

FINAL 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**

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February 6, 2009

Final 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	7
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	12
2.1.2.2 Fluid Removal From Well Site and Ultimate Disposition of Returned Fluids	13
2.1.2.3 Trade Secret Status of Additive Formulas or Constituents	15
2.1.2.4 Re-Fracturing	16
2.1.3 Well Testing	16
2.1.4 Natural Gas Production	16
2.1.5 Well Plugging	17
2.1.6 Well Density	17
3.0 GEOLOGY	19
4.0 POTENTIAL ENVIRONMENTAL IMPACTS	20
4.1 Noise, Visual and Air Quality Impacts	20
4.1.1 Noise Impacts	20
4.1.2 Visual Impacts	21

4.1.3 Air Quality Impacts	23
4.1.3.1 Greenhouse Gas Emissions	24
4.2 Water Resources	24
4.2.1 Water Withdrawals	24
4.2.1.1 Susquehanna River Basin	26
4.2.1.2 Delaware River Basin	28
4.2.1.3 Great Lakes Basin	28
4.2.1.4 Assessment of Water Withdrawals for High-Volume Hydraulic Fracturing in the Marcellus Shale and Other Low-Permeability Gas Reservoirs	29
4.2.2 Groundwater Quality	30
4.2.2.1 Safe Drinking Water Act Hydraulic Fracturing Exclusion	32
4.2.3 Surface Water Quality	32
4.2.3.1 Surface Municipal Water Supplies	33
4.2.3.2 Stream Disturbance	33
4.2.3.3 Erosion and Sedimentation Control	33
4.2.3.3.1 Clean Water Act Stormwater Exemption	34
4.2.4 New York City Watershed	34
4.3 Significant Habitats and Endangered, Rare or Threatened Species	36
4.4 Invasive Species	37
4.5 Floodplains	37
4.6 Fresh Water Wetlands	37
4.7 Road Use	38
4.8 Cumulative Impacts	39
4.9 Community Character	40
4.9 Areas of Historic, Architectural, Archeological, and Cultural Significance	41
5.0 PERMIT PROCESS AND REGULATORY COORDINATION	42
5.1 Public and Local Government Participation	42
6.0 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	44
7.0 ALTERNATIVE ACTIONS	50
8.0 TOPICS NOT INCLUDED IN THE FINAL SCOPE	51
8.1 Concerns Not Appropriate for a Generic Environmental Impact Statement	51
8.1.1 Prohibitions/Off-Limits Areas	51
8.1.2 Concerns to be Addressed by Site-Specific Review	51
8.1.3 Staffing Concerns	51
8.1.4 Enforcement Concerns	51
8.1.5 Determinations Regarding Exemption from Disclosure of Chemical Information	52
8.1.6 Health Impact Assessments / Epidemiological Studies	52
8.1.7 Other Issues	53
8.2 Mapping	53

8.3 Issues Addressed by Prior Environmental Review	54
8.3.1 Proposed New Setback Requirements	54
8.3.2 Concerns Related to Past Incidents and Occurrences	55
8.4 Concerns Which Require Legislative Action	55
8.5 Practices or Concerns Not Relevant in New York	56
8.6 Planning and Policy Concerns	56

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”).

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 Final 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 were considered in the preparation of this Final Scope. The Department’s next step will be to release the dSGEIS 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 process and, as appropriate, 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 Final 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, (5) removal of spent fracturing fluid from the well site and its ultimate disposition and (6) potential impacts at well sites where multiple wells will be drilled during a three-year period. 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 is also discussed.

Narrative background and context included in this document 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 Final 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>.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, Delaware and Tioga Counties, the Department expects to receive applications to drill in other areas including counties 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 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 Final 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 Greene, 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.

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;

⁶ 6 NYCRR 617.10(c)

⁷ 6 NYCRR 617.10(d)(1)

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

- 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 may have one or more significant adverse environmental impacts which were 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 three key factors: (1) required water volumes in excess of GEIS descriptions, (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, and (3) longer duration of disturbance at multi-well drilling sites.

(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.

(3) *Multi-well pads:* Well operators have suggested that as many as 16 horizontal wells could be drilled at a single well site, or pad. While this method will result in fewer disturbed surface locations, it will also result in a longer duration of disturbance at each drilling pad than if only one well were drilled there. ECL §23-0501(1)(b)(1)(vi) requires that all horizontal infill wells in a multi-well shale unit be drilled within three years of the date the first well in the unit commences drilling. The potential impacts of this type of multi-well project are not addressed in the GEIS.

⁹ 6 NYCRR 617.10(d)(4)

This Final Scope outlines the topics which will 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 River, Delaware River or Great Lakes-St. Lawrence River Basins
 - Well location in basins
 - Well location outside basins (diversion)

- Issuance of well permit for high-volume hydraulic fracturing with proposed water source outside the Susquehanna River, Delaware River or Great Lakes-St. Lawrence River Basins
 - Well location outside basins
 - Well location in basins (diversion)

- 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

- Issuance of a well permit for horizontal shale development from a multi-well pad, pursuant to ECL §23-0501(1)(b)(1)(vi) which requires that all horizontal infill wells in a multi-well shale unit be drilled within three years of the date the first well in the unit commences drilling.

Public scoping sessions were held in November and December, 2008, at six venues in the Southern Tier and Catskills. A total of 188 verbal comments were received at these sessions. In addition, over 3,770 written comments were received (via e-mail, mail, or written comment card). Of these, roughly 3,080 were form letters of various types. All of these comments have been read and reviewed by Department staff.

This 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 further site-specific review, but none have been permitted since 1992.

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.

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

¹⁴ Supplemental Findings Statement, April 19, 2003

(http://www.dec.ny.gov/docs/materials_minerals_pdf/geisfindsup.pdf)

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 lines¹⁵ and (2) at the time of well permit issuance, there is no certainty that any pipelines will be constructed. However, when a decision is made to construct a pipeline, Department permits are required if an environmentally sensitive area such as a stream or wetland would be disturbed. It is impossible to predict in advance where or how many such areas will be affected by pipeline or gathering line construction.

- *The dSGEIS will describe pipelines and associated facilities likely to be associated with a multi-well shale gas production site, and*
- *The dSGEIS will describe the environmental review process for pipelines and identify potential measures to prevent or minimize adverse impacts.*

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 and the longer duration of disturbance associated with multi-well sites.

In addition to the unique potential impacts associated with shale development, 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, potential impacts, and related topics for investigation 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>.¹⁶

¹⁵ Siting of major utility transmission facilities, governed by Article VII of the Public Service Law, are not subject to SEQRA review. See 6 NYCRR 617.5(c)(35).

¹⁶ 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, while recognizing that some aspects of shale development activity will be different from what is described in the GEIS, it is worthwhile to note that this pre-1992 drilling rate and site 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.*
- *The dSGEIS will review the potential impacts of multi-well site development, considering the requirement in ECL §23-0501(1)(b)(1)(vi) that all horizontal infill wells in a multi-well shale unit be drilled within three years of the date the first well in the unit commences drilling. In conjunction with the temporal noise, visual and air quality impacts referenced in Section 4 of this Final Scope, this review will also evaluate the need for a larger setback from private buildings or dwellings.*
- *The dSGEIS will also address the management and disposal of the larger volume of cuttings at multi-well sites.*

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 describes the use of water, hydrochloric acid and additives including surfactants, bactericides,¹⁷ 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.

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

¹⁷ Bactericides must be registered for use in New York in accordance with ECL §33-0701. Well operators, service companies, and chemical supply companies were reminded of this requirement in an October 28, 2008 letter from the Division of Mineral Resources formulated in consultation with the Division of Solid and Hazardous Materials. This correspondence also reminded industry of the corresponding requirement that all bactericides be properly labeled and that the labels for such products be kept on-site during application and storage.

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.

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 95% fresh water. The Department is collecting information and developing a database on the chemical constituents of the additives discussed above. The chemical manufacturing companies and the service companies that perform the fracturing are submitting chemical composition information on the different additives that may be proposed for use in fracturing shale formations in New York State. Operators will not be issued a well permit until the Department has complete chemical composition information for all of the proposed additives.

Notwithstanding the above discussion regarding casing, cementing and proper fluid handling, 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:

- ***Chemical composition of fracturing fluid additives proposed for fracturing shale formations in New York. This information will be shared with other appropriate Divisions within DEC, including the Division of Water (“DOW”), as well as with the NYS Department of Health and will be reviewed to determine if applicable standards and regulations are sufficient to prevent or mitigate potential impacts of their use and management.***

- *The feasibility of requiring use of green or non-chemical fracturing technologies and additives.*
- *Fluid handling at the surface and whether any additional controls are warranted.*
 - *Hydraulic fracturing design and modeling, with emphasis on containment of fractures and fracturing fluid in the target formation. The dSGEIS will review the available methodologies for ensuring containment, and evaluate the design parameters that should be included in well permit applications for staff review prior to permit issuance.*
 - *The effectiveness of the regulations of other oil and gas producing states with high volume hydraulic fracturing of shale and other low-permeability reservoirs. This evaluation will consider the advisability of adopting additional protective measures based on those that have proven successful in other states for similar activities.*

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."¹⁸ 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 ("UIC") program,
- municipal sewage treatment facilities, and
- out-of-state industrial treatment plants.

Injection Wells - Discussed in Chapter 15 of the GEIS, injection wells for disposal of brine associated with oil and gas operations are classified as Class IID in EPA's Underground Injection Control program and require federal permits. As stated in Section 4.2.2.1 of this document, the requirement for a UIC permit is not affected by the fact that hydraulic fracturing itself is excluded from the Safe Drinking Water Act's definition of "underground injection." Even if the brine disposal well is authorized to accept spent fracturing fluid, the UIC permit is still required. Under the Department's SPDES program, these wells have been categorized and regulated as discharges. The primary objective of both programs is protection of underground sources of drinking water, and neither the EPA nor the DEC issues a permit without a demonstration that injected fluids will remain confined in the disposal zone and isolated from fresh water aquifers.

A well permit issued by the Division of Mineral Resources is also required to drill or convert a well deeper than 500 feet for brine disposal. This permit is not issued until required UIC and SPDES permits have been approved. As noted in the 1992 Findings Statement, the permitting process for brine disposal wells "require[s] an extensive surface and subsurface evaluation which is in effect a supplemental EIS addressing technical issues. An additional site-specific environmental assessment and SEQR determination are required."

Because the Department is not seeking to reduce the level of site-specific review required for disposal wells, or to make generic SEQRA findings regarding their potential environmental impacts, the permitting process for brine disposal wells will not be reviewed in the dSGEIS.

Municipal sewage treatment facilities – Municipal sewage treatment facilities, known as Publicly Owned Treatment Works ("POTWs") are regulated by the Department's Division of Water

¹⁸GEIS, p. 9-44

(“DOW”). DOW notified POTW operators in a December 8, 2008 letter that they may not accept hydraulic fracturing wastewater or produced fluids from gas well development unless they have an approved pre-treatment or mini-pretreatment program, and an approved headworks analysis for these fluids.¹⁹

Any headworks analysis will require specific information regarding the fluids, including chemical makeup data, with specific attention paid to the concentration of total dissolved solids and aquatic toxicity data. Representative fluid samples will need to undergo laboratory testing to support a POTW’s headworks analysis, and such testing must be conducted by a laboratory certified by the New York State Department of Health (“NYSDOH”) Environmental Laboratory Approval Program (“ELAP”).²⁰

The Division of Mineral Resources has been providing, and will continue to provide, DOW with all information pertaining to the chemical composition of the hydraulic fracturing additives in an effort to assist in the review of any headworks analysis received. The Division of Water will review the headworks analysis and determine whether the POTW has adequately evaluated the effects of the proposed discharge on POTW operation, sludge disposal, effluent quality and POTW health and safety; whether the discharge will result in the discharge of a substance that will be subject to effluent limits, action levels, or monitoring requirements in the facility’s SPDES permit; and whether the proposed discharge contains any Bioaccumulative Chemicals of Concern or persistent toxic substances that may be subject to SPDES effluent limits or other Department permit requirements or controls. If necessary after the review of the headworks analysis, the Division of Water will modify a POTW’s SPDES permit so that the treatment operations are protected and discharge effluent limits and water quality standards are met in accordance with 6 NYCRR §750-1.18 (4).²¹ Such a modification would be subject to public review.

Road-Spreading - 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. In January 2009, the Division of Solid and Hazardous Materials (“DSHM”), responsible for oversight of the Part 364 program, released a notification to haulers applying for, modifying, or renewing their Part 364 permit that fracturing fluids obtained during flowback operations may not be spread on roads and must be disposed of at facilities authorized by the Department or transported for use or re-use at other gas or oil wells where acceptable to the Division of Mineral Resources. This notice specifies that only production brines may be used in road spreading and that any entity applying for a Part 364 permit or permit modification to use production fluid for road spreading must submit a petition for a beneficial use determination (“BUD”) to the Department. The BUD and Part 364 permit must be issued by the Department prior to any production brine being removed from a well site.

Other Options - Reuse/recycling at other wells, use of existing or new private in-state waste water treatment plants, and injection for enhanced resource recovery in oil fields have also been

¹⁹ An overview of POTWs and headworks analyses is available at <http://www.dec.ny.gov/chemical/8728.html>

²⁰ A current listing of ELAP laboratories is available at <http://www.wadsworth.org/labcert/elap/elap.html>

²¹ The regulations pertaining to obtaining a SPDES permit and operating in accordance with a SPDES permit can be accessed at <http://www.dec.ny.gov/regs/4585.html> and <http://www.dec.ny.gov/regs/4584.html>, respectively.

suggested, and as described in Section 4 of this scope, the Susquehanna River Basin Commission has finalized a rule which may encourage reuse of produced brine and flowback.

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 (other than road-spreading which has been prohibited), 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.*
- *Examination of whether additional waste tracking and manifesting requirements are necessary.*
- *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 to the Department that is claimed to be trade secret or confidential commercial information as those terms are expressly defined.²² 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. As previously stated, the Department requires full disclosure to the Department of all additives used in hydraulic fracturing prior to well permit issuance. Permits are only issued if complete chemical composition of each additive has been provided to the Department.

²² See 6 NYCRR 616.7(c)(2)(i) for these definitions, available at <http://www.dec.ny.gov/regs/4491.html#18083>

2.1.2.4 Re-Fracturing

Notification to and approval by the Department have not been required for routine well workover or servicing operations that do not result in alterations to a well's downhole casing configuration or designated use and status.

- ***Because of the possibility, not addressed in the GEIS, for additional high-volume hydraulic fracturing subsequent to the initial well completion, the dSGEIS will address the potential impacts of re-fracturing wells and will evaluate the need for additional procedures to avoid or mitigate such impacts.***

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 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."²³ This statement was based on single-well drill pads. Drilling of multiple wells from somewhat larger common pads is anticipated for Marcellus Shale development.

²³GEIS, p 10-1

- *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.

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 and well sites 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 are based on subsurface geologic and reservoir characteristics, 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.²⁴ This is the spacing requirement that has historically governed most gas well

²⁴A 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).

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 in adjacent spacing units 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 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 land disturbance, however, the larger surface area of the well pad will be offset by the need for only 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

Chapter 5 of the GEIS reviews petroleum geology in general as well as New York State's geology with respect to oil and gas production, and includes generalized geologic maps along with a stratigraphic column for southwestern New York.

In collaboration with the Department's Division of Solid and Hazardous Materials, the Division of Mineral Resources has started collecting data to determine if cuttings, spent fracturing fluids, or production water associated with Marcellus drilling contain elevated levels of Naturally Occurring Radioactive Materials ("NORM"). Elevated NORM concentrations may subject oil and gas workers to unnecessary radiation exposure, and concerns have been raised about public exposure through reuse of contaminated equipment or from improper disposal of cuttings or fluids. Analysis methods include field surveys and sample surveys using gamma ray spectroscopy. Data is being collected from vertical wells that target the Marcellus or deeper formations. In addition to collecting data at the sites of current wells, the Division is also working with well operators and the New York State Museum to obtain samples of cuttings and cores from previously completed wells.

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. Stratigraphic columns for central and southeastern New York will be included.***
- Analysis of NORM data and review of any required special precautions for cuttings or fluids handling and disposal.²⁵***

²⁵The 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>)

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 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.*²⁶

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."²⁷ The Department's *Visual EAF Addendum* is available to conduct a comprehensive review of visual impacts when one is needed.²⁸

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:

- 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,

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

²⁷p. FGEIS26

²⁸http://www.dec.ny.gov/docs/permits_ej_operations_pdf/visualeaf.pdf

- 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:²⁹

- ***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, 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.***

²⁹<http://www.dec.ny.gov/permits/6224.html>

- *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 from permanent or long-term production pits common in some western states do not arise because such pits 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 the following topics with respect to potential air quality impacts at well sites where horizontal drilling and high-volume hydraulic fracturing will be employed:

- *6 NYCRR Part 212³⁰ applicability and potential local impacts of air toxics and odors at well sites, based on a reasonable worst-case scenario for expected emissions of natural gas contaminants and hydraulic fracturing additives. Modeling will be in accordance with Department Policy DAR-1, Guidelines for the Control of Toxic Ambient Air Contaminants.³¹*
- *Applicability and possible impacts of 40 CFR 63 Subpart HH³² with respect to ongoing well operations such as gas dehydration.*
- *Investigation of the potential applicability of major source status under 6 NYCRR Part 201³³ for diesel equipment that may be present at multi-well sites for more than 30 days.*
- *Investigation of possible impacts on ozone attainment.*

³⁰ <http://www.dec.ny.gov/regs/4264.html>

³¹ <http://www.dec.ny.gov/chemical/30681.html>

³² <http://www.epa.gov/ttn/atw/oilgas/fr03ja07.pdf>

³³ <http://www.dec.ny.gov/regs/4304.html>

- *Investigation of the expected amount of sulfur dioxide emissions to determine if mitigation measures such as requiring low-sulfur fuel are advisable.*

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 final 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."³⁴

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 . . ."³⁵

4.2.1 Water Withdrawals

Water for hydraulic fracturing may be obtained from groundwater withdrawals or withdrawals from surface water bodies away from the well site. With respect to withdrawal from surface water bodies such as rivers and streams, equipment or structures such as standpipes 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.³⁶ The primary concern regarding groundwater withdrawal is aquifer depletion that could affect other uses.

The following concerns related to water withdrawals, including the potential cumulative impact of numerous withdrawals, will be addressed in the dSGEIS.

³⁴ ECL §23-0305(8)(d)

³⁵ ECL §23-0301(1)(b)

³⁶ NYCRR 703.2

- *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,*
- *potential impacts to fish and wildlife, and*
- *potential aquifer depletion.*

The dSGEIS will also 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.

Surface water withdrawals for shale gas development have been proposed in the Susquehanna and Delaware River Basins, where approval of the Susquehanna River Basin Commission ("SRBC") and Delaware River Basin Commission ("DRBC") are respectively required. SRBC has already reviewed and approved a number of projects in Pennsylvania and New York, following the process described below.

In addition to surface water withdrawals, SRBC and DRBC control diversions of water into and out of their respective basins. While ECL 15-1507 prohibits transport of water out of New York State via pipes, canals or streams without a permit from the Department, it does not specifically prohibit such transport by tanker truck, and neither SRBC nor DRBC control diversions from state-to-state. The recently enacted Great Lakes-St. Lawrence River Water Resources Compact prohibits the bulk transport of water from that basin in containers greater than 5.7 gallons.³⁷ Information on each of these basins and the governing Commissions or statutes is provided below for 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.*

³⁷ 5.7 gallons is the size of a typical water cooler bottle.

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 diversions 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.³⁸ In response to recent development activity associated with the Marcellus Shale formation, the SRBC made an administrative determination, effective October 15, 2008, that all water use and withdrawals associated with shale gas development was 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.

To buttress the administrative determination noted above, the SRBC also undertook a final rulemaking change, effective January 15, 2009, that established a new Approval by Rule process to regulate all consumptive use activity associated with development of the Marcellus and Utica Shales. Under the new rule, consumptive use approvals are issued on a drilling pad basis. Project sponsors may use a broad range of water sources as part of their approvals, including discharges from wastewater treatment facilities and other lesser quality water sources, public water supply systems, and other withdrawals separately approved by the SRBC. These new administrative approvals are issued for a five-year term, and require compliance with all standard monitoring, reporting and consumptive use requirements. The SRBC's existing requirements for review and approval of withdrawals were not affected by the new rule and remain in place.

³⁸<http://www.srbc.net/programs/projreviewmarcellustier3.htm>

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"³⁹ 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.⁴⁰ 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 impingement and entrainment⁴¹ 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 certify 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.

³⁹SRBC Policy No. 2003-1

⁴⁰Ibid.

⁴¹ 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.

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 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, Greene, 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 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 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. Discussions relative to coordination of site reviews and avoidance of regulatory duplication will continue, 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, including the Lake Champlain and Finger Lakes sub-watersheds.⁴² With the exception of water withdrawals subject to Article 15, Title 15 Public Water Supply permits,⁴³ any existing 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.⁴⁴ In addition, effective December 8, 2008, the Great Lakes-St. Lawrence River Basin Water Resources Compact ("Compact") (Title 10 of ECL Article 21) prohibits any new or increased diversion of any

⁴²<http://www.dec.ny.gov/lands/25676.html>

⁴³<http://www.dec.ny.gov/permits/6036.html><http://www.dec.ny.gov/lands/25581.html>

⁴⁴ <http://www.dec.ny.gov/lands/25581.html>

amount of water out of the Great Lakes Basin of New York with certain exceptions.⁴⁵ Also under the Compact, any proposed new or increased withdrawal of surface or ground water that will result in a consumptive use of 5 million gallons per day or greater averaged over a 90-day period requires prior notice and consultation with the Great Lakes-St. Lawrence River Basin Water Resources Council and the Canadian Provinces of Ontario and Quebec. Once New York establishes implementing regulations for the Compact, all new and increased water withdrawals must comply with the Compact's Decision-Making Standard, Section 4.11, which establishes five criteria all water withdrawal proposals must meet, including:

1. The return of all water not otherwise consumed to the source watershed;
2. No significant adverse individual or cumulative impacts shall occur to the quantity or quality of the waters and water-dependent natural resources;
3. Environmentally sound and economically feasible water conservation measures shall be implemented;
4. The withdrawal shall comply with all other applicable federal, state, and local laws as well as international agreements and treaties; and
5. The proposed use of water is deemed reasonable.

However, until New York establishes implementing regulations subject to the Compact, existing requirements for withdrawal registration and diversion approval remain in effect under 6 NYCRR Part 675, and ECL Article 15, Title 16, respectively.

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. However, the new Great Lakes-St. Lawrence River Water Resources Council has specific authority for the review and/or approval of certain new and increased water withdrawals. Review by this Compact Council will require compliance with the Compact's Decision-Making Standard and Standard for Exceptions.

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, including review of the methodologies used to protect a surface water body's designated best use during periods of low flow.

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

- *in-stream species evaluation,*

⁴⁵ ECL Article 21, Title 10

- *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 requirement⁴⁶,*
- *reduction or discontinuance of the withdrawal during periods of low flow,*
- *limitation of withdrawal rates and locations as necessary to maintain compliance with the Department's narrative flow standard for fresh surface water and protect best uses of the water body even during low flow periods,*
- *water intake design to minimize aquatic impacts from impingement and entrainment⁴⁷,*
- *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. 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

⁴⁶ A "passyby 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.

⁴⁷ 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.

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.⁴⁸ 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.⁴⁹ 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."⁵⁰ 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."⁵¹ 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 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.

• 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

⁴⁸ <http://www.dec.ny.gov/energy/42714.html>

⁴⁹ <http://www.dec.ny.gov/energy/1757.html>

⁵⁰ GEIS, p. 16-17

⁵¹ Ibid.

potential to create any groundwater pollution scenario that is not examined by the GEIS or is not addressed by existing requirements and practices. This will include examination of the potential need for setbacks from private water wells and springs used for domestic supply.

• The dSGEIS will evaluate potential requirements for private water well sampling, testing and monitoring by gas well operators.

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."⁵² 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.⁵³ Erosion and sediment control measures discussed below supplement the previously discussed fluid containment requirements for protecting surface water from 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

⁵² Pub. L. No. 109-58 § 322, 119 Stat. 694

⁵³ GEIS, p. 9-37

water bodies when no other Department permit is required, is covered by the 1992 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. This will include the examination of the potential need for increased surface water setbacks for sites where horizontal drilling and high-volume hydraulic fracturing are proposed.

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 must be maintained at all well sites, regardless of size. 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.

- *The dSGEIS will review applicability of the Department’s General Stormwater Permit and the best management practices available to well operators.*

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.”⁵⁴ 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 stormwater 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.

The EPA, in consultation with the New York State Department of Health (“NYSDOH”), issued a Filtration Avoidance Determination (“FAD”) in July 2007 which found that New York City’s watershed protection program for the Catskill/Delaware system meets the requirements for unfiltered water systems.⁵⁵ New York City’s Watershed Rules & Regulations, promulgated in May 1997 pursuant to Article 11 of New York State’s Public Health Law, govern certain land uses and contain specific regulatory requirements in order to ensure water quality protection within the Watershed.⁵⁶

The Department partners with New York City and NYSDOH in ensuring that the FAD requirements are fulfilled, and has committed to working with the New York City Department of

⁵⁴Pub. L. No. 109-58 § 323, 119 Stat. 694

⁵⁵ See http://www.nyc.gov/html/dep/html/watershed_protection/html/regcontext.html, <http://www.epa.gov/Region2/water/nycshed/filtad.htm> and <http://www.dec.ny.gov/lands/25599.html> for more information, including discussion of the 1997 NYC Watershed Memorandum of Agreement and previous FADs.

⁵⁶ http://www.nyc.gov/html/dep/html/watershed_protection/html/regulations.html#

Environmental Protection (“NYCDEP”) to ensure that activities related to gas development do not compromise the FAD. The two agencies will meet regularly while the SGEIS is in development, and DEC has and will share information with NYCDEP regarding well permit applications in the Watershed and in counties where subsurface infrastructure exists.

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 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 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 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.⁵⁷

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."⁵⁸

⁵⁷Letter 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).

⁵⁸Letter dated July 18, 2008, from NYCDEP Commissioner Emily Lloyd to Department Commissioner Alexander B. Grannis.

• 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.

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, including Natural Heritage Program data, 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 Invasive Species

Chapter 26 of the Laws of New York, 2008, amended the Environmental Conservation Law to create the New York Invasive Species Council and define the department's authority regarding control of invasive species in New York.

- *The dSGEIS will review the options available to well operators for controlling invasive species at well sites, as determined through consultation between the Division of Mineral Resources and the Department's Office of Invasive Species.*
- *As stated in Section 4.2.1.4 of this Final Scope, the dSGEIS will discuss potential mitigation measures for preventing the spread of aquatic invasive and nuisance species caused by water withdrawals or transfers.*

4.5 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.*

4.6 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 Department regulates activities within 100 feet of any wetland shown on the DEC regulatory wetlands maps (Article 24 of the ECL). Generally, Article 24 regulates larger wetlands (greater than 12.4 acres), but does regulate some smaller wetlands of unusual local importance. Second, regulates excavation and fill in wetlands connected to all navigable waters regardless of size (Article 15, Title 5 of the ECL).

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.***

4.7 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. Local governments have broad authority under Title 8 of New York State's Vehicle and Traffic Law to regulate road use in their jurisdictions. Therefore, early coordination between operators and local governments is strongly encouraged.

- ***The dSGEIS will describe the types and number of vehicles and trips associated with each stage of typical development at multi-well sites where high-volume hydraulic fracturing will be employed.***

In addition, ***the dSGEIS will identify 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.***

4.8 Cumulative Impacts

The 1992 Findings Statement defines project scope as an individual well, with project size defined as the surface acreage affected by development. 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. 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 occurs. Changes in the market and other economic conditions also have an impact on whether and how quickly individual wells are drilled. In any given area, mineral rights may be held by a variety of entities with a variety of different lease terms, geologic interpretations, drilling budgets and business plans. Because of these factors and because companies employ a limited number of drilling rigs and personnel, oil and gas development operations in New York have historically presented more of a sequential or "rolling" impact than a cumulative impact, with activity moving from place to place and previously drilled sites fully or partially reclaimed as new sites are drilled. History shows that these factors affect the rate and pattern of development of widespread, blanket formations such as the Medina and Queenston formations just as they do geologically constrained reservoirs like the Trenton-Black River. The timing, rate and pattern of development, on either a statewide or local basis, is very difficult to accurately predict.

As detailed in Section 2.1.6 of this document, overall site density is not likely to be greater than was experienced and envisioned when the GEIS and its Findings were finalized and certified in 1992. The Department recognizes in this Final Scope, however, the potential of larger sites, a longer duration of construction-type activities at multi-well sites, and the potential for increased impacts associated with high-volume hydraulic fracturing. In particular, this Scope states that the dSGEIS will review potential noise, visual, air quality and water resources impacts of the proposed action.

- *The dSGEIS will review and assess the information and methodologies that are available for estimating the potential rate of Marcellus Shale development, and will include a description of likely development based on the information and methodology deemed most applicable and appropriate.*
- *The dSGEIS will assess the levels of activity within a reasonable temporal and geographic framework that may result in adverse cumulative impacts with respect to noise, visual effects, air quality and water resources.*
- *The analysis of cumulative water resources impacts will acknowledge and evaluate the methodologies used by SRBC and DRBC to address cumulative impacts related to water withdrawal. 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 withdrawals 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.

• In conjunction with the above analyses, the dSGEIS will describe the measures available to prevent or mitigate significant adverse cumulative impacts associated with individual well pads and within defined geographic areas.

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, except for the factors defined in Section 4.1.3 for review in the dSGEIS, there is no basis for assessing cumulative impacts of these types of discharges. Should any unexpected or illegal emissions or discharges occur, they will be subject to enforcement and remediation.

• The analysis of cumulative water resources impacts will not address discharges governed by the Department's SPDES program, as the SPDES program is specifically designed to address cumulative loading of pollutants each time it issues a permit for a specific discharge.

• The analysis of cumulative air quality impacts will be limited to the factors defined in Section 4.1.3 for review in the dSGEIS.

4.9 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 GEIS⁵⁹ 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 multi-well site development or 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.⁶⁰ This will include

⁵⁹ GEIS, pp. 16-10 and 16-11

⁶⁰GEIS, pp. 3-10 and 3-11, as clarified on page FGEIS54

review of the compatibility of shale gas development with other land uses such as agriculture, tourism, and alternative energy 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.*

4.9 AREAS OF HISTORIC, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL SIGNIFICANCE

As stated in Chapter 8 of the GEIS,⁶¹ the New York State Historic Preservation Act of 1980 requires that all State agencies prevent adverse impacts on the State’s historic and archaeological resources. In order to ensure that drilling activities do not disturb any areas of historic or archaeological significance, Division of Mineral Resources staff currently review, and will continue to review, every permit application using the Geographic Information System (“GIS”) maps available at the State Office of Parks, Recreation and Historic Preservations (“OPRHP”) website.⁶² These maps show the locations of sites listed on the State or Federal Registers of Historic Places and archaeologically sensitive areas.

If a proposed well site falls within a potentially significant area, the applicant must conduct a Phase 1 survey⁶³ for all portions of the project that will involve ground disturbance, and provide the completed survey to OPRHP for review. At OPRHP’s discretion, where substantial prior disturbance can be documented, an area may be exempted from the Phase 1 survey requirement. The Phase 1 survey is designed to determine the presence or absence of archaeological sites or other cultural resources in the project area. OPRHP interacts directly with the applicant and includes Division of Mineral Resources staff on all communications and on its final determination. Alternatively, as noted in Chapter 8 of the GEIS,⁶⁴ the applicant may have an independent archaeological survey conducted and submit the results with the permit application.

The presence of archaeological artifacts or the proximity to a historic site does not necessarily preclude a well permit from being issued. Recovery of archaeological data from the affected area or special conditions such as setbacks greater than existing minimums or restrictions on times of well site operations may satisfy the requirements of the State Historic Preservation Act. Nonetheless, the Department cannot issue a well permit for any site location that requires OPRHP involvement, until OPRHP has made a determination.

⁶¹ GEIS, pp. 8-35

⁶² <http://www.oprhp.state.ny.us/nr/>

⁶³ OPRHP’s report standards for a Phase I survey are available at <http://nysparks.state.ny.us/shpo/environ/forms/ReportStandard.pdf>

⁶⁴ GEIS, pp. 8-37

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.⁶⁵ 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, for public review and comment, a proposed EAF Addendum for shale well applications in New York that include plans for high-volume hydraulic fracturing. Recommendations received during scoping regarding the information that should be required with well permit applications will be evaluated as part of the EAF development process.*

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, and will include, 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.*

- *The dSGEIS will provide an updated version of Table 15.1 in the GEIS⁶⁶ which summarizes the interagency coordination involved in the regulation of oil, gas, solution mining, and brine disposal operations in New York State.*

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

⁶⁵ <http://164.156.71.80/WXOD.aspx?fs=7780d840f80b00008000179c0000179c&ft=1>

⁶⁶ GEIS, pp. 15-1a

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.

• The dSGEIS will investigate appropriate measures and timing for sharing of information with localities to ensure awareness regarding the proposed action and its potential impacts.

• 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 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

The activities, potential environmental impacts, mitigation measures, and related topics identified by the Department 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.
- A review and analysis of the effectiveness of regulations in other oil and gas producing states with high volume hydraulic fracturing of shale and other low-permeability reservoirs, with an evaluation of the advisability of adopting additional protective measures that have proven successful elsewhere.
- Review of whether size of the well pad for drilling multiple wells at the same surface location may cause any potential environmental impact not addressed by the GEIS. This will include examination of disposal of the larger volume of cuttings at multi-well sites.
- Chemical composition of fracturing fluid additives and whether applicable standards and regulations are sufficient to prevent or mitigate potential impacts of their use and management.
 - The feasibility of requiring use of green or non-chemical fracturing technology.
- Fluid handling at the surface and whether 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.
- 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 likelihood of larger production well pads to determine whether there are any associated environmental impacts not addressed by the GEIS.

- Examination of the drilling, hydraulic fracturing, flowback and testing phases for Marcellus shale wells with respect to temporal noise, visual and air quality impacts, with emphasis on multi-well drilling pads and whether these impacts may warrant additional regulatory control including a larger setback from private buildings or dwellings.
 - 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*.
 - A description of the types and number of vehicles and trips associated with each state of typical development of multi-well sites where high-volume hydraulic fracturing will be employed will be included.
 - 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.

- Examination of the following topics with respect to potential air quality impacts at well sites where horizontal drilling and high-volume hydraulic fracturing will be employed:
 - 6 NYCRR Part 212⁶⁷ applicability and potential local impacts of air toxics and odors at well sites, based on a reasonable worst-case scenario for expected emissions of natural gas contaminants and hydraulic fracturing additives. Modeling will be in accordance with Department Policy DAR-1, Guidelines for the Control of Toxic Ambient Air Contaminants.⁶⁸
 - Applicability and possible impacts of 40 CFR 63 Subpart HH⁶⁹ with respect to ongoing well operations such as gas dehydration.
 - Investigation of the potential applicability of major source status under 6 NYCRR Part 201⁷⁰ for diesel equipment that may be present at multi-well sites for more than 30 days.
 - Investigation of possible impacts on ozone attainment.
 - Investigation of the expected amount of sulfur dioxide emissions to determine if mitigation measures such as requiring low-sulfur fuel are advisable.
- 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.
 - An assessment of sufficiency of existing protocols and regulations for protecting water quality standards in the Upper Delaware Scenic and Recreational River.
 - An evaluation of potential requirements for private water well sampling, testing, and monitoring by gas well operators.
 - An examination of the potential need for setbacks from private water wells and springs used for domestic supply.
 - An assessment of hydraulic fracturing design and modeling, with emphasis on containment of fractures and fracturing fluid in the target formation.
- Potential impacts of re-fracturing wells subsequent to the initial well completion, and the need for additional procedures to avoid or mitigate such impacts.
- Review of the applicability of the Department's General Stormwater Permit and best management practices available to well operators.

⁶⁷ <http://www.dec.ny.gov/regs/4264.html>

⁶⁸ <http://www.dec.ny.gov/chemical/30681.html>

⁶⁹ <http://www.epa.gov/ttn/atw/oilgas/fr03ja07.pdf>

⁷⁰ <http://www.dec.ny.gov/regs/4304.html>

- 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:
 - 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,
 - Potential impacts to fish and wildlife, and
 - Potential aquifer depletion.
- 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,
 - Reduction or discontinuance of the withdrawal during periods of low flow,

- Limitation of withdrawal rates and locations as necessary to maintain compliance with the Department's narrative flow standard for fresh surface water and protect best uses of the water body even 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.

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 and this final scope including 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.
- Examination of whether additional waste tracking and manifesting requirements are necessary.
- 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

- Review and assessment of the information and methodologies available for estimating the potential rate of Marcellus Shale development, including a description of likely development based on the information and methodology deemed most applicable and appropriate.
- Assessment of the levels of activity within a reasonable temporal and geographic framework that may result in adverse cumulative impacts with respect to noise, visual effects, air quality and water resources.
- 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.
- A description of the mitigation measures available to prevent significant adverse cumulative impacts associated with individual well pads and within defined geographic areas.

Community Character

- Evaluation of whether any aspect of multi-well site development or 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. This will include review of the compatibility of shale gas development with other land uses such as agriculture, tourism, and alternative energy 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. Recommendations received during scoping regarding the information that should be required with well permit applications will be evaluated as part of the EAF development process.
- 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.
- An updated version of Table 15.1 in the GEIS will be provided. This table summarizes the interagency coordination involved in the regulation of oil, gas, solution mining, and brine disposal operations in New York State.
- 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.
- Investigation of appropriate measures and timing for sharing of information with localities to ensure awareness regarding the proposed action and its potential impacts.

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:

- *the prohibition of development of Marcellus Shale and other low permeability reservoirs by horizontal drilling and high-volume hydraulic fracturing, and*
- *use of a phased-permitting approach to developing the Marcellus Shale and other low permeability reservoirs, including consideration of limiting and/or restricting resource development in designated areas.*

8.0 TOPICS NOT INCLUDED IN THE FINAL SCOPE

This section is added to the Final Scope to identify “prominent issues that were raised during scoping and determined to be not relevant or not environmentally significant or that have been adequately addressed in a prior environmental review.”⁷¹ The Department received many recommendations for very specific operational requirements or permit conditions which will be reviewed in conjunction with preparing the dSGEIS but which need not be listed here.

8.1 Concerns Not Appropriate for a Generic Environmental Impact Statement

8.1.1 Prohibitions/Off-Limits Areas

The Department received recommendations that the Final Scope identify specific areas based on local environmental, cultural or topographic features that should be off-limits or restricted with respect to drilling, water withdrawal, groundwater withdrawal or discharge, and that the impacts or ramifications of prohibiting or limiting activity in these areas be evaluated in the SGEIS. It was also recommended that out-of-state operators be prohibited from withdrawing water in New York. These recommendations are not incorporated into the Final Scope because these types of local characteristics are considered on a site-specific basis as permit applications are received. If aspects of a proposed drilling site raise an environmental concern not addressed by the GEIS and SGEIS, then a site-specific supplemental environmental impact statement may be required. If the applicant cannot demonstrate that sufficient mitigation of site-specific environmental impacts can be achieved, then the Department may deny the permit.

8.1.2 Concerns to be Addressed by Site-Specific Review

Comments on the draft scope included requests that the dSGEIS specifically evaluate a number of specific scenarios, geographic areas or locally significant natural or historical resources. While the dSGEIS will generally state how impacts to the resources of concern will be mitigated, local conditions lend themselves to site-specific review and are therefore addressed with each well permit application. See Section 4 of this Final Scope for an outline of the potential impacts and mitigation measures to be addressed in the dSGEIS.

8.1.3 Staffing Concerns

It is not the purpose of an environmental impact statement to review issues or make recommendations related to staffing. Comments received on staffing issues relative to DEC and other agencies will be considered in the budget planning and legislative processes.

8.1.4 Enforcement Concerns

The Department has far-reaching enforcement authority over the activities it regulates. It is not, however, the purpose of an environmental impact statement to provide enforcement recommendations or policies. Rather, the emphasis is on identifying measures to prevent the problems that would require enforcement actions to be taken. Comments received on

⁷¹ 6 NYCRR 617.8(f)(7)

enforcement issues will be considered by the Department in the legislative process and in the development of any related enforcement policy or guidance.

8.1.5 Determinations Regarding Exception from Disclosure of Chemical Information

Neither the Final Scope nor the dSGEIS will address recommendations received regarding whether the Department should publicly disclose records regarding hydraulic fracturing additives that have been submitted as “trade secret” or “confidential” information, because those issues are determined through the application of existing law. Exceptions from public disclosure are governed not by SEQRA, but by New York’s Public Officer’s Law (Freedom of Information Law) and the Department’s Records Access Regulations. The law and regulations are very specific with respect to the information staff may consider in determining to except information from disclosure. As of the date of this Final Scope, Department staff have initiated the required procedures to determine whether exceptions from disclosure should be granted. Staff-level determinations are subject to appeal to the Assistant Commissioner for Hearings and Mediation Services and then to court challenge. Pursuant to law information labeled as trade secrets or confidential must be safeguarded from disclosure until final determinations are made and all challenges are settled. However, Department staff will use the submitted information, regardless of public disclosure status, to complete requisite reviews and analyses.

8.1.6 Health Impact Assessments/Epidemiological Studies

Some commentators recommended that the SGEIS analyze the proposed action’s potential health effects on the population, with concern focused on fracturing fluid additives. As reflected throughout the 1992 GEIS and this Final Scope, the emphasis of the Department’s regulatory program and permitting process for natural gas wells is on preventing releases and discharges. This ameliorates any concern that the general population or any defined population group will be exposed to fracturing fluid additives. In addition, Section 2.1.2 of this Final Scope states the Department’s intent to consult with the NYS Department of Health regarding review of hydraulic fracturing additives to determine if applicable standards and regulations are sufficient to prevent or mitigate potential impacts of their use and management. Therefore, while the SGEIS will identify the necessary controls to preclude exposures, it will not include a health impact assessment of horizontal drilling and high-volume hydraulic fracturing. Therefore, this recommended addition is not reflected in the Final Scope.

Recommendations that epidemiological studies be conducted before horizontal drilling and high-volume hydraulic fracturing occur are also not incorporated into the Final Scope. Defined as “the study of diseases in populations of humans or other animals,”⁷² epidemiology seeks to determine disease risk factors, including environmental agents, and protective factors against diseases. The focus is on identifying the relevant risk factors and protective factors for a particular disease, but epidemiological studies cannot prove causation.⁷³ However, with respect to fracturing fluid additives, epidemiological studies are not a necessary prerequisite to the analysis and development of standards and regulations for preventing exposures, as described above.

⁷² <http://pmep.cce.cornell.edu/profiles/extoxnet/TIB/epidemiology.html>

⁷³ Ibid.

8.1.7 Other Issues

The following specific recommended topics are not incorporated into the Final Scope either because they do not relate to the environmental review of well permit applications for horizontal drilling and high-volume hydraulic fracturing or because they are addressed by other federal, state and local authorities.

- Pipeline rights-of-way and eminent domain
- Private leasing issues such as royalty rates, and non-payment of royalties
- Local communities' preparedness to respond to complaints and emergencies
- Tax assessments on gas wells, gas production or water use
- Federal highway safety
- Wellsite health and safety plans
- Requirement for well operators to establish rapid response teams
- Proof of well operators' liability insurance
- Requirement that natural gas produced from the Marcellus Shale be reserved for essential local services and purposes
- Likelihood and effects of a potentially transient workforce
- Potential positive or negative impacts on property values
- Compulsory integration
- Production metering

8.2 Mapping

The Department received recommendations that the Final Scope include maps of the Marcellus Shale and other shale or low-permeability formations in New York along with or overlain by maps of all resources that occur in prospective areas and could be affected by drilling. Another commentator asked for mapping of areas of existing contamination from other sources, with consideration to restricting drilling in such areas. It was also recommended that the Department provide maps of treatment and disposal facilities and collect various demographic data before completing the SGEIS.

Geology - Although the dSGEIS will contain informational maps as appropriate, Volume 1, Chapter 5 of the GEIS includes a stratigraphic column for southwestern New York and generalized geologic maps. Section 1 of this Final Scope describes the extent of the Marcellus shale formation in New York, and Section 3 indicates that the SGEIS will include recent information on the Marcellus and other shale formations along with stratigraphic sections for central and southeastern New York.

Other - Demographic analysis and other recommended maps are not incorporated into the Final Scope because identification of relevant local resources and concerns is part of the site-specific application review process. In addition to the application materials, Division of Mineral Resources staff who review the permit applications also use in-house maps and geographic information systems, along with pre-permit site inspections and consultation with staff in other

Department programs, to evaluate proposed sites and determine the need for further review or specific mitigation measures.

- *The dSGEIS will identify the resources used by staff and will also identify reference materials available to the public, including maps.*

8.3 Issues Addressed by Prior Environmental Review

As is stated in Section 2.0, and dictated by SEQRA, the SGEIS will focus on topics not addressed by the 1992 GEIS. Emphasis will be on potential impacts associated with the large volumes of water required to hydraulically fracture horizontal shale wells using the slick water fracturing technique. This Final Scope acknowledges the need to review water and waste management practices during all stages of this type of well drilling, stimulation, and development and to assess the longer duration of disturbance at multi-well pads. When a proposed project triggers a specific regulatory threshold or requirement, the approach to mitigation incorporates the latest advances in regulation and practices. Reference is made to the most currently available maps, information and technology. The following specific recommended additions or revisions are not incorporated into the Final Scope because they relate to impacts or activities that are fully addressed by the GEIS and current permitting practices:

- Cementing techniques and mixes used to seal wellbore casings
- Well permitting procedures and wellsite practices with respect to wildlife and habitat protection
- Well permitting procedures and wellsite practices with respect to agricultural lands
- Potential impacts of airborne dust associated with wellsite activities
- Emissions from accidental releases of methane and hydrogen sulfide
- Practices to prevent hydrogen sulfide emissions
- Potential impacts from temporary gas flaring and venting activities
- Wellsite revegetation practices
- Well permitting procedures in areas where undocumented, unplugged oil or gas wells may be present

8.3.1 Proposed New Setback Requirements

Many recommendations were received for setbacks from or buffer zones around features where no such setback or buffer is currently required. In the absence of any evidence of environmental degradation having occurred from the lack of such setbacks or any indication that the proposed activity raises a new concern regarding these features, these recommendations are not incorporated into the Final Scope. Site-specific well permit reviews will reveal any need for additional environmental review, special mitigation measures or permit denial related to any of these features.

In addition, recommendations to address setbacks from freshwater wetlands in the dSGEIS are not incorporated into the Final Scope because wetland buffers are already provided by the Department's freshwater wetlands permitting program.

8.3.2 Concerns Related to Past Incidents and Occurrences

The possibility of accidents and violations exists in any industry and under any regulatory program. These are addressed through remediation and enforcement actions including fines and penalties and Department orders for cessation of operations where necessary. In the absence of a pattern of incidents that indicates a regulatory weakness or gap, the occurrence of isolated accidents or violations do not of themselves constitute reason to re-open the GEIS. Therefore, recommendations to address specific past incidents of a unique and isolated nature are not incorporated into the Final Scope.

It is also beyond the scope of the SGEIS to prove that past drilling activities in New York did not result in unreported or undetected problems or to include unsubstantiated or wholly hypothetical impacts. Accordingly, plans for monitoring or random sampling of areas with past drilling activity are not incorporated into the Final Scope.

8.4 Concerns Which Require Legislative Action

The following specific recommended revisions or additions are not incorporated into the Final Scope because their implementation would require legislative action. These recommendations will be reviewed and evaluated within the context of the legislative process.

- Implementation of a severance tax on production
- Repeal of ECL §23-0303(2)
- Expansion of the notification requirements stated in ECL §23-0305(13)
- Re-assignment of royalties from wells on public lands
- Implementation of new or increased bonding/financial security requirements for gas well development activities
- Increased well permit fees
- Fees to cover cost of monitoring drinking wells
- Individual well fees for open space funding
- Implementation of a tax on gas companies to create a gas well trust fund for environmental cleanup, landowner and local government compensation, medical care and habitat restoration
- Establishment of a Public Water Protection Fund, funded by oil and gas drillers
- Re-evaluation of oil and gas waste classifications
- Regulation of seismic surveys conducted to locate potentially prospective acreage for gas drilling

8.5 Practices or Concerns Not Relevant in New York

The following specific recommended topics are not incorporated into the Final Scope because they pertain to practices which are prohibited or have not been proposed in New York.

- Open pit evaporation, vaporization or “misting” as a disposal method for produced water.
- Use of diesel fuel as a primary component of hydraulic fracturing fluid.

8.6 Planning and Policy Concerns

The Department received a number of recommendations that the SGEIS address over-arching planning and policy issues, particularly with respect to land use and energy strategies. It was also recommended that use of alternative and renewable energy sources be reviewed as an alternative to proposed shale gas development.

These topics go beyond the review of environmental impacts of well permit issuance and are therefore not incorporated into the Final Scope. Other state, federal and international agencies will continue to evaluate alternative energy technologies and where natural gas belongs in an overall environmental and energy strategy.