

DRAFT SCOPE

FOR

**DRAFT SUPPLEMENTAL
GENERIC ENVIRONMENTAL IMPACT STATEMENT
(dSGEIS)
ON THE OIL, GAS AND SOLUTION MINING
REGULATORY PROGRAM**

**WELL PERMIT ISSUANCE FOR HORIZONTAL DRILLING
AND HIGH-VOLUME HYDRAULIC FRACTURING TO
DEVELOP THE MARCELLUS SHALE AND OTHER LOW-
PERMEABILITY GAS RESERVOIRS**

Lead Agency:

New York State Department of Environmental Conservation
Division of Mineral Resources
Bureau of Oil and Gas Regulation
625 Broadway, Third Floor
Albany, NY 12233-6500

Submit comments to:
Attn: Scope Comments
Bureau of Oil & Gas Regulation
NYSDEC Division of Mineral Resources
625 Broadway, Third Floor
Albany, NY 12233-6500

Or email to: dmnog@gw.dec.state.ny.us with “Scope Comments” as the Subject

Prepared by:

*Bureau of Oil & Gas Regulation
NYSDEC Division of Mineral Resources*

October 6, 2008

Draft Scoping Document
**Well Permit Issuance for Horizontal Drilling
and High-Volume Hydraulic Fracturing to Develop
Shale and Other Low-Permeability Gas Reservoirs**
New York State
Department of Environmental Conservation

Table of Contents

	Page
EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	2
1.1 Description of the Proposed Action	2
1.2 Regulatory Jurisdiction	2
1.3 Project Location	3
1.4 State Environmental Quality Review Act	4
1.4.1 Well Permit Applications and the Environmental Review Process	7
1.4.2 SEQRA and Leasing of State Land for Oil and Gas Development	8
1.5 Pipeline Regulation	8
2.0 DESCRIPTION OF PROPOSED ACTION	8
2.1 Natural Gas Drilling and Production	9
2.1.1 Horizontal Drilling	9
2.1.2 Hydraulic Fracturing	10
2.1.2.1 Fluid Handling at the Well Site	11
2.1.2.2 Fluid Removal From Well Site and Ultimate Disposition of Returned Fluids	12
2.1.2.3 Trade Secret Status of Additive Formulas or Constituents	13
2.1.3 Well Testing	13
2.1.4 Natural Gas Production	14
2.1.5 Well Plugging	14
2.1.6 Well Density	15
3.0 GEOLOGY	16
4.0 POTENTIAL ENVIRONMENTAL IMPACTS	17
4.1 Noise, Visual and Air Quality Impacts	17
4.1.1 Noise Impacts	17
4.1.2 Visual Impacts	18
4.1.3 Air Quality Impacts	20
4.1.3.1 Greenhouse Gas Emissions	20

4.2 Water Resources	21
4.2.1 Water Withdrawals	21
4.2.1.1 Susquehanna River Basin	22
4.2.1.2 Delaware River Basin	24
4.2.1.3 Great Lakes Basin	25
4.2.1.4 Assessment of Water Withdrawals for High-Volume Hydraulic Fracturing in the Marcellus Shale and Other Low-Permeability Gas Reservoirs	25
4.2.2 Groundwater Quality	26
4.2.2.1 Safe Drinking Water Act Hydraulic Fracturing Exclusion	28
4.2.3 Surface Water Quality	28
4.2.3.1 Surface Municipal Water Supplies	29
4.2.3.2 Stream Disturbance	29
4.2.3.3 Erosion and Sedimentation Control	29
4.2.3.3.1 Clean Water Act Stormwater Exemption	30
4.2.4 New York City Watershed	30
4.3 Significant Habitats and Endangered, Rare or Threatened Species	32
4.4 Floodplains	32
4.5 Fresh Water Wetlands	32
4.6 Road Use	33
4.7 Cumulative Impacts	34
4.8 Community Character	35
5.0 PERMIT PROCESS AND REGULATORY COORDINATION	35
5.1 Public and Local Government Participation	36
6.0 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	37
7.0 ALTERNATIVE ACTIONS	42

EXECUTIVE SUMMARY

The Department of Environmental Conservation is responsible for regulating the development and production of oil and gas resources in New York State. Natural gas exploration and production companies, and mineral rights owners, are interested in developing a potentially significant gas resource in the Marcellus Shale through the use of horizontal drilling and a hydraulic fracturing technique known as “slick water fracturing.” This technique requires large volumes of water. The Department has identified the action of well permit issuance when high-volume hydraulic fracturing is proposed as one which requires further review under the State Environmental Quality Review Act (“SEQRA”). This draft scope and the public meetings where it will be discussed are the first steps in that process.

The Department evaluated its oil and gas regulatory program through development of a Generic Environmental Impact Statement (“GEIS”) which was finalized in 1992 and which sets parameters that are applicable statewide for SEQRA review of gas well permitting. This draft scope describes the topics related to well permit issuance for high-volume hydraulic fracturing that the Department has identified for review in a draft Supplemental Generic Environmental Impact Statement (“dSGEIS”). Written and verbal comments from all interested parties will be considered in the preparation of a Final Scope, and then the dSGEIS will be released for additional public review and comment. The final SGEIS, to be prepared after consideration of comments received on the draft, will set additional parameters for SEQRA review. The Department will then issue well permits for gas well development using high-volume hydraulic fracturing in accordance with both the GEIS and the SGEIS.

Aspects of high-volume hydraulic fracturing identified in this draft scope for further review include the potential impacts of (1) water withdrawals, (2) transportation of water to the site, (3) the use of additives in the water to enhance the hydraulic fracturing process, (4) space and facilities required at the well site to ensure proper handling of water and additives, and (5) removal of spent fracturing fluid from the well site and its ultimate disposition. Noise, visual and air quality considerations are noted, along with the potential for cumulative and community impacts. The well permitting process is described, and regulatory coordination with other jurisdictional agencies and local governments are also discussed.

Narrative background and context is included in this document solely for the purpose of assisting the reader in evaluating the draft scope, is based upon the Department’s experience implementing the GEIS and regulating oil and gas drilling in New York State, and is for reference only. Nothing contained in this draft scope is intended, nor should it be construed, as stating a position with respect to any matters that will ultimately be addressed in the SGEIS. In order to avoid duplication, and to ensure that the SGEIS serves to complement the GEIS, interested persons are urged to carefully review the GEIS, which may be found online at <http://www.dec.ny.gov/energy/45912.html>, in connection with the preparation of any comments.¹

¹ The GEIS also includes a glossary of technical terms which may be accessed for reference online at http://www.dec.ny.gov/docs/materials_minerals_pdf/dgeisgloss.pdf.

1.0 INTRODUCTION

1.1 Description of the Proposed Action

The Department of Environmental Conservation ("DEC" or "Department") has received applications for permits to drill horizontal wells to evaluate and develop the Marcellus Shale for natural gas production. Wells will undergo a stimulation process known as hydraulic fracturing. While the horizontal well applications received to date are for proposed locations in Chemung, Chenango and Tioga Counties, the Department expects to receive applications to drill in other areas including counties such as Delaware and Sullivan where natural gas production has not previously occurred. There is also potential for development of the Utica Shale using horizontal drilling and high-volume hydraulic fracturing and the Department is aware that this could bring use of those techniques to areas such as Otsego and Schoharie Counties, which would also be new to natural gas development. Other shale and low-permeability formations in New York may be targeted for future application of horizontal drilling and hydraulic fracturing if Marcellus and Utica development using this method is successful and the requisite infrastructure is in place. The Department proposes to satisfy the State Environmental Quality Review Act ("SEQRA") for most of these operations through the preparation of a Supplemental Generic Environmental Impact Statement ("SGEIS"), which will be read and applied in conjunction with the existing Generic Environmental Impact Statement (GEIS) on the Oil, Gas and Solution Mining Regulatory Program.²

The narrative background and context provided in this document is included solely for the purpose of assisting the reader in evaluating the draft scope, is based upon the Department's experience implementing the GEIS and regulating oil and gas drilling in New York State, and is for reference only. Nothing contained in this draft scope is intended, nor should it be construed, as stating a position with respect to any matters that will ultimately be addressed in the SGEIS.

1.2 Regulatory Jurisdiction

The State of New York's official policy, enacted into law, is "to conserve, improve and protect its natural resources and environment . . .,"³ and it is the Department's responsibility to carry out this policy. As set forth in Environmental Conservation Law ("ECL") §3-0301(1) the Department's broad authority includes, among many other things, the power to:

- manage natural resources to assure their protection and balanced utilization,
- prevent and abate water, land and air pollution, and
- regulate storage, handling and transport of solids, liquids and gases to prevent pollution.

² The GEIS is posted on the Department's website at <http://www.dec.ny.gov/energy/45912.html>.

³ Environmental Conservation Law (ECL) §1-0101(1)

The Department regulates the drilling, operation and plugging of oil and natural gas wells to ensure that activities related to these wells are conducted in accordance with statutory mandates found in the ECL. In addition to protecting the environment and public health and safety, the Department is also required by Article 23 of the ECL to prevent waste of the State's oil and gas resources, to provide for greater ultimate recovery of the resources, and to protect correlative rights.⁴ ECL §23-0303(2) provides that DEC's Oil, Gas and Solution Mining Law supersedes all local laws relating to the regulation of oil and gas development except for local government jurisdiction over local roads or the right to collect real property taxes. Likewise, ECL §23-1901(2) provides for supercedure of all other laws enacted by local governments or agencies concerning the imposition of a fee on activities regulated by Article 23.

As reflected by ECL §23-2101, New York is a member of the Interstate Compact to Conserve Oil and Gas and is bound with other states by statutory adoption of the compact to participate in the mission of the Interstate Oil and Gas Compact Commission ("IOGCC") of promoting conservation and efficient recovery of domestic oil and natural gas resources, while protecting health, safety and the environment. The IOGCC advocates state-level regulation of oil and gas resources and promotes regulatory coordination and government efficiency. New York actively participates in meetings where states, industry, environmentalists and federal officials share information and perspectives on emerging technologies and environmental issues. The IOGCC's work focuses on developing and implementing sound regulatory practices that maximize oil and natural gas production, minimize the waste of irreplaceable resources, and protect human and environmental health.

1.3 Project Location

The SGEIS and its Findings will be applicable to onshore oil and gas well drilling statewide, as are the existing GEIS and Findings, which are more fully described below. The prospective region for the extraction of natural gas from Marcellus and Utica Shales has been roughly described as an area extending from Chautauqua County eastward to Green, Ulster and Sullivan Counties, and from the Pennsylvania border north to the approximate location of the east-west portion of the New York State Thruway between Schenectady and Auburn.⁵ However, sedimentary rock formations which may someday be developed by horizontal drilling and hydraulic fracturing exist from the Vermont/Massachusetts border up to the St. Lawrence/Lake Champlain region and west along Lake Ontario to Lake Erie. Drilling will not occur on State-owned lands which constitute the Adirondack and Catskill Forest Preserves because of the State Constitution's requirement that Forest Preserve lands be kept forever wild and not be leased or sold. In addition, the subsurface geology of the Adirondacks, New York City and Long Island renders drilling for hydrocarbons in those areas unlikely.

⁴Correlative rights are the rights of mineral owners to receive or recover oil and gas, or the equivalent thereof, from their owned tracts without drilling unnecessary wells or incurring unnecessary expense.

⁵ A general map of the extent of the Marcellus Shale formation is available at <http://www.dec.ny.gov/energy/46288.html>. Additional maps and figures will be included in the dSGEIS.

1.4 State Environmental Quality Review Act

The Department's SEQRA regulations, available at <http://www.dec.ny.gov/regs/4490.html>, authorize the use of generic environmental impact statements to assess the environmental impacts of separate actions having generic or common impacts. A generic environmental impact statement and its findings "set forth specific conditions or criteria under which future actions will be undertaken or approved, including requirements for any subsequent SEQR compliance."⁶ When a final generic environmental impact statement has been filed, "no further SEQR compliance is required if a subsequent proposed action will be carried out in conformance with the conditions and thresholds established for such actions" in the generic environmental impact statement.⁷

Drilling and production of separate oil and gas wells, and other wells regulated under the Oil, Gas and Solution Mining Law (Article 23 of the Environmental Conservation Law) have common impacts. After a comprehensive review of all the potential environmental impacts of oil and gas drilling and production in New York, the Department found in 1992 that issuance of a standard, individual oil or gas well drilling permit anywhere in the state, when no other permits are involved, does not have a significant environmental impact. The review was conducted in accordance with SEQRA and is memorialized in the 1988 Draft and 1992 Final GEIS on the Oil, Gas and Solution Mining Program.⁸ A separate finding was made that issuance of an oil and gas drilling permit for a surface location above an aquifer is also a non-significant action, based on special freshwater aquifer drilling conditions implemented by the Department.

The Department further found in 1992 that issuance of a drilling permit for a location in a State Parkland, in an Agricultural District, or within 2,000 feet of a municipal water supply well, or for a location which requires other DEC permits, may be significant and requires a site-specific SEQRA determination. The only instance where issuance of an individual permit to drill an oil or gas well is always significant and always requires a Supplemental Environmental Impact Statement ("SEIS") is when the proposed location is within 1,000 feet of a municipal water supply well. Well stimulation, including hydraulic fracturing, was expressly identified and discussed in the GEIS as part of the action of drilling a well, and the GEIS does not recommend any additional regulatory controls or find a significant environmental impact associated with this technology, which has been in use in New York State for at least 50 years.

⁶ 6 NYCRR 617.10(c)

⁷ 6 NYCRR 617.10(d)(1)

⁸ <http://www.dec.ny.gov/energy/45912.html>

The 1992 findings were the culmination of a 12-year effort which included extensive public scoping and research by Department staff, followed by public comment and hearings on the Draft GEIS. Major issues identified through the previous scoping process and addressed in the GEIS, as listed on page 3 of the Draft GEIS, were:

- impacts on water quality;
- impacts of drilling in sensitive 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 and
- impacts on endangered species and species of concern.

The SEQRA regulations require preparation of a supplement to a final generic environmental impact statement if a subsequent proposed action which may have one or more significant adverse environmental impacts was not addressed.⁹ ***The Department has determined that some aspects of the current and anticipated application of horizontal drilling and high-volume hydraulic fracturing warrant further review in the context of a Supplemental Generic Environmental Impact Statement.*** This determination is based primarily upon two key factors: (1) required water volumes in excess of GEIS descriptions, and (2) possible drilling in the New York City Watershed, in or near the Catskill Park, and near the federally designated Upper Delaware Scenic and Recreational River.

(1) *Water Volumes:* The GEIS describes use of up to 80,000 gallons of water for a typical hydraulic fracturing operation. Multi-stage hydraulic fracturing of horizontal shale wells may require the use and management of millions of gallons of water for each well.

(2) *Anticipated Drilling Locations:* While the GEIS does address drilling in drinking water watersheds, areas of rugged topography, unique habitats and other sensitive areas, oil and gas activity in the eastern third of the State was rare to non-existent at the time of publication. Although the 1992 Findings have statewide applicability, the SGEIS will address whether additional regulatory controls are needed in any of the new geographic areas of interest given the attributes and characteristics of those areas. For example, the GEIS does not address drilling in the vicinity of the New York City watershed infrastructure which exists in the prospective area for Marcellus Shale drilling.

⁹ 6 NYCRR 617.10(d)(4)

A final scoping document will outline the factors which must be included in the SGEIS. The Department has preliminarily identified that the following anticipated Department actions may have potential impacts which are not specifically discussed in the original GEIS and which will therefore be assessed in the SGEIS.

- Issuance of a well permit for high-volume hydraulic fracturing with proposed water source within the Susquehanna or Delaware River Basins
 - Well location in basin
 - Well location outside basin (diversion)
- Issuance of well permit for high-volume hydraulic fracturing with proposed water source outside the Susquehanna or Delaware River Basins
 - Well location outside basin
 - Well location in basin (diversion)
- Issuance of well permit for high-volume hydraulic fracturing with proposed water source within the Great Lakes Basin
- Issuance of a well permit for high-volume hydraulic fracturing in the New York City Watershed, including in proximity to subsurface watershed infrastructure
- Issuance of a well permit for high-volume hydraulic fracturing in the Catskill Park
- Issuance of a well permit for high-volume hydraulic fracturing in the Upper Delaware River corridor

The Department will release the final scope following public meetings and a comment period on this Draft Scope. The primary goals of the scoping process are to focus the Draft SGEIS on any potentially significant adverse impacts of the proposed action and to eliminate consideration of any impacts that are irrelevant or non-significant.

Public scoping sessions will be held in November and December, 2008, at six venues in the Southern Tier and Catskills. A schedule of the public scoping sessions will be available in the Department's Environmental Notice Bulletin and through the Department's Marcellus Shale web page at <http://www.dec.ny.gov/energy/46288.html>. The public scoping sessions will provide an opportunity for all interested parties to comment on this Draft Scope. Written comments on this Draft Scope will also be accepted by the Department until the close of business on December 15, 2008.

Attn: Scope Comments
Bureau of Oil & Gas Regulation
NYSDEC Division of Mineral Resources
625 Broadway, Third Floor
Albany, NY 12233-6500

Or email to: dmnog@gw.dec.state.ny.us with "Scope Comments" as the Subject

Following the public scoping sessions and the written comment period, the Department will prepare a Final Scope for the Draft SGEIS. A copy of the Final Scope will be posted on the Department's website, provided to document repositories, and provided to all parties who submit written comments.

The Final Scope will serve as the outline and table of contents for the Draft SGEIS, which will be released for public comment prior to issuance of a Final SGEIS.

1.4.1 Well Permit Applications and the Environmental Review Process

The Department's 1992 Findings Statement¹⁰ describes the well permit and attendant environmental review processes. Each application to drill a well is an individual project, and the size of the project is defined as the surface area affected by development. The Department, which has had exclusive statutory authority since 1981 to regulate oil and gas development activities, is lead agency for purposes of SEQRA compliance.

The 1992 Findings authorized use of a shortened, program-specific environmental assessment form ("EAF"), which is required with every well drilling permit application.¹¹ The EAF and well drilling application form¹² do not stand alone, but are supported by the four-volume GEIS, the applicant's well location plat, proposed site-specific drilling and well construction plans, Department staff's site visit, and GIS-based location screening, using the most current data available. Oil and gas staff consults and coordinates with staff in other Department programs when site review and the application documents indicate an environmental concern or potential need for another Department permit.

When the application documents described above demonstrate conformance with the GEIS, SEQRA is satisfied and no Determination of Significance or Negative or Positive Determination under SEQRA is required. In that event Staff files a record of consistency with the GEIS. For the permit issuance actions identified in the Findings Statement as potentially significant, or other projects where circumstances exist that prevent a consistency determination, the Department's Full Environmental Assessment Form¹³ is required and a site specific determination of significance is made. Examples since 1992 where this determination has been made include underground gas storage projects, well sites where special noise mitigation measures are required, well sites that disturb more than two and a half acres in designated Agricultural Districts, and geothermal wells drilled in proximity to New York City water tunnels. Wells closer than 2,000 feet to a municipal water supply well would also require a Supplemental EIS (if closer than 1,000 feet) or a site-specific determination, but none have been permitted since 1992.

¹⁰http://www.dec.ny.gov/docs/materials_minerals_pdf/geisfindorig.pdf

¹¹http://www.dec.ny.gov/docs/materials_minerals_pdf/eaf_dril.pdf

¹²http://www.dec.ny.gov/docs/materials_minerals_pdf/dril_req.pdf

¹³http://www.dec.ny.gov/docs/permits_ej_operations_pdf/longeaf.pdf

1.4.2 SEQRA and Leasing of State Land for Oil and Gas Development

The Department evaluated the action of leasing of state land for oil and gas development under SEQRA and found no significant environmental impact associated with that action.¹⁴ Lease clauses and the permitting process with its attendant environmental review mitigate any potential impacts that could result from a proposal to drill.

1.5 Pipeline Regulation

As explained in Chapter 3 of the GEIS, project application review for natural gas wells does not include gas gathering or transmission lines (and ancillary facilities such as compression stations) for several reasons but primarily because (1) the Public Service Commission, not the DEC, has jurisdiction over the siting of transmission lines and (2) at the time of well permit issuance, there is no certainty that any pipelines will be constructed. However, Department permits are required if an environmentally sensitive area such as a stream or wetland would be disturbed. Because these permit reviews are done when the decision is made to construct a pipeline rather than as part of the well permit review process, pipeline regulation is not included in this draft scope.

2.0 DESCRIPTION OF PROPOSED ACTION

The Department proposes to use a Supplement to the Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Program to assess the environmental impacts from the issuance of permits to drill, deepen, plug back or convert wells for horizontal drilling and high-volume hydraulic fracturing in the Marcellus Shale and other low-permeability natural gas reservoirs. Review will be focused on topics not addressed by the original GEIS, with emphasis on potential impacts associated with the large volumes of water required to hydraulically fracture horizontal shale wells using the slick water fracturing technique.

In addition to potential impacts associated with large fluid volumes, including those relating to the composition, storage, and disposal of the fluids, each of the anticipated actions listed in Section 1.4 will also involve activities and potential impacts that are addressed by the existing GEIS and the 1992 Findings. Therefore, for background and to put the discussion of the above anticipated actions into context, this scoping document includes narrative which describes those activities and the conclusions reached in 1992. However, it is not the Department's intent or objective to re-open the 1992 Findings for any activity that was reviewed in the GEIS and which will remain consistent. The dSGEIS will only address new activities or new potential impacts. Those activities and potential impacts identified by the Department are bulleted in the below text and summarized in Section 6 of this document. In order to avoid duplication, and to ensure that the SGEIS serves to complement the GEIS, interested persons are urged to carefully review the GEIS, which may be found online at <http://www.dec.ny.gov/energy/45912.html>, in connection with the preparation of any comments.¹⁵

¹⁴ Supplemental Findings Statement, April 19, 2003
(http://www.dec.ny.gov/docs/materials_minerals_pdf/geisfindsup.pdf)

¹⁵ The GEIS also includes a glossary of technical terms which may be accessed for reference online at http://www.dec.ny.gov/docs/materials_minerals_pdf/dgeisgloss.pdf.

2.1 Natural Gas Drilling and Production

Chapters 9 and 10 of the GEIS comprehensively discuss well drilling, completion and production operations, including potential environmental impacts and mitigation measures. As described below, the dSGEIS will include additional discussion on horizontal drilling and hydraulic fracturing. The history of hydrocarbon development in New York through 1988 is also covered in the GEIS.

As noted in the GEIS, New York has a long history of natural gas production. The first gas well was drilled in 1821 in Fredonia, and the 40 billion cubic feet ("bcf") of gas produced in 1938 remained the production peak until 2004 when 46.9 bcf were produced. More than 50 bcf have been produced each year since then.

Well owners reported 6,683 producing natural gas wells in New York in 2007, nearly half of which are in Chautauqua County. With 1,056 square miles of land in Chautauqua County, 3,280 reported producing wells equates to three producing wells per square mile. Actual drilled density where the resource has been developed is somewhat greater than that, because not every well drilled is currently producing and some areas are not drilled. The Department issued 5,229 permits to drill in Chautauqua County between 1962 and 2007, or nearly five permits per square mile. Of those permits, 65% or 3,396 were issued during a 10-year period between 1975 and 1984, for an average rate of 340 permits per year in a single county. Although the number of wells is lower, parts of Seneca and Cayuga County have also been densely drilled. Many areas in all three counties – Chautauqua, Seneca and Cayuga – have been developed with gas wells on 40-acre spacing (i.e., 16 wells per square mile). Therefore, although the Department does not expect the rate of Marcellus drilling in any single county to match the peak Chautauqua County rate, it is worthwhile to note that the pre-1992 drilling rate and density were part of the experience upon which the GEIS and its findings are based.

Other New York counties with actively producing gas wells reported in 2007 were: Allegany, Broome, Cattaraugus, Chemung, Chenango, Erie, Genesee, Livingston, Madison, Niagara, Oneida, Ontario, Oswego, Schuyler, Steuben, Wayne, Wyoming and Yates.

2.1.1 Horizontal Drilling

Except for the use of specialized downhole tools, horizontal drilling is performed using the same equipment and technology as vertical drilling, with the same protocols in place for aquifer protection, fluid containment and waste handling.

The first horizontal well in New York was drilled in 1989, and in 2007 approximately 10% of the well permit applications issued by the Department were for directional or horizontal wells. The predominant use of horizontal drilling associated with natural gas development in New York has been during the past several years for production from the Black River and Herkimer formations. The combination of horizontal drilling and hydraulic fracturing is widely used in other areas of the United States as a means of recovering gas from tight shale formations.

- *The dSGEIS will examine whether there are any potential environmental impacts associated with horizontal drilling itself that have not already been sufficiently reviewed and mitigated.*

2.1.2 Hydraulic Fracturing

Hydraulic fracturing consists of pumping a fluid and a propping agent ("proppant") such as sand down the wellbore under high pressure to create fractures in the hydrocarbon-bearing rock. No blast or explosion is created by the hydraulic fracturing process. The proppant holds the fractures open, allowing hydrocarbons to flow into the wellbore after injected fluids are recovered. Hydraulic fracturing technology was first developed in the late 1940s. It is estimated that as many as 90% of wells drilled in New York are hydraulically fractured.

The GEIS discusses, in Chapter 9, hydraulic fracturing operations using water-based gel and foam, and described the use of water, hydrochloric acid and additives including surfactants, bactericides,¹⁶ clay and iron inhibitors and nitrogen. The fracturing fluid is an engineered product; service providers vary the design of the fluid based on the characteristics of the reservoir formation and the well operator's objectives. In the late 1990's, operators in other states developed a technology known as "slick water fracturing" to develop shale formations, primarily by increasing the amount and proportion of water used, reducing the use of gelling agents and adding friction reducers. Any fracturing fluid may also contain scale and corrosion inhibitors.

Both slick water fracturing and foam fracturing have been proposed for Marcellus Shale development. As foam fracturing is already discussed in the GEIS, the dSGEIS will focus on slick water fracturing. The two operators who have applied to date for permits to drill horizontal shale wells and stimulate them with high-volume slick water fracturing propose to use 2.1 to 2.4 million gallons of fresh water per well. More or less water may be used at other wells or by other operators. Both present applicants specify that fresh water will be obtained either from municipal suppliers or surface water intakes approved by the Susquehanna River Basin Commission, brought to the site by tanker trucks, and stored on-site in lined pits or steel tanks.

Concerns have been raised with respect to the potential for groundwater contamination from gas well drilling and hydraulic fracturing. Department regulations presently require, and will continue to require, that freshwater aquifers be sealed behind cemented steel pipe before a well is drilled to the depth where hydraulic fracturing will occur, which is typically thousands of feet below the aquifers. Therefore, the injected fluid does not come into contact with groundwater; it is, in fact, injected into and recovered through a wellbore that has been specifically constructed to safely convey hydrocarbons under pressure to the surface without negatively impacting fresh water aquifers. The Department has no record of any documented instance of groundwater contamination caused by hydraulic fracturing for gas well development in New York, despite the use of this technology in thousands of wells across the state during the past 50 or more years. Division of Mineral Resources staff responsible for permitting and oversight of gas well drilling since 1980 also do not recall any such instance.

¹⁶ Bactericides must be registered for use in New York in accordance with ECL §33-0701.

However, as with the produced hydrocarbons, proper fluid containment and handling of fluids at the surface before, during and after drilling is critical. Potential impacts of improper surface handling of fracturing fluids discussed in the GEIS and the few incidents recalled or recorded by Department staff are all associated with accidental discharges of small quantities, primarily of returned fluids, or flowback, in which any additives would be significantly diluted. To date no spill or discharge of chemical fracturing fluid additives in their pure, undiluted liquid or solid form has ever been reported to the Department, nor has the Department documented any environmental degradation that could be attributable to such an event.

The GEIS reviewed the regulatory program and available mitigation measures and did not find that hydraulic fracturing or the use of additives in that operation should change the conclusion that issuance of a standard, individual permit to drill is a non-significant action under SEQRA. Existing regulatory controls and requirements preclude any exposure pathway to the produced hydrocarbons and the components of the fracturing fluid which makes it possible for those hydrocarbons to be extracted. The fluid used for slick water fracturing is typically comprised of more than 99% fresh water.

Notwithstanding the above discussion, because of the larger fluid volumes required for slick water fracturing of horizontal wells and because questions have been raised about whether the additives used pose a pollution or contamination risk, particularly to ground water, the dSGEIS will review the following topics:

- *Information about fracturing fluid additives collected from service companies and chemical suppliers.*
- *Fluid handling and whether any additional controls are required.*

2.1.2.1 Fluid Handling at the Well Site

Fluids are handled at the well site both before and after hydraulic fracturing. Before fracturing, fresh water, sand and any other additives are delivered separately to the well site, in accordance with Department of Transportation regulations. Additives may be delivered in solid or liquid form, in sealed sacks, tanks or other containers. Water is delivered in tanker trucks that may arrive over a period of days or weeks, and may be stored onsite in tanks or lined pits. Blending occurs upon pumping into the cased and cemented wellbore, so that there is no long-term on-site storage of pre-mixed fracturing fluid.

Returned fluids, or flowback, may be directed to tanks or lined pits. The GEIS describes (a) unchecked flow through a valve into a lined pit, (b) flow through a choke into the pit, and (c) flow to tanks, and describes the potential problems associated with each. It was not found necessary to prescribe the use of any one of the three flowback methods. The Department additionally concluded, in the GEIS, that regulations detailing pit liner specifications are unnecessary because adequate maintenance is more critical to halting pollution than the initial specifications. Emphasis instead is on a general performance standard and on proper liner maintenance, which are monitored by Department field inspectors.

Given the fluid volumes associated with high-volume hydraulic fracturing of horizontal shale wells, the dSGEIS will include the following:

- *Examination of whether pit liner specifications should be required for high-volume hydraulic fracturing flowback operations.*
- *Assessment of whether steel tanks should be required in some or all areas to contain flowback fluids from high-volume hydraulic fracturing operations.*

2.1.2.2 Fluid Removal from Well Site and Ultimate Disposition of Returned Fluids

Every well permit issued by the Department specifies that fluids must be removed from the well site by a hauler with a valid Part 364 Waste Transporter Permit issued by the Department. Fluids must be removed before the pit is reclaimed and "[u]nder no circumstances may operators fill in a pit before removing waste fluids."¹⁷ Pits must be reclaimed within 45 days of operations ending, unless the Department approves an extension for good cause after inspecting the pit's condition.

Potential destinations for removed fluids discussed in the GEIS include:

- injection wells, which are regulated under both the Department's State Pollutant Discharge Elimination System (SPDES) and the federal Underground Injection Control program,
- out-of-state industrial treatment plants, and
- occasionally, local sewage treatment facilities.¹⁸

Reuse/recycling at other wells and injection for enhanced resource recovery in oil fields have also been suggested, and as described in Section 4 of this scope, the Susquehanna River Basin Commission is considering a proposed rule that would encourage reuse of produced brine and flowback.

¹⁷GEIS, p. 9-44

¹⁸ Road spreading for dust control and deicing (by a Part 364 Transporter with local government approval) is also discussed in the GEIS as a general disposition method used in New York for well-related fluids, but the most useful well-related fluid for this use is concentrated gas well production brine, not spent fracturing fluid. Operators are not expected to propose road-spreading as a disposal option for spent fracturing fluid from shale wells.

With respect to fluid disposal for flowback from high-volume hydraulic fracturing operations, the dSGEIS will include:

- *Review of information the Department is presently collecting from operators regarding volume and composition of the spent fracturing fluid.*
- *Examination of each of the above disposal options along with others that may be suggested during scoping, discussion of the limitations or regulatory controls that apply to each, and determination of whether any additional controls are warranted. This will include a review of the suitability and implications of fluid disposal at permitted municipal waste water treatment plants.*
- *Evaluation of the feasibility of requiring reuse/recycling of fracturing flowback fluids.*
- *Evaluation of potential well permitting procedures, such as verification of a disposal well permit or contract with a specific treatment plant, to ensure that available capacity exists for any proposed disposal destination.*

2.1.2.3 Trade Secret or Confidential Commercial Status of Additive Formulas or Constituents

Concerns have been expressed that some fracturing fluid constituents may be proprietary, and protected from disclosure under the federal Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA).

The New York State Public Officer's Law and the Department's Records Access Regulations govern the handling of any information submitted by or on behalf of applicants to the Department that is claimed to be trade secret or confidential commercial information as those terms are expressly defined.¹⁹ Neither the fact that a fracturing fluid formula may be considered proprietary, nor that the fact that EPCRA does not apply to the oil and gas extraction industrial sector, prevents the Department from requiring that the information be submitted for review by DEC, and where appropriate NYS Department of Health staff, if necessary to ensure that environmental protection and public health and safe drinking water objectives are met.

2.1.3 Well Testing

Wells are typically tested after drilling and stimulation to determine their productivity, economic viability, and design criteria for a pipeline gathering system if one needs to be constructed. If no gathering line exists, well testing necessitates that produced gas be flared. Regulations require the Department's approval for any flaring longer than a 48-hour cleanup period after completion or stimulation plus a 24-hour test period. Flare approvals typically require (1) notification to the appropriate Division of Mineral Resources field office, local officials, law enforcement, fire departments and adjacent landowners, (2) adequate wellhead design and equipment to control the

¹⁹ See 6 NYCRR 616.7(c)(2)(i) for these definitions, available at <http://www.dec.ny.gov/regs/4491.html#18083>

well, (3) proper fluids handling and disposal, (4) proper construction and maintenance of flare equipment to prevent damage to surrounding vegetation, (5) minimization of night flaring to the extent practical and (6) an on-site presence by company personnel.

- *The dSGEIS will consider whether any aspects of testing shale wells after high-volume hydraulic fracturing warrant additional regulatory control.*

2.1.4 Natural Gas Production

After stimulation and testing, completion equipment and any fracturing fluid tanks are removed and a production wellhead and gas gathering system are installed. As described in Chapter 10 of the GEIS, various gas treatment equipment may also be required to remove water and impurities from the extracted gas so that it is suitable for sale into a transmission pipeline. A brine tank will be installed on site if necessary. The storage of production brine in on-site pits has been prohibited in New York since 1984.

Any pits used for drilling or stimulation operations are reclaimed and the site is re-graded to the extent feasible to match it to the adjacent terrain. Department inspectors visit the site to confirm full restoration of areas not needed for production.

The GEIS states that "[P]roducing wells and their associated facilities usually cover only 10 to 15 percent of the original drillsite."²⁰ This statement was based on single-well drill pads. Drilling of multiple wells from common pads is anticipated for Marcellus Shale development, and is viewed favorably because it reduces the number of long-term production sites and may reduce the overall per-well acreage devoted to production and gathering facilities, resulting in less ground disturbance.

- *The dSGEIS will examine the likelihood of larger production well pads to determine whether there are any associated environmental impacts not addressed by the GEIS.*

2.1.5 Well Plugging

Unsuccessful wells and wells whose productive life is over must be properly plugged and abandoned, in accordance with Department-issued plugging permits and under the oversight of Department field inspectors. Proper plugging is critical for the continued protection of groundwater, surface water bodies and soil. Financial security to ensure funds for well plugging is required before the permit to drill is issued, and must be maintained for the life of the well.

When a well is plugged, downhole equipment and uncemented pipe must be removed from the wellbore, and cement must be placed across critical intervals to ensure seals between hydrocarbon and water-bearing zones. These downhole cement plugs supplement the cement seal that already exists at least behind the surface (fresh-water protection) casing and above the completion zone behind production casing. Most wells drilled in primary and principal aquifers will have been cemented to surface behind each casing string.

²⁰GEIS, p 10-1

Intervals between plugs must be filled with a heavy mud or other approved fluid. For gas wells, in addition to the downhole cement plugs, a minimum of 50 feet of cement must be placed in the top of the wellbore to prevent any release or escape of hydrocarbons or brine from the wellbore. This plug also serves to prevent wellbore access from the surface, eliminating it as a safety hazard or disposal site.

Removal of all surface equipment and full site restoration are required after the well is plugged.

The plugging requirements summarized above are described in detail in Chapter 11 of the GEIS and are enforced as conditions on plugging permits.

2.1.6 Well Density

The number of wells that may exist per square mile is dictated by reservoir geology and productivity, mineral rights distribution, and statutory well spacing requirements set forth in ECL Article 23, Title 5, as amended in 2008. The well spacing requirements have no relationship to the environmental reviews and do not authorize any specific type of drilling technology; regardless of the well spacing, each well undergoes an individual review in connection with the permit process. The statute provides three statewide spacing options for shale wells:

Vertical wells – Statewide spacing for vertical shale wells provides for one well per 40-acre spacing unit.²¹ This is the spacing requirement that has historically governed most gas well drilling in the State, and as mentioned above, many square miles of Chautauqua, Seneca and Cayuga counties have been developed on this spacing. One well per 40 acres equates to 16 wells per square mile (i.e., 640 acres). The wells within any given area will not all be drilled at once, and previously drilled sites will be reclaimed as or before new locations are drilled. Infill wells, resulting in more than one well per 40 acres, may be drilled upon justification to the Department that they are necessary to efficiently recover gas reserves. Again, however, by the time an infill well is drilled, the sites of any previously drilled wells in the 40-acre spacing unit will have been partially reclaimed. As stated in the GEIS and repeated above, production sites with one well per pad typically take up only 10 to 15% of the acreage used for drilling operations. Gas well development on 40-acre spacing, with the possibility of infill wells, was the prevalent gas well development method in New York prior to the GEIS (and remains so today) and is, therefore, part of the experience upon which the 1992 Findings were based.

Horizontal wells in single-well spacing units – Statewide spacing for horizontal wells where only one well will be drilled at the surface site provides for one well per 40 acres, plus the necessary and sufficient acreage to maintain a 330-foot setback between the wellbore in the target formation and the spacing unit boundary. This provision does not provide for infill wells, so the distance between wellbores will always be at least 660 feet. Surface locations may be slightly closer together because of the need to begin turning the wellbore some distance above the target

²¹A spacing unit is the geographic area assigned to the well for the purposes of sharing costs and production. ECL §23-0501(2) requires that the applicant control the oil and gas rights for 60% of the acreage in a spacing unit for a permit to be issued. Uncontrolled acreage is addressed through the compulsory integration process set forth in ECL §23-0901(3).

formation. However, it is likely that this scenario will result in fewer than 16 surface locations per square mile. This conclusion is based on the fact that the horizontal leg of each wellbore within the target formation is likely to be longer than 1,320 feet, which is the distance that would result in a 40-acre rectangular spacing unit. Therefore, spacing units are likely to be larger than 40 acres, and fewer than 16 will fit within a square mile. Although the wells are horizontal, well pads during both the drilling and production phases will be similar in size to those for vertical wells. Hence, horizontal shale drilling with one well per pad would not be expected to result in a well density greater than that contemplated when the GEIS and its Findings were finalized in 1992.

Horizontal wells with multiple wells drilled from common pads - The third statewide spacing option for shale wells provides, initially, for spacing units of up to 640 acres with all the horizontal wells in the unit drilled from a common well pad. While vertical infill wells may be drilled from separate surface locations, with justification, a far smaller proportion of vertical infill wells than 15 per 640-acre unit is expected. Therefore, fewer than 16 separate locations within a square mile area will be affected. Nevertheless, to accommodate multiple wells and wellheads, the initial well pad from which multiple horizontal wells will be drilled will be larger than is typical for single-well pads. With respect to overall environmental impact, however, the larger surface area of the well pad will be offset by the need to construct a single access road and gathering system to service wells on the pad. The size of a multiple well pad will likely be substantially smaller than the cumulative number of acres that would be necessary to accommodate the same number of single-well pads within the same area. This method also provides flexibility to avoid environmentally sensitive locations within the acreage to be developed.

The statute provides for variances from statewide spacing, with justification, which could result in a greater well density. This has always been true. A variance from statewide spacing requires the Department to issue a well-specific spacing order following public comment and, if necessary, an adjudicatory hearing. Environmental impacts associated with any well to be drilled under a spacing order will continue to be reviewed separately from the spacing variance upon receipt of a specific well permit application.

- ***The scenario of multiple horizontal wells drilled from common pads is not specifically reviewed in the GEIS. It will be addressed by the dSGEIS, with emphasis on whether size of the well pad and time needed to drill multiple horizontal wells at the same surface location may cause any potential environmental impact not addressed by the GEIS.***

3.0 GEOLOGY

The GEIS reviews petroleum geology in general as well as New York State's geology with respect to oil and gas production. The dSGEIS will include the following:

- ***Description of the Marcellus and other shale formations and summary of their history of development in New York, if any, along with recent reports on shale potential and reserve estimates.***

- *Discussion of the results of efforts currently underway by the Department to determine if cuttings, spent fracturing fluids, or production water associated with Marcellus drilling contain levels of Naturally Occurring Radioactive Materials ("NORM") that warrant special precautions regarding cuttings or fluids handling and disposal.*²²

4.0 POTENTIAL ENVIRONMENTAL IMPACTS

4.1 Noise, Visual and Air Quality Impacts

Drilling and production operations have local noise, visual and air quality impacts. These are reduced to some extent by surface siting restrictions that establish minimum required distances between well locations and residences, public buildings or other areas where people are expected to gather. The GEIS discusses noise, visual and air quality impacts in terms of both the short-duration well drilling phase – when the well site is, in effect, a small construction site – and the long-term production phase when such impacts are drastically reduced because the equipment used during drilling operations is removed and the areas not needed for production operations are reclaimed.

The GEIS states that most wells in New York State are drilled in less than a week, but that drilling could extend two weeks or longer. Deeper and horizontal wells drilled in recent years have taken longer.

- *The dSGEIS will explore the drilling, hydraulic fracturing, flowback and testing phases for Marcellus shale wells with respect to temporal noise, visual and air quality impacts.*

- *The dSGEIS will examine how the temporal noise, visual and air quality impacts will be experienced at multi-well drilling pads.*

4.1.1 Noise Impacts

Temporary, Short-Term Noise Impacts – As discussed in the GEIS, moderate to significant noise impacts may be experienced within 1,000 feet of a well site during the drilling phase, and will vary with the presence of topographic or vegetative barriers such as hills, trees and tall grass or shrubs. Drilling operations usually continue 24 hours a day. Noise sources during the drilling phase include various drilling rig operations, pipe handling, compressors, and operation of trucks, backhoes, tractors and cement mixing. In most instances, the closest receptor is the residence of the property owner where the well is located and the owner has agreed to the disturbance by entering into a voluntary lease agreement with the well operator. Nevertheless, when necessary because of nearby receptors (regardless of lease status), noise impacts can be

²²The Department concluded in 1999, with respect to production from other rock formations in New York, that "New York State oil and gas production equipment and wastes are not significantly contaminated by naturally occurring radioactive materials (NORM). The concentrations of NORM found on oil and gas production equipment and wastes pose no threat to the public health and the environment." (<http://www.dec.ny.gov/chemical/23473.html>)

mitigated by a combination of site layout to take advantage of existing topography and special permit conditions.

- *The dSGEIS will discuss (1) sources of noise, including truck movement into and out of the site and fluid pumping, associated with the high-volume hydraulic fracturing, flowback and well testing stages for the Marcellus Shale and other low-permeability gas reservoirs that could be developed by horizontal drilling and high-volume hydraulic fracturing and (2) available mitigation measures that may be employed, with reference, as applicable, to Department Program Policy DEP-00-1, Assessing and Mitigating Noise Impacts.*²³

Longer-Term Noise Impacts - Gas well production sites are described by the GEIS as very quiet.

- *The dSGEIS will discuss whether any additional production equipment or activities would be found at Marcellus Shale wells that would necessitate new or different mitigation measures.*

4.1.2 Visual Impacts

The requirement to assess impacts to visual resources was the subject of a topical response in the Final GEIS. The conclusion was that visual impacts from oil and gas drilling and completion activities are primarily minor and short-term, would vary with topography, vegetation, and distance to viewer, and would rarely trigger a need for site-specific comprehensive review or mitigating conditions such as limited drilling hours and camouflage or landscaping of the drill site. Drilling in and adjacent to State Parklands was recognized as "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."²⁴ The Department's *Visual EAF Addendum* is available to conduct a comprehensive review of visual impacts when one is needed.²⁵

Again, the majority of visual impacts associated with gas well drilling are temporary, occurring – similarly to road building or improvement projects, sewer line excavations and other necessary construction activities – during a period of time that is measured in weeks, not years. In addition, the likely drilling of multiple wells from a single, larger site instead of from multiple separate sites will reduce the number of locations where visual impacts will occur.

Temporary, Short-Term Visual Impacts – As with noise, the greatest visual disturbance at a well site is during the drilling stage, which includes stimulation (hydraulic fracturing) and completion operations. The feature which can be seen from the greatest distance is the drilling rig, which could be 100 feet or more tall. The GEIS estimated a maximum visibility threshold of less than two miles for a more typical 80-foot high rig. Other visible features of a drilling site may include:

²³ <http://www.dec.ny.gov/permits/6224.html>

²⁴ p. FGEIS26

²⁵ http://www.dec.ny.gov/docs/permits_ej_operations_pdf/visualeaf.pdf

- construction equipment such as bulldozers and backhoes present during the pre-drilling site preparation work,
- trucks of various sizes driven by the drilling crew and various service providers,
- compressors,
- pipe racks,
- temporary office or work shed ("dog house" in industry jargon), or
- lined pits, tanks or assembled tank trucks holding fluids associated with hydraulic fracturing.

The extent to which these features can be seen from offsite will vary from site to site based on topography, vegetation and other obstructions, and distance to viewing locations.

Longer-Term Visual Impacts - The visual effect of a well site after the drilling phase is determined by whether the well is a producer or a dry hole. In either case, reclamation work must begin with closure of any pit within 45 days of cessation of drilling and stimulation operations. If the well is a dry hole, the site will be graded and seeded and – unless it was heavily forested – little or no permanent visual impact will remain. All that will remain at a producing gas well site is an assembly of wellhead valves that may be about four to eight feet tall (commonly called a "Christmas tree"), with some auxiliary equipment such as a gas meter, a dehydrator, a gas-water separator, a brine tank and a small fire-suppression tank. The site will be substantially reclaimed so that the well pad and attendant access road are smaller and less obtrusive than during the drilling phase. At the end of the well's commercial life, the well will be plugged and the site completely reclaimed so that little or no long-term visual impact remains.

*The dSGEIS will review the factors summarized below in the context of anticipated Marcellus Shale operations, with reference, as applicable, to Department Program Policy DEP-00-2, Assessing and Mitigating Visual Impacts:*²⁶

- *The possibility of larger well pads.*
- *The possibility of larger lined pits for temporary storage of fluids associated with high-volume hydraulic fracturing operations.*
- *Greater number of trucks and tanks associated with multi-stage, high-volume hydraulic fracturing operations.*
- *Longer duration of impacts if multiple wells are drilled from a single surface location.*

²⁶<http://www.dec.ny.gov/permits/6224.html>

- *For informational purposes, the dSGEIS will include photographs of a variety of actual well sites in New York developed since the publication of the GEIS to illustrate their appearance during each stage of operations.*
- *Aerial views of existing densely drilled areas in New York will be included to assess whether cumulative long-term visual impacts exist in areas that have been developed for natural gas production.*
- *The dSGEIS will propose thresholds for site-specific reviews of potential visual impacts in close proximity to the Catskill Forest Preserve, the Upper Delaware Scenic Byway and the Upper Delaware Scenic and Recreational River.*

4.1.3 Air Quality Impacts

According to the GEIS, the primary potential air contaminants attributable to gas well drilling and production are (1) airborne dust from construction activities, including air drilling operations, or traffic on unstabilized access roads, (2) diesel fumes from equipment operation and (3) uncommon accidental uncontrolled flows of methane and hydrogen sulfide.

The impact of dust and exhaust fumes during well drilling and stimulation are short-term and of limited areal extent, similar to other small construction sites. Uncontrolled large flows of methane or hydrogen sulfide into the atmosphere from gas well sites are extremely rare in New York and if they occur would be the result of either accidents or permit violations.

During the production phase, a gas well is a closed system. Any small leaks resulting from equipment wear or failure would have a very minor impact until they are discovered and repaired. Concerns regarding evaporation of pit contents do not arise in New York because precipitation exceeds evaporation and because long-term production pits common in some western states have not been allowed in New York since 1984. Lined pits used during the drilling and stimulation phases must be reclaimed within 45 days after operations end.

- *The dSGEIS will examine whether any anticipated activity at Marcellus or other shale well sites could result in an air quality impact that is not discussed in the GEIS.*

4.1.3.1 Greenhouse Gas Emissions

The Department is currently developing guidance for how greenhouse gas emissions associated with permits the Department issues should be addressed in Environmental Impact Statements. That guidance will be subject to its own public review process before it is finalized, and its implementation with respect to shale gas development will be based on the form and applicability of the final guidance. Therefore, evaluation of greenhouse gas emissions related to shale gas development using horizontal drilling and high-volume hydraulic fracturing is not included in this draft scope but will be addressed as necessary after the Department's guidance is finalized.

4.2 Water Resources

Protection of water resources is a primary emphasis of the Department and the oil and gas regulatory program.

The Department is authorized by statute to require the drilling, casing, operation, plugging and replugging of wells and reclamation of surrounding land to, among other things, prevent or remedy "the escape of oil, gas, brine or water out of one stratum into another" and "the pollution of fresh water supplies by oil, gas, salt water or other contaminants."²⁷

In addition to its specific authority to regulate well operations to protect the environment, the Department also has broad authority to "[p]romote and coordinate management of water . . . resources to assure their protection, enhancement, provision, allocation and balanced utilization . . . and take into account the cumulative impact upon all of such resources in making any determination in connection with any . . . permit . . ."²⁸

4.2.1 Water Withdrawals

Water for hydraulic fracturing is likely to be obtained from surface water bodies away from the well site, including rivers and streams. Equipment or structures such as standpipes installed to obtain water from surface water bodies may require permits under Article 15 of the ECL. In addition, water quality standards established by state regulations prohibit any alteration in flow that would impair a fresh surface waterbody's designated best use.²⁹

Concerns related to surface water withdrawals, including the potential cumulative impact of numerous withdrawals, will be addressed in the dSGEIS. These concerns relate primarily to reduced flow and include:

- ***potential effects on volume of water available for other needs, including public water supply,***
- ***potential denigration of a stream's designated best use,***
- ***potential impacts to downstream wetlands and users and***
- ***potential impacts to fish and wildlife.***

In addition, the dSGEIS will discuss potential mitigation measures to prevent transfer of invasive species from one surface waterbody to another as a result of water withdrawal and subsequent discharge of unused fresh water into another surface waterbody.

²⁷ ECL §23-0305(8)(d)

²⁸ECL §23-0301(1)(b)

²⁹6 NYCRR 703.2

Surface water withdrawals for shale gas development have been proposed in the Susquehanna River Basin, where approval of the Susquehanna River Basin Commission ("SRBC") is required. SRBC has already reviewed and approved a number of projects in Pennsylvania and New York, following the process described below. Proposals are anticipated in the Delaware River Basin, where the Delaware River Basin Commission's ("DRBC") approval is required. Other withdrawal sites may be proposed in the Great Lakes Basin or in other areas where no jurisdictional water withdrawal authority currently exists. Information on each of these basins and the governing Commissions or statutes is provide below to provide background information regarding how the existing jurisdictional authorities review and address the potential water withdrawal impacts listed above.

- *The dSGEIS will evaluate the sufficiency of existing authorities (internal to DEC and external), protocols and regulations for addressing the potential impacts, including cumulative impacts, of water withdrawal associated with shale gas development by high-volume hydraulic fracturing.*

- *The dSGEIS will propose parameters for well-specific review of the identified water source for high-volume hydraulic fracturing. Duplication of an existing authority's efforts will be avoided to the extent possible while still meeting the Department's resource protection objectives.*

- *The dSGEIS will explore the opportunities and standards for alternate sources of water, such as waste water treatment plant effluent, cooling water, or saline aquifers.*

4.2.1.1 Susquehanna River Basin

The Susquehanna River Basin comprises 27,510 square miles in three states (New York, Pennsylvania and Maryland) and drains into the Chesapeake Bay. Twenty-four percent of the basin, or 6,602 square miles, lies within portions of Allegany, Livingston, Steuben, Yates, Ontario, Schuyler, Chemung, Tompkins, Tioga, Cortland, Onondaga, Madison, Chenango, Broome, Delaware, Schoharie, Otsego, Herkimer and Oneida Counties in New York.

The Susquehanna River Basin Commission ("SRBC") was established by a compact among the federal government, New York, Pennsylvania and Maryland to coordinate water resource management activities and review of projects affecting water resources in the basin. New York is represented on the SRBC by a designee of DEC's Commissioner, and DEC has the opportunity to provide input on projects requiring SRBC action.

Focusing its efforts on aspects of water management that do not duplicate State programs, the SRBC regulates consumptive water use and water withdrawals in the basin. SRBC considers injection into a subsurface formation as one form of consumptive use. Out-of basin diversions are likewise considered consumptive uses and are also regulated. In addition, SRBC has the authority to review the potential water quality impacts of water diversion into the Basin.

The Susquehanna River is the largest tributary to the Chesapeake Bay, with average annual flow to the Bay of over 20 billion gallons per day. Based upon existing consumptive use approvals

plus estimates of other uses below the regulatory threshold requiring approval, SRBC estimates current maximum use potential in the basin to be 882.5 million gallons per day. Projected maximum consumptive use in the Basin for gas drilling, calculated by SRBC based on twice the drilling rate in the Barnett Shale play in Texas, is about 28 million gallons per day as an annual average.³⁰

SRBC has announced that, effective October 15, 2008, all water use and withdrawals associated with shale gas development will be subject to SRBC regulation regardless of the rate of use or withdrawal. Among the stated objectives of SRBC's regulation are protection of water supplies, fish and aquatic life and recreation during periods of low flow. Regulated consumptive users must mitigate for consumptive use through storage, conservation releases or payments to SRBC to fund storage or other mitigation projects.

Prior to recommending approval of a proposed water withdrawal, SRBC staff evaluates potential adverse impacts to water resources and other water uses, and conducts an environmental impact screening. SRBC staff inspects the proposed withdrawal site and performs an in-stream species evaluation. To ensure consideration of the cumulative impact of water withdrawals, the proposed new withdrawal is evaluated in the context of previously approved intakes upstream and downstream. SRBC has the authority to adjust previously approved withdrawal rates if deemed necessary. Emphasis is placed on downstream effects during periods of low flow, and potential impacts on aquatic resources, competing users and in-stream flow uses. Water withdrawals are limited to the quantity and rate "needed to meet the reasonably foreseeable needs of the project sponsor"³¹ and the approved withdrawal quantity and rate may be less than was requested. Project sponsors must certify to the SRBC the property owner's permission to access the proposed withdrawal location.

Approvals include metering, monitoring, record-keeping and reporting requirements, and many projects include a "passby flow requirement" which specifies the minimum quantity of water that must pass a specific point downstream of the water intake in order for a withdrawal to occur. In the case where stream flow is less than the proscribed minimum quantity, withdrawals would have to cease. To date, SRBC approvals related to gas shale development have limited withdrawal rates to ten percent of the lowest average, consecutive seven-day natural or continuously augmented flow that would occur once every ten years (i.e., 10% of Q7-10). SRBC policy specifies that no passby flow requirement is necessary for such a low rate of withdrawal because impacts are minimal.³² As these withdrawal rates are already based on anticipated low flow conditions, reduction or discontinuance of the withdrawals during actual periods of low flow should not be necessary.

In addition to the impact evaluation associated with the withdrawal quantity, SRBC requires that the project design its water intake to minimize potential aquatic impacts associated with

³⁰<http://www.srbc.net/programs/projreviewmarcellustier3.htm>

³¹SRBC Policy No. 2003-1

³²Ibid.

impingement and entrainment³³ and that appropriate controls or treatment are put in place to prevent the spread of aquatic invasive or nuisance species.

Finally, in accordance with SRBC policy to not duplicate State programs, SRBC does not regulate the disposition of the hydraulic fracturing fluids that flow back after well stimulation, which have commingled with deep connate water. However, SRBC does require that the project demonstrate that all flowback and produced fluids, including brines, have been treated and disposed of in accordance with applicable state and federal law.

The SRBC reserves the right to reopen or modify any approval if necessary to mitigate or avoid adverse impacts and to protect public health, safety, welfare or the environment. SRBC's approval is contingent upon the project sponsor's obtaining any and all other required federal, state and local permits and approvals, and SRBC has authority to take enforcement actions when necessary.

SRBC's approval is also required for consumptive water uses where, instead of a new withdrawal, the project sponsor proposes to acquire water from a previously approved source such as a public water supply. An administrative "approval by rule" process is currently available for the consumptive use of water withdrawn from a public water supply. SRBC is considering a proposed rule-making to refine this process for projects related to shale gas development, requiring all consumptive use approvals to be obtained through an expanded approval by rule process that does not limit the source of water to public water supply systems. Among other sources, it would allow for and encourage re-use of water from sources such as flowback, production brines, and other waste waters that would otherwise be discharged.

SRBC and the Department have engaged in discussions regarding coordination between the two agencies with respect to shale gas development projects. These discussions will continue during the scoping period and will include the Department's Divisions of Mineral Resources, Water, and Fish, Wildlife & Marine Resources.

4.2.1.2 Delaware River Basin

Including Delaware Bay, the Delaware River Basin comprises 13,539 square miles in three states (New York, Pennsylvania, New Jersey). Eighteen and a half percent of the basin, or 2,362 square miles, lies within portions of Broome, Chenango, Delaware, Schoharie, Green, Ulster, Sullivan and Orange Counties in New York. This acreage overlaps with New York City's West of Hudson Watershed; the Basin supplies about half of New York City's drinking water and 100% of Philadelphia's supply.

The Delaware River Basin Commission ("DRBC") was established by a compact among the federal government, New York, New Jersey and Delaware to coordinate water resource management activities and review of projects affecting water resources in the basin. New York

³³ Entrainment occurs when aquatic organisms, including small fish larvae and eggs, are killed because water withdrawal removes them from their natural habitats. The addition of screening onto the intake pipes can reduce entrainment but will lead to impingement (i.e., trapping and killing) of organisms on those screens.

is represented on the DRBC by a designee of DEC's Commissioner, and DEC has the opportunity to provide input on projects requiring DRBC action.

The DRBC regulates consumptive water use, water withdrawal, transfer of water in and out of the basin and activities that could impact water quality such as fluid storage, injection, discharge and disposal. Like SRBC, DRBC has asserted jurisdiction over all water use and withdrawals associated with shale gas development, regardless of the rate of use or withdrawal. DRBC has identified its areas of concern with respect to natural gas drilling as reduction of flow in streams or aquifers, discharge or release of pollutants into ground water or surface water, and treatment and disposal of hydraulic fracturing fluid. DRBC staff will also review drill site characteristics, fracturing fluid composition and disposal strategy prior to recommending approval of shale gas development projects in the Delaware River Basin. Because no projects have been proposed to date in the New York portion of the Delaware River Basin, the Department's engagement on these issues with the DRBC has not advanced as far as those with the SRBC. However, discussions relative to coordination of site reviews and avoidance of regulatory duplication have begun and will continue throughout the scoping period, and will involve the Department's Divisions of Mineral Resources, Water, and Fish, Wildlife & Marine Resources.

4.2.1.3 Great Lakes Basin

In New York, the Great Lakes Basin is the watershed of the Great Lakes and St. Lawrence River, upstream from Trois Rivieres, Quebec, and includes all or parts of 34 counties.³⁴ With certain exceptions,³⁵ any withdrawal of surface or ground water from the Basin of more than 100,000 gallons per day averaged over a 30 day period must be registered with the Department's Division of Water. However, under the federal Water Resources Development Act of 1986 ("WRDA"),³⁶ any diversion of Great Lakes water out of the basin must be approved by the Governor of each Great Lakes state. The approval process for New York is set forth in ECL §15-1613, and the diversion also requires approval of the Legislature.

The Great Lakes Commission does not have regulatory authority similar to that held by SRBC and DRBC to review water withdrawals and uses and require mitigation of environmental impacts.

4.2.1.4 Assessment of Water Withdrawals for High-Volume Hydraulic Fracturing in the Marcellus Shale and Other Low Permeability Gas Reservoirs

The dSGEIS's proposed parameters for well-specific review of water sources in the Susquehanna and Delaware River Basins will be based upon the Department's conclusions regarding the adequacy of the reviews done, respectively, by SRBC and DRBC.

For well permits which propose new water withdrawals outside the Susquehanna and Delaware River Basins for high-volume hydraulic fracturing of the Marcellus Shale and other

³⁴<http://www.dec.ny.gov/lands/25676.html>

³⁵<http://www.dec.ny.gov/lands/25581.html>

³⁶ PL 99-662

low-permeability formations, and to the extent found necessary within the Basins, the dSGEIS will discuss potential mitigation measures such as, but not limited to:

- *in-stream species evaluation,*
- *assessment of combined impact of the proposed withdrawal and upstream/downstream intakes within a certain distance,*
- *evaluation of impacts to aquatic resources, competing users and the stream's designated best use during periods of low flow,*
- *passby flow requirement,*
- *reduction or discontinuance of the withdrawal during periods of low flow,*
- *limitation of withdrawal rate to that which would maintain compliance with the Department's narrative flow standard for fresh surface water and would cause a minimal impact during low flow periods,*
- *water intake design to minimize aquatic impacts from impingement and entrainment³⁷,*
- *controls or treatment to prevent the spread of aquatic invasive or nuisance species,*
- *evaluation of alternative water sources such as produced brine, flowback, or other available waste water streams, and*
- *requirement for mitigation through water storage or conservation releases.*

- *For well permits which propose new consumptive uses of potable water from public water supply systems, the dSGEIS will additionally address potential aquifer depletion from the incremental increase in withdrawals.*

4.2.2 Groundwater Quality

The Department's oil and gas regulatory program is a groundwater protection program. The GEIS comprehensively evaluates potential scenarios for impacts to groundwater from well drilling, stimulation, completion and plugging operations and includes the conclusions summarized below, which are applicable statewide.

Well Drilling Near Municipal Water Supply Wells – Issuance of a permit to drill less than 1,000 feet from a municipal water supply well is considered "always significant" and requires a site-specific SEIS dealing with groundwater hydrology, potential impacts and mitigation measures.

³⁷ Entrainment occurs when aquatic organisms, including small fish larvae and eggs, are killed because water withdrawal removes them from their natural habitats. The addition of screening onto the intake pipes can reduce entrainment but will lead to impingement (i.e., trapping and killing) of organisms on those screens.

Any proposed well location between 1,000 and 2,000 feet from a municipal water supply well requires a site-specific assessment and SEQRA determination. A site-specific SEIS dealing with groundwater hydrology, potential impacts and mitigation measures may be required for a proposed well between 1,000 and 2,000 feet from a municipal water supply well. For any proposed well within 2,000 feet of a municipal water supply well, all opportunities for public input normally provided under SEQRA are available.

Drilling Through Aquifers – Issuance of oil and gas well permits for locations above aquifers has been evaluated under SEQRA and determined not to have a significant environmental impact. Special aquifer conditions have been developed specifically to protect the groundwater resources of the state, and are required for all locations in designated primary or principal aquifer areas.³⁸ The Draft and Final GEIS satisfy SEQRA for these actions.

Casing and Cementing Practices – Standard casing and cementing practices required for every well dictate that the deepest freshwater zone is sealed behind cemented steel casing before the well is drilled deeper.³⁹ This practice eliminates the possibility of fracturing fluids or naturally occurring contaminants contacting fresh groundwater during any phase of operations but particularly during the pumping of fluids into or out of the well.

Fluid Containment – The GEIS notes that "[a]dverse impacts on groundwater due to stimulation are usually the result of improper fluid handling."⁴⁰ Groundwater contamination by seepage from unlined drilling and production pits has been reported to have occurred in other states. However, the GEIS also notes that "[w]here prudent measures are taken to contain flowback fluids or maintain pit integrity, problems are rare."⁴¹ In New York, drilling pits must be lined and must be reclaimed within 45 days of cessation of drilling and stimulation operations. Standard permit conditions require that all fluids be contained in a water-tight tanks or containers (which includes lined pits) and disposed of properly. In addition, since 1984, the Department has barred the use of long-term production pits. A number of well operators have recently used steel tanks rather than lined pits to capture flowback fluid, and have reported that they intend to continue this practice. Department inspectors check pit, liner and tank integrity. ***As stated above, the dSGEIS will examine whether, under certain defined circumstances, steel tanks should be required for flowback fluids associated with high-volume hydraulic fracturing operations in some or all areas.***

Disposal Wells – Well drilling and production fluids may be taken to disposal wells. These wells operate under State Pollution Discharge Elimination System ("SPDES") permits and federal EPA-Underground Injection Control ("UIC") permits which govern composition of the injected fluids, rates and pressures at which the fluids are injected, the injection zone and area of review, and reporting requirements. Three wells for private oil and gas production brine disposal are currently operating in New York, in Cayuga, Genesee and Livingston Counties. There are currently no operating commercial brine disposal wells in New York.

³⁸ <http://www.dec.ny.gov/energy/42714.html>

³⁹ <http://www.dec.ny.gov/energy/1757.html>

⁴⁰ GEIS, p. 16-17

⁴¹ Ibid.

- *The dSGEIS will evaluate whether anticipated horizontal drilling and high-volume hydraulic fracturing in the Marcellus Shale or other low-permeability formations in New York have the potential to create any groundwater pollution scenario that is not examined by the GEIS or is not addressed by existing requirements and practices.*

4.2.2.1 Safe Drinking Water Act Hydraulic Fracturing Exclusion

The federal Energy Policy Act of 2005 amended the UIC provisions of the Safe Drinking Water Act to exclude hydraulic fracturing from the definition of "underground injection."⁴² The objective of the federal UIC program is to protect underground sources of drinking water from contamination by underground injection of hazardous and non-hazardous fluids. However, protection of groundwater resources during oil and gas extraction activities is a responsibility of state government. In New York, this responsibility is fulfilled by the well construction and fluid handling requirements discussed in the GEIS and summarized above. The cited federal amendment in no way hampers or lessens the Department's authority over oil and gas well development in New York, including oversight of hydraulic fracturing activities to ensure protection of groundwater resources. In addition, the cited exclusion applies only to the use of hydraulic fracturing to develop wells for resource extraction, not to the regulation of brine disposal wells mentioned above regardless of whether the injected brine includes spent fracturing fluid.

4.2.3 Surface Water Quality

Regulations require that wells be sited at least 50 feet away from any public stream, river or other body of water. As discussed above, standard permit conditions require that all fluids be properly contained and disposed. Regulations require that fluid storage at the site shall be for a maximum of 45 days after cessation of drilling operations, unless the Department approves an extension and has inspected and approved the storage facilities.

The GEIS comprehensively addresses numerous potential scenarios for surface water impacts from drilling, completion and production operations, including potential pollution caused by improper containment or accidental spills of fracturing fluids and run-off containing chemicals used in the fracturing process. With respect to returned fracturing fluids, gelling agents, surfactants and chlorides are identified as the components of greatest environmental concern.⁴³ Erosion and sediment control measures discussed below supplement the previously discussed fluid containment requirements for protecting surface water from such pollution. Verification of fluid containment and the absence of runoff into surface water bodies is an essential component of each and every well site inspection conducted by Department staff. Inspectors have the authority to order immediate repairs or shut down any operation that is being conducted in violation of regulations or permit conditions. Accordingly, issuance of well permits which contain standard permit conditions and are subject to the Department's regulations, for locations near surface water bodies when no other Department permit is required, is covered by the 1992

⁴² Pub. L. No. 109-58 § 322, 119 Stat. 694

⁴³ GEIS, p. 9-37

Finding that issuance of a standard, individual oil or gas well drilling permit does not have a significant environmental impact.

- ***The dSGEIS will evaluate whether anticipated water use or other activities associated with Marcellus Shale development in New York, including in proximity to the Upper Delaware Scenic and Recreational River, have the potential to create any surface water impact that is not examined by the GEIS or is not addressed by existing authorities, requirements and practices.***

4.2.3.1 Surface Municipal Water Supplies

The Department's focus on fluid containment and surface water protection – via well siting restrictions, regulations, permit conditions and inspections – serve to protect municipal reservoirs. Furthermore, as discussed in the GEIS, municipal ownership or control of lands surrounding a reservoir effectively preclude oil and gas development unless the municipality leases the land for that purpose or does not control the mineral rights. As more fully described below, ***the dSGEIS will examine whether any additional environmental reviews or special mitigating permit conditions are necessary to protect surface reservoirs in the New York City Watershed.***

4.2.3.2 Stream Disturbance

Well Site Activities – A Stream Disturbance Permit issued by the Department is required for any well site activity that disturbs the bed or banks of a protected stream. The need for this permit is most often related to access road construction, and would be identified during review of the well permit application.

Other Activities – DEC Article 15 permits may also be required to construct water withdrawal infrastructure such as stand pipes. As stated above, ***the dSGEIS will propose parameters for well-specific review of the identified source of water for high-volume hydraulic fracturing operations. The need for an Article 15 permit, if it has not already been obtained, would be identified during this review along with the potential impacts and required mitigation measures.***

4.2.3.3 Erosion and Sedimentation Control

Erosion and sedimentation control measures deemed appropriate by the Regional Minerals Manager must be maintained at all well sites, regardless of size. The determination of what is needed is based upon the field inspector's pre-permit site visit, and the applicant's plan is part of the well permit application. Control measures must be in place prior to the commencement of drilling operations and are verified/inspected during drilling inspections by Department staff. Failure to adhere to an erosion and sedimentation control plan constitutes a violation which may result in the immediate suspension of drilling operations, fines and penalties.

4.2.3.3.1 Clean Water Act Stormwater Exemption

The federal Energy Policy Act of 2005 defined “oil and gas exploration, production, processing, or treatment operations or transmission facilities” to include all field activities and operations related to these facilities “whether or not such field activities may be considered to be construction activities.”⁴⁴ The effect was to exempt well site activities that disturb between one and five acres from the Clean Water Act’s requirement for National Pollution Discharge Elimination System (“NPDES”) stormwater permits for sediment runoff from small construction sites. The Environmental Protection Agency (“EPA”) thereafter modified its NPDES storm water permit regulations to reflect the revision. On May 23, 2008, in *Natural Resources Defense Council vs. USEPA*, the U.S. Court of Appeals for the Ninth Circuit filed an Opinion disagreeing with the EPA’s interpretation of the statute, vacating the modified rule, and remanding the matter back to the EPA for further proceedings. In July 2008, the EPA filed a petition for rehearing with the Court.

The federal exemption now under review has not diminished the Department’s authority to require appropriate erosion and sedimentation controls at all well sites, regardless of their size.

4.2.4 New York City Watershed

The Catskill/Delaware portion of the New York City Watershed, also known as the West of Hudson Watershed, lies within the area of interest for Marcellus and Utica Shale development and includes portions of Schoharie, Greene, Ulster, Sullivan and Delaware Counties. The area includes six surface reservoirs, portions of five underground tunnels or aqueducts, and other infrastructure. Concerns about potential impacts to the New York City Watershed fall into two categories: protection of the subsurface infrastructure and protection of surface water supplies.

Protection of Subsurface Infrastructure – The advent, in the late 1990s and early 2000s, of geothermal well drilling – also regulated under Article 23 of the ECL if the wells are deeper than 500 feet – led to mutually agreed upon protocols between the Department and the New York City Department of Environmental Protection (“NYCDEP”) for processing permits to drill in New York City and Delaware, Dutchess, Greene, Orange, Putnam, Rockland, Schoharie, Sullivan, Ulster and Westchester Counties. The Department agreed to notify NYCDEP of any proposed well in the counties outside of New York City, so that NYCDEP could determine if the proposed location is within a 1,000-foot wide protective corridor surrounding a water tunnel or aqueduct. For any well outside the corridor, the Department processes the permit application following its normal procedures without any further NYCDEP involvement. For any well within the corridor, the Department notifies the applicant that the proposed drilling is an unlisted action and may pose a significant threat to a municipal water supply, necessitating a site-specific SEQRA finding. A negative declaration is only filed upon a demonstration to NYCDEP’s satisfaction, through proposed drilling and deviation surveying protocols, that it is feasible to drill at the proposed location with confidence that there will be no impact to tunnels or

⁴⁴Pub. L. No. 109-58 § 323, 119 Stat. 694

aqueducts. NYCDEP is provided with a copy of each application for a permit to drill, and any permit issued requires notification to NYCDEP prior to drilling commencement.⁴⁵

Although the above protocol was developed for geothermal wells, Department staff is considering applying it to all well types regulated under Article 23, including natural gas wells. Except for the horizontal drilling and hydraulic fracturing that may occur thousands of feet below the depth of any tunnel or aqueduct, the methods and technologies for geothermal wells are the same as for natural gas wells.

In July 2008, before the Department announced its intention to prepare the SGEIS, NYCDEP requested that the Department create a "drilling exclusion zone within a 1-mile buffer to all NYC water supply infrastructure including reservoirs, tunnels, shafts, and other appurtenances [and] confirmation that all proposed drilling projects will continue to go through the [SEQRA] process and that there will be opportunity for public review and comment of any determination made under SEQRA."⁴⁶

- *The dSGEIS will evaluate the sufficiency of existing protocols and regulations for protecting New York City's subsurface water supply infrastructure from potential impacts related to gas well drilling and hydraulic fracturing.*

- *The dSGEIS will address the need for any exclusion zone, additional environmental review and additional special permit conditions. Protection of correlative rights with respect to offset drainage from wells on properties adjacent to any exclusion zone will also be considered.*

Protection of Surface Water Supplies – Fluid containment at well sites, erosion and sedimentation control, and protection of surface municipal water supplies are discussed above in Section 4.2.3.

- *As stated above for New York City water supply infrastructure, the dSGEIS will evaluate the sufficiency of existing protocols and regulations for protecting New York City's surface water reservoirs, with consideration of the fact that New York City controls a substantial amount of the acreage surrounding the reservoirs through fee ownership or conservation easements so that drilling would not occur on such acreage without the City's permission. Like any landowner, the City has the right to enter into leases for mineral rights or other use of its lands.*

⁴⁵Letter dated April 18, 2007, from Kathleen F. Sanford (Chief, Permits Section, Bureau of Oil & Gas Regulation, NYSDEC Division of Mineral Resources) to Kenneth E. Moriarty, Director, In-House Design, Bureau of Engineering Design & Construction, NYCDEP).

⁴⁶Letter dated July 18, 2008, from NYCDEP Commissioner Emily Lloyd to Department Commissioner Alexander B. Grannis.

4.3 Significant Habitats and Endangered, Rare or Threatened Species

Oil and gas permitting staff screen every proposed well location using current data in the Department's Master Habitat Databank geographic information system and coordinate with the Division of Fish, Wildlife and Marine Resources if the presence of an endangered, rare or threatened species or significant habitat or plant is indicated. This practice will continue. The GEIS also discusses the significant habitats known to exist at the time in or near then-existing oil and gas fields (heronries, deer wintering areas, and uncommon, rare and endangered plants). However, the potential mitigation measures for preventing harm to these habitats would also apply to others, such as the Upper Delaware Important Bird Area. The mitigation measures discussed in the GEIS include minimum distance between the disturbance and a habitat or occurrence, relocation of a proposed access road or well site, replanting of cover vegetation in disturbed areas, and complete avoidance of specific habitats or plant communities. Seasonal restrictions on drilling operations could also play a role. Potential mitigation measures are not limited to those discussed in the GEIS, but may include other alternatives recommended by Fish, Wildlife and Marine Resources staff based on current techniques and practices.

4.4 Floodplains

The GEIS, in Chapter 8, includes comprehensive guidelines which address site construction in flood prone areas.

- *The dSGEIS will examine whether any additional protections or environmental reviews are needed for drilling sites in floodplains where horizontal drilling and high-volume hydraulic fracturing are proposed.*

4.5 Freshwater Wetlands

Well Site Activities – Every proposed well location is checked both in the field and using the Department's Master Habitat Databank geographic information system to determine if any disturbance will occur within 100 feet of a freshwater wetland. State and/or federal wetlands permits may be required prior to development.

Two permitting programs are involved with regulating freshwater wetlands in New York State. First, the Freshwater Wetlands Act (Article 24 of the ECL) regulates activities within 100 feet of any wetland shown on the DEC regulatory wetlands maps. Generally, Article 24 regulates larger wetlands (greater than 12.4 acres), but does regulate some smaller wetlands of unusual local importance. Second, the Protection of Waters Act (Article 15, Title 5 of the ECL) regulates excavation and fill in wetlands connected to all navigable waters regardless of size.

The federal government regulates development activities in wetlands under Section 404 of the Clean Water Act.

Mitigation measures for avoiding wetland impacts are described in Chapter 8 of the GEIS, which provides that well permits are issued for locations in wetlands only when alternate locations are not available. Potential mitigation measures are not limited to those discussed in the GEIS, but may include other alternatives recommended by Fish, Wildlife and Marine Resources staff based on current techniques and practices.

Activities Away from the Well Site – Water withdrawals upstream from a wetland to provide water for hydraulic fracturing may affect the wetland. As stated in Section 4.2.1 of this document, ***the dSGEIS will propose parameters for well-specific review of the identified water source for high-volume hydraulic fracturing. The proposed parameters will address review of potential impacts to downstream wetlands.***

4.6 Road Use

High-volume hydraulic fracturing will result in more truck traffic than is associated with traditional drilling and well stimulation operations in New York. Hundreds of truck loads of water will be brought to and from each site. This will occur during a weeks-long period prior to hydraulic fracturing, and will occur over a similar period after fracturing operations have been completed. Much less traffic will occur during the producing life of a well.

The ECL specifies that local governments retain jurisdiction over local roads. Therefore, early coordination between operators and local governments is strongly encouraged. In addition, the SGEIS will address potential mitigation measures to ameliorate the impacts of short-term, high-volume truck traffic, such as:

- route selection to maximize efficient driving and public safety,
- avoidance of peak traffic hours, school bus hours, community events, and overnight quiet periods,
- coordination with local emergency management agencies and highway departments,
- upgrades and improvements to roads that will be traveled frequently for water transport to and from many different well sites,
- advance public notice of any necessary detours or road/lane closures,
- adequate off-road parking and delivery areas at the site to avoid lane/road blockage, and
- use of rail or temporary pipelines where feasible to move water to and from well sites.

4.7 Cumulative Impacts

Cumulative Surface Disturbance Impacts – The 1992 Findings Statement defines project scope as an individual well, with project size defined as the surface acreage affected by development. The number of wells which will ultimately be drilled cannot be known in advance, in large part because the productivity of any particular formation at any given location and depth is not known until drilling begins. Changes in the market and other economic conditions also have an impact on whether and how quickly individual wells are drilled. Each site resembles a small construction site (usually less than five acres) during the weeks-long drilling and hydraulic fracturing phases. However, because companies employ a limited number of drilling rigs and personnel, rather than a cumulative impact, oil and gas development operations present more of a "rolling" impact, with activity moving from place to place, and previously drilled sites fully or partially reclaimed as new sites are drilled.

It will take years, if not decades, for the Marcellus Shale to be fully developed, and once drilling operations are completed and sites reclaimed the longer term impact will consist of widely spaced and partially re-vegetated production sites and fully reclaimed plugged and abandoned well sites. As detailed in Section 2.1.6 of this document, overall well density is not likely to be greater than was experienced and envisioned when the GEIS and its Findings were finalized and certified in 1992.

- ***Evaluation of potential cumulative impacts in the dSGEIS will include an examination of the potential rate of development for the Marcellus Shale, with consideration given to potential constraints in available capacity for both water withdrawal and flowback disposal.***

Other Cumulative Impacts – The emission and discharge of pollutants into the atmosphere, or into ground and surface water from shale gas development will only occur as a result of violations or accidents. The regulatory program for oil and gas wells is not a discharge permitting program, but rather contemplates no significant discharges as part of the permitted activity. Accordingly, there is no basis for assessing cumulative impacts of these types of discharges. Should any emissions or discharges occur, they will be subject to enforcement and remediation. Cumulative impacts of water withdrawals are addressed by the Susquehanna and Delaware River Basin Commissions for intakes within the basins.

- ***As stated in Section 4.2.1 of this document, the dSGEIS will propose parameters for well-specific review of the identified water source for high-volume hydraulic fracturing. Potential cumulative impacts from multiple water withdrawal will be addressed. Duplication of an existing authority's efforts will be avoided to the extent possible while still meeting the Department's resource protection objectives.***
- ***Evaluation of cumulative impacts of water withdrawal will consider the scale of other everyday withdrawals, the non-continuous nature of withdrawals for well development, and the likely time frame for taking into account the natural replenishment of water sources.***

4.8 Community Character

As with the noise and visual impacts discussed above, any potential negative community impact occurs primarily during the drilling phase, which includes stimulation and completion. The impacts are similar to those of a construction site, analogous to road improvement or sewer excavation projects, with similar potential for temporary community impacts. Possible societal impacts described in Chapter 16 of the GEIS⁴⁷ include (1) the possibility of injury to humans or the environment if site access is not properly restricted to prevent accidents or vandalism and (2) temporal noise or visual impacts. Road use may also affect a community. Temporary land use conflicts are identified in the discussion of unavoidable adverse impacts in Chapter 19 of the GEIS. Potential positive impacts from gas development identified in the GEIS include the availability of clean-burning natural gas, generation of State and local taxes, revenues to landowners, and the multiplier effects of private investment in the State. The GEIS identifies increased human activity and access to remote areas provided by the access roads as secondary impacts, with the former again more intense during the drilling phase.

The dSGEIS will include the following with respect to community impacts:

- *Evaluation of whether any aspect of high-volume hydraulic fracturing of shale wells could be expected to change the GEIS's conclusion that major long-term changes to land use patterns, traffic and the need for public services are not anticipated as the result of gas well development.*⁴⁸
- *Evaluation of whether drilling and high-volume hydraulic fracturing of horizontal shale wells have any potential positive or negative community impact, including potential environmental justice impacts.*
- *Evaluation of potential economic and energy supply impacts of developing the Marcellus Shale and other low-permeability reservoirs in New York.*

5.0 PERMIT PROCESS AND REGULATORY COORDINATION

The well permit application process and the Department's use of a shortened Environmental Assessment Form ("EAF") are described in Section 1.4.1 of this document. In the spring of 2008, the Department began directing applicants for shale well permits to file the Full EAF, supplemented with information on fracturing fluid volumes, composition, handling and disposal. Likewise, Pennsylvania's Department of Environmental Protection has announced an addendum to its drilling application form that is now required for proposed Marcellus wells.⁴⁹ Two other agencies, the Susquehanna and Delaware River Basin Commissions, have or are in the process of developing new application forms for activities they regulate related to shale gas development.

- *The dSGEIS will include a proposed EAF Addendum for shale well applications in New York that include plans for high-volume hydraulic fracturing.*

⁴⁷ GEIS, pp. 16-10 and 16-11

⁴⁸ GEIS, pp. 3-10 and 3-11, as clarified on page FGEIS54

⁴⁹ <http://164.156.71.80/WXOD.aspx?fs=7780d840f80b00008000179c0000179c&ft=1>

As referenced throughout this document and summarized in Chapter 15 of the GEIS, oil and gas staff coordinate application review with other DEC Divisions and various outside agencies, including, when necessary, the New York State Department of Health. This coordination will continue.

• The dSGEIS will examine the extent of necessary additional coordination with other agencies such as the Susquehanna and Delaware River Basin Commissions, the New York City Department of Environmental Protection, and the National Park Service which reviews projects in the Upper Delaware Scenic and Recreational River corridor on behalf of the Upper Delaware Council. It should be noted that DEC is already represented on both River Basin Commissions and on the Upper Delaware Council, and is actively engaged with NYCDEP regarding protection of the City's drinking water supply.

5.1 Public and Local Government Participation

Under current law, regulations, the GEIS and its Findings, and the Department's routine procedures, the opportunities for local government or public input regarding environmental concerns related to permits to drill oil and gas wells are as follows.

• If the Department determines that drilling, stimulation and completion of the proposed well is consistent with the standards described in the GEIS, then the permit is issued with a condition that the permittee must notify any local government and affected surface owner prior to commencing operations [ECL §23-0305(13)]. The New York City Department of Environmental Protection would be included in this notification for any wells permitted within the NYC Watershed.

• The dSGEIS will consider whether the Department should require the notification to include other information such as anticipated truck traffic or any planned shipments of spent fluids to municipal waste water treatment plants, which would provide the opportunity for local governments to interact directly with the permittee or the waste hauler regarding these issues, and to involve the public as the municipality may deem appropriate.

• Oil and gas staff typically provide direct notification to local officials of permit applications in areas where drilling has not previously occurred. The purpose of this notification is to alert local governments of potential activities in their area so they can begin to address to the extent they deem necessary any matters related to local authority, such as local road use or input to waste water treatment plants.

• Local governments are notified of any proposed wellsite construction within 100 feet of Special Flood Hazard Areas and given an opportunity to comment, and the applicant must comply with local floodplain development regulations.

• Applications received are posted in the Division's public on-line searchable database on the Department's website. Division staff welcomes input from the surface owner and

neighbors during the application review and pre-site inspection, and may impose specific permit conditions to address environmental concerns if appropriate.

- Upon commencement of operations, Division staff responds to any complaints regarding noise or other issues raised by the public or local governments. Staff can direct remedial measures be taken if necessary, or can order operations shut down if a violation exists.

For the following actions which were found in 1992 to be significant or potentially significant under SEQRA, the process will continue to include all opportunities for public input normally provided under SEQRA:

- Issuance of a permit to drill in State Parklands.
- Issuance of a permit to drill within 2000 feet of a municipal water supply well.
- Issuance of a permit to drill that will result in disturbance of more than 2.5 acres in an Agricultural District.

The final SGEIS will be followed by a Findings Statement which will determine the level of public involvement required for the actions evaluated. Proposed Findings will be included in the dSGEIS.

6.0 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Potential environmental impacts and mitigation measures identified above for review in the dSGEIS are repeated below for convenience.

Well Site Operations

- Whether there are any potential environmental impacts associated with horizontal drilling itself that have not already been sufficiently reviewed and mitigated.
- Information about fracturing fluid additives collected from service companies and chemical suppliers.
- Fluid handling and whether any additional controls are required.
 - Examination of whether pit liner specifications should be required for high-volume hydraulic fracturing flowback operations.
 - Assessment of whether steel tanks should be required in some or all areas to contain flowback fluids from high-volume hydraulic fracturing operations.

- Consideration of whether any aspects of testing shale wells after high-volume hydraulic fracturing warrant additional regulatory control.
- Examination of the likelihood of larger production well pads to determine whether there are any associated environmental impacts not addressed by the GEIS.
- Review of whether size of the well pad and time needed to drill multiple wells at the same surface location may cause any potential environmental impact not addressed by the GEIS.
- Description of the Marcellus and other shale formations and summary of their history of development in New York, if any, along with recent reports on shale potential and reserve estimates.
- Discussion of the results of efforts currently underway by the Department to determine if cuttings, spent fracturing fluids, or production water associated with Marcellus drilling contain levels of Naturally Occurring Radioactive Materials (“NORM”) that warrant special precautions regarding cuttings or fluids handling and disposal.
- Examination of the drilling, hydraulic fracturing, flowback and testing phases for Marcellus shale wells with respect to temporal noise, visual and air quality impacts.
- Examination of how the temporal noise, visual and air quality impacts will be experienced at multi-well drilling pads.
- Discussion of (1) sources of noise, including truck traffic and fluid pumping, associated with the high-volume hydraulic fracturing, flowback and well testing stages for the Marcellus shale and other low-permeability reservoirs that could be developed by horizontal drilling and high-volume hydraulic fracturing and (2) available mitigation measures that may be employed, with reference, as applicable, to Department Program Policy DEP-00-1, *Assessing and Mitigating Noise Impacts*.
- Whether any additional production equipment or activities would be found at Marcellus Shale wells during the production phase that would necessitate new or different noise mitigation measures.
- Review of the following factors with respect to visual impacts, with reference, as applicable, to Department Program Policy DEP-00-2, *Assessing and Mitigating Visual Impacts*:
 - The possibility of larger well pads.
 - The possibility of larger lined pits for temporary storage of fluids associated with high-volume hydraulic fracturing operations.
 - Greater number of trucks and tanks associated with multi-stage, high-volume hydraulic fracturing operations.

- Longer duration of impacts if multiple wells are drilled from a single surface location.
- For informational purposes, photographs of a variety of actual well sites in New York developed since the publication of the GEIS to illustrate their appearance during each stage of operations.
- Aerial views of existing densely drilled areas in New York to assess whether cumulative long-term visual impacts exist in areas that have been developed for natural gas production.
- Proposed thresholds for site-specific reviews of potential visual impacts in close proximity to the Catskill Forest Preserve, the Upper Delaware Scenic Byway and the Upper Delaware Scenic and Recreational River.
- Whether anticipated activity at Marcellus or other shale well sites could result in an air quality impact that is not discussed in the GEIS.
- Whether anticipated horizontal drilling and high-volume hydraulic fracturing in the Marcellus Shale or other low-permeability formations have the potential to create any groundwater or surface water pollution scenario that is not examined by the GEIS or is not addressed by existing authorities, requirements and practices. This will include sufficiency of existing protocols and regulations for protecting water quality standards in the Upper Delaware Scenic and Recreational River.
- Whether any additional protections or environmental reviews are needed for floodplain sites where horizontal drilling and high-volume hydraulic fracturing are proposed.

Water Withdrawal

- Concerns related to surface water withdrawals, including the potential cumulative impact of numerous withdrawals, including:
 - Potential effects on volume of water available for other needs, including public water supply,
 - Potential denigration of a stream's designated best use,
 - Potential impacts to downstream wetlands and
 - Potential impacts to fish and wildlife.
- Potential mitigation measures to prevent transfer of invasive species from one surface waterbody to another as a result of water withdrawal and subsequent discharge of unused fresh water into another surface waterbody.

- Sufficiency of existing authorities (internal to DEC and external), protocols and regulations for addressing potential impacts of reduced stream flow, including cumulative impacts of water withdrawal associated with shale gas development by high-volume hydraulic fracturing
- Proposed parameters for well-specific review of the identified water source for high-volume hydraulic fracturing. Duplication of an existing authority's efforts will be avoided to the extent possible while still meeting the Department's resource protection objectives.
- Opportunities and standards for alternate sources of water, such as waste water treatment plant effluent, cooling water, or saline aquifers.
- Potential mitigation measures for new water withdrawals where necessary, including:
 - In-stream species evaluation,
 - Assessment of combined impact of the proposed withdrawal and upstream/downstream intakes within a certain distance,
 - Evaluation of impacts to aquatic resources, competing users and the stream's designated best use during periods of low flow,
 - Passby flow requirement,⁵⁰
 - Reduction or discontinuance of the withdrawal during periods of low flow,
 - Limitation of withdrawal rate to that which would ensure compliance with the Department's narrative flow standard for fresh surface water and would cause a minimal impact during low flow periods,
 - Water intake design to minimize aquatic impacts from impingement and entrainment (see footnote 32),
 - Controls or treatment to prevent the spread of aquatic invasive or nuisance species,
 - Evaluation of alternative water sources such as produced brine, flowback or other available waste water streams, and
 - Requirement for mitigation through water storage or conservation releases.
 - For new consumptive uses from public water supplies, potential aquifer depletion from the incremental increase in water withdrawal.

⁵⁰ A "passby flow requirement" specifies the minimum quantity of water that must pass a specific point downstream of the water intake. Withdrawals would have to cease if stream flow is less than the prescribed minimum quantity.

Fluid Disposal

- Review of information the Department is presently collecting from operators regarding volume and composition of the spent fracturing fluid.
- Examination of the disposal options discussed in the GEIS along with others that may be suggested during scoping, discussion of the limitations or regulatory controls that apply to each, and determination of whether any additional controls are warranted. This will include a review of the suitability and implications of fluid disposal at permitted municipal waste water treatment plants.
- Evaluation of the feasibility of requiring reuse/recycling of fracturing flowback fluids.
- Evaluation of potential well permitting procedures, such as verification of a disposal well permit or contract with a specific treatment plant, to ensure that available capacity exists for any proposed disposal destination.

New York City Watershed

- Inclusion of the New York City Department of Environmental Protection in the notification required by ECL §23-0305(13) for well permits issued in the Watershed.
- Sufficiency of existing protocols and regulations for protecting New York City's surface water reservoirs, with consideration of the fact that New York City controls a substantial amount of acreage surrounding the reservoirs through fee ownership or conservation easements so that drilling would not occur on such acreage without the City's permission.
- Sufficiency of existing protocols and regulations for protecting New York City's subsurface water supply infrastructure from potential impacts related to gas well drilling and hydraulic fracturing.
- The need for any exclusion zone, additional environmental review and additional permit conditions. Protection of correlative rights with respect to offset drainage from wells on properties adjacent to any exclusion zone will also be considered.

Cumulative Impacts

- Examination of the potential rate of development for the Marcellus Shale, with consideration given to potential constraints in available capacity for both water withdrawal and flowback disposal.
- Evaluation of the cumulative impacts of multiple water withdrawals, considering the scale of other everyday withdrawals, the non-continuous nature of withdrawals for well development, and the likely time frame for taking into account the natural replenishment of water sources. Duplication of an existing authority's efforts will be avoided to the extent possible while still meeting the Department's resource protection objectives.

Community Character

- Evaluation of whether any aspect of high-volume hydraulic fracturing of shale wells could be expected to change the GEIS's conclusion that major long-term changes to land use patterns, traffic and the need for public services are not anticipated as the result of gas well development.
- Evaluation of whether drilling and high-volume hydraulic fracturing of horizontal shale wells have any potential positive or negative community impact, including potential environmental justice impacts.
- Evaluation of potential economic and energy supply impacts of developing the Marcellus Shale and other low-permeability reservoirs in New York.

Permit Process and Local Government Coordination

- Proposed EAF Addendum for shale wells proposed to be developed in New York using high-volume hydraulic fracturing techniques.
- The extent of necessary additional coordination with other agencies such as the Susquehanna and Delaware River Basin Commissions, the New York City Department of Environmental Protection, and the National Park Service which reviews projects on behalf of the Upper Delaware Council in the Upper Delaware Scenic and Recreational River corridor.
- Whether the Department should require pre-spud local government notification to include information about anticipated road use and any planned shipments of spent fluids to municipal waste water treatment plants, which would provide the opportunity for local governments to interact directly with the permittee or the waste hauler regarding these issues, and to involve the public to the extent they deem appropriate.

7.0 ALTERNATIVE ACTIONS

Chapter 21 of the GEIS and the 1992 Findings Statement discussed a range of alternatives concerning resource development in New York State that included its prohibition and the removal of regulation. Regulation as described by the GEIS was found to be the best alternative. Regulatory revisions recommended by the GEIS have been incorporated into permit conditions, which have been continuously improved since 1992.

- *Alternatives to be reviewed by the dSGEIS will include (1) the prohibition of development of Marcellus Shale and other low permeability reservoirs by horizontal drilling and high-volume hydraulic fracturing and (2) other alternatives, if any, developed through the scoping process.*