

Submitted 11 January 2012 by

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I greatly appreciate the opportunities for public comment on two versions of the dSGEIS. I know that some of my 2009 comments (which may also have been made by others) were integrated into the rdSGEIS. I did find it frustrating to have worked on comments on the July 2011 dSGEIS and then realize the September 2011 version had not just additions of new socioeconomic sections but other new sections and changes throughout the document. For example, 6.1.3.4 is an entirely new section (also a very good addition). Substantial changes to the private well testing parameters for permit applications were not highlighted in the Executive Summary or press releases about the 2011 revisions to the dSGEIS. It was also difficult to review the stormwater SPDES and HVHF regulations released in the fall during the same comment period. I do appreciate the extension into January.

General comments for the entire dSGEIS:

Some prohibited locations and site-specific review locations will be subject to reconsideration in two or three years after permitting. The regulatory process is all subject to future review, in the same way that this SGEIS represents a revision of the 1992 GEIS, so what is the purpose of identifying particular restrictions for review, and what is the planned review process? Since the pace and spatial distribution of future permitting is unknown, and controlled by the activities of private developers rather than directed by the Department, it is hard to predict what regulatory knowledge will have been gained at a particular point in time. The extent of experience with permitting in a relevant geologic formation or region of the state seems much more relevant than a certain number of years. It may take far more than two or three years for the Department to have experience with multi-well pads that have reached the production and partial reclamation phase in less sensitive areas.

This SGEIS ultimately will apply to other formations including Utica Shale, but there are risk assessments and statements made which are specific to the Marcellus Shale or the portion of the state above the deeper Marcellus Shale. As the Department revises the dSGEIS, it should pay attention to whether language should be specific to Marcellus or generalized to all low-permeability formations. The phrase “low-permeability shale” is used, and that seems like a useful shorthand for the various formations.

Qualified language scattered throughout the background chapters such as proposed, likely, typical, could be, etc. can be confusing, so it should be clear whether the statement refers to what has happened in other states, what operators say they will probably ask to do in NYS, or what will be required in New York. The language throughout the document varies between “requires” or “adds a new requirement” versus “proposes to require”. Is there a meaningful difference between those? Are requirements actually in the regulations, with the SGEIS as supporting

evidence?

Given the structure of the SGEIS (reviewing setting and history, describing practices, describing risks, proposing mitigation), topics are repeated across many chapters. The SGEIS is also under the GEIS and linked to many other regulatory programs. The dSGEIS includes many cross-references to other sections and documents, and links to online resources, but I have suggested additional cross-references in many places. In the final SGEIS, some lucky editor will need to make sure that there is consistency across different sections.

Are the terms “project sponsor” and “operator” clearly defined somewhere? Both are used in the beginning of the dSGEIS. This is important for this industry given the number of subcontractors involved in the process.

Most sources of information are mentioned briefly in the text and/or in the footnotes. In summaries of studies by consultants, particularly in Chapter 5, there are repeated long references in the text to the consultants, e.g., “ICF International, under contract to NYSERDA to provide research assistance for this document...”. If DEC has confidence in the information in reports from those consultants, why are these treated differently than other references?

As long as they are defined first and in the glossary, common acronyms could be used more often to shorten the document (e.g., NYS, HVHF). This would also help with searching for particular terms (e.g., DOW).

Capitalization (or not) of Primary and principal Aquifers varies.

Detailed comments, suggestions, and questions in order of text

Executive Summary

p.2, first line - “has” should be changed to “have” to agree with “projections”

p.2, middle paragraph - The full name, draft SGEIS and dSGEIS should be enough variations of the document name; “draft Supplement” should not be necessary.

p.2, final paragraph – The final SGEIS will apply statewide since it includes areas of prohibition; it does not make sense to say it applies “except” in the restricted areas which are identified in the SGEIS.

p.4, Draft SGEIS paragraph – Text was not accidentally “omitted”, it was removed or deleted on purpose.

p.4, last full sentence – Does development over a 30 year period mean per well across all stages, or across the entire state in the initial development?

p. 6, Chapter 3 paragraph – Does “regulations, located at 6 NYCRR Part 550” mean “regulations in 6 NYCRR Part 550”

p.6, Chapter 5 paragraph – What does “most recent up-to-date” mean? Information provided in 2011? Just “current”?

p.9, Water Resources Impacts first paragraph – A semicolon is needed after “waste disposal”.

p.11, final paragraph – “developable shale formations” is not independently defined since there will be restrictions on development based on the vertical separation from freshwater aquifers among other things. “Developable” would be determined by a combination of the Department’s regulations and the estimates of where gas is most abundant. There is not a clear separation between “developable” and “undevelopable”. While the Marcellus may not be as useful for development at its northern, shallow limit, there may not be a thousand foot separation from shallow aquifers in that region.

p.12, second paragraph. The topic sentence does not make sense; there are many potential adverse impacts related to drilling wastewater, which is why the dSGEIS has containment and handling requirements to prevent adverse impacts. The third sentence is not clear since a tracking system for transport does not by itself address any environmental risk of drilling wastewater.

p.12, third paragraph, second sentence – Change “could be” to “are”.

p.13, second full paragraph – At a minimum, a comma is needed between “Marcellus Shale” and “NORM levels”. Is the point of this sentence that cuttings are not just composed of material from the Marcellus Shale, but also vertical well material, which dilutes its higher radioactivity? Otherwise it sounds from the first two sentences like Marcellus Shale radioactivity is high in place but somehow low when it reaches the surface, or higher than other bedrock but similar to the surface environment. In the last sentence of the paragraph, it seems the risk to water resources comes not from the volume of cuttings but from contact between the cuttings and water resources via pit liner leaks, spills, flooding, inappropriate burial, etc.

p.14, first full paragraph – “overall natural resource biodiversity” is meaningless.

p.14, second full paragraph – “The number of vehicle trips” is not an activity; movement of vehicles among well pads and other locations is the activity that might transfer invasive species.

p.15, first full paragraph – Change “is” to “are”.

p.15, final paragraph – “industry” is vague. Since these are predictions rather than regulations, should the language of “would not occur” and “would be” be changed to “are not likely” and “would probably be”? Item (3) should not be relevant if closed loop handling of wastewater is required.

p.16, final paragraph, first sentence – reword to something like “Greenhouse gas (GHG) emissions of all operational phases of proposed well pad activities were estimated.” Later in the paragraph, what is the difference between “activities” vs. “anticipated operations”?

p.20, final paragraph – replace “there either” with “above the mapped boundaries of the primary aquifers” or some other less vague phrase.

p.22, disclosure paragraph – “proposed for use” by whom? Is this really a list of likely chemicals, rather than ones that have been proposed? Similarly, instead of “Chemical usage”, I assume the NYSDOH reviewed “chemical characteristics”. Using NYSDOH as the active subject of the sentence might be clearer.

p.22, final paragraph – What does “gas or pollutants” mean? Why is “string” placed in quotation marks when it was not earlier?

p.23, stormwater paragraph – Addressing does not mitigate impacts; requiring pollution prevention measures does. The sentence could be simplified as “Secondary containment, spill prevention, and stormwater controls are required to mitigate risks to water resources from spills of chemical additives, hydraulic fracturing fluid, or wastewater.”

p.24, wildlife paragraph – This long sentence could be simplified, and it needs to be clear whether the acreage refers to the disturbance area or the habitat patch area, e.g., “To mitigate impacts on wildlife habitat caused by habitat fragmentation, the Department will require that permit applications include site-specific ecological assessments for surface disturbance within specified Forest Focus Areas and Grassland Focus Areas as described in Chapter 7.4.1.2.”

p.24, first bullet point – “Risky site plans” is vague.

p.25, fifth bullet point – What does “without a demonstrable showing” mean? Does this mean “without demonstrating”?

p.26, Chapter 8, first paragraph – “potential impacts of HVHF operations on local land use laws and policies” sounds backward, unless instead of impact “conflict with” is meant. Does “locality” mean “municipality”, or does it include adjacent areas?

p.28, middle paragraph. “Green” is not a meaningful term. What is meant by “The Department finds that the use...would proceed...” The Department should identify lower-risk chemicals, revising as new information is available, with permit applicants explaining why they need to use higher-risk alternatives to the lower-risk chemicals, not just “considering” lower-risk chemicals.

Chapter 1

p.1-1, first paragraph – Is the first list of counties for permits in the Marcellus Shale (since Utica Shale is mentioned in the next list)?

1.1.1.1 – Open in-ground wastewater pits should be prohibited on the basis of unnecessary risk to shallow groundwater and nearby surface water, not left as an option with additional site-specific review or not addressed because some leading gas drilling companies say they will not use them.

1.1.1.2 – My dictionary has “reusing”, no hyphen.

1.4.2.1 and 1.4.2.2 - Since the latter section refers to the former and each is short, these could be combined, or just made the second and third paragraph of 1.4.2. Otherwise “these watersheds” is unclear. Since the drinking water supplies are separate, the last sentence should end in “as unfiltered drinking water supplies.”

1.4.3 – The first sentence would be clearer if written in chronological order. A new paragraph will need to be inserted reflecting the July and September 2011 revised dSGEIS versions and subsequent public comment periods.

1.7 first paragraph – “would need to be consulted for” can be shortened to “contain”

1.7.1 - This paragraph may need to be updated to reflect recent legislation and regulation in other states. The FRAC Act is a pending bill in Congress (H.R. 1084 / S. 587), not a passed federal Act.

1.7.3.2 – This paragraph may need to be updated to reflect the water withdrawal legislation passed in the 2011 NYS legislative session (A5318A) and signed by Governor Cuomo in mid-August.

1.7.4 – The number of existing natural gas wells may not be known exactly but it should not be “countless”.

1.7.11 – My dictionary has “reevaluate” with no hyphen. Repeated in 1.8.

1.7.11.1 – The final bullet seems to be missing a verb (the others have “would be” or “would have”).

Chapter 2

2.4.1 – Rather than repeating the water use classifications from other DEC documents for several pages, it would be easier to refer to the source documents. Even if those use classifications are revised, the SGEIS will still be current. The main point of the section is made in the first two paragraphs before the tables and notes and more specifically in 6.1.1.

2.4.2 – There is a link to the annual report for the New York City drinking water supply. It is unclear why it is in this section about regulatory standards, or why only that one supply is listed rather than a link to the NYS DOH page of Consumer Confidence Reports, http://www.health.ny.gov/environmental/water/drinking/annual_water_quality_report/ If the NYC link is included, it would be better to use the general link in footnote 25 rather than a specific year.

2.4.3 – Either here or in section 2.4.5 about private water wells, there should be an explanation of how drinking water standards relate to private wells, e.g., “Private water supplies may use the

state drinking water standards as guidelines, but the owners are responsible for testing and treatment.”

2.4.3.1

There is a lot of background information about federal drinking water standards that could be covered more briefly. Since NYS has primacy, it might make more sense to combine the federal and state regulatory explanation into a single section.

Many tables of federal drinking water standards are repeated here, but the detailed footnotes from EPA were not, e.g., for action levels for lead and copper. EPA drinking water standards are subject to change over time. It would be better to link to the current EPA list of contaminants (<http://water.epa.gov/drink/contaminants/index.cfm>), which also provides context on health effects and common sources. Many of these compounds are not likely to be relevant to natural gas drilling impacts. There are problems in the table: fluoride and copper are repeated under primary and secondary standards without explaining the difference; species names are usually italicized, with genus capitalized and specific epithet uncapitalized; MRDL and MRDLG are not explained in the text; dates for arsenic are not explained and the date for uranium is not included; and errors in the EPA table are repeated here, e.g., none of the radionuclides are measured in mg/L.

The sentence about New York primacy is important and should be moved up to the first mention of New York enforcement at the bottom of p.2-13.

2.4.3.2

For relevance to natural gas drilling rather than public water supply development, this section could be shortened.

For a sentence at the top of page 2-19, county health departments are not NYSDOH’s only partners, not all county health departments have environmental health divisions (some rely on regional offices of NYSDOH), and punctuation is inconsistent. Suggested replacement:

“To assure the safety of drinking water in New York, NYSDOH, in cooperation with some county health departments, regulates the operation, design and quality of public water supplies; assures water sources are adequately protected; and sets standards for constructing individual water supplies.”

For the final paragraph, a more direct link to NYS DOH’s drinking water standards would be helpful, e.g., http://www.health.ny.gov/regulations/nycrr/title_10/part_5/subpart_5-1_tables.htm. As written, the final sentence is confusing; “principal organic contaminants with specific chemical compound classification and unspecified organic contaminants” could be deleted.

2.4.4

In the middle of the paragraph, suggested replacement:

“Privately owned residential wells supplying water to individual households do not require water supply permits.”

Rather than pasting in Table 2-5 it would be better to provide the reference and a link, e.g.,

http://www.health.ny.gov/environmental/water/drinking/faq_def.htm

2.4.4.1

Provide a citation for the first sentence (the DEC website itself states “In all, nearly 30% of New York State's population depends on groundwater, including much of the population of Long Island.” <http://www.dec.ny.gov/lands/67073.html>)

Within the next sentence, suggested replacement:

“most vulnerable, beginning in 1981 the NYSDOH identified Primary Water Supply Aquifers”

Next paragraph suggested replacement to reduce duplication and clarify:

“Principal Aquifers are defined in the DOW TOGS based on geology as “highly productive, but which are not intensively used as sources of water supply by major municipal systems at the present time.” The 18 Primary...”

The first paragraph mentions 18 Primary Aquifers; the second paragraph should be corrected from 21 to 18. There are 21 labels on the map on <http://www.dec.ny.gov/36164.html> but the Owego-Waverly, Olean-Salamanca, and Upper and Lower Cohocton were classified together in the TOGS (http://www.dec.ny.gov/docs/water_pdf/togs213.pdf). (I assume the Baldwinsville is an updated, more specific name for the Seneca River aquifer; the Waverly aquifer portion of the Owego-Waverly should be added to the map on <http://www.dec.ny.gov/energy/75581.html>)

Figure 2.1 - The aquifer names in the table and map should match the 18 designations. If the eastern New York aquifers are not included in the table because there are no non-water wells there, this should be explained in the text and/or a footnote below the table. Principal Aquifers should be plural in the table (they are not contiguous).

2.4.4.2

“Most public water systems with groundwater sources pump and treat groundwater from wells.” Don't all public groundwater systems pump and treat groundwater? This sentence can probably be deleted.

2.4.5

While the exact number of private wells in the state is not known, the estimate should be in the hundreds of thousands. The USGS estimates 1.87 million people in New York are on private wells (<http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf>); several people per household corresponds to hundreds of thousands of wells. The 1990 Census estimated 824,000 households on private wells in New York (<http://www.census.gov/hhes/www/housing/census/historic/water.html>).

What year were private water well construction standards implemented? Suggested insertion:

“took effect in 19XX are still in use.”

For the last sentence of the first paragraph, should “proposes” be “proposed” or “required”? Is the “150-foot setback” from the gas wellhead to the water wellhead?

In the second paragraph, does “well points” mean driven wells?

The long quoted section on springs could be cited by reference rather than being repeated here. For clarity “from springs” could be inserted before footnote 38.

In the final paragraph of this section, the definition of potable vs. salt water comes from the cited source, but there is no explanation of the importance of this number or why it differs from the drinking water standards cited in 2.4.3 (250 ppm NaCl, 1000ppm TDS vs. 250mg/L Cl⁻ (EPA, DOH), 500mg/L TDS (EPA)).

Next sentence, edit to “wells less than 850 feet deep that produce salt water” or “wells shallower than 850 feet that produce salt water”. The second half of the last sentence is vague. Who is determining the local potable water depth, the Department or the applicant? What constitutes “best available data”?

2.4.6

p.2-24, middle paragraph– Were other regional offices of NYSDOH and the many county health departments asked about groundwater contamination related to natural gas drilling?

The Harford Water District case in Cortland County should be addressed (described by the Cortland County Health Department in their comments on the 2009 dSGEIS http://cchd.cortland-co.org/images/ehpdfs/pdfs/evh/programs/public/water/sdgeis_comments_18dec09.pdf)

Although the brine contamination of surface and groundwater was not specific to HVHF, it is relevant to how the Department will regulate wastewater handling and provides a reference for buffer distances.

What contaminants were an issue in Chatauqua County (e.g., turbidity, salts, SVOC, methane)?

The statement “References have been made to some reports...” is vague and sounds dismissive. Active voice might improve the tone. The last sentence is also vague – what are “improper tests”, and what would constitute official confirmation?

p.2-25, final paragraph first sentence – sentence structure is confusing; suggested replacement: “In February 2007 at a gas well in the Town of Brookfield, Madison County, an operator caused turbidity in nearby water wells when it pumped compressed air for many hours in an attempt to free a stuck drill bit.”

Is there a reference for this incident?

last paragraph, I think his title is

Geoffrey Snyder, Director of Environmental Health, Madison County Department of Health.

Turbidity is discussed in 6.1.4.1, which cites the 1992 GEIS review of this subject and should be mentioned here. While the focus of the SGEIS and this section is HVHF, it would be helpful to explain here whether this turbidity occurs due to vertical drilling, horizontal drilling, or hydraulic fracturing.

2.4.7

There are several summary statements about watersheds that are not quite right (although some of the language is lifted from pages on the DEC website). The number of watersheds is arbitrary and depends on the scale applied. All watersheds in New York ultimately drain to the Atlantic Ocean; there are thousands of small-scale watersheds. The 17 watersheds used in many Department classifications are sensible functional groupings, but some of those watersheds flow into others (e.g., the Mohawk and Upper Hudson into the Lower Hudson). A watershed is matched to a single water body (not plural water bodies). All land on earth is in watersheds, so it is meaningless to say oil and gas drilling has occurred in watersheds, whether before or after 1821. Watershed boundaries are not always marked by obvious high points; they are based on elevation differences which can be subtle in relatively flat areas.

This entire section will need to be updated with respect to the new state water withdrawal legislation passed in 2011 (ECL Article 15 Title 33), as well as any regulatory updates by DRBC and SRBC.

p. 2-25 second full paragraph (inserted sentence) – It should be noted that regulation of the three watersheds discussed below extends beyond New York State. Areas outside those three basins fall under the new Title 33. Many watersheds fall under additional local drinking water source protection.

2.4.7.1, last paragraph

“discharge or release of pollutants” is vague; is this permitted discharge vs. accidental release?

“recommending approval” sounds weaker than the actual authority of the DRBC; its regulatory powers should be clarified.

2.4.7.2 – There is little discussion of the regulatory powers of SRBC with respect to gas drilling.

2.4.7.3

First sentence suggested revision:

“The New York part of the Great Lakes-St. Lawrence River Basin includes all or parts of 34 counties, including the Lake Champlain and Finger Lakes sub-watersheds.”

There is no explanation of the regulatory powers of the various Great Lakes agencies with respect to gas drilling. It would be helpful to provide links to the organizations.

2.4.8

First sentence suggested revision: “...is based primarily on volume and recharge.”

p.2-29

first paragraph, suggested revision:

“Groundwater recharge occurs when the amount of precipitation exceeds the losses due to evapotranspiration (transpiration by plants plus all evaporation), water retained by soil moisture, and surface runoff that flows beyond the recharge area. Typically, losses due to evapotranspiration are large in the growing season and less groundwater recharge occurs during

this time. Groundwater also is recharged by inflow from streams, lakes, and rivers, either naturally or from changes in subsurface water flow induced by pumping.”

A pumping test would be used to determine the yield; wouldn't the safe yield be a calculation based on that test result?

second paragraph, suggested revision:

“Surface water replenishment occurs from direct precipitation, from surface...”

third paragraph – the second and third sentences duplicate the first and could be deleted.

fourth paragraph – the second sentence is unnecessary (defines a flood, circular). Is there a citation for the length of drought relative to flooding in New York?

p.2-30 – The parts of speech in the bullet points are not parallel and some items are unclear, e.g., how does a financial payment recharge ground or surface water?

final paragraph – it would be helpful to put the first sentence last in this paragraph, after passby has been defined.

2.4.9

p.2-31, first paragraph, suggested revision: (start with the definition before using the term):

“Floodplain development is defined to mean any manmade change...or storage of equipment or materials. A floodplain development permit...floodplain development activity. Permits must comply with local floodplain development laws (often named Flood Damage Prevention Laws)...off-site flood damages. These local laws...in mapped flood hazard areas be built to certain standards identified in the NFIP regulations (44 CFR 60.3), the Building Code of New York State, and the Residential Code of New York State.

What does “virtually all” mean? The paragraph says development “must” start with a permit, but what happens in the other non-NFIP communities?

second paragraph – The 1% annual flood chance is the scientific basis; the 100-year flood is the common but often misunderstood metaphor of that probability.

suggested revisions:

“The BFE is the basic standard for floodplain development regulation, used to determine the required minimum elevation...”

“The floodway is the area that must be...”

“a separate...” would go with “map” not “map or maps”

What is meant by “more hazardous floodways” – in terms of physical flooding, chemicals, fire, monetary damage?

What does “in particular for floodways” mean – as opposed to the floodway fringe?

last paragraph suggested revision:

“Each community that participates in NFIP has a designated floodplain administrator who ensures that construction standards have been met before issuing a floodplain development permit application. This is usually the building inspector or code enforcement official.”

The floodplain section is presented without explaining what is most relevant to gas drilling, that chemicals in floodplains are at higher risk of contaminating surface water, groundwater, and surrounding land than if located on higher ground. It is not just a matter of physical water movement and damage.

2.4.9.1

This section should be rewritten to include more discussion of the 2006 Susquehanna River flooding and the extensive August-September 2011 flooding in the Southern Tier, Catskills, Schoharie Valley, Mohawk River, and other areas. Flooding does not identify concerns, it causes concerns.

2.4.9.2

This section also needs to be updated.

“Appendix 1 Alpha’s Table 3.4” = “Appendix 1”?

It is unclear who is doing which mapping in this section.

2.4.9.3

This section also needs to be updated.

2.4.10

suggested revision:

“Freshwater wetlands, commonly called marshes, swamps, sloughs, bogs, and flats, support aquatic or semi-aquatic vegetation. These areas are valuable resources, necessary for flood control, surface and groundwater protection, and wildlife habitat. Freshwater wetlands also provide opportunities for recreation, education and research, and aesthetic appreciation. Adjacent areas may share some of these values and, in addition, provide a valuable buffer for the wetlands.”

The wetland classes are not defined, nor is a reference to the classification provided, so the relevance of classes to gas drilling is not clear here.

third paragraph, suggested revision

“In the Adirondack Park, the APA regulates wetlands above one acre in size, and smaller wetlands that have free interchange of flow with any surface water. The FWA requires the Department and APA to map and classify wetlands.”

In the last sentence of that paragraph, is 100 feet a perimeter distance (not an area of 100 square

feet)? This may seem obvious but it is important for permitting gas well pad locations.

last paragraph, suggested revision:

“FWA regulates uses that...”

What are “continuing ongoing activities”? That should be explained or deleted.

Chapter 3

3.2.1, p.3-5, Third Scenario – “chemical information” is vague and could either be expanded or included in “other information”. A semicolon may be needed after “chemical information”.

3.2.2.2, first paragraph, final sentence – suggested revision: “...permit coverage for the well pad will be based on submission...”

3.2.2.3, top of p.3-8 – simplify to “0.1 acre”

3.2.3, p.3-9, item 2) – Would an information change also include a change in the maximum number of wells to be drilled on the site ?

3.2.3.1 -- The first long sentence might be clearer if items were grouped and separated with semicolons. Will the permit application also include horizontal distances, orientations, and planned numbers of fracturing stages? Does “the minimum depth and elevation of the top of the fracture zone” mean the top of the target formation, or the top of the expected fractures to be generated (the latter would be shallower)?

3.2.3.2

Should the first sentence also include the volume of water? “provide information” is vague. How would applicants get a list of previously approved water sources? To reduce the number of sites the Department must monitor and to reduce impacts of additional withdrawal infrastructure (e.g., gravel truck pads and access roads, potential littoral damage), it would be good to direct operators to existing locations. It may help to cross-reference this section to Chapter 5.7.

3.2.3.3

first paragraph – insert “both” in “scaled distances from the proposed surface location of both the well and the closest edge of the well pad to the relevant resources and features.”

“rig fueling tank(s)” should either be explained or there should be a reference to a later Chapter. If the tanks are located on the pad, many of the water features would already be covered by the first bullet of this group. If so, this bullet could be shortened, or it would at least be clearer to list the water features in the same order.

final bullet – delete “whichever results in the greatest number of wells” as all the existing wells from either distance method would be included with the language “and/or”. Most of the well information would be coming from the Department’s own database, but as long as details are being included here, it seems reasonable to add “location” and “completion date”.

3.2.3.4

first paragraph – remove the comma after depth.

final bullet and paragraph after it – Do the DOW water well information search wizard and the downloadable geodata files provide the same information? What are the oldest records in each?

“diligent efforts” could be open to interpretation. “municipal officials” includes a broad variety of people with varying levels of relevant information about water wells. For consistency and to prevent unnecessary workloads for local officials and duplication of efforts by different agencies, it would be helpful to present an list of required data sources that applicants should consult in order. Examples could include the cited EPA and DOW database s; NYS DOH Bureau of Public Water Supply Protection; DOH regional office(s); NYS DEC DOW; County Health Department(s) (if they have environmental health divisions); USGS topographic maps (<http://nationalatlas.gov>); county assessment office records; property owners and tenants; and an appropriate local government official, e.g., a town supervisor. Suggested optional data sources could include additional municipal officials, local DEC registered well drillers, trade associations of well drillers, the state office of the USGS. It is not my place to assign work to any of these groups, or to rank them in importance, but I think that DEC should make the water well identification procedure more structured.

One of the greatest challenges will be identifying abandoned wells or wells on vacant property. It will take diligence of many interested parties to apply local knowledge to that problem. Although the focus of this section is protecting drinking groundwater supplies, abandoned gas and water wells could present problems for gas well drillers and ultimately for groundwater.

In the final paragraph, why is the Department restricted to “internally” available information? As the lead agency, the Department needs to verify other sources of information; if the applicant has provided good documentation and sought confirmation with appropriate local sources, this should be relatively easy to check.

3.2.3.5

second bullet – Should this also include storage until reuse or treatment?

third bullet – Facilities or disposal wells in other states need to be verified, so delete “located in New York”.

3.2.3.7

It would be helpful to provide a link to the Interim List. Is this part of the application intended as a baseline against which future site reclamation will occur? Who is qualified to assess invasive species? This is a different field of knowledge from most of the requirements for the permit application. How finely must the local area be surveyed? A plant species survey will have different results depending on the season.

3.2.3.9

It would be helpful to provide more specific examples of local ordinances and contact

information, and to cross-reference this with Chapter 8. Permit applicants may not be familiar with local government in New York.

3.2.3.10

A cross-reference to the section in Chapter 7.4 would be helpful.

3.2.4

Does the Department have the final word on map location determinations?

Is 5) referring only to water bodies for public drinking water supply, i.e., water supply reservoirs and not reservoirs in general?

For 6) How would a property owner's waiver be documented as part of the permit?

How will freshwater impoundments be considered in prohibited locations, since they are not a direct part of the well pad for calculating distances?

3.2.5

first paragraph, change "on the pad and whether" to "on the pad or whether"

2) for "a known fresh water supply", this should be changed to "the deepest known fresh groundwater source". I would recommend prohibiting HVHF within 1000 vertical feet of the deepest fresh water supply source, and triggering site-specific review for drilling within 1000-2000 vertical feet. See my comments under 6.1.6.2

3) Suggested revision "Any proposed well pad over or within a 500-foot buffer around a Principal Aquifer (subject to reconsideration...)" pulling up the sentence after item 10).

4) 150 feet is a short distance from the well pad to drainage systems for triggering additional site review. It would be reasonable to increase this distance, or to account for slope and drainage rather than just surface distance (i.e., surface disturbance could have a greater affect on a steeper slope above a stream or storm drain). Are drainage ditches between fields or along roadsides included in this section?

6) Suggested revision, "from a pond, lake, or reservoir;"

8) How would the pump test data be generated before permitting? Would this be for cases where the water well already exists close to a wetland? "influence" is vague.

10) Flowback water should be stored in containers, not impoundments.

p.3-16, second full paragraph

The Department should also consult with Soil and Water Conservation Districts as appropriate. What is the timeline for developing permit conditions and BMPs, or does this mean it will be

done for each site-specific review in an Agricultural District?

Should “farm in an Agricultural District” be generalized to “property”?

In the next sentence, does “Staff” mean Department (i.e., DEC) staff?

The Division of Mineral Resources should provide “requirements” not just “guidance” on minimizing surface disturbance.

p.3-17, first line – Why is “active” specified?

General procedural questions for Chapter 3 – How will the order of permits being issued be handled? What would happen in the case of overlapping proposals for spacing units, (e.g., an unleased parcel of land between leased parcels could be included in multiple spacing unit proposals)?

Chapter 4

4.6, first paragraph

Insert a comma to split the compound sentence in “uranium, and gamma ray logs”.

Cite a source for the statement “The Marcellus is known to contain concentrations of NORM such as uranium-238 and radium-226 at higher levels than surrounding rock formations.”

Disturbance is a deviation from normal conditions, so “Normal disturbance” is an odd turn of phrase.

Last sentence – delete “to come under”

4.7 The writing in this section is very disorganized, and does not follow an outline of topics.

Suggested new first paragraph pulling from sentences scattered throughout and edited:
“Methane is a colorless, odorless gas, and is the main chemical in natural gas. Often landowners are not aware of the presence of methane in their well. It is generally non-toxic when dissolved in water, but can present an explosion hazard if a water well or building is not properly vented. The action level for methane recommended by the U.S. Department of Interior, Office of Surface Mining is 10 mg/L (in air? in water? be specific). The maximum solubility of methane in water is XXX mg/L.”

first paragraph p.4-36

“swampy areas” is not very technical. A better explanation would discuss methanogenic bacteria in low-oxygen wetlands, etc., which is relevant to source determination of methane in investigations.

Last sentence – gas-bearing should be hyphenated as it was earlier.

second paragraph – Delete the first four sentences (duplicative of things earlier and later) and move the others as suggested above.

p.4-37

first paragraph, suggested revision, not including footnotes; it is still a string of facts rather than an analysis:

“The existence of naturally occurring methane seeps in New York has been known since the mid-1600s. In August 1669, explorers observed natural gas flowing from joint planes in the Penn Yan Shale (Upper Devonian) at the foot of a falls over the Genundewa Limestone in the Bristol Hills area of Ontario County. Natural gas drilling began in western New York in the 1800s. A private water well in Schenectady County provided natural gas for the owner’s domestic use from 1965 to 1995. In 1987 engineers from the Department reported methane in well water in the Orchard Park subdivision near New Scotland, Albany County as “natural occurrences found in shale bedrock deposits beneath the development.”

The two sentences about Saratoga County are confusing. Is this the same neighborhood? Are these reports just statements to reporters, or did the reporters make observations? Did any scientists or engineers investigate at either time? Blasting, hydrofracturing a water well, and hydraulic fracturing for natural gas are different procedures and it is not helpful to conflate them here, even if the newspaper reports were confusing. Was the attempt to increase yield from the existing well or to drill deeper (“reach”) into a different supply? The Saratoga County information was stuck into a paragraph about naturally occurring methane, but was this considered natural methane or a contamination event?

p. 4-37, final paragraph – This is all speculation and generalization. What is “often”? Are the next two sentences talking about methane, yield, or overall water quality? “mechanical failures” of what? Delete this entire paragraph and put a proper summary paragraph at the end of the chapter.

p.4-38, first paragraph – indicate the counties. This section confuses investigation of historical records (well drilling records and interviews; historical chemical data are not mentioned) with present-day well conditions and chemical analysis. While historical records can indicate naturally occurring methane, “clear evidence” would be baseline chemical data.

middle paragraph – Change “adhered to” to “followed”

next paragraph – The study is by Osborn et al., not “Duke” “The authors” classified wells, not “Duke”. The action level information is background to put earlier in this section (as suggested above), not specific to this study. Report the actual concentrations from the study; all were low with a large standard deviation in the inactive sites.

last paragraph – Comparing across three parts of the state does not make sense; report the results from each region, or the range.

Add a paragraph or several sentences summarizing that methane can enter shallow groundwater, and therefore private water wells, naturally, and that isotopic studies and comparisons before and

after gas drilling must be used to distinguish natural versus gas drilling origins of gas.

Although the focus is on methane migration in New York, including references to scientific studies and reviews in Pennsylvania is appropriate given the geologic similarity between the Northern Tier of PA and Southern Tier of NY. These studies would include the PA portion of Osborn et al. 2011, PA DEP investigations in the northern tier of PA, and the recently released private well water study by Penn State researchers: http://www.rural.palegislature.us/documents/reports/Marcellus_and_drinking_water_2011_rev.pdf. (“The study’s pre-drilling results for dissolved methane also provided new information that documented its occurrence in about 20 percent of water wells, although levels were generally far below any advisory levels.” and “Most post-drilling methane levels were generally near or below the detection level (<0.02 mg/L) even after drilling and fracking had occurred (See Figure 8). Dissolved methane did increase at one drilled site but this site also had a moderate level of methane before drilling occurred. Dissolved methane did not increase at fracked sites and was not correlated to the distance to the nearest Marcellus well site.”)

For the final SGEIS, the Department should make sure that 2.4.6 and 4.7, which address water contamination from different perspectives, are consistent. The former considers only scientific studies valid, while the other includes newspaper articles.

Chapter 5

5.2.3

second paragraph – a comma may be needed between circulating and mud

5.2.4.2

It would be helpful to provide examples of reference values for radioactivity of (1) surface air; (2) surface rocks; (3) drinking water aquifer rocks; (4) ground and surface water; (5) some sort of organic matter (soils, wetland sediments, humans, etc.); (6) more than one data point on other deep rocks. The term “background” is used but this is a relative term – is the baseline surface air, surface rock, or something else? This section and others in the dSGEIS summarize background radioactivity and radioactivity of other rock layers without providing data or references.

from 5.2.4.2 “As discussed further in Chapter 6, the results, which indicate levels of radioactivity that are essentially equal to background values, do not indicate an exposure concern for workers or the general public associated with Marcellus cuttings.” “results” here are Tables 5.2a, 5.2b, and 5.3 – all Marcellus Shale data except one from PA Hamilton Limestone (gamma, Ra-226, Th-232, and K-40 only); no background values provided.

from 4.6 “The Marcellus is known to contain concentrations of NORM such as uranium-238 and radium-226 at higher levels than surrounding rock formations.” (no data sources cited)

from 6.1.9.1 “Gamma ray logs from deep wells drilled in New York over the past several decades show the Marcellus Shale to be higher in radioactivity than other bedrock formations including other potential reservoirs that could be developed by high-volume hydraulic fracturing.

However, based on the analytical results from field-screening and gamma ray spectroscopy performed on samples of Marcellus Shale, NORM levels in cuttings are not likely to pose a problem because – as set forth in Section 5.2.4.2 – the levels are similar to those naturally encountered in the surrounding environment.” (no data sources cited)

6.7 “Chapter 4 explains that the Marcellus Shale is known to contain NORM concentrations at higher levels than surrounding rock formations, and Chapter 5 provides some sample data from Marcellus Shale cuttings.”

Together these state that Marcellus Shale has higher NORM than surrounding rocks, but that it has the same NORM as “background values” and “surrounding environment”. So Marcellus > other rocks but Marcellus = background, so background > other rocks? Is that true?

Table 5.3 needs a full title (including that these are PA Marcellus cuttings from March 2010), to be corrected on p.5-iii as well.

Table 5.3 looks like a scanned image of a spreadsheet. It could be made larger and clearer by deleting the first two or three columns, shortening “transported gas rig cuttings” to “transported cuttings”, deleting two blank columns toward the right and narrowing the three data columns on the right. Element abbreviations were used in Table 5.2a. Averaging the variety of samples in the table does not really make sense.

Table 5.3 uses uR/hr while Tables 5.2a and 5.2b used mR/hr. What do the slashes and asterisks in the gamma column mean?

5.2.5.1, last sentence – can this be narrowed to sections 7.1 and 7.7?

5.2.5.2

first paragraph – How does a container designed to hold fluids and damp solids have “open sides”? While an opening must be used to add and remove fluid and to allow air to enter or leave with fluid volume changes, what is the difference between “closed top” and “open top” here?

p.5-38

first paragraph – change “dryer” to “drier”

second paragraph – moisture content and free liquids (occurs twice) are not hyphenated; sawdust is a compound word.

It may make sense to swap the order of the second and third paragraphs (the latter explains primary and secondary containers while the former refers to them and talks about final liquid handling before transport off-site).

p.5-39 It may be worth restating that these economic advantages for operators are in addition to the environmental protection mentioned in the 5.2.5 introduction.

5.3

first sentence - To clarify, suggested start: “Chapter 9 of the 1992 GEIS discusses hydraulic...” and it would help to use serial commas (inserting after acid and after inhibitors). Is nitrogen here N₂ gas?

second paragraph, first sentence – suggested revision “...states that recent developments in water-based fracturing technologies have reduced the concentration of chemicals...”

p.5-40 top of page

two subject-verb agreement corrections: permeability allows; use reduces.

last sentence of the paragraph – Define “formation damage” and whether this is in the target formation or other formations.

last paragraph – Have both been proposed in the Marcellus Shale in other states, or via permit application in NY?

5.4

General comments on this section:

It is difficult to assess the environmental and health risks of fracturing fluid in the environment. There are uncertainties about materials handling accidents, environmental concentrations, exposure pathways, and the toxicology of the constituent chemicals. An issue neglected by this section and most of the public discussion of fracturing fluid is that the properties of a mixture of chemicals can not be determined by looking at the properties of the ingredients separately. An MSDS is usually written for a pure chemical in a particular phase, or an exact mixture of chemicals, for functions like transport, handling, and laboratory protective equipment. The risks of a mixture may be greater or less or simply different than the risks of separate chemicals. Solid salts will dissolve in water and not exist as the original compounds; other ions may combine and precipitate; acids and bases will dissociate in water and react; pH changes will affect solubility; etc. In the case of fracturing fluid, chemicals are added in sequence precisely because they change the chemical and physical properties of the fluid. Toxicological risks may or may not be additive for different compounds within and across classes, and the risks have not been studied for some of the pure chemicals. This all becomes even more complicated for wastewater that includes chemicals from the target shale formation.

This type of analysis would be difficult to do, but I think this issue should be discussed in at least a general way in the SGEIS. If, as suggested in this section, fracturing fluid will indeed only have a small number of components, and not a tremendous number of initial compounds within those, and if fracturing fluid and wastewater samples have been analyzed, it should be possible to make some general statements about whether the initial fracturing fluid components remain in solution or are transformed. Do various compounds remain in their original state, dissolve in the fluid, or precipitate? As a result, do the environmental risks change? In other words, are the MSDSs and related documents relevant for just concentrated ingredients, or also for fracturing fluid or, ultimately, for the wastewater? Or do risk assessments for fracturing fluid and wastewater need to be based more on the actual chemical characteristics of those solutions (pH, TDS, actual concentrations, etc.)?

This section also does not discuss reuse of initial flowback water in future fracturing fluid. If the fluids are reused by the same company, in the same local area, and the number of ingredients is small, the composition of fracturing fluid may be generally similar to that mixed from freshwater, but it will be more complicated and less certain than a recipe of fresh water and pure chemicals. The top of page 5-122 mentions that additional friction reducers, scale inhibitors, and biocides may be needed, or that new additive products may need to be developed. Given the treatment requirements for all waste fluids, it may not change how fluids need to be handled, but the implications of reuse for fracturing fluid composition should be discussed in the SGEIS.

Specific comments on this section:

First sentence – insert “by volume” for the percentages (figures later in the section are by mass).

It may make more sense to go through the fracturing fluid functions and classes of additives covered in 5.4.1 and 5.4.2 first and then go through the detail on pp. 5-41 to 5-48 that precedes 5.4.1, i.e., to move this detail into section 5.4.3 with the other detailed chemical information based on the same survey of companies.

p.5-41 top –Is the Department confident that this represents a good cross-section of the service companies and sector chemical suppliers likely to operate in New York?

Was footnote 41 meant to be alphabetized?

7 lines down – suggest insertion: “Within these 167 products are 322...”

near bottom of paragraph – “the product has not been proposed for use in HVHF in New York to date” Does “proposed” mean in pending permits for HVHF in the Marcellus, Utica, etc., in New York, used in PA, proposed by the companies surveyed, or proposed and used in other gas drilling projects before HVHF?

last sentence – correct the cross-reference to Section 8.2.1.1.

Are the names in Tables 5.4 and 5.5 unique, either standard chemical names or unique trade names, e.g., there is only one product called “AI-2”? If not, could the manufacturer name be provided, e.g., “AI-2 (ACME Chemicals)”. There is a problem with the name “Salt” since salt is both a general term for ionic compounds and a common name for sodium chloride. Leaving general chemical names lower case could distinguish them from capitalized trade names.

Instead of putting them into two separate tables (5.4 and 5.5) which are really just lists, the two lists could be combined, with another column indicating the level of disclosure. and a third column listing CAS #s where possible, e.g., “101 and 102” vs. “unknown” vs. “101 and unknowns”. These product lists would be more meaningful with a fourth column for additive type, or sorted alphabetically within additive types (terms from Table 5.6). This would also show duplicates or different trade or common names for the same substances (e.g., several for nitrogen gas; hydrochloric and muriatic acid). A more organized list would support the

suggestion that there are similar chemicals in each class, and that the chemical variations of fracturing fluid may not be as complex as a long list of products might suggest.

Since the chemical lists in this section are being provided for “informational purposes”, it would be helpful if a web page of chemicals was provided for the public, with links from chemical names or CAS#s to MSDSs or CAS records where possible. This probably cannot just be done within the electronic version of the SGEIS since it would not translate to the legal paper version. This sort of public disclosure could also be done over time for chemicals for which permits have been issued rather than the full list of potential chemicals.

5.4.1

“Non-reactive” does not make sense – some of the products are used because they react to perform their function; these are not inert chemicals. As stated in 5.11.3, “...some are expected to be consumed in the well (e.g., strong acids) or react during the fracturing process to form different products (e.g., polymer precursors).” Was the intention to suggest limited side reactions, or stable compounds?

“Minimal residuals” – residuals of what in what after what?

“formation damage” – again, this term first used in 5.3 needs to be defined somewhere.

“Minimal environmental effects” – vague – does this mean as used or in case of a spill?

5.4.2 including Table 5.6

Again, what does “proposed” mean here in the introductory sentence and table title? “to date” – as of when?

As described in 5.9 on pp. 5-94 to 5-95, fracturing fluid additives are used in a particular sequence. Rather than alphabetical order, additives classes could be put in roughly the same order, e.g., acid, corrosion inhibitor, iron control; buffer, friction reducer; clay stabilizer, crosslinker, gelling agent, microbicide; proppant; breaker, etc.

In the surfactant purpose, what is meant by “fluid recovery”?

In the acid purpose, “providing an accessible path” is an odd phrasing and not necessary. “Muriatic acid” is an old common name for hydrochloric acid, not a different example.

The punctuation and capitalization are off in the examples for clay and corrosion control types.

The 47 footnote superscript could be moved after “beads” since that is the only bracketed item; the footnote itself could have “Proppants” instead of “Chemicals”.

top of p.5-51 – Delete “range of”. Move “typically” to “however, typically, only one”

Are the examples of compositions based on planned recipes?

Last sentence – suggested revision, “Based on this data, approximately 84-90% by mass of the fracturing fluid is water; approximately 8-15% is proppant ; and the remainder, typically <1%, consists of chemical additives described above.”

Photo 5.17 – Is the purpose of this to show the grain size? The photo could be cropped to save space or to enlarge the sand. The grain size could be described in the text.

Pie charts, while popular, do not provide more information than a clear table, and can be misleading and harder to read. Figs. 5.3, 5.4, and 5.5 could be replaced with a single small table as shown below. If pie charts are used, the same colors should be used for additive types across figures.

	Fayetteville Shale	Marcellus Shale 1	Marcellus Shale 2
Water	90.60	90.23	84.30
Proppant	8.96	9.11	15.00
Acid	0.11	0.40	0.67
Corrosion Inhibitor	0.001	0.0008	0.0006
Iron Control	0.004	0.020	0.0019
Friction Reducer	0.08	0.09	0.04
Buffer	0.01	--	--
Gelling Agent	0.05	0.001	--
Crosslinker	0.01	--	--
Clay Stabilizer	0.05	--	--
Bactericide	0.001	0.020	0.041
Breaker	0.01	0.00006	--
Surfactant	0.08	0.10	--
Solvent	--	--	--
Scale Inhibitor	0.04	0.02	0.008
Total (rounding error)	100.00	99.99	100.06

p.5-54 – The paragraph of text was mostly covered earlier at the start of 5.4.3.

Single sentence – Does this refer only to Marcellus? This is covered in the Conclusions section.

Table 5.7

Capitalization varies.

Footnote 54 – make sure “proposed” is clear

Footnote 55 – does “drilling” refer to drilling mud components?

5.4.3.1

first paragraph – ends in a run-on sentence; already covered earlier.

second paragraph – the dangling “compiled by NYSDOH” is unclear; perhaps rewrite the sentence with NYSDOH as the subject of the verb “grouped”. What is a “handful”? A small number of chemical additives is expected or typical, but the number has not been restricted so far in the SGEIS as “will only involve” might suggest.

Table 5.8 – Capitalization varies. The CAS # column could be made much narrower.

Footnote 57 change to “CAS Number within category”.

Why doesn't NaOH have a CAS # of 1310-73-2?

p.5-75

top – delete “one way or the other” and “that is undetected and/or unremediated”

first paragraph – This sounds like the human health impacts assessment will only be done after a spill, “If an actual contamination event such as a spill were to occur...”

For the sections by chemical classes, there is variation in how concentration is considered. Almost all of the compounds can be acute lethal poisons if consumed in concentrated high amounts. This is discussed for formaldehyde but not ethylene glycol (used in antifreeze) or ethanol for example.

Is the focus of these summaries for worker exposure or exposure via a contaminated aquifer? For acute or chronic health impacts?

p.5-78, Other Constituents – If health effects information is “lacking”, it is not in the toxicology literature to be searched.

p.5-79, last paragraph of section – What is “an upset condition”? What is meant by “proportionally larger” – in proportion to a single smaller well or a combination of smaller wells?

5.5

first sentence – Why is “DOT-approved” in quotation marks?

p.5-80, end of second paragraph – can this cross-reference be narrowed to 8.1.2 and 8.1.3?

5.6

second sentence – split the sentence in two for clarity, “reasons. Materials are”

p.5-81, second paragraph – “qualified personnel” and “common observed practices” are vague. Refer to specific requirements or defined best management practices for New York. This section should cross-reference to 7.1.3.3 which gives more information about spill control, which is one of the most important mitigation requirements for the well pad.

5.6.1, p.5-82, second bullet – what volume do these trucks carry?

5.7

This section needs editing. Verb tenses are all over the place and there is an excess of passive voice. Phrases like “typically”, “would likely”, “could be”, “may be”, “would need to be” etc. are used so often, and without citations or cross-references, that it is hard to tell whether information is current industry practice, current or proposed regulatory requirements, or general commentary.

first sentence – This is awkwardly written. Water volume depends to a large extent on the depth

and length of the well, and volume estimates are described more clearly in 5.9.

under Distance – insert “or pumping” after trucking. What is “water supply efficiency”? Operators, not routes, consider roadway wear.

under quantity - recommended change: replace “avoids the need to utilize” with “is preferred over”

5.7.1

first paragraph – How are freshwater delivery pipelines regulated, within this document (Chapter 8?), by the Department, or by outside agencies?

p.5-84, first line – Change “different stages” to “each stage”

p.5-85, end of first paragraph – It would be helpful to indicate the color of the tanks in Photo 5.7

5.7.2

first paragraph – is “a water management plan” a specific thing or does this just mean practical planning by an operator?

third paragraph – Cite references for the first and last sentences.

5.8 - See comments under 3.2.5 2)

5.9

p.5-92

top – replace “during fracturing operations” with “installed prior to fracturing operations”. The intermediate casing string is located between the surface and production string, but is installed before the production string is in place. It might be clearer to state that intermediate casing is installed within the surface casing and then production casing is installed within the intermediate casing. The “toe” is not defined as the far end until p.5-93.

first paragraph

Delete “Before perforating the casing and pumping fracturing fluid into the well,”; foreshadowing is confusing.

Is “treatment pressure” “hydraulic fracturing pressure”?

second paragraph – specify which “tanks”

Photo 5.24 Shows three lines and says three wells are being prepared. Preparation or fracturing of multiple wells at the exact same time is not discussed in the text.

There is no explanation of the perforation step here or in the summary in 5.15. Public discussion of fracturing often describes hydraulic fracturing pressure as blasting holes in the shale, and a better explanation of the perforation step prior to fracturing would be helpful, e.g., from

http://extension.psu.edu/water/marcellus-shale/hydrofracturing/introduction-to-hydrofracturing-1/copy_of_introduction-to-hydrofracturing/view

“After all casing runs are placed, a well service company perforates the production casing so that the well can collect fluids from the targeted formation. To accomplish this, the larger drill rig replaced by a smaller completion rig or a large crane. The rig or crane lowers a tool called a perforating gun into the production casing on a cable or by coiled tubing. The perforating gun is a long pipe with holes positioned along its length. The holes are loaded with explosives connected to a signal line running through the middle of the pipe. The pipe is lowered and pushed in the casing to a selected formation zone where the well is to collect oil or gas. A technician sends an electrical charge to the tool causing the explosive in each tool hole to detonate and punch through the steel casing and cement next to it. The next step is to pump diluted hydrochloric acid down the hole to clean out the well, dissolve the cement at each perforated zone, and expose the rock formation. The spent acid solution is removed as each zone is washed, and can be recycled. The gas well is now ready to be “fraced.””

Do any intermediate fluids return to the surface as wastewater (which could be simpler to reuse or treat), or only the final mixture of all the additives in flowback water? The description quoted above from PA states that hydrochloric acid is reused, and is not just diluted in the fracturing fluid that becomes flowback wastewater.

p.5-94

first paragraph – Insert “of time” after intervals.

second paragraph

What does “when the well is shut-in” mean?

For the sentence about “seepage in strata...”, seepage of what substance – water, fracturing fluid, existing formation fluids?

Can the cross-reference to Chapter 6 be more specific?

p.5-95, end of long passage – A new paragraph break after “formation clays.” might be helpful. It may also be helpful to start the paragraph with the “After hydraulic fracturing is complete...” passage and move the “The final step...” sentence down to end the paragraph, assuming the flush occurs along the entire lateral after all stage plugs are removed.

What material is used in stage plugs? Are they removed or milled into debris which becomes part of the flowback waste?

5.10

second paragraph – remove commas around “using the slickwater method”

third paragraph, final sentence – what does “treat” mean?

p.5-99, first paragraph – I have no idea what the second sentence means.

5.11 Is there a step, such as connecting the well to gathering lines, that provides a clear divide between flowback water and production brine? Is the wastewater handled separately?

5.11.2 – Provide the most important cross-references. Watertight is not hyphenated.

5.11.3

p.5-101 top line, change consists to consist (fluids is plural)

first paragraph – Generalize to other organic shales, not just the Marcellus.

bullet points – These “classes of parameters” are unclear and not mutually exclusive. Chlorides and sulfates are anions, not the only “dissolved solids”. Calcium is a metal and usually found as a cation (calcium is listed twice). Iron solids, mineral scales, dispersed clay, hardness compounds of metals, and possibly bacteria could all be part of suspended solids.

last paragraph – Clarify that Table 5.9 is pooled from multiple sites. What are detection limits for these substances? Without concentration information, it is hard to evaluate this list as many of these compounds would be “present” with no harm in aquatic habitats, drinking water, etc. Table 5.9 should be sorted alphabetically including the entries without CAS numbers. Provide some clarification on similar parameters such as “calcium” vs. “calcium, dissolved”. Is the former “total calcium” or “solid calcium salts”? Elemental calcium, sodium, potassium, magnesium, etc. will not be present.

Footnote 103 – provide a citation for the Marcellus Shale Coalition Study.

p.5-105 – It would be helpful to move this paragraph up before Table 5.9.

In Tables 5.9, 5.10, and 5.11, it does not make sense to treat properties of all aqueous solutions like pH, TDS, conductivity, and temperature as parameters to be detected. Detection implies a presence/absence or a concentration.

What is the regulatory difference that separates Tables 5.10 and 5.11? It is mentioned in the Table titles but not explained. What is “barium strontium p.s.”?

p.5-109 - It is confusing that the explanation for this study follows the presentation of data from it in Table 5.9. The first sentence is written like a press release celebrating the study instead of just explaining what it is. The bullet points are not parallel and do not all complete sentences that start with “The study:” What makes an analyte “conventional”?

Tables 5.12-5.21 could just be lists in columns, or parts of a single table

Table 5.12 – What is “nitrate-nitrate”? Nitrate and nitrate can be measured separately, combined by conversion to nitrite prior to analysis (sometimes written as nitrate+nitrite), or nitrate is calculated by difference of (nitrate+nitrite) - nitrite.

p.5-113 – Does the check mark indicate several samples over time at the same well? It would be helpful to give an example of the numbers in Table 5.23, e.g., In Well A, 7 out of 70 VOCs were detected on one or more sample days. Cells marked NA in Table 5.22 should be marked NA in Table 5.23, not zero. For that matter, the information in Table 5.22 could be reduced to a footnote to Table 5.23 since the only exceptions are marked with NA. The lab report qualifications about dilution and data flag keys are pointless here since we do not have the lab report.

p.5-115 – It could be noted that 16/70 VOCs, 26/107 SVOCs, and 9/20 organochlorine pesticides were detected in at least one well at least once. These tables could just be lists in columns.

p.5-116

As noted in the first paragraph and in comments for p.5-101 above, it is very difficult to interpret what all these tables mean with so little information about detection limits and laboratory quality control, much less to draw environmental risk information from this, e.g., for baseline water testing requirements.

No results are provided about source water samples and fracturing fluid samples which were mentioned in the second bullet point on p.5-109.

p.5-117 The information in Footnote 111 should be brought into the main text, or added to Table 5.24. Actually, the gross alpha numbers for NY in Footnote 111 exactly matches the range given for PA and WV data in Table 5.24, as does the maximum gross beta and the min and max for Radium-226, so maybe the title for Table 5.24 needs to be corrected. Delete the median column in Table 5.24 if it is not going to be used.

5.12

first paragraph – suggested revision: “Operators plan to maximize their reuse of flowback...” Delete “straight”. Add a comma after “Originally,” and delete “out” after “precipitate”.

bullet 1 – some parameters do not have concentrations

bullet 2 and final paragraph – “allowable” suggests a regulatory requirement, but these are practical operational limits on reuse.

p.5-119

Table 5.25 The title includes “based on input from one expert panel on Barnett Shale”. That should be cited or explained. It also says “maximum” but a range is provided.

It would be clearer to group the operational factors by chemistry vs. logistics, etc. An additional operational factor is timing of future fracturing jobs.

p.5-120 – How does “Density of neighboring population” affect treatment and reuse?

5.12.1

first line – substitute “needed” for “required” unless this will be a Department requirement.

second paragraph, suggested revision “One vendor provides a filtration unit that vibrates to increase filtration efficiency”. Based on estimates of 0.2 to 2.7 million gallons of wastewater per well, this unit would need to run on the order of 10 to 100 days.

p.5-121

top – What fouls the filter packs? (bacteria, sediment, minerals?)

first paragraph – What does “cleaner” mean here?

last paragraph – What is “excess treatment”? The final unit described would need to run 7 hours to 3 days.

5.12.2

first paragraph – Suggested revision, “Because high concentrations of certain parameters in flowback water may adversely affect the desired fracturing fluid properties, recycling without treatment is not always possible.”

It would make sense to collapse 5.12.2 and 5.12.2.1 into one section called Dilution if the example provided is reused with only dilution and not additional treatment.

5.12.2.1

first paragraph – What is “a partial snapshot”?

second paragraph – “Operators may propose...” Will this also be true for New York? Will there be a procedure where operators much decide and label how particular tanks will be used or disposed, with storage time restrictions on each?

Figure 5.6 – again, pie charts are not as useful as good tables, particularly with black text on dark colors and a huge range of percentages. Are these percent by mass or volume? Can the “recycled water” be characterized further, e.g., is it 85% water? Can any additives from recycled plus new sources be totaled? Most of the other chemicals it brings will be small in the total composition, but it would be helpful to have sample numbers for that. The significant digits on “other” are ridiculous and the number is formatted as a decimal instead of a percentage.

5.12.3

There is no discussion in this section or its subsections about where radioactivity is partitioned and concentrated. This could be an important aspect for waste disposal options, e.g., if some metals are precipitated with similar hardness chemicals.

first paragraph – Replace “gas-shale” with “shale gas”.

Figure 5.7 – This is more of a flow chart of options than a “configuration” of treatment technologies, which sounds like a physical diagram. It would helpful for this diagram to show the products from each technology (solid waste, liquid waste, liquid for further treatment, liquid for reuse, etc.). The font size could be increased if the diagram were rearranged. It would be

helpful if the subsection titles (including filtration and ozone) were indicated on this diagram.

5.12.3.1, p.5-125

first paragraph – Delete “prior to RO” and the semicolon after the parentheses.

last sentence – Replace “units, which” with “units that”

5.12.3.3 – Is there a reference for further reading on the Higgins Loop system?

Table 5.26 – Is the membrane life estimate the time in active use, or the total lifespan? The columns are not arranged in the same order as the subsections of the text.

5.12.3.6, first sentence – Should “thermal distillation” be substituted for “evaporation”?

Table 5.27 –The columns are not arranged in the same order as the subsections of the text.

5.13.1, last sentence – suggested revision: “Disposal of shale gas well cuttings in NYS is not expected to be precluded by high NORM from disposal...” The final version of the SGEIS should have appropriate cross-references to other sections on mud drilling cuttings, e.g., 5.2.3, 5.2.4, 5.2.5, and 7.1.9.

5.13.2 – How would the landowner’s permission be indicated – in the lease, permit application, etc.? Pits from HVHF could be larger than for smaller vertical wells. Will the ground be marked in any way (signs, survey markers, etc.) to indicate pit liner burial? Will the Department have records of pit burial locations?

5.13.3

first paragraph – Can “or unavailability or infeasibility of treatment options for other reasons.” be deleted or shortened to “or other reasons.”?

p.5-131, first bullet – indicate that UIC is under US EPA

final paragraph – “...and injection for enhanced resource recovery in oil fields have also been suggested.” Has oil field injection been formally included in a permit application in New York? Is this a possibility for HVHF wastewater?

5.13.3.2 – What does “upsetting their system” mean? (on p.6-63 the phrase “inhibition of biological activity and sludge settling” is used) The subject is POTWs plural. The related EPA pre-treatment standard program currently under review should be discussed in the SGEIS.

5.13.3.3 and Table 5.28 need to be updated to reflect current regional POTW policies.

5.13.3.4 – Remove the comma after “January 2009”

5.13.4 – Please be more specific and provide more information about “residuals disposal...into disposal wells.” Are residuals also taken to municipal landfills?

5.14

first sentence – Start the sentence with “Gas wells...” Can “stimulation” be replaced with “fracturing”?

second sentence – Replace “ahead of” with “before”. Is productivity of most shale gas wells in the region high enough that New York can require gathering lines be developed before well completion?

final sentence – This is the SGEIS; perhaps this sentence can be clarified with cross-references to other sections.

Table 5.15

As mentioned before, perforation is missing.

In the Duration for Horizontal Drilling, was “one to two wells at a time” discussed in the text?

In the Activities for Fluid Return, should “tanks, lined pits, impoundments, or pipelines” be shortened to “tanks” due to closed-loop handling requirements?

5.16.1 – Can this section be cross-referenced to one with more detail on reclamation, in the SGEIS or GEIS?

Table 5.30 – Some trailing significant digits appear to have been lost (i.e., right-most zeros missing).

5.16.2.2 – What are “active interconnects”? Will H₂S gas monitoring equipment on well pads be required for worker protection?

5.16.4 – Are there any environmental management or regulation implications due to shared equipment? For example, is shared equipment more efficient, or would it present problems during an investigation or emergency shutdown?

5.16.5 – Please provide an explanation or cross-reference of how DEC will be involved in brine storage tank inspections.

5.16.6

first sentence – Delete “, which are all discussed in the GEIS”. This section could be shortened by referring to the similar but more complete passage in 5.13.3.4, or each of the two sections could be shortened to cover only flowback water or production brine .

Is all production brine assumed to be too salty or contaminated for reuse in fracturing fluid? Again, this brings up the question from above about when flowback water becomes production brine.

5.16.8

middle of the first paragraph, “flowing the wells” is an odd construction that might sound better as “having wells flow”, “making wells flow”, or “controlling well flow”

Chapter 6

First paragraph, suggested revision:

“...Program (including the 1998 draft volumes and 1992 final volume) and the 1992 Findings Statement.”

6.1, second paragraph

After item 6), insert a sentence such as, “There are also impacts from aquatic invasive species but these are discussed mainly under ecosystem resources in 6.4.2.2 and 7.4.2.2.”

The statement about subsurface water supply infrastructure should be generalized to all such infrastructure. In many cases public infrastructure is above ground or in areas where natural gas development is unlikely to occur, but rural and suburban communities can have subsurface public drinking water and/or wastewater infrastructure. Damage to such infrastructure from drilling, new access roads, and heavy truck traffic is possible and cooperation with local government and utilities will be critical.

Revise the last sentence to “Potential water resources impacts...”

6.1.1 – “water supply” is not hyphenated (occurs twice). “surface water” is not hyphenated.

6.1.1.2 – Why does this section only mention streams as opposed to all water bodies?

6.1.1.3

This section is specific to flowing water (rivers and streams) so the title should be changed to Impacts to Stream Habitat

The writing style in this and subsequent sections is verbose and many ecology terms are thrown together in ways that are not meaningful. Writing style does matter, e.g., “some semblance of natural flow pattern” would actually mean a reduced or approximate version of the natural flow regime.

Suggested revision for this section:

“...formed by periodic disturbances and seasonal variability in stream flow resulting from precipitation and associated runoff. Maintaining habitat diversity within a stream channel is essential to provide suitable conditions for all life stages of aquatic organisms. Stream fish ...channel morphology. Habitat diversity is a function of seasonally high flows that scour fine material from pools and deposit bedload in riffles. Streamflow management decisions should maintain sufficient flow for habitat and sufficient variation for the natural disturbance regime to continue.

6.1.1.4

Suggested revision:

“Water withdrawals can adversely impact aquatic ecosystems by reducing water quantity, altering stream habitat, changing water quality, changing water temperature, or causing physical damage from the withdrawal infrastructure. Aquatic species...are among the factors known to affect aquatic and riparian species distributions.

Improperly installed...aquatic organisms including fish and macroinvertebrates as they are withdrawn with water. While the life history and behavior of most species of fish in the region will make entrainment of early life stages unlikely, older fish and other types of organisms may be affected. Intake pipes can be screened...location of the withdrawal structure on the water body, and the site-specific...operational measures that have proven effective...narrow slot width...”

There is no discussion of physical disturbances such as dust, erosion, and runoff. There is no discussion of removal of trees and other vegetation on streamsides and lakeshores, which provide shade and erosion control.

6.1.1.5 – Delete the final sentence

6.1.1.6

First two sentences – Aquifer depletion can also affect springs. “numerous groundwater withdrawals” is vague. Suggested revision after “used for hydraulic fracturing.”:

“A decline in groundwater level (i.e., a lowering of the water table) can occur when wells tapping an aquifer are pumped at a rate in excess of the recharge rate of the aquifer. It is also possible...that recharges and aquifer. Aquifer depletion may also result in aquifer compaction...unconfined aquifers.

Aquifer depletion can lead...streams, lakes, and wetlands, with corresponding...these habitats. Many New York headwater streams are derived primarily from groundwater in the summer.

Depletion of downstream groundwater, surface water, or wetlands can occur...out of the recharge area or basin from which they originated.”

6.1.1.7

Delete the first “in”.

The estimate for 30 years’ worth of wells does not translate into the number of simultaneous water withdrawals. Large volumes of water are needed early in well development, specifically for the fracturing step.

What is the “study area”? This should be addressing NYS.

Suggested revision: “There are several types of potential cumulative impacts from water withdrawals for natural gas development:”

p.6-7

first paragraph – This is a run-on sentence with subject/verb mismatch.

second paragraph – Move this paragraph and the bullet points beneath down after the explanation of the regulatory scheme for DRBC and SRBC, before the NYS Water Resources Law, and remove duplicates. The third sentence of the original paragraph can be simplified to “DRBC and SRBC require that operators and the reviewing authority perform evaluations...” The verb “consider” sounds advisory rather than regulatory. Make sure it is clear what authority SRBC and DRBC have over water withdrawal and related permitting.

p.6-9

Delete Figure 6.1 and the two sentences about it. NYS is geographically large and populous and the raw numbers for the other states are irrelevant.

Most summed NYS values are not as useful as an analysis by major watersheds (Susquehanna, Delaware, Hudson, etc.) including transfers.

Rather than a pie chart, the data for Fig. 6.2 could be presented in this type of table (I did not fill in all the percentages).

Withdrawal use, millions of gallons/day	Current		Projected Peak HVHF	
Thermoelectric power	7140	69.4%	7140	69.3%
Public supply	2530		2530	
Industrial	301		301	
Domestic	140		140	
Aquaculture	63.1		63.1	
Irrigation	51.1		51.1	
Mining	32.9		32.9	
Livestock	29.8		29.8	
HVHF	--	--	24.7	0.24%
Total	10290	100%	10310	100%

third paragraph – suggested revision: “While most withdrawals remain in the basin...”
Withdrawals are not returned if they never leave.

last paragraph – suggested revision: “Water withdrawal volumes associated with current natural gas drilling are small compared to all withdrawals in NYS, as are projections for HVHF withdrawals. The total volume...”

p.6-10, first paragraph – The data in 5.12.2 had $3.84/4.27 = 89.9\%$ fresh water. Wells in New York will be shallower for the Marcellus Shale, perhaps larger for deep Utica Shale. Provide a citation or cross-reference for the peak number of annual wells drilled.

Figure 6.3 – It is a bit misleading to have the export and consumptive pies the same size.

6.1.2

first paragraph – Suggested revision:

“Precipitation is the ultimate source of water for surface and groundwater. Surface runoff, whether from rainfall or snowmelt, is a valuable resource. However, excess or stormwater runoff, particularly when it interacts with the human environment, also conveys contaminants from the land surface to streams, lakes, and groundwater. This is especially true where material is washed into a nearby surface water body from asphalt,... and earthen construction sites.

second paragraph – Insert a comma after aquifers.

third paragraph – snowmelt is a compound word

fourth paragraph – macroinvertebrate is not hyphenated. Suggested revision: “...levels of nutrients including phosphorus and nitrogen that contribute to algae blooms, ...”

p.6-15, top – rather than “on-site drilling pit”, use consistent terminology.

This section should refer to SPDES permitting, at least by cross-reference to other sections of the SGEIS.

6.1.3

first paragraph – suggested revision: “vandalism, vehicle accidents, ground..”

second paragraph

second line – insert a comma after the first “additives”

Replace “traditional” with “conventional” or “non-HVHF”

What is “an upset condition”?

After “As mentioned earlier”, give a cross-reference. Insert “2011” before “review”.

6.1.3.1

This section states “poor casing construction”, the next “poor well construction and grouting”. Unless there is a difference, these could be parallel.

For “Pit leakage or failure...”, specify the type or types of pits relevant to this stage of HVHF.

6.1.3.2

Replace “stimulation” with “hydraulic fracturing” or “fracturing”.

Suggested revision: “grouped into categories in Table 5.8. Table 6.1 presents a comparison of the list of possible additive chemicals, chemicals regulated...”

It should be noted that MCLs are established for what is likely to be found in public drinking water supplies in quantities of concern, so the absence of an MCL does not indicate the absence or risk. It would be helpful to put the EPA and NYS MCLs adjacent in Table 6.1.

6.1.3.3

Tanks will also be used earlier in the drilling process for several purposes. Does “tank leakage”

here refer to storage tanks that are at the site for a longer time?

There will be fewer employees on site during this phase than earlier, which would reduce the risk of some human errors, but it may also take longer to notice some problems such as leaks unless inspection by the operator and the Department is frequent.

The last three paragraphs of this section could be shortened a bit since the tables are explained in Chapter 5. Some of my comments from that section will carry over to this one. Some properties such as pH are not the same as contaminants. Functional groupings of the chemicals in this table (either function for HVHF, chemical characteristics, or risk assessment) would help to make sense of this information by clustering similar chemicals. Capitalization of chemical names is inconsistent.

p.6-18 top – Radionuclides impacts are discussed in 6.7, not 6.8.

6.1.3.4

It might make more sense to start with the background information and definitions, but the first sentence is a nice summary statement.

second paragraph, first sentence – Suggested revision: “About half of NYS residents outside of NYC rely on groundwater for potable (drinking) water.” It might be good to give a number for upstate NYS excluding both NYC and Long Island, since the Primary and Principal designations are used for Upstate NYS (<http://www.dec.ny.gov/lands/36064.html>, <http://www.dec.ny.gov/lands/36119.html>, http://www.dec.ny.gov/docs/water_pdf/togs213.pdf).

To the last sentence on p.6-36, I would add, “...future public water supply use, development patterns, and population shifts.”

In or after the fourth paragraph (bottom of p.6-36), please include an important passage from the TOGS (http://www.dec.ny.gov/docs/water_pdf/togs213.pdf):

“In regard to the ability to yield water to wells, there is intended to be no difference between a Primary Water Supply Aquifer and a Principal Aquifer. The only difference is that one is used intensively now, and the other is not. **The Principal Aquifers are, in effect, the potential Primary Water Supply Aquifers of the future.**”

This makes it clear that there is no consistent difference between Primary and Principal Aquifers in geology, hydrology, water quality, or susceptibility to contamination. Aquifers could be moved between the two categories in the future. Given the spatial location of the aquifers shown in Fig. 2.1, Fig. 2.4, and various DEC diagrams linked above, it is likely that pairs of Primary and Principal Aquifers are hydrologically connected, especially during floods. **The two categories of aquifers should receive equivalent protection from surface spills.**

The example described in Fig. 6.4 and the last paragraph of p.6-37 does not mention why 2000’ depth to the Marcellus Shale was chosen. An explanation for the green color should be added to the Fig. 6.5 legend.

Additional detail about mapping Primary and Principal Aquifers could be noted. “The Division of Water is ultimately responsible for making the formal determination as to whether a location is within a Primary Water Supply Aquifer Area or a Principal Aquifer Area.”

(http://www.dec.ny.gov/docs/water_pdf/togs213.pdf) and “When consulting these maps it is important to keep in mind that they were created at a scale of 1:250,000 and thus show only the general extent of the aquifers. They were not intended for detailed site evaluations.

Determination of the precise location of aquifer boundaries or of well yields may require additional data. (<http://www.dec.ny.gov/lands/36119.html>)” Also, the recharge area of an aquifer as mapped on the surface may not correspond exactly to the spatial extent of an underground aquifer, so the maps and resulting protective buffers should be based on the surface recharge area to be protected rather than the aquifer (groundwater-bearing rock) per se. Given how shallow these particular aquifers there is probably not much of a difference.

Given the locations of many Principal and Primary Aquifers in stream valleys, it would be helpful to add a brief discussion of flooding to this section and to cross-reference it to the sections on floodplains. Restrictions on drilling in important aquifers and floodplains, among others, are likely to overlap rather than restricting development in separate areas.

6.1.4

first sentence – This sentence is a little unclear. Can “The wellbore being drilled, completed, or produced” be changed to “A wellbore undergoing development”? Can “is ineffectively sealed” be changed to “was poorly constructed or has been damaged”? “nearby” is vague.

second paragraph – Gas wells on a multi-well pad will also be closer to one another, at the surface at least, than conventional wells covered in the 1992 GEIS.

The risks for contamination of private water wells increases for older or poorly constructed water wells, and for private water wells that are located near (and may share groundwater with) older, improperly abandoned, or poorly constructed water wells.

6.1.4.1

What is the lateral distance over which turbidity impacts are seen? It would be helpful to review this topic, especially with respect to gas wells.

The recently released private well water study by Penn State researchers includes information about sediment and changes in naturally occurring metals (which could be affected by changes in local redox conditions) due to drilling

(http://www.rural.palegislature.us/documents/reports/Marcellus_and_drinking_water_2011_rev.pdf). This study is undergoing revision and peer review and will likely be published during the Department’s comment review period. As one of the few studies with baseline, post-drilling, and post-fracturing private water supply data, it should be included in the final SGEIS. Some excerpts:

“These three cases each involved changes in sediment/metals. Each water well had pre-drilling manganese concentrations near or below the drinking water standard (0.05 mg/L) that increased far above the drinking water standard after drilling occurred (shown as circled points in Figure

11). These same water supplies had increased iron concentrations after drilling (Appendix I) and one also experienced a large increase in total suspended sediment (Appendix I) ... Sediment and/or metals (iron and manganese) increases due to aquifer disturbance during drilling can also show impacts to water wells from gas drilling. Overall, less than 1 percent of the water wells in this study showed quantitative evidence of sediment and/or metals increases that were noticeable to the water supply owner and confirmed by water testing results. Occasional changes to groundwater can be expected with any land disturbance or drilling activity, and are often short-lived, but they are still disruptive to water supply owners... Impacts that did occur appeared to be related to disturbance or drilling activity rather than fracking.”

Another particular well provides an example of the possible spatial and temporal extent of these types of disturbances after drilling and fracking: “...increases in numerous other water quality parameters. While these increases were apparent, they did not exceed or closely approach Safe Drinking Water standards. These increases were observed just days after fracking was completed on a Marcellus well approximately 1,400 feet from the water well. Organic carbon levels did not increase in this well after fracking. An additional post-drilling sample was collected from this water well approximately 10 months after fracking, which showed nearly all parameters...had nearly returned to pre-drilling concentrations.”

6.1.4.2 – A review of the EPA Region 8 study in Pavilion, WY that is currently under review should be included in the final SGEIS. It will likely have implications or justification for the casing and other construction requirements for HVHF.

6.1.5

Throughout the SGEIS, and particularly in this section, the terms “NYC watershed” and “Syracuse watershed” should not be used. Watersheds are defined based on water bodies, not cities. This section is not about Onondaga Lake or the Hudson River. Precise language is not trivial as there will be many regulatory and legal implications from this part of the SGEIS. There are physical separations between these cities and their drinking water supply watersheds. There are multiple source watersheds for NYC. Other municipalities use each drinking water supply system. Other municipalities are actually located in the drinking supply watersheds. You could refer to some acronym such as “Syracuse drinking water supplies (SDWS)” or “NYC drinking water supplies (NYCDWS)”. Since the justification for prohibition of HVHF natural gas drilling in these watershed is their EPA FAD status, it would be better to refer to an acronym based on “drinking water sources with FAD (FADDWS)” or “unfiltered municipal supply watersheds”. Should any other drinking water supplies receive a FAD in the future, it would also be covered by these provisions.

p.6-43, first paragraph – The first part of the first sentence is awkwardly worded and sounds as though unfiltered surface water systems have caused a public health problem.

6.1.5.1, end of first paragraph – “stormwater” is a compound word

Information about the 2011 floods should be added section 6.1.5 or one of its subsections.

6.1.6 – Include information about the EPA Region 8 Pavilion study.

6.1.6.2, first bullet – The term “developable shale formation” is unclear. If this is an expectation about what parts of the Marcellus formation are likely to be attractive to operators, it cannot be assumed in place of regulations. Since the Marcellus and Utica shales outcrop within the state, the vertical separation from drinking water is not always at least 1000’. As stated in the quote on p.6-54, “most of the extents of both shales are found at depths greater than 1000 feet in New York.” Section 3.2.5 states that permit applications for drilling with less than that vertical separation will trigger site-specific SEQRA review, so such locations exist and are not prohibited.

I do not agree with the interpretation of the data in Fisher 2010 (by Pinnacle/Halliburton in Fig. 2 of (<http://www.bfenvironmental.com/pdfs/inducedfracturingoilreporter.pdf>)) given the much smaller vertical separation of the Marcellus Shale from fresh water in New York. Examples of fractures in Pennsylvania in very deep Marcellus wells (5000 to 8500’ in that data) can extend vertically for more than 1000 feet. The text states, “Almost 400 separate frac stages are shown, color coded by state. As can be seen, the fractures do grow upward quite a bit taller than in the Barnett, but the shallowest fracture tops are still $\pm 4,500$ feet, almost one mile below the surface and thousands of feet below the aquifers in those counties.” While that is far below the freshwater aquifers in PA, the Marcellus Shale is much closer to the surface in New York.

The exact length of fractures is not predictable, and is not monitored in every fracturing operation, as described in Chapter 5.8. Re-fracturing may “extend the fracture length beyond the original fracture dimensions” (Chapter 5.10) so an extra buffer distance is needed to maximize resource extraction over the life of the well.

Even if engineering controls can reduce the vertical range of fractures, prohibiting fracturing close to freshwater aquifers is a reasonable risk reduction measure. **I would recommend prohibiting HVHF within 1000 vertical feet of the deepest fresh water supply source, and triggering site-specific review for drilling within 1000-1500 vertical feet separation.** The site-specific review could simply mean the Department would verify that the deepest groundwater layer is not being tapped for drinking water in that area. It could require that additional monitoring data be collected during perforation and fracturing and submitted to the Department. This would not restrict development of the deeper Marcellus Shale along the Southern Tier or the Utica Shale further north. As proposed for other setbacks and restrictions, this could be subject to future review if data submitted by operators to the Department demonstrates that their engineering controls are sufficient to prevent problems in New York. The end of this section states “as previously discussed, at the shallow end of the target depth range in new York, fracture growth orientation would change from vertical to horizontal.” This would be confirmed with actual field data. Such a review should be based on data and not on a time span of a particular number of years.

p.6-54, under Natural Controls...
 “developable shale formations” is used again.

final paragraph – The description in 5.8 does not support the definitive language about induced fractures used here.

p.6-55

middle of page, “Permit conditions will require pumping operations to cease...” Since the permit is issued before fracturing (here called pumping), how will this be enforced and reported to the Department? (This may be explained elsewhere in the SGEIS).

second paragraph – The last sentence may need to be modified – this is true at greater depth, but does not mean that fluids will be pulled toward the gas well near the surface.

p.6-56

first line – Rather than “regional dip”, is the point that elevation changes in New York are gradual?

6.1.8

Change “are” to “is”

6.1.8.1

first paragraph – Provide a technical explanation for “upsets its system” (on p.6-63 the phrase “inhibition of biological activity and sludge settling” is used)

second paragraph – Change “could be” to “will be”. Change “have treatment...water impacts” to “impact treatment....receiving water.”

p.6-58

first paragraph – Add a comma before “combined”. Change “requires” to “require”. Delete the period and comma after the second “1.3.8”. Change “whether the discharge will result in the discharge” to “whether the change will result in discharge”.

last line – change “a source” to “an agreement”

p.6-59

last paragraph – change “makeup” to “composition”

p.6-61

first paragraph – Does “native water” mean water from the target formation?

p.6-62

top of page – From the calculations, would less than 1mg/d be about 0.6mg/d or 600,000g/d?

Case Study paragraph – Is this based on the 10 barrels/d production brine rate in 5.16.5? Would another (regionally unreasonable) possibility to rule out be storing the waste and dilute it over a longer period of time?

6.1.8.3

A “)” is missing from the last sentence.

6.1.8.5

Should this refer to Sections 6.1.8.1 through 6.1.8.4? Or is only 6.1.8.4 included because it is the most feasible of the four?

6.1.9

There would also be waste from smaller chemical additive containers (bags, buckets, etc.) as described in 5.5 which could be substantial for limited time periods and would be larger than for conventional drilling sites. These materials would need to be landfilled or rinsed with appropriate wastewater controls; a reference to related Department programs would be helpful.

6.1.9.1

See comments under 5.2.4.2.

6.3

Wetlands tend to retain sediments and could concentrate contaminants, presenting a slightly different contamination scenario than in a stream.

p.6-206, last paragraph – Are these estimates national for all oil and gas development?

Chapter 7

7.1.1

Several parts of this section will need to be updated to reflect the regulations associated with the new state water withdrawal law.

7.1.1.5, second bullet – Change “Affects to” to “Effects on”

7.1.3.2

bottom paragraph – Change “includes stimulation” to “including fracturing”)

It may be useful to repeat the statement from 5.16.5, “The storage of production brine in on-site pits has been prohibited in New York since 1984.” Would the only contents of open pits be water-based drilling muds/cuttings and fresh water?

7.1.3.3 – Setbacks are detailed in section 7.1.11, not 7.1.12

7.1.3.5

first sentence – Replace “Sections” with “Section”

p.7-41 second paragraph – A large portion of the primary and principal aquifer area overlaps with other restrictions (floodplains, private wells, municipal wells, buildings, etc.) rather than adding new areas.

See my comments in 6.1.3.4, from which I conclude “The two categories of aquifers should receive equivalent protection from surface spills.” **Primary Aquifers and Principal Aquifers are equivalent and connected groundwater resources with the highest susceptibility to**

surface contamination from well pad spills, vehicle accidents, and other incidents. Both should be restricted from HVHF development. While I find it unlikely that the special protections they need will change in the coming years, any review of these restrictions should be based on appropriate and sufficient permitting experience far into the production and partial site reclamation phase in less sensitive areas, not the passage of a certain amount of time.

7.1.4

Testing private water wells is not a pollution prevention measure like secondary containment or a distance setback. Baseline and follow-up testing are needed in case of a spill or a private well owner complaint to assist the Department in investigation. Although it is not directly discussed in the SGEIS, they are also needed to assist all parties in a legal dispute. It is in the interest of private well owners, the gas drillers, and the Department to have good data about private well water quality before and after drilling and fracturing.

The dSGEIS is already requiring identification of private wells in a 2640' radius (Section 3.2.3.4), and testing to a 1000' radius (or 2000' if there are none to test within 1000'). **I would recommend identification and testing to a 3000' radius.** Most setbacks are somewhat arbitrary distances. This recommendation would provide more water quality information but does not take any additional area out of production. The Pennsylvania State University Water Extension program, which has substantial experience with the both baseline water quality and the impacts of Marcellus gas drilling on private well water in our region, has recommended testing to 3000'.

http://www.rural.palegislature.us/documents/reports/Marcellus_and_drinking_water_2011_rev.pdf. Osborn et al. discussed methane migration within a 1000m zone around private wells.

The suite of tests proposed by the Department is prohibitively expensive for many private well owners, but will be a relatively minor expense in the budget of a well pad operation. If operators are confident in their well construction, they should be willing to do extensive baseline and follow-up testing. Private well owners will want to have baseline and follow-up testing to protect their health and property value, and for peace of mind about natural gas development. It is certain that many will learn of pre-existing problems with their water quality of which they were not aware. One of the classic characteristics of large industrial-environmental conflicts is that financial benefits and environmental risks are not distributed evenly. Paying for private water well testing is one way that those who benefit financially from gas drilling can provide a valuable community environmental health service. Well testing will also provide useful information on private well water quality for the Department, DOH, and local government to use in future environmental and public health planning, including future natural gas regulation.

Some wells may fall into multiple testing circles from wellheads in different directions. The dSGEIS does not address this possibility, but there should be some provision for allowing water quality testing results to be used for multiple permit applications, rather than having one or more operators pay for duplicate tests in a short time frame. Homeowners should not have to deal with excessive third-party testing either (e.g., having to be home to provide access to water testing more often than necessary).

Test results should be sent directly from the testing laboratory at the same time to the operator, homeowner, Department, and county and regional health department(s). There is no reason for the test to pass through the operator to the homeowner a month later, or for environmental and health agencies not to have the data available and organized prior to any investigation. The Department, DOH, and laboratories should cooperate on standard reporting tools. Since the permit application will require a standard set of initial water quality parameters, that information should be organized into a standard reporting template. Raw laboratory reports are often very difficult for homeowners and even water quality professionals to interpret. A summary sheet of the required parameters with MCL violations clearly marked and provided each time testing is done would help all parties.

In the paragraph above I mentioned county and regional health departments. **Twenty-one county health departments in NYS, including some in the Southern Tier and Catskills, do not have environmental health staff.** They refer water quality issues to their regional office of NYSDOH. <http://www.health.ny.gov/environmental/water/drinking/distphn.htm> Many county health departments that do have environmental health staff have few resources allocated for private water well programs. Even larger county health departments have expressed concern about staff time and training to deal with complaints related to natural gas development. When development increases, complaints will rise whether or not contamination is occurring. Additionally, spacing units may occur along county boundaries, so multiple counties may need to be involved. It may be advantageous to manage this water quality data and complaints at the state DOH level, perhaps at the regional DOH offices. The state DOH certifies water testing labs, has the authority to work across counties, and would be easier to fund for additional staff to manage water quality data and complaints. Or perhaps counties could be given an option about whether they would prefer to handle initial investigations themselves, or have the Department or DOH in that role. If private water wells fall under multiple testing circles as described above, the Department or DOH could help manage the scheduling and cost distribution of tests.

p.7-45

top of page – Some scheduling plan should be provided in case a HVHF well is drilled but not fractured for more than a year, or never fractured. It might be that the schedule extends for a year after drilling, and not just three months after drilling, if drilling is the final activity on the site.

The SGEIS should specify a time frame for when baseline water quality samples are collected prior to the start of drilling (e.g., within one year prior to the beginning of drilling activity).

second full paragraph – Rather than testing “may be warranted, it “may be required by the Department”.

Many homeowners with private water wells do not regularly test their water. The SGEIS does not discuss what will happen if baseline water quality test results indicate problems. Will the homeowner have time to investigate or address the problem before the drilling permit is granted or drilling begins? What if the homeowner has maintenance done on their well, or installs new treatment equipment, or shock-chlorinates the well?

Table 7.3

Barium – The parameter name should be changed to “Barium (or another drilling mud component)”. It would be helpful to provide examples of what other substances might be required.

Gross alpha/beta – Rename to Gross alpha and beta

Iron and Manganese – These tests should be for total iron and total manganese. Depending on redox chemistry, which may vary naturally or due to drilling disturbance, these metals may occur as reduced ions, more oxidized ions, or solid oxides.

Methane and ethane – Revise to “Occur naturally” and “dissolved gases”.

The procedure for measuring static water level is not explained in this section. Reference to the appropriate DOH document would be helpful. This parameter may have to be measured by a certified well driller or other professional separate from the water quality parameters.

VOCs – Clarify whether this is total VOCs or if details are provided, and whether or not BTEX are provided in detail.

I would suggest two other parameters be included in required testing:

1) **Bromide.** It is found in flowback water and could cause problems in the creation of disinfectant by-products in chlorinated public or home water treatment systems. The bromide/chloride ratio may be useful in investigations.

2) **TSS or Turbidity.** Although these vary naturally with season, rainfall, water usage, etc. this is both a parameter that may be affected by drilling and one that homeowners are likely to notice themselves.

The permit application should not be considered complete unless there are reliable data for all parameters. If laboratory equipment failed, a sample bottle was lost, samples were past the proper holding time, etc., a new round of sampling for the missing parameters should be conducted.

p.7-47. The proposed water testing program will rely on private sector water testing labs certified by the NYS Department of Health (DOH). The SGEIS should state that testing labs must be financially independent of both homeowners and gas drilling permit applicants. The SGEIS should state clearly that measurement of static water level and collection of water quality samples must be done by third-party staff of certified labs, not by homeowners or gas drillers or their representatives. Testing must be performed at a lab that is certified for the particular tests in Table 7.3, or which subcontracts to labs that are certified for those particular tests.

second paragraph – Hyphenate “in-home”

7.1.9

It would be useful to cross-reference this section with 5.2.3 and 6.1.9.

first line – Replace “the” with “a”

second line – Replace “the” with “a”

p.7-67

first paragraph – Suggested revision: “...polymer-based mud may not be buried on site; they must be managed...”

I would recommend a setback of 1000’ from private wells, with the ability of the private well owner to waive that distance. This would allow drilling to proceed where nearby leaseholders would like it to, while providing a greater buffer for private well owners who would like that extra protection, especially those who are not leaseholders. Transient effects of increased sediment/turbidity and increased metals (see comments under 6.1.4.1) are likely to occur from drilling activity in such a radius. While those water quality problems may not present a health threat, they will be a nuisance and could create financial costs due to impacts on home water treatment equipment (e.g., having to replace filters and membranes), plumbing fixtures, or appliances.

Roadside springs can act as de facto public water supplies. Will these be included in any setbacks or water quality testing?

7.1.11.1

A number of comments I made on earlier sections relate to measures in this section.

second paragraph – Section 7.1.5 does not pertain to the vertical separation issue.