.
- c. Cement plugs shall be placed in wells across all oil, gas and fluid zones, across all casing stubs, below the base of the freshwater zone or across the surface casing shoe, and at the ground surface. Intervals between plugs shall be filled with a heavy mud or other approved fluid.
- d. Intervals not occupied by cement shall be filled with gelled fluid as specified by Regional Minerals Manager. Gelled fluid minimum requirements are density equal to 8.65 ppg with a 10 minute gel-shear strength of 15.3 to 23.5 lbs/100 sq. feet. Abandonment fluid requirement can be waived in the shallow Devonian oil fields by Regional Manager if the operator submits documentation which verifies that the interval between producing zone and surface casing shoe is void of even minor fluid or hydrocarbon zones.
- e. Production zone plug in oil wells Place either cement or sand/gravel through production zone or set in impermeable sealing bridge plug above the zone. An additional 50 feet of cement shall be set above with no tag required or place 25 feet of cement and tag.
- f. Production zone plug in gas wells -
  - Squeeze cement producing zone through cement retainer set above perforations or place cement from T.D. across producing zone.

- Cap with an additional 50 feet of cement.

- For a lost circulation zone or other special circumstances, a cast iron bridge plug/sealing packer shall be set above the producing zone and capped with 50 feet of cement. Tagging of these plugs may be required.

- g. Injection zone plugs -
  - A blind packer shall be set in the injection tubing at flood packer depth.
  - USEPA jurisdiction. Sever injection tubing above original cement and remove. Cement shall be placed in the wellbore
     50 feet above point of tubing severence, including excess for tubing infill.
  - Non-USEPA jurisdiction option. Place 25 feet of cement in tubing. Sever tubing and remove. Place 25 feet of cement in wellbore above.
- h. All zones containing hydrocarbons or fluid must be sealed with cement.
  - Zones in open hole Place cement plugs across each zone to 50 feet above and spot gel in all inter-plug intervals or place cement from T.D. to 50 feet above shallowest zone.
  - Zones behind uncemented casing Recover casing below the zone and place cement from 25 feet below the casing stub to 50 feet above the zone or perforate and squeeze the zone and place cement within the casing across the zone to 50 feet above.
- i. When the producing zone is isolated below junk-in-the-hole, a cement retainer shall be set above the junk and sufficient

cement shall be squeezed to seal the producing zone below. An additional 50 feet of cement shall then be placed atop the retainer.

- j. Surface casing shoe plugs -
  - Uncemented casing. For oil wells, the cement plug shall be 50 feet across the casing shoe or the former casing seat. This plug shall be set on top of a supporting bridge plug or impermeable sealing packer. For gas wells, a 100 foot cement plug across the shoe shall be placed.
    Cemented casing. For oil wells, a 50 foot cement plug shall be placed across casing shoe and shall be tagged if not set on a weight tested packer. For gas wells, a 100 foot cement plug shall be placed across casing shoe.
- k. All attempts shall be made to recover uncemented casing. If uncemented casing cannot be recovered, it must be perforated or ripped and have cement squeezed or placed into the annular space.
  - Surface casing partial recovery. The surface casing stub shall be sealed with 50 feet of cement, 25 feet in and 25 feet out or shall be capped with a sealing bridge plug/packer with 25 feet of cement on top. Excess cement shall be used to account for annular fill-up and all water bearing or fluid loss zones above the stub shall be sealed with cement. All inter-plug intervals shall be filled with an approved fluid.

- Surface casing - no recovery. Surface pipe shall be ripped or perforated and fluid shall be circulated through

the annulus. If circulation can be established, cement shall be squeezed into the surface casing annulus. When squeezing cannot be accomplished due to annular restrictions or the wellhead configuration, either the entire wellbore from the shoe plug to the surface shall be filled with cement or cement shall be placed from the surface casing shoe plug to 25 feet above the ripped or perforated joints, and a tag of this plug shall be required.

- Production casing with cemented surface pipe. Uncemented production casing shall be recovered no higher than 25 feet below the surface casing shoe or perforated below the surface casing shoe and sufficient cement squeezed to fill the annulus. If the casing is recovered, a 50 foot cement plug shall be placed across the stub, 25 feet in and 25 feet out. As with all stub plugs, excess cement shall be placed to account for annular fill-up.
- Production casing with uncemented surface casing. Every effort shall be made to recover the production casing below the shoe of uncemented surface casing, including milling out the pipe. Gas wells with uncemented surface casing shall be plugged according to procedures outlined in 4(a)(b) with the exception that a 100 foot cement plug across the former surface casing shoe will be required.

# 1. Minimum cement plug lengths shall be as follows:

- 15 feet for oil wells.

- 50 feet for gas wells.

m. The DEC may require the location and hardness of any required

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plug to be checked by re-entering the well and tagging the plug.

- n. In agricultural areas, the casing must be cut off below plow depth (approximately 4 feet). Topsoil cover must be replaced and the site must be seeded to re-establish vegetation.
- o. It is recommended that the temporary shut-in regulations be amended to include all wells regardless of commercial potential.

#### F. ENHANCED OIL RECOVERY OPERATIONS

Injection and production wells utilized for all enhanced oil recovery operations must conform to the existing and proposed mitigation measures outlined previously for primary recovery oil and gas wells. The following addresses those mitigation measures specific to enhanced oil recovery operations.

# 1. Existing Mitigation

- a. A permit must be obtained from the Department prior to initiating any secondary recovery or pressure maintenance operations. The permit application must be accompanied by, or contain the following:
  - a statement summarizing the proposed operation;
  - the name, description and depth of the targeted formation;
  - information detailing the geologic sequence of adjacent formations;
  - the casing program for the existing or proposed input wells including the proposed method for testing the casing;
  - a plat map showing the lease or unit containing the project;

- a tabulation of recent gas-oil ratios and oil and water production tests for each of the producing wells;
- a list of names and addresses of offsetting operators including a statement that each has been sent a copy of the permit application;
- if the operations will involve the unit operation of a pool or any part of a pool subject to integration and unitization, the application must also contain graphs or statements detailing expected oil and gas production and estimates of additional oil and gas revenue. The Department order providing for unit operations shall become effective when at least 60 percent of the owners and royalty interests, respectively, have approved of the proposed operations.
- b. Unless sufficient cause can be demonstrated otherwise, oil field operators are required to cement surface or freshwater protection casing to the surface.
- c. An annual statement is required from waterflood operators showing injected and produced fluid volumes and injection pressures.
- d. Flaring of annular gas is approved on a temporary basis only. Operators must find an acceptable method of use or cease operation of their wells.
- e. Earthen pits used for storing separator waste must be percolation tested and lined with an impervious material to prevent fluid infiltration into groundwater. A moratorium has been placed on future separator ponds and existing ponds are to be phased-out.

#### 2. Proposed Mitigation

- a. For new waterfloods and new tertiary recovery projects, an additional site specific environmental assessment and SEQR determination will be required. A supplemental site specific environmental impact statement may be required for any new enhanced oil recovery operation or major expansion of an existing project.
- b. Detailed geologic and engineering studies will also be required with the permit application. Casing inventories of all existing and planned wells, monitoring data, and the results of any injection tests shall also be included.
- c. Well conversions and recompletions for enchanced recovery purposes will be subject to more explicit regulations.
- d. Spacing criteria will be established by regulation for all new fields which could be influenced by future enhanced oil recovery operations.
- e. Fluids from flowback operations shall be contained in a watertight tank.
- f. Injection wells will be monitored as stipulated by the Federal UIC program.
- g. Injection pressures shall be such as to not propagate fractures. Pressures are limited by the UIC regulations and must also be approved by DMN. The maximum reservoir injection pressure shall be verified by a step-rate pressure test on at least one injection well in each new project in an area where the maximum injection pressure has not been verified to the satisfaction of the DEC. This requirement parallels the UIC requirements and contributes to groundwater protection.

- h. Any unlined earthern ponds or pits designed to hold enhanced oil recovery system byproducts must be eliminated if it is determined that enviornmental damage is occurring. This includes those pits belonging to peripheral operators under the influence of the flood. For new projects, such fluids shall be stored temporarily in watertight tanks or lined impermeable ponds or pits for subsequent disposal.
- Plugging and abandonment methods, cement requirements, and disposal methods in the old oil field areas will be required to adhere to those regulations set forth for oil and gas operations.
- j. Documentation of produced fluids will be required on the Annual Production Report.
- k. A chemical analysis of at least one sample of injected and produced water, respectively, will be required on an annual basis for each project. The minimum analysis shall consist of the following parameters: ph, sodium, chloride, specific conductivity, calcium, magnesium, iron, sulfates, and total dissolved solids.

# G. SOLUTION SALT MINING

All of the previously discussed proposed mitigation measures for siting, drilling, completing, and abandoning oil and gas wells shall also apply to solution salt mining wells. The following addresses those mitigation measures specific to solution salt mining operations.

# 1. Existing Mitigation

a. The fee for a solution mining permit is the same as for oil and gas wells, ranging from \$225 to \$2725 depending on the depth of

the well.

- b. Metering or measurement of brine produced by solution mining and the maintenance of the records from a cavity or group of cavities is required until wells penetrating the cavities have been plugged and abandoned.
- c. Brine disposal by subsurface injection must be approved by the Department and all offsetting lease holders and operators must be notified. The disposal application is held for ten days.
- d. Disposal of salt impurities such as chlorides and sulfates into abandoned salt cavities must be approved by the Department.

# 2. Proposed Mitigation

- a. For new solution mining projects or major modifications to existing projects, an additional site-specific environmental assessment and SEQR determination will be required and a supplemental EIS may be required.
- b. The oil and gas regulations, 6NYCRR Parts 550 to 558, will be revised to include solution mining wells, where appropriate.
   Certain requirements specific to solution mining will be added.
- c. Solution mining well plat maps will be required to include the following:
  - a scale of one inch equals 600 feet or less for wells that are spaced at least 1320 feet apart or one inch equals 400 feet or less for wells that are less than 1320 feet apart;
  - property boundaries under the owner's control;
  - the area proposed to be affected by solution mining operations;
  - location and API well number of each well on the property;
  - location of roads, surface water, buildings, significant

landmarks and topographic features in the affected area.

- d. Regulations will prohibit siting of solution mining wells within 150 feet of the lease boundary line. Exceptions may be allowed on a case-by-case basis.
- e. Partial surface restoration of the drilling site will be required after the cessation of drilling operations. Drilling fluids will be disposed of within 45 days.
- f. Regulations will specify that brining operations be conducted in such a way to prohibit extension of the cavity beyond the boundary line of the lease, integrated lease or unit in which solution mining is being developed.
- g. Operators will be required to maintain a spill contingency plan in the event a pipeline leak occurs.
- h. Regulations and permit conditions will require monitoring of wells, pipelines, and storage tanks.
- Subsidence monitoring will be required for all operations.
   Operations will be suspended if adverse environmental impacts result from subsidence.
- j. The Department will exercise its authority to require monitoring wells when solution mining operators are adjacent to large freshwater aquifers.
- k. Sheds protecting wellheads and pumps will have to be vented ifmethane gas has been encountered by the solution mining wells.
- The brine injection application holding period will be increased to 15 days.
- m. The Department will aggressively pursue those operators that do not properly plug and abandon their solution mining wells.

- n. Solution mining well plugging and abandonment regulations will require that a cast iron bridge plug or bridge of other approved material be set in the wellbore above the solution cavity with 50 feet of cement on top. In all other ways plugging and abandonment shall be in accordance with the plugging procedures required for oil and gas wells.
- Surface restoration requirements will be stipulated by regulation.
- p. A final map shall be submitted with the plugging report which details the location and extent of the salt cavity, any subsidence, sink holes, or mud boils.
- q. Plugging responsibilities will not be transferrable without the agreement of the parties involved and the approval of DEC.

#### H. UNDERGROUND STORAGE

All of the previously discussed existing and proposed mitigation measures for siting, drilling, completing, and abandoning oil and gas wells also apply to underground storage wells. The following addresses those mitigation measures specific to underground storage operations.

- 1. Existing Mitigation
  - a. If test wells are converted for storage or pressure monitoring operations, a permit must be obtained from the Department.
  - b. A permit must be obtained from the Department with approval by the State Geologist for any operation devoted to the storage of gas or liquefied petroleum gas.
  - c. Operators must give notice to persons engaged in underground

mining operations of the commencement of any phase of oil or gas well operations which may affect the safety of such

underground mining operations.

- d. Operators must submit an affidavit when applying for a storage permit that attests to the acquisition of at least 75 percent of the storage rights in the reservoir and buffer zone. The operator then has up to two years after the first injection of gas to secure the remaining 25 percent storage rights.
- e. If the remaining 25 percent storage rights cannot be acquired after reasonable effort within the two-year period, the operator is required to secure such rights under provisions of the eminent domain procedure law.
- f. Before filing a suit for acquisition proceedings, a map must be filed with the Department detailing the location, boundaries, and surface acreage of the reservoir and buffer zone.
- h. In addition to the storage value of any property being leased, the value of any commercially recoverable native oil and gas must also be considered.
- The Department may revoke or suspend any storage permit for failure to comply with any of its provisions.
- j. The Department requires that every operator file a yearly report detailing the status of each storage project.
- k. Operators are required to reclaim the premises of terminated storage operations so as not to cause a health hazard or a decrease in the value of the property. The Department may act to place the premises in satisfactory condition and the operator is liable for the cost should he fail to meet his obligations.

# 2. Proposed Mitigation

- a. When applying for a state storage permit for a new underground gas storage project, a copy of the EIS submittal to FERC will be required.
- b. Regulations will specify the definition of a storage project modification. A major modification to an existing project will require a SEQR determination and a supplemental EIS may have to be prepared.
- c. Test well drilling will be subject to the permitting requirements governing oil and gas wells.
- d. Potential earthquake dangers are to be addressed in the environmental assessments made prior to approval of a new storage field.
- e. New regulations will reflect the amended definition of a storage reservoir buffer zone as detailed in the Environmental Conservation Law.
- f. The distance from underground mining operations within which notification will be required shall be specified via permit conditions.
- g. Regulations will address technical data submission required in the application for an underground storage permit. Additional data will be required involving reservoir properties, geologic conditions, production history, etc.
- h. A detailed well review will be required at an application for an underground storage permit. This review should summarize well status, downhole conditions, well pressure histories, and test well disposition.
- i. A listing of the mud system ingredients for drilling a mined cavern main shaft and the proposed disposal method will be

required with the underground storage permit application.

- j. Seeding and/or mulching of the waste rock pile in conjunction with the application of lime or fertilizer will be required when appropriate by permit conditions.
- Permit conditions will specify provisions for diminishing significant visual impacts associated with compressor location.
- Muffler devices will be specified via permit conditions for compressor exhaust when noise levels are deemed excessive.
   Screens or vegetation may also be required.
- m. The yearly operators storage report will have to be submitted by March 1 to allow operators time to assemble and assess storage data.
- Regulations will identify specific infractions concerning routine storage project operation. Mitigation techniques to rectify or alleviate any problems will also be specified.
- Specific abandonment procedures will be formulated for wells in mined storage caverns or abandoned salt cavities.
- p. An operational report summary will be required when operations are terminated at a storage facility.
- q. An underground storage abandonment permit will be required. The application will be in the form of an abandonment summary report detailing the final status of the reservoir and storage equipment.

# I. SUMMARY

The main objective of the DEC's mitigation program is to ensure the safe, efficient, and environmentally sound development of the State's energy resources. While both the short and the long term environmental effects of

this energy development are considered when formulating mitigation measures, it is the elimination of long term effects that is given the most emphasis. The preceding mitigation summary exemplifies this. Of primary concern are the contamination of the State's surface and groundwater resources by drilling and production activities and the correlative rights of landowners.

Continued successful energy development is essential for maintaining the social and economic stability of New York State. A sound regulatory program will guarantee the rights of the State's citizens and protect the environment while promoting continued exploration and development of the State's energy resources.

#### A. INTRODUCTION

The oil and gas industry makes a substantial contribution to the local economies of southwestern and central New York. The economic impacts of the oil and gas industry are broad based, and as with other industries, there are direct impacts which multiply into direct and indirect effects. As a general example, the direct social and economic impacts from oil and gas activity are the monetary gains realized by the operators, contractors, and landowners who lease their lands.

The monetary gains generated by an industry such as investment, direct and indirect jobs, salaries and revenues which in turn filter down through a wider segment of society are referred to as the multiplier effect. The multiplier effect from the oil and gas activity in New York State is 1.4. This means that in New York State for every \$1 output generated at the wellhead, the total contribution to the State's economy is 1.4 dollars, reflecting the fact that indirect effects generate output in other industries in New York. Another perspective on multiplier effect is the estimate that for every dollar of output from the wellhead, an additional 21 cents is earned by persons employed by non-government industries and for every additional \$1 million in oil and gas output, 7.9 new jobs are created (United States Department of Commerce, 1986). The reported earnings multiplier of 1.4 for the oil and gas industry in New York is lower than many manufacturing and service industries, partly because the industry as a whole is not labor intensive, and also because most of the companies which provide services to the industry in New York are headquartered in nearby Pennsylvania.

In 1986, New York production as well as national production, dropped significantly in response to lower oil and gas prices. Low oil and gas prices

are currently benefiting most consumers, but low oil and gas prices and declining domestic production have negatively impacted oil and gas producers, and a large portion of society that is affected indirectly by the petroleum industry. As prices continue to decline, the effects will spread outward affecting even greater numbers of people. An estimated 1.6 million jobs have been lost nationwide (Interstate Oil Compact Commission, 1986). The magnitude of this crisis is indicative of how important the oil and gas industry is to the U.S. economy.

New York, with its diverse economic base, has not suffered as much as states which rely heavily on oil and gas revenues. However, the impact remains considerable, and significant declines in drilling activity and production have occurred. Most affected by the industry slump are the oil and gas producing counties in the southwest part of the state.

# 1. <u>Historical Benefits to State</u>

The first commercial oil well in Limestone, New York, the Job Moses #1, was drilled just six years after Drake's historic discovery well in Titusville, Pennsylvania. The predominantly agricultural Southern Tier was transformed into a series of boomtowns as new fields were discovered in Cattaraugus and Allegany Counties. Before the discovery of oil, the hilly Southern Tier counties were mostly hardscrabble farms, on poor, rocky soil. Most of the timber had been clear cut, and the hillsides and streams were ravaged by the effects of erosion and siltation. Although the initial environmental impact of exploration and production was considerable, with cutting of much of the remaining timber to build derricks, it was not as damaging to this region as the early clear and cut farm practices. The contamination of local streams with oil and brine was caused not so much by early drilling practices as by early oil transport and storage practices in which streams were used as open conveyances, and early wooden storage tanks

leaked appreciably. Even the negative impacts of these practices did not persist. Today much of the once barren area is thickly forested, and there is abundant fish and wildlife.

Most of the historic production came from the Richburg and Bradford sands which extend into New York from the Pennsylvania oilfields. In 1882, New York State's oil production peaked at an all time high of 6.6 million barrels. Even after the initial boom was over, the area continued to benefit from oil activities. Oilfield employment and oil related industries such as the manufacture of nitroglycerin, engines, derricks, and storage tanks brought people and prosperity to this portion of the State. As pipelines and refineries were built, further investment and employment opportunities developed.

The oil discoveries brought services to an area which had been previously isolated from the Industrial Revolution that was transforming much of the rest of New York. Telegraph lines and railroads were built, linking the Southern Tier with the rest of the state, further encouraging investment and development. Community services improved; between 1879 and 1885, the towns acquired municipal water systems, indoor plumbing, fire departments, and telegraph service. The natural gas produced in association with the oil was also used locally for heating homes and powering industries.

#### B. NEW YORK PRODUCTION AND MARKET VALUE

1. Production

Although the price of oil and gas fell in 1985, the price decrease was offset by higher production. In 1985, approximately 1,071,000 barrels of oil and 33 billion cubic feet of gas were produced. Generally, oil production in New York has been declining steadily, but recent Bass Island discoveries and production offset the general decline for a few years. Bass Island wells

contributed 29.7 percent of the State's total crude oil production in 1986. The sharp decline in oil prices in 1986 led to a 20.3 percent drop in the State's production of crude oil. There were 852,564 barrels of oil produced in 1986, compared to the 1,071,280 barrels produced in 1985. Natural gas production in New York continued to increase in 1986, although at a slower rate than during the previous three years. Total gas produced in 1986 was 34.2 billion cubic feet (BCF), representing a slight increase of 1.2 BCF or 3.6 percent over 1985 production.

The number of active oil and gas operators in New York State declined 60 percent between 1984 and 1986. There were 591 oil and gas operators who reported active wells in 1986, down from 978 operators in 1984. The majority of New York State oil and gas producers are small operators. Although the maximum number of wells reported for a single operator was 1,846 wells, the average number of wells per operator is twenty.

#### 2. Market Value

Market value of the State's 1986 oil production was approximately \$13.3 million. Natural gas prices also fell in 1986, from \$3.37 per thousand cubic feet (MCF) in 1985 to an average of \$2.60 per MCF in 1986. Wellhead gas prices are highly variable because of the increasing variety of gas contracts, especially with regard to the large volumes of gas transported by the pipeline companies for direct sales from producers to end users. Market value of the State's 1986 gas production was approximately \$87.6 million.

The combination of lower prices and decreased oil production reduced the total market value of New York State's oil and gas production to \$100.09 million in 1986, the lowest level since 1982. This represents a decrease of \$42.1 million, or 29.4 percent from \$143 million in 1985 (Figure 18.1). Wellhead oil prices dropped precipitously during the first half of 1986 before leveling off somewhat toward the end of the year. A barrel of New York State



FIGURE 18.1 18-4a crude sold in January 1986 for \$26, dropped to a low of \$12 by late July and early August, and rebounded to \$16.50 by December 31. The average price per barrel for 1986 was approximately \$15.65, compared to \$25.15 in 1985.

In 1986, New York produced 5.6 percent of the gas it consumes which makes it a net importer of gas. Production has significantly increased since 1980, when New York production represented only 2 percent of the State's consumption.

#### C. LEASING PROCESS AND REVENUES

#### 1. Leasing Private Lands

The first step in drilling for oil or gas involves leasing. In the case of privately owned land, the decision to lease the mineral rights is made by the landowner, who receives a stated percentage of production, usually 1/8 of the market value, in the form of royalties. State regulation is not involved at this stage. (Appendix 4 summarizes the leasing process in detail.)

The economic benefits of leasing lands for oil and gas development can be considerable, but caution must be exercised. The landowner must make sure that his property and interests are protected, and that he is aware of the implications of leasing his mineral rights. Compensation for signing a lease is usually given in the form of a bonus payment which is based on a dollar amount per acre leased. The landowner also receives delay rental payments, usually \$1 or \$2 per acre, for each year of the lease until a well is drilled.

With an equitable leasing contract, the landowner can enjoy many benefits: (1) royalties from production, (2) cash bonuses and delay rentals, (3) free produced gas for household use, (4) the construction of new roads if needed, or the improvement of existing roads and other facilities used by the drilling company. If provided for in the lease, all construction will be removed at the end of drilling and production, and the site restored to a compatable condition. Alternatively, provisions can be made to retain the

access roads for landowner use.

2. Private Leasing Revenues

Landowners in New York who leased their property for oil and gas production received \$17.9 million in 1985, or one-eighth of the total estimated market value of \$143 million. In 1986, landowner royalties were reduced to \$12.7 million.

Royalty payments provide many financial benefits to individual landowners. Much of New York's production is in rural areas, so many farmers benefit from royalty income. With their high capital equipment costs and low market prices for their crops, farmers throughout the nation have been forced to sell their farms. Royalty income has helped many to span their cash flow gap and keep their land. In addition, the multiplier effects of royalty income go far beyond the benefit of helping some farmers keep their farms. Businesses in the area benefit from the money spent by individuals receiving royalties and from the dollars spent by people locally employed by the oil and gas industry.

# 3. Leasing Process for Public Lands

The leasing process for public lands differs from that of leasing private lands because it involves a lease which is obtained by competitive bidding. An exception to competitive bidding is made when warranted for very small parcels such as along a highway right-of-way.

The first step in leasing State land is the selection of parcels by the Department, either as a response to industry requests, or to requests by other State agencies. The Department may also issue a Call for Nominations or independently select parcels to be put up for bid, based on its assessment of their oil and gas potential. Next the Department sets target dates for the leasing and obtains conceptual approval for all oil and gas leases. After onsite inspections and a review of environmental concerns and public use

conflicts are made, the necessary documentation for SEQR is prepared. All environmental concerns and/or conflicts must be addressed or mitigated to obtain SEQR Committee approval. The status of the title and mineral rights must also be reviewed.

The Department then prepares a leasing package which includes a Legal Notice for Bidders, an advertisement for publication in industry journals, bid documents and the formal lease. The leases are awarded after the sealed competitive bids which have been submitted, are publicly opened and read on the appointed sale date.

#### 4. Current State Land Leasing

Authorized by Title 11, Section 23-1101 of the Environmental Conservation Law, the DEC makes leases on behalf of the State for exploration, production, and development of oil and gas on State lands other than State Parks. In 1986 the Department managed 54 leases covering 48,812 acres, of which 28,192 acres were DEC Reforestation Lands, and the remaining 20,620 acres were Conservation Fund lands or other agency lands. Seventeen of the leases have been developed, utilizing 15,097 acres and accruing \$307,794 in production royalties during 1986 while the remaining 33,715 undeveloped acres generated \$58,035 in delay rentals and storage fees. Total revenues from the Onshore Leasing Program in calendar year 1986 were \$365,829. (Figure 18.2).

1986 Leasing Revenues					
	<u>B</u> ids	<u>Rentals</u>	Royalty	Storage	
DEC Reforestation Areas	\$ 0	\$12,783	\$288,896	\$11,468	
Conservation Fund Lands	0	2,571	0	0	
Other Agency Lands	0	577	18,898	30,636	
Combined Leasing Revenues	\$ 0	\$15,931	\$307,794	\$42,104	
Total Leasing				\$365,829	



FIGURE 18.2 18-7a

#### 5. Lake Erie Leasing

Although the lands beneath Lake Erie have proven gas potential, as evidenced by Canadian production, current low gas prices make the exploration and development of gas reserves uneconomic at this time. There has been low industry interest in Lake Erie not only because of the low gas prices, but because of the projected expense of operations under the anticipated environmental requirements. It is unlikely that a state lease sale for Lake Erie will be held in the near future unless economic conditions change dramatically. When drilling in Lake Erie becomes economically feasible, prior to any initiation of the leasing program, a public involvement process would be conducted to address the environmental impacts. Any subsequent exploration would be regulated and monitored to avoid damage and contamination to the environment. Other offshore State lands in Lake Ontario and the Atlantic coast are unlikely to become available for leasing.

# 6. Oil and Gas Revenues

a. <u>Local Property Tax Revenues</u> - The estimated real property tax revenue attributable to oil and gas production in 1986 was approximately \$2.7 million, \$2.3 million from gas and \$.4 from oil production (Figure 18.3). The revenues generated by oil and gas royalties and taxes have had considerable impact on communities in the oil and gas producing counties. Property taxes on producing leases increase the community tax base which can result in lower taxes on the individual tax payer. The increased tax revenues are used by some local governments for community improvements such as highway equipment.

One-half of the 1985 real property tax revenues went to Chautauqua County where 1985 production was 371,715 bbls. of oil and 24,496,118 MCF of gas. Cattaraugus and Allegany were the next most productive counties, with 473,127 bbls. of oil and 3,007,521 MCF of gas and 141,515 bbls. of oil and 284,006 MCF

# FIGURE 18.3



FIGURE 18.3 18-8a of gas, respectively. In 1986, Chautauqua County again led the State in oil and gas production and revenues where 430,102 barrels of oil and 22.7 billion cubic feet of gas were produced.

b. <u>Permit and Fee Revenues</u> - The Department collects revenues from specific oil and gas activities stipulated in the Oil, Gas and Solution Mining Law of 1981. Permit and fee revenues decreased from \$811,019 in 1984 to \$270,041 in 1986 due to lower oil and gas prices and the subsequent decline in drilling. See Figures 18.4 and 18.5 for a comparison between prices and oil and gas production.

Permit fees for new oil and gas wells are dependent on the depth of the well and average between \$700 and \$900 per well. Revenues from each permit are deposited in the State's General Fund, except for a separate \$100 fee that goes to the Oil and Gas Account. This account was established by law in 1981 for the plugging and abandonment of problem oil and gas wells. In addition, penalties for violations of the law are deposited in this Account.

The Department also collects fees for determination of a well's status under the federal Natural Gas Policy Act of 1978 (NGPA), through an agreement with the Federal Energy Regulatory Commission. Cost charges are also assessed for copies of oil and gas records under the State Freedom of Information Law (FOIL). Below is a summary of the 1986 permit and fee revenues.

1986 Permit and Fee Revenues	
Oil and Gas Permit Depth Fees	\$182,050
Oil and Gas Account Fees	26,200
Fines and Penalties (Oil and Gas Account)	24,550
Natural Gas Policy Act Fees	30,900
Freedom of Information Fees	6,341
Total Permits and Fees	\$270,041

FIGURE 18.4



# FIGURE 18.4 18-9a



FIGURE 18.5 18-9b

#### D. RELATED ECONOMIC BENEFITS

#### 1. The Value of Investment

A total drilling investment in New York State of \$35 to \$98 million per year is estimated if operators drill between 250 to 700 wells in a year, at an average cost of \$140,000 per well.

For example in 1984, 688 wells were drilled in New York State. Assuming an average cost of \$140,000 per well, the total drilling investment would be estimated at \$96.3 million. Additional money spent on pipelines, tank batteries and other installations would increase total industry investment to an estimated \$180 million.

Much of the investment in the oil and gas industry in New York is made through the use of limited partnerships. The limited partnership business arrangement consists of a number of limited partners (investors) and a general partner (operator). The limited partners supply the investment capital while the general partner provides the management and know-how. Limited partnerships are of particular interest to the oil and gas industries for a number of reasons. First, limited partnerships are appropriate for the passthrough of losses from oil and gas investments. Second, they are well suited for investors who wish to invest in a business, but want to protect the rest of their financial resources from potential business failure. Finally, limited partnerships offer the investor the advantage of locking out any financial partners from management of the venture. Given the willingness of investors to assume substantial risks, the rewards can be excellent. Although the Tax Reform Act of 1986 brought about significant adverse changes to the attractiveness of tax-favored investments, the special tax breaks for oil and gas were left largely intact. These breaks include the deduction of intagible drilling costs and percentage depletion. In addition, oil and gas

investments were the only investments specifically excepted from the limitations on deductions and credits from passive activities. Inasmuch as the precipitous decline in oil prices, after a decade of constant increases, has made oil and gas investments somewhat discouraging, stable or increasing prices in the near future would once again make such investments very attractive from an economic standpoint.

Whether an investment is made by a C Corporation, a S Corporation, a limited partnership, or a proprietorship, the investment policy is usually the same, i.e., the maximization of net cash flow. Several yardsticks are used to measure the worthwhileness of an investment, of which the most common are: "payback period", "rate of return on investment", and "discounted cash flow" or "DCF". When oil and gas prices were higher, an investor could expect a payback in as little as two years, and a return of as much as five times the original investment over the life of the investment (using undiscounted dollars). Given the current low level of prices, coupled with the adverse economic impact from the resulting practice of production curtailment, investors could experience longer payback periods and smaller rates of return than ever before.

#### 2. <u>Secondary Benefits of Oil and Gas Operations</u>

a. <u>Free Gas to Landowners</u> - One of the fringe benefits for landowners can be free gas that is produced from leases on their land. This gas can be used for household purposes and light industries such as maple syrup production or fruit drying. Free gas can save the landowner hundreds of dollars a year in heating fuel costs and provide opportunities that might otherwise be unavailable. As the gas is already on the property, there are no transportation or storage costs, and the landowner can enjoy the benefits of a clean efficient fuel, not normally available in rural areas. Landowner gas
connections are not regulated by any government agencies, thus the landowner uses this resource at his risk.

b. <u>End User Savings</u> - When gas can be sold at the wellhead directly to the end user, the costs to the end user company are reduced. In recent years, gas producers have been receiving lower and lower prices at the wellhead, but utilities have not appreciably lowered the prices charged to the end users of natural gas because of longstanding contractual obligations based on large volumes of supply. In addition, the decontrol of petroleum pricing has allowed No. 6 fuel oil to compete favorably with natural gas. In response to this situation, many industrial plants have switched to dual fuel capacity to take advantage of low fuel oil prices.

In 1985, federal regulations were changed to allow industries (end users) to deal directly with gas producers. These regulatory changes have allowed end users to take advantage of low wellhead and spot gas market prices rather than being tied solely to fixed price contracts with a utility. The difference between the utility and wellhead price has resulted in savings to many end users of millions of dollars per year. The situation found in New York State, with widely scattered moderately low volume gas production, lends itself to the direct end user sales phenomenon.

The gas producer also benefits by having a firm marketplace for his production. The price of gas can now be directly negotiated with the end user so that both parties profit. The recent regulatory changes allow the gas producer to charge a price for gas which is determined by the supply - demand conditions of the marketplace, whereas before, the transportation company had controlled the field price.

Some of New York end users have gone a step further and have developed their own interruptable supply of gas. For example, U.S. Gypsum, faced with the high fuel costs of the early 1970's, was almost forced to close down local

plants after 70 years of manufacturing. Instead, the company developed its own gas fields and pipelines to provide an assured supply of gas for present and future needs. U.S. Gypsum now has an estimated 40 year supply of gas and has been able to expand its manufacturing capability (Rosen, 1986). Several schools and institutions such as Wells College, also have their own gas wells to ensure a secure supply of fuel for heat and power. Public institutions can apply and generally receive variances to the State's minimum spacing requirements.

Both privately owned gas such as the U.S. Gypsum fields, and locally produced gas sold directly to the end user, can have significant effect on revitalization of older industrial areas of New York. The lower prices and more reliable supplies can also provide opportunities for new industries.

c. <u>Access Roads</u> - When drilling operations are completed, the access roads are often left in place after site reclamation because they improve access to the area. Rig roads are built to take heavy trucks and equipment, and since the operators pay construction costs, landowners can be spared the cost of what would be an expensive road to build. Farmers can use the rig roads on their land to move farm machinery, and on state land, the roads are valuable for logging and recreation access.

# 3. <u>Gas Storage Benefits</u>

In 1986, total storage capacity of New York's underground gas storage projects was approximately 176.6 billion cubic feet, of which 91.2 billion cubic feet, or 51.6 percent, was working gas capacity.

Underground gas storage makes use of old depleted gas fields and salt caverns to store gas, injecting it when gas is plentiful and cheap, and withdrawing it during times of peak demand, usually during the winter.

Gas has been stored underground in New York State since 1916 when the

Zoar storage field, the oldest gas storage field in the United States, was activated in Erie County. At the end of 1986, there were 21 active gas storage fields in the State. Most of the storage fields are concentrated in western New York near major gas production areas and pipelines.

Underground gas storage provides many economic benefits in addition to providing prime deliverability. Gas is available in quantity at times of peak demand, thereby helping to eliminate the problems of winter shortages and the subsequent hardships which might be suffered. Generally, it is cheaper to store gas underground adjacent to high demand areas than to build sufficient pipeline capacity to assure deliverability of the same amount of gas. Also, the assurance of an uninterrupted supply to urban areas increases the investment and the development of industry.

# E. IMPACTS OF LOW OIL AND GAS PRICES IN NEW YORK

Although New York State's economy is more diversified than that of major oil producing states such as Texas, low oil prices have had substantial effects on the economy of southwestern New York. Twenty-five hundred people used to be directly employed by the New York State oil and gas industry; the number was reduced to fifteen hundred in 1986. Wellhead value of oil and gas dropped \$42.1 million in 1986. One of New York's largest independent companies, Berea Oil and Gas Corporation, drilled 90 wells in 1984, but stated they expected to drill only 18 in 1986 (Knudson, 1986). Other independent oil companies have fared even worse, and several have been forced into bankruptcy.

Wells are being shut-in, or permanently plugged and abandoned in higher numbers. Table 18.1, New York State Oil and Gas Statistics, shows that in 1986, 1,638 oil wells were shut-in, up from 1,400 in 1980. Four hundred, seventy-one wells were plugged and abandoned in 1986, compared to 114 in 1980. Most (99 percent) of New York's oil wells are strippers. Stripper wells are defined as producing less than 10 barrels of oil per day (BOPD). The

# **TABLE 18.1**

# NEW YORK STATE OIL AND GAS STATISTICS

ANNUAL PRODUCTION	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	PREL IMINARY 1986
OIL (1,000 BBLS)	857	824	852	855	824	849	831	902	952	1,071	853
GAS (MMCP)	9,200	10,700	13,900	15,500	15,650	19,000	18,760	20,380	27,000	33,054	34,152
NUMBER OF WELLS	8,800	8,964	9,118	12,000	13,561	14,082	14,300	13,467	13,809	14,992	14,377
01L	5,016	4,913	5,039	5,100	5,220	5,176	5,272	4,705	4,584	4,815	4,400
GAS	1,195	1,467	1,452	1,620	2,076	2,636	2,969	3,489	4,279	4,780	5,038
SHUT-IN OIL	1,393	1,528	1,512	1,500	1,400	1,402	1,308	1,436	1,475	1,629	1,671
SHU'T-IN.GAS	432	292	352	520	500	726	996	995	821	890	781
STORAGE	764	764	763	763	765	822	831	839	839	841	836
PLUGGED & ABANDONED (DURING YEAR)	442	455	352	117	119	184	262	90	182	269	471
WATER INJECTION				2,500	3,500	3,038	2,924	2,093	1,811	2,037	1,651

economics of producing these stripper wells was very marginal before oil and gas prices decreased abruptly. Individual wells may only produce 1/4 to 1/2 BOPD, and some entire fields are produced only during 3 to 4 warm months of the year. Stripper production contributed 57 percent of the State's total oil production, and much of this production is extracted through secondary recovery (waterflooding). Most of the wells that were shut-in or plugged and abandoned during 1986 because of low oil prices were stripper wells.

Given an oil price of \$15 per barrel, and the increasing costs imposed by regulation, it is likely that the majority of these marginal wells will be shut-in or abandoned in the near future. The situation is further complicated by the fact that most strippers are on waterflood, and it is technically risky to shut in a waterflood with the expectation of being able to produce again. When water injection is halted, reservoir conditions change, and the oil bank created by injection will continue to travel and pass existing wells. This means new wells would have to be drilled to bring a field back into production, and it would not be economically feasible in most cases. The deterioration of well casings and pumping equipment in a shut-in field add further to the potential reopening costs, particularly when the equipment is old.

In fact, some waterfloods in New York have produced with the same pumps and powerplants for over 60 years. Many of the operators in these old oilfields repair rather than replace old equipment to keep costs down. The current low prices and marginal economic conditions make it difficult for producers to buy new, non-polluting equipment. These marginal fields have been economic because of the low production costs, but the combination of increased environmental awareness and regulation with low oil prices will

probably be the end for many of New York's very old oilfields.

One reason New York stripper wells continued to operate long after those in other states became uneconomic, was because they produced Penngrade crude, which traditionally commanded premium prices for refining into lubricants and motor oils. Penngrade crude which sold for \$25 bbl in May 1985 dropped to \$13.50 bbl by May 1986 (Maslowski, 1986). The high quality and high price of Penngrade crude was sufficient incentive for producers to continue operating marginal strippers even when they produced far less than 10 BOPD.

Concurrently during the last decade, the demand and price paid for Penngrade crude has dropped because motor oils are no longer straight 100 percent Penngrade oils, but are blended with additives and viscosity agents. Refiners can now use lower grade oil for making lubricants which last longer. Because of the low prices, the small refineries that handle Penngrade crude are having problems making gasoline economically. One refinery in Pennsylvania, where most New York oil is refined, reported getting \$.45 per gallon for gasoline in May 1986 which cost them \$.52 per gallon to refine (Maslowski, 1986). Since refiners can no longer pay higher prices for Penngrade, regional producers are shutting in these stripper wells by the hundreds.

# F. ECONOMIC IMPACTS ON NEW YORK EXPLORATION

A natural gas price between \$3 - \$3.50 per MCF is needed to drill and economically develop new gas reserves in New York State. Producers currently have little incentive to drill exploration wells with the attendant risk of a dry hole. Most recent drilling has been field development, a relatively safe investment. Because of the lack of exploration, new fields are not being found. This, however, does not mean that they are not there. The Bass Island trend, discovered in 1981, was not suspected to exist prior to its accidental discovery, and this trend is now a major oil producer. Similar trends may be

awaiting discovery. There is further potential for tight Medina sand and Ordovician Trenton production. Cambro-Ordovician potential has not been fully tested; there are undoubtedly more fields to be found.

Exploratory success in the western overthrust belt of the Rocky Mountain states has led to some interest in the 60,000 square mile Appalachain overthrust in the eastern states. The eastern overthrust belt consists of sequences of Paleozoic sedimentary rock overlain by thrusted layers of impermeable shale and metamorphic rock. Repeated episodes of intense thrust faulting can create many large hydrocarbon traps.

In New York, the eastern overthrust belt is a narrow band extending from Orange and Dutchess Counties northward along the Vermont border. Although overthrust tests in Tennessee and West Virginia have been successful, the New York portion of the structure is relatively unexplored. Many dry holes were drilled in the Western Overthrust before major production was discovered, and it is expected that when the price of oil increases, additional eastern overthrust tests will be drilled in New York.

The widespread Devonian shales in New York have considerable gas potential. In 1821, the first natural gas well in the United States was drilled to a depth of 60 feet in Fredonia, New York. Production from this well was a few thousand cubic feet per day for over 35 years. When it was shut-in, the well could no longer supply the entire town, but it was still capable of production. Long well life and moderately low but steady productivity are characteristic of the Devonian shale gas wells. Research by the U.S. Department of Energy has shown that shale gas production can be increased sevenfold by drilling the wellbore horizontally, instead of vertically, through the shale pay zone. This technique has great potential for shale gas exploration and development, but until gas prices increase, it

remains experimental.

New York has an estimated possible and probable future gas reserve potential of 4 TCF (trillion cubic feet) (VanTyne & Copley, 1984). With the finding cost estimated at \$2/Mcf, there could be an investment of 8 billion dollars in New York gas development over a period of 50 years when gas is again scarce and prices rise. Given average production of 150,000 Mcf per well, an estimated 26,000 wells would be needed for full development. As more new areas of potential are discovered the future possible and probable reserves should increase.

# G. IMPACTS OF ENVIRONMENTAL REGULATIONS ON THE OIL AND GAS INDUSTRY

Recently imposed New York State regulations and guidelines have added additional expenses to the oil and gas industry. These regulations and guidelines have provided badly needed environmental protection, yet they have been imposed at a time when oil and gas prices are low and the tax burden on this industry is high. The cost of recently imposed or enforced State regulations and permit conditions are detailed below:

- o The Aquifer Permit Conditions (1982, revised 1985) adds an average incremental cost per well of \$1,500 to \$3,000. The cost can double if the well is greater than 3,500 feet deep because stage cementing tools may be required to cement the production casing to the surface. In addition, many rotary drillers had a one-time cost of \$10,000 to \$15,000 for retooling when aquifer conditions were first imposed.
- o The new Bass Island Regulations (1986) add an average incremental cost per well of \$3,000 to \$4,000, but depending on the operator's former operating practices the cost might be a low as \$1,500. Operating costs in the Bass Island are \$500 incrementally higher per year as a result of the regulations.

o The pit liner requirement (1982) adds an average incremental cost per

well of \$150 to \$200.

- o The cementing and casing guidelines (1986) add an average incremental cost per well of \$2,000 to \$2,500. In addition, a one-time cost of \$10,000 for retooling was necessary for many old oilfield and cable tool drillers.
- o The Brine Blowdown Pit Elimination program (1984-1987) costs operators an average of \$200 to \$500 per well. This cost can be higher when site clean-up is extensive and/or a brine tank installation is necessary.
  o In addition, with the elimination of brine blowdown pits, the alternative disposal methods for brine cost operators an average of \$1.50 to \$2 per barrel of brine, plus \$.50 per truck tanker mile for transportation of the brine to an approved disposal site.

Not all of the above imposed permit conditions and regulations are additive. Nevertheless, some economic hardship has been imposed. These requirements have added significant environmental protection consistent with the legislative mandates of the Oil, Gas and Solution Mining Law.

While the costs of environmental regulation appear high, the costs to society of no regulation are far greater. Because it is comparatively easy to calculate the direct monetary costs of regulation in terms of added man hours, extra equipment and additional paperwork, these costs are questioned when no corresponding monetary value on the benefit of the regulation is assigned. Unfortunately, it is difficult to assign precise monetary values to aesthetic benefits such as the beauty of an unspoiled wilderness. The monetary value for improvements in such areas as clear air, clean water, and clean soil are easier to estimate and assign by using parameters such as increased property value, decreased health care costs, increased recreational and tourist use, and improved production from forestry, fishery and agriculture.

Another method used to assess the benefit of regulation is to compare the cost of compliance with cleanup costs. In the case of an oil spill which could have been prevented through routine maintenance and contained by diking, the cost of maintenance and diking would be compared to the cost of cleaningup the obvious physical damage and pollution on the surface. Where the spill location is immediately adjacent to surface waters, estimates of longer-term less obvious costs such as the loss of fishing revenues might be appropriate to add. In a worst case scenario where surface pollution is not removed, and there is sufficient time for percolation into groundwaters, the difficult task and very high cost of restoring a contaminated aquifer must be added. Most experts in this field agree that in most cases it is much cheaper to prevent pollution than to restore the environment after it has occurred.

Environmental regulations improving the quality of air, water and land by the reduction of pollutants create direct changes in physical attributes such as visibility, odor, and taste which are readily perceived by most human beings as aesthetic benefits, but these attributes are also directly related to human health. Increased health costs are an obvious and documented effect of pollution. This fact, which was not widely recognized fifty to a hundred years ago, has been confirmed by advancing technology. Insurance companies now keep statistics and assign monetary values to the illnesses that can be attributed to pollution. It is possible to compute the health cost of chronic pollution. Examples of health costs caused by pollution include lost worker days, worker compensation, lost earnings and the increase in insurance premiums for workers in industries which handle hazardous waste. Changes in the quality of life such as increased pain, discomfort and grief are very difficult to assess, but ours is a very litigious society. The courts have awarded very large sums of money to people who can prove negative impacts on their quality of life were caused by pollution. In addition, the costs of

lawsuits brought against companies that cause pollution which result in illness and death are usually passed on to the consumer and thereby cost everyone.

#### H. SUMMARY

As discussed in this chapter, New York's oil and gas industry is a vital economic force on both the statewide and local levels. Oil and gas exploration and development stimulates investment, creates jobs, and generates revenues. Direct monetary gains are realized by operators and their employees, royalty owners, contractors, and support industries. Taxpayers benefit from the property taxes levied on the industry, permit and fee revenues paid to government agencies, and the overall development of their local regions.

The recent downturn in oil and gas prices and the resultant impact on the industry is well documented. The price stability experienced during the first half of 1987 has caused a feeling of cautioned optimism to surface. Lower oil and gas prices have also led to lower drilling and production costs. Decreased revenues have forced operators to better engineer their prospects and pay more attention to detail. The survivors of the downturn thus stand better prepared to develop existing reserves and explore for new sources of production.

One mandate of the Department is to foster the development of the State's resources. The other mandate is to ensure that it is done in an environmentally safe manner. These primary mandates can be compatable.

#### XIX. UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are those adverse environmental effects that can be expected to occur regardless of mitigation measures. Additionally, as oil, gas, solution salt mining and gas storage activity increases, so does the potential for the probability of adverse environmental impacts.

Though the potential for severe negative impacts from any one site is low, when all activities in the State are considered together, the potential for negative impacts on water quality, land use, endangered species and sensitive habitats increases significantly.

# A. Oil and Gas Drilling and Development

- Short term degradation of surface water quality from suspended solids will occur during access road construction and pipeline installation at any stream crossings.
- Temporary accelerated erosion is expected in the immediate vicinity of the drill site and access road.
- Pipeline construction will disturb a narrow corridor of land during construction.
- Operating drill rigs could temporarily disrupt the scenic vista for some people living and working in the area. Other people will perceive the drilling rigs as visually interesting.
- Longer term visual impacts from changes in landscape and installation of production facilities will occur if the well is economically viable.
- The temporary loss of land and associated loss of wildlife habitat will occur.
- Possible loss of some individual animals and localized declines in abundance or distribution of some plants and animals may occur.
- Temporary land-use conflicts or impacts resulting from the acreage used for the drill site, access road, gathering line and production facilities will occur.

- Short term negative noise impacts may be experienced for 5 to 10 days by people living in close proximity to the drill site.
- Short term minor adverse air quality impacts resulting from the dust and diesel exhaust fumes generated at the drill site can not be totally mitigated.
- Some minor adverse impacts will continue throughout the life of a well, such as atmospheric emissions, noise and the potential for operational accidents.
- Minor increases in trace metals and hydrocarbons near drilling rigs may occur in the immediate vicinity.
- The potential adverse impacts and conflicts associated with the disposal of drilling and production solid and liquid wastes cannot be entirely eliminated.

# B. Enhanced 011 Recovery

- Unavoidable land use impacts are greater because of the need for injection and water treatment surface facilities.
- Some increase in negative asthetics including visual disturbances, noise and odors associated with the injection and water treatment facilities is unavoidable.
- C. Solution Salt Mining
- Drilling impacts associated with oil and gas wells also apply to solution mining wells.
- When larger quantities of salt are produced from an underground solution salt mining operation, the potential for subsidence exists, even with careful planning, in areas with thin overlying bedrock.
- Surface waters and the associated aquatic life may be temporarily adversely affected when large quantities of water are removed for solution salt mining.
- The potential for brine leaks from associated transport pipes, storage tanks

and wells exist particularly when corrosion inhibiting measures are not taken.

- D. Underground Gas Storage
- Some of the gas storage fields have been in use for several decades, so long term land use impacts are greater.
- Long term localized increase in noise and atmospheric emissions due to compressor operations will occur.
- Increased noise, visual disturbance and atmospheric emissions will occur from the heavy traffic during the removal of mined cavern debris, the stockpiling of cavern debris and the general servicing needed for a storage cavern site.
- E. Geothermal
- Impacts of drilling, completing and abandoning geothermal wells generally resemble those of oil and gas wells.
- The land use impacts may be slightly higher because of associated heat recovery facilities.
- New York State has relatively low geothermal potential and significant geothermal development is not anticipated.
- F. Stratigraphic
- Impacts of stratigraphic test wells are relatively minor because they are short term.
- These wells are drilled for information, not production of potential pollutants like oil or gas, and the well drill site and borehole are usually much smaller.
- Land use impacts are also much lower than those of oil and gas wells because no surface production/injection facilities are needed and the small area disturbed can be reclaimed as soon as the tests are completed and the well is abandoned.

# G. Brine Disposal

- Impacts of drilling, completing and plugging brine disposal wells (Class IID) are very similar to impacts of oil, gas and injection wells used for oil recovery (Class IIR).
- The land use impacts may be slightly higher because of the required support facilities such as brine loading and storage tanks and the associated surface containment and safety equipment which are required under State guidelines.

#### XX. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The irreversible and irretrievable resources committed are those natural and human resources that will be consumed, converted or made unavailable for future use.

#### A. Oil and Gas Drilling and Development

- The production of natural gas and oil constitutes an irretrievable commitment of nonrenewable natural resources.
- Other resources irreversibly committed include the materials used and consumed during the drilling and completion of an oil or gas well which cannot be recovered or recycled with present technology. These resources include petroleum derived fuels and lubricating oils, materials used for cement, casing, drilling, completion and stimulation fluids and any worn rig parts or equipment such as drill bits.
- Death and/or permanent disability could occur in the event of a blowout or rig fire and should this occur, it would be an irreversible loss of human resources.
- An irretrievable loss of biological resources could occur in the event of a large oil spill in a sensitive habitat.
- B. Enhanced Oil Recovery
- Enhanced oil recovery furthers the production of oil which is a nonrenewable natural resource.
- An irreversible commitment of equipment and materials is made for injection and water treatment facilities.
- C. Solution Salt Mining
- The development and extraction of rock salt is an irretreivable commitment of a nonrenewable natural resource.
- The irretrievable loss of biological resources could occur in the event of a large brine spill in a sensitive habitat.

- The loss of land for many uses may occur in the event of subsidence.

#### D. Underground Gas Storage

- Recharging a depleted gas reservoir may result in the migration of gas dutside of the reservoir which may be an irretrievable loss of natural gas resources.
- Due to the permanent nature of gas storage reservoirs, the irretrievable loss of some flora and fauna habitats occurs.

#### E. <u>Geothermal</u>

- An irreversible commitment of equipment and materials is made for drilling, operating, plugging and abandoning geothermal wells.

#### F. Stratigraphic Test Wells

- An irreversible commitment of minor amounts of equipment and materials is made for drilling, testing, plugging and abandoning stratigraphic test wells.

#### G. Brine Disposal Wells

- An irreversible commitment of equipment and materials is made for drilling, operating, plugging and abandoning brine disposal wells.

#### XXI. ALTERNATIVE ACTIONS

The potential problems associated with oil, gas, solution mining and gas storage activities are numerous and their actual impacts versus potential impacts on the environment are difficult to differentiate and assess. The range of alternatives available concerning resource development in New York can be grouped into three basic categories.

Alternative A. Prohibition of Resource Development

Alternative B. Removal of Regulation

Alternative C. Maintenance of Status Quo versus Revision of Existing Regulations

#### A. PROHIBITION OF RESOURCE DEVELOPMENT

Total prohibition would be contrary to state and national interests. Total prohibition would eliminate domestic production of 852,564 barrels of oil, 34.2 billion cubic feet of natural gas and approximately 2.7 million tons of salt per year, and deprive industry and landowners of \$100.09 million in income from oil and gas and approximately \$63 million from salt production annually. In addition, the 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. Currently available alternate energy sources such as coal, oil shale and nuclear have equivalent or more severe environmental impacts or costs (see Table 21.1). A combination of the above alternatives would be necessary to replace the lost oil and gas production should a total or limited prohibition of oil and gas activity occur. Prohibition of underground gas storage would limit gas supplies in the winter months resulting in severe shortages. New York State is the third largest salt producer in the nation and prohibition of this industry could cause nationwide shortages.

TABLE 21.1 Alternate Energy Sources and Associated Adverse Impacts

Source/Action	Impact/Obstacle
Imports (Oil and Gas)	- increased reliance on unreliable foreign sources - adverse effects on trade balance - increased risk of oil spills from tankers
*Energy Conservation	- increased consumer cost - large capital investment - decreased comfort and standard of living
*Coal	<ul> <li>disruption of land</li> <li>emissions of SO<sub>2</sub> and particulates</li> <li>water pollution<sup>2</sup> (surface and ground)</li> <li>increased noise</li> <li>large amount of water needed for gasification</li> </ul>
*Nuclear Fission	<ul> <li>release of small amount of radioactive material and heat</li> <li>high cost and public concern limiting construction of new plants</li> <li>no suitable waste disposal solution</li> </ul>
Tar Sands	<ul> <li>modification of surface topography</li> <li>water pollution</li> <li>dust and vehicle emissions</li> <li>increased noise level</li> <li>disposal of residual material</li> <li>cost not presently competitive</li> </ul>
Oil Shale	<ul> <li>disposal of spent shale</li> <li>disruption of land</li> <li>dust and vehicle emissions</li> <li>large quantities of water needed in processing</li> <li>cost not presently competitive</li> </ul>
*Solar	<ul> <li>high initial or fixed cost unattractive to individual home-owner given other alternatives</li> <li>commercial use not technologically possible at present</li> </ul>
*Hydroelectric	<ul> <li>irreversible commitment of land resources</li> <li>elimination of wildlife habitats</li> <li>high initial cost</li> <li>loss of free-flowing river recreation</li> <li>most favorable sites already in use</li> </ul>

NOTE: Some of the Alternate Energy \*Sources do not entirely replace petroleum and the numerous derived products such as lubricating oils, plastics, synthetic textiles, pharmaceuticals, insecticides, etc.

TAKEN IN PART FROM: FEIS, 1982, St. George Basin, Minerals Management Service Alaska OCS Program. Although total prohibition is expostulated by some segments of the population, it is against legislated State and Federal mandates. Everyone uses petroleum and petroleum derived products, but some people oppose oil and gas development in close proximity to their property unless they are receiving royalty benefits.

Although prohibiting oil and gas development would certainly eliminate all of the associated adverse impacts, these impacts would simply be exchanged for the adverse impacts associated with coal, oil shale, additional hydroelectric dams or nuclear plants if we are to maintain the current standard of living. A limited prohibition, such as the restriction of oil and gas drilling and solution salt mining in the most critical and environmentally sensitive areas is a more viable alternative.

#### B. REMOVAL OF REGULATION

The environmental damage which resulted from past unregulated oil, gas and solution mining activities has been discussed throughout this statement. By 1963, when the State's first comprehensive oil and gas conservation law was passed, surface streams, ground water and land in some areas had been contaminated by oil and salt water. Fluids naturally segregated in the subsurface by impermeable strata had been allowed to commingle in uncased or incompletely cased production and injection wells. Oil and brines had spewed from wells drilled without adequate control. Oil, gas and brine had leaked from improperly plugged and abandoned wells, from wells improperly cased and completed, and from neglected surface storage and gathering systems. Pollutants had leached from unlined pits and holding lagoons. Pollutants had been dumped onto the land and into surface waters from overflowing storage pits and separators.

Not all of the past environmental problems caused by earlier oil and gas operations, can be attributed to an unconcerned, unregulated industry. Many

conscientious operators undertook their operations with real concern for the environment and they used state of the art technology to accomplish their objectives. As with any industry, however, some imprudent operators, free of regulation and surveillance, had failed to adopt technical improvements in equipment and methods and continued operation utilizing obsolescent tools and practices. Blowouts, uncontrollable salt water flows, cave-ins, commingling of subsurface fluids and waste of resources sometimes resulted.

The advent of artificial stimulation and reservoir pressure maintenance techniques to enhance oil production compounded the problems. Both practices involve the pressured injection of fluids (usually freshwater in New York's oil fields) into the hydrocarbon-bearing strata. Improperly equipped injection and production wells in some areas had allowed both injected fluids and produced oil and brine to infiltrate unprotected porous strata or escape to the surface.

Solution salt mining practices where freshwater is injected through wellbores into rock salt beds to dissolve the rock salt and the resulting brine is brought to the surface either through the injection well or through offset wellbores have not changed greatly in the last huundred years. But some earlier solution salt mining operations caused subsidence and contamination of subsurface freshwater zones, because the forces causing wellbore collapse and subsidence were not understood or engineered around.

The practice of collecting and storing salt water and drilling fluids in earthen pits has been especially damaging to the environment. Unlined pits installed in naturally porous soils, or whose bottom rested on fractured or weathered bedrock, allowed waste fluids to percolate into surrounding soils and underlying aquifers. Even when excavated in relatively impermeable soils or lined with impermeable material, the pits were often allowed to fill with

precipitation and overflow onto surface soils and into nearby streams.

Though there are many conscientious operators who use environmentally sound methods to drill and complete their wells and would continue to do so without regulation, there are also those who would not. Due to population pressures, once abundant natural resources are limited. Proper management of these natural resources is so critical that we cannot entrust our environment to unregulated industries again.

In the absence of regulation, few well spacing, lease integration or pool unitization programs would be undertaken. Waste would be common. Superfluous wells would be drilled by small lease holders in an effort to prevent drainage of their oil or gas. Mineral owners unable to finance their own well, and with insufficient holdings to encourage a prospective lessor, would probably find their minerals produced by adjacent wells.

It is also likely that, without statewide regulation, local ordinances restricting mineral exploitation would proliferate, and either discourage investment or make potentially valuable mineral lands unavailable for development.

# C. MAINTENANCE OF STATUS QUO VERSUS REVISION OF EXISTING REGULATIONS

The State's oil, gas, solution mining and underground gas storage regulations have not been updated since 1972. The current regulatory program is in need of modernization through updated regulations. The primary mandate of the existing 1972 regulatory program was natural resource management. The primary mandate of the new 1981 and 1984 Oil, Gas and Solution Mining Law and the more recent amendments is not only resource management but also environmental protection. Most of the environmental protection measures mandated by the new Law are currently applied through permit conditions.

Many of the permit conditions have been imposed by the Division in

response to both existing and potential problems that could occur. The oil and gas industry has considered some of the imposed permit conditions unnecessary and their implementation too abrupt. Long term planning is absolutely essential for a financially successful oil and gas development venture. Currently, the industry is having difficulty not only because of low oil and gas prices, but also because it is difficult to adequately plan a long term drilling program with changing drilling, casing and cementing requirements. The revision, publication and uniform enforcement of comprehensive regulations will alleviate these latter problems.

The oil and gas industry has complained that expensive strictures have been added during a time that industry can least afford them. The additional requirements on wells drilled in aquifer areas may add an estimated \$1,500 to \$15,000 per well. It is true, that these added costs make the average New York oil or gas well extremely marginal at todays' reduced energy prices. Oil and gas development activity in New York State will probably be curtailed until oil and gas prices again increase. The industry has always been cyclic and long term environmental protection cannot be sacrificed for short term cycles of monetary gain or loss.

The monetary benefits to the State and the people of the State from the oil and gas industry can be assessed. From the gross income from oil and gas produced at the wellhead, millions in landowner royalty revenues and State and local property taxes were generated. About \$100 million is invested annually in the drilling of new wells even with the current depressed state of the industry. In addition, it is estimated that over 1,500 people in the State are directly employed in the oil and gas industry. The Department has collected \$720,000 for the Oil and Gas Account in fees, fines and penalties since 1981.

Unfortunately, a direct comparison between added oil and gas development costs and environmental costs is difficult because there is no widely accepted measure of their value. It is difficult to assign a monetary value to the natural resources enjoyed by all people of the State. Insurance companies and the courts do assign a monetary value or compensation to the human suffering and misery caused by pollution, and it is cheaper to prevent it.

The primary purpose of this Environmental Impact Statement has been to review in a comprehensive manner not only the effect of oil, gas, solution mining and underground gas storage activity in New York State, but also the Department of Environmental Conservation's existing Regulatory Program. Throughout the text, the inadequacy of portions of the existing program has been discussed. Extensive regulatory revisions are needed to formalize the current permit condition system and mitigate the environmental hazards associated with the development of New York's mineral resources.

#### GLOSSARY OF TECHNICAL TERMS

- Amphibolite: A crystalloblastic (metamorphica)ly recrystalized) rock consisting mainly of amphibole and plagioclase.
- Anaerobic: Living or active in the absence of free oxygen.
- Anhydrite: A mineral; anhydrous calcium sulfate, CaSO,.
- Annular Space: The space between casing and the wellbore or between two strings of casing.
- Anorthosite: A plutonic rock (formed at great depth) composed almost wholly of plagioclase.
- Anticline: A fold with strata sloping downward on both sides from a common crest.
- API: American Petroleum Institute.
- API Number: A number referencing system designed by the American Petroleum Institute to identify wells in which each state and county has a number code.
- Aquifer: A zone of permeable, water saturated rock material below the surface of the earth capable of producing significant quantities of water.
- Attenuation: The act of lessening the amount, force, magnitude, or value of.
- Baker Tanks: Portable skid-mounted storage tanks for temporary usage at a wellsite.
- Bank Run Gravel: Gravel found in natural deposits with varying mixtures of sand, silt and clay.
- Barrel: 42 U.S. gallons.
- Base Gas: ("Cushion Gas") needed to help produce the "working gas" rapidly. Includes injected gas plus native gas and is normally held permanently within a gas storage reservoir.
- BBL: Barrel.
- BCF: Billion cubic feet.
- Benching: Method of quarrying by alternating vertical and horizontal excavations yielding a step (stair) profile.
- Benthonic: 1. The bottom of a standing body of water.2. Or pertaining to sea-floor types of life.
- Bentonite: A natural clay, used as cement or mud additive for its expansive characteristics and/or its tendency not to separate from water.

Blooie Line: Pipe that diverts fluids from the wellbore to a reserve pit.

Blowout: Uncontrolled flow of gas and/or oil from a well.

BOD: Biochemical Oxygen Demand.

BOP: Blow Out Preventer.

- Brachiopod: Any of the phylum of marine, shelled animals with two unequal shells (Brachiopoda).
- Bridge Plug: A type of mechanical packer that is usually permanent which is used in a well casing to isolate a zone.
- Brine: A solution containing appreciable amounts of NaCl and/or other salts. Synonymous with salt water.
- Brine Disposal Well: A well (Class IID) for subsurface injection of associated produced brines from oil, gas and underground gas storage operations, or a well (Class V) for disposal of spent brine from geothermal and solution mining operations.
- Brush Bridge Plug: An obstruction placed in a well at a specified depth. It can be the stump of a tree, brush, sacks, rags or any other material used as the foundation for a plug isolating a zone in the wellbore or casing.

Bryozoan: Any of the phylum of aquatic invertebrate animals (Bryozoa).

BTX: Benzene, Toluene, and Xylene. Aromatic hydrocarbons.

Buffer Zone: An area designed to protect and separate.

- Cable Tool: Equipment for cable-tool drilling consisting of a heavy metal bar sharpened to a chisel-like point and attached to 1 to 2 inch diameter cable. The gravity impact of the heavy metal bar (bit) pulverizes the rock which is removed with a bailer.
- Caliper Log: A log that is used to check for any wellbore irregularities. Run prior to primary cementing as a means of calculating the amount of cement needed. Also run in conjunction with other open-hole logs for log corrections.

Cambrian Period: Time period ranging from 580 - 520 million years ago.

Carbonate: Containing the  $(CO_3)^{+2}$  radical.

Carcinogen: Cancer causing substance.

Casing: Metal pipe used to line a wellbore and give the borehole stability.

Casinghead: Top of surface casing above the ground to which control valves and flow pipes are attached.

Casing Shoe: Reinforcing collar screwed onto the bottom of surface casing that guides the casing through the hole while absorbing the brunt of the shock.

Cation: A positively charged ion.

- Caustic: A material that eats away (corrodes) by chemical action, high alkalinity. A base with a very high pH.
- CEA: Critical Environmental Area.
- Cement Bond Log: A log used to evaluate the effectiveness of a primary cement job based on the different responses of sound waves in metal pipe and cement. It can also be used to local channels in the cement.
- Cement Retainer: An expandable plug (packer) run on tubing or casing that allows cement to be pumped below.
- Centipoise: A unit of viscosity equal to one hundredth of a dyne-second per square centimeter.
- Circulation: The round trip made by the well fluids from the surface down the tubing, wellbore or casing and back to the surface.
- Clastic: Consisting of fragments of rocks or of organic structures that have been transported from their places of origin.
- Coagulate: To cause or become thickened or clotted.
- Completion: Preparation of a well for production after it has been drilled.
- Condensate: Liquid hydrocarbons recovered by conventional surface separators from natural gas. Condensate has an API gravity of 50° to 120°.
- Conductor Pipe or Casing: Large diameter casing that is set or driven into the unconsolidated material above bedrock to keep this material from caving in. Usually it is relatively short in length.
- Conglomeritic: Rock containing amounts of gravel, pebbles or cobbles.
- Connate Water: Water trapped in the pore space of sedimentary rocks at the time the rock was deposited.
- Correlative Rights: Rights of any mineral owner to recover resources that underlay their property.
- Cumulative Impact: Two or more individual effects on the environment which, when taken together, may compound or increase the other's environmental impact.
- Cushion Gas: ("Base Gas") includes injected gas plus native gas and is normally held permanently in a gas storage reservoir.

Cuttings or Samples: Chips of rock cut by the drill bit and brought to the surface by the drilling fluid. They indicate to the wellsite workers what kind of rocks are being penetrated and can also indicate the presence of oil or gas.

CZM: Coastal Zone Management.

- Darcy: A unit of permeability equal to one cubic centimeter of fluid of one centipoise viscosity flowing in one second under a pressure differential of one atmosphere through a porous medium having a cross section of one square centimeter and a length of one centimeter.
- Decollement: Detachment structure caused by the differential response of unique rock types to deformation.

Deliverability: Volume per unit of time that can be delivered.

- Detritus: Fine particulate organic debris.
- Devonian Period: Period of time ranging from 415 360 million years ago.
- Dip: Angle of inclination from the horizontal.
- Dipper: A localized, somewhat archaic term for person who salvages floating oil from surface waters.
- Disconformity: 1. A surface of erosion between parallel strata. 2. Contact between discordant structures (e.g., a dike).
- DMN: Division of Mineral Resources, New York State Department of Environmental Conservation.
- DMR: Division of Marine Resources, New York State Department of Environmental Conservation.
- DOH: New York State Department of Health.
- Dolostone: A sedimentary rock composed of fragmental, concretionary, or precipitated dolomite  $[CaMg(CO_3)_2]$ .
- Dome: A roughly symmetrical upward convex fold.
- DRA: Division of Regulatory Affairs, New York State Department of Environmental Conservation.
- Drag Fold: 1. Minor folding of strata along the walls of a fault in which the "drag" of displacement has produced flexures in the beds on either side.
  - Minor folds that form in an incompetent bed when the more competent beds on either side move in such a way as to subject it to a couple.

Drilling Fluid: Mud, water, or air pumped down the drill string which is used to carry cuttings from the bottom of the hole and acts as a lubricant for the bit. It is also used for pressure control when drilling in high pressure formations and helps maintain the wellbore.

Drive Pipe: Conductor casing which is driven into the ground.

- Dry Hole: A well in which oil or gas is not encountered in sufficient quantities to be commercial and warrant completion to production.
- EAF: Environmental Assessment Form.
- Ecosystem: The system composed of interacting organisms and their environments.
- Effective Porosity: Property of rock or soil containing intercommunicating pore space, expressed as a percent volume of total bulk volume.
- Eminent Domain: A right of government to take private property for public use.
- Evaporite: Sediment deposited from ancient seas as a result of extensive or total evaporation.
- Fault: A fracture or fracture zone along which there has been displacement of the sides relative to each other.
- Field: The area encompassing a group of producing oil and/or gas wells.
- Filter Cloth: Material used to underlay fill and other material which allows water to pass through it, but not sediment, thus preventing settling and unwanted siltation.

Flowback: Return of fluids, used in the stimulation process, to the surface.

Flowmeter: An instrument that measures fluid flow rates.

Flue Gas: An exhaust gas (e.g., from an air compressor).

Fluid Saturation: Percent volume of effective porosity occupied by a fluid.

Fold: A bend in strata or any planar structure.

Footwall: The mass of rock beneath a fault plane.

Fossils: The remains or traces of plants or animals which have been preserved by natural causes.

Fracing (pronounced "fracking"): Injection of fluids under high pressure in order to induce fractures in the producing formation, thereby increasing permeability.

Fry: Recently hatched fish.

- Gamma Ray Log: Log that records natural gamma radiation of the formations. Shales can be identified because of their high natural gamma radiation content.
- Gas Cap Drive: Type of primary reservoir energy where free, compressed gas exists above an accumulation of saturated oil and exerts pressure on the oil causing it to move toward the wellbore.

Gas Saturation: Percent of effective porosity occupied by gas.

- Geothermal Gradient: The rate at which the earth's temperature increases with depth. The general average is 1°F/100'.
- Geothermal Well: A well drilled to explore for or produce natural heat found in underground hydrothermal, geopressured, or hot dry rock reservoirs.
- Gravity Drive: Type of primary reservoir energy where the force of gravity is sufficient to cause the oil and gas to flow to the wellbore.
- Graywacke: A coarse sandstone or fine-grained conglomerate, usually dark gray, composed of subangular to rounded fragments of quartz, feldspars, etc.
- Grenville Province: The eastern margin of the vast Canadian Shield. It includes the Precambrian rocks exposed in the Adirondack Mountains.
- Grout: A concrete mixture that can be placed into a well annulus from the surface. Also a verb.
- Hanging Wall: Mass of rock above a fault plane.
- Hardpan: A hard impervious layer of soil composed chiefly of clay cemented by relatively insoluble materials.
- Hydrocarbon: A compound containing arrangements of only two elements, hydrogen and carbon.
- Hydrogen Sulfide: (H<sub>2</sub>S) A malodorous, extremely toxic gas with the characeristic odor of rotten eggs.
- Hypalon: Commercial name for a synthetic plastic-like material used to line pits.
- Idle Well: A well which is unplugged and that has been inactive longer than two years.
- Igneous Rocks: Formed by solidification from a molten or partially molten state.
- Inert Gas: Group of gases that exhibit great stability and extremely low reaction rates.

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- Intermediate Casing or String: Casing set below the surface casing in deep holes where added support or control of the wellbore is needed.
- Interstitial: Relating to, or situated in, the interstices, spaces or cracks between things.
- Kill Fluid: Heavy fluid used to control well pressure.
- Landlocked: Enclosed or nearly enclosed by land.
- Lanyards: Broadly; a chord or line to hold something.
- Lease Gas: Gaseous hydrocarbons produced at the well or on the lease.
- Lifelines: Broadly; a line to which a person may cling, attach, or use to save or protect their life.
- Limestone: A bedded sedimentary deposit consisting chiefly of calcium carbonate [CaCo<sub>3</sub>].
- Lingula: An ancient genus of brachiopods (shelled marine animals).
- Lithologic: Refers to sediments or rocks. The physical character of a rock, generally determined megascopically (by the human eye).
- Log: A graphic display of a certain rock properties or certain geophysical characteristics of rock as a function of depth.
- Lost Circulation Material: Material put into fluids to block off the permeability of a lost circulation zone.
- Lost Circulation Zone: Rock formation that is so permeable or soluble that it diverts the flow of fluids from the well.
- LPG: Liquified Petroleum Gas.
- LWRP: Local Waterfront Revitalization Program.
- Macaroni String: Small diameter tubing used for cleaning out or cementing into confined spaces such as the well tubing or annulus.

Marine: Of, belonging to, or caused by the sea.

- Marker Bed: A bed which is distinctive and traceable in outcrop or which accounts for a characteristic signature on a geophysical log or seismic time-distance curve.
- Mast: 1. A simple derrick made of timbers or pipe held upright by guy wires.2. A sturdy A-frame used for drilling shallow wells or for workovers.
- MCF: Thousand cubic feet.
- Metamorphism: Chemical and/or physical change in a rock as a result of heat and/or pressure.

- Mineral Rights: The ownership of the minerals under a given surface, with the right to enter and remove them. It may be separated from the surface ownership.
- MMCF: Million cubic feet.
- Mousehole: A short hole drilled to the side of a wellbore to hold the next joint of drill pipe.
- Mudboils: Silty mounds formed under certain geologic conditions as groundwater erupts at the surface.
- Mudlogging (Unit): Trailer located at the wellsite housing equipment and personnel to progressively analyze wellbore cuttings washed up from the borehole.
- Native Gas: Gas originally in place in an underground formation.
- NGPA: Natural Gas Policy Act.
- Noise Log: A log that picks up sound vibrations in the wellbore caused by flowing liquid or gas. Used to determine fluid entry points or flow behind casing.

Nonwetting Phase: The pore space fluid which has the greatest mobility.

- Oil Wet: The condition in the pore space of the rock where oil coats the grains of the rock and is the more immobile phase.
- Operator: Any person or organization in charge of the development of a lease or operation of a producing well.

OPRHP: Office of Parks, Recreation and Historic Preservation.

Ordovician: Period of geologic time ranging from 520 - 465 million years ago.

- Overburden: 1. Material of any nature that overlies a deposit of useful materials.
  - 2. Cumulative weight of the rock above some subsurface depth.
- Paleozoic Era: A period of time ranging from 570 225 million of years ago, the beginning of which is marked by the appearance of abundant fossils.
- Pathogens: A specific causitive agent (as a virus or bacterium).

Pay: Zone of oil or gas in commercial quantities.

Pennsylvanian: Period of time ranging from 310 to 280 million years ago.

Percolation Test: Test to determine at what rate fluids will pass through soil.

Perforate: To make holes through the casing to allow the oil or gas to flow into the well or to squeeze cement behind the casing.

Permeable: Having pores or openings that allow liquids to pass through.

- Petroleum: In the broadest sense the term embraces the full spectrum of hydrocarbons (gaseous, liquid, and solid).
- Plat: A map of land plots.
- Plugging: To place cement and other fluids in a well at appropriate intervals in order to prevent migration of fluids from or within the well.
- Pluton: A body of igneous rock that has formed beneath the surface of the earth.
- Pneumatic: Run by or using compressed air.
- Polymer: Chemical compound of unusually high molecular weight composed of numerous repeated, linked molecular units.
- Pool: 1. An underground reservoir or trap containing oil.2. A single separate reservoir with its own pressure system.
- Porosity: Volume of pore space expressed as a percent of the total bulk volume of the rock.
- Potable: Suitable for drinking.
- Precambrian Era: A period of time ranging from 4,500 570 million years ago.
- Primary Production: Production of a reservoir by natural energy in the reservoir.

Primary Reservoir Energy: The naturally occurring condition or mechanism which exists in a reservoir that aids the migrations of fluids to the wellbore.

Production Casing: Casing set through the producing zone of the well.

PSC: Public Service Commission.

PSI: Pounds per square inch.

- Pump and Plug Method: A technique for placing cement plugs at appropriate intervals.
- PVC: Polyvinylchloride; a durable petroleum derived plastic.

Quartz: A mineral, SiO<sub>2</sub>.

- Radioactive Tracer Surveys (RATS): A survey in which a radioactive isotope is released in a well and followed with a detector which is used to detect fluid movement and rate. It can also be used to recognize channels behind casing, tubing or casing leaks, and determine the flow direction of injected fluids.
- Rat-hole: A short slanted hole drilled near the wellbore to hold the kelly joint when not in use.

Real Property: Includes mineral claims and water rights.

Reeving: Hoisting from the derrick floor to the crown block.

- Reservoir Rock: 1. Permeable formations in which hydrocarbons have accumulated.
  2. "Reservoir" means any underground reservoir, natural or artificial cavern or geologic dome, sand or stratigraphic trap, whether or not previously occupied by or containing oil or gas.
- Reworked: Sediment that has been moved after preliminary deposition, commonly resulting in transportation and sorting.
- Riprap: Erosion control device. Heavy irregular rocks or concrete used to form a wall or foundation that must resist the forces of waves, tides, or strong currents.
- Rollovers: Convex upward folds on the hanging wall of a thrust fault.
- Rotary Rig: A derrick equipped with rotary equipment where a well is drilled using rotational movement.
- Royalties: The landowners share of the value of oil and gas produced.
- Sacrificial Anode: Cathodic protection provided by galvanic coupling of an anode (a substance which easily loses electrons or corrodes) to a well casing, tank or pipeline needing protection. The sacrificial anode is consumed during protection of the steel object.
- Sandstone: A various colored sedimentary rock composed chiefly of sandlike quartz grains cemented by lime, silica or other materials.

Schist Arenite: Metamorphosed graywacke.

- Scolithus: Trace fossil, vertical tube left by a burrowing organism.
- Secondary Recovery: The extraction of oil from a field beyond what can be recovered by normal methods of flowing or pumping.
- Secondary Silica Cement: Silica (SiO<sub>2</sub>) precipitated in the pore space of a rock after deposition.

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- Sedimentary: Rocks formed from sediment transported from their source and deposited in water.
- Seep: Natural leakage of gas or oil at the earth's surface.

Seismic: Related to earth vibrations produced naturally or artificially.

- Separator: Tank used to physically separate the oil, gas, and water produced simultaneously from a well.
- Sequestering Agent: Chemical additives that reduce chemical reaction between injected fluids and formation fluids.
- SEQRA: State Environmental Quality Review Act.
- Setback: Minimum distance required between a well operation and other zones, boundaries, or objects such as highways, wetlands, streams, or houses.
- Shale: Laminated sedimentary rock in which the constituent particles are predominantly of clay size.

Short Ton: 20 short hundred weight, 2,000 pounds.

Shut In: (verb) To close the valves at the wellhead to keep the well from flowing or to stop producing a well.

Shut-In: (adjective) The state of a well which has been shut-in.

Significant Habitats: Areas which provide some of the key factor(s) required for survival, variety or abundance of wildlife, and/or for human recreation associated with such wildlife.

Siliceous: Of, relating to, or derived from silica.

Sill: 1. A submerged horizontal ridge embedded in stream bottom usually at relatively shallow depth.

2. An intruded body of igneous rock that is parallel to bedding.

- Siltation: The build-up of silt in a stream or lake as a result of activity that disturbs the streambed, bank, or surrounding soil.
- Siltstone: Sediment in which the constituent particles are predominantly silt size.

Silurian Period: Period of time ranging from 405 - 415 million years ago.

- Show: Small quantity of oil or gas, not enough for commercial production.
- Sliding Scale: A flexible scale that can be adjusted to variables (e.g., income, time).

Sloughing: Cave-in of soil or soft rock such as shales from the side of the wellbore.

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Solution Gas Drive: Type of primary reservoir energy where the major mechanism of energy is a result of gas coming out of solution with decreased reservoir pressure.

Source Bed: Rocks in which oil or gas are generated.

- Spacing: Distance separating wells in a field to optimize recovery of oil and gas.
- SPDES: State Pollutant Discharge Elimination System.
- Spinner Survey: Generic name for logs that use spinner type velocimeters to monitor fluid velocities. Used to identify leaks in casing or tubing, analyze stimulation results, and establish injection or production profiles and flow rates.
- Spring: A place where groundwater naturally flows from a rock or soil onto land or into a body of surface water.
- Spudding: The initial stage of drilling a well.
- Squeeze: Technique where cement is forced into the annular space between casing and the wellbore.
- Step Out and Infill Drilling: To move the minimum spacing unit outside or inside an existing area.
- Step-Rate Pressure Test: Pressure test where a succession of equal pressure steps (usually increasing) are sustained for a constant time duration.
- Stimulation: Act of increasing a zone's permeability by increasing the porosity and permeability or inducing fractures.
- Strand Plain: The shoreline, a beach.
- Stratigraphic Trap: Accumulation of hydrocarbons entrapped as a result of variation in rock type, usually caused by a change in the environment of deposition.
- Stratigraphic Test Well: A hole drilled to gather engineering, geologic or hydrological information including but not limited to lithology, structural, porosity, permeability and geophysical data.
- Strippers: Stripper wells are oil wells producing less than 10 (BOPD) barrels of oil per day.
- Stromatolite: Laminated calcareous rocks formed from fossil algae.
- Structural Trap: Accumulation of hydrocarbons entrapped as a result of faulting or folding.
- Surface Casing: Casing extending from the surface to below the deepest fresh water aquifer. It is inside the conductor pipe and also acts as an anchor for well control equipment.
Surface Rights: Ownership of the surface of land only.

- Surfactants: Chemical additives that reduce surface tension; or a surface active substance. Detergent is a surfactant.
- Swab: To clean out the borehole of a well with a special tool on a wireline which evacuates fluids and reduces the hydrostatic head to encourage flow.
- Synclinorium: A broad regional syncline on which minor folds are superimposed.
- Taconic Orogeny: Mountain building episode in the latter part of the Ordovician Period, named for Taconic Range of eastern, New York.
- Tag: To check the presence and location of something, usually in reference to cement plugs.
- Tank Battery: A group of tanks used for storage of oil and other produced fluids from a well or wells.

TDS: Total Dissolved Solids.

Thrust Fault: A low angle reverse fault; the hanging wall moves up in relation to the foot wall.

Tight Formation: Formation with very low permeabilities.

- Tile Drainage: Man-made drainage system utilizing open-ended ceramic pipes in areas of poor drainage.
- Trap: 1. A body of porous and permeable, hydrocarbon bearing rock which is sealed by impervious rock.
  - 2. A geologic structure which retards the free migration of hydrocarbons.

Turbidity: Amount of suspended solids in a liquid.

- Unit Operation: Joint operation of separately owned producing leases in a field, pool or reservoir.
- Viscosity: A measure of the degree to which a fluid resists flow under an applied force.
- Water Drive: Type of primary reservoir energy where the energy is provided by the influx of water from the sides, edge, or below the oil accumulation.

Watershed: Drainage area of a stream, lake, or aquifer.

Water-wet: The condition in the pore space of a rock where water coats the grains of the rock and is the more immobile phase.

Weathered: Endured the action of the atmosphere.

Wildcat: Well drilled in area where oil and gas has not yet been found.

WOC Time: "Waiting on cement" time. Allowing cement to harden or set.

- Working Gas: In regard to underground gas storage, gas recovered from storage for sale to customers.
- Workover: Repair operations on a producing well to restore or increase production.

WRCRA: Waterfront Revitalization and Coastal Resources Act.

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**Division of Mineral Resources** 

# DRAFT

### Generic Environmental Impact Statement On the Oil, Gas and Solution Mining Regulatory Program

JANUARY 1988

## VOLUME III

Appendices 1-8

New York State/Department of Environmental Conservation MARIO M. CUOMO, Governor THOMAS C. JORLING, Commissioner

#### APPENDIX 1 - UNDERGROUND STORAGE

#### APPLYING FOR A CERTIFICATE OF PUBLIC CONVENIENCE

#### AND NECESSITY UNDER SECTION 7 OF THE NATURAL GAS ACT

The United States Government has declared that the business of transporting and selling natural gas for ultimate distribution to the public should be regulated to ensure the public of a stable energy source. Therefore, Federal regulation in matters relating to the foreign and interstate transportation and sale of natural gas is necessary. The Federal Energy Regulatory Commission (FERC) was created within the Department of Energy to assess fairly the needs and concerns of all interests affected by Federal energy policy.

The provisions of the Natural Gas Act apply to the transportation of natural gas in interstate commerce, to the sale or resale of natural gas in interstate commerce for ultimate public consumption for domestic, commercial, or industrial use, and to natural gas companies engaged in such transportation or sale. The provisions do not apply to any other transportation, distribution, or sale of natural gas, to the facilities used for such distribution, or to the production or gathering of natural gas.

If the transportation or sale of natural gas in interstate commerce involves gas received by any person from another person within or at the boundary of a state for ultimate consumption within that state, then the provisions of the Act do not apply. This exemption also pertains to the facilities used for transportation or sale provided that such persons and facilities are subject to regulation by a state commission. A certification that such state commission has regulatory jurisdiction over rates and services must be presented to the Federal Energy Regulatory Commission.

#### A. APPLICATION FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

Applications under Section 7 of the Natural Gas Act shall include all

data and information necessary for a full and complete understanding of a proposed project. The effect of a proposed project upon the applicant's present and future operations must also be outlined. In addition, all applications previously filed for authorization to serve any portion of the market contemplated by the proposed project must be listed by docket number.

- An original and seven copies of the application must be furnished to the Commission.
- 2. Application Contents. The application is to contain the following:
  - a. The legal name and business address of the applicant, whether an individual, partnership, or corporation, and the state under the laws of which organized or authorized.
  - b. The name, title, and mailing address of the person or persons to whom communications are to be addressed.
  - c. The facts and technical data supporting the assertion that the proposed project is vital to the welfare of the public.
  - d. A concise description of the applicant's existing operations and details concerning the proposed service, sale, operation, construction, extension, or acquisition. Construction and operation dates are also to be included.
  - e. A statement as to whether any supplemental applications have been or will be filed with any other Federal, State, or regulatory body; and if so, the nature and status of each application.
  - f. A table of contents listing all exhibits and documents filed in conjunction with the application.
  - g. A form or notice suitable for publication in the Federal Register which will briefly summarize the facts

contained in the application.

- 3. Abbreviated Applications. When the testing and development of an underground storage reservoir requires the construction and operation of natural gas pipeline and compression facilities, an abbreviated application for a budget-type certificate may be filed subject to the following restrictions.
  - a. The certificate will be valid for only three years.
  - b. Injected gas volumes restricted to 2,000,000 mcf per field and 10,000,000 mcf for all fields. The gas will be injected for testing purposes only during off-peak periods.
  - c. Further authorization by the Commission will be required before the developed storage field can be utilized to render service.
  - d. Total expenditures for the three year period cannot exceed \$3,000,000 or \$1,000,000 in any one year. Waivers may be granted when good cause is shown.
  - e. Within 60 days of the conclusion of each year of the three year budget period, a summary report must be filed for each project detailing the following:
    - description of the type of gas reservoir and the facilities constructed.
    - location and costs of the facilities.
    - estimates of the storage capacity and daily deliverability of each project including monthly volumes of gas injected and withdrawn.
  - f. If the reservoir to be tested and developed is an aquifer reservoir, then summary reports must be filed quarterly.
- i. Deficient Applications. Filing of a deficient application will result in the issuance of a notice of deficiency. Applications not

amended within 20 days of the deficiency notice will be rejected.

- 5. Interventions and Protests. The applicant is required to furnish a copy of the application and any attachments to anyone who has filed a notice of intervention or petitioned for leave to intervene in the certification proceedings.
- 6. Dismissal of Application. When a hearing is scheduled as a result of intervention filings and protests, the applicant must go forward on the date set and present its full case in support of the application. Failure to do so will result in dismissal of the application.

#### C. EXHIBITS TO BE ATTACHED TO APPLICATIONS

- 1. Form of Exhibits. Each exhibit shall contain a title page showing applicant's name, docket number space, title of exhibit, letter designation of the exhibit, and a table of contents if the exhibit is 10 or more pages. All gas volumes shall be stated upon a basis of 14.73 psia.
- Exhibits. Following is a listing of exhibits required for application for a certificate of public convenience and necessity for an underground storage project.
  - a. Articles of incorporation and bylaws.
  - b. State authorization. Statements are required for each state
     where applicant is authorized to do business.
  - A list of names and business addresses of applicant's officers and directors.
  - d. A detailed explanation of the applicant's or any of its officers' or directors' relationships with any person or organized group of persons involved in natural gas operations.

- e. A list of other applications and filings under Sections 1, 3, 4 and 7 of the Natural Gas Act filed by the applicant which are pending before the Commission.
- f. A geographical map showing all of the facilities to be constructed or acquired and existing facilities of the applicant. This map shall clearly show the relationship of the new facilities to the applicant's overall system and shall include:
  - the location, length, and size of pipelines.
  - location and size (rated horse power) of compressor stations.
  - connection points of existing and proposed facilities with distribution systems and sources of supply such as gas producing and storage fields.
- g. For areas where construction will not be on applicant's currently used rights-of-way or immediately adjacent thereto, a map or diagram must be submitted showing existing rights-ofway belonging to the applicant or others.
- h. If the proposed facility will be located in or routed through an area listed in the National Register of Historic Places or in the National Register of Historic Landmarks, the applicant shall list the Federal, State and local agencies which have been or will be consulted prior to construction. This also applies to disturbance of any officially designated park, scenic, wildlife, or recreational area.
- i. All applicants shall include a brief statement concerning the following factors:

- the environmental impact of the proposed actions.

- any adverse environmental effects which cannot be avoided

should the proposal be implemented.

- alternatives to the proposed action.
- the relationship between local short-term uses of man's environment and the maintenance and enhancement of long term productivity.
- any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.
- j. Flow diagrams reflecting the maximum deliverabilities that the applicant's existing and proposed facilities would be capable of achieving. These diagrams are to be accompanied by supporting engineering design data including assumptions and design parameters.
- k. A statement of total gas supply available to the applicant for the proposed services including the following:
  - an estimate of remaining recoverable gas reserves available to the applicant.
  - deliverability studies detailing attainable natural gas volumes.
  - gas contract purchase agreement information for those contracts upon which the applicant proposes to rely. Copies of new contracts must be included. Contracts already on file with the Commission may be incorporated by reference without supplying additional copies.
  - a study of each proposed gas storage field showing location, geology, original and present reserves for each reservoir, pressure history for each reservoir, proposed working and

cushion gas volumes and pressures, a deliverability study including annual injection and withdrawal rates, and maximum storage capacities and deliverabilities under the proposed plan of development.

- Market data including estimated gas delivery volumes for the first three years of operation of the proposed services.
- m. Information detailing construction costs, financing plans, service agreements, management plans, anticipated revenues and expenses, estimated depreciation and depletion allowances, and rate schedules.

#### D. FILING FEE TO ACCOMPANY APPLICATION

The applicant for a certificate of public convenience and necessity under Sections 7(c) and (e) of the Natural Gas Act will be assessed a filing fee of \$50.

#### E. INCREASES IN STORAGE CAPACITY

The holder of a certificate to operate a storage facility is authorized to increase the maximum volume of natural gas in storage provided that the new volume can be safely stored without the construction of new facilities.

- 1. Capacity expansion requests shall included the following:
  - a. The current and requested maximum storage capacity;
  - b. The current and requested maximum storage pressure;
  - c. Average depth of the storage formation;
  - Copies of any geologic or engineering studies demonstrating the feasibility of the proposed increase in storage volume;
  - e. A statement outlining the purpose of the proposed increased capacity.
- Reporting Requirements. For capacity increases, the certificate holder is required to submit semi-annual reports until the requested

maximum storage capacity is reached. Thereafter, the reports shall continue on a semi-annual basis for one year. The following information is to be included in the report:

- a. Daily gas injection and withdrawal volumes.
- b. The volume of natural gas in the reservoir at the end of the reporting period.
- c. The maximum daily injection and withdrawal rate during the report period and the average reservoir pressure corresponding to those rates.
- d. Information concerning any gas leakage problems including the results of tracer surveys.
- e. Any gas well surveys and pressure measurements.
- f. Structure and isopachous contour maps showing the outline of that part of the reservoir occupied by gas. This map need not be filed if no changes have occurred since the previous filing.
- g. A discussion of current operating problems and conclusions.

#### APPENDIX 2 - FREEDOM OF

#### INFORMATION LAW (FOIL)

This section discusses how a citizen or oil and gas operator may request access to information on file with the Department, and the criteria the Department must use in determining whether to permit or deny access to that information under the Freedom of Information Law (Public Officers Law, sections 84-90).

All of the information maintained by State agencies is accessible to the public, except for records or portions of records which fall within one of eight categories specifically exempted from disclosure under Section 87(2)(d). Two of these categories apply to the Oil, Gas, Solution Mining and Gas Storage Programs. The Department may deny access to records or portions of records that:

- a. are specifically exempted from disclosure by State or Federal statute;
- b. are trade secrets or are maintained for the regulation of commercial enterprise which if disclosed would cause substantial injury to the competitive position of the subject enterprise.

The Environmental Conservation Law restricts public access to records which reveal the amounts of oil or gas produced, sold, purchased, acquired, stored or transported within the State. Section 23.0305.8 (f) of the ECL states that production records must be kept confidential for six months after the period to which those records or reports apply. In addition, permit applications are subject to environmental review, and the Department has established a policy that permit applications are accessible to the public.

Access to all other types of information falls under the guidelines of the Freedom of Information Law (FOIL).

Under the Freedom of Information Law regulations, each agency must maintain a list of all the subjects or filing categories used in keeping its

records, and must appoint a records access officer to coordinate the agency's response to public requests for access to those records. The records access officer keeps the subject matter lists up-to-date, assists the requester in identifying the records sought, makes copies of the records or assists the requester in making copies, certifies that the copies are accurate and, if the records cannot be found, certifies that the agency does not have possession of the requested records or that they cannot be found after a diligent search.

A request for access must be made in writing, and must "reasonably describe" the record of interest by providing dates, titles, file designations, or any other information which will help to find the requested records (section 89(3)). A request for oil and gas or solution mining information should be directed to the Records Access Officer, Department of Environmental Conservation, 50 Wolf Road, Albany, NY 12233-0001. Within five business days after receiving of a written request, the agency must make the record available, deny access in writing and give the reasons for denial, or furnish a written acknowledgement of receipt of request and a statement of the approximate date when the request can be granted or denied. A fee may not be charged for inspection, certification, or a search for the records, but fees up to \$.25 may be charged for each photocopied page, or a fee which is based on the actual cost of reproduction may be imposed (section 87(1)(b)(111)).

When a request is received, the Department must follow the criteria in paragraph (d), subdivision (2), section 87 of the Public Officers Law in making its determination to grant or continue an exception from disclosure. The same criteria are listed in 6 NYCRR 616.7 (c)(2) of the Official Compilation of the Rules and Regulations of New York State, and pertain specifically to the Oil, Gas, and Solution Mining Programs. The criteria the Department must consider are:

- Whether or not the records are trade secrets or are maintained for the regulation of commercial enterprise which if disclosed would cause substantial injury to the competitive position of the commercial enterprise.
- 2. Factors pertaining to determining whether or not a trade secret exists:
  - a. the extent to which the information is known outside of the business of the person submitting the information;
    For example, if the depth to the producing horizon can be easily determined using data from other nearby wells, or from publically available reference sources, then the information may be well known outside the business of the submitter.
  - b. the extent to which it is known by the person's employees and other involved in his business; For example, if information is disseminated among the company's employees, investors, or partners, it may not be considered confidential.
  - c. the extent of the measures taken by the person to guard the secrecy of the information; For example, if the information is generally kept in a locked safe, it may be considered confidential.
  - d. the value of the information to the person and to his competitors;
    For example, if the company's long-term leasing strategy is based on information contained in the records from a well or wells, and this information cannot be generated from other available sources, it may be considered exempt from disclosure.
  - e. the amount of effort or money expended by the person in

developing the information;

For example, if a company invested in seismic data in a wildcat area, the information may be determined to be exempt from disclosure.

f. the ease or difficulty with which the information could be properly acquired or duplicated by others. For example, despite a sizable investment in a specific well location, the well has been drilled in an old, existing field, and other operators can easily acquire or develop the information from that particular well.

A written denial of access must state the reasons for the denial, and advise you of your right to appeal to the person designated to hear appeals by the Commissioner of the Department. If your request is denied, you may appeal the decision within 30 days. Upon receiving an appeal, the agency has 10 business days to fully explain in writing the reasons for further denial to access or provide access. Copies of all appeals and the determinations made in those appeals must be sent to the Committee on Open Government, which monitors compliance with the Freedom of Information Law among New York State agencies, and intercedes when a denial has been made improperly. An applicant may seek a full judicial review of a final agency denial by initiating a proceeding under Article 78 of the Civil Practice Law and Rules. A court may, at its discretion, award reasonable attorney's fees to persons challenging a denial of access to records in court under certain circumstances. The court must find that the record was of "clearly significant interest to the general public," and that the agency "lacked a reasonable basis of law for withholding the record".

#### APPENDIX 3 - MOVEMENT OF CONTAMINANTS IN AQUIFERS

When an oil or gas reservoir is situated below an aquifer, drillers have to penetrate through the water bearing strata to get to the petroleum deposit. Usually all the necessary steps are taken to make sure that drilling muds and chemicals in the mud do not flow from the well to the aquifer. But, in case of a very porous lost circulation zone, a possibility exists that mud could seep through to the aquifer. In this case, environmental engineers must answer two important questions:

1) If the drilling mud enters the aquifer, to what extent will the aquifer be contaminated during the time the drill bit is penetrating the aquifer? 2) After the well penetrates through the aquifer, and after it is cased and cemented, no contaminant seeps through from the well, but the volume of pollutant already in the aquifer is transported by water under the effect of pressure differential created by pumping or gravity. The problem to resolve then would be to find what happens to the contaminant that has already invaded the aquifer.

As stated above, the history of contaminant movement in the aquifer from time zero until the final distribution goes through two phases: Phase I deals with the transient movement of the contaminant during the drilling phase and Phase II tackles the problem of transient contaminant distribution after the well is cemented along its interface with the aquifer.

#### Assumptions

Both Phases I and II are subject to the following assumptions:

- a. No chemical or physical retardation of the contaminant
- b. No transverse dispersion
- c. Isotropic homogeneous medium (aquifer)
- d. Contaminants carried by convection and dispersion
- e. Dispersion is a diffusive process
- f. The well penetrates the entire thickness of the aquifer within two days.

Phase I

As indicated above, a worst case scenario is obtained by maintaining at the interface between the well and the aquifer a concentration of contaminant equal to the maximum percentage of additives present in the drilling mud. If this concentration is designated by S and if the interface between the well and the aquifer is taken as the spatial origin of the problem, one of the boundaries of the problem would be:

For 
$$x=0$$
,  $5(0,t)=0$  For all  $t'_{5}$  (1)

Far away from this point or at a distance equal to the radius of drainage of the considered well it is safe to assume that the contaminant concentration is nil. This can be expressed as

For 
$$x = 76200 \text{ cm}$$
,  $S(76200, t) = 0$  (2)  
For all  $t'_{S}$ 

Before any drilling takes place or before the well penetrates the aquifer, there is no contaminant in the aquifer or,

For 
$$t=0$$
,  $5(x, c)=0$  For all  $x$ 's <sup>(3)</sup>

.

Between boundaries (1), (2) and (3) the value of contaminant concentration is given by the function S(x,t) which is the solution of the linear partial differential equation

.

$$\frac{\partial s}{\partial t}(x,t) + \cup \frac{\partial s}{\partial x}(x,t) = D \frac{\partial^2 s}{\partial x^2}(x,t)^{(4)}$$

This equation represents the transient transport of a substance S subject to a constant velocity of flow U and constant longitudinal dispersion D. The medium of flow is assumed homogeneous. It is assumed that transversal dispersion is negligible as verified by analyzing several sets of data gathered from the literature. These data show that under the conditions considered the transversal dispersion represents only 5 percent of the longitudinal component.

The solution of equation (4) subject to boundaries  $\{1, (2), (2)\}$  and (3) was given by Rifai, Kaufman and Todd and Ogata and Banks

$$\frac{5(x,t)}{5} = \frac{1}{2} \operatorname{erfc} \left( \frac{x - vt}{2(\Delta t)^{\frac{1}{2}}} \right) +$$

$$\frac{1}{2} e^{\frac{vx}{D}} \operatorname{erfc} \left( \frac{x + vt}{2(\Delta t)^{\frac{1}{2}}} \right)$$
(5)

Relation (5) allows the calculation of the concentration of contaminant as a function of distance x and time t. This solution was applied to the Jamestown aquifer. More specifically, it was used to study the percolation and movement of the additives contained in the mud into the aquifer during a period of two days while the oil and gas well was penetrating the water saturated interval.

#### Mud Composition - Maximum Concentration

The maximum concentration of additives in the mud was obtained by summing up all the material added to a volume of 250 barrels of water and then dividing the sum by the total sum of additives and water. Our regional office in Olean reported the following mud composition:

100 sacks of bentonite each weighing 50 lbs.
1 sack of lime each weighing 80 lbs.
1/2 sack of caustic soda weighing 25 lbs.
10 sacks of cottonseed hull each weighing 40 lbs.
5 sacks of mud seal each weighing 60 lbs.
250 barrels of water

The original concentration of contaminant S may be obtained as follows:

$$5_0 = \frac{100 \times 50 + 80 \times 1 + 0.5 \times 25 + 10 \times 40 + 5 \times 60}{(5000 + 80 + 12.5 + 400 + 300) + 250 \times 62.4} = 6.21\%$$

#### Results Obtained

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1

Equation (5) gives the concentration distribution of the contaminant as a function of time and distance. One useful way to use relation (5) would be to fix a certain time t, hold it constant and evaluate S for various positions of x until S becomes equal to zero. These calculations give the concentration profile for the assumed time. The integration of this profile gives the volume or mass of contaminant which has entered the aquifer up to the assumed time t. If it took 2 days to penetrate the aquifer, then the concentration profile for t = 2 days would be calculated as a function of x.

The result of this work is shown in Fig. 1. which indicates that about 280 cms. of the aquifer have been contaminated with a concentration of 6.2 percent. This distance represents only 0.39% of the drainage radius. The remaining contaminated part represents a distance of 120 cms. with concentration decreasing from 6.2 percent to zero.

### APPENDIX 3, FIGURE 1 CONTAMINANT PENETRATION INTO AQUIFER



CONCENTRATION (%)

Phase II

After 2 days of drilling it was assumed that the gas well has already penetrated the entire thickness of the aquifer and that a good cementing job has eliminated completely the infiltration of the contaminant from the wellbore. Stated in mathematical terms this condition can be translated into

For 
$$X = 0$$
,  $S(0,t) = 0$  For all  $t'_{s}$  (6)

The second boundary condition at the end of the drainage radius is similar to the condition used in Phase 1 or

$$5(71200, t) = 0$$
 For all  $t'_{3}$  (7)

In this phase the most important condition is the initial boundary. At t=0 the profile for t=2 days would be used

In brief, the problem to solve in this second phase would consist of solving equation (4) subject to boundary and initial conditions (6), (7) and (8).

Because of the complexity of the initial condition, equation (5) was solved by means of an explicit numerical scheme. This scheme is based on the following approximations:

$$\frac{25}{2t} \equiv (5_{i}, n+i - 5_{i}, n) / 0t \qquad (9)$$

$$\frac{25}{2x} \equiv (5_{i+1}, n - 5_{i-1}, n) / 20x$$

$$\frac{2^{2}}{2x^{2}} \equiv (5_{i+1}, n - 25_{i}, n + 5_{i-1}, n) / 0 = 2$$

Replacing the approximations

by their values in equation (4) and making the necessary algebraic transformations and ordering, one can readily obtain the following numerical relations:

. . . . . .

$$\begin{aligned} \text{Si}_{,n+1} &= \text{Si}_{-1,n} \left[ \text{D} \text{D} t + \frac{U}{2} \text{D} \text{X} \text{D} t \right] \frac{1}{\text{D} x^2}^{(10)} \\ &+ \text{Si}_{,n} \left[ \text{D} x^2 - 2 \text{D} \text{D} t \right] \frac{1}{\text{D} x^2} \\ &+ \text{Si}_{+1,n} \left[ \text{D} \text{D} t - \frac{U}{2} \text{D} \times \text{D} t \right] \frac{1}{\text{D} x^2} \end{aligned}$$
Relation (10) states that the value of the concentration at position i and time t + t can be expressed explicitly in terms of 3 values of concentration calculated at time t but at positions i-l, i and i + l. Because such a scheme can be unstable the following conditions must be imposed on the coefficients of relations (10).

$$\frac{Dt}{D\bar{x}^{2}} \leq \frac{1}{20}$$
$$\Delta x \leq \frac{2D}{27}$$

(11)

A Fortran computer program was written and debugged to solve equation (10) subject to the boundary conditions expressed in (6), (7) and (8). The increments of space and time were carefully chosen subject to the constraints of (11) to ascertain that a stable solution was obtained.

Several runs were made with variable coefficients of dispersion with different results as discussed in the next section.

## **Results Obtained**

The manner in which contaminants move through an aquifer depends largely on the value of the coefficient of dispersion and the velocity of the water flow in the aquifer. A review of the literature revealed that under ideal laboratory conditions and homogeneous media, the coefficient of dispersion at low flow velocities is of the same order of magnitude as the velocity itself. However, as the velocity of water flow increases, the coefficient of dispersion increases much more rapidly.

In flow through heterogenous formations, such as occurs in practical cases, tortuosity and a moderate to high velocity of water flow result in a large increase in the coefficient of dispersion. For these conditions, the effects of dispersion control the distribution of contaminants much more effectively than convection.

Two sets of graphs were prepared: one with a velocity of flow and a coefficient of dispersion respectively equal to 0.019 cm/sec and 0.019  $cm^2$ /sec; the other with an equal velocity but a coefficient of dispersion ten times larger (see Figures 2 & 3). As expected, the run with the higher dispersion yielded a set of curves with lower peaks but larger breadths.

# APPENDIX 3, FIGURE 2 DISTRIBUTION OF CONTAMINANT IN AQUIFER



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A-3, FIGURE 3

<u>5-</u>b

For example, for t=10 days and D=0.019 cm<sup>2</sup>/sec, the concentration of contaminant is 4.5 percent. The zone of finite concentration extends about 1500 cms. For D=00.19 cm<sup>2</sup>/sec, the peak concentration of contaminant decreases to about 1.2 percent but the size of the zone of finite concentration increases to about 4000 cms. If t is increased to 20, 30, and 40 days, the peak concentration for D=0.019 cm<sup>2</sup>/sec decreases from 4.5 percent to 3.5, 3 and 2.5 percent. For equal values of time, the peak concentration corresponding to D=0.19 cm<sup>2</sup>/sec decreases from 1.2 to 0.8 to 0.7 to 0.6 percent.

From a practical standpoint, the way to circumvent this type of pollution would be to conduct a careful evaluation of the dispersion in the aquifer under consideration. If the dispersion is small, the zone of contamination moves as a slug with the same velocity as the water in the aquifer. This slug can be produced out of the aquifer over a short interval of time. However, if the coefficient of dispersion is larger, practical solution dictates that the water well be located far enough from the drilling well so that the contaminant concentration falls below the concentration allowed by Federal and State regulations.

From this analysis, one can conclude that for the type of dispersion likely to exist in porous media and for a large enough water velocity in aquifer, a worst case scenario indicates that the contaminant concentration is too small to cause any harmful effects.

The case considered in this study was labeled a worst case scenario. In reality it should be labeled an unrealistic worst case. The reason is simply that as soon as mud enters the aquifer, bentonite and other contaminants presents in the mud are usually deposited near the wellbore plugging the formation and isolating the aquifer from further mud flow.

# REFERENCES

- Rifai, M.N.E., Kaufman, W.J., and Todd, D.K., 1956 "Dispersion Phenomena In Laminar Flow Through Porous Media", University of California I.E.R. Series 90.3.
- Ogatta, A. and Banks, R.B., 1961 "A Solution Of The Differential Equation Of Longitudinal Dispersion In Porous Medina", Professional Paper 411-A, U.S.G.S., Washington, D.C.

### APPENDIX 4 - MINERAL OWNERSHIP AND

# LEASING SUMMARY

This short summary of oil and gas leasing practices and nomenclature was developed in response to public requests for information received during the scoping process for the GEIS. While it is generally understood that the act of leasing, taken by itself, causes no environmental impacts, it does create the potential for impacts where none existed before. Inasmuch as a lease is a legally binding instrument with responsibilities and obligations for all involved parties, no one should casually enter into such an agreement without a reasonable understanding of its potential consequences. Accordingly, the following information on acquisition of mineral rights has been provided to give concerned parties a broad overview of oil and gas leases. Attention is focused on the fundamental clauses common to virtually all such agreements.

# A. MINERAL OWNERSHIP

Any person who intends to drill an oil, gas or solution mining well must first have the legal right to extract the subsurface minerals. The potential developer may obtain the right to extract minerals via one of the following:

 Purchase of Fee Simple Estate - Fee simple ownership (also called fee or fee simple absolute) holds full right, title and interest to the surface and to all the minerals underneath the parcel in question, in addition to the air space above it.

A fee simple interest may be acquired by patent from a governmental authority, by warranty deed, by court order, or by devise or descent. The owner has the right to use and to occupy; the right of quiet enjoyment; and the right to sell, mortgage, devise, lease, develop, improve and subdivide. The fee simple owner may sever his land vertically or horizontally. One who sells only certain mineral strata, or to a limited depth, retains the right of access to the

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lower strata and to other minerals not divested. With the act of severance, the surface and the minerals each become a distinct freehold estate subject to the laws of descent, devise and conveyance.

In most states, New York State included, it is a fact that purchasers are not bound by prior but unrecorded severances of surface or minerals unless the purchaser has actual knowledge of such a sale. Knowledge of prior sale constitutes notice, even if the instrument has not been recorded.

The purchase of a fee simple estate for the purpose of oil and gas development is rare.

2. Purchase of a Mineral Deed - A mineral deed is a conveyance of interest in real property to transfer title of minerals in place. The mineral deed may sever the mineral interest from the surface, creating a separate freehold estate. The deed may transfer all or a fractional portion of the grantor's undivided interest. The mineral deed may be forever unto the grantee, his heirs and assigns, or it may be terminable. Commonly, term mineral deeds are for 15 or 20 years and "as long thereafter" as oil or gas is "found". The word "found" has been construed to mean "produced". If the term mineral deed has no "thereafter" clause, an oil and gas interest taken from the term mineral owner should be ratified by the reversionary owner in the event that production extends beyond the mineral term. Temporary cessation of production that does not terminate the interest under which production is obtained may not terminate the mineral grant that is into its secondary or "thereafter" term. After cessation of production, future production cannot revive prior rights.

The use of mineral deeds to obtain oil and gas rights sees

little contemporary use.

3. Oil and Gas Lease - Currently, the most common way to obtain mineral rights is by way of a mineral lease. The basic difference between a mineral deed and an oil and gas lease is that the deed is evidence of a sale, a grant of a separate estate. Certain states' statutes consider the oil and gas lease to be a "sale" of real property; but under a lease, the lessee may take action to keep the lease in force. Production is immaterial to the effectiveness of a mineral deed. A lease has an implied convenant to develop; a deed does not. The conveyance of mineral interest includes the right to enter upon the premises for ingress and egress, to explore and produce, even without an express convenant to that effect. A lease "demises and leases" for a specified period of time and allows the lessee reasonable use of the surface for installations.

### B. THE OIL AND GAS LEASE

Once an operator decides to pursue an active course of exploration in a given area, he will then approach the mineral owner(s) in an attempt to secure the necessary rights. In contemporary practice, these exploration and development rights will almost invariably be in the form of an oil and gas lease.

The granting of a lease has, in itself, no impact other than a positive economic gain for the lessor (the party granting the lease). However, it has been argued that the granting of a lease creates the potential for negative environmental impacts since the lessee (the party to whom the lease has been granted) has an implied easement to use the surface of the land as may be reasonably necessary to obtain the minerals covered by the lease. The lessee's interest is the dominant one and the surface of the land is servient to his use. Inasmuch as a lease is a negotiated instrument, it is within the

province of the potential lessor to condition the granting of a lease on the inclusion of such protective stipulations as may be deemed necessary. Furthermore, before any drilling may take place, each well must be permitted by the State. Such permits are granted on a site specific basis and subject to protective stipulations which may be called for upon completion of the Environmental Assessment Form. Nonetheless, an examination of the standard provisions found in a contemporary lease is instructive.

- Lease Objectives The essential provisions of an oil and gas lease are those necessary to make a valid transfer of rights and accomplish the lessee's fundamental goals which are:
  - a. to obtain the <u>right</u> to develop leased land for an agreed term without any <u>obligation</u> to develop, and
  - b. if production is obtained, to have the right to maintain the lease for as long as it is economically viable.
- Primary Lease Clauses Generally, these provisions can be found in just three clauses; the granting clause, the term clause and the drilling delay rental clause.
  - a. The granting clause of an oil and gas lease spells out the rights that are granted by the mineral interest owner to the lessee. The effect is to grant to the lessee the right to search for, develop and produce oil and gas from the leased premises without imposing any obligation to do so. To be valid, the granting clause must identify the size of the interest granted, the substances covered by the lease and the land covered by the lease. In addition, most granting clauses specifically indicate uses permitted.
  - b. The term clause of an oil and gas lease sets the period of time that the rights given in the granting clause will extend.

Typically, modern lease term clauses provide for a <u>primary</u> and <u>secondary</u> term. The <u>primary term</u> is a fixed term of years during which the lessee has the right, without any obligation, to operate on the premises. The <u>secondary term</u> is the extended period of time for which rights are granted to the lessee once production is obtained.

The purpose of the primary term is to give the lessee adequate time to acquire additional leases in the area; to do geological and geophysical tests to determine the feasibility and location of test wells; and to arrange for financing and support services to drill. The length of the primary term is often established by negotiation and is a function of existing and anticipated market conditions. Ten years was once a common primary term. It is still frequently used in unproven and marginally producing areas. Terms from one to five years are more typical in areas with established oil and gas production.

The primary term states the maximum period of time for which the lessee can maintain the lease rights without drilling. It may be cut short either by surrender of the lease by the lessee or by failure to pay delay rentals properly. It may be extended by production or, under many leases, by operations into the secondary term.

The purpose of the secondary term is to give the lessee the right to hold a producing lease as long is it is economically sound to do so. The secondary term is an indefinite period of time simply because it is impossible to determine for how long a lease will be profitable at the time it is granted.

c. The drilling delay rental clause ensures that the lessee has no

obligation to drill during the primary term by mitigating any implied obligation to test the premises.

Lessors do not generally resist drilling delay rental clauses. In part, this is because the clauses have become customary in lease forms. Lessors commonly enter into leases with the expectation that development will not occur until close to the end of the primary term, if ever. Those who consider the timing of drilling the first well important will negotiate for a short primary term or for a specific drilling obligation. Moreover, many lessors look forward to periodic receipt of delay rental payments.

3. Defensive Clauses - The foregoing clauses are indispensable in a modern oil and gas lease. However, they constitute only a part of the overall document. Over the years, a number of defensive clauses have come to be routinely included in the oil and gas lease.

In contrast to real property leases, oil and gas leases are generally interpreted strictly against the lessees. Strict interpretation has been justified by the rules of construction that a written instrument is to be interpreted against its drafter, that an instrument is to be construed against the party owing performance under it, and that an option is to be construed against its holder as well as by public policy in favor of freeing property to be developed by another. At the trial court level, strict interpretation against the lessee may be explained on the mundane basis that disputes over lease provisions usually go to trial in the county where the lessor lives, before judges and juries living in the area.

Lessees have countered strict interpretation by using defensive

language. As a result, leases now contain lengthy and complicated defensive clauses to protect what lessees regard as their legitimate interests.

Clauses have been added to oil and gas leases to modify the general rule that a lease terminates at the end of its primary term unless there is production in paying quantities. These clauses extend the term of the lease without production in stated circumstances. This group inlcudes: (1) dry hole clauses, (2) operations clauses, (3) pooling and unitization clauses, (4) force majeure clauses, (5) shut-in royalty clauses and (6) cessation of production clauses.

- (1) A dry hole clause prevents the consequences of condemnation or abandonment of the lease from the drilling of an unproductive well on the leased premises and clarifies what the lessee must do to maintain the lease for the remainder of the primary term.
- (2) An operations clause is included in most leases to protect the lessee against expiration of the primary term while drilling operations are in progress. The clause also functions to extend the lease beyond the cessation of drilling operations in the secondary term for so long as the lessee pursues completion of the well and the marketing of its production with due diligence.
- (3) Pooling and unitization provisions in a lease give the lessee authority to commit the lease property to pooling and unitization and to adjust the rights of the involved parties accordingly.
- (4) A force majeure clause in an oil and gas lease relieves the lessee of complying with duties imposed by the lease if failure to perform results from causes recognized as beyond the control

of the lessee and so named in the clause.

- (5) Most leases now contain a shut-in royalty clause which provides for maintenance of the lease by payments in lieu of production if a well capable of producing is shut-in beyond a specified period.
- (6) It is inevitable that oil and gas wells will cease production from time to time. Equipment must periodically be repaired or replaced. Routine maintenance may require that the well be shut down for a "workover". Few oil and gas wells produce without interruption over the course of their existence. Because of the obvious inequity of termination for a temporary stoppage, most oil and gas leases now contain a temporary cessation of production clause. This clause states that so long as produciton does not cease for more than an agreed period of time, the lease will be maintained.

Another group of defensive clauses in lease forms is intended to liberalize the relationship between the lessor and the lessee. These are provisions that the lessees <u>could</u> function without but, when present, simplify administration and aid in avoiding problems of strict lease interpretation. They include, but are not limited to: (1) payment of delay rentals, (2) warranty clause, (3) lesser interest clause, (4) subrogation clause, (5) equipment removal provisions, (6) notice of assignment clause, (7) no increase of burden provisions, (8) separate ownership clause, (9) surrender clause and (10) notice before forfeiture and judicial ascertainment clause.

4. Royalty Clauses and Implied Coverants - Up to this point, the clauses discussed have been those deemed necessary by the lessee to protect his interests in the property. From the lessor's point of view, the

main provision in an oil and gas lease is usually the royalty clause, which provides for compensation to the lessor. The lessor receives a bonus payment for the grant of a lease and, during the primary term, may receive periodic payment of delay rentals. If production is obtained, the lessor will then be paid a royalty, which is usually stated as a percentage of production or proceeds.

Royalty as a percentage of production is a hedge against uncertainty. The existence of hydrocarbons beneath a leasehold cannot be proved until a well is drilled. If no production is gained, the royalty is without value. On the other hand, if the presence of abundant recoverable reserves is proven, the royalty becomes extremely valuable. A percentage royalty balances the interests of the lessor and the lessee against the inherent risks of exploration.

Contemporary leases are usually drafted and prepared by the lessees to protect their interests in exploration and development. However, lessees are held bound by terms in addition to those that are written. Implied covenants are unwritten promises that generally impose burdens on lessees and work to protect the lessors. Five of the most commonly encountered implied covenants are: (1) The Implied Covenant to Reasonably Develop, (2) The Implied Covenant for Further Exploration, (3) The Implied Covenant to Protect Against Drainage, (4) The Implied Covenant to Market and (5) The Implied Covenant to Operate with Reasonable Care and Due Diligence.

Of the foregoing, the fifth Implied Covenant is noteworthy. Claims for breach of the Reasonable Care and Due Diligence Covenant have, in the past, been based on the following objections. a. Lessee damage to property through negligence or incompetence.

- b. Damage to lessor by lessee by premature abandonment of a productive well.
- c. Failure by lessee to use advanced production techniques.
- d. Failure of lessee to protect lessor through failure to seek favorable regulatory action.

Due to the broadly based wording of this covenant, the categories of application listed above should not be considered as limits to its useage. The courts have been quick and creative in extending implied covenants to protect lessors' interests. It is likely that the Implied Covenant to Operate with Reasonable Care and Due Diligence will be used by the courts to remedy future problems, such as environmental impact issues, even though they do not clearly fall within the categories noted above.

### C. CONCLUSIONS

The material presented in this brief summary about oil and gas leasing represents the provisions found in almost all modern oil and gas agreements. It is becoming increasingly common to find leases that have been negotiated with additional special clauses or amendments written into the instruments. Heightened environmental awareness and increased sophistication on the part of lessors have led to an increase in demand for express covenants to govern special areas of concern.

For example, a lessor may wish to have express provisions included in a lease which address such items as the lessee's responsibility for surface damage, the proximity of wells to structures on the property, injury to livestock, protection of water supplies, unique wildlife habitats, wetlands, noise control, etc.

From the foregoing material, it is readily apparent that the oil and gas lease is a complex instrument. It is broadly worded in part to allow for

unforeseen events and is minutely detailed in other areas to cover areas of specific concern. Since a lease is a binding legal document which may be in force for a long period of time, landowners should consult with legal counsel before entering into any such agreements. Such action will help landowners to avoid or mitigate potential negative impacts to their property while simultaneously allowing them to enjoy the economic benefits realized from the production of any minerals found under their land.

## APPENDIX 5

# OIL, GAS, SOLUTION MINING, GAS STORAGE, BRINE DISPOSAL,

### STRATIGRAPHIC, AND GEOTHERMAL WELL DRILLING

## ENVIRONMENTAL ASSESSMENT FORM

Purpose: The EAF is designed to help applicants and agencies determine, in an orderly manner, whether a project or action is likely to have a significant effect on the environment as required by Article 8 of the Environmental Conservation Law. The question of whether or not an action is significant is not always easy to answer. Therefore this form has been designed to gather comprehensive information regarding environmental impacts of drilling oil, gas and solution mining wells while being flexible enough to allow site specific characteristics of individual operations to be included. There are no "right" or "wrong" answers; rather the information may be evaluated in total to determine environmental significance.

Process: This form is to be completed and submitted with each well drilling permit application. Your answers to the attached questions will be evaluated by the agencies having jurisdiction over the proposed well site. If an environmental impact is found to be both large and its consequence is important, a draft environmental impact statement may be required.

\* \* \* \* \* \*

## INSTRUCTIONS

- This form is designed for DRILLING PERMITS. If your application is not for a drilling permit, ask for a standard Environmental Assessment form.
- ANSWER EVERY QUESTION. INCOMPLETE ASSESSMENT FORMS WILL BE RETURNED. If you are unable to answer some questions, contact the Mineral Resource Personnel in your region for guidance.
- Attach a sketch or additional pages if you feel it will clarify your answers.
- If you believe your drilling plan(s) prevent a potentially large impact, describe your prevention on an attached sheet.

November 1985 - Division of Mineral Resources

Effective April 1, 1986

Effective July 23, 1987 for Brine Disposal, Geothermal and Stratigraphic Wells

# WELL NAME AND NUMBER:

NAME AND ADDRESS OF APPLICANT:

Street.		
P.O.:	State:	Zip:
Business Phone: ()		
DESCRIPTION OF PROJECT: (Briefly	y describe type of project	or action)

PROJECT LOCATION: (or attach plat of wellsite)

PROJECT SITE IS THE WELL SITE AND SURROUNDING AREA WHICH WILL BE DISTURBED DURING CONSTRUCTION OF SITE, ACCESS ROAD, PIT AND ACTIVITIES DURING DRILLING AND COMPLETION AT WELLHEAD.

(PLEASE COMPLETE EACH QUESTION - Indicate N.A. if not applicable)

# A. SITE DESCRIPTION

(Physical setting of developed project site, including site of well, pits, access road and staging area.)

Land Use of Project Site

1.	Total area of project site:	sq.	ft.	Approximate	square
	footage of the items below:				

	-	Presently (Sq. ft.)	During Construction (Sq. ft.)	After Completion (Sq. ft.)
	Agricultural (cropland, hayland,pasture, vineyard, etc.)			
	Meadow or Brushland (non agricultural)			
	Forested			
	Wetland (as per Article 24 ECL)	<u></u>		
	Non vegetated (rock, soil, fill)	<u> </u>		
2.	General character of land uneven and rolling,	I: Generally un Generally eve	iform slope n and flat	_, Generally •
3.	Present land use: Rural Suburban, Industria Other	, Forest, I, Comme	, Agricultura rcial, Urba	al, an,
4.	What is the dominant land mile radius of the projec and the scale of developm	l use and zonin t (e.g., singl ment (e.g., 2-s	g classification e family resident tory)?	within a 1/4 tial, R-2)
5.	Is the site presently use open space or recreation	ed by the commu area? Yes	nity or neighborl No	nood as an
6.	Is any portion of the wel approved purusant to Arti Law? Yes No	l site within cle 25AA of th If ves. which	an agricultural o e Agriculture and one?	listrict 1 Markets
7.	Is any portion of the sit water conservation plan p Law, Subdivision 7-a; Sec	e within a lan oursuant to NYS tion 9?Y	d parcel having a Soil and Water ( esNo	a soil and Conservation

8. Is the well site located within a coastal zone management area? \_\_\_\_Yes \_\_\_\_No

	What is the predominant soil type(s) at the site?
10	
10.	what is the estimated depth to bedrock? it.
11.	what is the estimated depth to the water table?It.
12.	supply (a g aguifar recorrect)? Non No
	If yos, what is the name of the supply?
	Distance from project site
13	Is the project site over a primary or principal aquifer? (These are
13.	notential high-vield aquifers that are currently being used or have
	the potential to be used for drinking water).
	Yes No
14.	Are there lakes or ponds within or nearby the project site? Yes
	No If yes, name , size acres.
	Distance from project site to lake/pond. ft.
15.	Are there streams within or nearby the project site? Yes No
	If yes, name of stream and river to which it is a tributary.
	Distance from project site to streamft.
16.	Is any portion of the property located in the 100 year flood plain?
	YesNo.
17.	Is there a wetland located at or adjacent to the well site?Yes
	No
18.	Does the project site contain any species of plant or animal life
	that are as threatened or endangered? Yes No.
	If yes, identify the species and source of information
10	Are there any known archaeological and/or historical recourses which
19.	will be affected by drilling operations? Ves No
20.	Have you consulted with the NYS Office of Parks. Recreation, and
20.	Historic Preservation or other authority regarding the
	archaeological or historical resources at the site? Yes
	No If yes, who was consulted?
PROJE	CT_DESCRIPTION
(Phy	vsical setting of developed project site, including site of well,
pits	, access road and staging area.)
1.	What are the physical dimensions and size of the project site?
	During After
	Presently Construction Completion
a)	Presently Construction Completion Access Road: (length & width)
a) b)	Presently Construction       Completion         Access Road: (length & width)
a) b) c)	Presently Construction       Completion         Access Road: (length & width)
a) b) c)	Presently Construction Completion Access Road: (length & width) Well Site: (length & width) Total Area: (Sq. ft.)
a) b) c) <u>Acce</u>	Presently Construction Completion Access Road: (length & width) Well Site: (length & width) Total Area: (Sq. ft.)
a) b) c) <u>Acce</u> 2.	Presently Construction Completion Access Road: (length & width) Well Site: (length & width) Total Area: (Sq. ft.) <u>ess Road</u> Is it possible to utilize existing or common corridors when building the access road? Yes No Locate access road on attached
a) b) c) <u>Acce</u> 2.	Presently Construction Completion Access Road: (length & width) Well Site: (length & width) Total Area: (Sq. ft.) ess Road Is it possible to utilize existing or common corridors when building the access road? Yes No Locate access road on attached plat.
a) b) c) <u>Acce</u> 2.	Presently Construction Completion Access Road: (length & width) Well Site: (length & width) Total Area: (Sq. ft.) <u>ess Road</u> Is it possible to utilize existing or common corridors when building the access road? Yes No Locate access road on attached plat. Will material be brought in to build the access road and/or well

4.	Will any measures be used to control access to the site? (e.g., gates, fencing, etc.)YesNo If yes, describe
5.	What will be the anticipated average number of vehicle trips onto public roads per day? During drilling After completion
6.	Will access roads be treated to control dust? Yes No If yes, what will be used?
Eros	sion Control
7.	Are erosion control measures needed during construction of the access road and well site?YesNo If yes, describe.
8.	How will surface run-off be minimized?
Dril	
9.	What will the operating hours of the rig be?
10.	How distant will the nearest noise receptor be from the well and production facilities (house, office, etc.)?
11.	From where will the water used on-site be supplied?
12.	If there is a discharge of fresh water during drilling operations, is there the potential that it may interfere with the flow of nearby streams? Yes No Cause erosion? Yes No Raise the water level in nearby ponds or lakes? Yes No
13.	What possible fluids will be produced during drilling operations (e.g., oil, gas, fresh water, brine, etc.)?
14.	How will the drilling fluids and stimulation fluids be contained and disposed of?
15.	Will waste of any type be disposed of at the site?Yes No If yes, describe.
16.	Will fuel and/or other lubricants be stored on-site? Yes No If yes, what addition measures will be taken to contain to contain accidental spills or leakage during the drilling phase?
17.	Will any open burning take place during drilling operations? YesNo If yes, what type of materials will be burned?

Production and Site Restoration

- 18. Will the topsoil which is disturbed be stockpiled for reclamation use? Yes No
- 19. What will be the approximate duration of soil disturbance on this well site, staging area, and access road? \_\_\_\_\_ days.

20.	Does the reclamation plan include restoration of land management
	systems for soil and water conservation or require permanent
	drainage features (e.g., diversion terraces, subsurface drain lines,
	culverts, outlet ditches, etc.)?YesNo
	Describe:

- 21. Does the reclamation plan include revegetation after the drilling is completed? \_\_\_\_Yes \_\_\_No If yes, what plant materials will be used? \_\_\_\_\_Approximately how soon after drilling will seeding/mulching take place? days.
- 22. Will the pit liner be removed after drilling operations? Yes No
- 23. Please outline your planned production facility including permanent structures for this well. (Include wellhead equipment, pump jacks, and production waste containment)

24. Will production brine be stored on site? Yes No If yes, how will it be stored? (i.e., underground tank, above ground tank).

25. What method of disposal will be used for production brine/wastes?

# Other Permits Needed

26.	Are any additional perm	its required for th	nis project? (lo	cal, state,
	federal). Please list	each additional per	rmit separately.	
	Permit	Approval	Submittal	Approval
		Required	Date	Date
		<u> </u>		
	<u></u>			
Preparer	's Signature:			
Name/Tit:	le (Please Print):			
Represent	ting:			
Date:				

SUGGESTED SOURCES OF INFORMATION FOR OIL, GAS AND SOLUTION MINING ENVIRONMENTAL ASSESSMENT FORM A.4 Dominant Land Use and Zoning Classifications Sources: Local planning office Town Supervisor's Office Town Clerk's Office A.6 Agricultural District Information Sources: Cooperative Extension DEC - Division of Lands and Forests NYS Dept. of Agriculture and Markets DEC Regional Division of Regulatory Affairs DEC Regional Division of Mineral Resources A.7 Soil and Water Conservation Plan Sources: County Soil and Water Conservation District Office A.8 Coastal Zone Management Areas Sources: Local unit of Government NYS Dept. of State, Coastal Management Program DEC - Division of Water (maps) DEC Regional Division of Regulatory Affairs (maps) A.9 Dominant Soil Type Sources: NYS Dept. of Agriculture and Markets Soil Conservation Service Cooperative Extension Soil Survey Map U.S.D.A. Region 9 contact: Paul Puglia Agricultural Central Rural Route No. 2 Turner Road Jamestown, NY 14701 (716) 664-2351 DEC Regional Division of Regulatory Affairs A.10 Estimated Depth to Bedrock Sources: H<sub>2</sub>O Well Drillers Lândowners Previously drilled wells - in DEC Division of Mineral **Resources files** DEC Division of Mineral Resources offices have maps with overburden information which might be used for estimating depth to bedrock. County bedrock maps being prepared by the New York State Geological Survey A.11 Estimated Depth to Water Table Sources: H<sub>2</sub>O Well Drillers Lāndowners Previously drilled wells in DEC Division of Mineral Resources files.

A.12 Public Water Supply Sources: Local unit of government NYS Dept. of Health NYS Atlas of Community Water Systems Sources, 1982, NYS Department of Health. Atlas of Eleven Selected Aquifers in New York State, United States Geological Survey, 1982. A.13 Primary or Principal Aquifer Sources: Local unit of government NYS Dept. of Health NYS DEC Division of Water - Regional Office Availability of Water from Aquifers in New York State -U.S.G.S. Department of the Interior Availability of Water from Unconsolidated Deposits in Upstate New York - U.S.G.S. Department of the Interior. A.16 100 Year Flood Plain Sources: DEC Division of Water DEC Regional Divisions of Regulatory Affairs DEC Region 9 Division of Mineral Resources flood plain maps by municipality. A.17 Wetlands Sources: DEC Regional Division of Fish and Wildlife DEC Region 9 Division of Mineral Resources has wetland maps for each county in Region 9. A.18 Threatened or Endangered Species Sources: DEC Significant Habitat Unit - Delmar DEC Regional Division of Regulatory Affairs A.19 Archaeological or Historic Resources Sources: NYS Office of Parks, Recreation and Historic Preservation circles and squares map DEC Division of Construction Management - Cultural **Resources Section** DEC Regional Division of Regulatory Affairs B.26 Additional Permits Needed Sources: DEC Regional Division of Regulatory Affairs DEC Regional Division of Mineral Resources NYS Office of Business Permits

# **APPENDIX 5, COMMENTS**

# COMMENTS OF THE OIL, GAS, AND SOLUTION MINING ADVISORY BOARD

# ON THE WELL DRILLING ENVIRONMENTAL ASSESSMENT FORM

#### Comment

Add language to purpose section stating that "those who will need to determine significance will range from those with little or no formal knowledge of the environment to those who are technically expert in environmental analysis. In addition, many who have knowledge in one particular area may not be aware of the broader concerns affecting the question of significance".

Add language before "Name and Number of Project" to indicate that "it is expected that completion of the Environmental Assessment Form will be dependent on information currently available and will not involve new studies, research or investigation. If information requiring such additional work is unavailable, so indicate and specify each instance".

Depth to bedrock may be unknown prior to drilling.

An appendix should be attached to the EAF which provides the name, address and telephone number of the person or agency who may be contacted for information on threatened or endangered plant or animal life, 100 year flood plain, municipal water supplies, coastal zone management area, land use and zoning classifications and archeological and/or historic resources that exist on the project site.

The fill-in-the-blank statements for distance to the stream or lake or pond are superfluous under the questions about whether or not the project site is contiguous to a stream or lake or pond.

#### DEC Response

This exact wording was not adopted, however, a reference list showing where information can be obtained for the BAP has been prepared. The Division is developing standard environmental mitigation measures as part of the GEIS.

Not incorporated because most if not all the information is currently available. A reference list has been prepared to show the types of sources that can be used to get information on fourteen environmental questions operator's may have difficulty answering.

The word "estimated" is incorporated in the question and a reference list has been prepared indicating where this information might be obtained.

Agree. A reference list for the EAP has been prepared.

The questions are reworded to address this concern.

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COMMENTS

# APPENDIX 5, COMMENTS (CON'T)

#### Comment

The size of the wetland which triggers completion of this item should be listed.

Delete question about whether or not project site is located within an agricultural district.

The question about fluids that will be produced does not apply to disposal wells.

The questions about whether material will be brought in to build the access road/well site cannot be answered accurately.

The question about operating hours of the rig should be deleted.

The question about distance of the nearest noise receptor to the rig should be deleted.

The question about where the water used on-site will be supplied should be revised to include "If water supply is from wells, indicate pumping capacity \_\_\_\_gallons/minute", to conform with EAF's for other activities in New York State.

#### **DEC Response**

Not incorporated. DEC Staff will decide if mitigation measures may be needed in relation to the wetland, once one is identified.

Not incorporated. Actions affecting agricultural districts are subject to more detailed environmental review under SEQR.

If the questions do not apply, the respondent should so indicate.

The respondent should answer to the best of his/her ability. If not sure, then respondent should so indicate.

This question is necessary on the EAF. This EAF is designed to more closely assess the environmental impacts of oil, gas and solution mining activities. The operating hours of the rig may need to be adjusted under special circumstances in order to decrease the noise level impacts of drilling on other residents or facilities in the immediate area.

This question is necessary to address the impacts of the operation of the surrounding area. Under special circumstances, rig operating hours may need to be adjusted to decrease adverse affects of noise.

Not incorporated.

# APPENDIX 5, COMMENTS (CON'T)

#### Comment

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The question about depth to water table should be revised to read "What is the anticipated depth to water table".

The question about minimizing surface run-off should be deleted.

The question about storage of fuel and/or lubricants on-site should be deleted.

The questions about open burning, controlled access to the site, stockpiling topsoil and duration of soil disturbance and revegetation after drilling should be deleted from the EAP. These questions are not in other EAP's used by the Department.

Add an item about the number of jobs generated before and after construction/drilling.

#### DEC Response

This question was revised to read "What is the estimated depth to water table".

Disagree. This question is necessary to ensure that an environmentally sound drilling operation is conducted. Uncontrolled surface run-off leads to erosion, sedimentation and vegetation loss.

This question is necessary for environmental safety reasons. The proper location of fuel and/or lubricants on-site will reduce the chances of accidents and explosions and thereby reduce environmental problems that could result from such accidents.

Disagree. These questions are important to access the overall impacts of oil, gas and solution mining on the environment. The impacts of a project on soil and soil stability are legitimate concerns under SEQR and should be minimized where possible.

Disagree. The number of jobs created by an individual drilling/construction operation will have little impact on assessing the overall environmental impact of the project and mitigation measures that should be adopted.

### APPENDIX 6 - GATHERING LINES

Gathering lines not subject to the Federal Minimum Pipeline Safety Standards 49 CFR Part 192 must be designed, constructed, tested, operated and maintained as specified in Appendix 14-k of Part 255.

#### Appendix 14-k

Any gathering line or portion thereof not subject to Federal regulations. under 49 CFR part 192 and located more than 150 feet from a residence or place of public assembly shall be designed, constructed, tested, operated and maintained in conformance with sound engineering practices, including the following:

I. All joints shall be visually inspected for defects and shall have a neat workmanlike appearance. Qualified welders and plastic joiners shall be employed.

2. All pipe shall be installed with a minimum of two feet of cover, except as otherwise provided herein or except where solid rock is encountered, in which case the minimum cover shall be 12 inches. In areas subject to erosion or in locations where future grading is likely, such as at road, highway, railroad and ditch crossings, additional protection shall be provided. In areas actively cultivated for commercial farm purposes in at least two out of the last five years, as identified by the farmland operator<sup>1</sup>, all pipe shall be installed with a minimum 40 inches of cover unless the farmland operator agrees that normal agricultural practices, including land fitting (e.g., plowing, subsoiling, disking, etc.) and prospective agricultural engineering projects can be safely accommodated with a cover of less than 40 inches, taking into account the recommended practices and

<sup>1</sup>The farmland operator can also designate such support land areas not under active cultivation but subject to land management practices such as, but not limited to, drainage and soil erosion control systems.

standards of the United States Department of Agriculture, Soil Conservation Service<sup>2</sup> contained in its National Handbook of Conservation Practices and its National Engineering Manual. The farmland operator may require a depth-ofcover greater than 40 inches as a condition of permitting a right-of-way across his or her land where necessary to safely accommodate such practices and projects.

3. Each gathering line must be protected from washouts, floods, unstable soil, landslides or other hazards that may cause the pipeline to be exposed, to move, or to sustain abnormal loads.

4. A suitable conductive wire shall be installed with plastic pipe to facilitate locating it with an electronic pipe locator. Other suitable material or means for accomplishing this purpose may be employed.

5. The maximum allowable operating pressure for plastic pipelines is to be in accordance with the following formula:

$$P = \frac{2st \times 0.32}{(D-t)}$$

Where: D = Specified outside diameter, mm (in.).

- P = Design pressure, kPa\* (psi).
- s = For thermoplastic pipe the long-term hydrostatic strength determined in accordance with the referenced specification at a temperature equal to 23 degrees C (73 degrees F), 38 degrees C (100 degrees F), 49 degrees C (120 degrees F), or 60 degrees C (140 degrees F); for reinforced thermosetting plastic pipe, 75,800 kPa (11,000 psi).
- t = Specified wall thickness, mm (in.).
- \* = kPa is the symbol for Kilopascal lkPa + 0.14504 psi.

<sup>2</sup>Information about soil types and applicable agricultural engineering standards and practices may be obtained from the U.S. Department of Agriculture, Soil Conservation Serice office, located in the county in which the gathering line is to be installed. 6. All deleterious defects, gouges, dents and grooves shall be eliminated prior to testing.

7. The pipeline shall be subjected to a minimum pressure test of 100 psig or 1 1/2 MAOP, whichever is greater, for two hours. However, the maximum test pressure for plastic pipe may not be more than three times the design pressure of the pipe. Where reservoir pressure of the field is less than these pressures, the reservoir pressure may be the test pressure.

8. Test medium shall be air, inert gas or water. Other media acceptable to the Gas Division may be used with prior approval.

9. Regardless of installation date, pepeline markers shall be installed at each crossing of a public road, railroad, navigable waterway, and wherever else that it is necessary to identify the location of the gathering line so as to reduce a material possibilility of damage or interference. In areas used for commercial farm purposes in at least two of the last five years, pipeline markers shall be installed at points which adequately identify the location and direction of the pipeline. Such location points shall be determined in consultation with the farmland operator.

The following shall be written legibly on a background of sharply contrasting color on each line marker:

- (i) the wording "Warning," "Caution," or "Danger" followed by the words "Gas Pipeline"; and
- (ii) the name of the operator and the telephone number (including area code) where the operator can be reached at all times.

10. Maps shall be prepared documenting the location of the line and critical valves.

11. The pipelines shall be patrolled a minimum of every two years for washouts and other hazardous conditions, including a check for area population

development change.

12. The line shall be surveyed for leakage at least once every five years.

13. The adequacy of overpressure protection devices shall be verified annually to ensure safe operation of the line.

14. To abandon the gathering system in place, all sources of gas must be disconnected from the system, the system shall be purged with air or an inert gas and the ends sealed.

15. Sufficient documentation shall be maintained which demonstrates that the intent of these regulations has been met.

Any person intending to construct a line in an area used for commercial farm purposes in at least two of the last five years shall, regardless of the proposed operating pressure of the line, complete the information requested in Appendices 7-G and 7-G(a) of this Title and provide one copy each of Appendices 7-G and 7-G(a) to the affected farmland operator and the local county soil and water conservation district at least 48 hours in advance of the start of construction. The person shall retain a copy of the Appendices 7-G and 7-G(a) for review by any interested party in the future.

# APPENDIX 7-G (Part 255)

# NOTIFICATION OF CONSTRUCTION FOR GAS GATHERING LINES TO BE SUBJECTED TO PRESSURE OF 125 PSIG OR MORE OR FOR GAS GATHERING LINES TO BE LOCATED IN AN AREA USED FOR COMMERCIAL FARM PURPOSES

COMPANY\_\_\_

DESCRIPTION OF PROJECT\_\_\_\_\_

LOCATION OF PROJECT (file a copy of the map filed with the Article VII application)

ESTIMATED STARTING DATE ESTIMATED COMPLETION DATE PERSON TO BE CONTACTED REGARDING PROJECT\_\_\_\_\_ ADDRESS\_\_\_\_\_\_

 TELEPHONE NO.

 MAXIMUM ALLOWABLE OPERATING PRESSURE

 LOCATION CLASS\*

 PIPE & COATING DESCRIPTION

 a. NOMINAL DIAMETER

 b. NOMINAL WALL THICKNESS

 c. PIPE SPECIFICATION

 d. GRADE

 e. COATING TYPE

 f. METHOD OF APPLICATION

 g. LONGITUDINAL JOINT TYPE

 TEST DATA:

a. TEST MEDIUM

b. DURATION

c. TEST PRESSURE

NAMES AND MAILING ADDRESSES OF AFFECTED FARMLAND OPERATORS: Name Mailing Address

\_\_\_\_\_ DATE\_\_\_\_\_

<sup>\*</sup>If the line is to be constructed within 150 feet of an existing structure used for a residence or place of business that portion of the line must be constructed to transmission line standards. Under these circumstances, contact the Albany Office of the Gas Division prior to construction: (518) 474-5453

## MINIMUM COVER

For each area used for commercial farm purposes complete Appendix 7-G(a), including the statement of the farmland operator and a copy of a map showing each farmland border, nearest public road and the proposed route of the gathering line. Indicate the proposed depth of cover for all segments of the line and respective length of each such segment.

If minimum prescribed cover cannot be maintained, indicate location, nature of problem, and special precautions to be observed.

I hereby certify that this gathering line will be constructed to the requirements of Appendix 14-K of 16 NYCRR Part 255.

(Signed)

Officer of corporation

## APPENDIX 7-G(a)

MAP OF AN AREA USED FOR COMMERCIAL FARM PURPOSES AND REVIEW OF THE PROPOSED DEPTH-OF-COVER BY THE FARMLAND OPERATOR

(To be completed for each affected farmland area, as denoted under "Minimum Cover" in Appendix 7-G)

NAME OF FARMLAND OPERATOR FOR THE AFFECTED AREA:

LOCATION OF AFFECTED FARMLAND AREA:

(Nearest public road, Town, County)

**REVIEW INFORMATION** 

FARMLAND OPERATOR: I am aware that the local Soil Conservation Agent\* is available to discuss with me, prior to executing this document, depth-ofpipeline cover compatible with safe practices and standards of the U.S. Department of Agriculture, Soil Conservation Service, contained in the National Handbook of Conservation Practices and its National Engineering Manual. I have reviewed and have a copy of the proposed map (attached hereto) of the line across my farm.

Date

(Signed) Farmland Operator

\* USDA, Soil Conservation Service employee or County Soil and Water Conservation District employee.

### APPENDIX 7 - BRINE DISPOSAL WELL PERMITTING GUIDELINES

Brine Disposal wells must meet all federal UIC specifications and obtain a federal Class IID UIC permit. In addition, a State Pollution Discharge Elimination Systems (SPDES) permit from the NYSDEC Division of Water is required to operate a disposal well. A permit to drill a well for disposal or convert a well for disposal is required from the Division of Mineral Resources. A drilling permit fee is required for a new disposal well, but no fee is required for a permit to convert an existing well to a disposal well. The operator must also provide a bond or other financial security to cover the operator's plugging responsibilities for such a well. In addition, a Mineral Resources permit is required for the plugging of any such fluid disposal well.

No SPDES permit is required for a well in which an operator injects brine exclusively for the purpose of enhanced oil recovery.

All brine disposal wells must be constructed to NYSDEC specifications. A geological and engineering report must be submitted for review and approval by the Bureau of Wastewater Facilities Design before the well is drilled or converted to disposal. Operating conditions will be specified in the SPDES permit and monitoring reports will be required.

The general guidelines that have been used for the disposal of approved fluids (production brines) are as follows:

- No reinjection of well fluids will be allowed in, above, or below any primary groundwater aquifer as designated by the New York State Department of Environmental Conservation.
- The fluids shall not be injected at pressures greater than 80 percent of the fracturing pressure. If the fracturing pressure for the injection

zone has not been determined, the bottom hole pressure shall not exceed a gradient of .6 psi per foot of depth. The weight of the column of fluid must be included in the calculation of bottom hole pressure.

- 3. All valves on a well shall be secured when the well is unattended either by chain and padlock or other approved method and suitable control of unauthorized access to the wellsite must be maintained.
- The well operator must keep a record of the date and times of injection and the volumes and sources of injected fluids.
- 5. Should any unusual situations such as equipment failure, vandalism or other conditions occur causing a potential violation of surface or groundwater quality standards, or a potential hazardous condition, the permittee shall immediately notify the NYSDEC Regional Office when such conditions begin and when the conditions cease.

Many other factors must be considered before a disposal well can be approved. More specific guidelines, in addition to the existing guidelines, are proposed in order to streamline the NYSDEC disposal well permitting process.

Prior to preparation and submittal of a disposal well application, it is strongly recommended that the applicant and/or design engineer arrange a preliminary technical conference with the Region office of the Division of Water and the Division of Mineral Resources where the injection well will be located. The Division of Mineral Resources is to act as a technical advisor to the Division of Water with respect to the subsurface well construction and any required injectivity testing.

The data required by the DEC prior to approval of a disposal well should include the following where applicable.

A. An engineering and geologic study including but not limited to:

1. A brief statement outlining the purpose of the project, the well name,

the fluids to be injected, the name, description and the depth of the proposed injection zone.

- The reservoir characteristics of the injection zone, such as porosity, permeability, average thickness, areal extent, fracture gradient, temperature, pressure and fluid saturations.
- 3. A description of the well construction of the existing or proposed disposal well. This should include the planned well drilling program, casing diagram, casing weights grades and lengths, volume and type of cement, records of all logs run and the proposed method of testing the well's integrity.
- 4. The regional and local freshwater flow systems must be briefly described and the deepest freshwater zone must be identified. A water quality baseline survey of surrounding freshwater supplies should be made. The report should delineate the number and location of potable water supplies in the area.
- 5. The area of review of the disposal well shall be a minimum one-fourth mile radius or a larger radius as determined by the DEC based on site specific conditions.
- 6. The location of all oil, gas or solution mining wells (active, inactive and abandoned) within the determined area of review or influence of the proposed injection well must be accurately shown on a neat legible plat drawn to scale. This plat must also identify the surface owners, offsetting leases and operators.
- 7. The written approval of the surface landowner where the injection well is located and offsetting operator notification are required. Copies of landowner approval and offset operator notification must be submitted at application.
- 8. Casing diagrams, including cement plugs, and actual or calculated cement fill behind casing of all active, inactive, abandoned or deeper-zone producing wells within the area of review or influence and evidence that abandoned wells in the area will not have an adverse effect or cause damage to life, health, property or natural resources must be submitted.
- 9. A chemical analysis of the liquid to be injected shall be filed with the DEC with the application. The minimum analysis shall consist of the following parameters, ph, chloride, sodium, calcium, magnesium, iron, specific conductivity, total dissolved solids, sulfates, hardness and oil or grease. Additional analyses must be submitted whenever the formation the injection fluid originated from is changed, or as requested.
- B. An Injection Plan including the following:
  - A flow schematic or map illustrating all aspects of the wellhead, pretreatment equipment, storage facilities, pumping equipment etc.
  - 2. All equipment specifications including pipelines, pumps, filters, tank pressures, recorders, meters etc. The noise levels generated by the injection pumps should also be specified.
  - A monitoring system or method to ensure there are no leaks or other well malfunctions.
  - Specifications of any wastewater pre-treatment, filtration, and additives to be used.
  - The maximum anticipated surface injection pressure and daily rate of injection.
- C. Operation and Maintenance Requirements are as follows:
  - 1. The maximum bottom hole injection pressure shall not exceed .6 psi per foot of depth unless the operator can submit sufficient data on the

fracture gradient for the injection zone which is specific to the area where well is located, or runs a step-rate injectivity test to DEC specifications to determine the fracture pressure. These specifications are detailed below.

- a. A step-rate test should be conducted prior to any sustained liquid injection or after a period of shut-in if stimulation is necessary. The results of this type of test are conclusive only if proper procedures are used. The proper procedures are as follows:
  - The fluid to be used in any injectivity test should be the same fluid the operator plans to inject for disposal.
  - 2) The test well should be shut-in long enough after stimulation so that the bottom hole pressure is near the original shut-in pressure.
  - 3) The step-rate test should be initiated from the shut-in static bottom hole pressure or hydrostatic pressure to the pressure required to fracture the injection zone formation or the desired injection pressure whichever is lower.
  - 4) The test should be carried out by injecting fluid in a series of <u>constant-rate</u> injections with rates increasing step wise from low to high.
  - 5) Ideally, the duration of each rate step should be <u>equal</u>. In relatively low permeability formations (K < 5md) such as commonly found in New York State, each rate step should last one hour. For formations with greater permeabilities (K > 5md), the duration of each rate step will be specified.
  - 6) Surface pressure reading must be used to monitor during the test. Bottom hole pressure readings from an Amerada-type

pressure recording device is also strongly recommended. When smaller pressure increments occur for a unit rate change, fracturing has probably taken place.

- 7) Injection rates during the test should be controlled with a constant-flow-rate regulator and flow rates should be measured with a calibrated turbine flowmeter and rate meter.
- 2. An accurate operating pressure gauge and a pressure recording device shall be available at all times. All injection disposal wells shall be equipped for the installation and operation of such gauges on both tubing and annulus.
- 3. All injection piping, valves, and facilities shall be equal to or exceed design standards for the maximum anticipated injection pressure, and shall be maintained in a safe and leak-free condition.
- 4. In case of injection well shut down or malfunction, a back-up system or the capability of a minimum of 30 days retention of the wastewater must be available.
- 5. The disposal well site including off-loading pad, transfer pumps, and storage tanks must be in a diked area constructed of impermeable material and capable of holding 150% of the volume of the largest tank or 150% of the capacity of all tanks if they are gravity manifolded together. There shall be locking valves at all outlets from each tank and on the line to the injection well. Locks shall also be provided on tank access covers and facility access gates. Fencing to preclude unauthorized access shall be provided.
- 6. The trucks hauling waste brine to the wells shall be required to have a valid Part 364 permit. A log and manifest of all brine received for injection shall be kept.

- 7. A suitable fluid with appropriate inhibitors must be utilized between the injection tubing and casing.
- 8. Data from a continuous pressure recorder, shall be maintained to monitor the disposal well to ensure the disposal well operation is in conformance with the permitted operational limits and to insure that damage to life, health, property or natural resources does not occur. All injection wells shall be equipped with a pressure activated automatic shut-down system. Injection shall be terminated immediately if there are deviations from the permitted operational limits.
- 9. The charts from the pressure recorder, which will be considered a permanent record of the well operating pressure, shall be submitted to the state for review at intervals specified in the SPDES permit.
- 10. Additional requirements such as a monitoring well program and additional specialized injectivity tests, radioactive tracer and/or spinner surveys, temperature logs or modifications of the above requirements may be necessary to fit specific circumstances.

# APPENDIX 8 - FORMS USED IN THE OIL, GAS AND SOLUTION MINING PROGRAM

# Application for Permit to Drill, Deepen, Plug Back or Convert a Well Subject to the Oil, Gas and Solution Mining Law (#85-12-5).

- Applicant must supply: 1) owner's and operator's address and phone number 2) proposed well's type, location, elevation, total depth, etc. 3) type of rig, drilling fluid and spudding date, 4) details on each proposed casing string and cement job.
- Form must be accompanied by surveyor's plat (map) of well site.
- Used by DEC to: 1) find proposed well location to conduct pre-drilling site inspection, 2) assess the adequacy of the proposed engineering program and 3) determine if modifications and/or permit conditions are needed.

# Oil, Gas and Solution Mining Well Drilling Environmental Assessment Form (EAF)

- This form must accompany <u>all</u> well permit applications. Applicant must complete Part I giving detailed information on the proposed well site including presence of sensitive environmental resources, surrounding land uses and operator's construction plans (site and access road dimensions, erosion control measures, restoration plans, etc).
- Parts II and III are completed by DEC to determine whether there will be any significant social or environmental impacts requiring project modification or permit conditions. Information on form also indicates if other permits (wetlands, stream disturbance, etc) will be needed.

# Pre-Drilling Site Inspection Report (85-15-25)

- Completed by DEC inspectors during field visit. They check the accuracy of the well plat, well spacing and setbacks, proximity of well site or access road to protected resources, the potential for erosion and

sedimentation and the need for other permits.

# Organizational Report for 011, Gas and Solution Mining Activities (85-15-12)

- Submitted with <u>first</u> permit application and refiled whenever organizational changes occur. The form covers: 1) type of organization (corporation, association, partnership) 2) type of activity (production, drilling, storage, salvage, etc.) 3) the name, title and address of <u>all</u> directors, officers, general and limited partners, and 4) any previous name and address of the organization.
- Used by DEC for initial project review and contacting operator or owner when necessary. Also used for identifying all the responsible parties in case of violations.

# Declaration of Active and Inactive Unplugged Oil and Gas and Solution Mining Wells Subject to Financial Security in New York State (85-12-10)

- Well owners must give the name, API number, depth and permit date for each well they own. Form must be accompanied by correct financial security in acceptable form.
- Used by DEC to assess each well owner's financial security requirements based on number and depth of their wells. Department will use the financial security to properly plug and abandon wells if the owner fails to do so.
- Drilling permits cannot be issued unless proposed well has adequate financial security.

# Financial Security Worksheet (85-11-2)

- Worksheet used by both well owners and DEC to compute correct amount of financial security based on depth and number of wells.

#### Well Plugging and Surface Restoration Bond (85-02-2)

- Filled out by a Surety authorized to do business in the State of New York and filed by the well owner or operator. The Surety must identify the amount of the bond and the owner/operator whose wells it applies to. The signed form legally obligates the Surety to surrender the funds to the State of New York if wells are not properly plugged and abandoned.

# Well Drilling Permit for Oil, Gas and Solution Salt Mining (85-20-2)

- Document prepared by DEC which authorizes drilling of an oil, gas or solution mining well. Includes assigned API identification number, permit expiration date and any special permit conditions the Department deems necessary.
- Permit must be posted in a conspicuous place throughout drilling operations.

# Application for A.P.I. Well Identification Number (85-16-1)

- Submitted by well owner to obtain an API number for a well that does not already have one (older wells). The owner must supply general information on the well's type, location and condition.
- DEC uses the numbers to keep track of well records. This numbering system is used by government and private industry nationwide.

# Well Drilling and Completion Report (85-15-7)

- Submitted by the owner/operator within 30 days of a well's completion. The form contains detailed information on the well's type, location, drilling, casing, cementing, logging, completion, perforation, and testing. The record of rock formations and oil, gas and water zones penetrated must also be filled in on the back of the form.
- DEC uses the information to determine whether the well complies with all

rules, regulations and permit conditions.

- The information on Completion Reports is a vital part of the Division's records. It is essential in any investigation of well pollution problems that may arise. The information on casing, cement and fluid zones is also important in selecting correct plugging procedures when the well is abandoned.

# Post Drilling Site Inspection Report (Internal Regional Form)

- DEC staff fill out this form during the site inspections conducted after the well has been drilled and completed. The form contains information on the condition of the access road, well site, wellhead and production equipment. DEC staff perform this inspection to ensure the operator has complied with rules, regulations and permit conditions.

# Annual Well Status and Production Report (85-15-4)

- Submitted annually by well owner who must list each well, its type, API number, status (active or inactive), and amount of production.
- DEC uses the production information from the forms to keep track of the industry output and activity. The forms are also useful in tracking down: 1) wells not covered by financial security and, 2) shut-in wells that have illegally been left unplugged.

#### Purchaser or Taker's Annual Gas Report (85-15-5)

- Submitted annually by purchaser or taker for each and every lease or unit. Identifies well, owner, meter number and MCF of gas purchased or transported.
- DEC uses the information to double check Production Report figures.

#### Purchaser or Taker's Annual Crude Oil Report (85-15-6)

- Same as above, only for oil instead of gas.

# Operator's Annual Natural Gas Storage Report (85-15-2)

- Submitted annually by the owner or operator for every natural gas storage reservoir. The form compares current and previous year's reservoir data, corrosion data, number and type of wells, reservoir acreage and the volumes of gas stored and withdrawn.
- DEC uses this information to keep track of the state of the industry and ensure compliance with rules, regulations and permit conditions.

#### Operator's Annual LPG Underground Storage Report (85-15-9)

- Submitted annually by the owner or operator of every LPG storage reservoir. Required information and DEC use similar to above.

# Operator's Annual Solution Salt Mining Report (85-15-24)

- Submitted annually by the owner or operator of each salt mining operation. Owner must provide well names, API numbers and information on well types and amount of fluids injected and produced.
- DEC uses the information to determine whether the operation complies with rules, regulations and permit conditions.

# Notice of Intention to Plug and Abandon (85-12-4)

- Submitted by owner or operator who desires a permit to plug and abandon a well. The form contains information on the well's location, casing record and the proposed plugging details.
- DEC uses the information on this form to determine whether the proposed plugging program is adequate or must be modified before a plugging permit can be issued.

#### Permit to Plug and Abandon (85-20-3)

- Document prepared by DEC authorizing plugging of well according to the

procedures submitted in the plugging application or required in permit conditions.

# Plugging Report (85-15-8)

- Must be submitted by owner or operator within 30 days after plugging of any well. Form contains description of well and the plugging and abandonment procedures used.
- Used by DEC to ensure compliance with rules, regulations and permit conditions.

#### Plugging Inspection Form (Internal Regional Form)

- Filled out by DEC staff during the site inspection performed after the well has been plugged and abandoned. Inspector must check on the site's final condition, casing left in well, removal of equipment and debris and other measures necessary to comply with well site restoration requirements.

# Notice of Transfer of Well Plugging Responsibilities (85-12-9)

- Form submitted by transferee identifying well name, location, etc. The transfer of well plugging responsibility must be signed by both the transferee and transferor in the presence of a notary public. Transferee must have sufficient financial security to cover their new well before the Department will release the previous owner from legal responsibility.
- Used by DEC to ensure that ownership of wells is not transferred to persons who do not have adequate financial security to guarantee proper plugging of a well.

# Initial Bottom Hole Pressure and Gas-Oil Ratio Report (85-15-15)

- Submitted by owner or operator when required by DEC. (example Bass

Island well). Form provides results of initial bottom hole pressure test and production tests.

- DEC uses report, in conjunction with other information, to determine whether operator is managing production in a manner that will not waste resources.

# Annual Bottom Hole Pressure Test\_Report (85-15-23)

- Submitted by owner or operator on an annual basis when required by DEC (example Bass Island well). Form gives results of a static bottom hole pressure test. DEC uses report, in conjunction with other information, to determine whether the operator is managing production in a manner that will not waste resources.

# Gas/Oil Ratio and Quarterly Production Report (85-15-16)

- Submitted quarterly by owner or operator when required by DEC. (example Bass Island well). Form provides information on gas production, oil production and the gas-oil ratio broken down by month.
- DEC uses report, in conjunction with other information, to determine whether operator is managing production in a manner that will not waste resources.

# Complaint Form (Internal Regional Form)

- Completed by DEC Staff in investigating complaints. Includes information on the nature of the complaint, inspections performed, samples or photographs taken and the resolution of the case.