

## COMMUNITY IMPACT ASSESSMENT: HIGH VOLUME HYDRAULIC FRACTURING



THIS COMMUNITY IMPACT ASSESSMENT WAS PREPARED BY GREENPLAN, INC. UNDER CONTRACT WITH THE TOMPKINS COUNTY COUNCIL OF GOVERNMENTS (TCCOG) AND INCORPORATES WORK DONE BY TCCOG'S GAS DRILLING TASK FORCE. THE STUDY WAS FUNDED BY TCCOG, TOMPKINS COUNTY AREA DEVELOPMENT (TCAD), AND THE PARK FOUNDATION.

DECEMBER 15, 2011

## Forward

This Community Impact Assessment has been developed by the Tompkins County Council of Governments ([TCCOG](#)) to help its member communities prepare for the exploitation of natural gas using the technique called hydraulic fracturing combined with horizontal drilling. The TCCOG is an association of local governments organized to provide a forum for discussion and negotiation leading to agreements for more efficient and fiscally responsible delivery of government services. In 2010, TCCOG established a Gas Drilling Task Force (GDTF). This Task Force seeks to network municipalities within the County to manage the large amount of information surrounding drilling for natural gas in the Marcellus and Utica shales using hydraulic fracturing. The Task Force has been exploring ways for municipalities to exert local control over gas drilling activities that affect the health, safety and well-being of County residents.

The Community Impact Assessment is intended to provide reliable and factual information for communities in Tompkins County so they are better prepared for the potential environmental and economic impacts of hydraulic fracturing for the natural gas that underlies the region. This Assessment document is provided in both paper and electronic forms. A separate Executive Summary is also available in both paper and electronic forms. The electronic form (i.e. Portable Document Format or PDF file) contains hyperlinks<sup>1</sup> to the studies and reports that were used in its development so readers can view the source documents that were relied upon. A webography of these source documents is provided at the end of this Assessment. A webography is simply a bibliography of on-line documents, cited using their internet addresses (i.e. Uniform Resource Locator or URL).



Marcellus Shale where it reaches the surface near Marcellus, New York

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<sup>1</sup> A hyperlink (or link) is a reference to a document that the reader can directly follow, or that is followed [automatically](#). Hyperlinks are the underlined words or phrases in the paper version of this document.

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Cover graphic source: Tompkins County municipalities and water resources  
from the County's GIS Portal

# Tompkins County Community Impact Assessment

*It is the Subcommittee's judgment that if action is not taken to reduce the environmental impact accompanying the very considerable expansion of shale gas production expected across the country – perhaps as many as 100,000 wells over the next several decades – there is a real risk of serious environmental consequences and a loss of public confidence that could delay or stop this activity.*

U.S. Department of Energy  
Secretary of Energy Advisory Board on Shale Gas Production, November 10, 2011

## A. Introduction

The peak of conventionally obtained natural gas production in the United States occurred in [1973](#). The only significant untapped sources are now [unconventional](#) ones, such as gas that is trapped in low-permeability shale formations, tight gas sands, coal beds and hydrates. Access to these unconventional sources requires new drilling and exploration techniques known as high volume hydraulic fracturing combined with horizontal drilling ([HVHF](#)). Both the Marcellus and Utica shale [formations](#) lie buried deep below all of Tompkins County. Due to the nation's increasing reliance on unconventional methods to extract natural gas from underground formations, over 95 percent of all new wells are now routinely treated using HVHF. According to the United States Energy Information Administration, the combination of horizontal drilling and HVHF technologies has made it possible for the gas industry to produce shale gas economically, leading to an average annual growth rate of [48 percent](#) over the 2006 to 2010 period. Most shale gas wells are only a few years old. Production efforts, especially those in Pennsylvania that are more advanced than New York State, have a very short history in this region of the country and consequently reliable data on long-term production and ultimate gas recovery rates are [lacking](#). The potential for gas drilling in Tompkins County already exists. As of October 2009, 39 percent of the land area in Tompkins County had already been leased by gas companies.

This Assessment has been prepared as a guide for local decision-makers within Tompkins County's 16 municipalities, as well as for residents and business interests. Its overriding goal is to provide objective and factual information on HVHF. Information on HVHF comes from several sources that are often in conflict with one another. This includes the following:

- The gas industry and those businesses that depend upon the gas industry. While they can be reliable sources of information on the processes and techniques of HVHF, because their [primary interest](#) is management as for-profit corporations, some aspects of HVHF that have the potential to impact their profit margins may be downplayed or understated, avoided entirely, or exaggerated. It has been well documented that some businesses in the oil and gas industry have used their [financial](#) resources to pay "experts" to question the [science](#) associated with fossil fuel use. Due to the skepticism associated with these sources, they have been used with caution in this Impact Assessment since their reports and other documents are not routinely independently reviewed (see the third bullet below) and can consist of unproven statements. In fact, some reports published by the oil and gas industry or consultants to the

industry have methodologies that are deemed “proprietary” or their sources of data are not disclosed. Therefore, their results cannot be verified or reproduced by independent researchers. It is only through careful scrutiny by independent researchers that such reports can survive peer review and become accepted sources of reliable data.

- Government agencies that regulate the gas industry. The New York State Department of Environmental Conservation (DEC) is the primary regulatory agency with the authority to permit HVHF. The DEC’s role is broad in regulating water quality, air quality and the operations of the gas industry. However, the DEC’s role of protecting the environment is also tempered by the State’s declaration of policy to encourage gas development by providing for “*the operation and development of oil and gas properties in such a manner that a greater ultimate recover of oil and gas may be had...*” [§ 23-0301 of the New York State Environmental Conservation Law]. The DEC states at the outset of their most recent Revised draft Supplemental Generic Environmental Impact Statement (Revised dSGEIS) that “*The exploration and development of natural gas resources serves the public’s need for energy while providing substantial economic and environmental benefits.*” Thus, the State’s interest in fostering **gas development** activities must be recognized when reviewing the EIS documents prepared by the DEC, by its consultants (who also are known to [provide services](#) to the gas industry), and by other State agencies involved in the preparation of the environmental impact statement (EIS) documents like the New York State Energy Research and Development Authority (NYSERDA). It should be noted that the US Environmental Protection Agency (EPA) is currently studying the environmental impacts of HVHF; initial research findings are expected in 2012 with a final report ready by 2014.
- Academic institutions are largely interested in the pursuit of knowledge and education. Research studies originating with colleges and universities can provide a reliable source of information on HVHF because these studies normally go through peer review. Peer review is a process of self-regulation by academics or professionals involving qualified individuals within the relevant field. Peer review methods are employed to maintain standards, improve performance and provide credibility. In academia, peer review is used to determine an academic paper's suitability for publication. These sources are normally independent of financial interests in the gas industry or the advocacy interests of environmental or citizens groups and have been heavily relied upon in this Assessment. Many research papers were recently [presented](#) at a “Marcellus Shale Multi-State Academic Research Conference” held at the Blair County Convention Center in Altoona, PA on May 10<sup>th</sup> and 11<sup>th</sup> 2011.
- Non-governmental organizations (NGOs) are usually legally constituted organizations that include citizen groups like Sustainable Tompkins, service organizations like Habitat for Humanity, industry trade organizations like the Independent Oil and Gas Association of New York, think tanks such as the Rocky Mountain Institute, and environmental groups such as the Environmental Defense Fund. Each of these groups advocate for a particular viewpoint. If their research efforts have been conducted in an independent manner and present facts that can be independently verified, then they can be a reliable source of information provided they properly cite sources.

News media, such as newspapers, radio and television have historically been reliable sources of information. The Internet has spawned its own brand of new media sources including blogs and online journals; by 2008 more Americans reported getting their national and international news online than from newspapers. Other new sources include podcasts, Internet radio and news aggregators such as Google News or Fluent News. News media were traditionally reporters of fact. However, in 1996, the Code of Ethics of the Society of Professional Journalists was amended to remove “objectivity” from a section titled “accuracy and objectivity.” A new reference in the Code stated “Public enlightenment is the forerunner of justice and the foundation of democracy. The duty of the journalist is to further those ends by seeking truth and providing a fair and comprehensive account of events and issues.” While this works well for political reporting, it does not work for reporting on scientific issues when there is a consensus view by scientists. Reporters in the news media often present both sides of settled issues which can mislead readers. These sources have been used, but with caution.

This Assessment will use the above sources only when there is an abundance of evidence about the impacts of HVHF and where falsehoods can be recognized and marginalized. Where doubt exists about a particular HVHF issue that is portrayed as fact, this Assessment will point out the potential for discrepancy and lead the reader to further information on the subject. It is not the intent of this Assessment to add to the already broad body of information on HVHF. Rather, this Assessment provides decision-makers and others with as complete and realistic a picture as possible of what can be expected when HVHF gets underway in New York State so that everyone is better prepared for extraction of the natural gas that exists in the Marcellus and Utica shale regions.

The consensus seems to be that development of a natural gas industry in the Marcellus region presents economic opportunities for some, but the negative economic impacts on others are not well understood. The State has acknowledged that there will be negative economic impacts to local government and some local businesses in their latest Revised dSGEIS and many of the economists who have studied the impact of gas development on the economy have reached similar conclusions. More research efforts on this critical issue are needed by those with real world gas industry economics experience, especially those who have a disinterested role to play, so that we can gain a fuller understanding of employment impacts, training needs, and opportunity costs, among many other areas. This Assessment provides greater details on the following topics. At a minimum, the following areas should be further investigated by the State as part of its GEIS review process:

1. What are the potential economic impacts on existing industries such as wineries, tourism, and education (Cornell University, Ithaca College and Tompkins County Community College), particularly the long-term consequences and cumulative impacts of gas industrialization?
2. What are the economic impacts on agriculture, including the dairy industry (because it relies heavily on trucking) as well as the emerging organic farming and grape industries?
3. What is the potential for short term labor shortages, as low income residents are pushed out of the region by higher paid gas workers?
4. Will there be potential increases in other wage rates with corresponding effects on existing businesses?

5. What are the full costs of road and bridge construction, improvement, and repair and how it will they paid for, as questioned by the NY State Department of Transportation?
6. Will the added costs of emergency services such as police, fire, and other emergency responders as a result of increased traffic, construction, production activities as well as accidents, spills, and other emergencies be paid for by the additional ad valorem taxes collected by local governments?
7. What will be the added costs for public water supply systems if additional filtration is required?
8. Will there be long term impacts on the regional economy if it is replaced with a boom-bust economy based upon a non-renewable resource?
9. What are the potential long-term costs for providing education, housing, health care, recreation, and solid waste management to serve the added population as a result of in-migration?
10. Will the types of growth and development envisioned by communities, through their comprehensive plans and zoning regulations, be inhibited or thwarted by gas development activities, thereby preventing realization of such plans?

In reviewing the information provided, it is essential to understand that shale gas development in the Marcellus region is in its infancy and the scientific understanding of the relatively new technology of HVHF and its effects on humans and the environment are just beginning to emerge. There will no doubt be a wealth of information that becomes available as more researchers tackle the thorny issues associated with HVHF. This Assessment is only a starting point for investigating both the economic benefits and detriments associated with HVHF. It points the readers to researchers who are beginning to understand how the complex geology of the Marcellus and Utica shale formations interact with the HVHF process, affecting natural resources and communities alike. A great deal of additional research is needed to clear up the often conflicting information that is available, so that researchers, medical professionals, economists, engineers, planners, and scientists can reach a consensus on what the ultimate economic and environmental impacts will be on Tompkins County and the region. Based upon the current state of knowledge, we can say with some certainty that we do not have all of the answers.

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## **B. Regional Trends**

Tompkins County contains an uncommon mixture of spectacular natural features, a vibrant urban center, internationally renowned academic institutions, and a productive and attractive working landscape. With its mixture of urban, suburban, and rural landscapes, Tompkins County offers a diverse living environment for its residents. The principal industries are education, manufacturing, tourism and agriculture. According to the Tompkins County Comprehensive Plan, *“Although a relatively small sector of the local economy, agriculture contributes in many ways to our quality of life. Farmers maintain 30 percent of the county’s land...Agriculture and agriculture-related enterprises represent a significant share of the rural economy, and contribute to the quality of life and the scenic countryside that attracts tourists and business to the area. Approximately 230 full-time farms contribute \$50 million annually to the local economy. Many more people are employed in farm-related jobs, such as transporting and processing farm products and supplying farmers with necessary supplies. The total value of farming in Tompkins*

*County may exceed \$100 million a year...There is an emerging interest in the link between renewable energy and farming. Wind energy can be harvested and biomass energy can be generated to provide farmers with a long-term source of income. Renewable energy sources, such as solar, can be used on the farm to replace other fuels. Renewable energy can also help reduce pollution, global warming, and dependence on imported fuels.”*

According to the [Tompkins County Economic Development Strategy](#), “Tompkins County has experienced steady, moderate growth for many decades. Since 1960 the economy has restructured from being primarily driven by durable goods manufacturing to being primarily a college town with manufacturing and high-tech sectors playing important supporting roles. Agriculture, Tourism, and some professional services also contribute to the economic base. The populace is well educated and family income distribution is above the national average. While 85% of the population is white, in the 1990’s all population growth was due to increasing minority populations, particularly Asian and Hispanic. The county’s moderate growth sets it apart from the rest of central upstate New York, a region that has faced economic stagnation and population decline in recent decades.”

What has great potential for altering the steady, moderate growth of the County is a new interest in exploitation of the natural gas that underlies Tompkins County and the region. In just a few years, this has increased due to changes in gas well development technology including new technologies for horizontal drilling and hydraulic fracturing of bedrock. Construction of the Millennium Pipeline, a 182 mile pipeline that delivers natural gas from Steuben County, NY through New York’s Southern Tier to Rockland County, NY has also contributed to the interest. The Marcellus and Utica Shale areas are in relatively close proximity to high natural gas demand markets in the Northeast.

According to the US Department of Energy, the Marcellus Shale covers an area of 95,000 square miles at an average thickness of 50 feet to 200 feet. New York’s portion of the Marcellus Shale is approximately 18,750 square miles and is found very deep – over 1 mile below ground in places. Under Tompkins County, the Marcellus Shale ranges from 2,000 to 5,000 feet below the ground surface. To date, there are almost fifty companies that are already exploiting the Marcellus Shale for natural gas production, or have expressed interest in conducting gas drilling in the Marcellus Shale region. One company alone, [Statoil ASA](#) of Oslo, Norway partnering with Chesapeake Energy, says it could drill as many as 17,000 natural gas wells in the Marcellus Shale field over the next 20 years.

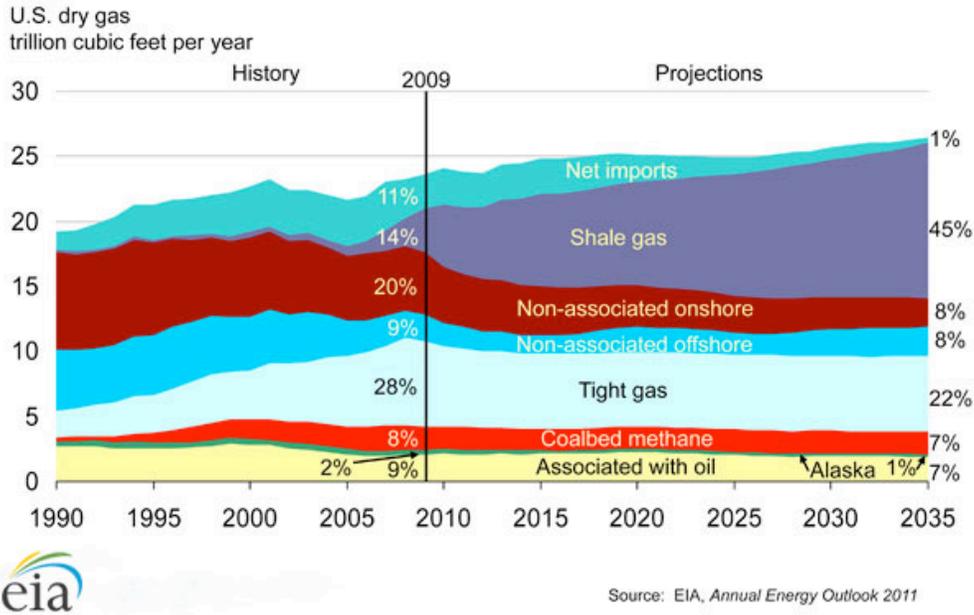
According to [www.geology.com](http://www.geology.com), “Marcellus was the Opening Act. A rock layer below the Marcellus Shale could prove to be another incredible source of natural gas. The Marcellus Shale captured public attention when leasing and drilling activities began pumping billions of dollars into local economies and citizens began debating the environmental, social and economic impacts. All of this began suddenly in 2004 when Range Resources Corporation drilled the first Marcellus well using modern drilling technology. Now, just a few years later, the Marcellus Shale is being developed into one of the world’s largest natural gas fields. However, what we are seeing today from the Marcellus is only the first step in a sequence of natural gas plays. The second step is starting in the Utica Shale. The Utica Shale is a rock unit located a few thousand feet below the Marcellus Shale. It also has the potential to become an enormous natural gas resource. The Utica Shale is thicker than the Marcellus, it is more geographically extensive and it has already proven its ability to support commercial production. It is impossible to say at this time how large the Utica Shale resource might be because it has not been thoroughly evaluated and little public information is available about its organic content, the

*thickness of organic-rich intervals and how it will respond to horizontal drilling and hydraulic fracturing. However, the results of early testing indicate that the Utica Shale will be a very significant resource.” To corroborate the [www.geology.com](http://www.geology.com) comment, staff at the New York State Museum have [stated](#) that the overlay of the two formations create “Great potential for natural gas production in Marcellus and Utica Shales.”*

According to the United States Geological Survey, “In 2008, two professors at Pennsylvania State University and the State University of New York (SUNY) Fredonia estimated that about 50 TCF (trillion cubic feet) of recoverable natural gas could be extracted from the Marcellus Shale (Engelder and Lash, 2008). In November 2008, on the basis of production information from Chesapeake Energy Corporation, the estimate of recoverable gas from the Marcellus Shale was raised to more than 363 TCF (Esch, 2008). The United States uses about 23 TCF of natural gas per year (U.S. Energy Information Administration, 2009), so the Marcellus gas resource may be large enough to supply the needs of the entire Nation for roughly 15 years at the current rates of consumption.” These estimates do not account for natural gas found in the even deeper Utica Shales. The Energy Information Administration (EIA) [estimated](#) in their April 2011 Annual Energy Outlook the United States possesses 2,552 TCF of potential natural gas resources and shale resources accounts for 827 TCF of this estimate. The US Geological Survey, in August of 2011, released a new [estimate](#) that the Marcellus Shale contains about 84 TCF of undiscovered, technically recoverable natural gas and 3.4 billion barrels of undiscovered, technically recoverable natural gas liquids. There have been a number of [sources](#) that have [criticized](#) or provided [alternative views](#) to the State’s [estimate](#) of a 50 percent probability that there is 489 TCF of natural gas in the Marcellus Shale.

Interest in the Marcellus Shale formation has been likened historically to the gold rush in mid-19th century California. Potential Marcellus gas production revenues alone have been predicted in the billions of dollars in several publications. Of course, predictions are based on circumstances that can change, sometimes rapidly, depending on markets, worldwide volatility from political unrest, the assumptions that qualify the models, and most importantly the strengths and weaknesses of the studies used to make the predictions. However, the reason there is great interest in the Marcellus and Utica Shales is the current and projected demand for natural gas and the economic opportunities it represents to landowners, gas companies and others that could benefit.

Natural gas is in demand in the United States, in part, because it has become widely available (87% was produced domestically in 2009 and 97% in North America) through a network of 305,000 miles of interstate and intrastate transmission pipelines. Compared to wood, coal or oil, natural gas is convenient to use and relatively clean to burn in comparison to these other fuels. Shale gas in 2009 made up 14 percent of total U.S. natural gas supply. Production of shale gas is expected to continue to increase, and constitute 45 percent of U.S. total natural gas supply in 2035 as shown in the following graphic from the Energy Information Administration.



While the nation is beginning to transition to renewable energy sources such as solar, wind, geothermal and others, natural gas currently creates electricity, heats millions of homes, is a feedstock for the production of ammonia used in fertilizers, can be used as an alternate vehicle fuel source, heats water, cooks food and makes backyard barbecues possible year-round. As a fossil fuel, it is a finite resource yet demand for it is rising. Like oil and coal, natural gas was formed from the fossilized remains of dead plants and animals exposed to heat and pressure in the Earth's crust over millions of years (for decades, the coal industry and others have referred to coal and other fossil fuels as "[buried sunshine](#)"). Estimates are that society today burns about 100,000 years of ancient plant growth (i.e. ancient solar energy) each year. This has created an imbalance in carbon dioxide levels in the atmosphere.

According to the DEC, more than 75,000 oil, gas and solution salt mining wells have been drilled in New York State since the late 1800's with about 14,000 wells currently active. The first natural gas well in the country was drilled in Fredonia, NY by William Hart (1821). The first commercially successful oil well in the world was drilled just south of Jamestown, NY in Titusville, PA (1859). Gas has been produced from the Marcellus Shale since 1880 when the first well was completed in the Naples field in Ontario County. The Naples field produced 32 MMcf (million cubic feet) during its productive life and most shale gas



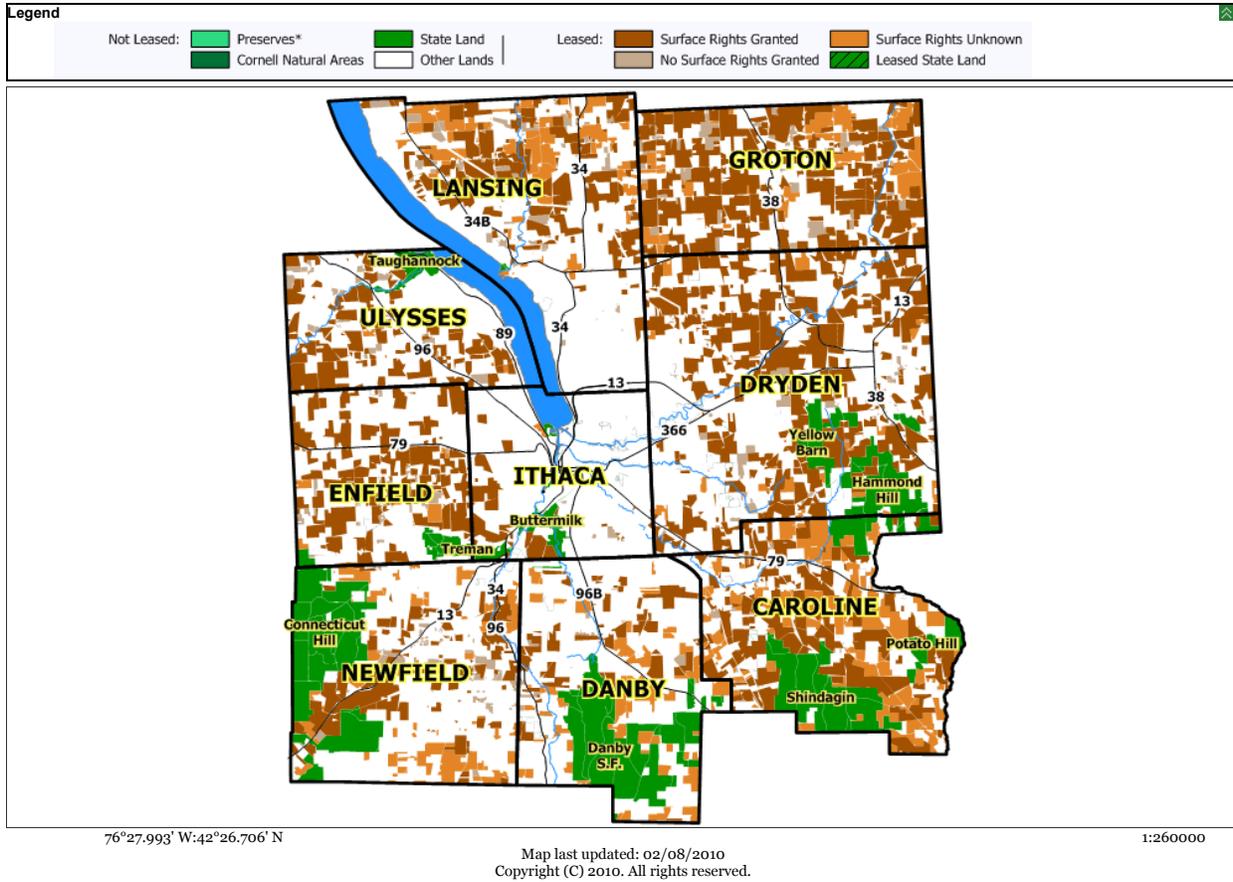
discoveries in New York since then have been in the Marcellus Shale. The photo above from the NY State Museum Collection shows historic gas drilling in Richburg, NY.

In New York, all gas wells completed in the Marcellus Shale so far are vertical wells. To date, 49 wells have been developed, 18 of these wells are active while the remainder are either inactive, plugged and abandoned, or shut-in. According to DEC records in its Oil and Gas [database](#), 105 wells have been permitted in Tompkins County. While none of the 105 wells are identified as drilled in the Marcellus or Utica Shale Formations, 25 targeted the Black River formation, six targeted salt formations and the remainder are classified as “Not Applicable” or “Confidential.” The Black River formation is a gas producing limestone and dolostone formation but gas production from this formation has been declining in New York State. Most of the gas production activity in the Black River formation has been in the counties to the south and west of Tompkins County, namely Chemung, Steuben, Schuyler, Allegheny and Yates counties.

Natural gas facilities that have recently been constructed in nearby locations include the Millennium Pipeline described above. According to the [Millennium Pipeline Company](#), the Millennium Pipeline offers *“Unparalleled Pathways to ... Northeast... Marcellus Shale... Traditional natural gas markets are expected to grow in the Northeast as efforts increase to improve air quality. Western New York storage development supports seasonal use of natural gas and discoveries of local gas production including Marcellus Shale gas improve optionality and reliability of natural gas. Millennium Pipeline is well positioned to deliver these benefits to gas consumers.”*

The Millennium Pipeline went into service in 2008. Millennium makes extensive use of existing utility easements, extending from Independence in Steuben County NY to Buena Vista in Rockland County NY. Millennium, which is supplied by local production and storage fields and interconnecting upstream pipelines, serves customers along its route in the Southern Tier and Lower Hudson Valley as well as serving several major utility customers in New England and the New York City area.

In 2009 a group of volunteers began collecting leasing data for properties in Tompkins County. This information was transferred to maps and presented on the website [www.tcgasmap.org](http://www.tcgasmap.org). This information has been used by the TCCOG Gas Drilling Task Force in its assessment of the possible impact of gas drilling on Tompkins County. This information undoubtedly contains some errors and can only be viewed as a reasonable approximation of what is currently the case. As stated on the [www.tcgasmap.org](http://www.tcgasmap.org) website, *“The information presented...was collected by volunteers who looked at the 2,673 gas leases filed in the Tompkins County Clerk’s Office between January 1, 2005 and October 15, 2009. All of the data shown here is public information. In the time since the leases were filed, some parcels have split and some have merged. Some leases contain errors in the town or tax parcel number. Some errors have been made in transcribing the data. We have corrected as many of these errors as possible, and have made every attempt to insure that the data is accurate, but undoubtedly, some mistakes remain.”* The following map, available from [www.tcgasmap.org](http://www.tcgasmap.org), shows the leasing activity updated to February 8, 2010.



An analysis of this leasing information reveals that a total of 39 percent of the land area in Tompkins County had already been leased by gas companies between January 2005 and October 2009. The break-down by municipality is shown in the Table below:

Percent Land Area Leased by Gas Companies In Tompkins County	
Municipality	Percent Land Area Leased
Town of Caroline	55%
Town of Danby	23%
Town of Dryden	41%
Town of Enfield	44%
Town of Groton	69%
Town of Ithaca	12%
Town of Lansing	42%

Percent Land Area Leased by Gas Companies In Tompkins County	
Municipality	Percent Land Area Leased
Town of Newfield	29%
Town of Ulysses	37%
Village of Cayuga Heights	0%
Village of Dryden	13%
Village of Freeville	33%
Village of Groton	19%
Village of Lansing	1%
Village of Trumansburg	14%
City of Ithaca	0%
Tompkins County	39%

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### C. Local Planning and Zoning

Local planning and zoning by towns, villages and cities is the foundation for control of land use in New York State. The State has recognized this through its enabling statutes in the Town, Village and General City Law as well as in other laws such as the Municipal Home Rule Law and the Environmental Conservation Law. DEC's former Director of the Division of Mineral Resources, which is the agency responsible for regulation of gas wells, remarked about the role of local government agencies in the regulation of mining in New York State. When discussing mining at an Albany Law School conference he stated that *"It is important to recognize that DEC is not a land use agency, and that the authority remains at the local government level. It has always been our position that localities need to determine appropriate land uses and that DEC, even if we believe that a site may not be zoned properly, will not interfere in those decisions. DEC is not a land use agency, and we must abide by the local zoning whether we agree or not."*<sup>2</sup>

Other DEC programs acknowledge the role of local government to regulate natural resources in addition to the State role. In New York State DEC's recommended critical area protection programs, discussed in the FINAL Upstate New York Groundwater Management Program (Division of Water, 1987) document, it

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<sup>2</sup> Gregory H. Sovas, "Environmental Forum: 'Sustainable Development and Mining,' Perspectives on New York's Mined Land Reclamation Law," Albany Law School, April 17, 1998, pages 4 and 8.

states that “Land use controls are among the most important mechanisms available to effectively manage groundwater resources. Land use is a very basic determinant of potential groundwater contamination as well as of groundwater use... where protection of critical groundwater resources is a sufficiently important and valid public purpose, there appears no reason why carefully developed local land use controls should not be an essential part of a local groundwater protection program.”

Some communities in Tompkins County, and other counties in the Marcellus and Utica Shale regions have already taken steps to prohibit gas drilling while others have not. There are two points of view as to whether local governments can prohibit gas drilling. Some argue that prohibition of gas drilling under a local land use control law like zoning, amounts to regulation of gas drilling, which is preempted by the New York State Environmental Conservation Law. Others point to a prohibition on gas drilling as a legitimate exercise of a municipality’s police power, granted to them by the State Legislature through the planning and zoning enabling acts. Lawsuits have been filed in Tompkins and Otsego counties as of the publication date of this Assessment. It is believed that these lawsuits will wind their way up to the State’s highest court, the New York State Court of Appeals unless action is taken by the Legislature to clarify the power of local governments to prohibit or regulate gas drilling activities if they do so through a comprehensive planning process just as for any other land use.

This Community Impact Assessment presents an analysis of the Tompkins County Comprehensive Plan that relates directly to the potential effects of HVHF on the County and its municipalities. The Assessment includes a summary of the comprehensive plans for the County’s two most populated towns and two of the least populated towns, the towns of Ithaca, Dryden, Ulysses, and Danby. This summary is presented as an example of the types of planning and community character issues that need to be examined on a community-by-community basis. The DEC’s Revised dSCEIS did not conduct such an analysis, instead using a regional summary approach for three regions in the State. None of these three regions included Tompkins County.

In the Community Character Impacts section of the Revised dSCEIS released in September of 2011, the DEC states:

*High-volume hydraulic fracturing operations could potentially have a significant impact on the character of communities where drilling and production activities would occur. Both short-term and long-term, impacts could result if this potentially large-scale industry were to start operations. Experiences in Pennsylvania and West Virginia show that wholesale development of the low-permeable shale reserves could lead to changes in the economic, demographic, and social characteristics of the affected communities.*

*While some of these impacts are expected to be significant, the determination of whether these impacts are positive or negative cannot be made. Change would occur in the affected communities, but how this change is viewed is subjective and would vary from individual to individual. This section, therefore, seeks to identify expected changes that could occur to the economic and social makeup of the*

*impacted communities, but it does not attempt to make a judgment on whether such change is beneficial or harmful to the local community character.* [emphasis added]

The failure of the Revised dSGEIS to properly assess potential impacts of HVHF on land use and community character means that communities are left to carry out their own analysis. Numerous court cases on community character have outlined a proper level of analysis. The SEQR regulations are explicit that “creation of a material conflict with a community’s current plans or goals as officially approved or adopted” or “the impairment...of community...character” are potentially significant adverse impacts.

To adequately assess impacts on community character, there needs to be documentation and an evaluation of all affected municipalities that have adopted comprehensive plans and zoning regulations or other land use controls. This information is readily available from the New York State [Department of State](#). DEC states that assessing impacts on community character is subjective. This is a false premise and is in conflict with [planning agency guidance](#) and some of the leading [court cases](#) on the issue of community character. A more in-depth discussion of the issue can be found in [Section U Community Character](#).

Once affected communities have been identified and using readily available information, an assessment can be made as to whether HVHF is compatible with a community’s goals. A Land Use Analysis for the Town of Middlefield in Otsego County provides a number of ideas for assessing impacts on community character and the Middlefield Analysis was relied upon by GDTF in conducting its own analysis of the issue. The Tompkins County Planning Department, in collaboration with the Tompkins County Council of Governments, completed an analysis of how municipalities can address planning and zoning issues related to gas drilling. A comprehensive set of municipal tools, that can be used to prioritize a review of current plans, laws and regulations or the adoption of new plans, laws and regulations, as applicable to each community, can be found at the County’s website [here](#). This is one of the first places a community should go to determine whether HVHF is consistent with the community’s unique vision of its future. It includes concrete steps that can be taken for a community to decide how to address gas drilling based upon the limited universe of tools available to municipalities under State law.

Here are a number of questions that a community needs to consider when assessing HVHF. These are the types of questions the DEC should be answering in its dSGEIS as to whether heavy industrialization is compatible with the character of affected communities. If a municipality has had a community planning process over the past few decades, some of these questions may have already been asked and may be documented in the municipality’s official documents including meeting minutes:

- What does the municipal comprehensive plan or zoning law say about how the community wants to grow, protect its resources, enhance its quality of life?
- If it doesn’t have a plan or a zoning regulation, then research any other source of information available on land use issues in the community, including meeting minutes and County plans that discuss growth and development.
- Does it want industrial development?
- Does it want to remain rural with clean air and clean water?
- Does it want to encourage agriculture and forestry or perhaps tourism?

- Does it want to avoid traffic congestion?
- Does it want to minimize or avoid changes to its landscapes and scenic areas?
- Does it want to avoid increasing the costs of providing municipal services?
- Is it concerned about losing its identity and sense of place if development activities are unregulated or poorly regulated?
- Is it concerned about any increases in air, light, water and noise pollution, increases in crime, and displacement of residents?
- Is it concerned about decreases in open space, wetlands, water resources, and wildlife including biodiversity?

Several other questions related to community character and HVHF, that should be considered, include the following:

- Will heavy industrialization accelerate the displacement of local residents and businesses affected by HVHF?
- Will HVHF result in an increased vacancy rate among commercial properties or lead to less of the types of development desired in the community?
- Will HVHF lead to lower property values for lands in close proximity to such operations?
- Will HVHF affect the way in which lenders treat mortgages and their continued viability? This is an issue because mortgage documents normally prohibit hazardous activity and hazardous substances on the property secured by the mortgage. There has already been attention to this issue by the [legal profession](#). The issue doesn't just include landowners who enter into leases with gas companies, only to find out that they have violated their mortgage. It also includes adjoining landowners who are included in the compulsory integration<sup>3</sup> process of gas drilling permits.

The next section of the Assessment will discuss the Tompkins County Legislature's adopted County Comprehensive Plan and the comprehensive plans of four of Tompkins County's municipalities. These include the towns of Ithaca, Dryden, Ulysses and Danby. Each will be described in terms of their planning documents and the relevant goals and recommendations concerning rural character, aesthetics, agriculture, natural areas protection and other factors that could be affected by the industrial characteristics of gas development.

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## 1. Analysis of Tompkins County Plan and Four Municipal Plans

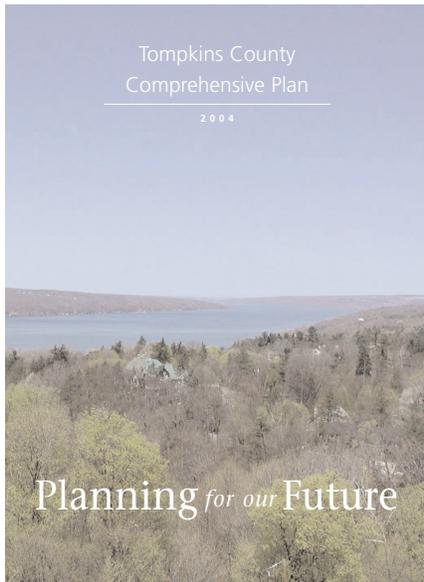
### Tompkins County Comprehensive Plan

The most dominant natural feature in Tompkins County is Cayuga Lake. The Lake is the second-largest Finger Lake and the longest, widest, and one of the deepest of the eleven Finger Lakes.

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<sup>3</sup> Compulsory integration is permitted in New York State based upon a law that was enacted by the Legislature in 2005. It involves government action that forces a property owner who wishes no drilling activity below its property into a drilling pool if the lessee (gas company) otherwise has control of 60% of a 640 acre spacing unit assigned to a well pad.

Tompkins County has approximately 26 miles of shoreline on Cayuga Lake. It is located in a glacial valley with steep slopes along the lakeshore punctuated by many picturesque gorges. Cayuga Lake serves as a supply for drinking water, is a major regional recreational and tourism resource, and an important link in the waterfowl flyway of the Atlantic Coast. Nearly four-fifths of the county's land area drains into Cayuga Lake before moving northward, ultimately to Lake Ontario. The southern fifth of the county drains southward into the Upper Susquehanna River.



With its varied topography and landforms, the county contains a number of interesting ecological communities, including streams, lakes, ponds, marshes, meadows, fens, forests, swamps, and cliffs. Nearly 200 important natural areas have been identified by the County's Environmental Management Council (EMC) in the Unique Natural Areas Inventory of Tompkins County. Tompkins County is also home to a National Natural Landmark, McLean Bog, located in the Town of Dryden. In addition, the County has one Recreational River (a portion of Fall Creek), one Critical Environmental Area (Coy Glen), four state parks, all or part of eight state forests, several Audubon-designated Important Bird Areas, and a variety of lands protected by the local Finger Lakes Land Trust, Cornell University, and The Nature Conservancy.

The Tompkins County *Comprehensive Plan* was adopted in 2004. As described by the Plan, Tompkins County, *“located in the Finger Lakes Region of Upstate New York, contains an uncommon mixture of spectacular natural features, a vibrant urban center, internationally renowned academic institutions, and a productive and attractive working landscape.”*

Higher education is the largest industry in Tompkins County (anchored by Cornell University and Ithaca College), followed by manufacturing, high-tech, utilities, agriculture and tourism. *“Our institutions of higher education remain preeminent and underpin our economic and community vitality. Tompkins County continues to emerge as a regional cultural center, and tourism flourishes as Ithaca and Tompkins County become recognized as the most exciting gateway to the Finger Lakes region.”* About one-third of the county is active farmland and 13 percent is protected forests and natural areas.

The County Comprehensive Plan's vision for the next 20 years is thriving rural communities, in large part due to sustainable use of agricultural and forest resources. There would be increased diversity in the agriculture sector, and an emerging clean energy component based on renewable resources. Conserved forest lands would provide multiple benefits to water resources, sustainable yields of forest products, wildlife habitat, and reduction of greenhouse gases. The county would continue to have plentiful clean surface and ground water, which is recognized as an important community asset in a world where an abundant supply of clean water is an increasingly scarce commodity.

The *Comprehensive Plan* is organized around ten basic interlocking principles, which are supported by long-term goals that provide a framework to guide future decision-making, and specific short-term activities to implement the goals. A large portion of the *Plan* is devoted to economic development and environmental protection. The *Plan* recommends that “*the local economy should be enhanced by building on important community assets, such as a highly educated workforce, an entrepreneurial spirit, dynamic academic institutions, and a high quality of life.*” The economic growth of the region depends on the export sectors, which include “*education, manufactured goods, high-tech products and services, and tourism.*” Agriculture contributes to rural character and quality of life, which in turn “*attracts skilled workers employed at the more urban job centers, as well as professionals with home-based businesses.*” Tourism, which draws visitors and supports cultural, historical, and commercial resources throughout the county, increases economic stability and attracts workers and businesses to the area. The *Plan* recommends that “*a diversified rural economy centered around the working rural landscapes of farms and forests, and the livelihoods of those who depend upon them, should be preserved and enhanced.*”

The environmental protection goals focus on water resources, natural beauty, and protection of open space. The *Comprehensive Plan* notes that “*water resources provide drinking water, recreational opportunities, and environmental benefits, and should be protected and used appropriately.*” Natural features that “*define our community and form the foundation of our local and regional ecological systems, should be preserved and enhanced.*” The *Plan’s* goals to protect environmental resources, open space and farmland are further elaborated in the *Tompkins County Conservation Plan* developed in 2007.

A concern expressed in the *Plan* is that farmland is being consumed by rural residential, commercial, and sometimes industrial development. The *Plan* does not recommend heavy industry, which could result in these and other adverse impacts on the county.

## Town of Dryden Comprehensive Plan

### Town of Dryden Comprehensive Plan

Adopted December 8, 2005



The Town of Dryden is located in eastern Tompkins County and, in terms of population, is the County’s third largest municipality after the City and Town of Ithaca. The Town includes two villages (the villages of Dryden and Freeville) and other concentrations of populations are located in various hamlets. Despite growth that has occurred in the past several decades, the Town still qualifies as a rural municipality with a population density of only 100 persons per square mile outside the villages and hamlets. Most roads in the Town serve primarily as local roads designed for relatively low volumes of traffic.

Approximately 24% of the Town’s land area consists of steep slopes, and this topography has endowed the Town with signifi-

George R. Frantz & Associates 604 Cliff Street - Ithaca, NY - 14850-2014  
(607) 256-9310 e-mail: geoplant@metescape.net

cant open space resources, including agricultural lands that create scenic vistas across several valleys of the Town, and the forested slopes of the Allegheny Plateau. Portions of six watersheds are located within the Town's boundaries, and most of the Town drains into the Virgil Creek and Fall Creek, a major tributary of Cayuga Lake. The Town contains extensive surface and groundwater resources, and most of its major streams are classed C(TS) or higher, meaning that they are suitable for primary and secondary contact recreation and are trout spawning waters. The majority of residents depend on groundwater as their primary water source, and the Village of Dryden uses groundwater for its municipal water supply. The NYS Department of Health conducted a source water assessment of the Village of Dryden water system and found, with respect to three of four wells, that the susceptibility for potential contamination was medium to high.

The Town contains 35 NYS DEC wetlands and approximately 3,350 acres of wetlands mapped by either DEC or the U.S. Army Corps of Engineers. The Tompkins County EMC has identified 57 areas in the Town that harbor rare or endangered flora and fauna, unique geologic features or contain excellent examples of ecosystems or biotic communities. These areas have been designated Unique Natural Areas (UNA). The Town's Conservation Board has identified 35 potential Critical Environmental Areas. Approximately 1,870 acres of land in the Town that is considered ecologically or geologically significant is protected through inclusion in 16 private preserves.

The Town adopted a *Comprehensive Plan* in 2005. The overall goal of the Plan is to “*preserve the rural and small town character of the Town of Dryden, and the quality of life its residents enjoy, as the town continues to grow in the coming decades.*” Objectives to achieve this goal include protecting important natural open space resources, environmentally sensitive areas, unique flora and fauna, and scenic resources in the town. The *Plan* notes that the “*environmental resources of the Town of Dryden, including air, water, and soil, are of relatively high quality and are essential to a good quality of life, public health, and a thriving economy.*” The Town has embarked on a number of initiatives to protect its environmental resources, including completion of an Open Space Inventory that details the location and character of key environmental attributes, a study of the Virgil Creek Aquifer, and active participation in the Cayuga Lake watershed Intermunicipal Organization which furthers watershed studies and protection activities.

Truck traffic has been identified as a major concern by residents in several areas of the Town, particularly in the two villages, along the NYS Route 13 corridor, and Fall Creek Road. Traffic volumes and speeds on the highways that pass through the villages and hamlets is adversely impacting the quality of life. A significant transportation objective outlined in the *Comprehensive Plan* is to work with the State and Tompkins County to initiate steps that will channel truck traffic away from residential areas of the Town and off minor highways within the Town.

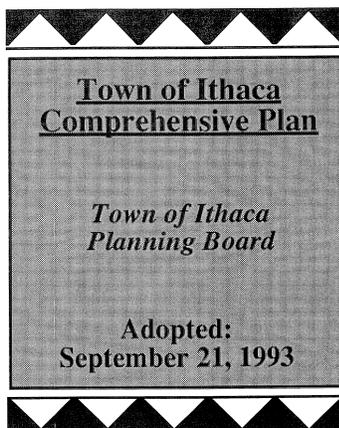
In terms of economic development, the *Comprehensive Plan* recognizes the importance of preserving agricultural resources, providing goods and services in the villages, and allowing for development of light industrial, warehousing, and research and development enterprises within or adjacent to existing industrial and commercial areas while preserving Dryden's rural and small-town character.

It also notes that areas designated for future light industrial and office park developments should be outside environmentally sensitive areas such as mature woodland, stream corridors, and wetland areas. The *Comprehensive Plan* does not recommend heavy industry.

In August 2011, the Dryden Town Board adopted an amendment to the Town's Zoning Law clarifying the Town's prohibition of natural gas exploration and extraction. This heavy industry, which generates significant truck traffic and emissions, is an industrial use that is not suitable for the Town of Dryden and is not recommended in the *Comprehensive Plan*. The Town Board found that heavy industrial use such as gas exploration and extraction in the rural environment of Dryden poses a significant threat to the Town's residents' health, safety, and general welfare since widespread environmental and human health impacts have resulted from natural gas exploration and extraction in other areas through the deposit of toxins into the air, soil, water, environment, and in the bodies of residents.

The resolution adopting the Zoning amendment notes that impacts associated with natural gas exploration, extraction, treatment, storage and transportation include: concentrated traffic and extra-heavy truck traffic on town highways not designed for such traffic; disturbance of land for clearing, grading, surface preparation and well pads; erosion and sediment deposition in local waterways; noise and dust; potential spillage of flowback water from drilling processes; construction of new compressor stations, potential fragmentation of agricultural lands and forests; and pollution of local surface waters and aquifers. All of these impacts are contrary to the goals and objectives of the Town's *Comprehensive Plan*. As noted in the resolution, clean air and water are essential to most resources and activities in the Dryden area and the quality of the air and the water will be degraded by natural gas exploration and extraction activities, which may cause irreparable harm to public and private water supplies, pollution of the surface and ground water, soil, and air, and may cause cancer, lung disease, and respiratory diseases.

### Town of Ithaca Comprehensive Plan



The Town of Ithaca is situated on the hillsides surrounding the deep valley occupied by Cayuga Lake (one of Central New York State's Finger Lakes) and Cayuga Inlet. The topography, shaped by past glacier action, is rolling hills with views across the lake and numerous watercourses contained by ravines or gorges, sometimes deep and spectacular, leading to the lake. Cayuga Lake, the largest body of water in the Town, is a very important natural, recreational, and visual resource, as well as a source of public drinking water for much of the Ithaca area. All land in the Town, and much of the land in Tompkins County, drains into Cayuga Lake. Nineteen areas in the Town have been included in the Tompkins County Environmental Management Council's (EMC) report Unique Natural Areas of Tompkins County (January, 2000).

The majority of the developed area of the Town is devoted to housing and institutional (i.e., higher educational) uses. Only 85 acres was devoted to industry in 1990. Farming is still the predominant land use in several areas of the Town, and the Town currently has 24 farms in operation.

Most through roads in the Town of Ithaca were laid out over a century ago and originally served as bridle paths or wagon trails. As the Ithaca area has grown, the increase in traffic has been dramatic with the result that these local roads are now forced to carry heavy traffic that they were not designed to accommodate. Because large amounts of both local and through traffic are carried on the same roads, the roads do not function well as either arterials or local roads, creating conflicts among drivers and between drivers and residents.

The Town's Comprehensive Plan was adopted by the Town Board in September 1993. In 2008, the Town of Ithaca began the process of updating its 1993 Plan. The Town is also preparing an Agricultural and Farmland Protection Plan (AFPP), a draft of which was released in March 2011 and updated in October 2011. It is anticipated that recommendations from the AFPP will be incorporated into the amended Comprehensive Plan and the entire AFPP will be included as an Appendix.

A major goal of the 1993 Comprehensive Plan is "to improve the environment and to preserve and protect it from degradation." Objectives to fulfill this goal are to have:

- Protection of natural resources, selected open space, environmentally sensitive areas, and unique natural areas.
- Protection of water and air quality and to keep impacts from erosion, sedimentation, and drainage to a minimum.
- Specific actions to implement these objectives include protecting FEMA flood plains, NYS DEC wetlands and wetlands delineated by the Town, areas where slope, soil, depth to bedrock, or vegetation indicate potential erosion problems, CEA's, important stream corridors, mature forests, and wellhead and watershed protected areas.

To protect water quality the Plan recommends preparing a Watershed Management Plan that encompasses management of storm water, stream corridors, soil erosion and sedimentation, and groundwater.

With regards to the economy, the Comprehensive Plan addresses commercial, agricultural, and light industry/office park development. The commercial goals are "to promote a stable and diverse local economy," and "to provide for a limited number of small-scale neighborhood-oriented commercial areas which are safe and attractive." Throughout the discussion, the emphasis is on local and small-scale businesses in three commercial zones, Neighborhood Commercial, Community Commercial, and Lakefront Commercial. There is no discussion of permitting heavy industry.

The Plan's agricultural goal is to "enhance agricultural viability and preserve agricultural land resources." Objectives include ensuring that farming activities take precedence over other uses in areas zoned for agriculture, and encouraging agricultural practices which minimize contamination of the environment, soil ero-

sion, and surface water runoff. To encourage a diversified agricultural sector, the Plan recommends “allowing non-farming agribusiness in agricultural zones (e.g., feed and seed dealer or farm implements dealer), limited to avoid negative impacts on traffic, farming, soils, housing and so on.” There is no discussion of permitting heavy industry.

The light industrial/office park goal is “to plan certain areas for nonintrusive and/or office park development in order to provide a variety of employment opportunities and increase the tax base.” Again, the emphasis is on “small-scale light industrial and/or office park development” that is located so as “not to adversely affect surrounding residential neighborhoods and the environment.” Light industry should be “compatible in type and size to existing local industries.” There is no recommendation for heavy industry.

The transportation goal is “to provide a transportation system that is safe, efficient, convenient and environmentally responsible.” Objectives to achieve this goal are to have “minimal negative impacts on people and the environment from traffic, road maintenance, road construction, noise, exhaust and the like.” In addition, future development should be designed “so as to minimize adverse impacts on roadway efficiency and safety” by “limiting the scale and concentration of development to what can be supported by the transportation system.” The transportation system should “promote, protect, and enhance agricultural and scenic resources along rural roads in the Town.” Similarly, the Plan’s housing objective is for “neighborhoods that are quiet, clean, and safe” with “low traffic, low vehicle speeds.” Recommended actions to accomplish this is to “ensure that inappropriate nonresidential uses are not located close to or within established neighborhoods” and to “ensure that large volumes of traffic are not routed through residential areas.”

In the Plan’s discussion of the land use patterns map, the “limited industrial use” category indicates “only existing industrial activities.” The Plan recommends that the Town examine where new light-industrial and office park activities should be located; however, it does not recommend areas for heavy industry.

The Town’s commitment to preserving agriculture can be seen in its draft AFPP and the Town Code. The draft AFPP states that “the rural character of the Town~enjoyed by Town residents and essential to the local tourist industry~is provided largely by local farmers and State Parks.” The plan uses the definition of “open space” from the 2009 NYS Open Space Conservation Plan to define Ithaca’s agricultural and forestlands as “land which is not intensively developed for residential, commercial, industrial or institutional uses.” Recommendations to enhance the economic viability of farms focus on tourism-related businesses (such as farm stands and markets, U-pick operations, CSAs, and agritourism sites), and agricultural-related businesses (such as greenhouses and value-added product operations).

Chapter 104 (Agricultural Assessments) of the Town Code authorizes the Town to use agricultural assessments rather than full value assessments for the purposes of calculating the taxes for fire district purposes on agricultural lands. Section 25 of the Town’s Zoning Law establishes Agricultural Zoning Districts in the Town, the purpose of which is “to assure a proper economic and physical environment for continued agricultural use of land and other non-extractive natural resource land uses; to maintain an open rural character to viable agricultural areas; to assure compatible types and densities of development on lands that are usable for agricultural pursuits; and to minimize other land uses incompatible with farming” [emphasis added].

Although the purposes refers to “nonextractive natural resource land uses,” mining is allowed in the district if authorized by special approval (as distinct from a special permit) from the Zoning Board of Appeals, and the definition of “mining” states that this activity refers only to the extraction of solid materials.

The Town also has a Conservation Zone, the purpose of which is to “preserve the outstanding natural features in certain areas of the Town.” Among the natural values and ecological importance of these areas are their “diversity as a plant and wildlife habitat, their existence as biological corridors, their importance for natural drainage features, their scenic views and rural character, and their importance as an educational and recreational resource. In addition, certain lands in the Conservation Zones contain large areas of steep slopes, wetlands, highly erodible or poorly drained soils and, in one instance, the City of Ithaca water supply, which must be taken into consideration in planning for future development.” This District is also intended to “preserve existing areas of contiguous open space, prevent unnecessary destruction of woodland areas, preserve natural stormwater retention and water quality functions, preserve existing and potential agricultural land and promote appropriate development densities and flexibility of design and development of land.” Certain of the areas included in Conservation Zones, in recognition of their natural and ecological significance, have been designated by the Tompkins County Environmental Management Council as Unique Natural Areas. It is a further purpose of the Conservation Zone “to preserve the natural resources and scenic beauty of the areas to promote tourism as an important economic benefit to the Town of Ithaca.”

Industrial zones are included in the Town, but only for manufacturing and light industrial uses (not mining). Prohibited uses include: factories or works such as arsenal, blast furnace, boiler works, iron, steel, brass or copper foundry, metal ore, smelting, planing mill, rolling mill and stockyards or slaughterhouse, and the manufacturing or storage of explosives and gas, oil and other flammables or petroleum products.

In July 2011, the Town Board adopted a resolution clarifying the definition of “mining” in the Zoning Law to explicitly prohibit natural gas exploration and extraction. The resolution stated that natural gas exploration and extraction would “pose a significant threat to residents’ health, safety and welfare” since “widespread negative environmental impacts have resulted from natural gas exploration, extraction and related operations in other areas, including negative impacts on groundwater quality, surface water quality, air quality, traffic, scenic resources, neighborhood and community character, vegetation and habitats.”

# Town of Danby Comprehensive Plan

TOWN OF DANBY COMPREHENSIVE PLAN AMENDMENT OF  
2011  
ADOPTED -2011  
DRAFT August 1, 2011

**Introduction**  
All legal and moral authority of governments first arises through the consent of the governed in the covenant documents that bind them and empower local governments to begin to exist. Hence, New York State was created by and is now regulated and governed by the Constitution. An original part of the New York State Constitution is Article IX, wherein the Bill of Rights for local governments was written and declared the supreme law of the state. In Article IX, at § 1, the power of local self-government is confirmed:

"Effective local self-government and intergovernmental cooperation are purposes of the people of the state."  
Thus, and in furtherance thereof, local governments were given certain Constitutionally expressed powers, among these are the home rule powers of Article IX, § 2, the most important of which is the right and power of local governments to govern and protect the public health, safety, health, and well-being of persons and property within the limits of such municipalities. These powers were then codified by the Legislature in Division of Laws, Book of particular powers were the Statute of Local Governments, the Municipal Home Rule Law and the Town Law. From the Constitution, then, and these laws, the Town of Danby was clearly and expressly granted power to regulate its internal affairs and to exercise its power to govern and protect public safety and public health, particularly to regulate the diverse and unique make-up of the Town of Danby, as also in all other towns - each and every one in existence, and New York State recognized, Constitutionally and in its Legislature, that no set of standardized laws could properly govern local citizens, all of whom should be self-governing as to their own best uses and ends.

The Statute of Local Governments then spells out this standard. Therein, at § 50, local governments were granted express powers to the extent that, subject to certain limitations, they may: (a) acquire, manage, dispose of and regulate property; (b) adopt, amend, and repeal zoning regulations, and to perform comprehensive or other planning work relating to its jurisdiction. The Municipal Home Rule Law (which, among other things, expanded and clarified these powers and gave the local governments the power to create laws, and not just resolutions) at § 9 grants the Town of Danby the clear and expressed power to adopt and amend local laws (that are not inconsistent with provisions of the New York State Constitution or with any general state law relating to its respective affairs, or government) included within the express powers of local jurisdiction are the acquisition, use, management and use of its rights, roads, streets, avenues and property; the protection and enhancement of the physical and visual environment of the municipality; the power of government to protect and regulate public order, conduct, and safety; and to regulate, prevent, and preserve the health and well-being of persons or property within the Town of Danby, including the power to adopt local laws providing for the regulation or licensing of occupations or businesses, and the power, by amendment or repeal, to govern and regulate the property, affairs, and government of the Town of Danby and the Town thereof. Also included are the power of municipalities to adopt resolutions or ordinances that are regulations for carrying into effect and administering local laws, and the concurrent power to enforce any statute, local law, resolution, rule or regulation relating to parking, licensing of occupations or businesses, fire prevention and safety, health and sanitation, and building, zoning, and planning.

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The Town of Danby is located in the rural south/central portion of Tompkins County. Approximately one-quarter of the Town land area is located within the Danby State Forest, which dominates the southern, portion of the Town. Danby is primarily a residential community with only a small number of community-oriented commercial and service establishments. The Town is rich in natural resources including wetlands, surface waters, aquifers, scenic viewsheds, State Park and Forest land, Unique Natural Areas, endangered/protected plant and animal species, farmland, and privately protected lands. Ninety percent of housing units obtain water from wells drawn from aquifers about which the Town currently has very limited information. A 1998 Historic Ithaca survey of all structures in Danby found that agricultural sites and structures, along with historic cemeteries, are the

Town's most threatened cultural resources. In the same year, in a Comprehensive Plan Survey, respondents identified maintenance and protection of open spaces and agricultural lands as significant priorities for the next ten years.

According to the 1998 Comprehensive Plan survey, 75% of respondents felt that light industry was not appropriate for Danby, 98% felt that environmental protection was important, and 80% listed rural atmosphere as important. The Comprehensive Plan vision statement calls for "a community that values and seeks to conserve its rural character," growth that "will not unduly or unreasonably disrupt neighborhoods," and development that encourages the use of "natural resources in order to enhance both environmental and economic development."

The Plan states that preservation of Danby's rich environmental resources is a critical. Significant objectives to attain this goal include protecting water resources from sedimentation, contamination and flooding, and ensuring adequate private and public water supplies. With regards to the aquifer, the plan recommends developing ways to fund USGS Aquifer studies through cost-sharing with Tompkins County so that the Town can identify problems and opportunities related to water supply and quality.

Economic development is envisioned as being local, community-oriented, small-scale, and supporting tourism. Danby's agricultural lands, as well as its State Park and Forest lands, historic and cultural resources, are recognized as economic resources that can provide a basis for future employment in education, recreation and tourism. The Plan promotes enhancing viable, environmentally responsible agricultural uses in the Town, and using Danby's historic and cultural resources as assets to promote tourism or recreational activities such as the development of scenic drive and cemetery tours, bike trails that pass by historic resources, and walking trails near historic farmlands. The Plan also recognizes the importance of aesthetics to the promotion of the tourism industry, and recommends:

- Designating State routes in national and State historic and scenic byway programs (such as the New York Scenic Roads Program) to encourage retention of viewsheds

- Drafting local legislation to recognize and protect the rural/pastoral qualities of certain roads and views in agricultural areas.

The goals, objectives and strategies for Land Use in Danby are based on a vision of revitalized town centers with managed residential growth and protected open spaces. Respondents to the 1998 Comprehensive Plan Survey valued open space and recreation and believed in the importance of limiting business development, which many felt should be placed in the Central Danby hamlet. The Plan states that agricultural land, wetlands, County Unique Natural Areas, State-owned lands, areas with historic or scenic value, and lands with slopes greater than 15% should be protected from extensive development. To this end, the land use goal seeks "to preserve natural, agricultural, and historic resources in Danby and the greater community."

Danby is currently in the process of developing a 2011 update to the 2003 Comprehensive Plan. Part of the Comprehensive Plan update is to clarify what is meant by the use of the generic term "industry" and its variants in the Plan. As noted in the 2011 Update:

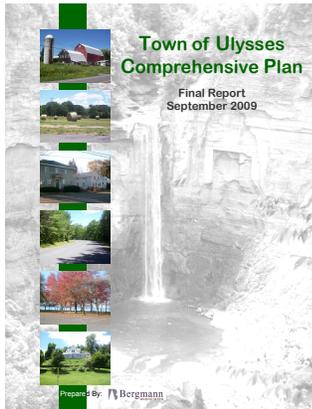
The Town [in the 2003 Plan] declared that plans for future development 'should recognize characteristics that render certain land uses less desirable and evaluate where development can create conditions hazardous to properties or to the aesthetic and ecological value of the resources themselves.' As well, 'working landscapes' - such as farm fields, pastures, fallow fields, forests, orchards, and vineyards - were deemed of vital importance. It was recognized that such uses, though often under private control, have the potential to increase local property values, are aesthetically and historically valuable, and constitute a public good, such that planning goals are needed to promote and maintain these working landscapes while retaining their aesthetic, historic, and economic value.

To protect these resources, and the values inherent in the rural, small town of Danby, goals and values that are highly valued by residents and over 40 years of planning and zoning, the 2003 Comprehensive Plan did recognize the need for businesses and the development of light industries, but only in certain areas of the Town, and generally along major State Route development corridors. Indeed, every reference to industry, generally, references "light industry" as the Town of Danby knew, and recognized, in 1955, 1965, 1989, and 2003, and at all points in between, that heavy industry was inconsistent with the vision and needs of the Town of Danby, and would destroy the key components that Danby sought to preserve - its environmentally significant inventory of places and things, and its small town, rural character. Even the value of tourism, which is a major economic stimulus in Danby, would be negatively impacted by certain industries, particularly heavy industry or industries that have significant impacts upon people and the land.

The draft 2011 Plan amendment notes that "the effects of allowing heavy industrial development, or industries with significant industrial impacts (including, but not limited to, hydrofracking and oil and gas mining) is destructive to the character and health of the Town, because of, but not solely because of, water pollution, aquifer contamination and/or depletion, air pollution, road damage, water and air contamination, increased densities and housing impacts, each one of which could, and all or any combination of which will, greatly diminish the positive aspects of Danby hereby sought to be protected." The purpose of the

amendments is therefore to prohibit such uses in the Town. Accordingly, a draft Local Law dated August 1, 2011 prohibiting gas and petroleum mining is currently under consideration by the Town Board.

### Town of Ulysses Comprehensive Plan



Ulysses is a picturesque community that is well known for its vistas of farmland, hills and Cayuga Lake. The Town’s character is defined by agricultural lands and open spaces interspersed with pockets of residential development, a variety of small-scale commercial uses, and a well-defined village center in Trumansburg. The Town has retained its rural, small-town character despite the development pressure that has impacted other communities; agriculture is still an important aspect of the local economy, and natural attributes such as lakes, creeks and waterfalls are enjoyed and valued by residents. The Tompkins County EMC identified 10 areas in Ulysses that are designated Unique Natural Areas that harbor rare or endangered flora and fauna, unique geologic features or contain excellent examples of ecosystems or biotic communi-

ties. Taughannock Falls State Park, nearby wineries, and Cayuga Lake create tourism opportunities which help to sustain the Town’s economic base.

The Comprehensive Plan, most recently amended in 2009, identifies the town’s rural character, agricultural lands, and natural resources as characteristics that people value for contributing to a positive quality of life. The Plan recognizes that “the wrong type and scale of future development could lead to the loss of existing agricultural businesses, changes to the character of rural roadways as they see increased traffic, and the loss of open space and scenic views as large parcels get subdivided and sold.” To prevent this, the Plan includes policies, objectives and actions in support of the following Vision Statement for Ulysses, which is designed to guide future actions and which recognizes the Town’s agricultural heritage, natural beauty and environmental assets:

*Ulysses is a rural community in the Finger Lakes region that takes great pride in its agricultural heritage and character, natural resources, and small-town atmosphere. Significant community features, including our farms and lakeshore, make Ulysses a desirable location for residents and visitors alike. We will continue to celebrate and protect our unique resources by promoting efforts that support agricultural sustainability, open space conservation, a balanced approach to economic development, and revitalization of village and hamlet centers. We will strive to effectively balance future growth with the conservation of key community assets through proactive planning in a manner that benefits all residents, both today and in the future.*

The environmental and natural resource policy to support this vision states that “the Town of Ulysses is defined by a rich diversity of natural features and open spaces. The abundance of fields, woodlands, wetlands, waterfalls, gorges, and lakeshore contribute greatly to the quality of life here, and serve as important habitat for plants and wildlife. Resi-

*dents have expressed a strong desire to preserve the quality of these natural features and resources. To do so, the Town will strive to employ sound development practices, proper zoning guidelines, and community stewardship to reduce or eliminate the degradation of these valuable resources.”*

Objectives to implement this policy stress the need to preserve the Town’s natural and environmental resources, protect existing water resources and maintain water quality, protect existing air resources and maintain air quality for the health and safety of residents. To further these objectives the Plan outlines specific action steps including the need to *“identify and enact measures to protect the quantity and quality of groundwater for Town residents, including the protection of open space and prohibiting over-withdrawal of groundwater resources, and limiting potential negative impacts associated with septic systems, agricultural practices and commercial containments.”*

Through the implementation of sound land use planning principles, the Plan aims to encourage sustainable land use and development. The land use policy states that *“the rural landscape is an important attribute of the community; the preservation of this landscape must be balanced by thoughtful residential and commercial growth that is focused around targeted development nodes. The Town will support development patterns that conserve its unique natural resources, reduce energy consumption, and strive to enhance land values within the Town.”* Specific objectives to implement this policy include protecting a high quality of life for all residents through proactive planning that complements the existing rural character of the Town and protects the value of natural and environmental resources. The Plan also recommends limiting future development to designated areas as identified on the Future Land Use Plan, encouraging alternative modes of transportation such as public transit, biking and walking, and reducing energy consumption. Specific action steps include developing strategies for protecting and maintaining high quality agricultural land for agricultural uses, and for preserving the rural landscape.

Policy #3, entitled Local Economy, seeks to *“promote a diversified economy that builds on established local industries, including agricultural production, tourism, and small-business development.”* The Plan includes as an objective in support of this policy the need to diversify the local economy and promote economic growth by supporting and promoting tourism-based opportunities.

The community services policy seeks *“to provide safe, healthy, and enjoyable ways for residents of the Town to enjoy the natural, cultural, and historic resources, which contribute to the overall landscape of the Town.”* The fifth and final policy, entitled Community Identity, states that *“Town residents are proud of the established community identity of Ulysses as a desirable place to live and recreate in the Finger Lakes region. We recognize that the Town of Ulysses and the Village of Trumansburg offer unique opportunities for small business owners, residents, and visitors. The Town seeks to honor its agricultural heritage and rural settlement pattern and celebrate its natural beauty and resources.”* To implement this policy, the Plan calls for promoting the cultural and historic resources within the Town, and enhancing the assets that make Ulysses a unique and desirable place to live while solidifying its identity as part of the greater Finger Lakes region.

There is no mention in the Comprehensive Plan of encouraging heavy industry in the Town, and as discussed in detail later in this report, such a recommendation would be contrary to the Town’s goals of preserving natural and environmental resources, preserving agricultural land for agricultural production, and

encouraging a tourism-based economy. For this reason, in August 2011, the Town Board adopted a local law amending the Town's Zoning Law to clarify that natural gas and/or petroleum exploration, extraction, support activities, and storage, transfer, treatment or disposal is prohibited in the Town. As set forth in the resolution adopting Local Law No. 2 of 2011, *"there is mounting evidence that widespread negative environmental impacts have resulted from, or are reasonably expected to result from natural gas and/or petroleum exploration, extraction and related operations in other areas of the country, including negative impacts on groundwater quality, surface water quality, air quality, traffic, scenic and natural resources, neighborhood and community character, vegetation and habitats."*

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## 2. GDTF Gas Development Build-Out Analysis

This section of the Community Impact Assessment will provide a build-out analysis of the potential for gas well development in each of the municipalities in Tompkins County, through accepted measures of impact, in categories such as loss of farmland, truck impacts on local roads, water and chemical use and wastewater disposal, employees needed by the industry, and potential effects to community services. The build-out analysis was prepared by the TCCOG Gas Drilling Task Force (GDTF) in June of 2011. Maps showing lands leased by gas companies between 2005 and 2009 together with projections of the number of wells that may be developed in each of the communities can be found under the heading "Tompkins County & Towns Part B at the GDTF [website here](#).

This analysis will summarize the documented characteristics and impacts associated with gas development and will place particular emphasis on the most recent technologies being used to develop unconventional gas reserves, such as the Marcellus Shale formation. There has been the greatest interest in exploitation of such reserves in the region and this interest is expected to grow as **all other sources of energy decline** as shown on the US Department of Energy's chart above. HVHF occurs on both vertical and horizontal wells. A step-by-step illustrated presentation of HVHF of a vertical well in Otsego County, by Gastem, can be found [here](#).

Gas drilling and production has all of the characteristics of heavy industry. Heavy industry has been defined by the American Planning Association (see [Planning Advisory Service Report # 421](#)) as *"A use engaged in the basic processing and manufacturing of materials and products predominately from extracted or raw materials, or a use engaged in storage of, or manufacturing processes using flammable or explosive materials, or storage or manufacturing processes that potentially involve hazardous or commonly recognized offensive conditions."* The U.S. Department of Labor, in the Standard Industrial Classification Manual, includes Industry Group 131 (Crude Petroleum and Natural Gas) and Group 138 (Oil and Gas Field Services) under Division B: Mining.

While there are many characteristics of these operations that differ significantly, they do share some common effects including the potential for economic benefits to the community in which they reside through employment and tax revenues. But, new industrial jobs not only create income for a community, they also create costs as new families move in and public services must be provided. Furthermore, industrial growth

also carries with it inevitable and unavoidable adverse environmental impacts. These include significant truck traffic, noise, odors, safety hazards, unsightly conditions, loss of habitats, declines in water and air quality, to name a few topical areas. The costs of heavy industry are not always felt while the industries are in operation. New York State is currently home to almost 100 superfund<sup>4</sup> sites with nearly half of them contaminating or threatening contamination of drinking water sources. The superfund sites have left a toxic legacy that has sometimes been paid for using tax revenues, so the actual economic costs of heavy industry are often shared by all.



Heavy Industry (Photo: Sura Nualpradid)



Gas Well Drilling (Photo: NYC-DEP)

The following sections will analyze and discuss the build-out analysis results based upon the potential for gas well development in Tompkins County. Also included is an examination of the potential adverse and beneficial impacts that can be expected to a variety of relevant areas of environmental concern.

Geologists have long known about the natural gas resources of the Marcellus Shale formation. It is buried deep beneath Tompkins County. Until recently however, use of conventional vertical drilling technologies failed to provide a significant supply of natural gas from the formation. Beginning in the 1970's, the US Department of Energy funded the Eastern States Shale Project to develop new technologies to advance development of shale gas. The Project resulted in a new application of an already known technology referred to as directional drilling. This technology uses an initial vertical drillhole at the surface and then slowly turns the drill 90 degrees to penetrate long horizontal distances, sometimes over a mile, through the Marcellus Shale bedrock. Hydraulic fractures are then created in the rock at intervals from the horizontal section of the borehole, allowing a substantial number of high-permeability pathways to contact a large volume of rock. This technology is commonly referred to as hydraulic fracturing, hydrofracking, hydrofrac, or simply fracking and abbreviated as HVHF. Use of the new technology (also referred to as unconventional drilling or unconventional gas), combined with a substantial increase in the price of natural gas and the other factors described herein, created unprecedented gas leasing and drilling activity in the Marcellus Shale region.

Below the Marcellus Shale formation is the Utica Shale formation. As discussed in Section B above, this formation is considered to have the potential to “become an enormous natural gas resource. Staff of the [New York State Museum](#) have stated that “Gastem has had some recent success drilling vertical Utica wells in Otsego

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<sup>4</sup> Superfund is the name for the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. It was designed to clean up sites contaminated with hazardous substances. The law authorized the EPA to identify parties responsible for contamination and compel them to clean up the sites. Where responsible parties cannot be found, the Agency can clean up sites itself.

County...[and]...*The overlay of Utica and Marcellus fairways create a potential two-for-one opportunity for drilling shale gas.*” Therefore, it is possible that both Marcellus and Utica Shale formations could be exploited either consecutively or concurrently. **While additional gas well development of the Utica Shales is likely in the future, potential build-out of the Utica Shale formation has not been included in this analysis. As a result, this build-out analysis likely understates the overall impact from gas development activities in the County.**

In order to estimate the number of new gas wells that could potentially be developed in the County, using high-volume hydraulic fracturing combined with horizontal drilling, GDTF developed a build-out analysis of the potential rates and densities of natural gas well development that could be seen in the coming years in the Marcellus Shale formation.

Build-out is a planning tool that estimates the impact of cumulative development upon a community’s land areas once all of the potentially developable land has been converted to the use or uses under study. No attempt has been made to conduct a build-out for related heavy industrial activities or for oil or solution well development since none of these uses are currently in as high demand as natural gas using HVHF. This does not mean that they will not be developed in the future, just that any exercise aimed at estimating the extent to which heavy industries like gas processing plants, chemical or other similar operations or oil or solution well development would become established in the County is speculative at this time. But, horizontal drilling combined with HVHF is the hottest development to hit the Marcellus Shale region in decades. Like HVHF combined with horizontal drilling, future technologies could eventually be developed to more efficiently extract oil that is known to exist in the region. Tompkins County is not well positioned in relation to Interstates 81 and 86 (i.e. the former Route 17), but industrial growth in the future is possible as a result of the presence of the gas industry in the area which may induce demand for related industries.

In fact, the presence of natural gas in the Marcellus and Utica Shale formations could induce new industrial development in the region for support industries or other heavy industries that rely on the use of fossil fuels as illustrated in the photo below. An example is the proposed Seneca Lake gas storage facility. This facility is being planned by Inergy Midstream, LLC for the former US Salt plant just north of Watkins Glen NY, with underground storage for 1.45 billion cubic feet of natural gas, to which they propose to add an up-to-88.2 million gallon liquid propane storage facility, also underground, plus a 14-acre, 92 million gallon brine pond on the surface.



Photo by Halliburton of a Gas Processing Plant in the Barnett Shale region of north Texas

The build-out provides a peek into the future by examining probable future gas development intensities and patterns. It helps residents and local officials to envision the extent of heavy industrial growth from HVHF operations. If examined in isolation, the risks and impacts from one individual well, may not be significant, but once examined cumulatively, the overall effect on the County and its municipalities is likely to be significant. The build-out analysis can assist residents and decision-makers in understanding, ahead of time, the impacts heavy industrial activities can have on the community. It identifies the potential number of wells, the amount of water consumed, wastewater (flowback) generated, chemicals used, the number of acres of active farmland which will be converted or impacted, the number of truck trips made on local roads, and potential employees needed for each gas well in the future. This information can be used by local officials to estimate the infrastructure that may need to be built, expanded or improved to accommodate the growth of industrial development. This includes the secondary growth needed by employees of the companies that attempt to develop new wells, the need to construct or reconstruct roads and bridges that are capable of accommodating the truck loads of 80,000 pounds or more. While the US Department of Transportation governs weight limits on the Interstate system to 80,000 pounds, these limits can be exceeded because states have the right to issue temporary oversize and/or overweight permits for rigging equipment that can be as heavy as 100,000 pounds. Knowing in advance that millions of heavy truck trips are predicted<sup>5</sup> on local and State roads can help local officials and others quantify the services required by local government. The assessment also helps in the selection of policy alternatives to determine whether or not to accommodate the anticipated new industrial development.

The steps to undertaking the build-out analysis are relatively straightforward. First, lands that are not suitable for gas well development, such as urban land and water are deducted from the overall gross County acreage. Then, an assumption that 50 percent of the lands that could be leased for gas development are in fact leased or are subject to compulsory integration and developed with gas wells. The 50 percent assumption is conservative because this does not include the potential for backspacing nor development of addi-

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<sup>5</sup> The NY State Department of Transportation has predicted an increase of 1.5 million heavy truck trips each year in the State as a result of HVHF.

tional wells in the Utica Shale formation. More than 50 percent of the County's land area may be subject to leasing in the future.

According to the New York State Museum's [Reservoir Characterization Group](#) (for petroleum) there is "Great potential for natural gas production in Marcellus and Utica Shales." However, due to the recent dramatic increase in use of the Marcellus Shale just the past few years (primarily in Pennsylvania and other states without a moratorium on horizontal drilling combined with hydraulic fracturing like New York), there is little information that would allow for a characterization of the specific factors that can be used to estimate GDTF's full build-out of gas production in Tompkins County. Therefore the figures provided are estimates based upon the best available information. The actual build-out will ultimately be a function of the interplay between four factors: local geology, natural gas pricing and drilling economics, leasing patterns, and State and local government laws, guidelines, and regulations.

Other sources used includes the analysis conducted by the New York City Department of Environmental Protection (NYC-DEP), for its water supply watershed in the [Final Impact Assessment Report](#) prepared by Hazen and Sawyer in December of 2009. This study was relied upon to develop reasonable assumptions that could apply to Tompkins County. The assumptions generated by the DEC in their 2009 dSGEIS document, to estimate the number of well pads per square mile and other relevant factors, were used to estimate the potential for well development in the County.

The studies used in developing GDTF's build-out include the NYC-DEP [Report](#) and the DEC's dSGEIS document which both reviewed shale gas formations around the country that have similar high potential for gas production as the Marcellus. Many of the locations used in developing multipliers and the other factors used in calculating the build-out numbers were for similar areas. Readers are encouraged to examine the information used by those agencies in applying the baseline multipliers and other measurement standards used by these sources and by this analysis.

The Marcellus formation is an extensive resource that occurs beneath much of the State and it has been estimated by the DEC that it will require tens of thousands of wells to fully exploit. As such, cumulative impacts from many wells constructed throughout the County and the Region must be evaluated in order to fully characterize the potential risk from both concurrent and consecutive activities at multiple locations. This Community Impact Assessment only attempts to answer the question of how much of an impact gas development will have on Tompkins County. The well build-out density in the County has been combined with quantitative estimates for various activities associated with each well to develop cumulative values. Maps prepared by GDTF, showing leased lands and projections of well density in each municipality can be found at the GDTF [website](#). **The analysis is not a prediction, per se, of what will occur at any particular time. For policy-makers however, it shows the consequences of gas development activities where no local controls exist.**

The entire process of gas well development, from site development through completion, takes approximately four to ten months for one well. Multiple horizontal wells may be drilled from a common well pad. One multi-well pad can accommodate eight to twelve wells and can recover the natural gas from a spacing unit

covering a maximum of one square mile (640 acres). New York State requires that all wells from a pad must be drilled within three years of the first well, so sites will likely experience a relatively high and constant level of heavy industrial activity for at least one and up to three years. The estimate of 210 well pads and 2100 wells that could be developed in Tompkins County, could be drilled in a relatively intensive but short period of time or could be drilled over a period of generations as all areas in the County that are potentially available for drilling are pursued by the gas industry. In addition, the fracturing process could be repeated multiple times over the life of a well (i.e. refracking) to restore declining gas production rates. According to [Halliburton](#) (one of the world's largest providers of products and services to the gas industry), *"It has been established that only 10% of GIP [Gas In Place] is recovered with the initial completion. Refracturing the shale can increase the recovery rate by an additional 8% to 10%. Simple re-perforation of the original interval and pumping a job volume at least 25% larger than the previous frac has produced positive results in vertical shale wells."* Schlumberger, an oilfield services company for the oil and gas industries, states that *"Shale gas wells don't come on as strong as tight gas, but once the production stabilizes, they will produce consistently for 30 years or more."* Thus, the true impacts of each well that is drilled can be felt for decades as the gas resource is fully exploited. Readers should also carefully note the exclusion of wells drilled into the Utica Shale formation, which may create an additional heavy industrial demand in the County for generations.

### **Build-out Analysis Assumptions**

The following assumptions were adapted by GDTF from the research methodologies adopted by the City of New York in its [Final Impact Assessment Report](#) prepared by Hazen and Sawyer in December 22, 2009, by the New York State Department of Environmental Conservation in its [Draft Supplemental Generic Environmental Impact Statement 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](#), by the [Manual of Build-Out Analysis](#) by the Center for Rural Massachusetts at the University of Massachusetts at Amherst, and by the Town of Middlefield Land Use Analysis prepared by GREENPLAN Inc.

**Infill wells.** GDTF's analysis does not include the development of additional infill wells that can be drilled. Infill wells, resulting in more than one well per 40 acres or other spacing requirement of the Environmental Conservation Law, may be drilled upon justification to the DEC that they are necessary to efficiently recover gas reserves. The gas industry refers to this as "downspacing" and it is a technique that is widely used in other gas formations around the nation. According to [Oil and Gas Investor](#), *"As plays become further developed and the reservoir is better understood, downspacing begins."*

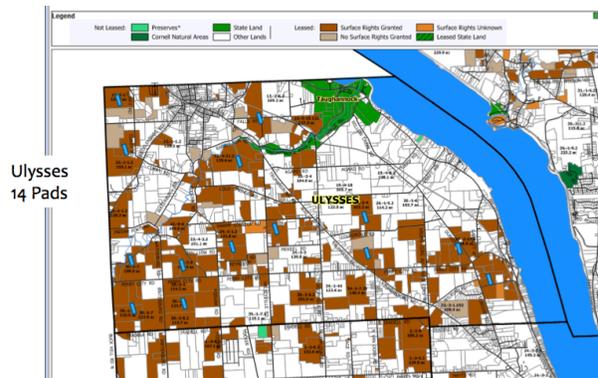
**Utica Shale and Other Gas-Bearing Formations.** This analysis has not included future development of the Utica Shale formation for natural gas since not enough information is known today about the full extent of the resource available there. It is also important to note that the well spacing assumptions discussed below are not applicable when wells are drilled into different gas-bearing formations.

**Potential Developable Land Area.** GDTF estimated the potential level of development of gas wells in Tompkins County by calculating the total County land area in square miles. This is 492 square miles or

314,880 acres. Next, urban developed lands and water areas, which consist of 71 square miles (45,440 acres), were deducted for a net area of 421 square miles. GDTF then assumed that 50 percent of the net area was leased to gas companies or was included in the area subject to gas development due to compulsory integration. As stated above, 39 percent of Tompkins County’s land area was leased for gas development between January 2005 and October 2009 and an additional 11 percent of the land could be easily added through compulsory integration and additional leasing activity, once the State permitting process begins in 2012. Thus, the total acreage that could be potentially developed with gas wells was projected by GDTF to be 210 square miles or 134,400 acres of land.

**Well Density.** New York State regulations allow up to 16 wells per square mile. This equates to 16 wells per 640 acres or 1 well per 40 acres. The US Energy Department has stated that “*average well spacing in the Marcellus is 40 to 160 acres per well.*” The DEC’s dSGEIS indicates a lower density, approximately six to nine wells per square mile, is more likely. According to the NYC-DEP Report, this estimate is corroborated by recent permit applications in Sullivan County, which are based on five to six wells per square mile. Well densities to date in excess of three wells per square mile in other areas have been documented from shale gas plays with significantly higher localized densities. For example, Denton County, TX has a well density of 5.5 wells per square mile over approximately 400 square miles (40 percent) of the county’s land area. It has not been established that these areas have been completely developed so higher gas well densities are possible. Similarly, annual well completion rates in excess of five wells per square mile have been documented, and permit applications suggest that these rates could be higher also. According to Dr. Tony Ingraffea, a Professor in the School of Civil and Environmental Engineering at Cornell University, a **minimum** of eight wells per square mile will be needed to maximize gas recovery.

Projected well density is shown on maps available at the GDTF’s [website](#). Well density was based upon visually identifying parcels of already leased land, plus adjacent land that could be compulsorily integrated, sufficient to support a 640 acre spacing unit. As an example, the Town of Ulysses map is shown to the right (pads are in blue). Pad size, including related site development, was assumed by GDTF to average 8.8 acres. The number of wells per pad range from 8 – 12, averaging 10. The DEC’s Revised dSGEIS also includes an estimate for installation of utilities to serve the wells. This adds 3.68 acres of disturbance to the total for the well pads.



**Farmland Acreage.** The number of acres of active farmland in Tompkins County is 70,054 or 26 percent of the County’s net land area. For estimating the number of acres of farmland lost as a result of site disturbance activities, the 8.8 acre figure per well pad site was used for GDTF’s calculation of farmland lost. This estimate is considered very conservative since a disproportionate amount of farmland is likely to be impacted.

**Water Consumption.** The volume of water required to fracture a horizontal well depends on a variety of factors, including characteristics of the target formation, the length of the lateral, and fracture goal. The photo to the right from Tioga County, PA. by Dick Martin ([www.PaForestCoalition.org](http://www.PaForestCoalition.org)) shows a water impoundment holding 14.5 million gallons of water. Industry data cited in the DEC's dSGEIS indicates that on the order of 3,000,000 to 8,000,000 gallons of water may be required to fracture a single horizontal well in the Marcellus formation. Professor Tony Ingraffea of Cornell University has stated that Chesapeake Energy is averaging 5.5 million gallons of water per well in Pennsylvania's Marcellus Shale play. Nevertheless, the NYC-DEP in their build-out of the Catskill Watershed assumed an average of 4,000,000 gallons of water would be consumed per well. GDTF's analysis uses the assumption that 5,000,000 gallons of water will be needed to develop each new horizontal well. The estimates provided are conservative and only include the initial fracking. As discussed below, wells are expected to be refracked to increase the recovery rate as the resource is depleted over the life of the well.



Photo credit : [www.PaForestCoalition.org](http://www.PaForestCoalition.org)

**Chemical Use.** Water and sand use have been reported by the gas industry and the US Department of Energy to comprise 98 to 99.5 percent of the fracturing fluid mixture, with the remaining 0.5 to 2.0 percent consisting of an array of chemical additives used to control fluid properties during the various stages of the fracking process. Though the proportion of chemicals in fracturing fluid is low relative to the large amounts of water required by the fracturing process, meaningful assessment of potential water quality impacts requires that chemical additives be expressed on a mass basis. This is especially important due to the toxicity of the chemicals used, as described below in the section on Water Resources. An assumption of 167 tons (334,000 pounds) of chemicals used per well, cited by the NYC-DEP in their analysis has been assumed in GDTF's analysis.

**Flowback.** After the hydraulic fracturing procedure is completed and pressure is released, the direction of fluids pumped into the well reverses and a significant flow comes back to the surface. The process and the returned chemical and water mixture are referred to as "flowback." According to the DEC's Revised dSGEIS, "Flowback water recoveries reported from horizontal Marcellus wells in the northern tier of Pennsylvania range between 9 and 35 percent of the fracturing fluid pumped. Flowback water volume, then, could be 216,000 gallons to 2.7 million gallons per well." The NYC-DEP Report cites a flowback volume of 400,000 to 2,800,000 gallons per well and for purposes of their build-out analysis, the NYC-DEP Report uses an average of 2,000,000 gallons of flowback to the surface. The GDTF analysis assumed that 20 percent of the water injected into the well will return to the surface as flowback or 1,000,000 gallons per fracturing. This flowback water and chemical mixture has been found to include not only the chemicals pumped into the well but it also con-

tains heavy metals and radionuclides found in the bedrock that are released during the hydrofracking process. According to the U.S. Geological Survey, a typical 3 million gallon hydrofrac produces 15,000 gallons of chemical waste. In existing Marcellus wells outside of New York this waste is stored on-site in large holding ponds to evaporate, be land spread if legal, or until trucks haul it to other locations, for processing and disposal, where suitable facilities exist. The flowback fluids must be contained and are subject to treatment and sometimes reuse. There are three sewage treatment plants in Tompkins County that currently process 2.6 billion gallons of wastewater each year. It is unknown if the treatment plants are capable of processing the industrial wastes likely to constitute the flowback. In addition, the estimated 1.05 billion gallons would represent a 40 percent increase in the capacity of the plants.

**Truck Trips.** Development of natural gas resources are accompanied by a significant increase in the level of heavy truck traffic compared to current conditions. The DEC's Revised dSGEIS estimates the number of truck trips per well at roughly 900 to 1,300, approximately two-thirds of which are for water and flowback hauling. The NYC-DEP Report cites a range of 800 to 2,000 truck trips per well and for purposes of their build-out analysis, the NYC-DEP Report uses and the GDTF analysis assumes an average of 1,200 truck trips per well. Under the complete Build-out, this equals 252,000 one way truck trips per year. At key intersections in the County, trips would be doubled for one loaded trip and one empty truck trip. Total traffic experienced would be 504,000 new heavy truck trips per year, which is almost double the current 600,000 heavy truck trips each year in Tompkins County. This figure does not account for truck trips through the County that are generated in surrounding counties as a result of HVHF.



Photo by Halliburton

**Employment.** James Ladlee, Director of Penn State Cooperative Extension's Clinton County office and Larry Michael, Executive Director of Workforce and Economic Development at Pennsylvania College of Technology, have estimated the creation of Marcellus Shale jobs involving the development of the pad and well itself. Several studies, including theirs, have found roughly the same statistic: statewide in Pennsylvania, preparing, drilling and beginning the production of a Marcellus Shale well will require the equivalent of 11 to 13 full-time jobs per well. This doesn't mean that only a dozen or so people do all the work. Instead,

their study found that, on average, it takes 410 individuals, across 150 different job types from roustabout and truck driver, to roughneck and mud logger to get a well up and running. But nearly all of the workers are only there for a few days or weeks at a time. Many of the workers come from other gas drilling regions, typically Texas, Oklahoma and Arkansas due to their more mature gas industry and the specialized nature of the jobs. Adding up the hours, it's equivalent to 11 to 13 people working on one well site for an entire year. GDTF's analysis assumes an average of 12 employees per well. These employees will require lodging and services in the community for the duration of the well drilling activity, which has been estimated to last up to three years for one well pad with six to eight wells and from four to eight months per well with one well per pad. Re-fracking of each well must also be accounted for as described above. The 10 year build-out assumes a total of 2,520 jobs each year which represents four percent (4%) of the County's current 65,700 employment.

**A Final Build-out Analysis Caution.** As Neils Bohr, a Nobel Laureate in Physics once stated, *“Prediction is very difficult, especially about the future.”* This analysis of the extent of gas development activities in Tompkins County may understate the overall impact that could be experienced. It should not be viewed as a prediction of what will occur but as an exercise that can help residents and decision-makers understand the implications of taking no action to prepare for the possible growth of development that is occurring in other locations with the energy resources identified herein.

The results of GDTF's build-out calculations can be found in the following table summarizing several impact categories. The impacts of the build-out will be discussed in detail in the sections that follow the table.

Estimated Wells and Well Pads by Town		
Town	Well Pads	Wells
Caroline	36	360
Danby	12	120
Dryden	44	440
Enfield	17	170
Groton	44	440
Ithaca	3	30
Lansing	30	300
Newfield	10	100
Ulysses	14	140
Tompkins County Total	210 Pads	2100 Wells

<b>Summary of the GDTF Build-out Analysis</b> (estimates are assumed over a 10 year timeframe)		
<b>Impact category</b>	<b>Unit of Measure</b>	<b>Build-out Analysis Estimates</b>
Countywide Land Disturbance	8.8 acres/well pad	1,848 acres
Active Farmland Lost	26% of County	480 acres
Water Consumption	5,000,000 gallons/well	10,500,000,000 gallons countywide
Chemicals Used	167 tons/well	350,700 tons county-wide
Flowback Wastewater	20% of water injected	2,100,000,000 gallons countywide
Truck Trips	1,200 trips per well	2,520,000 trips
Full-time Equivalent Jobs	12 per well	25,200 "worker years"

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#### D. New York State Environmental Studies

In the early 1990's, a Generic Environmental Impact Statement (GEIS) was prepared by the DEC on the oil, gas and solution mining industry. A GEIS is a tool that can be used to encourage a particular type of development activity by assessing the impacts of the activity and then setting thresholds or criteria that must be followed to minimize or avoid adverse environmental impacts. If the thresholds or criteria are followed, then applicants for development permits need not conduct site-specific environmental reviews under the State Environmental Quality Review Act (SEQR). In 2005, the U.S. Congress enacted amendments to the Safe Drinking Water Act, among other laws, that [exempted](#) HVHF from complying with certain requirements. This and other factors paved the way for HVHF to expand exponentially in natural gas regions throughout the nation.

Then, as demands for HVHF grew, in July of 2008 the DEC began a study of HVHF and issued a draft Supplemental GEIS (dSGEIS) for public review in 2009 with public hearings held in several locations. A moratorium was put in place from June 2010 until June of 2011 but this moratorium did not affect HVHF for vertical gas or oil drilling. The moratorium is not officially in place as of the date this Assessment was published, but the State does not expect to issue permits for HVHF until 2012. Due to the significant criticism the State received on the inadequacy of the 2009 dSGEIS (more than 13,000 comments), the DEC decided to prepare a Revised dSGEIS, which was released in parts beginning in July of 2011 and in full by September of 2011.



**Revised Draft**  
Supplemental Generic Environmental Impact Statement  
On The Oil, Gas and Solution Mining  
Regulatory Program

**Well Permit Issuance for Horizontal Drilling  
and High-Volume Hydraulic Fracturing to  
Develop the Marcellus Shale and Other  
Low-Permeability Gas Reservoirs**

Lead Agency:  
NYSDEC, 625 Broadway, Albany, NY 12233

Lead Agency Contact:  
Eugene Lett  
NYSDEC, 625 Broadway, 14<sup>th</sup> Floor  
Albany, NY 12233  
(518) 402-8044

Action Location: Statewide  
Comments Due By: December 12, 2011

Prepared By:  
NYSDEC, with Assistance from Alpha Environmental, Inc., Ecology and Environment Engineering,  
P.C., ICF International, USIS Corp, NTC Consultants and Siemens/Outokumpu LLC  
Date of Completion of dSGEIS: September 30, 2009  
Date of Completion of Revised dSGEIS: September 7, 2011

The Revised dSGEIS (the full [dSGEIS is available electronically](#) but is big at 47.1 MB) on gas drilling characterizes the trend in demand for gas drilling as follows: “The Department of Environmental Conservation (Department) has received applications for permits to drill horizontal wells to evaluate and develop the Marcellus and Utica Shales for natural gas production. To release the gas embedded in the shale formations, wells would undergo a stimulation process known as high-volume hydraulic fracturing. While the horizontal well applications received to date are for proposed locations in Broome, Cattaraugus, 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 in Otsego and Schoharie Counties and elsewhere as shown in Chapter 4. Other shale and low-permeability formations in New York may also be targeted for future application of horizontal drilling and high-volume hydraulic fracturing. . . The Marcellus Shale formation has attracted great attention as a significant new source of natural gas production. The Marcellus Shale extends from Ohio through West Virginia and into Pennsylvania and New York. In New York, the Marcellus Shale is located in much of the Southern Tier stretching from Chautauqua and Erie Counties in the west to the counties of Sullivan, Ulster, Greene and Albany in the east. According to researchers at Penn State University, the Marcellus Shale is the largest known shale deposit of gas in the world. Engelder and Lash (2008) first estimated gas-in-place to be between 168 and 500 Tcf with a recoverable estimate of 50 Tcf. While it is early in the productive life of Marcellus Shale wells, the most recent estimates by Engelder using well production decline rates indicate a 50 percent probability that recoverable reserves could be as high as 489 Tcf.<sup>6</sup>

The Revised dSGEIS states that “High-volume hydraulic fracturing, which is often used in conjunction with horizontal drilling and multi-well pad development, is an approach to extracting natural gas in New York that raises new, potentially significant, adverse impacts not studied in 1992...Also, hydraulic fracturing requires chemical additives, some of which may pose hazards when highly concentrated. The extra water associated with such drilling may also result in significant adverse impacts relating to water supplies, wastewater treatment and disposal and truck traffic. Horizontal wells also generate greater volumes of drilling waste (cuttings). The industry projections of the level of drilling, as reflected in the intense development activity in neighboring Pennsylvania, has raised additional concerns relating to community character and socioeconomics.”

The Revised dSGEIS estimates that DEC may receive applications to drill approximately 1,700 - 2,500 horizontal and vertical wells for development of the Marcellus Shale alone during a “peak development” year. According to the DEC, an average year may see 1,600 or more permit applications but the dSGEIS does not define what is meant by a “peak development year” or an “average year.” Development of the Marcellus Shale in New York may occur over a 30-year period and the State has assumed that the life of the wells will be around 30 years, meaning that a 60 year time horizon is anticipated for tapping and production of natural gas from the Marcellus Shale. Using the average year estimates means that up to 48,000 permit applications may be received by the State in the Marcellus Shale region alone. The DEC used this level and time-

<sup>6</sup> Tcf refers to trillion cubic feet and is abbreviated as Tcf or TCF.

frame of development in its assumptions of potential impacts in the Revised dSCEIS. As discussed above, the Utica Shales also underlie Tompkins County and this potential natural gas reservoir can also be expected to be tapped in the future. Many believe that once well pads are in place for tapping the Marcellus Shale that additional wells will be drilled for tapping the Utica Shale. Although the State limits the number of wells to 16 per square mile (one well per 40 acres), this does not limit the drilling of additional wells if they are in other gas bearing formations (such as the Utica Shales) nor does it preclude downspacing, which is permitted upon justification to the DEC that additional wells are necessary to efficiently recover gas reserves.

The DEC hired a consultant to complete an estimate of the potential economic benefits of HVHF. While the consultant's analysis calculated the total economic value of HVHF, it did not estimate the costs to local, county or State government associated with HVHF. This would normally include the costs of increased demands for community social services, wear and tear on roads, public health costs, police and fire, first responders, hospitals and the costs of the long term "bust" that occurs with extractive industries when the resource has been depleted. The potential [loss in value of homes](#) in affected areas was not factored into the State's analysis. The potential risks associated with properties located near gas wells, that may be unable to obtain mortgages from banks or homeowners insurance, are additional concerns that have been [documented](#). Homeowners who have signed leases may find themselves in technical default of their mortgages, making it difficult for them to sell or refinance their home. There are other economic consequences associated with gas development activities that will be summarized later in this Assessment. The state's Revised dSCEIS made no attempt to address this issue in its analysis of economic effects.

The State's Revised dSCEIS looks at the potential impacts and proposed mitigation measures for those impacts on several topical areas including water resources, ecosystems and wildlife, air quality, greenhouse gas emissions, radioactive materials, socio-economics, aesthetics, noise, transportation and community character. This Community Impact Assessment is not designed to provide a critique nor official comments of the Tompkins County Council of Governments on the Revised dSCEIS. However, where the Revised dSCEIS identifies an issue but fails to characterize the potential impacts or to provide mitigation in accordance with accepted planning and environmental practices, those failures will be identified.

The state's Revised dSCEIS proposes a number of measures to protect surface water, among a number of other mitigation strategies. According to the DEC, they including the following:

- Well pads for HVHF will be prohibited within 2,000 feet of public drinking water wells, river or stream intakes and reservoirs for a period of three years, after which this distance will be reviewed and re-evaluated.
- Surface disturbance associated with HVHF, including well pad and road construction, will be prohibited on the state's 18 Primary Aquifers and within 500 feet of their boundaries for a period of two years after which this distance will be reviewed and re-evaluated.
- The State has proposed requiring a site specific SEQR review and an individual SPDES permit for HVHF projects at any proposed well pad within or within 500 feet of a Principal Aquifer with a review and re-evaluation of this measure after two years, as with Primary Aquifers.

- HVHF would be prohibited within 500 feet of private wells or a domestic use spring, unless waived by the landowner.
- HVHF would be prohibited within 100 year floodplains.
- The issuance of well permits for HVHF within wetlands would only occur when alternate locations are not available and would be subject to a site-specific SEQR review and a wetlands permit for State protected wetlands. Fuel tanks would need to be set back from wetlands by at least 500 feet.
- Site-specific SEQR reviews would be required for any well pad proposed within 150 feet of a stream, a storm drain, a lake or pond.
- HVHF would be prohibited within the Syracuse and New York City watersheds.

Curiously, the State has proposed no new standards that would govern setbacks for a gas well from a private dwelling, which is currently and which has been proposed to remain at only 100 feet, 75 feet from the traveled part of a public road and 150 feet from a public building (like a school) or area. [Some](#) have identified these setbacks as the least restrictive in the Nation. The photo from The Marcellus Effect [blog](#) shows HVHF near a home in Dimock, PA. Setback distances are an integral component of municipal zoning regulation for land uses, especially when it involves health and safety issues.. It bears mentioning that some of the drilling rigs used in the HVHF process can be as high as 170 feet tall.



The impacts of HVHF and the impacts of other important environmental issues discussed in the State’s proposals, from the 2011 dSGEIS, will be discussed more fully in the topical sections below. Where the State’s assessments of impact are contradicted by published reports, those will be pointed out so readers can look deeper into the subjects.

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## E. Land Resources

In the past, land was viewed largely as a commodity and its only function was to enable the owner to make money. Over the past few decades, that attitude has changed. Many now think that land should only be viewed as a resource rather than a commodity. While this resource view correctly indicates the direction of the changed attitudes, it ignores the constitutional right to own land and to buy and sell it freely. Land must be treated as both a resource and a commodity. Those who view land only as a resource ignore the social and economic impact that would come with any massive restrictions on the free alienability of land. Those who view land only as a commodity ignore the decades of research that now helps us to understand the science of ecology and the benefits, including economic, of protecting nature and natural resources. The commodity view also ignores the considerable attention that has been afforded to environmental pro-

tection and legitimate land use control regulations by our executive, legislative and judicial branches of government.

If local government wants to protect its natural resources, it must also weigh the costs and benefits of doing so. Sometimes, protecting natural resources has obvious benefits. Tourism is driven by those who visit a community because it has protected the unique qualities of its lands, waters, and other important resources. In this context, it makes financial sense to protect land resources to ensure that visitors have a positive experience with nature within their jurisdiction. Would tourists want to flock to a community that has invested heavily in industrial operations? Many studies have now documented that preservation of natural resources and protection of open space are essential factors in helping a community retain existing jobs and to attract new ones. For instance, the Trust for Public Land in their study [The Economic Benefits of Parks and Open Space](#) found that retention of natural amenities are critical to ensuring a higher quality of life and are one of the most important components for attracting both employers and employees. Rural areas with a high quality of life tend to see more growth in small businesses.

The effects of changes in the land use makeup of Tompkins County, if and when heavy industrial development like gas drilling and production were to become established, could be dramatic and permanent. These changes were researched and characterized by the DEC in their 1992 Generic Environmental Impact Statement (GEIS) on the Oil, Gas and Solution Mining Regulatory Program and these characteristics have been updated with the State's 2009 and 2011 Supplemental environmental documents. Much additional research has been conducted by others since that time.

There have been several sources used to estimate the amount of land necessary for HVHF. The DEC, the gas industry and The Nature Conservancy have each attempted to predict the overall amount of land necessary to conduct HVHF. The majority of the industry's activity centers on drilling individual gas wells for primary production. Gas operations vary in the amount of land used, their effect on local topography and the volume of soil disturbed during construction operations. In 1992, DEC estimated that "*generally access road and site construction disturb less than two acres of land.*" In the 2009 and 2011 dSGEIS, the DEC increased their estimates and discussed multi-well pads "*ranging in size from 2.2 to 5.5 acres.*" The amount of land necessary for the utility infrastructure to serve the well pad would add 3.68 acres for water and electrical lines, gas gathering lines and compressors. Aerial photographic research conducted in Pennsylvania by The Nature Conservancy has found similar results with well pads disturbing, on average 3.1 acres of land with an additional 5.7 acres devoted to associated infrastructure, such as roads, pipelines, and water impoundments for a total area of disturbance for each well pad of 8.8 acres. For impact analysis purposes, it is reasonable to conclude that slightly less than nine acres of land will be disturbed for construction of a HVHF well pad. While the DEC estimated that some reclamation of the well pads will occur after the drilling phase, this should be considered only a temporary measure because refracturing of the wells could occur in the future, as discussed above. Halliburton has stated that "*It has been established that only 10% of GIP [Gas In Place] is recovered with the initial completion. Refracturing the shale can increase the recovery rate by an additional 8% to 10%.*" Therefore, this Community Impact Assessment advises local governments that for each well pad, it can be

expected that up to about eight and eight-tenths (8.8) acres of land will be devoted to gas drilling, fracturing, refracturing and production for a generation or more.

Impacts associated with the siting of well operations are directly related to the location, size and land contours of each well site. Tompkins County has widely varying topography and divergent landforms. Low elevations range from 382 feet above sea level for locations on Cayuga Lake to over 2,000 feet on Connecticut Hill. Areas of steep slope, if proposed for HVHF drilling operations, will involve greater regrading operations than areas with gentle slopes because a relatively flat site is required in order to accommodate the industrial operations. The relatively flat lands in the northern portion of the County (Ulysses, Lansing, and Groton) can be expected to see less disturbance than the steep hills and valleys of the southern portion of the County (Newfield, Danby, and Caroline).

Direct impacts of well pad development are virtually the same as those for all other earth moving and construction operations. Vegetation is removed, soil is regraded to accommodate the infrastructure, and then stabilized with structures or by other means. The regrading of land and conversion of soils to infrastructure uses unavoidably alters the natural soil profile. Some areas not needed permanently will be reclaimed under State regulations. However, areas that will be permanently altered for access, gas production, and gas transmission, including sufficient areas needed for refracking operations in the future, will also result in a permanent visual alteration in the County's landscapes. This would lead to an unavoidable impact on both land and aesthetic resources.

The build-out analysis estimated the total land area in the County that will be directly impacted as a result of gas well development would be 1,848 acres. The direct impacts on land stem from regrading for construction of the well pad itself including accommodating drilling rigs and auxiliary equipment such as tanks or ponds (for water, fuel, chemicals, and wastewater), generators, compressors, solids control equipment (shale shaker, de-silter, de-sander), choke manifold, accumulator, pipe racks, office space, equipment maneuvering areas and other associated facilities. Roads to access well and other sites must be built, and accidents involving chemical spills (See [Water Resources](#) below) as well as trucks transporting fluids and other materials increase the risk of soil contamination. In the case of heavy industry, typically raw materials must be transported away from the site for processing elsewhere. In addition to the drilling and extraction operations, the gas products must be transported. The transmission requires the construction of gathering lines, transmission lines and compressor stations, all of which can adversely impact land and other resources. The long-term adverse environmental impacts on a property from the drilling operations will remain well into the foreseeable future.

Erosion and sedimentation result largely from site preparation and include grading operations, which often involve a failure to install erosion control measures properly. Regardless, erosion and sedimentation is unavoidable when a site is constructed in steep slope areas. Vegetation losses are unavoidable (see [Plants and Animals](#) below). Every site must be stripped of vegetation and long-term vegetation losses are most severe when an operator fails to properly segregate topsoil from other excavated material. Topsoil takes hundreds of years to form and its loss can have serious long term impacts on the land's ability to support crops and other vegetation. (See [Plants and Animals](#) and [Agriculture](#) below). Persistent erosion can also result in sig-

nificant changes in the landscape (See [Visual Resources](#) below). The potential for accelerated rates of erosion continues long after the construction activities are completed. When the topsoil is not set aside and redistributed properly, the topsoil layer can become buried, effectively sterilizing surface soils.

Negative environmental impacts on soil also result from accidental spills of oil, brine or chemical materials used by heavy industry or involved in drilling and production of gas wells. More than one of six wells can be [expected to leak fluids](#) to surrounding soils according to Ronald E. Bishop, Ph.D., CHO of the Chemistry & Biochemistry Department at the State University of New York, College at Oneonta. Depending upon the type and amount of material spilled, the contaminated soil may be unable to support vegetative growth. Brine and other waste fluids high in salt can kill vegetation and retard growth for years. Similarly, oil and other petroleum products, such as diesel fuel used by machinery and in the fracking process itself, when spilled on the ground surface, can kill plants and retard new growth. With the exception of potential soil contamination from industrial activities like gas development, it should be noted that all land development activities requiring vegetation removal, regrading and then stabilization with structures, like residential or commercial development, can have similar long-term impacts on land.

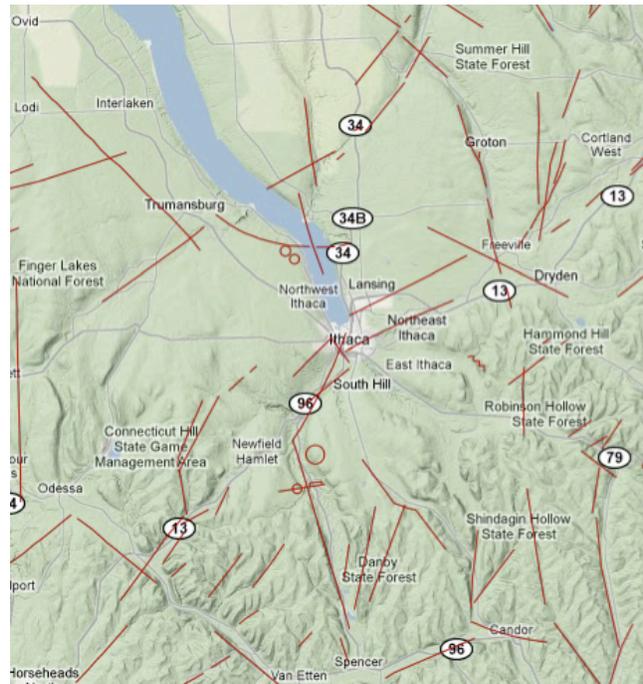
The HVHF process produces drill cuttings, which are considered solid wastes. Cuttings may be managed within a closed-loop tank system or within a lined reserve pit on the site. The DEC has proposed allowing disposal of cuttings from drilling processes that use only air and/or water on-site, at construction and demolition (C&D) debris landfills. Cuttings from processes that use any oil-based or polymer-based products could only be disposed of at a municipal solid waste (MSW) landfill. The revised dSGEIS proposes to require that a closed-loop tank system be used to manage drilling fluids and cuttings for horizontal drilling where: 1) there is no acceptable acid rock drainage (ARD) mitigation plan for on-site cuttings burial; and 2) for cuttings that, because of the drilling fluid composition used must be disposed off-site, including at a landfill.

The State's Revised dSGEIS states that *"There is a reasonable base of knowledge and experience related to seismicity induced by hydraulic fracturing. Information reviewed indicates that there is essentially no increased risk to the public, infrastructure, or natural resources from induced seismicity related to hydraulic fracturing. The microseisms created by hydraulic fracturing are too small to be felt, or to cause damage at the ground surface or to nearby wells. Accordingly, no significant adverse impacts from induced seismicity are expected to result from high-volume hydraulic fracturing operations."* However, there have been reports of HVHF causing seismic activity and geologists have not yet reached a consensus about the issue. Reuters reported on [November 1, 2011](#) that *"Cuadrilla Resources on Wednesday said shale gas exploration work probably triggered minor earthquakes at its drill site near Blackpool in northwest England earlier this year. 'It is highly probable that the hydraulic fracturing of Cuadrilla's Preese Hall-1 well did trigger a number of minor seismic events,' a report commissioned by the company said."* Other news sources, as well as the [US Geological Survey](#), have reported or confirmed the possibility that earthquakes have been caused by human activity. These include [Oil Price Watch](#), [NY Times](#), [Wall Street Journal](#), [Fox News](#), [Power Magazine](#), and [others](#). Both the U.S Army Corps of Engineers and the U.S. Geological Survey, after fifty years of [research](#), confirmed on a federal level that that "fluid injection" introduces subterranean instability and is a contributory factor in inducing increased seismic activity. Fluid injection at the Rocky Mountain

Arsenal near Denver, Colorado, is believed to be the cause of a 1967 magnitude 5.5 earthquake. The Cuadrilla Resources reported earthquakes are considered “minor” at 2.3 and 1.5 on the Richter scale and there were 48 other smaller events reported at the Preese Hall-1 well. For comparison, the August 2011 earthquake centered in Louisa County, Virginia, measured 5.8 on the Richter scale. It was felt across New York and more than a dozen other states and in several Canadian provinces.

While the DEC dismisses the potential seismic activity as “too small to be felt, or to cause damage at the ground surface or to nearby wells.” some [geologists](#), that have conducted [research](#) into the issue for more than a decade, have concluded otherwise and local experts have developed [educational materials](#) to explain how induced seismicity can occur. Local officials, gas drillers, and the DEC should be aware of the geological fault lines that exist in Tompkins County. These can be seen on the map created by [Conrad Volz](#) based upon New York Geological Survey data and mapping.

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## F. Water Resources

*"Water promises to be to the 21st century what oil was to the 20th century: the precious commodity that determines the wealth of nations."*

(Fortune Magazine, Shawn Tully, May 15, 2000)

According to the DEC’s Revised dSGEIS, “New York City & Syracuse Watersheds: As the only unfiltered surface supplies of municipal water in the state, these watersheds are unique and deserve special protection to maintain their EPA Filtration Avoidance Determinations. Industrial activity, such as increased truck traffic, could impact these determinations. Losing this designation would mean New York City and Syracuse would be required to spend billions of dollars to build water filtration plants. Therefore, high-volume fracturing will be prohibited within these watersheds, within 4,000 feet of their boundaries and within 1,000 feet of NYC’s subsurface water supply infrastructure unless approval is granted after site-specific review.” Prohibiting high volume hydraulic fracturing (HVHF) for shale gas in the New York City and Syracuse watersheds, because they are unfiltered sources of drinking water, only makes sense when other equally important water resource areas are treated similarly. Unfiltered groundwater is the source of drinking water for approximately 45 percent of Tompkins County residents, including those with individual wells or on one of five municipal drinking water systems that rely on groundwater, and over 170

small private systems. According to [Robert W. Howarth](#), The David R. Atkinson Professor of Ecology & Environmental Biology at Cornell, “Given the likely spacing of wells within New York State should shale gas be developed, the majority of private drinking water wells in gas development areas seem likely to be contaminated.” While some may consider this to be an overstatement, spills, accidents and malfunctions are likely to result in surface and groundwater contamination incidents, based upon the experiences of other regions with HVHF.

The other 55 percent of Tompkins County residents rely on surface waters as their source of drinking water. These come principally through community/municipal water supply systems that provide some level of filtering and/or treatment. However, municipal water filtration systems are not designed to remove the range of toxins found in typical HVHF water contamination (such as methane, benzene and other volatile aromatic hydrocarbons, surfactants and organic biocides, barium and other toxic metals, and soluble radioactive compounds containing thorium, radium, and uranium). The consensus of many scientists, physicians and engineers are that municipal filters are not [effective](#) for protecting public health against these contaminants. The very basis of the State’s proposal to prohibit HVHF in locations where unfiltered water is sourced, but allowing it in areas with filtered water systems or unfiltered groundwater wells, is potentially flawed.

Cayuga Lake is glacial in origin but is fed by numerous tributaries and groundwater springs. The Cayuga Lake watershed is part of the 5,100 square-mile Oswego River watershed basin. This basin handles runoff from all the watersheds of the Finger Lakes, plus other streams and rivers. The largest of the Finger Lakes watersheds, the Cayuga Lake watershed covers 800 square miles of land draining into Cayuga Lake, including 49 villages, towns and cities in seven counties. Cayuga, Seneca and Tompkins Counties directly border the lake, while portions of Cortland, Schuyler, and Tioga Counties contribute to the upper watershed. More than 140,000 people live and work in this area, and all are part of the watershed taken as a whole.

More than 30,000 Tompkins County residents in six municipalities<sup>7</sup> are served by drinking water from Cayuga Lake and others in surrounding counties also depend upon the Lake as their source of water supply. The Revised dSGEIS emphasizes the risk of spills and surface water contamination from trucking accidents in unfiltered drinking water supplies. There are other sources of contamination from HVHF than trucking accidents. A significant portion of the water and chemical solution used to fracture the rock returns to the surface, first as flowback and then as production brine, both classified by DEC as non-hazardous industrial wastewater. Both liquid wastes are referred to herein as wastewater, although they may be regulated differently by the DEC. Nevertheless, thousands of flowback and production brine leaks and spills have been documented in the span of just a few years and they are unavoidable regardless of the proposed mitigation measures.

The DEC has estimated that it may receive an average of 1,600 applications for gas wells per year in the Marcellus Shale region over a 30 year period. This estimate, if it proves to be accurate, could result in

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<sup>7</sup> The Bolton Point Municipal Water System serves residents in the towns of Dryden, Ithaca and Lansing, the Villages of Cayuga Heights and Lansing and provides water to some City of Ithaca customers. It provides water to Cornell University during emergencies and planned maintenance periods.

48,000 new gas wells in the Marcellus Region over the next 30 or so years. According to Ronald Bishop, Ph.D, CHO of the Chemistry and Biochemistry Department at the State University of New York, College at Oneonta, if future impacts may be inferred from historical performance, then the cumulative chemical and biological impacts from the gas industry in New York may be predicted for projects of any scope by combining incident statistics with documented health and environmental impacts. Dr. Bishop has [re-searched](#) incident statistics and inferred that 10,000 gas wells would produce sediment run-off into nearby waterways of at least 80,000 tons per year. Such a level of gas well development would reasonably be expected to generate about 1,200 citations for serious regulatory violations and at least 200 incidents of groundwater contamination in the short term. Over a century, about 1,600 leaking gas wells should be anticipated. Based upon these estimates, the number of expected incidents that may be expected in Tompkins County and the Marcellus Shale region (from DEC estimates) are shown in the table below.

<b>Ronald Bishop, Ph.D, CHO - SUNY/Oneonta Chemistry Biochemistry Department Analysis</b>			
<b>Chemical/Biological Risk Assessment Data</b>	<b>For Each 10,000 wells</b>	<b>GDTFs Tompkins County Buildout of 2,100 Wells</b>	<b>DEC Marcellus Shale Estimated Wells - 48,000 Over 30 Years</b>
Sediment Runoff to Waterways (tons/year)	80,000	16,800	384,000
Citations for Serious Regulatory Violations	1,200	252	5,760
Incidents of Groundwater Contamination	200	42	960
Number of Leaking Wells	1,600	336	7,680

Disposal of flowback is expected to be largely to surface waters through publicly owned sewage treatment plants (POTW). POTW's "industrial pretreatment" permit requirements may have been designed to prevent "pass through" of pollutants, but many HVHF pollutants are hazardous, like benzene, heavy metals, radioactive materials and some of the 632 chemicals and other components used in HVHF. These substances were not likely to be in the wastestream when POTW permits were issued and such POTWs were not designed to treat them. According to the DEC, "there is questionable available capacity for POTWs in New York State to accept high-volume hydraulic fracturing wastewater." Until POTWs or other wastewater disposal options are available, flowback disposal is an issue whether it involves filtered or unfiltered public water supply sources. Community water supply systems in Tompkins County, like the City of Ithaca's, Cornell University's and the Bolton Point Water System (which serves the towns of Dryden, Ithaca, and Lansing and the villages of Cayuga Heights and Lansing), cannot remove dissolved contaminants. If HVHF flowback is discharged in the watershed, these dissolved contaminants have the potential to find their way into Cayuga Lake and into tap water.

Production brine disposal options were discussed in the 1992 GEIS and these include injection wells, treatment plants and road spreading for dust control and de-icing. Any applicant for a permit to use production brine for road spreading must submit a petition to the DEC for a beneficial use determination (BUD). The DEC has stated in the Revised dSGEIS that they will not issue such permits until additional information on the naturally occurring radioactive materials (NORM) content becomes available and has been evaluated. The Revised dSGEIS states that *“The NYSDOH will require the well operator to obtain a radioactive materials license for the facility when exposure rate measurements associated with scale accumulation in or on piping, drilling and brine storage equipment exceed 50 microR/hr ( $\mu$ R/hr). A license may be required for facilities that will concentrate NORM during pre-treatment or treatment of brine.”* The DEC states that radiation surveys are necessary at specified time intervals for Marcellus wells developed by HVHF since NORM content varies from well to well. The DEC indicates that the potential for NORM in both flowback and production brine may require licensing of a facility and may be subject to discharge limitations to protect workers, the general public and the environment.

The potential impacts of HVHF on water resources include watershed impacts, water supply, water quality, and accidents, described as follows:

1. Watershed impacts

Land clearing, loss of forested cover, soil compaction, erosion and stormwater runoff are all associated with well pad construction, road and pipeline construction, and well operation. Loss of forested cover and soil compaction interfere with groundwater recharge and contribute to watershed impairment. Erosion and subsequent runoff have the potential to significantly contribute to degradation of surface water quality. Gas well development results in a decrease in overall watershed forest cover, and an increase in compacted impervious surfaces. The disruption of local drainage patterns caused by heavy truck traffic and other equipment on small rural roads and nonpaved cleared surfaces, including numerous wetland and small stream crossings, has the potential to substantially interfere with the ability of watersheds to provide adequate water supply and high quality water, especially when these activities occur over a large area. Surface compaction may substantially reduce the flood control capability of natural systems, especially in floodplains and wetlands. Nonpoint source pollution from stormwater runoff and erosion often results from site clearing and grading. Especially where well pads are near small wetlands or streams, the resulting cumulative impacts may be significant. On a single gas well pad site in Fernow forest, WV, a US Forest Service [study](#) provides a conservative estimated loss of 2.3 tons of soil per 2.47 acres, measured at this single site, due to improperly installed and maintained silt fences. Any streams or wetlands in close proximity would likely be affected by this level of erosion and potential sedimentation. The potentially large amount of land cleared for well pads, pits, roads and pipelines increases the chances of widespread and cumulative sedimentation and subsequent water quality issues.

The impact on wetlands is especially significant. Small wetlands are some of the most ecologically and economically valuable habitats but they are also among the most threatened. Research documents a minimum 100 foot vegetated buffer is necessary for wetland water quality protection. The DEC protects only wetlands that are 12.4 acres or more and only if they appear on DEC maps. The federal government does not afford

any buffer protection for smaller wetlands. However a significant portion of wetlands are smaller in size, and cumulatively provide significant benefits including flood control, water quality improvement, and moderation of stream flows during drought. Since no protective buffer is required, these wetlands are not protected from water quality impacts.

## 2. Water supply



Hydraulic fracturing requires the use of large quantities of water and fracturing fluids, which are injected underground at high volumes and pressure. Each well can be hydrofracked multiple times over a period of years, using anywhere from 3 to 8 million gallons of water each time. The GDTF build-out analysis assumed water consumption of 5 million gallons per well. With an average well density of 10 wells per drilling unit of 640 acres, the cumulative effect of this level of water use is significant. The GDTF build-out analysis estimated that 10.5 billion gallons of water supply could be required for gas development in Tompkins County over the next 8 to 15 years. For comparison, this amount of water is more than the entire volume of Honeoye Lake (see Google Image to the left), the 10th largest Finger Lake, which contains 9.5 billion gallons of water within a 1,772 acre surface water area. This water will come from surface or groundwater resources. For example, 56 percent was sourced from groundwater and 43 percent from surface water in the Barnett shale region of Texas; 55 percent from surface water and 45 percent from local water utilities in portions of the Susquehanna basin (Pennsylvania). Water withdrawals from groundwater and aquifers are equally problematic; groundwater is the source of baseflow for most rivers and streams and supplies drinking water to a large portion of the County's residents.

Replenishment of groundwater occurs slowly over time, depends on watershed condition (e.g. forest cover, impervious surfaces) and is affected by local conditions including drought. During times of low flow or drought, impacts of HVHF on local water supplies would be even more significant, affecting water quality, temperature, aquatic ecosystems, and recreation as well. Sufficient ground and surface water resources will be needed to support drilling operations without adversely impacting existing users and habitats. The availability of water resources to supply drilling efforts in the County have yet to be determined.

## 3. Water quality

During hydraulic fracturing, large volumes of water mixed with various chemicals, sand and other constituents are injected deep underground. Chemicals include acids, biocides, corrosion inhibitors, defoamers, emulsifiers, gellants, resins, surfactants and viscosifiers. The Marcellus shale naturally contains high levels of salt and naturally occurring radioactive materials (NORM), some of which will dissolve in the hydrofracking fluid. Estimates are quite variable and generally range from 9 and 35 percent or more (some up to 70%)

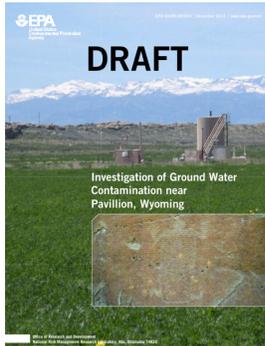
of this fluid comes back out of the well as flowback. Flowback water requiring disposal is considered industrial wastewater. GDTFs build-out analysis assumed 20 percent of the water injected would flowback to the surface and require treatment. The Revised dSGEIS states that *“to ensure that wastewater from high-volume hydraulic fracturing operation is properly disposed, the Department proposes to require that before any permit is issued the operator have Department-approved plans in place for disposing of flowback water and production brine.*

The Revised dSGEIS states in several locations that the DEC proposes to require, via permit condition and/or regulation, that flowback water handled at the well pad be directed to and contained in covered watertight steel tanks or covered watertight tanks constructed of another material approved by the Department. However, the Revised dSGEIS also states that *“The Department was informed in September 2010 that operators would not routinely propose to store flowback water either in reserve pits on the wellpad or in centralized impoundments. Therefore, these practices are not addressed in this revised draft SGEIS and such impoundments would not be approved without site-specific environmental review.* Thus, it appears possible that flowback could be stored on-site in reserve pits or in centralized impoundments with an additional SEQR site-specific environmental review.

Flowback contains high levels of total dissolved solids (TDS) and NORMS, as well as added chemicals. According to the State’s Revised dSGEIS, *“no POTWs in New York State currently have TDS-specific treatment technologies, so the ability to accept this wastewater is limited by influent concentration and flow rates.”* The remainder of the injected fluids stays underground. Flowback is stored in tanks or pits (with a site-specific SEQR review) at the well site, recycled for use in future fracturing jobs, injected into underground storage wells, or transported to wastewater treatment facilities. Production brine may be applied to roads as a deicing agent or for dust control if a beneficial use determination (BUD) has been made by the DEC.

Although gas companies have not been previously required to disclose the chemical composition of flowback, recent research has begun to fill this information gap. A 2011 report issued by the US House of Representatives documents that between 2005 and 2009, oil and gas companies used more than 2,500 hydraulic fracturing products containing 750 chemicals and other components. These included 652 different products that contained one or more of 29 chemicals that are: (1) known as or are a possible human carcinogen; (2) regulated under the Safe Drinking Water Act for their risks to human health; or (3) listed as hazardous air pollutants under the Clean Air Act. The Revised dSGEIS also reveals the extent of the chemicals used in the HVHF process. While only a small number of these chemicals are used in any given fracturing operation, because of limited disclosure, it is uncertain exactly which chemicals are being used. The Revised dSGEIS adds some clarity to the issue. Under the Revised dSGEIS, there will be a new requirement that operators evaluate the use of alternative hydraulic fracturing additive products that pose less potential risk to water resources. The Revised dSGEIS proposes that a project sponsor must disclose all additive products it proposes to use, and provide Material Safety Data Sheets for those products, so that the appropriate remedial measures can be imposed if a spill occurs. The DEC states that it will *“publicly disclose the identities of hydraulic fracturing fluid additive products and their Material Safety Data Sheets, provided that information which meets the confidential business information exception to the Department’s records access program will not be subject to public disclosure.”*

Chemicals that appeared most often include methanol, isopropanol, crystalline silica, ethylene glycol, 2-butoxyethanol, hydrotreated light petroleum distillates, and sodium hydroxide. Their properties vary. For example, 2-butoxyethanol (2-BE) is a foaming agent or surfactant in 126 products. According to EPA scientists, 2-BE is easily absorbed and rapidly distributed in humans following inhalation, ingestion, or dermal exposure. Studies have shown that exposure to 2-BE can cause hemolysis (destruction of red blood cells) and damage to the spleen, liver, and bone marrow.



A closely related substance, 2-butoxyethanol phosphate (2-BEP), was detected by the United States Environmental Protection Agency (EPA) in a [study](#) of a gas field in Pavillion Wyoming. Results released by the EPA in [November 2011](#) and [December 8, 2011](#) seem to confirm the close relationship between HVHF operations and aquifer contamination that have been suspected. Pavillion is a very sparsely settled area in rural Wyoming with no other industrial development than gas wells.

In a separate study, the Pennsylvania DEP has derived a list of 54 chemicals that may be used during the process, including sixteen that affect 10 or more health effect categories (including skin, eye or sensory organs, respiratory effects; gastrointestinal or liver effects, damage to the brain, or cardiovascular effects). These include benzene, acetone, arsenic, heavy metals, bromide, sulfate, toluene, and cylenes. Hydrofracking fluids sometimes contain diesel fuel. The EPA has [stated](#) that the use of diesel fuel in fracturing fluids poses a great threat to underground sources of drinking water. The IOGA states that diesel fuel is not being used at this time, but once again limited disclosure makes this claim difficult to document. DEC has proposed a permit condition that would not authorize the use of diesel as the primary carrier fluid (i.e., diesel-based hydraulic fracturing).

With an average concentration of chemicals of 0.5-2.0 %, an average horizontal fracking operation using four million gallons of water may contain 20,000 to 80,000 gallons of chemicals. When this amount is multiplied by the number of wells and number of times any one well may be refracked, the cumulative amount of chemicals both below and above ground is significant. In addition, naturally occurring radioactive materials and brine from underground rock are present in varying amounts in both flowback and production brine.

The hydrofracking solution that remains underground, that can range from 30 to 80 percent, has the potential for migration into groundwater depending on rock composition and specific site characteristics. Research, such as the EPAs described above, has shown that hydrofracking fluids can make their way into local wells, as can methane from the hydrofracking process. Well failures, such as inadequate or cracked well casings can allow fracking water to [potentially contaminate](#) drinking water supplies. Some [reports](#) have indicated that hydraulic fracturing fluids have entered local wells in gas development areas from Wyoming to Dimock PA, to Colorado, contaminating water supplies. The presence of [methane](#) is one indicator of such contamination; methane is a health hazard and is highly flammable. Methane is also linked to explosions and may be leaked into nearby rivers and streams.

#### 4. Accidents, spills and violations.

[Documentation](#) of a variety of accidents that have occurred during the HVHF process are an essential element in overall hydrofracking impact review. Future similar accidents are highly likely based on past experience from other states, due to the nature of the hydrofracking processes, extent of proposed drilling, lack of comprehensive and consistent oversight, well siting in or near sensitive areas, and the inevitability of mechanical failure or human error. The accidents often involve water resources, thus increasing the likelihood that impacts will be transported downstream. It only takes one accident, at one site, as a result of human error or mechanical failure, to create significant ecological damage, particularly if the well is sited in a sensitive area.

A report by Riverkeeper (a not-for-profit organization concerned with clean water) entitled [Fractured Communities](#) documents over 100 cases of environmental contamination where gas drilling resulted in adverse impacts. These include more than 20 cases of drinking water contamination in Pennsylvania; over 30 cases of groundwater and drinking water contamination in Colorado and Wyoming and more than 10 cases of surface water spills of drilling fluid in the Marcellus Shale region. It also includes more than 30 investigations of stray gas migration from new and abandoned wells in Pennsylvania, numerous illegal operations and permit violations by gas drilling companies and explosions that occurred between 2006 and 2010 that contaminated groundwater and/or surface water.

As well drilling and hydraulic fracturing activities are increasing in some states like Pennsylvania, there is a corresponding increase in the number of accidents being reported. On April 21, 2011, an apparent equipment malfunction caused a major blowout during a fracking procedure at a natural gas well in Bradford County, PA and spilled thousands of gallons of chemically contaminated water into a stream that flows into Towanda Creek and ultimately the Susquehanna River. Seven families were evacuated and farmers were advised to not allow their livestock to drink the Creek water. In addition, the Pennsylvania Land Trust Association has reviewed violations of state Oil and Gas laws by Marcellus shale well drillers in Pennsylvania between January 2008 and August 20, 2010, [finding](#) a total of 1614 violations of state laws due to gas drilling or other earth disturbance activities related to natural gas extraction in this 2.5-year period.

Tompkins County has diverse water resources that provide for the domestic, commercial, and recreational needs of the community. The County's groundwater, surface water, and wetlands do not function as separate systems but are part of an interconnected whole. About 80 percent of Tompkins County's water drains north into the Finger Lakes and eventually into Lake Ontario, while 20 percent drains south to the Susquehanna River and eventually into the Chesapeake Bay. There is about 26 miles of shoreline along Cayuga Lake. Tompkins County contains about 20,000 acres of identified wetlands. The United States Geological Survey has recently determined that approximately 60 percent of the flow in surface water streams in central New York originates from groundwater resources. Surface water provides drinking water for approximately 55 percent of Tompkins County residents. Three water treatment facilities in the County rely on surface water. Bolton Point, operated by the Southern Cayuga Lake Intermunicipal Water Commission, draws its water from Cayuga Lake; the Cornell Water Filtration Plant draws from Fall Creek; and the City of Ithaca Water Treatment Plant uses water from Six Mile Creek. Groundwater is the source of drinking

water for approximately 45 percent of County residents, including those with individual wells or on one of five municipal drinking water systems that rely on groundwater, and over 170 small private systems.

According to the Tompkins County Comprehensive Plan, “Many of the threats to water quality in Tompkins County come from more dispersed, “non-point” sources. Since 1969, low-density development in the county has increased by 10,000 acres and the amount of impervious surfaces has increased by nearly 1,000 acres. These changes, the associated increase in non-point source pollution, and the intensification of land use have led to increased erosion and sedimentation, loss of wetlands and riparian areas, greater amounts of stormwater runoff and pollutants carried by the runoff, as well as an increase in flooding. Other impacts of increased rates of stormwater runoff include accelerated channel erosion and alteration of streambed composition, which can dramatically degrade aquatic habitats. A New York State Department of Environmental Conservation water quality study found that from 1992 to 2002, water quality throughout New York State declined, attributable in large part to changes in land use and the intensity of land use.

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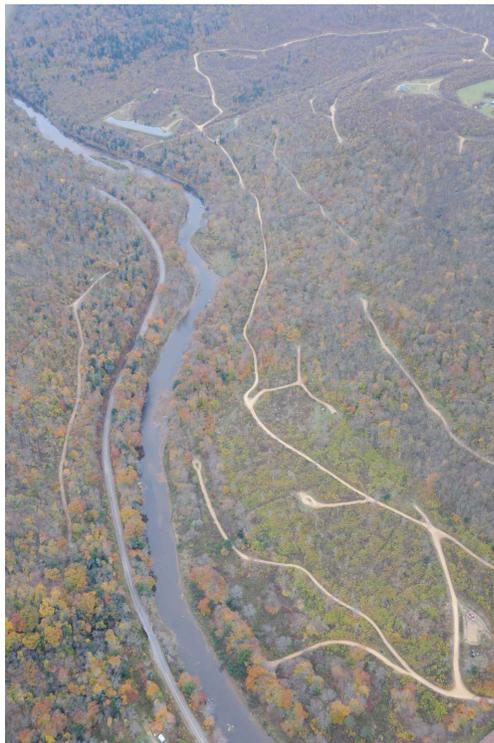
## **G. Plants, Animals and Ecosystem Services**

*The dSCEIS concludes that high-volume hydraulic fracturing operations would have a significant impact on the environment because such operations have the potential to draw substantial development into New York, which would result in unavoidable impacts to habitats (fragmentation, loss of connectivity, degradation, etc.), species distributions and populations, and overall natural resource biodiversity. Habitat loss, conversion, and fragmentation (both short-term and long-term) would result from land grading and clearing, and the construction of well pads, roads, pipelines, and other infrastructure associated with gas drilling.*

2011 Revised dSCEIS Executive Summary, page 14

Gas development activities affect natural systems on several levels. Such activities affect habitats, species, and ultimately ecosystems and, according to the State’s Revised dSCEIS, these impacts are unavoidable. The benefits provided to human communities by ecosystem services are in turn affected. These impacts are complex due to the interconnections among species and their habitats. Changes in habitat and condition affect different species in different ways. For example, species that may be most susceptible to loss of connectivity between habitats and increased roads and traffic are those that disperse across the landscape like migrating birds and bats, and reptiles and amphibians traversing between uplands and wetlands. Certain species, such as stream salamanders and brook trout, are extremely sensitive to changes in water quality or temperature. Other species are affected by loss or changes in food supply resulting from land use impacts. Some species are found in only a very few areas within New York State, while others are found primarily within the Marcellus Shale region. Many of these species, whether they depend upon upland forests or freshwater wetlands and streams, may experience changes in behavior, reproduction, distribution, or mortality from the array of impacts associated with gas well construction and operation, associated road and pipeline construction, and flowback use and disposal. A summary of impacts, such as site clearing, removal of

vegetation, construction of well pads, pits, roads, pipelines, stream and wetland crossings, associated with natural gas development activities, is provided as follows.



**Habitat fragmentation.** These activities result in significant forest habitat fragmentation, i.e. breaking up forest cover into smaller fragments, reducing forest cover, and loss of connectivity between fragments, as shown on the aerial photograph by Carl Heilman, of a drilling area on the south side of Tionesta Creek in Western Pennsylvania. Size of habitat fragments affects which species are able to thrive within them, as different species have different habitat requirements. Tree frogs, flying squirrels and certain woodland flowers are sensitive to forest fragmentation because of changes in canopy cover, humidity and light levels. Other species at risk are those that are of conservation concern such as tree bats and woodland turtles and snakes. The clearing of forest for construction of well pads, roads and pipelines causes impacts beyond the actual acres cleared. In Pennsylvania, The Nature Conservancy found that the amount of forest cleared for a single well pad includes about 8.8 acres of direct disturbance as well as an additional 21.2 acres of indirect impact resulting from the increase in forest habitat “edge,” the area that extends at least

330 feet (100 meters) into adjacent forest. Impacts extend into this “edge” area for a number of reasons. Interior forest species avoid edges for different reasons. Black-throated blue warblers and other interior forest nesting birds, for example, avoid areas near edges because of the increased risk of predation. Some species, especially common species such as whitetail deer and cowbirds, are attracted to forest edges – often resulting in increased competition and predation. Invasive plants often thrive on forest edges and can displace native forest species. As large forest patches become progressively cut into smaller patches, populations of forest interior species decline, while populations of edge tolerant species increase. The increase of non-native invasive species in areas where native vegetation is removed or disturbed changes habitat and food sources for wildlife. Invasive species are often difficult and costly to eradicate and New York State maintains an active [program](#) to prevent or mitigate invasive species.

**Wetlands and streams.** Headwater forested streams provide the greatest filtration capacity for nutrient removal. Construction activities that impair water quality, especially erosion and stormwater runoff into small streams and wetlands, also impair the functioning of these systems and their ability to support plants and animals. These impacts range from road crossings, that interrupt water flow, to road construction in streambeds. Small wetlands that lack regulatory status are particularly at risk. As documented on the [DECs website](#), these small wetlands provide significant ecosystem functions, but are typically not protected. Degraded wetlands have impaired functions, with a resulting loss in the benefits they provide. This includes loss or degradation of vernal pools and impacts on the rare species they support.

**Increased truck traffic.** Increased truck traffic results in direct mortality for wildlife species moving across roads, especially for species that regularly move between habitat areas, such as reptiles and amphibians. This mortality can be significant, especially for species of conservation concern, considering the extent of small rural roads, their crossing of multiple habitats, and the extent of truck traffic associated with HVHF.

**Noise and light.** The operation of gas wells and gas distribution entails noise from engines, compressors, and operations of other heavy equipment on a continual basis, including lighting at night. These have been known to affect the behavior and distribution of species in the vicinity of the activities, and may affect behavior or reproductive success of certain sensitive species. Bright lights may confuse or attract migrating birds.

**Water withdrawals.** Water used for HVHF is taken from local surface or groundwater sources. Small rivers, streams, ponds, lakes and wetlands are particularly vulnerable to the changes in hydrology that result from these withdrawals. Small streams, especially headwaters, support a high diversity of plants and animals, including rare species. Considering that an average of five (5) million gallons of water is used per HVHF operation, this singular amount may not measurably affect Cayuga Lake. However, it could be devastating to a small waterway and its biological diversity. The cumulative impacts, given the potential for multiple well development occurring simultaneously, also need to be considered. Since water systems are interconnected, water withdrawn from a stream or from groundwater will impact connected and downstream water resources as well. Aquatic habitats are altered by seasonal fluctuations in water level, especially during drought. Lowered water levels increase the effect of pollutant concentration and susceptibility to higher temperatures especially during times of low flow. These impacted conditions are especially significant for sensitive stream species like trout that require cold, clean water, and stream salamanders that are sensitive to changes in water quality. With the recent discovery of Hydrilla in Cayuga Inlet, the spread of invasive aquatic species at water withdrawal sites requires special attention. Based on the Revised dSGEIS, it appears that DEC is committed to monitoring arrangements that will protect seasonal water flows, but it is not clear how they will be able to accomplish this with their limited staffing and monitoring capabilities.

**Air pollution.** Air pollutants associated with gas well sites include the volatile organic compounds that enter the air from activities at well pad sites. These are described in the section on air quality. It is likely that toxic air pollutants from emissions and from flowback pits (if approved using a site-specific SEQR review) would affect wildlife, especially vertebrates. Effects on [livestock](#) have been recorded.

**Wastewater.** Wastewater from HVHF, consisting of both flowback and production brines, returns to the surface and is stored onsite. In addition to the chemicals added to the water prior to hydrofracking, the fracturing process adds a number of substances from the underground environment to the water that returns after fracking. As a result, flowback has very high levels of total dissolved solids, or TDS, which is the amount of material in dissolved form, including minerals, salts or metals, in a given volume of water. The amount of dissolved solids in flowback exceeds that found in typical river water; these high total dissolved solids can be a serious impairment to water quality in freshwater systems.

The combined effects of habitat fragmentation and potential release of fracturing water into streams could have significant impacts on aquatic ecosystem services. Changes in TDS can be toxic to aquatic organisms, reducing the size of biological communities and ultimately impacting fisheries and water quality. For example, studies conducted by the [Academy of Natural Sciences](#) measured the conductivity of stream water, the abundance of certain sensitive insects and the abundance of salamanders in streams located in areas with high density drilling, low density drilling and no drilling. The results showed water conductivity almost twice as high in the high density sites as it was in the low density and reference sites, while numbers of both salamanders and sensitive insects were significantly reduced in high density sites. Amphibians are especially vulnerable to changes in the environment and their absence is often an ecological "early warning" system. Aquatic insects provide a critical food source for trout. Additional water quality impacts on wetlands, streams, and ponds and the species they support are described via ongoing research as well as documentation of the consequences of spills, leaks and accidents that resulted in freshwater contamination.

**Wastewater disposal.** Hydrofracking wastewater has the potential to affect plants and animals at every step of storage, transport, or processing. A U.S. Forest Service [study](#) documented destruction of trees and other vegetation when they came into contact with wastewater that was manually sprayed into adjacent forest from a hydrofracking wastewater pit. The same study documented changes in soil chemistry and subsequently potential impacts on soil biota. Where wastewater is processed in wastewater treatment plants that are not effective in removing salts, TDS, NORMS, and many chemicals used in HVHF, releases to surface waters from treated, yet salt enriched, wastewater can significantly affect freshwater ecosystems and the species they support.

**Accidents and violations.** The potential for contamination of streams, ponds, lakes and wetlands from hydrofracking wastewater as a result of various accidents, mechanical and human error, spills, leaks, and direct release into surface waters can be significant. Refer to the water quality section for additional information. Damage to plants and animals, habitats and ecosystems depends on the specific chemicals and other harmful constituents (e.g. salts) present in the wastewater as well as the specific characteristics of the surface waters and the types of species (including those of particular conservation concern) and their sensitivity to water quality changes.

**Cumulative impacts on ecosystem benefits and services.** The cumulative effect of forest fragmentation, loss and degradation of small wetlands and streams, increase in invasive species, and subsequent decrease in diversity of native plant and animal species is likely to be significant across the larger landscape as numerous well pads are constructed. Impacts on headwater streams and wetlands, which in many cases support a high diversity of plants and animals of conservation concern, may result from the loss of or encroachment on protective vegetated buffers (necessary for water quality protection and species' needs including nesting), soil compaction and disruption of water flow and connectivity at stream and wetland crossings, and sediment loading from stormwater runoff. These effects on wetland and stream habitats are exacerbated by additional water quality degradation from HVHF wastewater via spills, leaks, or accidents. These may be cumulatively significant within individual watersheds. The magnitude of gas well development may impair recovery of ecosystems and populations over time.

Ecosystems provide a variety of services that benefit human communities, and many of these have economic value as well. New York State provides [information](#) about these benefits, but does not legally protect them. A diversity of plants and animals play important roles in ecosystem functioning and thus are important to these benefits and services.

<b>Summary of HVHF Activities and Effects on Ecosystem Services</b>			
<b>Gas Well and Hydrofracking Activities</b>	<b>General Habitat</b>	<b>Impacts or Threats to Species</b>	<b>Ecosystem Services Affected</b>
Clearing and grading, removal of trees, construction of drilling pads, roads, pipelines; increased traffic; air pollution; noise; light; wastewater spills and accidents	Forest	Loss of habitat connectivity, habitat fragmentation, toxic contamination (soil or vegetation), loss of trees, nesting disturbance, increased edge habitat and changes in species; loss of interior forest species; increased invasive species	Watershed protection, stabilization of stream/river banks, water temperature moderation, air quality, biological diversity
Construction of well pad, roads, pipelines; unprotected wetland crossings; increased truck and equipment traffic; wastewater spills and accidents; withdrawal of local water supply; waste pits and leakage	Wetlands (freshwater wetlands, marsh, vernal pool) and ponds	Degradation of water quality from contaminants, toxics, stormwater runoff; increased nutrient loading; altered hydrology (including decreased water supply), loss of forested buffer and adjacent critical terrestrial habitat, nutrient and sediment loading, loss of connectivity between habitats, invasive species	Flood control, water quality improvement, groundwater recharge, recreation, education, habitat for species of conservation concern, maintenance of streamflow during drought
Road crossings; erosion and stormwater runoff from construction, spills and accidents; wastewater spills, discharges; withdrawal of local water supply; waste pits and leakage	Rivers, streams, lakes	Degradation of water quality from contaminants, toxics, stormwater runoff; increased nutrient loading; increased water temperature; water loss from withdrawal; altered streamflow esp. during drought; riparian corridor degradation and buffer loss; increase in invasive non-native species, loss of insect life as food source for fish	Watershed connections, water supply, recreation, fisheries

Tompkins County contains a high diversity of habitats and species of plants and animals. The New York Flora Atlas [documents](#) 1419 plant species in Tompkins County. There are 41 of these species that are State listed as endangered and 24 State listed as Threatened. The importance of plant species in the County is

difficult to quantify without site-specific information. Many rare plants are associated with freshwater wetlands, while others prefer disturbed sites such as old fields. The importance of a variety of native plants is more readily seen in the composition of habitats and the role of plants in ecosystems.

Wildlife has been more readily identified. But here too its value lies in its diversity including species of conservation concern and in the role of species in ecosystems. The County’s habitats support a variety of wildlife species. Tompkins County is split into two ecoregions, the High Allegheny Plateau and the Great Lakes Ecoregion. In the High Allegheny Plateau, there are 288 bird species, 38 mammal species, 114 fish species and 64 reptile or amphibian species. Of these 504 species, 86 are listed in the New York State Comprehensive Wildlife Strategy Plan as Species of Greatest Conservation Need (SGCN). These are generally the species that are most sensitive to impacts. According to the [DEC](#), *“The most frequently cited threat to species groups occurring in the Allegheny Basin was outright loss of habitat via conversion to human-dominated land use...The second most commonly cited threat to SGCN in the basin is toxic contaminants. Contaminants affect both terrestrial and aquatic species in the basin. Degradation of water quality, which may also include contaminants, was the third most common threat listed to aquatic species groups in the basin. Heavy metals from oil and gas production and PCBs from disposal of industrial wastewater negatively affect aquatic life in the Chadakoin River...Human disturbance is considered a significant threat to both aquatic and terrestrial species in the Allegheny basin.”*

According to the [DEC](#), the Southeast Lake Ontario Basin is currently home to at least 129 Species of Greatest Conservation Need (SGCN) representing 24 percent of the total SGCN statewide. Another 49 SGCN are thought to be extirpated from the basin at this time. The terrestrial open upland system-subsystem association includes several habitats in the basin that support 45 SGCN. Grasslands, lakeside beaches, and cliffs and open talus are all part of this association. Forested lands in the basin support at least 38 SGCN. Forests provide critical breeding habitat for deciduous/mixed forest breeding birds, early successional forest/shrubland birds, and forest breeding raptors. Of the forest breeding birds in this basin, Cerulean warbler is notable because it is a candidate for federal listing as a Threatened species, although numbers in New York have been stable or increasing.

Tompkins County is likely to support many of the SGCN due to the variety of its habitats in both the High Allegheny Plateau and the Great Lakes ecoregions, including the Southeast Lake Ontario basin (i.e. Oswego River watershed). The following table provides some examples.

Selected Habitats and Associated Species of Greatest Conservation Need Likely to be Found in Tompkins County	
Habitats	Examples of Species of Greatest Conservation Need*
Forests: deciduous forest, shrubland, woodland	black-throated blue warbler, Cerulean warbler, red-headed woodpecker, wood thrush, Louisiana waterthrush, scarlet tanager; eastern red bat, hoary bat, silver-haired bat; American woodcock, golden-winger warbler, ruffed grouse, whip-poor-will, Canada warbler, brown thrasher, prairie warbler; long-eared owl, red-shouldered hawk, northern goshawk, Cooper’s hawk, sharp-shinned hawk

Selected Habitats and Associated Species of Greatest Conservation Need Likely to be Found in Tompkins County	
Habitats	Examples of Species of Greatest Conservation Need*
Freshwater wetlands and ponds	American bittern, pied-billed grebe, king rail; four-toed salamander, wood duck, American black duck, spotted turtle; Jefferson's salamander, blue-spotted salamander
Rivers and streams, riparian corridors	brook trout, dragonflies, mayflies and stoneflies; hellbender, longtail salamander, northern red salamander; mink; river otter; wood turtle; blackchin shiner, comely shiner, swallowtail shiner
Grasslands and open fields	northern harrier, upland sandpiper, horned lark, vesper sparrow, grasshopper sparrow, Henslow's sparrow

\*Including but not limited to species listed as Endangered, Threatened or Special Concern by the State of New York

Gas development activities affect habitats and the individual species that live in those habitats. Due to its affect at the landscape level, it also impacts species diversity, and the ability of ecosystems to provide the services that benefit human communities. The benefits of maintaining high biological diversity and intact ecosystems are far reaching. They include water quality and supply, sediment control, nutrient cycling, flood control, groundwater recharge, pollination of crops, habitats and gardens, rural character, air and water quality improvement, control of invasive species, recreation including fishing, hunting and birdwatching, natural areas and human health.

A landscape that is biologically diverse is more resilient to changes, and this stability helps to ensure that ecological services and benefits will continue into the future. Many of these benefits also have economic value to the County, especially within the watershed context. As stated in [Economic Benefits of Open Space Preservation](#) by the New York State Office of the State Comptroller, 2010, “Decision-making that explicitly considers and values the positive economic effects of open space, as well as environmental and quality-of-life implications, will best serve a community’s long-term interests.” Some of these economic benefits, noted in the report, include the control of stormwater runoff, flood control and storage, erosion control, preservation of surface water quality and stream flows, and groundwater recharge.

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**H. Air Quality**

Air quality in Tompkins County is considered “good,” the highest classification given to air quality by the EPA. Overall air quality is better than the U.S. average, based upon the EPA’s [Air Quality Index](#). While lead, sulfur dioxide and nitrogen dioxide levels are slightly higher than the US average, other pollutants of concern, such as ozone and particulates, are better than the US average and roughly comparable with New York State’s average ozone levels. Ozone levels have been getting better in Tompkins County. Following several years of ozone levels higher than the US average in the first part of the last decade, they have been

consistently decreasing in the County. There were no non-attainment days in Tompkins County in 2010 due to ozone or other air pollutants of concern.

Air quality impacts from HVHF include emissions from a variety of stationary and mobile sources. One of the largest sources of air pollution is engines used by trucks and heavy equipment. Air emissions from the exploration and production of shale gas include a variety of potential air pollution sources that change during different phases of operation. These include exhaust from drilling rigs; venting and flaring of natural gas; exhaust from multiple diesel-powered pumps (to achieve necessary pressure in the well); vehicular traffic; volatile chemicals that escape into the air from waste pits; fugitive emissions from leaks in pipe connections and other equipment; dehydrators that remove water from natural gas and separators that may vent large volumes of methane and volatile organic compounds (VOCs); sulfur removal systems; and diesel powered compressors and pumps operating 24 hours a day. Photo is from Squidoo.com.



A significant amount of methane, a potent greenhouse gas with a global warming potential up to 70 times greater than that of carbon dioxide, escapes into the atmosphere every year from gas fields and facilities. A recent [study](#) from Cornell University cautions that the amount of methane released during HVHF, gas processing and transmission produces greenhouse gas emissions at least as significant as those produced by burning coal, and that overall this method has a global warming potential greater than that of conventional gas or oil.

A [report](#) recently released by the US House of Representatives states that more than 2,500 hydraulic fracturing products containing 750 chemicals and other components were used between 2005 and 2009. These included 25 toxic chemicals that are hazardous air pollutants and that are used in various hydraulic fracturing products. 595 products contained 24 different hazardous air pollutants (pollutants that cause or may cause cancer or other serious health effects e.g. reproductive effects or birth defects, or adverse environmental and ecological effects) including hydrogen fluoride, lead, and methanol. In another [study](#), the Pennsylvania Department of Environmental Protection identified 21 chemicals, used in hydrofracking fluid, that are readily airborne. All of them cause human health effects that affect gastrointestinal and liver systems, respiratory system, skin and eyes, cardiovascular and blood condition, brain and nervous system, kidneys, immune system, reproductive system and endocrine system. Six of the 21 are known cancer-causing agents. While only a small number of these chemicals are used in any given fracturing operation, because of limited disclosure we can not be certain which chemicals are being used.

Summary of Selected Air Pollutants Generated During HVHF		
Air pollutant	Source	Impacts
Methane	Venting of natural gas, dehydration	Tendency to explode
Diesel Fuel	Stimulation fluids, oil-based drilling muds, engines and heavy equipment	Mixture of hydrocarbons including carcinogens
Heavy metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, zinc)	Diesel fuel exhaust	Lead is harmful to children's neurological development and can also cause health problems in adults, including reproductive problems, high blood pressure, and nerve disorders
Volatile organic compounds (benzene, toluene, ethylbenzene, xylenes, formaldehyde, etc.)	Venting and flaring of natural gas, waste pits, engine exhaust, compressors, wastewater dehydration and storage, compressor operation	React with nitrogen oxides to form ozone and smog; health effects include: cancer, reproductive and nervous system, respiratory and neurological effects
Sulphur dioxide	Engine exhaust (gasoline or diesel fuel containing sulphur), natural gas flaring	Reacts with other chemicals to form particulate pollution, with health effects including lung damage, respiratory illness, heart conditions
Nitrogen oxides	Compressor engines, flaring, exhaust from diesel and natural gas engines	React with VOCs to form ozone and smog; health effects include lung damage, respiratory illness, heart conditions, premature death.
Particulates	diesel fuel exhaust, dust from pits, venting and flaring	Health effects include respiratory illness, may combine with other air pollutants for additional health effects; particulates from diesel exhaust are carcinogenic.
Polycyclic aromatic hydrocarbons	Diesel exhaust, flaring, pits	Possible carcinogens, reproductive effects in animals
Hydrogen fluoride	Waste pits	Highly corrosive and systemic poison, causes severe health effects due to deep tissue penetration, absorption of substantial amounts may be fatal.

The cumulative effect of these contaminants is the potential for degraded air quality and subsequent effects on human health. This can be illustrated by following the impacts of just one of them, ozone, which is a commonly measured air quality indicator. Ozone is a major component of smog and a potentially harmful pollutant. It is created by sunlight reacting with chemicals found in gasoline vapors and emissions from cars and industrial activities. Besides generating an array of human health effects, ozone also has been

shown to have detrimental effects on plants and ecosystems, reducing forest growth and crop yields (see [Section I Agriculture](#)).

Air pollution impacts from hydrofracking have been examined in areas where gas drilling has been in practice for some time. The following cases illustrate some of these impacts.

**Dallas-Fort Worth, Denton and Dallas Counties, TX.** The Dallas-Fort Worth area has seen a dramatic impact on its air quality from natural gas drilling in the Barnett Shale. A report prepared by Southern Methodist University found that the pollutant emissions from natural gas drilling activities, per day, surpassed those produced by all of the vehicle traffic in the Dallas-Fort Worth region.

**Town of DISH, Denton County, TX.** Reports of human illness, animal illness (including neurological effects and blindness in horses), and deaths led to an air quality study of the effects of gas wells and compressor stations. The [study](#) found the “*presence in high concentrations of carcinogenic and neurotoxin compounds in ambient air near and/or on residential properties. The compounds in the air indicate quantities in excess of what would normally be anticipated in ambient air in an urban residential or rural residential area. Many of these compounds verified by laboratory analysis were metabolites of known human carcinogens and exceeded both Short-term and Long-term effective screening levels...*” and included benzene, xylene, carbon disulfide, naphthalene, dimethyl disulfide, methyl ethyl disulfide, and pyridine metabolites. According to the study, “*The Town of DISH has virtually no heavy industry other than the compression stations. There is no other facility with the capability to produce the volume of air toxins present within miles of the Town. Fugitive emission sources of hazardous air pollutants emanating from the oil and gas sector include emissions from pumps, compressors, engine exhaust and oil/condensate tanks, pressure relief devices, sampling connections systems, well drilling (hydraulic fracturing), engines, well completions, gas processing and transmissions as well as a mobile vehicle transportation emissions. Along with hazardous air pollutants (HAPs) and known carcinogenic compounds, air toxic compounds that contribute to smog formation were identified and are a known emission of gas industrial exploration, compression, processing and distribution.*”

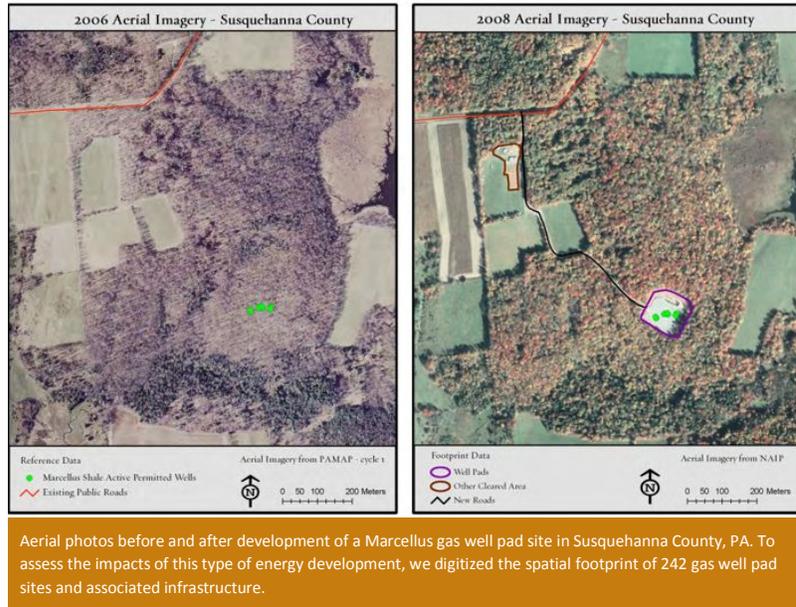
**Sublette County, Wyoming.** This is one of the most sparsely populated counties in the continental United States and home to significant natural gas fields. The state of Wyoming recently [recommended](#) “non-attainment” status be given by the EPA for ozone that has reached unhealthy levels due to air pollution from natural gas development.

Within Tompkins County, air emissions generated from gas development activities could be significant, along with subsequent effects on health, ecosystems and agriculture. Increased air emissions and ozone due to truck traffic alone could be significant. At an average of 2400 truck round-trips per well, (as per GDTFs Build-out), and further multiplied by the number of wells at build-out, the result points to a potentially significant increase in emissions and ozone levels.

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## I. Agriculture

It is a goal of the Tompkins County Comprehensive Plan to “Encourage development that is designed to preserve open space and valuable agricultural and forest land.” and to “Protect prime agricultural land for agricultural use.” The GDTF build-out analysis calculated a direct loss of active farmland in the County of 480 acres. The loss of active farmland is considered conservative and probably low because a disproportionate amount of farmland is likely to be affected by HVHF operations. Nevertheless, any direct loss of farmland from gas development is contrary to the County’s goal. Every well pad or



access road that cuts across a farm field fragments productive farmland. As farm parcels become smaller, there are fewer contiguous areas of active farming available to operating farms. Eventually farms may become too small to operate profitably. As farms go out of business, the critical mass to economically support related businesses is reduced. Loss of those businesses leaves remaining farms without nearby supply or service providers. As a result other farms will inevitably fail simply from being caught up in the spiral. Pennsylvania agricultural agencies report that 25 percent of farmers receiving royalty payments from gas companies discontinued farming, while another 25 percent converted from dairy farms to grazing operations. Before and after photos of a Marcellus well in Pennsylvania farm country, from The Nature Conservancy, is shown above.

Explosions, spills, flares and leaks from gas pipes associated with natural gas drilling, production and transmission (see [Section P, Public Health](#) below) have all been shown to have negative effects on agricultural soils and account for some of the indirect impacts on agriculture. One [study](#) shows that gas flaring adversely affects soil fertility, causing the soil to become more acidic and reducing total organic carbon, nitrate, and phosphate content. Another study reports that methane from pipeline leaks changed the oxygen and bacterial composition of the soil, and altered a plant’s ability to fix nitrogen, to successfully complete cellulose conversion, and to maintain an adequate hydration level. Gas drilling emissions have led to increased ground level ozone. Some long-term studies document impacts to [agricultural productivity](#) due to ground level ozone.

Livestock near gas operations drink surface water from ponds and streams, which can be contaminated from the use of fracking fluids at the surface as a result of injecting, withdrawing, collecting, storing and disposing of flowback. Small spills can have very big effects on livestock by contaminating their drinking

water or the grasses that they eat. Both livestock and game are attracted to the sodium in HVHF fluids. There are documented reports of livestock illness and death from exposure to spills. The US Forest Service has [documented](#) a significant increase in the use of pad sites by deer and bear. While not an agricultural impact *per se*, it has the potential to affect outdoor recreational activities in the County such as hunting.

As discussed above under Water Resources, naturally occurring radioactive materials have contributed to contamination of gas production areas. Uranium, radon and other radioactive decay products have been [measured](#) in the air, soils and water at or near natural gas sites. Taken up by plants, these radioactive elements can bioaccumulate in the food chain, eventually appearing in milk and dairy products if dairy farms are located nearby and can be cause for concern for gas drilling operators and farmers exposed to such materials. Similarly, heavy metals including arsenic, barium, cadmium, chromium, lead, and mercury have been found in drilling waste and can be absorbed by plants and incorporated into the food chain as well. While it is possible to decontaminate soil, it takes a minimum of four years of specific successive plantings to get these metals out.

Recent trends in agriculture have included a movement to strengthen local and regional food markets, to establish local and regional green markets throughout New York State, and there has been considerable interest in organic and natural farming methods. State residents have become more aware that most of the food found in grocery stores travels an average of 1500 miles from farm to table. The movement away from transportation of foods from distant continents and toward locally grown food is now regarded as a long term strategy for ensuring food security.

The number of certified organic farms in New York State increased from 218 in 2002 to 590 in 2008 with a concentration of organic farms in the Marcellus Shale region. The number of actual certified organic farms represents a fraction of the farms practicing natural farming methods and many of these farms are working towards organic certification. The local organic food market is a rapidly growing sector of New York agriculture and is highly valued by farmers market patrons in New York City, its suburbs and elsewhere around the State.

What could become a significant issue for agriculture in Tompkins County, as well as the remainder of the farms found in the Marcellus Shale region, is the effect that HVHF will have on the perceptions of buyers of New York's farm products. In an open letter to Members of the New York State Senate, the New York State Assembly, former Governor Patterson and then Governor-Elect Cuomo dated December 8, 2010, the Park Slope Food Coop, a 15,800 member wholesale buyer of New York State agricultural products stated that it will start researching alternatives to New York State products if hydrofracking occurs on farms in the areas where they buy their agricultural products from. The Co-op, just in the last year, purchased over \$1,500,000 of fruits and vegetables grown in New York State, \$500,000 of chickens and over \$400,000 of beef, lamb, and pork from New York State farms.

Agriculture has a large impact on the County's economy. According to the County Comprehensive Plan: *"Farmland makes up nearly a third of Tompkins County's land area. Agriculture and agriculture-related enterprises represent a significant share of the rural economy, and contribute to the quality of life and the scenic countryside that at-*

tracts tourists and business to the area. Approximately 230 full-time farms contribute \$50 million annually to the local economy. Many more people are employed in farm-related jobs, such as transporting and processing farm products and supplying farmers with necessary supplies. The total value of farming in Tompkins County may exceed \$100 million a year.”

Royalties to farmers may offer short-term relief and added cash to continue to farm for those who sign gas leases. But, there is also the likelihood that once a lease is signed, the farmer will decide to close the farm, move elsewhere and simply live off the royalties from the well(s) as has occurred in Pennsylvania. But there is a great deal of evidence to suggest that unconventional shale gas extraction could ultimately damage the County’s agricultural base, as well as other sectors of the County’s economy that depend upon farming.

The quality and marketability of locally produced agricultural products depends upon clean air and water that, as described above, could be degraded by HVHF. Instances of drilling-related groundwater contamination have been reported in many states including New Mexico, Colorado, Texas, Wyoming, Louisiana, Pennsylvania, and West Virginia. Surface waters have also been contaminated. Sixteen cattle were reported to have died in a northwestern Louisiana field in 2009 after apparently drinking fluids near a natural gas drilling rig, according to [news reports](#). High levels of airborne toxic emissions have been detected in Dish, Texas, and Rifle, Colorado. Similar instances of contamination could render nearby farmland, that is not subject to leasing and drilling, unsuitable for agriculture (especially organic farms or those seeking to become certified organic) and put those additional farmers out of business.

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## J. Visual Resources

*“Visual impacts would typically result from the introduction of new landscape features into the existing settings surrounding well pad locations that are inconsistent with (i.e., different from) existing landscape features in material, form, and function. The introduction of these new landscape features would result in changes to visual resources or visually sensitive areas and would be perceived as negative or detrimental by regulating agencies and/or the viewing public.”*

Revised dSGEIS, page 6-263

According to the Tompkins County Comprehensive Plan: “Many of the rural areas of Tompkins County offer a high quality of life. They offer a beautiful natural environment with scenic views of natural and working landscapes, a strong sense of community built on neighbors helping neighbors, and are generally quiet, safe, comfortable places to live...the scenic countryside that attracts tourists and business to the area.” and “It is the policy of Tompkins County to: Preserve and protect scenic views, areas of natural beauty, and the rural character of Tompkins County.” The Tompkins County Conservation Plan reinforces this goal by stating that “Scenic views and tranquility can be undermined by development that is poorly sited. Tompkins County is well known for its scenic qualities and recreational amenities. These benefits support our thriving tourism industry and contribute to the quality of life of residents.”

The most dominant natural feature in Tompkins County is Cayuga Lake. The Lake is the second-largest Finger Lake and the longest, widest, and one of the deepest of the Finger Lakes. Tompkins County has ap-

proximately 26 miles of shoreline on Cayuga Lake. Located in a glacial valley, it is punctuated with steep slopes and scenic gorges, some with wall elevations reaching 300 feet. Glacial action and centuries of scouring and erosion have created these dramatic landforms that provide great scenic value around the lake. From many locations along the steep hillsides and roads bordering the lake, views of the water, the Ithaca urban area, and the opposite shore can be spectacular. In other places, views are fleeting or are obscured by dense tree growth. According to the Tompkins County Comprehensive Plan: “Regional efforts are underway to create and promote the Cayuga Lake Scenic Byway, encircling the lake, to enhance this tourism resource.”

Tompkins County is home to Taughannock Falls State Park, Treman State Marine Park, Buttermilk Falls State Park and Robert H. Treman State Park, has one Recreational River (a portion of Fall Creek), one Critical Environmental Area (Coy Glen), all or part of eight state forests, several Audubon-designated Important Bird Areas, and a variety of lands protected by the local Finger Lakes Land Trust, Cornell University, and The Nature Conservancy. The Tompkins County Comprehensive Plan identifies 14 “Natural Features Focus Areas” based on the location and concentration of natural resources, such as Unique Natural Areas, wetlands, stream corridors, public drinking water resources, Important Bird Areas, and hiking and multi-use trails and trail corridors. These 14 focus areas all relate to visual resources and were adopted by the Tompkins County Legislature in December 2004 after extensive public outreach.

The scenic areas surrounding Cayuga Lake are the reason why Tompkins County is home to three State Scenic Byways designations. The Cayuga Lake Trail, the Scenic Route 90 Trail, and Forest Home Drive have all been designated for their scenic beauty. Tourism facilities are driven, in part, by the scenic rivers, valleys and hills that comprise the sense of place. In 2009, Tompkins County attracted an [estimated](#) 843,000 visitors that generated tourism spending of \$156 million. About half of these visitors came to Tompkins because of its scenic beauty with the remainder related to the County’s educational institutions. New York State estimates that every \$1.00 generated directly by tourism indirectly generates \$7.00 for the State’s economy and this includes the local residents who are employed by tourism or are benefited by the dollars tourists bring into the community. Additional information on the impact of HVHF on tourism in Tompkins County can be found below in [Section L](#).

The DEC published in 2000 a Program Policy document entitled [Assessing and Mitigating Visual Impacts](#). It is a guide to defining and assessing visual impacts for DEC staff as well as for SEQRA reviews by State and local agencies. According to the document:

*“An ever expanding body of research has demonstrated that environmental aesthetic values are shared among the general population. This research finds that such values are not idiosyncratic, random, or arbitrary. For example, millions of people visit Niagara Falls for our shared appreciation of its beauty. Many places have been recognized for their beauty and designated through Federal or State democratic political processes, reinforcing the notion that environmental aesthetic values are shared. Recognition of aesthetic resources also occurs at local levels through zoning, planning or other public means. That these special places are formally recognized is a matter of public record.”*

The policy document relies heavily on site-specific visual impact assessment methodologies in offering guidance to DEC staff who must conduct such assessments. For purposes of this Community Impact Analysis, the document is not entirely pertinent because no specific gas developments using HVHF are currently proposed in Tompkins County to enable an assessment based upon a specific location. However, it does offer some clues as to how to assess the significance of an impact based upon certain principles, including but not limited to the area affected, the size of the structure in relation to its surroundings, its location in relation to aesthetic resources, ability to screen the structure, use of lighting, and the permanence of the impact.

This analysis of the visual impacts of HVHF is presented in a generic format using the factors outlined above as a guide. Heavy industrial activities like HVHF are widely perceived as “unsightly.” None currently exist within Tompkins County. As illustrated in the GDTF build-out analysis, up to 2100 gas wells could potentially be developed on 210 well pads disturbing a total of 1,848 acres of land throughout the County. Therefore, virtually the entire County could be affected based upon the build-out.

Unless required as a condition of obtaining a drilling permit, it is not clear how the State proposes to protect visual resources from a reading of the Revised dSGEIS since no specific mitigation measures are proposed. This is usually a province of local land use controls. The State does recognize Municipal Home Rule Authority with regards to land use controls when it states in Section 1.7.5 (page 1-11 of the Revised dSGEIS) that *“Applicants be required to compare the proposed well pad location to local land use laws, regulations, plans and policies to determine whether the proposed activity is consistent with such local land use laws, regulations, plans and policies.”* If the applicant or local government informs the DEC of a conflict in this regard, the DEC would request additional information in considering whether significant adverse impacts relating to land use and zoning would result from permit issuance. However, the State proposes no objective standards for protecting visual resources nor does it state what DEC will do if there is a conflict.

For the development of well pads, once vegetation is removed and the well pad sites and access roads are regraded, then the soils are generally stabilized using crushed rock which is brought in and compacted to stabilize the pads and access roads to accommodate the equipment and truck traffic, and the drill rig and equipment used during the drilling phase is brought to the site along with any production equipment once it is determined that the well is viable. The degree of visual impact of grading activities will vary depending upon whether there are gentle or steep slopes. The photograph to the right by Cer-



tus Strategies shows what can happen as a result of grading in steep slope areas, which exist throughout Tompkins County.



Drill rigs vary in height from 30 feet for a small cable tool rig to 100 feet or greater for a large rotary rig for a vertical well. The rigs used for horizontal drilling will be like the one illustrated to the left, 140 feet or greater, and will have more supporting equipment than for vertical wells. A taller rig with a larger footprint and substructure and 170 feet in total height, can be used for drilling consecutive wells on a pad. On well pads with multiple wells, the equipment noted above is on the site for up to three years for one well pad with six to eight wells and from four to eight months per well with one well per pad. Drill rigs are provided with lighting during the night due to the 24 hour nature of the operations.

Long term visual impacts of a well pad, after the drilling phase, are determined by whether the well is a viable well or is considered a “dry hole.” In either case, reclamation work is supposed to begin within 45 days of cessation of drilling and stimulation. If the well is a dry hole, the entire site is supposed to be reclaimed. If the site was heavily forested, there will be a permanent visual impact. If the site was agricultural land, then the reclamation process depends upon whether it can be suitably reclaimed for active agricultural use again. As discussed above under [Agriculture](#), the success of reclamation for farming depends upon many factors that must be evaluated on a site by site basis. Was there any contamination of soils? Was the topsoil properly stockpiled, protected from erosion and then properly regraded so that its productivity can be restored? These and other questions are all relevant to the success of reclamation.



Photo: Chesapeake Energy photograph of equipment needed for a HVHF job in the Marcellus Shale, WV

If the well pad is productive, then the access road must be maintained in effect permanently. Re-fracking of each well is likely, as discussed above, so much of the equipment required for this process must be brought back to the site each time it is refracked. The NYC-DEP in their build-out analysis of the Catskill Watershed lands estimated re-fracking at intervals of five to ten years over a forty year life of each well.

During the production period of a well, there will be an assembly of wellhead valves and auxiliary equipment such as meters, a dehydrator, a gas-water separator, a brine tank and a small fire-suppression tank. Multi-well pads will have larger equipment to handle the increased production. For purposes of the build-out analysis, it was assumed that each pad would average 8.8 acres in size over the life of the well and includes areas devoted to the access roads and impoundments. Visual effects of a Pennsylvania drill rig are compared with those of a windmill farm near Morrisville, NY below.



An infrastructure of pipelines<sup>8</sup> and compressor stations must also be constructed to transport gas to markets. While most of these pipes are installed underground, a number of above ground facilities will be permanently installed with an accompanying visual impact of industrialization. Even with underground pipelines, the visual impacts are unavoidable since the above ground vegetation over the pipeline must be maintained in a trimmed condition for the life of the pipeline.

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## K. Cultural Resources

Tompkins County has eight Historic Districts listed on the State and National Registers of Historic Places, at least 58 individual properties are listed on the State and National Registers, there is one National Historic Landmark property, and numerous additional properties or structures that have been deemed to be eligible for listing on the State and National Registers. Most concerns related to potential negative impacts on historic resources is directed at those sites, properties, structures or objects that are listed or that are eligible for listing in the National Register of Historic Places. Direct adverse impacts to historic resources may include destruction of all or part of a historic property, isolation from or alteration of its surrounding envi-

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<sup>8</sup> According to the US Department of Energy, "Transporting natural gas from the wellhead to the final customer involves several physical transfers of custody and multiple processing steps. A natural gas pipeline system begins at the natural gas producing well or field. Once the gas leaves the producing well, a pipeline gathering system directs the flow either to a natural gas processing plant or directly to the mainline transmission grid, depending upon the initial quality of the wellhead product. The processing plant produces pipeline-quality natural gas. This gas is then transported by pipeline to consumers or is put into underground storage for future use."

ronment, introduction of visual, audible or atmospheric elements out of character with the property (or that alter its setting), and neglect that results in its deterioration or destruction. Primary impacts on archaeological resources may occur whenever the ground surface is disturbed by construction activities. Construction impacts consist of potential disturbances of sites with the consequent loss of scientific or historic information.

Development of or alteration to the open spaces that surround known historic or archaeological resources may diminish the historic integrity of such properties. Similarly, alteration of the character of potential historic districts by the introduction of structures, objects or land uses incompatible with the historic setting or buildings in the district would be considered an adverse impact on the cultural quality of the district.

The specific location of archeological sites is kept confidential by the OPRHP because these resources are vulnerable to looting and vandalism. However, there are many found throughout the County. General locations of sensitive areas can be identified online through the OPRHP's publicly accessible tools found on the State agency's web site. The DEC had this to say about archeology in their 1992 Oil and Gas GEIS: *"The impacts of construction activities on archaeological resources are more serious. Since archaeological sites are generally difficult to detect by their surface appearance, they are more likely to be damaged during construction. Even if artifacts are salvaged before excavation begins, removal from their original location and disturbance of the site will destroy much of their value. Even with safeguards, it is possible for an archaeological site to escape detection until construction actually begins."*

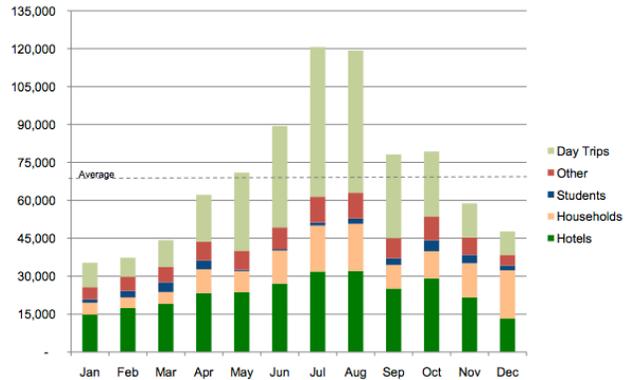
The GDTF build-out analysis has illustrated the extent to which gas development activities could be spread out throughout the County. Therefore, if this build-out occurs, it is highly likely that gas development would cause adverse impacts on cultural resources that exist in the County. The adverse effects include the direct adverse effects to historic resources and primary effects to archaeological resources if the well pads or access roads were in areas of archaeological sensitivity. Secondary impacts could include impacts from vibrations caused by heavily laden trucks on local roads that may pass in close proximity to historic structures.

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## **L. Tourism**

While education is a major industry in Tompkins County, tourism is the seventh largest employment sector, [generating](#) 2,366 jobs and bringing in about \$22.5 million in State and local tax revenues annually. Overall, there were 843,135 total visitors to Tompkins County in 2009 generating tourism spending in the County of \$156 million. Important tourist attractions include Cornell and Ithaca College, Downtown Ithaca, State parks and waterfalls/gorges, wineries, Cayuga Lake, the Farmers Market and Johnson Art Museum. Tourism has other positive impacts on the County that include an emphasis on conservation of important natural areas, conservation of historic sites, preservation of community character, and improvement of infrastructure. These are, after all, the setting for the features that attract tourists to the County and region in the first place.

Tourism creates more jobs per dollar of investment than heavy industries like gas production. Tourism is a labor intensive industry, compared with heavy industries like gas drilling, which is about 10 times more capital intensive than the average American industry. While tourism creates local jobs, many of them are low paying and seasonal as shown on the 2009 visitor chart, prepared for the Tompkins County Strategic Tourism Planning Board by Chmura Economics & Analytics. On the other hand, the gas industry relies on a small, transitory workforce from out-of-state areas but some of the jobs are higher paying than local industries and, if training is provided to local residents, there may be more permanent jobs created for the duration of gas development activities. Local employment potentially benefitted by the gas industry is usually in trucking, construction and retail jobs, some of which are part-time, short-term, or low-paying.



As stated in the Tompkins County Comprehensive Plan: “Tompkins County contains an uncommon mixture of spectacular natural features, a vibrant urban center, internationally renowned academic institutions, and a productive and attractive working landscape. With its mixture of urban, suburban, and rural landscapes, Tompkins County offers a diverse living environment.” As discussed in other sections of this Community Impact Assessment, the heavy industrialization that accompanies gas development runs a risk of contaminated surface water, groundwater, air and soils, and will create the visual impacts of an industrialized landscape in a scenic region that depends upon clean water, clean air, and scenic and aesthetic resources to fuel a large sector of its economy. An industrialized landscape will unavoidably transform areas of natural beauty, upon which the tourism industry depends. If the County were to become heavily industrialized, it may take time for the full effects to be felt by the tourism industry, but once tourists visit the area’s facilities and potentially have a bad experience due to heavy truck traffic and visually compromised landscapes, they may never come back.

If buildout occurs, tourism will be impacted by the disruption of the historic patterns of demand for motel and hotel rooms. In neighboring Pennsylvania, the gas industry has become a major consumer of hotel and motel space, reportedly renting out blocks of rooms for many months in advance. While this may represent a boom for the owners of these establishments, it will make it more difficult or nearly impossible for tourists and college-related visitors to find accommodations.

Supporting and growing tourism is a key component of local economic development strategies in Tompkins County communities, especially since the economic impact of visitor spending is about [\\$156 million](#) per year. As discussed below in [Section R](#) Economy and Jobs, gas drilling is a specialized industry, and many well workers are transient. According to research conducted by Andrew Rumbach for the Southern Tier Central Regional Planning and Development Board and the Appalachian Regional Commission, it is likely that tourism-related businesses, such as hotels and other lodging facilities, would [benefit](#) from the influx of gas workers. However, this may also strain the available supply and pricing of hotel and motel rooms, result-

ing in a reduction or loss of these resources for tourists as well as business and educational visitors to the County. Rumbach states:

*“The tourism “brand” of the Southern Tier is very much intertwined with agriculture; rolling hills, scenic farmlands, rural vistas, and viticulture are major contributors to the tourism draw here. Farmers markets, agricultural fairs, and family-owned restaurants can be found in almost every town and city. The Finger Lakes wine industry has rapidly become one of the most popular wine destinations in the eastern United States, with dozens of vineyards, tasting rooms, and bed & breakfasts that stretch from the Southern Tier counties to north of the Finger Lakes. Supporting and growing the tourism sector is a key component of economic development strategies for the counties in the STC over the next several decades. Besides the significant tourism assets already in place, vineyards, viticulture, and wine tourism are a major focus for economic investment and growth...Though the tourism sector creates a significant number of jobs in the STC region, it is likely that the value of gas drilling, measured simply by jobs created and wages generated, will exceed the value of tourism in the short term. It is also likely that many tourism related businesses, including hotels, restaurants, and shopping venues, would benefit from the influx of gas workers...These observations come with two major caveats, however.*

*First, tourism brings many non-monetary benefits to the STC region and its communities. Most important, tourism amenities improve the quality of life of residents. Restaurants, shops, parks and outdoor recreation areas, campgrounds, wineries, festivals, museums, and other related amenities are beneficial to local residents as well as visitors. These amenities also make a region more attractive for economic investment; they are some of the crucial resources that allow an area to attract economically mobile populations, like young professionals and retirees (Markusen 2003, 2004). The preservation and maintenance of rural and outdoor assets is also an important component of sustainable economic development strategies; these assets are a renewable resource for the region, and tourism creates a financial incentive to protect them.*

*Second, whereas many tourism related businesses are locally owned and operated and are thus part of a long-term economic development trajectory for the region, the employment “boom” in gas drilling will be relatively short-term and non-local...In order to gauge the true impact of gas drilling in the Marcellus Shale on tourism and tourism development, we need to look at the cumulative impact of drilling across the STC region. Individual gas wells and drilling activity, while disruptive at a local scale, will likely have very little impact on the tourism sector. Cumulatively, however, the regional industrialization associated with widespread drilling could do substantial damage to the region’s “brand,” threatening the long-term growth of tourism here. Increased truck traffic, automobile traffic, air pollution, noise pollution, and industrial accidents, decreased availability of hotel/motel rooms, campground spaces, and RV parking, negative visual impacts from multiple drilling rigs in rural view-sheds, storage facilities, gravel pits, and compressor stations, disruptions to wildlife and hunting grounds, fears over lake and stream pollution and many other associated impacts of drilling will change the character of the region from pristine and rural to gritty and industrial. If so, the re-*

*gion’s ability to attract tourism may be damaged in the long-term, as the perception (and reality) of the region as an industrial landscape may far outlast the employment and monetary benefits of gas drilling.”*

According to Rumbach, the region’s long-term ability to attract tourists could be damaged if the tourism “brand” of the region is replaced with a perception of it as an industrial landscape. This, in turn, can have greater ramifications for the economy. Besides the Rumbach study, which was unanimously approved by the Southern Tier Central Regional Planning and Development Board on June 23, 2011, there has been [anecdotal evidence](#) from other locations including Pike County Pennsylvania. According to a news report in the [Pike County Courier](#) that quoted Sally Corrigan, director of the Pike County Community Planning Office, *“There has been a concern by those wanting to visit and vacation in Pike County whether it is safe to bring their families and children since all they have heard or know about fracking is that dangerous chemicals are being used and the drilling companies don't always comply with safety requirements. This is affecting our tourism and is a concern to area businesses,”* she said.

Industrialization has the potential to adversely affect infrastructure by the large trucks that must ply local roads, and even the potential for increasing health related concerns. The effects on Tompkins County of heavy industrialization will likely mean a reduced or compromised tourism industry. The County needs to consider whether tourists will want to visit an area where they may have to contend with heavy truck traffic, industrialized landscapes, and potentially polluted natural resources.

It is useful to note that other area tourism/business organizations, like the Cooperstown Chamber of Commerce, have raised concerns about the potential impacts of HVHF on their tourism economies. As provided in a Statement released from the Chamber on February 11, 2011: *“The relative contribution of natural gas from hydrofracking to either the economy or the energy needs of the region is minimal and development does not materially contribute to a sustainable national or regional energy policy...The plans for drilling pose a direct and material threat to the interests of the Chamber membership. Industrial-scale hydrofracking in the upstate region will irreparably damage the essential qualities that make the Cooperstown area an excellent place to live, raise families, farm and work. It puts at risk much of the local economy, ranging from hotel and tourism to restaurant and retail businesses, most of which are driven by the hundreds of thousands of tourists who choose to visit the region every year.”*

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## **M. Transportation**

*“The potential transportation impacts are ominous.”*

New York State Department of Transportation

Development of heavy industrial activities, like natural gas drilling and production will be accompanied by a significant increase in the level of heavy truck traffic compared to current conditions. GDTF’s build-out analysis conservatively estimates the number of truck round-trips per well at 2,400, approximately two-thirds of which are for water and wastewater (flowback) hauling. On an annual basis, the number of additional truck trips per year depends on the number of wells drilled in a given year. For full build-out of all wells in

Tompkins County, GDTF estimated the total number of heavy truck round-trips at 5,040,000. For the reasons discussed below, that number of trips per well may be very conservative, understating the overall impact.

Any increase in the number of travel cycles in the County will increase the risk of accidents. The risk of any accident increases substantially if it occurs with a truck carrying hazardous materials and the accident occurs in close proximity to a water feature such as Cayuga Lake, Six Mile Creek, Taughannock Creek, Salmon Creek, Fall Creek, Virgil Creek, or along/across one of the multitude of tributaries to these waters.

Tompkins County has a diverse network of State, County and local roads. Large volumes of truck traffic will stress all roads but, according to the Tompkins County Comprehensive Plan: *“New York State, Tompkins County, and local municipalities struggle to maintain the existing network of roads, bridges, and public transit. Annual transportation expenditures by all levels of government within Tompkins County total about \$35 million.”* Local roads and bridges will be especially affected by trucks weighing 80,000 pounds and sometimes up to 100,000 pounds since these facilities have not been built to withstand repeated heavy truck traffic. This will increase maintenance and capital costs and will also increase the risk of accidents that result in leakage or spillage of hazardous materials. The risks associated with such spills are discussed below under Public Health.

While State highways were constructed to handle heavy traffic, the remaining road network in Tompkins County is maintained as either county or municipal roads. Most of these smaller roads were constructed for farm and residential access but not for industry. Municipal bridges, culverts and road beds were not designed to handle the numbers of trips nor the 40 to 50 ton loads that HVHF trucks carry. The State’s Revised dSGEIS states that *“it is anticipated that the largest impacts from truck traffic would be near wells under construction or on local roadways.”* [see Revised dSGEIS page 6-310]

Trucking for the hydraulic fracture equipment, water, sand and flowback removal represents over 80 percent of the total truck traffic. This trucking takes place in weeks-long periods before and after the hydraulic fracture. It occurs during the initial hydraulic fracture and then again every time a well is refracked. Truck traffic associated with intensive industrial activity, on a relatively constant basis and over a period of decades will impact local quality of life. Trucking activity will be accompanied by provision of equipment and material supply systems (warehouses, garages, support services), gas gathering and pipeline systems, compressor stations, and waste disposal systems to name a few of the associated facilities. The potential rate and density of heavy industrial development may cause a significant and relatively rapid industrialization of the County.

Trucks used by heavy industrial activities like HVHF can involve convoys of 100 or more trucks to a site when it is being mobilized and demobilized. The photo to the right by James “Chip” Northrup shows truck traffic associated with well drilling in Towanda, Pennsylvania. Water and wastewater tankers can also arrive in convoys. The effects of diesel exhaust have been described above under Air. If the trucks drive on unpaved or gravel roads, which exist in the County and which will be constructed for well pad access, dust can also be a source of emissions. According to the [U.S. Bureau of Mines](#), some primary concerns associated with heavy truck traffic are that large and heavy trucks start slowly, drive slowly, and stop slowly, and can interfere with other traffic; they are noisy, especially when Jake brakes<sup>9</sup> are used in hilly areas like Tompkins County; heavy trucks can create dusty conditions and materials can fall off the truck, possibly damaging or breaking windshields and injuring persons, and heavy trucks can damage local roads especially in the springtime when the ground thaws.



Generally, heavy trucks will work out of service yards and truck traffic will be heaviest near the yards, traveling in convoys to and from well sites. Trucking operations for drill sites is generally through the use of contract truckers that are paid by the load. Observations are that these drivers drive faster than conditions or speed limits dictate because more loads hauled means more income for the owner/driver and when especially hilly areas must be traversed, like Tompkins County, heavily laden trucks use downhill momentum to get uphill more efficiently. Well operations go on 24 hours of the day seven days a week so the truck traffic is non-stop.

Traffic can also be affected when roads must be crossed by pipelines. While the initial trucking activity is related to drilling, producing wells will require additional local disturbance associated with the opening up of roads and drainage ways to allow the construction of underground pipelines which will be necessary to connect the well heads to markets.

The design and construction of transmission pipelines is subject to regulation by the State Public Service Commission. But, this is not the case with gather and distribution (local service) lines. Typically all of these lines are installed underground for weather and safety related reasons. When a pipeline crosses a local road it would normally require the approval of the local Highway Superintendent. During the time a road is cut open to install a pipeline, it is not available for public and emergency use. An additional concern with local roads is seismic testing. One of the practices that drillers follow involves the use of trucks with special equipment to explore the geological structure of an area through vibration or underground sound waves. The principal concern regarding this type of use relates to any restriction to traffic flow while this type of exploration is occurring and the potential for damaging local roads.

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<sup>9</sup> This is a diesel engine braking mechanism that causes a loud “machine-gun” noise when a large truck decelerates.

The State has no ability to enter into road use agreements with trucking operations and DEC has no regulatory authority over trucking operations associated with HVHF. Speeding tickets and safety violations are usually poorly enforced on rural roads. There is no offset in place for the costs associated with damage to roads, bridges, traffic crowding other users off the road, car repairs and damage to windshields.

In 2011, the New York State Department of Transportation prepared an internal “Discussion Paper” on the Transportation Impacts of Marcellus Shale development. Although the document is labeled as a “Draft” and was prepared for internal State government use, it has been reproduced and is available for [download-ing](#) from several sources. The Executive Summary of the document is worded strongly, urging caution by all affected. This is how the document is introduced:

*“The potential transportation impacts are ominous. Assuming current gas drilling technology and a lower level of development than will be experienced in Pennsylvania the Marcellus region will see a peak year increase of up to 1.5-million heavy truck trips, and induced development may increase peak hour trips by 36,000 trips/hour. While this new traffic will be distributed around the Marcellus region this Discussion Paper suggests that it will be necessary to reconstruct hundreds of miles of roads and scores of bridges and undertake safety and operational improvements in many areas.*

*The annual costs to undertake these transportation projects are estimated to range from \$90 to \$156 million for State roads and from \$121-\$222 million for local roads. There is no mechanism in place allowing State and local governments to absorb these additional transportation costs without major impacts to other programs and other municipalities in the State.*

*This Discussion Paper also concludes that the New York State Department of Transportation and local governments currently lack the authority and resources necessary to mitigate such problems. And, that if the State is to prepare for and resolve these problems it is time to establish a frank and open dialogue among the many parties involved.”*

The Revised dSCEIS has a number of errors in the calculations provided, estimating the number of truck trips generated as a result of HVHF. Some of the data presented is conflicting and in need of correction. Other data is improperly explained or labeled. There is also a lack of a full assessment of transportation impacts such as the additional truck trips needed to refracture each well or to provide for downspacing (see [Section D.2](#) above) of additional wells, which is common in the industry and permitted in New York State if justified. This means that a realistic picture of the full scope of transportation impacts on New York State is not currently provided by the DEC.

Using the figures provided, New York State has estimated that gas well development will occur over a period of 30 years. Statewide, new truck trips generated annually as a result of HVHF could number 53,473,000 under a “High Development Scenario” as a result of HVHF in the initial years of gas well development, increasing to 533,360,000 truck trips in year 10 and continuing at that level each year until a 30 year time horizon is reached. The State divided the Marcellus Shale play into four regions, based upon expected demands for gas drilling. Region A, which consists of the adjoining counties of Chemung, Tioga, and

Broome (close but not adjacent), are expected to account for 50 percent of all new well construction in New York State. Tompkins is in an area of several other counties that are expected to account for 22 percent of all new well construction. Looking at the anticipated truck trips generated in the three counties just south of Tompkins, a total of up to 266,680,000 new truck trips have been projected annually under the high development scenario as a result of HVHF. This equates to 730,630 new truck trips per day, 30,442 new truck trips each hour, 24 hours of the day in this three county area for at least the next 30 years. A county by county analysis was not completed for the Revised dSGEIS so no realistic figures are available just for Tompkins County.

The State's traffic figures assume that each well has a life of 30 years. This means that the State has projected the "boom" phase of gas development activities will last 60 years. As stated in the Revised dSGEIS, "Because of the assumption of a 30-year development period, wells constructed in Year 30 are assumed to be productive until Year 60." The State's Revised dSGEIS traffic estimates do not account for [refracking](#) each well so the estimated truck trips are an understatement of the number of truck trips that can be expected to occur over the 60 year period. As discussed above in [Section D.2](#) according to Halliburton only 10 percent of the gas in place is recovered initially and refracking is necessary. According to [some gas industry estimates](#), refracking multiple times of 10 or more has been occurring in the Barnett Shale region. DEC's Revised dSGEIS does not acknowledge this practice and instead states that "Normally, hydraulic fracturing is only performed once in the life of a well." [See page 6-296].

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## N. Energy Trends

*A few hundreds of years ago, human beings discovered the genie in the bottle...coal. Coal led to oil, which inadvertently led to natural gas. These fossil fuels that our society has come to rely on for stability are simply fossilized plants; they are concentrated organic matter, concentrated energy. They allowed a relic from the past, when harvested and burned, to do the work that would take many humans to accomplish. The scale and magnitude of the work that we have been able to achieve has increased exponentially with the use of fossil fuels, but so has our ability to impact various ecosystems of the planet.*

Dennis Dimick, Executive Editor National Geographic

Fossil fuels developed over millions of years from decaying organic material like plants. They turned the sun's ancient energy into coal, oil and natural gas. Coal companies have regularly referred to coal as "buried sunshine." Each year, society burns an estimated 100,000 years of ancient plant growth meaning that we're fueling our civilization with ancient sunlight. The burning of fossil fuels have come with a price. For most of human history, carbon dioxide (CO<sub>2</sub>) levels in the atmosphere have been stable and around 275 to 285 parts per million (ppm). Beginning about 250 years ago, carbon dioxide levels began to increase, now registering at 392 ppm in 2011, increasing at a rate of about 2 ppm each year. The increases are mainly due to CO<sub>2</sub> emissions from the combustion of [fossil fuels, gas flaring, and cement production](#). Most scientists, climate experts, and many national governments are now saying 350 ppm is the safe upper limit for CO<sub>2</sub> in

our atmosphere. This is because of the “greenhouse effect” that was first described by Joseph Fourier in 1824. Then, in 1896, a Nobel Laureate chemist calculated ([see American Institute of Physics website](#)) that if the amount of carbon dioxide in the atmosphere were to double, global temperatures would rise 9 to 11 degrees Fahrenheit. The latest scientific thinking is that a doubling of carbon dioxide in the atmosphere will raise temperatures 3 to 8 degrees Fahrenheit.

According to UCLA researchers, who [reported](#) the results of their study of CO<sub>2</sub> in the October 8, 2009 issue of Science magazine, global CO<sub>2</sub> levels are at their highest levels in the past 15 to 20 million years. The Earth’s average temperature has been increasing over the past century, with warming accelerating over the past 50 years, according to observations of temperatures globally. Of the hottest 12 years since temperatures began to be measured in the 1850s, 11 have occurred in the past 12 years. No known natural forces can account for the recent severe warming. The causes and effects of this warming trend, and the debates it has fueled, have been widely published and need not be repeated here. What is important to consider, however, is that use of fossil fuels is increasing, the pace of climate change is increasing, and governments worldwide are planning ways to both mitigate and adapt to these challenges.

The Planning profession has recognized the urgency of creating sustainable communities throughout the nation to address this issue. The American Planning Association (APA) in 2004 adopted an official [Policy Guide on Energy](#). The goal of the [Guide](#) is to help planners, and the communities and individuals they serve, to increase energy conservation and renewable energy production while significantly reducing use of non-renewable energy sources such as oil and gas. Most Americans are unaware of the large role energy plays in their everyday lives, and particularly how today’s energy production and consumption are directly connected to the condition of the environment, the health of the economy, and the quality of life that will be experienced by future generations.

The Planning profession also understands the connections between use of fossil fuels and climate change. On April 11, 2011, the APA adopted an official [Policy Guide on Planning and Climate Change](#). As stated in this [Policy Guide](#), “*The earth is getting warmer and it will continue to do so well into the future, creating a wide range of impacts that include sea-level rise, droughts, and heat waves. The key question is how fast and how severe the impacts will be and whether we can adopt policies for mitigating and adapting to these impacts.*” The General Energy Policy of the American Planning Association, its Chapters and Divisions, its 16,000 certified planners (AICP) and its 40,000 members are to “*support efforts to reduce greenhouse gas emissions related to the production and use of energy in the built environment.*” The policy also supports establishment of strategies to minimize the conversion of farmland and woodland for other uses because this strategy will enhance carbon sequestration, these land uses support the local economy, and they allow communities to retain rural character.

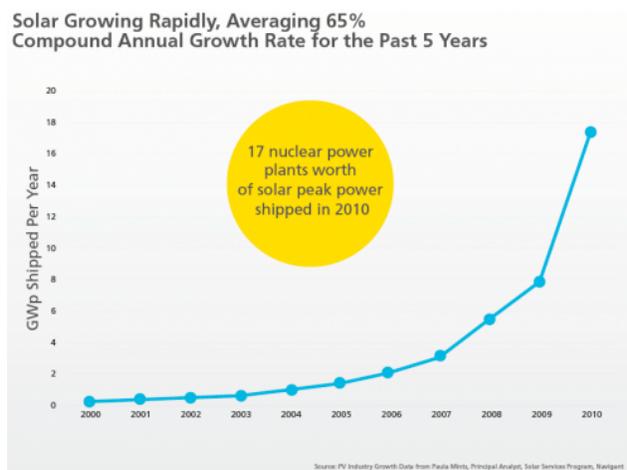
While many in the fossil fuels industry talk of an increasing demand for these products necessitating an expansion of their operations, the Rocky Mountain Institute (RMI) has taken a different approach in its efforts to reduce use of fossil fuels. Their Executive Director, Amory Lovins is the principal author of [Winning the Oil Endgame](#), an independent, peer-reviewed synthesis for American business and military leaders that charts a roadmap for getting the United States completely and profitably off oil. As stated in the report: “*Winning the Oil Endgame offers a coherent strategy for ending oil dependence, starting with the United States*

but applicable worldwide. There are many analyses of the oil problem. This synthesis is the first roadmap of the oil solution—one led by business for profit, not dictated by government for reasons of ideology. This roadmap is independent, peer-reviewed, written for business and military leaders, and co-funded by the Pentagon. It combines innovative technologies and new business models with uncommon public policies: market-oriented without taxes, innovation-driven without mandates, not dependent on major (if any) national legislation, and designed to support, not distort, business logic. The RMI strategy integrates four technological ways to displace oil: using oil twice as efficiently, then substituting biofuels, saved natural gas, and, optionally hydrogen. According to the RMI’s calculations, “The quickest and cheapest way to save large amounts of natural gas is to save electricity: improving total U.S. electric efficiency by 5% would lower total U.S. gas demand by 9%—enough to return gas prices to \$3–4/MBTU for years to come...Reducing natural gas demand will tame the volatile gas markets, lower gas prices, and potentially cut gas bills by \$40 billion per year and electric bills by an additional \$15 billion per year.”

Alternatives do exist to an increasing use of finite natural gas reserves. After all, saving fuel is cheaper than buying fuel, so a decreased use of fossil fuels isn't costly, but profitable. According to [Bloomberg New Energy Finance](#), the best wind farms in the world already produce electric power as economically as coal, gas and nuclear generators and the average wind farm will be fully competitive by 2016. According to Justin Wu of Bloomberg: “The public perception of wind power tends to be that it is environmentally-friendly, but expensive and intermittent. That is out-of-date - in the best locations, where generation is already cost-competitive with fossil fuel electricity, and that will be the case for the majority of new onshore turbines installed worldwide by 2016. The press is reacting to the recent price drops in solar equipment as though they are the result of temporary oversupply or of a trade war. This masks what is really going on: a long-term, consistent drop in clean energy technology costs, resulting from decades of hard work by tens of thousands of researchers, engineers, technicians and people in operations and procurement. And it is not going to stop: In the next few years the mainstream world is going to wake up to wind cheaper than gas, and rooftop solar power cheaper than daytime electricity.”

The solar energy industry has been expanding rapidly as shown on the chart. For the latest solar trends the website [CleanTechnica](#), which prepared the graph on the right, has a number of additional graphs that illustrate other current and projected renewable energy trends.

[RMI](#) advocates for saving natural gas for future use as an alternative to the dwindling supplies of oil rather than increasing the supply of natural gas. Forestalling access to the natural gas found in the Marcellus and Utica Shales within the County can have the effect of preserving it in place for future generations. Future technologies may make it more environmentally benign to extract (and use) than the current HVHF processes, along with their accompanying adverse impacts, that have been described at length herein. RMI says that “A \$180-billion investment over the next decade will yield \$130-billion an-



*nual savings by 2025; revitalize the automotive, truck, aviation, and hydrocarbon industries; create a million jobs in both industrial and rural areas; rebalance trade; make the United States more secure, prosperous, equitable, and environmentally healthy; encourage other countries to get off oil too; and make the world more developed, fair, and peaceful.”*

There are other reasons why avoidance of fossil fuels may make sense. Robert W. Howarth, the David R. Atkinson Professor of Ecology & Environmental Biology at Cornell University has studied the emissions from natural gas drilling and production. In October of 2011, he provided [testimony](#) to the New York State Assembly Committee on Environmental Conservation regarding the Revised dSGEIS. According to Howarth, the “sGEIS completely ignores peer-reviewed scientific literature and instead relies on industry web sites. For context, the scientific understanding on greenhouse gas emissions from shale gas has undergone a massive change in the past 11 months. A great deal of new information and new analyses have been published or presented recently, and all of this information is completely ignored by the sGEIS. Instead, the presentation represents a viewpoint based on information from the 1990s and earlier, before any shale-gas development even occurred. The latest scientific information leads to the strong conclusion that shale gas has the largest greenhouse gas footprint of any fossil fuel, when emissions of methane gas are fully considered and the consequences evaluated at time scales of 50 years or less following emission.”

Natural gas is being widely advertised and promoted as a clean burning fuel that produces less greenhouse gas emissions than coal when burned. While less carbon dioxide is emitted from burning natural gas than from burning coal per unit of energy generated, the combustion emissions do not tell the whole story. Howarth’s [study](#) (in conjunction with Renee Santoro and Anthony Ingraffea of Cornell) found that when there was a complete consideration of all emissions from natural gas, including the full range of emissions of greenhouse gases from using natural gas obtained by hydrofracking, that they are 2.4-fold greater than are the emissions just from the combustion of the natural gas. A [video](#) of a gas well being finished in Pennsylvania graphically shows the extent of emissions. When the total emissions of greenhouse gases are considered, greenhouse gas emissions from hydrofracking obtained natural gas are estimated to be 60 percent more than for diesel fuel and gasoline. Hydrofracking obtained natural gas and coal from mountain-top removal reportedly have similar releases. The authors warn that:

*“Until better estimates are generated and rigorously reviewed, society should be wary of claims that natural gas is a desirable fuel in terms of the consequences on global warming...The large GHG footprint of shale gas undercuts the logic of its use as a bridging fuel over coming decades, if the goal is to reduce global warming. We do not intend that our study be used to justify the continued use of either oil or coal, but rather to demonstrate that substituting shale gas for these other fossil fuels may not have the desired effect of mitigating climate warming.”*

While the first part of the following statement in the DEC’s Revised dSGEIS may be accurate: “Production and use of in-state energy resources – renewable resources and natural gas – can increase the reliability and security of our energy systems, reduce energy costs, and contribute to meeting climate change, public health and environmental objectives.” the statement about “meeting climate change...objectives” is in need of updating with the latest scientific studies.

An important consideration to bear in mind, in the debate over exploitation of shale gas resources, is to what extent this non-renewable resource competes with green energy technologies. It is likely that the substantial investments being made in the Marcellus Shale and other unconventional gas resources will slow the development of renewable technologies and distract politicians and the public from developing a long-term sustainable energy policy based upon non-polluting energy sources.

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## O. Noise

*Studies have shown that there are direct links between noise and health. Problems related to noise include stress related illnesses, high blood pressure, speech interference, hearing loss, sleep disruption, and lost productivity.*

U.S. Environmental Protection Agency

Noise is essentially any unwanted sound. DEC's Revised dSGEIS documents the noise levels that can be expected from HVHF. While the dSGEIS states that "Production-phase well site equipment is very quiet and has negligible impacts." that would not be the case with HVHF and refracking. The Revised dSGEIS projections of noise levels for HVHF are as shown in the Table below. As stated in the Revised dSGEIS, "As discussed in the 1992 GEIS (NYSDEC 1992), moderate to significant noise impacts may be experienced within 1,000 feet of a well site during the drilling phase. With the extended duration of drilling and other activities involved with multi-well pads, the Department will review the location of multi-well pads closer than 1,000 feet to occupied structures and places of assembly and determine what mitigation is necessary to minimize impacts." While the Revised dSGEIS suggests some mitigation measures, there is no standard identified that would be used to consistently minimize or avoid the adverse impacts.

While recognizing the hazards of noise pollution, the State's Revised dSGEIS proposes no regulatory standard such as a decibel limit, measured at the property line. This is the standard approach municipalities use to regulate noise levels in a community. The regulation of noise is a proper function of a municipal noise regulation. If a drilling operation is not in compliance with such a regulation, the drilling operator can be subject to a fine

The Table below shows the expected noise levels for the several activities associated with HVHF. The DEC does not disclose the source of the information, citing "Confidential Industry Source" so the information is not subject to verification and may not accurately reflect the full impacts of HVHF on noise levels in Tompkins County. It understates the noise impacts measured and reported in LaPlata County Colorado (see Table below). The Table also contrasts the projected noise levels by illustrating the US Department of Housing and Urban Development's (HUD) acceptable noise levels and those established by the EPA as benchmarks. Noise levels that exceed HUD's and EPA's standards are shown in the shaded cells.

Briefly, the threshold of human hearing is defined as 0 decibels (dBA). Very quiet conditions, such as a library are approximately 40 dBA. Noise levels between 50 and 70 dBA define the range of normal daily activities. Anything above 70 dBA is considered noisy, and then loud, intrusive, and deafening. The dBA

scale is logarithmic, meaning that each increase of 10 dBA describes a doubling of perceived loudness. Thus, the noise in an office, at 50 dBA, is perceived as twice as loud as a library at 40 dBA. A 5 dBA change in noise levels will be readily noticeable.

HUD sets exterior noise standards for residential development based upon Day-Night Sound Level values. “Acceptable” values are less than or equal to 65 dBA with a 10 dBA penalty applied to noise levels during the period from 10 PM to 7 AM. Values of 65 to 75 dBA are considered “Normally Unacceptable” while values of 75 dBA or more are considered “Unacceptable.” Interior noise levels of 45 dBA are the goal of the HUD noise levels. The US EPA also sets noise standards for the outdoor environment to protect the public from activity interference and annoyance. These noise levels should not exceed 55 dBA, which will permit spoken conversation and other activities such as sleeping, working and recreation.

dSGEIS Projected Noise Levels Exceeding U.S. EPA & HUD Standards						
Drilling Related Activity	Activity Duration (days)	Distance from Noise Source				
		50 feet	250 feet	500 feet	1000 feet	2000 feet
Access Road Construction	3-7	89	75	69	63	57
Well Pad Preparation	7-14	84	70	64	58	52
Rotary Air Well Drilling	28-35/well	79	64	58	52	45
Horizontal Drilling	28-35/well	76	62	56	50	45
HVHF	2-5/well	104	90	84	78	72

Notes:

1. Activities that exceed the EPA’s outdoor standards and HUD’s daytime noise standards are shown in red shading. Activities that exceed EPA’s outdoor noise standards and HUD’s nighttime noise standards are shown in yellow shading.
2. The U.S. Environmental Protection Agency recommends ear protection for 8 hours of 75 dBA or more noise exposure. At 91 dBA, the daily exposure limit is 2 hours without ear protection.
3. In New York State, the setback distance for gas drilling from an inhabited dwelling is 100 feet.

To inject the required water volume and achieve the necessary pressure, up to 20 diesel-pumper trucks are operated simultaneously. Typically the operation takes place over two to five days for a single well. The drilling of a typical well pad with an average of 10 wells would mean drilling over the life of the well pad for a period of about 350 days, 24 hours a day and then HVHF for a period of 50 days, 24 hours a day. Since the State allows gas drilling up to 100 feet from a private dwelling and 150 feet from a public building or area, this means that homes located within 500 feet of a well pad would be subjected to the equivalent of a year or more of noise levels continuously exceeding the EPA’s and HUD’s standards. Some may even be exposed to noise levels that exceed the Federal Occupational Safety and Health Administration’s (OSHA) eight hour standards.

According to the Revised dSGEIS, “Most of the high-volume hydraulic fracturing would occur in quiet rural areas where the noise levels are typically as low as 30 dBA, depending on weather conditions and natural noise sources.”

While the Revised dSGEIS assesses quantitative (number crunching) impacts on noise levels, it does not assess qualitative impacts on noise levels, such as the impacts that occur in “quiet rural areas” that have for centuries been accustomed to low ambient noise levels. For reference, some common noise levels can be found on the Table to the right. The “quiet rural areas” referred to by the DEC are communities whose character, based in part on a quiet rural environment, could be lost for a generation or more (i.e. the DEC’s estimated 60 year build-out) as a result of HVHF. DEC stated

Common Noise Levels					
Common Outdoor Noise Levels	Noise Level (dBA)		Common Indoor Noise Levels		
Jet flyover at 1,000 feet	110	—	—	110	Rock band
Gas lawnmower at 3 feet	100	—	—	100	Inside subway train
Diesel truck at 50 feet	90	—	—	90	Food blender at 3 feet Garbage disposal at 3 feet
Noisy urban area (daytime)	80	—	—	80	Shouting at 3 feet
Gas lawnmower at 100 feet	70	—	—	70	Vacuum at 3 feet Normal speech at 3 feet
Heavy traffic at 300 feet	60	—	—	60	Large business office
Quiet urban area (daytime)	50	—	—	50	Dishwasher next room
Quiet urban area (nighttime)	40	—	—	40	Small theater (background) Library
Quiet suburban area (nighttime)	30	—	—	30	Bedroom at night Concert hall (background)
Quiet rural area (nighttime)	20	—	—	20	Broadcast & recording studio
	10	—	—	10	
	0	—	—	0	Threshold of hearing

in the Revised dSGEIS that impacts on community character are too subjective to assess whether they are positive or negative. Loss of rural character because of a significant increase in noise levels, over what has been in place for centuries, will unquestionably impact the character of the community and neighborhood where HVHF occurs. It is undeniable that those living within 1,000 feet of a HVHF gas drilling operation will have a significant diminution in the character of their community and neighborhood, as evidenced from the change from a community where the typical background noise levels are 30 dBA to a period of potentially months and perhaps years of around-the-clock high noise levels from gas drilling activities on multi-well pad sites.

According to the US Census Bureau, American’s number one neighborhood complaint, above crime, traffic and poor public services, is noise. Noise can raise your blood pressure and change your blood chemistry. Adrenaline levels can rise from noise sources, indicating an imposition of stress. Noise is the leading cause of hearing loss in the nation. Exposure to excessive noise has been estimated to have made at least 10 million Americans a little deaf. Noise affects humans and animals in adverse ways.

The medical literature has identified the human health impacts of noise pollution on the communities surrounding oil and gas development specifically in relation to oil and gas exploration activities: drilling, well pumps, compressors, and vehicle traffic. Low frequency noise, produced from oil and gas compressors, may be of concern in the surrounding communities. A small number of studies reported the following symptoms related to low frequency noise: annoyance, stress, irritation, unease, fatigue, headache, adverse visual functions and disturbed sleep.

Traffic related noise produced from gas activity, also of concern to surrounding communities, has not been studied. Although many papers have been published in the last five years suggesting an association of cardiac health effects and noise related to traffic, these studies are restricted to urban settings. The majority of these studies reported annoyance and disturbance due to road traffic noise and associations with a higher incidence of myocardial infarctions, hypertension, ischemic heart disease, and sleep problems.

During drilling of wells, drills are operated 24 hours of the day and with multi-well pads, this can go on a year or more. Other on-site equipment can also run 24 hours of the day seven days a week. Expected noise levels, from equipment used in oil and gas activities, was measured and studied in La Plata County, Colorado. The following were reported:

Equipment	Decibel level	Comparable noise
Crane for Hoisting Rigs	68 dBA (500 feet from source)	Highway or Train at 50 feet
Fuel and Water Trucks	68 dBA (375 feet. from property boundary)	Highway or Train at 50 feet
Average well site	65 dBA (500 feet from source)	Industrial Area
Concrete pump for drilling	62 dBA (500 feet from source)	Industrial Area
Typical compressor station	50 dBA (375 feet from property boundary)	Background noise in Office
Pumping units	50 dBA (325 feet from property boundary)	Background noise in Office

The expected noise levels from HVHF can be expected to transform Tompkins County from a relatively quite rural area to one that shares many characteristics with much more urban and industrialized communities.

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## P. Public Health

*“The protection of drinking water sources and supplies is extremely important for the maintenance of public health, and the protection of this water use type is paramount.”*

DEC Revised dSGEIS, page 2-13

Accidental spills, leaks, and releases associated with natural gas well drilling and fracturing activities have resulted in hundreds of documented groundwater and surface water contamination incidents across the country. Surface spills can be a relatively common occurrence at well sites because the drilling and fracturing process involves transfer of large volumes of fluids between trucks, tanks, wells, pits, and pipelines, often at high flow rates and pressures, substantially increasing the likelihood of a spill due to human error, equipment failure, or accident. Surface spills can be categorized as resulting in either acute or chronic impacts based on proximity to streams and lakes. Acute spills include accidental or intentional chemical re-

leases that occur adjacent to or in a stream or lake. Chronic spills are considered to occur at the well site or beyond the immediate vicinity of a stream or lake.

Approximately 167 tons of chemicals are used for each well. The GDTF build-out estimated the number of tons of chemicals that would be used in the County as 350,700 tons (701,400,000 pounds). Wastewater (flowback) contaminated with chemicals, heavy metals and radionuclides would be on the order of 2,100,000,000 gallons. Given the enormous volume of chemicals and wastewater that could be transported into and out of the County and generated within the County over a multi-decade development and production period, acute spill scenarios are realistic and should be expected to occur within the County. This is a natural outcome of a complex and intensive heavy industrial activity that could occur hundreds of times per year across the County. This is particularly important in light of the proximity of roads adjacent to numerous streams, wetlands, ponds and Cayuga Lake, the heavy volume of truck traffic required to haul wastewater and chemicals and the wintertime driving conditions in the hilly countryside .

In addition to acute spills, it is reasonable to expect that development of natural gas resources in the County will be accompanied by an increased frequency of chemical, wastewater and fuel spills at or near well pads. Site spills can be reduced through implementation of best management practices (BMPs) for pollution prevention, waste minimization, chemical handling and storage, and so on. However, even with appropriate BMPs and regulations, mechanical failures, human errors, and accidents are inevitable, [estimated](#) to involve more than one in six shale gas wells over the next century. Impacts will be minor when on-site personnel respond quickly and limit the impacts of the incident. But significant contamination will occur when spills go undetected, plans are not followed, equipment is not maintained, and/or BMPs are not implemented. Even if most site spills are mitigated with minimal impact, the chronic occurrence of multiple spills per year over a period of several decades can be expected to compromise public confidence in the quality of Cayuga Lake and local groundwater as a source of public water supplies.

Some examples of accidents include the following reports. A June 3, 2010 gas well blowout in Clearfield County, Pennsylvania, about 100 miles outside Pittsburgh, sent at least 35,000 gallons of wastewater and natural gas into the air for 16 hours. While there were no casualties, State personnel and an independent investigator concluded that the cause of the incident was untrained personnel and the failure to use proper well control procedures. The 35,000 gallons of wastewater, collected after two nearby creeks were polluted, led investigators to conclude that nearly 1 million gallons of wastewater had been released. This figure includes the uncontrolled discharge of flowback fluids and saltwater flowing on the ground and into a tributary of Little Laurel Run, a high quality cold water fishery.

In June 2010, an explosion at a gas well in West Virginia sent seven injured workers to the hospital. Chief Oil & Gas owns the well, which is operated by AB Resources PA, LLC. The crew had finished drilling the well and was starting the hydraulic fracturing proc-



### **Blast at Chesapeake Marcellus site**

**A flash fire at a Chesapeake-operated natural gas liquids storage tank last night in south-western Pennsylvania injured three workers and forced Chesapeake to shut in production at the Marcellus shale site, the company said.**

**News wires** 24 February 2011 17:28 GMT

Fire: Chesapeake shuts in production after blast  
Image courtesy of SCANPIX/AP/WPXI.COM

ess when they hit a pocket of methane that caused the explosion. The explosion occurred in Marshall County, West Virginia, 55 miles southwest of Pittsburgh. The incident pictured in the photograph above occurred in Pennsylvania on February 23, 2011.

On April 1, 2010 both a tank and open pit used to store hydraulic fracturing fluid caught fire at an Atlas well pad in Hopewell Township Pennsylvania. Washington County's hazardous materials team responded to the fire and a state police fire marshal ruled the blaze an accident and estimated it cost Atlas Energy \$375,000 in damages. Flames were at least 100 feet high and 50 feet wide, with the plume of black smoke visible for miles. The fire at a natural gas rig in Texas pictured to the right, from [FireDirect.net](http://FireDirect.net), started on April 5, 2011 and took ten days to extinguish.



On December 15, 2007 an explosion occurred inside a home in Bainbridge, Ohio. Two residents in the home were not injured but the structure was damaged significantly. After investigating, the Ohio Department of Natural Resources determined that nearby HVHF operations, conducted by Ohio Valley Energy Systems Corp. in the Clinton sandstone formation, caused the explosion.

Most recently on April 20, 2011, as reported by WNEP, *“Officials said thousands of gallons of fluid leaked over farm land and into a creek from a natural gas well in Bradford County [PA]. Chesapeake Energy officials said Wednesday night the leak had been contained and the situation was stable. The rupture near Canton happened late Tuesday night, contaminating nearby land and creeks. The blowout happened on the Morse family farm in LeRoy Township outside Canton, a farming community. Chesapeake Energy officials said a piece of equipment on the well failed. A major response was launched to stop the leak of frack fluid and get control of the well. Water gushed from the earth at the Chesapeake well pad for hours Wednesday. It was all hands on deck to put a stop to the leak of fracking fluid that, according to company officials, spilled thousands and thousands of gallons into nearby land and waterways. Company officials stressed no gas leaked. ‘We’ve been able to limit the flow. We’re still doing additional work to regain full control,’ said Brian Grove of Chesapeake Energy. He added there is no telling yet how much of that extremely salty water mixed with chemicals and sand has impacted the nearby Towanda Creek, but no gas has escaped into the air.”*

Gas development involves use of hazardous machinery and hazardous materials. Accidents can and will happen. They are expected to occur if the natural gas industry becomes established in the County. According to [Ronald D. Bishop](#), PhD, Professor in the Chemistry and Biochemistry Department at the State University of New York, College at Oneonta, *“If future impacts may be inferred from recent historical performance, then:*

- *Between two and four percent of shale gas well projects in New York will pollute local ground-water over the short term. Serious regulatory violation rates will exceed twelve percent.*
- *More than one of every six shale gas wells will leak fluids to surrounding rocks and to the surface over the next century.*

- Each gas well pad, with its associated access road and pipeline, will generate a sediment discharge of approximately eight tons per year into local waterways, further threatening federally endangered mollusks and other aquatic organisms.
- Construction of access roads and pipelines will fragment field and forest habitats, further threatening plants and animals which are already species of concern.
- Some chemicals in ubiquitous use for shale gas exploration and production, or consistently present in flowback fluids, constitute human health and environmental hazards when present at extremely low concentrations. Potential exposure effects for humans will include poisoning of susceptible tissues, endocrine disruption syndromes, and elevated risks for certain cancers.
- Exposures of gas field workers and neighbors to toxic chemicals and noxious bacteria are exacerbated by certain common practices, such as air/foam-lubricated drilling and the use of impoundments for flowback fluids. These methods, along with the intensive use of diesel-fueled equipment, will degrade air quality and may cause a recently described “down-winder’s syndrome” in humans, livestock and crops.
- State officials have not effectively managed oil and gas exploration and production in New York, evidenced by thousands of undocumented or improperly abandoned wells and numerous incidents of soil and water contamination. Human health impacts from these incidents appear to include abnormally high death rates from glandular and reproductive system cancers in men and women. Improved regulations and enhanced enforcement may reasonably be anticipated to produce more industry penalties, but not necessarily better industry practices, than were seen in the past.”

DEC’s Revised dSGEIS states that “Contamination of surface water bodies and groundwater resources during well drilling could occur as a result of failure to maintain stormwater controls, ineffective site management and inadequate surface and subsurface fluid containment practices, poor casing construction, or accidental spills and releases including well blow-outs during drilling or well component failures during completion operations. A release could also occur during a blow-out event if there are not trained personnel on site that are educated in the proper use of the BOP system.” Although the State has recognized the potential public health threats of HVHF, the Revised dSGEIS did not make any attempt to assess impacts to human health.

Accidental spills, leaks, and releases associated with natural gas well drilling and HVHF activities have occurred and are expected by the State to occur. Even though there has been [documented](#) water resource contamination, such as has occurred in groundwater in the vicinity of gas development activities in Pavillion, WY and surface water contamination such as described above, there was no attempt by the State to [conduct](#) a Health Impact Assessment for their Revised dSGEIS. According to the [Centers for Disease Control and Prevention](#), Health Impact Assessment (HIA) is “A combination of procedures, methods, and tools by which a policy, program, or project may be judged in terms of its potential effects on the health of a population, and the distribution of those effects within the population.” It is recommended by the US Department of Health and Human Services as a planning resource. It is especially relevant for HVHF issues such as [water quality](#) and [air quality](#).

Baseline [information](#) for a HIA has already been accomplished by the DEC and State Health Department and there is a developing [database](#) of information on the public health impacts of HVHF. [Larysa Dyrszka](#),

MD provides a comprehensive [summary](#) of the state of the information that does exist from testimony she provided to the NY State Assembly’s Hearing on the Potential Public Health Impacts of Hydraulic Fracturing, held on May 26th, 2011. While the State has avoided conducting a HIA, even though it was [recommended](#) by the Council of the Medical Society of the State of New York and by [more than](#) 250 medical experts, along with the Medical Societies of at least seven upstate counties and the regional office of the American Academy of Pediatricians, evidence suggests that it is called for and should be completed. Examples of HIAs from [Colorado](#) and [Alaska](#) provide a good starting point for New York State to follow.

For example, here’s what the HIA for Garfield Colorado had to say about the effects of HVHF on water quality: *“Water pollution is hazardous to the public health. Garfield County Oil and Gas studies, EPA studies, and other studies demonstrate that natural gas development and production can release contaminants to domestic water supplies and compromise water quality. Individual circumstances can influence the potential contamination of water. In Garfield County, accidents and malfunctions have been the most common cause of water contamination from natural gas development and production. However, the Mamm Creek Hydrological Study indicates some impacts to groundwater, such as increased levels of chloride and methane, from routine natural gas operations. If a domestic water resource is contaminated, remediation is time and cost intensive and may not restore the water resource to a quality for domestic use.”*

Here’s what it said about the effects of HVHF on air quality, among many other issues addressed by the HIA: *“Air pollution is a known hazard to the public health. There is sufficient information available to indicate that even with current practices and technologies the natural gas industry produces large amounts of air pollutants. In addition, Antero’s recent well development activities on the Watson Ranch pad resulted in short term health impacts. Antero has proposed additional mitigation measures for the project in Battlement Mesa but these mitigations are as yet untested. Further mitigation measures may be needed to reduce the likelihood of health effects. As it stands, the Antero project has the potential to pollute the air and negatively impact the public health in Battlement Mesa. Many information gaps exist.”*

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## **Q. Energy Boomtown Effects**

Energy extraction “boom” and “bust” cycles have been studied for decades. There is a wealth of information available documenting the experiences of communities around the nation that have been transformed almost overnight into boom economies when gas extraction starts, only to be followed by a bust economy when the energy resource has been depleted. The State’s Revised dSGEIS speaks to the issue of the short-term boom but makes no attempt to estimate the costs associated with the long-term bust.

According to Penn State’s College of Agricultural Sciences Cooperative Extension, many communities in the Marcellus Shale region are currently experiencing rapid population growth and changes to daily life as natural gas development accelerates. Communities experiencing this growth have been called “boomtowns.” Previous research on these boomtowns, usually in the western United States, has documented both positive and negative impacts to economies, communities, families, and individuals.

Two recent efforts to investigate the boomtown effect in the Marcellus Shale region have been undertaken by Cornell University and The Pennsylvania State University. In Penn State's 2009 [Energy Boomtowns & Natural Gas: Implications for Marcellus Shale Local Governments & Rural Communities](#), Jeffrey Jacquet discusses this issue as follows:

*The impacts of energy extraction on small towns were extensively studied during the 1970s and 1980s, when rural areas of the western United States underwent a period of significant energy development. While more than 25 years old, these studies represent the most recent wide-scale analysis on the effects of energy development in the United States. A number of social and economic trends emerged from this work and a so-called "Boomtown Impact Model" took shape among researchers studying the development in these rural communities. The model posits that rural communities are often overwhelmed by rapid population influxes associated with the energy development and that energy development often provides a number of unique opportunities and challenges to communities and local governments.*

*Local governments are often caught unprepared by the waves of new growth and are at a disadvantage to mitigate potential growth problems. Some of these disadvantages include a lack of information, growth volatility, lack of jurisdiction, conflict between long-term residents and new residents, resistance to new government policy or planning strategies, shortage of staff or expertise, and a lack of or lag in sufficient revenue. Boomtown research has shown that economic impacts can be mixed, as some sectors or communities will benefit much more than others. Businesses or residents not directly tied to the energy industry may have to deal with inflationary or employment pressures while not seeing gains in revenue. Job growth can be stratified, as while new jobs will be created, not all workers will be suited for or interested in these jobs. Expectations for economic benefits are often unrealistically high, and while economic and job growth does occur, these expectations are not met. A significant body of literature shows that boomtowns can harbor disproportionate increases in social problems such as crime, mental health problems, community dissatisfaction, education shortfalls, and other indicators. Research shows that certain groups of people will have different social reactions to rapid growth, depending on their stature in the community and whether they were residents before the growth occurred."*

An even more recent effort has been undertaken by Susan Christopherson, a Professor of City and Regional Planning at Cornell University and Ned Rightor, President of New Economy Dynamics LLC. Their [investigation](#) of the issue raises a number of issues similar to the work at Penn State. As stated in their [Report](#) summary:

*"The extraction of non-renewable natural resources such as natural gas is characterized by a "boom-bust" cycle, in which a rapid increase in economic activity is followed by a rapid decrease. The rapid increase occurs when drilling crews and other gas-related businesses move into a region to extract the resource. During this period, the local population grows and jobs in construction, retail and services increase, though because the natural gas extraction industry is capital rather than labor intensive, drilling activity itself will produce relatively few jobs for locals. Costs to communities also rise significantly, for everything from road maintenance and public safety to schools. When drilling ceases be-*

*cause the commercially recoverable resource is depleted, there is an economic “bust” – population and jobs depart the region, and fewer people are left to support the boomtown infrastructure.”*

The authors discuss the economic benefits of shale gas development as follows:

*“Natural resource extraction industries typically play a small role in state economies. Their employment impact is tiny compared to industries such as retail or health services (Headwaters, 2011). On the other hand, these industries have major impacts on the regions where production takes place. Shale gas drilling does bring an economic “boom” to the regions that experience it. As drilling companies move into a community, local expenditures rise on everything from auto parts to pizza and beer. New jobs are created in hotels and retail. Landowners receive royalty payments and have extra spending money in their pockets. This increased economic activity is very welcome in Pennsylvania and New York, especially in light of the “great recession.”*

But, the economic effects do not come without consequences and positive economic outcomes cannot be taken for granted according to the authors. They raise important questions that must be factored into the optimistic projections of economic benefits:

- 🎧 Who will get the jobs that are created?
- 🎧 What are the costs of shale gas drilling to the public?
- 🎧 How will the costs and benefits be distributed?
- 🎧 How will other regional industries, such as tourism and agriculture, be affected?
- 🎧 Where will the royalty money be spent?
- 🎧 How long will the boom last, and what happens when it ends?

Their investigation involved analysis of studies completed in Pennsylvania, New York and other shale gas plays around the nation in an attempt to answer these questions. Typically, the drilling phase of shale gas development usually depends on an out-of-state workforce, except for truck haulers and construction jobs. The direct employment opportunities for local residents come from the post-drilling production phase when permanent jobs are needed to maintain the natural gas infrastructure.

Communities will need more police protection, especially for the increased truck volume and the need to enforce weight limits. Fully loaded tractor trailers on local roads result in more traffic problems and accidents requiring more fire and police protection. There are documented increases in emergency response needs, building permit applications, and arrests. The emergency response needs stem from the trucks, road conditions, drilling and truck accidents, and the population influx. Emergency response also includes the response to environmental incidents, which most communities are not prepared for.

Schools are affected. When new workers move into the region, some of them bring their families. School districts in the County can be expected to see increasing demands for classroom space as both students and staff needs increase.

While the local demand for goods and services increases and local businesses can benefit, prices go up not just for the temporary residents, but for long-time local residents too. Jeffrey Jacquet's study found that workers in the mining sector have higher wages than local residents and their increased demand for goods and services have the effect of increasing prices by twice the national rate over a six-year study period.

Rental housing is especially affected. As demand increases for rentals, rents increase and local renters, who cannot afford their apartment any longer, are displaced. Hotels and motels also fill up with gas workers and while the increased demand for rooms may benefit hotel and motel owners and local restaurants, it may hurt other local businesses that typically serve the interests of a more traditional clientele. In some locations, hotels may have few rooms available for the usual clientele: recreation seekers, tourists, hunters, wine aficionados, parents of college students and regular business travelers. There is also a "permanent resident exclusion" from state and local hotel occupancy taxes on longer stays of more than 90 days in New York (30 days for most counties including Tompkins), meaning that these guests do not pay the tax that helps support local tourism activities.

This population influx comes with short- and long-term added costs. Tompkins County, the City of Ithaca, and the towns and villages in the County can be expected to bear a wide range of demands for new services or increased levels of service. These include added administrative capacity, staffing levels, equipment, and outside expertise, which will all be needed to meet those demands.

The experience in Bradford County, PA is illustrative of the sometimes unexpected effects of gas drilling. When the news that the 2010 census had determined that population in the County had declined by two percent since 2000, some residents were surprised because of their experiences facing traffic congestion and rising prices, produced by the presence of the new transient population.

One of the biggest impacts of the boom phase is the fiscal effects for local road and bridges repairs and maintenance. Another Cornell [study](#) completed by C. J. Randall points out:

*"Dust, noise, and road damage from industry truck travel are tops on the list of citizen complaints in areas where gas is extracted via shale gas drilling. A typical Marcellus well requires 5.6 million gallons of water during the drilling process, in almost all cases delivered by truck. Liquid additives are shipped to the well site in federal DOT-approved plastic containers on flatbed trucks; hydrochloric acid and water are delivered – and flowback is hauled away – in tanker trucks. Millions of gallons of liquid used in the short (weeks-long) initial drilling period account for half of the estimated 890 to 1340 truckloads required per well site. Because of its weight, the impact of water hauled to one site (364 trips) is the equivalent of nearly 3.5 million car trips. Few roads at the town level in New York State have been built to withstand this volume of heavy of truck traffic."*

The routes taken by all those trucks will be on public roads. In rural Tompkins County, the roads were never designed to withstand the volume or weight of this level of truck traffic, especially under freeze-thaw conditions. As pointed out by the New York State Department of Transportation, "The annual costs to under-

take these transportation projects<sup>10</sup> are estimated to range from \$90 to \$156 million for State roads and from \$121-\$222 million for local roads. There is no mechanism in place allowing State and local government to absorb these additional transportation costs without major impacts to other programs and other municipalities in the State. Indeed, New York State is one of the very few states that does not impose a tax on [gas production](#) leaving the question of who pays for these additional costs unanswered. Road use agreements and local Ad Valorem taxes can provide some needed local resources, but the funds flowing to towns appear unlikely to match the costs and will lag expenses by several years, and there are virtually no funds flowing to the State.

Water extraction sites must be developed to provide water for HVHF. After extraction, the gas must move to the transmission lines via local pipelines and compressor stations. Flowback wastewater must be transported to treatment facilities, which must be built to handle toxic wastes, since none currently exist in Tompkins County. While these and related facilities will be located where they are deemed most desirable by the gas industry, it may not necessarily be where drilling and production is taking place and where tax revenue is presumably being generated. This raises additional questions for local governments: Who will regulate these facilities, and monitor and enforce standards? What staffing and resources will be required? How will the money to support these efforts be provided?

The facilities typically include:

- [“Man camps”](#) (essentially trailer parks or dormitories) for short-term out-of-state workers
- Depots for equipment
- Staging areas
- Gravel quarries
- Water extraction sites
- Wastewater treatment plants capable of handling toxic materials
- Injection wells
- Disposal areas (landfills)
- Gas storage facilities

These facilities and services are connected by rail spurs and heavy truck traffic. These heavy industrial facilities can have significant impacts on the County’s regional economy and industries such as tourism, hunting and fishing, organic farming, winemaking and agricultural sectors. In addition to potentially dangerous facilities where pipelines full of methane and high-pressures, noise has been a serious concern related to compressor stations because they produce noise levels in the 85 to 95 decibel range. These levels are at or above the federal Occupational Safety and Health Administration (OSHA) threshold of safety for an 8-hour day, and compressors work a 24-hour day. These facilities can effect adjacent property values and regional industries like the County’s wineries. Local government may have a role in the permitting of pipeline routes along rights-of-way and may also require filings and notice to abutters. These activities require exper-

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<sup>10</sup> According to DOT’s Draft Discussion Paper : Transportation Impacts of Potential Marcellus Shale Gas Development, projects necessary to accommodate an annual increase of 1.5-million heavy truck trips and induced development increases in peak hour trips of 36,000 per hour.

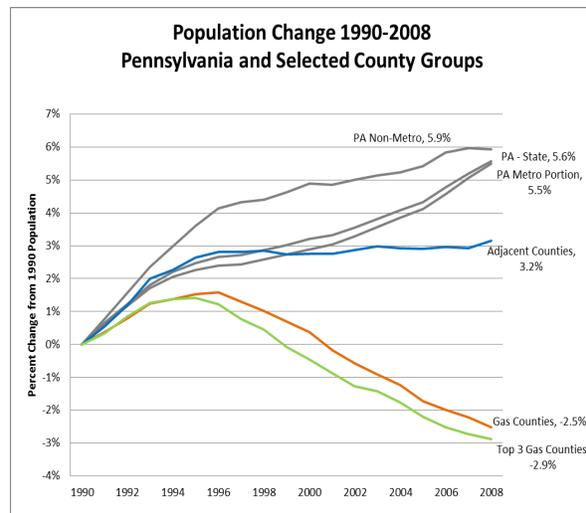
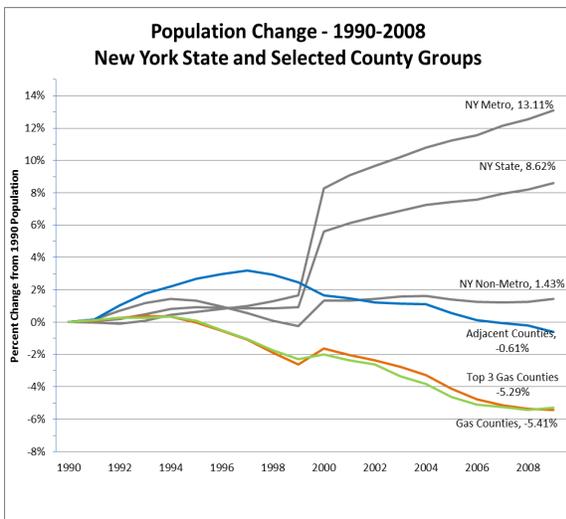
tise, administration, monitoring, and enforcement capacity, and all involve planning and public administration costs.

The potential loss in property values suggest that this may raise a conundrum for local governments. If HVHF comes to town, will the ad valorem taxes payable on gas wells make up for the lost tax revenue from declining assessed values on real estate. A [Report](#) prepared for Advocates for Springfield in Otsego County suggests that it may not.

Based upon the studies of other boomtown areas, the following list summarizes the potential costs that will need to be planned for by local governments:

- Accelerated road maintenance needs
- Traffic congestion from trucks
- Higher public safety costs
- Increased demand for health and education services
- Increased demand on public administrative services (e.g. planning and zoning, permitting, assessments, housing assistance)
- New service requirements, such as emergency response capacity and environmental monitoring and remediation.

There are other boomtown impacts of gas development activities that have been documented. According to [studies](#) in New York and Pennsylvania conducted by Susan Christopherson of Cornell University, when compared to adjacent counties or all of non-metropolitan New York, counties with significant natural gas drilling are characterized by population loss and smaller increases in real personal income. In Pennsylvania, counties with conventional gas production (1991-2005) show similar trends. Graphs, prepared by the Cornell Department of City and Regional Planning, and that illustrate this effect can be seen below:



Other Cornell findings include personal income growing more slowly in New York gas-producing counties between 1990 and 2008. There was a 108% average growth in real personal income between 1990 and 2008 for Non- Metropolitan New York State. That growth was an average of 101% for counties adjacent to gas counties, a 99% average growth for the 10 top gas counties, and a 97% average growth for the top three gas-producing counties (Chautauqua, Chemung, Steuben). In Pennsylvania, incomes grew more slowly in gas-producing counties. Compared to all non-metropolitan counties, gas counties in Pennsylvania grew more slowly in real personal income, and slightly faster in per capita income. But compared to adjacent counties, gas counties grew much more slowly in both total and per capita income in Pennsylvania.

Some of the energy boomtown effects include those with unexpected consequences. There have always been anecdotal reports of the social consequences of oil and gas development. These have been documented to include an increase in the demands for [strip clubs](#) and “[man camps](#)” as shown in the photograph from pennantv.com of one in Troy, Pennsylvania below. Loss of local businesses that depend on clean water may also occur, as [announced](#) in November 2011 by Ommegang Brewery in Cooperstown.



\*Man Camp\* of RVs for drilling crews on Troy, PA fairgrounds.

Studies of the energy boomtown effects in the western states may offer some clues as to how Tompkins County will fare if local governments pursue gas development or work actively to control its adverse effects. According to a Headwater Economics<sup>11</sup> study entitled [Fossil Fuel Extraction as a County Economic Development Strategy: Are Energy-focusing Counties Benefiting?](#)

*“In counties that have pursued energy extraction as an economic development strategy—places we call energy-focusing (EF) in this report—the long-term indicators suggest that relying on fossil fuel extraction is not an effective economic development strategy for competing in today’s growing and more diverse western economy. When compared to their rural peer counties, EF counties suggest an analogy to the fable of the tortoise and the hare. While EF counties race forward and then falter, the non-energy peer counties grow steadily. At the finish line, counties that have focused on broader development choices are better off, with higher rates of growth, more diverse economies, better-educated populations, a smaller gap between high and low income households, and more retirement and investment income.”*

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<sup>11</sup> An independent non-profit firm, not supported by the gas industry or by advocates against HVHF.

## R. Economy and Jobs

The State's EIS documents project that revenues flowing to New York State as a result of shale gas development could be between \$31 million and \$125 million a year in personal income tax receipts, there could be a total of \$1.45 million in tax revenues to local government for each well over its 30 year life, and \$621.9 million to \$2.5 billion in employee earnings could be directly and indirectly generated per year at maximum build-out, depending on the development scenario developed by DEC. [see DEC's [Fact Sheet](#) on the subject]. These figures have already been criticized as flawed by some [industry experts](#). The assessment of environmental and community impacts by the DEC therefore, must be used with caution and verified since they are not independently peer reviewed. The peer review process is expected to occur as part of the Public Comment period on the Revised dSGEIS, which is being held during the preparation of this Assessment and which is expected to conclude on January 11, 2012. Readers are encouraged to review the record of the Public Comment period for comment on the Socio-economic aspects of the Revised dSGEIS. It is not known whether the DEC will post copies of such comments, but any Final GEIS document that DEC prepares must include either the comments received or a summary of the comments. Further information will likely be available at a later date on the State's [SGEIS web page](#).

A Pennsylvania [study](#) completed by Timothy Kelsey and others, released in August of 2011 by The Marcellus Shale Education & Training Center (MSETC), a partnership of the Pennsylvania College of Technology and Penn State Extension, indicates that economic activity associated with gas drilling has had a major impact within the State. The Study concludes that:

*Our study of the economic impact of Marcellus Shale indicates that it had major impact within Pennsylvania during 2009. As with prior studies of Marcellus Shale in Pennsylvania, we relied upon the standard Input-Output economic model IMPLAN to estimate the direct, indirect, and induced effects across the economy and found that Marcellus Shale-related activity accounted for approximately 24,000 new jobs and \$3 billion of economic output in Pennsylvania during 2009...In addition, we accounted for how many Marcellus workers are non-Pennsylvanian, and thus how much payroll is not going to Pennsylvania households. Such workers do spend some of their income in Pennsylvania, but they tend to spend it differently than do residents, which affects the overall economic impacts. Our study included a survey of local businesses, which confirmed the IMPLAN results that positive economic impacts are occurring broadly across the economy in the communities where drilling is very actively occurring. About one-third of all the businesses in Bradford County, for example, reported that their sales had increased due to natural gas development and only 3 percent reported sales had declined.*

*We also surveyed Pennsylvania local governments in the Marcellus Shale region to identify whether they are experiencing new tax revenues, new service demands, or new costs as a result of the early stages of Marcellus Shale development. A number of local governments reported that these had increased, but there was little pattern to their responses in relation to the amount of drilling activity occurring within their jurisdiction. Only 18 percent of the governments experiencing Marcellus development activity said their tax revenues had increased, which indicates that most local governments*

with Marcellus activity are not seeing more tax revenue as a result. In comparison, 26 percent of the local governments indicated that their costs had increased, particularly related to road expenses. This confirms that considering both revenues and costs is critical for having a complete understanding of the impacts of Marcellus Shale.

We did not attempt to quantify the costs of Marcellus Shale development, such as effects on the environment and health. We hope that future economic studies can consider such costs as better information becomes available about the incidence and extent of such impacts. In addition, we did not address the distribution of benefits and costs, even though the equity of how these are distributed underlies much of the current policy debate about Marcellus Shale. The long run implications of Marcellus Shale development are still unknown. Jobs and income in the short run are important, but many would argue that other factors are equally (if not more) important, such as clean water, healthy forests and other ecosystems, clean air, and good public health. In addition to affecting quality of life, these are important resources for the future of Pennsylvania communities, including future economic opportunities, social and physical infrastructure, well-functioning local government and institutions, and community well-being. We believe our results must be viewed as a preliminary, short-run view of the economic impacts of Marcellus Shale, and be placed in a broader context of these other important concerns.

According to [Susan Christopherson](#) of Cornell University's City and Regional Planning Department, "Evidence from already developed shale plays indicates that shale gas drilling relies mostly on out-of-state workers. Local employment is concentrated in trucking, construction and retail jobs - many of which are part-time, short-term, or low-pay. While there have been exaggerated claims about job creation in Pennsylvania, more accurate data from the [Keystone Research Center](#) and the [Pennsylvania Department of Labor and Industry](#) show that Marcellus core industries have created about 9,300 jobs since the shale boom began in 2007 - far below projections. All job creation is important during a recession, but shale gas jobs are making only a modest contribution to Pennsylvania's economy. We can expect similar results in New York."

Ms. Christopherson's finding is significant because New York State, in the Revised dSGEIS, has projected the creation of up to 53,969 direct and indirect jobs as a result of HVHF, based upon the experience in Pennsylvania. Ms. Christopherson's figures are in sharp contrast with the estimates of the number of jobs that would be created in Pennsylvania, taken from a [study](#) that was prepared for the Marcellus Shale Coalition, a gas industry group. In this study, it was projected that the number of workers supported by the gas industry in Pennsylvania would likely hit 156,000 this (2011) year, up from 60,000 in 2009 and 140,000 last (2010) year. The projections in the earlier Marcellus Shale Coalition study have already been significantly scaled back by the [authors](#).

A [December 6, 2011 report](#) from the Pennsylvania Department of Labor's Center for Workforce Information and Analysis (CWIA) provides an up-to-date snapshot of labor market information for Pennsylvania's Marcellus Shale related industries and related economic activity: In all of Pennsylvania for the three years ending with the first quarter, 2011, there were 10,868 new jobs created in Marcellus Drilling "Core Industries" and 1,028 jobs lost in "Ancillary Industries," for a net employment change of 9,840.

The actual net new Marcellus related jobs created in Pennsylvania of 9,840 is significantly less than the claims of 72,000 new jobs being created, as reported in numerous news media. The origin of this discrepancy lies in a single substitution of one word for another: new “hires” were erroneously claimed as new “jobs.” Here is a simple example of the difference:

1. **Worker A** leaves his or her maintenance job with Town to take a new job with Gas Driller.
2. Town hires a replacement maintenance person, **Worker B**. **Worker B** quits current job at Gravel Pit.
3. Gravel Pit hires **Worker C**, who leaves a part-time job at the Highway Department.
4. Highway Department hires **Worker D**, who had been unemployed.

The result of this exercise is one (1) New Job and four (4) New Hires. The ratio of “New Jobs” to “New Hires” is actually much greater than the 1 to 4 example and is critical to correctly measuring the economic impact of gas development. As explained by the Pennsylvania Department of of Labor & Industry, “..an increase in new hires does not directly equate to an increase in the total employment count. The new hires count is simply an indication of hiring activity in an industry. Separations, in the form of layoffs or quits, are linked to job destruction and account for the other half of the employment change equation. The balance of hires and separations result in employment change.” Readers attempting to assess the potential positive and negative impacts of gas drilling on Tompkins County should be aware of the differences between “New Hires” and “New Jobs” and stay alert to any possible overstatement of employment benefits linked to gas drilling activity as a result of confusion between these two terms.

Some of the reasons why the estimated number of HVHF jobs are so divergent is explained by the Keystone Research Center<sup>12</sup> in a [Policy Briefing](#). According to Keystone: “The size of that [job growth] contribution has been significantly overstated in recent statements and news reports. Policymakers and the public need to look to other policies that predate the Marcellus boom – such as, investments in education, economic development, renewable energy, workforce skills, and unemployment benefits – to explain Pennsylvania’s relatively strong recent job growth.”

Jeffrey Jacquet of Cornell University has provided a continuing study of the economic implications of shale gas drilling. In a February 2011 Report entitled [Workforce Development Challenges in the Natural Gas Industry](#) he states: “A worker-by-worker tally of the Marcellus Shale industry in Pennsylvania found that the drilling phase accounted for over 98% of the natural gas industry workforce engaged at the drilling site...The majority of these jobs include the “roughnecks” who work on drilling rigs, excavation crews, CDL (tractor-trailer) drivers, heavy equipment operators, hydro-fracturing equipment operators, and semi-skilled general laborers. Because most of the job opportunities occur during the drilling phase of operations, and because drilling activity in a given locale can quickly escalate or decline, natural gas employment conforms to a pattern of “Boom” and “Bust” found in other types of mining and natural resource development activity ~ where the population base may expand rapidly over a number of years before shifts in commodity prices, energy company business strategies, or natural resource policies cause extraction activity to collapse, leading new residents and workers to leave the community.” It is important to note that these jobs are required only while wells are being drilled; once drilling activity stops, these jobs are no longer needed locally and

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<sup>12</sup> Keystone calls itself “a leading source of independent analysis of Pennsylvania’s economy and public policy.”

workers move on to the next drilling operation. Many times, drilling activity may pause, or move to another area of the gas play, or move to another part of the continent, forcing drilling crews to follow the work to a new location or find a new source of employment.

According to Jacquet, “*natural gas industry contractors and subcontractors are accustomed to working at multiple and changing locations throughout North America or the world, and because skilled workers are often needed very quickly, it is commonplace within the natural gas industry to utilize non-local workforces. Industry veterans will typically have worked in locations throughout the United States or the world. For New York or Pennsylvania workers who become well trained in the gas industry, this means that they may eventually be forced to work elsewhere, but will likely retain strong job security if they are willing to do so...Furthermore, industry employees will sometimes work 12-hour shifts for weeks at a time, and then receive several continuous weeks of leave while an entirely new crew of workers takes their place...However, in general, as development moves forward, the workforce will become somewhat more local to a region. Some employees will decide to fully relocate to the area. Some companies will construct regional offices. As employee turnover occurs, some employers will fill positions with locally-based workers if they are available.*”

Once the drilling is completed, a local workforce is needed to monitor and maintain production of the wells. According to Jeffrey Jacquet, “*The MSETC<sup>13</sup> studies (detailed below) have found that approximately one worker is needed to monitor and maintain 6 wells under production.*” If GDTF’s estimate of 2,100 wells in Tompkins County comes to fruition, then it can be expected that up to 350 local jobs may be created in the County over the next 60 years as a result of gas development.

In conclusion, according to Jeffrey Jacquet’s studies to date, a small but significant portion of the jobs associated with natural gas drilling will be local, well paying, and long-term. But, significant investments will be needed in local educational institutions to provide technical and trade programs to local workers interested in these types of jobs.

A study commissioned by the Broome County Legislature in 2009 estimated a potential value per gas well by multiplying projected prices of natural gas times the anticipated quantity of gas per well, resulting in **ten-year gross revenues per well of \$9.3 million**. However, this figure does not factor in the costs of well development, which have been estimated to average \$3.5 million per well. The Broome County study has been criticized by some economists. A report entitled Unanswered Questions About The Economic Impact of Gas Drilling In the Marcellus Shale: Don’t Jump to Conclusions by Jannette Barth, PhD of J. M. Barth & Associates, Inc. (March 22, 2010), analyzed several economic studies of natural gas drilling and production including the Broome County study, the DEC’s 1992 GEIS and 2009 dSGEIS, economic and employment indicators from gas and non-gas producing counties in New York State and Pennsylvania,<sup>14</sup> and economic studies of the natural gas experiences in Texas and other Western states. The conclusions of the Barth report are as follows:

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<sup>13</sup> The Penn College of Technology’s Marcellus Shale Education and Training Center (MSETC).

<sup>14</sup> Data sources included the US Census Bureau’s American Community Survey and County Business Patterns reports.

*Decision makers may be on the verge of making bad choices for the health of the regional economy. The oil & gas industry is not a reliable industry on which to base an economic development plan. Alan B. Krueger, Chief Economist and Assistant Secretary for Economic Policy at the US Department of Treasury, stated, "The oil & gas industry is about ten times more capital intensive than the US economy as a whole." Krueger continues, saying that encouraging oil and gas production is not an effective strategy for creating jobs. (Remarks of Alan B. Krueger to the American Tax Policy Institute Conference, October 15, 2009).*

*Headwater Economics...study...conclusions are that "while energy-focused counties race forward and then falter, the non-energy peer counties continue to grow steadily...Counties that have focused on broader development choices are better off, with higher rates of growth, more diverse economies, better educated populations, a smaller gap between high and low income households, and more retirement and investment income.*

*The entire Marcellus Shale region in New York may be at risk both economically and environmentally. While the environmental risks have been a focus of concern, many stakeholders have assumed that a positive economic impact may result. In reality, the economic impact may very well be negative. And the likelihood is that gas drilling would adversely affect other economic activities such as tourism and sport fishing and hunting. To some extent gas drilling and these other industries are likely to be mutually exclusive. The net effect is what must be considered."*

One of the more recent comprehensive [analyses](#) of the economic implications of Marcellus Shale development was carried on at the Cornell University Department of City and Regional Planning. According to the April 2011 [The Economic Impact of Marcellus Shale Gas Drilling: What Have We Learned? What are the Limitations](#) by David Kay:

*"We conclude that existing evidence about the Marcellus shale gas operations is inadequate to make confident predictions about the numbers of jobs that will be created, business expansion, or revenue generation. Gas development is already directing new money into the Marcellus region, and the prospects for substantial short-term economic gain for some local businesses and property owners are real. Many economic development opportunities will also arise.*

*On the other hand, mixed economic results are also occurring even in the short run. The rising tide is not likely to lift all boats: there will be losing communities, and individuals who are displaced or left behind. Moreover, the experience of many economies based on extractive industries warns us that short-term gains frequently fail to translate into lasting, community-wide economic development. Most alarmingly, a growing body of credible research evidence in recent decades shows that resource dependent communities can and often do end up worse off than they would have been without exploiting their extractive reserves. When the economic waters recede, the flotsam left behind can look more like the aftermath of a flood than of a rising tide.*

*In the end, it seems clear that neither riches nor ruin are inevitable. The academic consensus is that the quality of policy and governance makes an important difference to the realization of an extractive industry's long-term*

*economic development potential. The prospects for positive economic impacts in the short run should not blind policy makers to the potential for long term harm to overall economic development, especially when responsible, proactive policies may reduce and even reverse that risk.”*

Another important economic impact on the region, that was not addressed in the State’s Revised dSCEIS nor that seems to have received much attention is the loss of future economic development potential. This could occur once the infrastructure of pipelines, compressor stations and producing wells are in place, preventing further building on or near these gas facilities. This is a potential issue that is best addressed by each municipality, based upon an examination of the municipal comprehensive plans and zoning regulations. The questions posed in [Section C](#) above are a good starting point for local officials and citizens to being the process of determining whether municipal comprehensive planning and zoning will be fostered or stifled by HVHF.

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## S. Resource Competition

HVHF uses natural, cultural, and human resources which can result in competition for these resources with other industries and uses. The clearest example of this is water. The large volumes of water needed to drill wells and fracture the rocks can draw down local water supplies. A horizontal well can require several million gallons of water. [Chesapeake Energy](#), for example, averages 5 million gallons of water per well in a typical horizontal deep shale natural gas well while the State’s Revised dSCEIS estimated average water use per well at 3.8 million gallons. GDTF estimated 5 million gallons per well. To put this into perspective, the amount of liquids that can be carried by a large tank truck (18 wheeler) is 5,500 to 9,000 gallons.

The millions of gallons of water used in HVHF come from either local ground or surface water, and are usually trucked into the well site from off-site sources. According to Chesapeake, in the Barnett Shale, 56 percent of water used in drilling comes from groundwater and 43 percent from surface water; less than one percent (1%) is reused or recycled. While the Revised dSCEIS states that “*operators plan to maximize reuse of flowback water for subsequent high-volume hydraulic fracturing operations, with some companies targeting goals of recycling 100% of flowback water,*” according to the DEC, freshwater consumption and hauling in current practice still comprises 80 to 90 percent of the water used at each well for HVHF.

According to the State’s Revised dSCEIS, water withdrawals for drilling can have a range of impacts on local water, including stream flow reduction, degradation of stream uses, harm to aquatic life, aquifer depletion and inadequate water supply during times of drought. The US Fish and Wildlife Service and the National Park Service have stated that “large-scale changes in land use and increased water withdrawals, like those associated with natural gas development (including the construction of exploratory wells), will likely affect the [Services’ trust resources](#).”

There could be competition for rental housing units in Tompkins County. In areas of Pennsylvania where Marcellus shale drilling activity is already occurring, it has been [documented](#) that there have been difficulties accommodating the influx of new workers. There have been [reports](#) of large increases in rent (dou-

bling, tripling or more) in Bradford County, Pennsylvania, as a result of the influx of out-of-area workers. There have also been “frequent reports” of landlords not renewing leases with existing tenants in anticipation of leasing at higher rates to incoming workers, and reports of an increased demand for motel and hotel rooms, increased demand at RV camp sites, and increases in home sales. Such localized increases in the demand for housing have raised concerns about the difficulties caused for existing local, low-income residents to afford housing.

Likewise, there could be competition for jobs in Tompkins County. Anecdotal evidence indicates that the demand by the gas industry for truck drivers is already resulting in competition for workers with established firms in Tompkins County. Local newspapers publish ads by Pennsylvania companies seeking drivers at the same time that some local companies are also advertising for drivers, apparently trying to replace truck drivers lost to the gas industry. The higher wages paid by the gas industry are a benefit to the driver, but can have the negative consequence of a disruption to established long term local employment needs.

Other areas in which resource competition may result from HVHF include consumption of energy and natural materials, and human resources. Natural gas production, like all fossil fuel industries, is an energy-intensive process that uses energy to drill wells, run generators and pumps, transport gas, treat waste, and perform all other processes related to [drilling](#). The need for sand and gravel or crushed rock to create access roads to well sites increases the demands, and often costs, for natural resources required by the construction industry, homeowners and highway departments and can be expected to result in an increase in person-time related to review of new permit applications.

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## T. Community Services

*“The increase in ad valorem property taxes would have a significant positive impact on the finances of local government entities...local governments would also experience some significant negative fiscal impacts resulting from the development of natural gas reserves in the low-permeability shale.”*

Revised dSGEIS, page 6-262

The State’s current EIS process will ultimately conclude with the adoption of a written Findings Statement by the DEC. The Findings Statement, by law, must: 1) consider the relevant environmental impacts, facts and conclusions disclosed in the final EIS; 2) weigh and balance relevant environmental impacts with social, economic and other considerations; and 3) provide a rationale for the agency's decision; [see 6 NYCRR 617.11(d)]. Therefore, it should be kept in mind that while a SEQR review process may outline significant adverse environmental impacts as a result of a proposed action, it also mandates that those environmental impacts be balanced with social and economic factors. The Revised dSGEIS includes a whole new section devoted to Socioeconomic Impacts, concluding that HVHF “*activities could provide a substantial economic boost for the state in the areas of employment, wages and tax revenue for state and local governments.*” The Revised dSGEIS also acknowledges that the increased HVHF activity will place a greater demand on government services. The Revised dSGEIS states that “*governments would experience some significant negative fiscal im-*

*pacts...."* However, there was no attempt in the Revised dSGEIS to quantify the costs associated with these demands. Therefore, the assessment of fiscal impacts in the Revised dSGEIS should be considered incomplete.

Economic impacts are not an environmental impact *per se* but fiscal impact analysis has become commonplace in EIS documents. This is because there are patterns of population concentration, distribution or growth, community infrastructure, and existing community or neighborhood character that are all environmental areas of concern under SEQR and each of these relevant areas can be affected by economic conditions. Such factors are appropriate to study in an EIS document. Fiscal impact analysis has been around as a planning tool for decades, used by planners, economists, business interests, municipal officials, and assessors. It is the primary means to assess the consequences of development on community service delivery. The absence of a fiscal impact analysis in an EIS in this context must be considered a significant inadequacy. Elected officials and municipal department heads must be aware of the public costs associated with HVHF beforehand, so that local governments can project the numbers of public employees, whether they are police, fire, public works or others, who must be hired and the kinds of municipal facilities that will be needed to serve a changing population that is expected from HVHF, even if only during the boom part of an expected boom and bust cycle (see [Section Q](#) above).

The State's Revised dSGEIS includes an exhaustive quantitative analysis of the economic benefits of HVHF. However, the State has also characterized the negative impacts associated with HVHF in only a qualitative manner as *"potentially significant adverse impacts on local communities associated with an increase in population and increased demand for housing and community services are tied to the rate of development."* To date, the State has made no effort to assess the quantitative fiscal impacts on local governments as a result of the increased demands for community services. It is incumbent upon the State to assess and to quantify the economic and fiscal costs to local governments so that decision-makers can prepare for the changes that may be inevitable. Of particular relevance are the cost and revenue implications that are distinctive to shale gas development outlined by David Kay in his research efforts discussed above.

Studies of HVHF in other areas show that the impacts to community services as a result of HVHF include a broad range of needs, some of which may be already available while others require local legislative action. These include but are not limited to: accelerated road construction, repair and maintenance requirements; traffic congestion from trucks requiring greater police protection; control of oversize truck loads on local roads; enforcement of State stormwater management requirements by building departments; higher public safety costs as a result of spills and accidents; increased demands for health, education, recreation, and solid waste services as a result of population growth; increased demands on public administrative services such as planning and zoning, assessments, and housing assistance; enforcement of noise pollution (if local noise regulations are in effect); permitting for opening town roads for installing pipelines; monitoring seismic testing on town roads; registration of landmen (if applicable regulations exist) who solicit lease agreements with landowners; water supply permitting for large withdrawals from community water supply systems if required by local regulations; discharge of wastewater if local community sewage treatment plants gain approval for

processing of flowback; and new service requirements that may not have been previously needed in rural communities, such as emergency response capacity and environmental monitoring and remediation.

According to a [survey](#) of local government officials in Clinton County, PA, a larger number of officials said their costs are increasing than said that their revenues are increasing as a result of Marcellus activity, which suggests that development of Marcellus shale is creating fiscal concerns in some municipalities as they try to respond to higher service needs.

Other Pennsylvania [studies](#) have shown mixed outcomes. The data indicate that Marcellus shale development brings some positive economic activity for communities. The analysis reflected the early stages of natural gas drilling and did not include the cost impacts of Marcellus development on public services nor the impact on local government and school district tax collections since royalty and leasing income is exempt in Pennsylvania from the local earned income tax and local jurisdictions cannot levy sales taxes.

The State DEC has projected that local governments with sales tax revenue sharing could experience a substantial increase in sales tax receipts from the additional economic activity in the region and they could also see an increase in ad valorem property tax revenues. Ad valorem is a property tax on gas wells, administered in New York by the Office of Real Property Tax Services (ORPTS) and municipalities. The ad valorem tax is not a production tax or a severance tax that is tied to the gas produced. New York is one of only two states that have no production or severance tax on natural gas. The tax is valued based upon the income stream expected from the well. The Revised dSAGEIS estimates that ad valorem taxes could be as high as \$1.45 million over the 30-year life of a typical horizontal well. However, the State to date has not estimated whether these increased tax revenues for local government will pay for the increase in community services necessitated by gas drilling activities. As stated on page 2-262 of the Revised sDGEIS:

*“In addition to the positive fiscal impacts discussed above, local governments would also experience some significant negative fiscal impacts resulting from the development of natural gas reserves in the low-permeability shale. As described in previous sections, the use of high-volume hydraulic-fracturing drilling techniques would increase the demand for governmental services and thus increase the total expenditures of local government entities. Additional road construction, improvement, and repair expenditures would be required as a result of the increased truck traffic that would occur. Additional expenditures on emergency services such as fire, police, and first aid would be expected as a result of the increased traffic and construction and production activities. Also additional expenditures on public water supply systems may also be required. Finally, if substantial in-migration occurs in the region as a result of drilling and production, local governments would be required to increase expenditures on other services, such as education, health and welfare, recreation, housing, and solid waste management to serve the additional population.”*

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## U. Community Character

The DEC's Fact Sheet on the Revised dSGEIS states that: "To mitigate potential cumulative impacts to community character, the SGEIS proposes that DEC, in consultation with local governments, may limit simultaneous development of well pads and wells in proximity to each other. This approach would also help mitigate any noise impacts, visual impacts and impacts from increased truck traffic. DEC will monitor the pace and concentration of development throughout the state and will consider additional measures to mitigate the adverse impacts at the local and regional levels. Where appropriate, and in consultation with local governments, DEC will impose specific construction windows within well construction permits to ensure drilling activity and cumulative impacts are concentrated in one specific area." But will this offer to consult with local government result in an ability for municipalities to control their own destiny, and if desired and in conformance with a comprehensive plan, to either say no to gas drilling or to control where, when and how it occurs?

There is a close relationship between municipal comprehensive plans and generic environmental impact statements. This relationship is acknowledged in the State Environmental Review Act (SEQR) regulations [6 NYCRR 617.10(b)] as well as in New York State Village [§ 7-722.8], Town [§ 272-a.8] and General City Law [§28-a.9]. In particular, a municipal comprehensive plan may be designed to also serve as a generic EIS. In some respects, the Revised dSGEIS can be considered a land use plan that will determine the direction this new industrial use will take in New York State. It appears headed for a new regulatory and institutional arrangement that will have significant and long-term implications for a majority<sup>15</sup> of New York State's up-state communities. The State has acknowledged that it will "consider" local planning and zoning if a local government informs the DEC on a permit application that a proposed well may be inconsistent with such planning and zoning. But, the State should also acknowledge that heavy industries like gas drilling may be unwanted in a locality and home rule should be allowed to take precedence over the State's insistence that it provides "substantial economic and environmental benefits." in all cases.

Community character impacts relate directly to whether HVHF is compatible with municipal comprehensive planning and zoning. [Section C](#) above discusses the extent to which HVHF is compatible with the Tompkins County Comprehensive Plan as well as the comprehensive plans of the towns Dryden, Danby, Ulysses and Ithaca. In particular, the analysis examined the degree to which these comprehensive plans would be frustrated if HVHF were to become widespread in the County. The plans represent the essence of what residents envision the future of their communities to be. Communities are provided with the tools for establishing a planning process that allows them to determine their future well being. Do they desire to pursue economic development regardless of any negative impacts or are they interested in building upon an already established plan to maintain a sense of place, retain clean water and air, set aside good agricultural lands and productive forests, foster a robust tourism industry, maintain protected scenic and natural areas, keep roads relatively free from heavy congestion or from an increased risk of accidents, pro-

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<sup>15</sup> The Marcellus and/or Utica shales underlie every county in New York State except the Adirondacks, most of the area east of the Hudson River and the New York Metropolitan area.

vide good employment opportunities in desirable sectors based upon slow and steady growth, and to ensure that these will still be available to be enjoyed by their children and grandchildren? These are some of the questions each community needs to ask itself when examining the effects of HVHF on their respective community's character.

It is instructive to provide some background here on how New York State laws and the courts have dealt with the issue of community character. As provided in the New York State Village, Town and General City laws: *Among the most important powers and duties granted by the legislature to a [village town city] government is the authority and responsibility to undertake [village town city] comprehensive planning and to regulate land use for the purpose of protecting the public health, safety and general welfare of its citizens.*<sup>16</sup> But what is community character and is it even something that can be defined let alone described? An examination of community character as part of a comprehensive plan process usually begins with an inventory of important community assets as well as natural and cultural resources. It includes identifying the types of development that the community wants to encourage or support (and those that are not desirable and should be excluded) and then establishing standards that will facilitate development to be encouraged while maintaining key community assets and resources.

When new development projects are proposed in a community by a developer or when new policies or regulations are proposed by a local legislative body for adoption, SEQRA reviews must be conducted by local officials. This is no different from what the DEC has been conducting in their EIS process since 2009. It is useful to understand what the State Environmental Quality Review Act and its implementing regulations say about community character. It is an issue that must be considered by every agency conducting a SEQRA review when it judges the merits of a proposal against the "Criteria for Determining Significance" found in 6 NYCRR 617.7(c). Here, it is stated "(v) the impairment of the character or quality of important historical, archeological, architectural, or aesthetic resources or of existing community or neighborhood character; (vii) the creation of a hazard to human health; (viii) a substantial change in the use, or intensity of use, of land including agricultural, open space or recreational resources, or in its capacity to support existing uses; (ix) the encouraging or attracting of a large number of people to a place or places for more than a few days, compared to the number of people who would come to such place absent the action. Each of these four criteria suggests areas that are appropriate for consideration in any environmental assessment of impacts on community character.

The courts have also ruled on community character in a number of cases. In the *H.O.M.E.S. v. New York State Urban Development Corporation (UDC)* case, the Syracuse Carrier Dome stadium had been proposed to increase in size from 24,000 to 50,000 spectators. The court ruled that the UDC failed to consider incremental increases in traffic-related impacts such as emergency vehicle access, parking, traffic stoppage and air pollution. The Court held that the environmental review should have considered how the traffic problems would affect the existing community character. In the *Chinese Staff and Workers Association v. City of New York Hallmark* case, the issue here was the proposed construction of luxury housing in Chinatown. "Gentrification" was identified as the main impact and the State Court of Appeals held that

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<sup>16</sup> See Village Law § 7-722, Town Law § 272-a, and General City Law § 28-a.

“existing patterns of population concentration, distribution or growth and existing community or neighborhood character are physical conditions within the meaning of environment.”

Here in Tompkins County in the *East Coast Development v. Kay, et al.* case, the City of Ithaca Planning Board had denied site plan approval for construction of a Wal-Mart store. The Court upheld the denial based on the visual impacts to observation points of Buttermilk Falls State Park (a community character issue) but found that the Board impermissibly considered purely economic impacts of the potential competition from the store. In another similar case in the Adirondacks, in *Wal-Mart v. Planning Board for the Town of North Elba*, the Town had denied siting of a Wal-Mart Store because of the potential impacts of empty store fronts on the appearance and character of downtown. The court ruled that this was a valid concern as were the visual impacts and it was permissible for the Town Board to consider whether proposed mitigating measures in fact ameliorated adverse visual effects due to a viewshed protected by a Scenic Preservation Overlay District. The local land use law provided a basis for the denial.

As far as significance is concerned, there is also guidance from the SEQR regulations about how to determine if a significant impact exists, especially for community character issues like aesthetic/visual resources, noise, lighting, existing land use, recreation and open space, historic or archeologic resources, and health and safety. The questions to ask are whether a proposed action diminishes public enjoyment or appreciation of an inventoried resource, such as a scenic viewshed or a residential neighborhood, or if it will impair the character or quality of an inventoried place, such as a tourist attraction, park or open space.

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## V. Regional Implications

The Tompkins County Comprehensive Plan clearly addresses the need for regional planning to help maintain and promote livable, vital communities. Local municipalities play a key role by developing and implementing comprehensive plans that reflect their own goals. The County Comprehensive Plan provides an opportunity to coordinate these efforts and create a shared community vision. This is what the County Plan says about the need for regional planning:

*“A key theme in this Comprehensive Plan is the interrelationship among the various aspects of our daily lives: housing, transportation, jobs, the environment, and neighborhoods and communities. These interrelationships often extend well beyond county lines and are regional in nature. Tompkins County is part of a broader geographic area and economic market that influences everything from where we choose to shop and live to what areas we visit to hike and swim. An over-arching principle of the Plan is that Tompkins County will work proactively with towns, villages, the City of Ithaca, adjoining counties, and state and federal agencies to cooperatively address regional issues, such as natural resources, public infrastructure, and consumer, employment, and housing markets.*

*The Plan outlines ways the community can address regional and intermunicipal issues that may or may not be included in local planning efforts. Often, local municipalities have a full workload simply addressing the important day-to-day issues of local concern. Regional planning can help municipal*

*governments address key issues of concern, such as sprawl, economic development, housing affordability, and environmental protection. It can also help residents of rural and urban areas to recognize their inter-connectedness and issues of mutual interest.*

*New York State clearly places land use authority in the hands of its towns, villages, and cities. The State also specifically recognizes that intermunicipal planning is needed to cooperatively address regional issues. To this end, the State encourages the development of county comprehensive plans to address development and preservation issues that transcend local political boundaries.”*

As discussed throughout this Community Impact Assessment, the potential for regional effects from HVHF is real and the need for regional planning has never been greater. The State’s Revised dSGEIS predicts that HVHF will occur over a period of 60 years and will affect virtually every community that is underlain by the Marcellus and Utica Shales. Whether a municipality finds itself in the position of having many wells drilled in the future or none at all, there will be regional impacts that will transcend Tompkins County’s boundary as well as individual municipal boundaries.

Regional issues that will be potentially affected are summarized in the following Table:

<b>Regional Issue</b>	<b>Regional Resource Affected</b>
Water Quality	Cayuga Lake, Dryden Lake, Six Mile Creek, Taughannock Creek, Salmon Creek, Fall Creek, Virgil Creek, tributaries to these waters, Primary and Principal Aquifers, Public Water Supply watershed areas critical for drinking water, recreation, habitat, and fishing opportunities
Air Quality	Tompkins County’s Air Quality Index is better than the US average Air Quality Index
Highways	Tompkins County’s geography results in regional and intrastate traffic being funneled through the City of Ithaca. Local and County roads have not been constructed to accommodate heavy truck traffic.
Socioeconomics including community services	Need for community services like police, fire, first responders, social services, health services, road construction, maintenance and repair,
Housing	Demand for rental housing and hospitality rooms, affordability, availability, property values
Agriculture	Farms and in particular organic farms, wine industry, foodsheds
Tourist attractions	University related, Gorges & State Parks, Downtown Ithaca and the Commons, Dining & Restaurants, Cayuga Lake, Arts, Music, and Theatre, Wineries, Discovery Trail & Museums, B&Bs, Inns, and Resorts
Ecological systems	Biodiversity, habitat fragmentation, forestry, fishing and hunting opportunities, wetlands, Species of Greatest Conservation Need and Natural Features Focus Areas, Important Bird Areas, Natural Heritage Sites
Economic development resources	Institutions of higher education, regional cultural attractions, tourism resources, increased and diversified housing supply, improved workforce/business skills, revitalized commercial districts and town centers
Visual resources	Cayuga Lake Scenic Byway, Warren Overlook, Route 13, Ithaca Falls, Taughannock Falls, gorges and other identified scenic resources

Regional Issue	Regional Resource Affected
Cultural resources	Erie Canalway National Heritage Area, State and National National Register properties, locally important historic resources, archaeological sites
Recreational resources	Finger Lakes Trail, Black Diamond Trail, the 200 miles of hiking, multi-use and other trails such as the Finger Lakes Water Trails, The Fens and The Gorges, Cayuga Lake and parks
Protected Lands	State Parks, State Forests, Protected Natural Areas (such as Finger Lakes Land Trust, The Nature Conservancy), Unique Natural Areas (UNA) of Tompkins County, County Parks, Important Bird Areas, County identified Natural Features Focus Areas, and regional open space resources identified in the State Open Space Plan

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## W. Recommended Actions

*Among the most important powers and duties granted by the legislature to a [village town city] government is the authority and responsibility to undertake [village town city] comprehensive planning and to regulate land use for the purpose of protecting the public health, safety and general welfare of its citizens.*

New York State Town, Village and General City Laws

Previous sections of this Assessment have presented a broad overview of how HVHF affects communities and the environment, based upon the experiences of other regions where HVHF for shale gas has become an established industry. The picture that emerges is one where adverse environmental impacts and both positive and negative economic impacts can occur. Some of these impacts will be immediate, others will be realized over time, perhaps generations.

However, there are a number of measures that communities can take to prepare for HVHF, assuming that it could become established in Tompkins County following the conclusion of the State’s environmental impact studies and promulgation of new regulations on the gas industry. This Community Impact Assessment is designed to assist municipalities by gathering information for governing bodies to use in their deliberations when addressing gas drilling activities.

Whether or not HVHF becomes established in Tompkins County, it is likely that it will in other Southern Tier counties based upon gas industry and State projections. Indeed, there is already anecdotal evidence that existing gas drilling in northern Pennsylvania counties, is affecting Tompkins County. Reports, such as increased air traffic at Ithaca Tompkins Regional Airport and increased demands for local truck drivers, constitute non-scientific observations but they do provide proof that may assist research efforts on the economic consequences of gas drilling.

The first place to start is an examination of the municipal comprehensive plan and land use controls. Planning and zoning under New York State’s enabling acts are fundamental to the use and regulation of land. Planning is the principal means for a community to engage in a cooperative process of creating a

common vision for the future that meets the unique values and needs of its citizens. Planning is a tool for shaping growth, enhancing development and protecting resources now and for future generations. Planning works best when it is guided by local residents, conforms with State laws and caselaw and gets implemented by local officials. When done right, it will promote economic development, protect private property while preserving and enhancing its value, and protect neighborhoods, farmland, historic and natural resources, and community features.

The Tompkins County Planning Department strives to provide each community with up-to-date professional planning guidance and tools to help accomplish the goals of each community. A new tool created by the Planning Department is an [online guide](#) for addressing potential gas drilling impacts. It includes a method for evaluating the comprehensive plan, zoning and subdivision regulations as well as other municipal powers such as road protection, aquifer, floodplain, wetland, and wellhead protection, designation of critical environmental areas, creation of noise, lighting and air standards, scenic areas protection, tree preservation, pipeline (gathering lines) regulations, extractive mining, stormwater runoff and illicit discharges, and imposition of fees. The TCCOG has also established an [online guide](#) to model laws and resolutions that can be used by local legislative bodies to address gas drilling activities. Additional resources can be found below.

Some communities in Tompkins County have already taken action to prohibit heavy industrial activities like gas drilling and production. The Town of Dryden's recent enactment of prohibitions on a variety of land uses related to natural gas and petroleum development has been challenged in the Tompkins County Supreme Court; it is expected that the case may wind its way to the State's highest court, the Court of Appeals. The decision of whether to prohibit heavy industrial activities like gas drilling is one that can only be made after consulting a municipal attorney. [Attorneys](#) for the gas industry believe that the State's Oil Gas and Solution Mining Law preempts local zoning regulations of the industry. Other [attorneys](#) and [legal experts](#) believe that zoning provisions regulating land use generally, including prohibiting gas drilling in some districts like any other land use or prohibiting it entirely is not a "regulation" of the gas industry but is an incidental control resulting from a municipality's exercise of its right to determine appropriate land uses through zoning. This Assessment does not take a position as to whether State law preempts local efforts to prohibit gas drilling. Thus, the subsection on Zoning Regulations in the Table below has been designed to address land use issues generally because gas drilling activities, regardless of their location, can cause pressures for other growth and development in all communities throughout the region that can only be effectively addressed through zoning. The many ways in which a municipality can address HVHF have been summarized below:

Municipal Action	Discussion	Further Resources
Comprehensive Plans	<ul style="list-style-type: none"> <li>▶ Review the plan, if there is a written one, to identify whether industrial activities were contemplated; prepare a comprehensive plan if there is not an adopted one</li> <li>▶ Involve the public in plan preparation or amendment</li> <li>▶ Ensure the plan reflects residents' vision for the future</li> <li>▶ Conduct natural and cultural resource mapping so that important community features are identified for protection and enhancement</li> <li>▶ Incorporate County Comprehensive Plan principles into municipal plans</li> </ul>	<a href="#">Tompkins County Planning Department's Planning Tools</a>  <a href="#">NY Department of State Local Government Services</a>  <a href="#">American Planning Association</a>  <a href="#">Groundwater Resource Mapping</a>  <a href="#">Environmental Resource Mapper</a>
Zoning Regulations	<ul style="list-style-type: none"> <li>▶ Review zoning districts and uses to determine ultimate build-out of the community if there are zoning regulations</li> <li>▶ Engage the County Planning Department to determine if zoning is warranted and to get help</li> <li>▶ Consider using the services of a professional planner to draft zoning</li> <li>▶ Review the regulations for issues such as access, signage, landscaping, noise, lighting, building placement, natural and cultural resource protection (see Site Plan Regulations below)</li> <li>▶ Require site plan review for driveway permits to gas pad areas to minimize impacts to neighbors</li> <li>▶ Review special use permit requirements and establish standards for individual uses</li> <li>▶ Review the zoning and subdivision regulations to determine if design standards or guidelines have been developed to illustrate the types of development and neighborhoods that are desired</li> </ul>	<a href="#">Center for Rural Massachusetts Manual of Build-Out Analysis</a>  <a href="#">NY Department of State Zoning Publications</a>  <a href="#">NY Planning Federation Model Ordinances</a>  <a href="#">Tompkins County Vital Communities Toolbox</a>
Site Plan Regulations	<p>Regardless of whether a municipality has zoning, it can enact site plan regulations to address development issues such as compatibility with surroundings, pedestrian and vehicle access, economic impacts, impacts on air, water, and noise, visual compatibility, geology, topography, soil characteristics, vegetation, wildlife, drainage, erosion, wetlands, flood hazards, site density, plans and elevations of structures, signs, landscaping, fencing, buffers, and utilities among other reasonable site issues</p>	<a href="#">NY Department of State Site Development Review</a>

Municipal Action	Discussion	Further Resources
Local Laws	New York State Municipal Home Rule Law (MHRL) allows a community to enact local laws for "protection and enhancement of its physical and visual environment." Communities have used this State law to enact wetlands regulations, watercourse and water body protection regulations, hillsides and steep slopes protection regulations, protection of wildlife habitat, groundwater, game and game birds, scenic areas, fish, flood control, soil conservation, reforestation, timber harvesting and tree preservation, and stormwater regulations. Local laws have also been used to establish critical environmental areas as overlay districts as well as natural resource and open space protection districts (just like residential or commercial districts) under zoning.	<a href="#">New York Rural Water Association</a> <a href="#">Town of Colonie Watercourse Protection Law</a> <a href="#">Pace University School of Law</a> <a href="#">Environmental Law Reporter Open Space Protection Techniques</a>
Historic Resources	New York State General Municipal Law allows a community to enact a landmark preservation law under section 96-a of Article 5-K.	<a href="#">NY State Department of State</a>
Other Local Controls	<ul style="list-style-type: none"> <li>▶ Consider adopting local light, noise and air quality regulations</li> <li>▶ Require that landmen (representatives of drilling companies) register before operating in a community so that residents can identify individuals who are soliciting the use of land</li> </ul>	<a href="#">Noise Pollution Clearinghouse</a> <a href="#">NY Planning Federation Diesel Idling Guide</a>
Critical Environmental Areas	Designate natural and cultural resources as Critical Environmental Areas (CEA) under the New York State Environmental Quality Review Act (SEQR). Legislative boards, planning boards and zoning boards can all designate CEA's, which then require an additional level of environmental assessment in accordance with SEQR. Inform DEC of all locally designated CEA's	<a href="#">DEC's SEQR Handbook</a> <a href="#">Town of Ithaca CEA</a>
Emergency Responders	Ensure that local emergency responders are informed of the exact contents of fracking fluids at well sites and transport routes so that proper treatment can be provided in the event of spills or contamination incidents	

Municipal Action	Discussion	Further Resources
Roads	<ul style="list-style-type: none"> <li>▶ Plan, post, and enforce truck routes that minimize high-volume truck traffic</li> <li>▶ Devise Road Use Agreements (RUAs) or state-level fees that support road maintenance while drilling or production activity is underway</li> <li>▶ Anticipate “haul routes” to and from drilling sites based leased parcel and permit location information, and infrastructure</li> <li>▶ Undertake a comprehensive traffic impact study and document baseline roads by video/ photographs of pre-development road conditions</li> <li>▶ Estimate road damage costs using AASHTO standards for equivalent single axle loads (ESALs)</li> <li>▶ Consider adopting restrictions on hours of operation on local roads for heavy industrial uses</li> <li>▶ Establish inter-municipal agreements to ensure consistent policies for mitigating heavy industry operations on roadways connecting neighboring municipalities</li> <li>▶ Require pre-use roads assessments performed by a licensed Civil Engineer, paid for by any company expecting to heavily use local roads and infrastructure</li> <li>▶ Then enact a road use law, where haulers (all heavy trucks) exceeding a certain weight are required to pay for a permit for their activities</li> <li>▶ Establish “financial undertaking agreements” (i.e., cash bond, escrow, or letter of credit) sufficient to cover the real cost of damages to local roads including infrastructure (e.g., drainage, culverts, bridges)</li> </ul>	<p><a href="#">Cornell Local Roads Program</a></p> <p><a href="#">Yates County Roads Preservation and Use Program</a></p> 
Pipelines	<ul style="list-style-type: none"> <li>▶ Require permits and inspections by the highway superintendent for road openings for pipelines to ensure alternative arrangements for the period during which the road is closed, alternative traffic circulation or by-pass routes, the listing of responsible parties for the road closing and restoration, and specifying the quality of the replacement roadway to be provided upon completion of construction</li> <li>▶ Co-locate pipelines in road rights-of-way to minimize impacts of additional land disturbances</li> <li>▶ Encourage companies to share pipelines to avoid duplication and decrease impacts while offering economies of scale</li> </ul>	<p><a href="#">Field Safety Guide</a></p> <p><a href="#">Tompkins County Information</a></p>

Municipal Action	Discussion	Further Resources
Community Services	<ul style="list-style-type: none"> <li>▶ Create a community “task force” to act as a clearinghouse of information on HVHF</li> <li>▶ Identify “what is normal” for local communities, so that increases in demand for local government services can be noticed quickly</li> <li>▶ Identify capacities and “problem thresholds” for local government services and for private services like EMT’s</li> <li>▶ Identify jurisdiction and authority over issues of concern</li> <li>▶ Create a list of telephone numbers and email addresses for management and emergency contacts in the event of an incident at or near a drill site or established gas well</li> <li>▶ Connect with gas companies to identify ways to mitigate problems</li> <li>▶ Monitor gas well development (i.e. drill rig numbers and locations, well locations, permit trends, and production trends) using GIS mapping</li> <li>▶ Identify likely growth scenarios and monitor commercial, industrial, and residential development trends</li> <li>▶ Plan for the new growth and how it will be paid for (new fees and bond resolutions)</li> <li>▶ Continue to plan for projects, facilities, and services that will remain after gas-related growth has subsided or reversed</li> <li>▶ Plan and implement central water and wastewater systems in existing centers and priority growth areas and balance such development opportunities with open space, farmland and forestry protection strategies in rural areas</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">DEC Oil and Gas Database</a></li> <li><a href="#">Tompkins County GIS Portal</a></li> <li><a href="#">Cornell Natural Gas Resource Center</a></li> <li><a href="#">Mineral Resources Environmental Notice Bulletin</a></li> <li><a href="#">Catskill Citizens for Safe Energy</a></li> </ul>
Mobile Homes	<p>Zoning is the most common method of regulating mobile homes. For communities that lack zoning, a free-standing regulation or local law can be enacted.</p>	<ul style="list-style-type: none"> <li><a href="#">NY State Department of State</a></li> </ul>
Training	<ul style="list-style-type: none"> <li>▶ Train emergency management responders on blow-out prevention, gas flaring procedures and layout of flow lines</li> <li>▶ Encourage residents to sign up for NY Alert notifications of chemical spills or gas fires</li> <li>▶ Encourage Tompkins Cortland Community College to establish training curricula for long term gas production and monitoring jobs so these permanent jobs go to local residents rather than “out-of-towners”</li> <li>▶ Ensure local assessors are properly trained on the valuation and assessment of gas producing property</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">NY Alert</a></li> <li><a href="#">TC3’s Adult Learning Center</a></li> <li><a href="#">NY State Office of Real Property Tax Services</a></li> </ul>

Municipal Action	Discussion	Further Resources
Stormwater Management	The State DEC encourages municipalities to enact local regulations for management of stormwater. The State of New York recommends that every community, whether or not it is regulated under the state/federal stormwater program, to adopt a Stormwater Management Local Law.	<a href="#">NY State Department of Environmental Conservation</a>
Intermunicipal	<ul style="list-style-type: none"> <li>▶ Consult with the County’s Soil and Water Conservation District and existing water users to determine best locations for water withdrawals</li> <li>▶ Explore options for sharing services, protecting resources on a regional basis, and treating significant land use issues similarly regardless of location</li> <li>▶ Take advantage of the Tompkins County Council of Governments to help make connections to neighbors and to tap into a regional forum for addressing intermunicipal issues</li> <li>▶ Resolve jurisdictional disputes and help coordinate permitting processes through joint meetings with local, county, state and federal representatives</li> </ul>	<a href="#">Tompkins County SWCD</a> <a href="#">Tompkins County Council of Governments</a> <a href="#">NY State Department of State</a> <a href="#">Pace University Land Use Law Center</a>
Energy Use	<ul style="list-style-type: none"> <li>▶ Reduce energy consumption through comprehensive planning and community design that incorporates strategies for both mobile and non-mobile energy efficiency</li> <li>▶ Adopt smart growth development strategies</li> <li>▶ Streamline community alternative energy use such as wind and solar systems</li> <li>▶ Encourage programs aimed at reducing individual energy consumption</li> <li>▶ Ensure that local land-use standards proactively encourage the installation of renewable energy technologies</li> </ul>	<a href="#">American Planning Association</a> <a href="#">Rocky Mountain Institute</a> <a href="#">Smart Growth America</a> <a href="#">Environmental Protection Agency</a> <a href="#">US Green Building Council</a> <a href="#">Cornell Green Choices</a>

Additional information about HVHF can be expected to be available over time as governmental agencies, academic institutions and others continue to study the issues associated with gas drilling. Political entities have established their own fact-finding processes about HVHF. The New York State Assembly Standing Committee on Environmental Conservation and the Assembly Standing Committee on Health held hearings in 2011 on the Health Impacts of Hydraulic Fracturing Techniques. However, it is important to understand the extent to which lawmakers may be influenced by gas companies. A Report issued in April of 2011 by Common Cause/New York entitled “[Deep Drilling, Deep Pockets](#)” highlights the millions of dollars that have been spent by gas companies on lobbying activities designed to influence New York’s lawmakers to look favorably on HVHF. There has also been a [study](#) completed by Common Cause on the federal level that identifies almost \$750 million spent by energy companies lobbying for HVHF between 2001 and 2011.

The DEC established a High Volume Hydraulic Fracturing Advisory Panel in July of 2011. The Panel, composed of politicians, gas industry and business representatives and environmental organization representatives, has been meeting since July of 2011 with recommendations expected in 2012.

Federal agencies are studying the issue. The US Environmental Protection Agency is in the midst of a Hydraulic Fracturing Study with the initial research findings expected in 2012 and a final report ready in 2014. This study was not available at the time this Assessment was completed. On April 12, 2011, the US Senate Committee on Energy and Public Works held a hearing on “Natural Gas Drilling: Public Health and Environmental Impacts.” A complete transcript of the hearing can be found [here](#).

In regards to government agency actions, it should be noted that there have been quite a number of government documents, including internal documents leaked to reporters and others, that paint a picture of HVHF more ominous than official documents reveal. A good [example](#) is the 30,000 pages of documents assembled by the New York Times from federal and state government sources. Another one cited in this Assessment is an internal “Discussion Paper” from the New York State Department of Transportation that does not appear as if it was used by the DEC in its preparation of the Revised dSGEIS. This is significant because it portrays potential impacts on transportation and highway infrastructure from a lack of State and local funding sources that is quite different from what is presented in the DEC’s Revised dSGEIS.

Finally, the Laws of New York State have long recognized the essential role that cities, towns and villages play in the regulation of land use within their borders. For more than 75 years under the State’s planning and zoning enabling acts, municipalities have been developing ways to address issues of growth, development, and protection of the public health and welfare. The State Court of Appeals addressed the issue of municipal land use control and resource extraction in a [1996 case](#), where it stated that “*A municipality is not obligated to permit the exploitation of any and all natural resources within the town as a permitted use, if limiting that use is a reasonable exercise of its police power to prevent damage to the rights of others and to promote the interests of the community as a whole.*” New York State’s Executive, Legislative and Judicial branches all have various means for addressing changes in land use, especially when trends emerge that affect the lives and livelihood of State residents. Ultimately, it will be up to the citizens of Tompkins County and their elected representatives to inform State government officials of their opinions on gas drilling and HVHF.

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## Webography

The following web bibliography, or webography, contains the Uniform Resource Locators (a URL is the internet address found in the title bar of a web browser usually beginning with “http://www.”) for each of the citations noted in this Community Impact Assessment. Every attempt has been made to provide up to date links to the articles used. Since the internet is an ever evolving information resource, what is present on a particular website one day, may disappear tomorrow. As an aid to readers, in addition to the URL, the author and source of the article (where available) has also been provided. Each of the citations below appear in the order in which they appear in the text of this Assessment.

<http://www.tompkins-co.org/tccog/>

Tompkins Council of Governments website

[http://www.ugcenter.com/US-Shales/The-Disruptive-Shales\\_29751](http://www.ugcenter.com/US-Shales/The-Disruptive-Shales_29751)

The Unconventional Oil and Gas Center “The Disruptive Shale”

[http://www.eia.gov/energyexplained/index.cfm?page=natural\\_gas\\_where](http://www.eia.gov/energyexplained/index.cfm?page=natural_gas_where)

US Energy Information Administration “Where Our Natural Gas Comes From”

<http://www.agiweb.org/environment/earthnotes/note.html?PublicID=4>

American Geosciences Institute “Hydraulic Fracturing and Shale Gas Production”

<http://geology.com/articles/utica-shale/>

geology.com “Utica Shale - The Natural Gas Giant Below the Marcellus? Stacked plays in the Appalachian Basin produce multiple natural gas pay zones.”

[http://www.eia.gov/forecasts/aeo/source\\_natural\\_gas.cfm](http://www.eia.gov/forecasts/aeo/source_natural_gas.cfm)

US Energy Information Administration “ANNUAL ENERGY OUTLOOK 2011” Summary

<http://www.eia.gov/forecasts/aeo/>

US Energy Information Administration “ANNUAL ENERGY OUTLOOK 2011” Download

<http://www.naturalgaswatch.org/?p=970>

Natural Gas Watch “The Shale Gas Industry: A Peek Behind the Curtain”

[http://www.google.com/url?sa=t&rct=j&q=union+of+concerned+scientists+smoke+mirrors+and+hot+air&source=web&cd=1&ved=0CBsQFjAA&url=http://www.ucsusa.org/assets/documents/global\\_warming/exxon\\_report.pdf&ei=D7igToDmOuj00gHZq\\_D4Bw&usg=AFQjCNEIWH2Fi7F8K8vuBN2uqADjopXc7w](http://www.google.com/url?sa=t&rct=j&q=union+of+concerned+scientists+smoke+mirrors+and+hot+air&source=web&cd=1&ved=0CBsQFjAA&url=http://www.ucsusa.org/assets/documents/global_warming/exxon_report.pdf&ei=D7igToDmOuj00gHZq_D4Bw&usg=AFQjCNEIWH2Fi7F8K8vuBN2uqADjopXc7w)

Union of Concerned Scientists “Smoke, Mirrors & Hot Air: How ExxonMobil Uses Big Tobacco’s Tactics to Manufacture Uncertainty on Climate Science”

[http://www.ucsusa.org/scientific\\_integrity/abuses\\_of\\_science/](http://www.ucsusa.org/scientific_integrity/abuses_of_science/)

Union of Concerned Scientists “Abuses of Science”

<http://www.cnbc.com/id/45208498>

CNBC New Report “Oil Executive: Military-Style ‘Psy Ops’ Experience Applied”

<http://www.naturalgaswatch.org/?p=939>

Natural Gas Watch “Shale Gas Industry Insider: We Are Losing the Messaging War on Fracking”

<http://www.ene.com/Markets>

Ecology and Environment Inc. “Markets”

<http://www.marcellus.psu.edu/research/pdf/acadhandout.pdf>

Marcellus Shale Multi-State Academic Research Conference, Blair County Convention Center, Altoona, Pa. May 10-11, 2011

<http://www.nytimes.com/gwire/2010/02/22/22greenwire-energy-industry-reps-greet-house-fracking-prob-63352.html>

New York Times News Report “Energy Industry Reps Greet House Fracking Probe With Shrug”

<http://www.dec.ny.gov/energy/46288.html>

NY State Department of Environmental Conservation webpage devoted to Marcellus Shale

[http://www.dentonrc.com/sharedcontent/dws/drc/localnews/stories/DRC\\_DrillValues\\_0918.1046e9a00.html](http://www.dentonrc.com/sharedcontent/dws/drc/localnews/stories/DRC_DrillValues_0918.1046e9a00.html)

Denton Record Chronicle New Report “Drilling can dig into land value”

<http://www.cce.cornell.edu/EnergyClimateChange/NaturalGasDev/Documents/PDFs/NYSBA%20Journal%20nov-dec2011.pdf>

New York State Bar Association Journal “Homeowners and Gas Drilling Leases: Boon or Bust?”

<http://www.scribd.com/doc/72545747/Worst-Fracking-Regs>

James L. “Chip” Northrup Article entitled “Worst Fracking Regs”

<http://marcelluseffect.blogspot.com/2011/05/frackins-ok-as-long-as-you-dont-breathe.html>

The Marcellus Effect blog

[http://www.tcad.org/files/uploads/20090602\\_2006%20TCAD%20ED%20Strategy.pdf](http://www.tcad.org/files/uploads/20090602_2006%20TCAD%20ED%20Strategy.pdf)

Tompkins County Area Development's “Economic Development Strategy”

<http://www.statoil.com/en/About/Worldwide/USA/Pages/ShaleGasMarcellus.aspx>

Statoil ASA Article entitled “In 2008, Statoil acquired a 32.5% interest in the Marcellus shale gas acreage from Chesapeake Energy Corporation”

<http://www.geology.com>

[geology.com](http://www.geology.com) “News and Information About Geology and Earth Science”

[http://esogis.nysm.nysed.gov/esogisdata/downloads/talks/Smith\\_1130\\_Weds\\_AAPG\\_Shale.pdf](http://esogis.nysm.nysed.gov/esogisdata/downloads/talks/Smith_1130_Weds_AAPG_Shale.pdf)

New York State Museum PowerPoint Presentation entitled “Utica and Marcellus Potential in New York State”

<http://www.eia.gov/forecasts/aeo/>

US Energy Information Administration “ANNUAL ENERGY OUTLOOK 2011” Download

<http://www.usgs.gov/newsroom/article.asp?ID=2893>

US Geological Survey Newsroom: USGS Releases New Assessment of Gas Resources in the Marcellus Shale, Appalachian Basin

<http://www.scribd.com/doc/68519448/NY-Gas-Reserve-Estimates>

Advocates for Springfield article entitled “Economic Assessment Report by Ecology and Environment Inc. Overstates Total Recoverable Reserves”

<http://english.ruvr.ru/2011/11/09/60084618.html>

The Voice of Russia news report “Shale gas fields in EU: myths and reality”

<http://www.theoil Drum.com/node/7075>

The Oil Drum: Discussions About Energy and Our Future article “Shale Gas—Abundance or Mirage? Why The Marcellus Shale Will Disappoint Expectations”

<http://www.dec.ny.gov/energy/46288.html>

The DEC's Marcellus Shale webpage

[http://globalecology.stanford.edu/DGE/Dukes/Dukes\\_ClimChange1.pdf](http://globalecology.stanford.edu/DGE/Dukes/Dukes_ClimChange1.pdf)

University of Utah Biology Department article entitled "Burning Buried Sunshine: Human Consumption of Ancient solar Energy"

<http://www.dec.ny.gov/cfm/xtapps/GasOil/>

The DEC's Oil and Gas Database

<http://www.millenniumpipeline.com/>

The Millennium Pipeline's company's website

<http://www.tcgasmap.org>

The Marcellus Accountability Project for Tompkins County

[http://www.dos.state.ny.us/lg/publications/Rural\\_Resource\\_Survey.pdf](http://www.dos.state.ny.us/lg/publications/Rural_Resource_Survey.pdf)

The NY State Legislative Commission on Rural Resources' publication "2008 Survey of Land Use Planning & Regulations in NYS"

[http://www.co.suffolk.ny.us/upload/planning/pdfs/SCPF\\_RM\\_2002\\_SEC03.pdf](http://www.co.suffolk.ny.us/upload/planning/pdfs/SCPF_RM_2002_SEC03.pdf)

Suffolk County Planning Department's publication "SEQR and Community Character"

<http://digitalcommons.pace.edu/cgi/viewcontent.cgi?article=1241&context=peir&sei-redir=1&referer=http://www.google.com/url?sa=t&rct=j&q=Chinese%252BStaff%252BBand%252BWorkers%252BAssociation%252Bv.%252BCity%252Bof%252BNew%252BYork%25252C%252B68%252BNY2d%252B359%25252C%252B509%252BNYS2d%252B499%252B%2525281986%252529&source=web&cd=7&ved=0CEEQFjAG&url=http%253A%252F%252Fdigitalcommons.pace.edu%252Fcgi%252Fviewcontent.cgi%253Farticle%253D1241%2526context%253Dpeir&ei=kOSyTqaWM-H20gHFhcSqBA&usg=AFQjCNE7OXE4jHW2Za0fnjRqU-7V842POw%23search=%22Chinese+Staff+and+Workers+Association+v.+City+of+New+York%252C+68+NY2d+359%252C+509+NYS2d+499+%25281986%2529%22>

Pace University Environmental Law Review publication entitled "New York's SEQRA in the Courts"

<http://www.tompkins-co.org/planning/energyclimate/GasDrillingToolsforMunicipalities.htm>

Tompkins County Council of Government's and Tompkins County Planning Department's online "Municipal Tools for Addressing Potential Gas Drilling Impacts"

<http://www.scribd.com/doc/70784790/Fracking-the-Homestead>

New York State Bar Association article "Homeowners and Gas Drilling Leases: Boon or Bust?"

<http://www.planning.org/pas/reports/chronlist.htm>

American Planning Association Planning Advisory Service publication list.

<http://www.glyfac.buffalo.edu/mib/course/marcellus/drillingfracingrn.pdf>

Gastem documents in a PowerPoint presentation the steps involved in the use of HVHF a vertical well in Otsego County

[http://esogis.nysm.nysed.gov/esogisdata/downloads/talks/Oil\\_and\\_Gas\\_Plays.pdf](http://esogis.nysm.nysed.gov/esogisdata/downloads/talks/Oil_and_Gas_Plays.pdf)

The Reservoir Characterization Group at the New York State Museum and the New York Geological Survey's presentation "Unconventional Oil and Gas Plays of New York State"

[http://esogis.nysm.nysed.gov/esogisdata/downloads/talks/Smith\\_1130\\_Weds\\_AAPG\\_Shale.pdf](http://esogis.nysm.nysed.gov/esogisdata/downloads/talks/Smith_1130_Weds_AAPG_Shale.pdf)

The Reservoir Characterization Group at the New York State Museum, New York State Energy Research and Development Authority, and the New York Geological Survey's presentation "Utica and Marcellus Potential in New York State"

[http://www.nyc.gov/html/dep/pdf/natural\\_gas\\_drilling/12\\_23\\_2009\\_final\\_assessment\\_report.pdf](http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/12_23_2009_final_assessment_report.pdf)

New York City Department of Environmental Protection “Impact Assessment of Natural Gas Production in the New York City Water Supply Watershed: Final Impact Assessment Report”

[http://www.halliburton.com/public/pe/contents/Papers\\_and\\_Articles/web/Q\\_through\\_Z/UnconventionalGas\\_H05270.pdf](http://www.halliburton.com/public/pe/contents/Papers_and_Articles/web/Q_through_Z/UnconventionalGas_H05270.pdf)

Hart Energy Publications “Advances In Unconventional Gas Solutions to meet growing gas demand worldwide”

<http://www.sustainableotsego.org/Risk%20Assessment%20Natural%20Gas%20Extraction-1.htm>

Ronald E. Bishop, PhD., CHO “Chemical and Biological Risk Assessment for Natural Gas Extraction in New York”

<http://www.reuters.com/article/2011/11/02/us-cuadrilla-tremors-idUSTRE7A12SA20111102>

Reuters November 2, 2011 news report “UK firm admits shale gas work caused tremors”

[http://earthquake.usgs.gov/learn/topics/megaqk\\_facts\\_fantasy.php](http://earthquake.usgs.gov/learn/topics/megaqk_facts_fantasy.php)

US Geological Survey Earthquake Hazards Program “Earthquake Facts & Earthquake Fantasy”

<http://oilprice.com/Energy/Natural-Gas/U.S.-Government-Confirms-Link-Between-Earthquakes-and-Hydraulic-Fracturing.html>

oilprice.com November 8, 2011 news report “U.S. Government Confirms Link Between Earthquakes and Hydraulic Fracturing”

[http://www.nytimes.com/2011/08/24/us/24earthquake.html?\\_r=1](http://www.nytimes.com/2011/08/24/us/24earthquake.html?_r=1)

New York Times August 23, 2011 news report “Rare Strong Earthquake Hits Colorado”

<http://online.wsj.com/article/SB124476331270108225.html>

Wall Street Journal June 12, 2009 news report “Temblors Rattle Texas Town: Residents Suspect a Drilling Boom Is Triggering Small Quakes, but Scientists Lack Proof”

<http://www.foxnews.com/scitech/2011/03/01/fracking-earthquakes-arkansas-man-experts-warn/>

Fox News March 1, 2011 news report “Earthquakes in Arkansas May Be Man-Made, Experts Warn”

[http://www.powermag.com/coal/Of-Fracking-Earthquakes-and-Carbon-Sequestration\\_2079.html](http://www.powermag.com/coal/Of-Fracking-Earthquakes-and-Carbon-Sequestration_2079.html)

Power Magazine August 1, 2009 news report “Of Fracking, Earthquakes, and Carbon Sequestration”

<http://www.policyalternatives.ca/publications/monitor/big-fracking-problem>

Canadian Centre for Policy Alternatives “Big ‘Fracking’ Problem: Natural gas industry’s ‘fracking’ risks causing earthquakes”

[http://water.epa.gov/type/groundwater/uic/upload/2004\\_5\\_3\\_uicv\\_techguide\\_uic\\_tech\\_overview\\_uic\\_regs.pdf](http://water.epa.gov/type/groundwater/uic/upload/2004_5_3_uicv_techguide_uic_tech_overview_uic_regs.pdf)

US Environmental Protection Agency “Technical Program Overview: Underground Injection Control Regulations”

<http://www.linkedin.com/pub/jack-century/b/389/7a3>

Jack Century, J.R. Century Petroleum Consultant LinkedIn web page

<http://www.searchanddiscovery.com/abstracts/html/1995/annual/abstracts/0015e.htm>

Jack Century abstract of article “Oil and Natural Gas Induced Seismicity”

[http://www.cce.cornell.edu/EnergyClimateChange/NaturalGasDev/Documents/PRI%20Papers/Marcellus\\_issue3.pdf](http://www.cce.cornell.edu/EnergyClimateChange/NaturalGasDev/Documents/PRI%20Papers/Marcellus_issue3.pdf)

Museum of the Earth, Cornell Cooperative Extension, New York State Water Resources Institute, Cornell University Department of Earth and Atmospheric Sciences, and Cornell University Agricultural Experiment Station publication “Making the Earth Shake: Understanding Induced Seismicity A discussion of the possibility of induced seismicity resulting from natural gas drilling in the Marcellus Shale.”

<http://data.fractracker.org/cbi/snapshot/page?concept=~014f8d11de23c411e0add7d741eb94295a>

fractracker.org mapping product “New York State Brittle Structure (Faults) and Marcellus Exploratory Well Permits”

[http://www.psehealthyenergy.org/data/Howarth\\_testimony\\_-\\_Oct\\_12,\\_2011.pdf](http://www.psehealthyenergy.org/data/Howarth_testimony_-_Oct_12,_2011.pdf)

Robert W. Howarth, The David R. Atkinson Professor of Ecology & Environmental Biology at Cornell University “Statement to the Assembly Committee on Environmental Conservation regarding the draft sGEIS for shale gas development in New York State”

[http://www.psehealthyenergy.org/data/Sign\\_on\\_letter\\_Final.pdf](http://www.psehealthyenergy.org/data/Sign_on_letter_Final.pdf)

Physicians Scientists & Engineers for Healthy Energy letter to Governor Andrew M. Cuomo dated September 15, 2011 (signed by 59 scientists)

<http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf>

Ronald E. Bishop, PhD., CHO “Chemical and Biological Risk Assessment for Natural Gas Extraction in New York”

[http://www.nrs.fs.fed.us/pubs/gtr/gtr\\_nrs76.pdf](http://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs76.pdf)

US Department of Agriculture, Forest Service “Effects of development of a natural gas well and associated pipeline on the natural and scientific resources of the Fernow Experimental Forest” (Gen. Tech. Rep. NRS-76)

<http://www.epa.gov/region8/superfund/wy/pavillion/PavillionAnalyticalResultsReport.pdf> and

[http://www.epa.gov/region8/superfund/wy/pavillion/EPA\\_ReportOnPavillion\\_Dec-8-2011.pdf](http://www.epa.gov/region8/superfund/wy/pavillion/EPA_ReportOnPavillion_Dec-8-2011.pdf)

United States Environmental Protection Agency Contract No. EP-W-05-050 “Expanded Site Investigation – Analytical Results Report Pavillion Area Groundwater Investigation, Pavillion, Fremont County, Wyoming” and “Draft Investigation of Ground Water Contamination near Pavillion, Wyoming”

[http://www.msnbc.msn.com/id/45246260/ns/us\\_news-environment/%23.Tr027GBhpj](http://www.msnbc.msn.com/id/45246260/ns/us_news-environment/%23.Tr027GBhpj)

MSNBC November 10, 2011 news report “‘Fracking’ chemical found in town's aquifer”

[http://www.epa.gov/ogwdw/uic/pdfs/cbmstudy\\_attach\\_uic\\_ch04\\_hyd\\_frac\\_fluids.pdf](http://www.epa.gov/ogwdw/uic/pdfs/cbmstudy_attach_uic_ch04_hyd_frac_fluids.pdf)

United States Environmental Protection Agency Chapter 4, Hydraulic Fracturing Fluids in “Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs”

[http://www.greenchoices.cornell.edu/downloads/development/marcellus/Marcellus\\_Riha\\_Rahm.pdf](http://www.greenchoices.cornell.edu/downloads/development/marcellus/Marcellus_Riha_Rahm.pdf)

Cornell University City & Regional Planning publication Working Paper Series “Framework for Assessing Water Resource Impacts from Shale Gas Drilling”

<http://www.propublica.org/article/buried-secrets-is-natural-gas-drilling-endangering-us-water-supplies-1113>

Pro Publica November 13, 2008 news report “Buried Secrets: Is Natural Gas Drilling Endangering U.S. Water Supplies?”

<http://www.pnas.org/content/108/20/8172>

Proceedings of the National Academy of Sciences of the United States of America abstract of article “Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing”

<http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf>

Ronald E. Bishop, PhD., CHO “Chemical and Biological Risk Assessment for Natural Gas Extraction in New York”

<http://www.riverkeeper.org/wp-content/uploads/2010/09/Fractured-Communities-FINAL-September-2010.pdf>

Riverkeeper publication “Fractured Communities: Case Studies of the Environmental Impacts of Industrial Gas Drilling”

<http://www.dec.ny.gov/animals/265.html>

DEC's web page on Nuisance & Invasive Species

<http://www.dec.ny.gov/lands/47486.html>

DEC's web page on Conserving Small Wetlands in the Hudson Valley

<http://www.ksla.com/global/story.asp?S=10268585>

KSLA News 12 April 28, 2009 news report "Cows in Caddo Parish fall dead near gas well"

<http://www.pinchot.org/gp/EffectsofMarcellusShale>

Pinchot Institute for Conservation publication "Assessing the Environmental Effects of Marcellus Shale Gas Development: The State of Science"

[http://www.nrs.fs.fed.us/pubs/gtr/gtr\\_nrs76.pdf](http://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs76.pdf)

US Department of Agriculture, Forest Service "Effects of development of a natural gas well and associated pipeline on the natural and scientific resources of the Fernow Experimental Forest" (Gen. Tech. Rep. NRS-76)

<http://www.dec.ny.gov/animals/279.html>

DEC web page Biodiversity & Species Conservation: Sustaining New York's Animals, Plants and Ecosystems

<http://newyork.plantatlas.usf.edu/Results.aspx?countyname=Tompkins&countycode=TOMP&FIPS=36109>

New York Flora Association "New York Flora Atlas: Plant List for Tompkins County"

[http://www.dec.ny.gov/docs/wildlife\\_pdf/alleghenytxt.pdf](http://www.dec.ny.gov/docs/wildlife_pdf/alleghenytxt.pdf)

DEC publication "Comprehensive Wildlife Conservation Strategy for New York: Allegheny Basin"

[http://www.dec.ny.gov/docs/wildlife\\_pdf/ontariosetxt.pdf](http://www.dec.ny.gov/docs/wildlife_pdf/ontariosetxt.pdf)

DEC publication "Comprehensive Wildlife Conservation Strategy for New York: Southeast Lake Ontario Basin"

<http://www.osc.state.ny.us/reports/environmental/openspacepreserv10.pdf>

Office of the State Comptroller "Economic Benefits of Open Space Preservation"

<http://www.usa.com/tompkins-county-ny-air-quality.htm>

usa.com "Tompkins County Air Quality"

<http://www.sustainablefuture.cornell.edu/news/attachments/Howarth-EtAl-2011.pdf>

Springerlink.com letter "Methane and the greenhouse-gas footprint of natural gas from shale formations"

<http://democrats.energycommerce.house.gov/sites/default/files/documents/Hydraulic%20Fracturing%20Report%204.18.11.pdf>

US House of Representatives Committee on Energy and Commerce Minority Staff report "Chemicals Used in Hydraulic Fracturing"

[http://www.dep.state.pa.us/dep/deputate/airwaste/aaq/aqm/docs/Marcellus\\_NC\\_05-06-11.pdf](http://www.dep.state.pa.us/dep/deputate/airwaste/aaq/aqm/docs/Marcellus_NC_05-06-11.pdf)

Commonwealth of Pennsylvania Department of Environmental Protection "Northcentral Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report"

[http://townofdish.com/objects/DISH\\_-\\_final\\_report\\_revised.pdf](http://townofdish.com/objects/DISH_-_final_report_revised.pdf)

Town of DISH, Texas report "Town of DISH, Texas Ambient Air Monitoring Analysis Final Report"

<http://deq.state.wy.us/out/downloads/Rushin%20Ozone.pdf>

Office of Governor Dave Freudenthal: Letter to US EPA on Wyoming 8 hour ozone designation recommendation

<http://www.onepetro.org/mslib/servlet/onepetroreview?id=SPE-93666-MS&soc=SPE>

Society of Petroleum Engineers “Impact of Gas Flaring on Soil Fertility”

<http://www.oeffa.org/documents/FrackingpowerpointPDF.pdf?PHPSESSID=021148783e86a62518ed44daa0a73aa0>

Ohio Environmental Council “Deep-Shale Gas Drilling Concerns for farmers and rural communities”

[http://www.nrs.fs.fed.us/pubs/gtr/gtr\\_nrs76.pdf](http://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs76.pdf)

US Department of Agriculture, Forest Service “Effects of development of a natural gas well and associated pipeline on the natural and scientific resources of the Fernow Experimental Forest” (Gen. Tech. Rep. NRS-76)

[http://www.r-cause.net/uploads/8/0/2/5/8025484/radio\\_active\\_wast\\_comments\\_rdsgeis.pdf](http://www.r-cause.net/uploads/8/0/2/5/8025484/radio_active_wast_comments_rdsgeis.pdf)

Comments on rDSEIS on Marcellus Shale Development By Marvin Resnikoff, Ph.D. Radioactive Waste Management Associates, October 2011

<http://www.ksla.com/Global/story.asp?S=10325772>

KSLA News 12 news report “We may now know what killed cows in Caddo Parish”

[http://ciser.cornell.edu/ASPs/search\\_athena.asp?IDTITLE=2554](http://ciser.cornell.edu/ASPs/search_athena.asp?IDTITLE=2554)

Cornell Institute for Social and Economic Research “Profile of Visitors to Tompkins County, 2009”

[http://www.dec.ny.gov/docs/permits\\_ej\\_operations\\_pdf/visual2000.pdf](http://www.dec.ny.gov/docs/permits_ej_operations_pdf/visual2000.pdf)

DEC Policy System “Assessing and Mitigating Visual Impacts”

<http://www.tompkins-co.org/ctyadmin/tourism/docs/2010VisitorStudy/TompkinsCountyVisitorProfile.pdf>

Tompkins County Strategic Tourism Board “Profile of Visitors to Tompkins County”

[http://www.stcplanning.org/usr/Program\\_Areas/Energy/Naturalgas\\_Resources/STC\\_RumbachMarcellusTourismFinal.pdf](http://www.stcplanning.org/usr/Program_Areas/Energy/Naturalgas_Resources/STC_RumbachMarcellusTourismFinal.pdf)

Southern Tier Central Planning and Development Board “Natural Gas Drilling in the Marcellus Shale: Potential Impacts on the Tourism Economy of the Southern Tier”

<http://devsoc.cals.cornell.edu/cals/devsoc/outreach/cardi/publications/loader.cfm?csModule=security/getfile&PageID=1018556>

Cornell Community & Regional Development Institute “The Economic Consequences of” Marcellus Shale Gas Extraction: Key Issues”

[http://www.tourismeconomics.com/docs/ILNY\\_Impact\\_Executive\\_Summary.pdf](http://www.tourismeconomics.com/docs/ILNY_Impact_Executive_Summary.pdf)

Tourism Economics “The Economic Impact of Tourism and the I Love New York Campaign”

<http://assembly.state.ny.us/drp/testimony/New%20York%20State%20Hospitality%20and%20Tourism.pdf>

New York State Hospitality and Tourism Association “Testimony by Daniel C. Murphy to the State Assembly Ways and Means Committee”

[http://www.strausnews.com/articles/2011/11/10/pike\\_county\\_courier/news/6.txt](http://www.strausnews.com/articles/2011/11/10/pike_county_courier/news/6.txt)

The Pike County Courier November 4, 2011 news report “Fracking creating an image problem for Pike County’s tourism industry”

<http://dnrweb.dnr.state.md.us:8080/FullDisp?itemid=00016235>

US Department of the Interior Bureau of Mines “Reclamation and pollution control : planning guide for small sand and gravel mines”

<http://marcellusdrilling.com/2011/07/leaked-ny-dept-of-transportation-analysis-says-potential-impacts-from-marcellus-drilling-on-state-and-local-roads-are-ominous/>

Marcellus Drilling News article “Leaked NY Dept of Transportation Analysis Says Potential Impacts from Marcellus Drilling on State and Local Roads are “Ominous”

[http://www.halliburton.com/public/pe/contents/Papers\\_and\\_Articles/web/Q\\_through\\_Z/UnconventionalGas\\_H05270.pdf](http://www.halliburton.com/public/pe/contents/Papers_and_Articles/web/Q_through_Z/UnconventionalGas_H05270.pdf)

Hart Energy Publications “Advances In Unconventional Gas Solutions to meet growing gas demand worldwide”

<http://www.ingaa.org/File.aspx?id=6422>

Cambridge Energy Research Associates report prepared for the Interstate Natural Gas Association of America titled “Changing Geography of North American Natural Gas”

<http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf>

United Nations Intergovernmental Panel on Climate Change: Fourth Assessment Report: Climate Change 2007 (AR4) Chapter 2

[http://aip.org/history/climate/summary.htm#N\\_1\\_](http://aip.org/history/climate/summary.htm#N_1_)

American Institute of Physics web page “Introduction: A Hyperlinked History of Climate Change Science”

<http://www.sciencedaily.com/releases/2009/10/091008152242.htm>

Science Daily October 8, 2009 news report “Last Time Carbon Dioxide Levels Were This High: 15 Million Years Ago, Scientists Report”

<http://www.planning.org/policy/guides/pdf/climatechange.pdf>

American Planning Association “Policy Guide on Planning and Climate Change”

<http://www.oilendgame.com/>

Rocky Mountain Institute “Winning the Oil Endgame”

<http://bnef.com/PressReleases/view/172>

Bloomberg New Energy Finance November 10, 2011 news report “Onshore wind energy to reach parity with fossil-fuel electricity by 2016”

<http://cleantechnica.com/2011/11/10/about-solar-energy-why-solar-energy/>

Cleantechnica.com, an environmental scientific and technical blog

<http://rmi.org/rfexecutivesummary>

Rocky Mountain Institute “Reinventing Fire Executive Summary”

[http://www.psehealthyenergy.org/data/Howarth\\_testimony\\_-\\_Oct\\_12\\_2011.pdf](http://www.psehealthyenergy.org/data/Howarth_testimony_-_Oct_12_2011.pdf)

Physicians Scientists & Engineers for Healthy Energy Statement to the Assembly Committee on Environmental Conservation regarding the draft sGEIS for shale gas development in New York State by Robert W. Howarth, The David R. Atkinson Professor of Ecology & Environmental Biology Cornell University, October 12, 2011

<http://www.eeb.cornell.edu/howarth/Marcellus.html>

Commentary in Nature Magazine by R/ Howarth and A. Ingraffea: “Greenhouse Gas Footprint of Shale Gas Obtained by High Volume, Slick-Water Hydraulic Fracturing”

<http://www.psehealthyenergy.net/resources/view/198782>

Physicians Scientists & Engineers for Healthy Energy “FLIR<sup>17</sup> video of a well being “finished” in Susquehanna County, Pa”

<http://63.134.196.109/documents/RiskAssessmentNaturalGasExtraction.pdf>

Ronald E. Bishop, PhD., CHO “Chemical and Biological Risk Assessment for Natural Gas Extraction in New York”

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<sup>17</sup> FLIR manufactures Thermal Imaging Infrared Cameras.

[http://www.msnbc.msn.com/id/45246260/ns/us\\_news-environment/%23.Tr027GBhpj](http://www.msnbc.msn.com/id/45246260/ns/us_news-environment/%23.Tr027GBhpj)

MSNBC November 10, 2011 news report "'Fracking' chemical found in town's aquifer"

<http://water.washington.edu/Research/Articles/2000.rethinking.pdf>

Environmental Impact Assessment Review article "Rethinking human health impact assessment"

<http://www.cdc.gov/healthyplaces/hia.htm>

US Centers for Disease Control and Prevention web page for "Health Impact Assessments"

<http://www.cdc.gov/healthyplaces/healthtopics/water.htm>

US Centers for Disease Control and Prevention web page for "Health Impact Assessments for Water Quality"

<http://www.cdc.gov/healthyplaces/healthtopics/airpollution.htm>

US Centers for Disease Control and Prevention web page for "Health Impact Assessments for Air Quality"

[http://www.dec.ny.gov/docs/permits\\_ej\\_operations\\_pdf/hodreport.pdf](http://www.dec.ny.gov/docs/permits_ej_operations_pdf/hodreport.pdf)

NY State Departments of Environmental Conservation and Health "Report of the Health Outcome Data Workgroup"

[http://www.upstate.edu/cnymph/pdf/hydraulic\\_fracturing\\_implications.pdf](http://www.upstate.edu/cnymph/pdf/hydraulic_fracturing_implications.pdf)

SUNY Upstate Medical University "Public Health Implications of Hydraulic Fracturing"

<http://psehealthyenergy.net/users/view/14205>

Physicians Scientists & Engineers for Healthy Energy profile of Dr. Larysa Dyrszka

[http://www.gasdrillingtechnotes.org/uploads/7/5/7/4/7574658/potential\\_stressors\\_human\\_health\\_id\\_2011.pdf](http://www.gasdrillingtechnotes.org/uploads/7/5/7/4/7574658/potential_stressors_human_health_id_2011.pdf)

NY State Assembly Hearing on the Potential Public Health Impacts of Hydraulic Fracturing: Potential Stressors on Human Health that have been identified in areas where gas drilling occurs

[http://www.gasdrillingtechnotes.org/uploads/7/5/7/4/7574658/nys\\_assembly\\_013\\_adam\\_law.pdf](http://www.gasdrillingtechnotes.org/uploads/7/5/7/4/7574658/nys_assembly_013_adam_law.pdf)

The Council of the Medical Society of the State of New York resolution on the "Health Impacts of Hydraulic Fracturing Techniques"

[http://www.gasdrillingtechnotes.org/uploads/7/5/7/4/7574658/250\\_medical\\_people\\_10-5-11.pdf](http://www.gasdrillingtechnotes.org/uploads/7/5/7/4/7574658/250_medical_people_10-5-11.pdf)

Letter to Governor Andrew M. Cuomo dated October 5, 2011 from more than 250 medical experts, along with the Medical Societies of seven upstate counties and the regional office of the American Academy of Pediatricians, warning Governor Cuomo that New York State has failed to analyze public health impacts of hydraulic fracturing in its rush to approve permits for drilling

<http://www.garfield-county.com/public-health/battlement-mesa-health-impact-assessment-draft2.aspx>

Garfield County Colorado Public Health Impact Assessment

<http://www.hiaguide.org/hia/national-petroleum-reserve-alaska-oil-development-Plan>

Columbia University Institute on Medicine as a Profession Health Impact Assessment of the North Slope of Alaska

<http://nercrd.psu.edu/publications/rdppapers/rdp43.pdf>

The Northeast Regional Center for Rural Development: The Pennsylvania State University, NERCRD Rural Development Paper No. 43 "Energy Boomtowns & Natural Gas: Implications for Marcellus Shale Local Governments & Rural Communities"

[http://greenchoices.cornell.edu/downloads/development/marcellus/Marcellus\\_SC\\_NR.pdf](http://greenchoices.cornell.edu/downloads/development/marcellus/Marcellus_SC_NR.pdf)

Cornell University City & Regional Planning Working Paper Series: “How Should We Think About the Economic Consequences of Shale Gas Drilling?”

<http://devsoc.cals.cornell.edu/cals/devsoc/outreach/cardi/publications/loader.cfm?csModule=security/getfile&PageID=1018556>

Cornell Community & Regional Development Institute “The Economic Consequences of” Marcellus Shale Gas Extraction: Key Issues”

[http://greenchoices.cornell.edu/downloads/development/marcellus/Marcellus\\_Randall.pdf](http://greenchoices.cornell.edu/downloads/development/marcellus/Marcellus_Randall.pdf)

Cornell University City & Regional Planning Working Paper Series: “Hammer Down: A Guide to Protecting Local Roads Impacted by Shale Gas Drilling”

<http://www.ncsl.org/default.aspx?tabid=12674>

National Conference of State Legislatures “State Energy Revenues Update”

<http://www.businessweek.com/ap/financialnews/D9PG5N3G0.htm>

Bloomberg Businessweek September 2, 2011 news report “Life on an oil field 'man camp' -- not for everyone”

<http://www.scribd.com/doc/63144744/Fiscal-Effects-of-Gas-Drilling-in-Otsego-County-NY-8-15-11-Final>

Harry Levine article on scribd.com titled “The Fiscal Effects of Fracking in Otsego County, NY”

[http://www.greenchoices.cornell.edu/downloads/development/marcellus/Marcellus\\_Prelim\\_Results.pdf](http://www.greenchoices.cornell.edu/downloads/development/marcellus/Marcellus_Prelim_Results.pdf)

Susan Christopherson presentation titled “Marcellus Hydro-Fracturing: What Does it Mean for Economic Development?”

<http://www.ktva.com/home/outbound-xml-feeds/Strippers-Flock-to-Oil-Boom-Town-132796198.html>

KTVA October 11, 2011 news report titled “Strippers Flock to Oil Boom Town Oil and gas exploration has increased dramatically in the wind-swept ranching town of Williston, bringing with it thousands of young and mostly male workers”

<http://www.businessweek.com/ap/financialnews/D9PG5N3G0.htm>

Bloomberg Businessweek September 2, 2011 news report “Life on an oil field 'man camp' -- not for everyone”

<http://thedailystar.com/localnews/x1267472742/Ommegang-Fracking-may-force-us-to-leave>

thedailystar.com November 15, 2011 news report “Ommegang: Fracking may force us to leave”

[http://headwaterseconomics.org/pubs/energy/HeadwatersEconomics\\_EnergyFocusing.pdf](http://headwaterseconomics.org/pubs/energy/HeadwatersEconomics_EnergyFocusing.pdf)

Headwater Economics report titled “Fossil Fuel Extraction as a County Economic Development Strategy: Are Energy-focusing Counties Benefiting?”

[http://www.dec.ny.gov/docs/materials\\_minerals\\_pdf/econimpact092011.pdf](http://www.dec.ny.gov/docs/materials_minerals_pdf/econimpact092011.pdf)

DEC Fact Sheet “Economic Impacts of High-Volume Hydraulic Fracturing in New York State”

<http://www.scribd.com/doc/65070417/SGEIS-Socioeconomic-Hype>

James (Chip) Northrup article on scribd.com titled “Socioeconomic Study Is Premised On Incorrect Reserve Estimates”

<http://www.dec.ny.gov/energy/47554.html>

DEC’s web page for the “Revised 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”

<http://www.marcellus.psu.edu/resources/PDFs/Economic%20Impact%20of%20Marcellus%20Shale%202009.pdf>

The Marcellus Shale Education & Training Center (MSETC) partnership of the Pennsylvania College of Technology and Penn State Extension presentation titled “Economic Impacts of Marcellus Shale in Pennsylvania: Employment and Income in 2009”

<http://www.timesunion.com/opinion/article/Hydrofracking-a-boom-bust-endeavor-1971392.php>

Albany Times Union August 14, 2011 opinion by Susan Christopherson titled “Hydrofracking a boom-bust endeavor?”

<http://marcelluscoalition.org/2011/07/highlights-from-new-marcellus-shale-study-%E2%80%9Cprolific-marcellus-could-soon-lead-us-in-natural-gas-production%E2%80%9D/>

Marcellus Shale Coalition July 21, 2011 news report “Highlights From New Marcellus Shale Study: “Prolific Marcellus Could Soon Lead US in Natural Gas Production”

<http://stateimpact.npr.org/pennsylvania/2011/08/30/new-study-cuts-estimated-marcellus-job-creation-in-half/>

State Impact Pennsylvania, a collaboration between [WITF](#), [WHYY](#) and [NPR](#), August 30, 2011 news report “New Study Cuts Estimated Marcellus Job Creation in Half”

[http://www.paworkstats.state.pa.us/admin/gsipub/htmlarea/uploads/Marcellus\\_Shale\\_Fast\\_Facts\\_Viewing.pdf](http://www.paworkstats.state.pa.us/admin/gsipub/htmlarea/uploads/Marcellus_Shale_Fast_Facts_Viewing.pdf)

Pennsylvania Department of Labor & Industry “Marcellus Shale Fast Facts, December 2011 Edition”

<http://keystoneresearch.org/publications/research/drilling-deeper-job-claims-actual-contribution-marcellus-shale-pennsylvania-jo>

Keystone Research Center June 20, 2011 report titled “Drilling Deeper into Job Claims: The Actual Contribution of Marcellus Shale to Pennsylvania Job Growth”

[http://greenchoices.cornell.edu/downloads/development/marcellus/Marcellus\\_Jacquet.pdf](http://greenchoices.cornell.edu/downloads/development/marcellus/Marcellus_Jacquet.pdf)

Cornell University City & Regional Planning publication Working Paper Series “Workforce Development Challenges in the Natural Gas Industry”

[http://greenchoices.cornell.edu/downloads/development/marcellus/Marcellus\\_Kay.pdf](http://greenchoices.cornell.edu/downloads/development/marcellus/Marcellus_Kay.pdf)

Cornell University City & Regional Planning publication Working Paper Series “The Economic Impact of Marcellus Shale Gas Drilling What Have We Learned? What are the Limitations?”

[http://www.chk.com/media/educational-library/fact-sheets/barnett/barnett\\_water\\_use\\_fact\\_sheet.pdf](http://www.chk.com/media/educational-library/fact-sheets/barnett/barnett_water_use_fact_sheet.pdf)

Chesapeake Energy “Water Use in Barnett Deep Shale Gas Exploration”

[http://www.oipa.com/page\\_images/1208787861.pdf](http://www.oipa.com/page_images/1208787861.pdf)

Barnett Shale Water Conservation and Management Committee presentation titled “Water Use and Conservation in Barnett Shale Energy Development”

<http://hydraulicfracturing.airtk.com/Water-Usage/Pages/Information.aspx>

Chesapeake Energy “Hydraulic Fracturing Facts”

[http://www.eenews.net/assets/2011/06/01/document\\_gw\\_01.pdf](http://www.eenews.net/assets/2011/06/01/document_gw_01.pdf)

Lawsuit: “State of New York versus US Army Corps of Engineers, US Fish & Wildlife Service, National Park Service, US EPA” in regards to compliance with the National Environmental Policy Act of 1969

[http://www.philadelphiafed.org/community-development/publications/cascade/77/08\\_impact-of-marcellus-shale-on-housing-needs.cfm](http://www.philadelphiafed.org/community-development/publications/cascade/77/08_impact-of-marcellus-shale-on-housing-needs.cfm)

Federal Reserve Bank of Philadelphia article “Impact of Marcellus Shale on Housing Needs”

[http://housingforum.phfa.org/slides/Session%2014\\_Mike%20Kearney.pdf](http://housingforum.phfa.org/slides/Session%2014_Mike%20Kearney.pdf)

Pennsylvania Commonwealth Housing Forum “Marcellus Shale”

<http://sustainableotsego.org/Risk%20Assessment%20Natural%20Gas%20Extraction-1.htm>

Ronald E. Bishop, PhD., CHO “Chemical and Biological Risk Assessment for Natural Gas Extraction in New York”

[http://www.greenchoices.cornell.edu/downloads/development/marcellus/Marcellus\\_Kay.pdf](http://www.greenchoices.cornell.edu/downloads/development/marcellus/Marcellus_Kay.pdf)

Cornell University City & Regional Planning publication Working Paper Series “The Economic Impact of Marcellus Shale Gas Drilling What Have We Learned? What are the Limitations?”

<http://www.clintoncountypa.com/resources/CCNGTF/pdfs/articles/9.22.11%20-%20Natural%20Gas%20Drilling%20Effects%20on%20Municipal%20Governments.pdf>

Clinton County Natural Gas Task Force “Natural Gas Drilling Effects on Municipal Governments in the Marcellus Shale Region”

<http://pubs.cas.psu.edu/FreePubs/pdfs/ua468.pdf>

Penn State College of Agricultural Sciences “State Tax Implications of Marcellus Shale: What the Pennsylvania Data Say in 2010”

<http://www.tompkins-co.org/planning/MunicipalToolsreGasDrilling.htm>

Tompkins County Planning Department’s “Municipal Tools for Addressing Potential Gas Drilling Impacts”

<http://www.westfirmlaw.com/flare/AnschutzvTownofDryden.pdf>

Anschutz Exploration Corporation vs. Town of Dryden Article 78 filing

<http://www.westfirmlaw.com/flare/AmicusFilings.pdf>

Anschutz Exploration Corporation vs. Town of Dryden Article 78 proceeding: Amicus brief of Natural Resources Defense Council, Inc.; Brewery Ommegang; Theodore Gordon Flyfishers, Inc.; Riverkeeper, Inc.; and Catskill Mountainkeeper

<http://www.middlefieldny.com/Documents%20Forms/Docs/BSK%20final%20Memo%20Gas%20Drilling.pdf>

Bond, Schoeneck & King PLLC Legal Memorandum to Town of Middlefield Town Board in regards to “Local Jurisdiction over Gas Drilling”

<http://www.tompkins-co.org/planning/planning%20tools/index.htm>

Tompkins County Planning Department’s “Vital Communities Toolbox”

[NY Department of State Local Government Services](#)

Local Community Services provided by the NY Department of State

[American Planning Association](#)

American Planning Association’s services to Planning Boards and Commissions

[Groundwater Resource Mapping](#)

DEC’s “Groundwater Resource Mapping”

[Environmental Resource Mapper](#)

DEC’s online natural resources mapping tool

[Center for Rural Massachusetts Manual of Build-Out Analysis](#)

University of Massachusetts at Amherst, Center for Rural Massachusetts planning publications

[NY Department of State Zoning Publications](#)

NY Department of State’s Land Use Training & Technical Assistance for Zoning

[NY Planning Federation Model Ordinances](#)

Model ordinances and local laws from the NY Planning Federation

[Tompkins County Vital Communities Toolbox](#)

Tompkins County Planning Department's "Vital Communities Toolbox"

[NY Department of State Site Development Review](#)

NY Department of State's Land Use Training & Technical Assistance publication "Site Development Plan Review"

[New York Rural Water Association](#)

New York Rural Water Association's publication "Local Source Water Protection and Smart Growth in Rural New York: A Guide for Local Officials"

[Town of Colonie Watercourse Protection Law](#)

The Town of Colonie's (Albany County) adopted Local Law regulating watercourses.

[Pace University School of Law](#)

Pace University Land Use Law Center's publication "Preventing Landscape Fragmentation: A Holistic Use of Local Land Use Regulation"

[Environmental Law Reporter Open Space Protection Techniques](#)

Environmental Law Institute's article on "Successful Community Strategies to Protect Open Space"

[Noise Pollution Clearinghouse](#)

Noise Pollution Clearinghouse Law Library of Noise Regulations and Ordinances of US Cities, Counties and Towns

[NY Planning Federation Diesel Idling Guide](#)

A joint publication of the New York Planning Federation, the United States Environmental Protection Agency and the New York State Energy Research and Development Authority "A Municipal Official's Guide to Diesel Idling Reduction in New York State"

[DEC's SEQRA Handbook](#)

The DEC's Guide to the State Environmental Quality Review Act

[Town of Ithaca CEA](#)

Coy Glen Critical Environmental Area, designated by the Town of Ithaca

[Cornell Local Roads Program](#)

Cornell's "Model Town Ordinances for Road Preservation and Traffic Control"

[DEC Oil and Gas Database](#)

New York's Oil and Gas Database

[Tompkins County GIS Portal](#)

The Tompkins County GIS Portal, a gateway to GIS Mapping Resources and Geo-spatial data in Tompkins County

[Cornell Natural Gas Resource Center](#)

Cornell Cooperative Extension's Natural Gas Resource Center with information including academic research, industry analysis, local government officials and citizens

[Mineral Resources Environmental Notice Bulletin](#)

DEC's Environmental Notice Bulletin just for Mineral Resources applications and regulations

[Catskill Citizens for Safe Energy](#)

A collection of Internet links to learn more about the potential effects of natural gas drilling in the Marcellus Shale

[NY Alert](#)

New York State's "All-Hazards Alert and Notification web-based portal"

[TC3's Adult Learning Center](#)

Tompkins Cortland Community College's Center for Adult Learning and Training

[NY State Office of Real Property Tax Services](#)

New York State Department of Taxation and Finance Office of Real Property Tax Services, Oil and Gas Unit's "Overview Manual for Valuation and Assessment of Oil and Gas Producing Property in New York State "

[NY State Department of Environmental Conservation](#)

DEC's "Stormwater Management Guidance Manual for Local Officials: Construction and Post-Construction Stormwater Runoff Management"

[Tompkins County SWCD](#)

Tompkins County Soil and Water Conservation District's Press Release on Marcellus Shale Drilling

[Tompkins County Council of Governments](#)

The Tompkins County Council of Governments's home web page

[NY State Department of State](#)

Albany Law School's "Technical Assistance Project: New York State Shared Municipal Services Incentive (SMSI) Grant Program Technical Assistance Manual"

[Pace University Land Use Law Center](#)

Pace University Law Faculty publications: "Grassroots Regionalism Through Intermunicipal Land Use Compacts"

[American Planning Association](#)

American Planning Association Policy Guides

[Rocky Mountain Institute](#)

Rocky Mountain Institute's Knowledge Center Library

[Environmental Protection Agency](#)

US EPA Climate Change information page

[US Green Building Council](#)

U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) programs

[Cornell Green Choices](#)

Cornell University's Green Choices web page "How to Benefit the Climate and Your Community"

[http://www.citizenscampaign.org/PDFs/CC\\_REPORT\\_FINAL.pdf](http://www.citizenscampaign.org/PDFs/CC_REPORT_FINAL.pdf)

Common Cause/New York publication titled "Deep Drilling Deep Pockets: Expenditures by the Natural Gas Industry in New York to Influence Public Policy"

<http://fuelfix.com/blog/2011/11/10/energy-companies-spent-750-million-lobbying-for-hydraulic-fracturing/>

Houston Chronicle's energy business news at fuelfix.com, November 10, 2011 news report "Energy companies spent \$750 million lobbying for hydraulic fracturing"

[http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing\\_ID=270378f4-802a-23ad-4d07-c6b1fd44510b](http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing_ID=270378f4-802a-23ad-4d07-c6b1fd44510b)

US Senate's Full Committee on Environment and Public Works and Subcommittee on Water and Wildlife joint hearing entitled, "Natural Gas Drilling: Public Health and Environmental Impacts"

<http://landuse.law.pace.edu/landuse/documents/PublishedArticle/Reg2/MunConOverMiningNY.doc>

New York Environmental Law Journal "Municipal Control Over Mining in New York"

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