BEFORE THE NEW YORK STATE SENATE
STANDING COMMITTEE ON ENVIRONMENTAL CONSERVATION

PUBLIC HEARING

TO EXAMINE WASTEWATER PRODUCED
FROM HYDRAULIC FRACTURING

The Inn on the Lake
770 South Main Street
Canandaigua, New York

December 12, 2011
11:00 a.m. to 5:00 p.m.

PRESIDING:

Senator Mark J. Grisanti
Chair

SENATE MEMBERS PRESENT:

Senator Patrick M. Gallivan

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SENATOR GALLIVAN: I'm Senator Patrick Gallivan. I represent the 59th District, which includes the city and town in Canandaigua, in southern Ontario County, and then, heads east, and cuts across Livingston, Wyoming, and Erie County, ending at the lake.

So, I'm coast-to-coast: Canandaigua Lake, out to Lake Erie.

But, I would like to welcome everybody this morning to this hearing.

Welcome, Senator Mark Grisanti, who is the Chairman of the State Senate Environmental Conservation Committee, to discuss, clearly, what is among the issues of our times.

We're in the heart of the Finger Lakes.

And, the constituents, my constituents, have raised, time and time again, their concerns about hydrofracking as it relates to the Finger Lakes and the water supply.

So, that's among the things that we're here today to focus on.

And I'd like to thank Senator Grisanti for agreeing to come out here to talk about this, which, of course, affects more than just -- than what we're facing here in the Finger Lakes, but, statewide.

And Senator Grisanti has been traveling the state, with different meetings, different hearings, in an attempt to gather as much information as possible so that we then can, ultimately, go forward, and do our jobs.

But with that, I thank you again.

I appreciate the fact that people took time out of their day to attend today.

And, I appreciate Senator Grisanti's work, and his willingness to come here and focus on the issue of water.

And, I'd like to turn it over to him.

SENATOR GRISANTI: Thank you.

Again, good morning, everybody.

Thanks for the introduction, Senator Gallivan.

I want to thank all those who are going to be testifying today, and all those who are in attendance today.

And, if there was miscommunication out there as far as how this hearing was going to be conducted, what we had is, we had people that were submitting their testimony prior to the hearing.

It's, in a sense, not a hearing as it was normally done by the DEC, where many, many people

would testify; they would get a whole two to three minutes.

This is a hearing that's going to be very specific.

As you know, hydraulic fracturing represents the most important, either, economic-development opportunity in the state, but also, most important, environmental concerns to possibly ever face this state.

So, as Chairman of the Senate Committee on Environmental Conservation, I have been asked with the responsibility, along with Senator Gallivan, to scrutinize this particular practice.

And since the SGEIS report, it's been reviewed by many individuals, including most of you here.

And during this year, I've told groups on both sides of this issue, that I would look at every issue that we have, listen to all the testimony, as it relates to fracking, and make a case-by-case determination.

But, this hearing today is narrowly focused.

The prior hearings that have been across the state have been very broad.

This hearing is specifically focusing on the

byproducts of hydraulic fracturing; and, specifically, the wastewater and cuttings.

So, that's what this hearing is limited to.

There have been hearings held by the DEC, the Assembly, many local governments, county governments, across the state, but until today, as I said, those hearings have been a little bit broad.

And our goal here today, myself and Senator Gallivan, is to just have a little bit more focus on some of the issues.

So, I'm hopeful that the experts here today, and the people that are testifying, will help educate us with their experience.

And for those of you that do want to submit comments, still, it has been extended by the DEC, from December 12th, which, today was going to be the cutoff date, to January 11.

So, that is still going to go forward.

Also, I'll remind you, if anybody is here in -- you know, we're at The Inn on the Lake, Canandaigua. There are -- there is a restaurant here, for those of you that want to either get coffee or snacks, or something like that, that is open.

But, with that said, we'll move forward.

And the first to come and testify here today is, we have from the DEC, Deputy Commissioner Eugene Leff.

And I would ask you to approach here, and begin your comments.

(Off-the-record discussion at Chairman's table.)

SENATOR GRISANTI: Gene, before you get started, I got handed to me, there was another senator -- as you know, we left this open.

There was going to be -- we sent it out to all 62 senators, to come here and listen to the testimonies.

You can see you got myself and Pat here.

We got a response from a lot of senators that weren't able to make it.

One in particular was Senator Avella, who asked me to read this statement into the record, and I will do so at this time.

He, basically, thanks myself and Senator Gallivan, "for scheduling this very important public hearing to discuss the wastewater issues involved in hydraulic fracturing.

"It is crucial that public hearings such as this are held, and people are given an opportunity

to engage in detailed discussions on the appropriateness of allowing what is very controversial, and potentially devastating form of extracting natural gas.

"I regret that I am unable to attend today's hearing. However, I urge Senator Grisanti to continue this public-hearing process regarding hydrofracking, and respectfully ask that an additional hearing be scheduled in Albany when the legislative session resumes in January 2012, so we can expand this discussion and invite additional speakers."

He goes on to state, Senator Avella:

"That while I reviewed the statements of those invited to speak today with an open mind," he has "serious reservations regarding an overall safety of this form of extraction of natural gas reserves."

"As many of you, I have spent countless hours researching the issue, and have willingly met with advocates on both sides of the issue, including industry supporters.

"However, after long deliberation," he says, he believes "that the dangers of this injury may be too great, and the risk to human health and a vital

water resource far outweigh the proposed economic benefits, which are temporary, and certainly not guaranteed."

He's "especially concerned about the health and environmental risk posed by the disposal and processing of hydraulic fracking fluids and drill cuttings."

"I have come to learn, that despite the current moratorium on hydrofracking in New York, the State currently allows hydrofracking waste products, including drill cuttings, pulverized rock, and drilling fluid to be dumped in our landfills, spread on our fields and roads, and treated in waste treatment facilities that may not necessarily be equipped to properly treat such materials.

"Much of this hydrofracking waste includes low-level radioactive waste, such as RA226, which is a known carcinogen, and it is especially dangerous if inhaled and ingested.

"It is not a stretch of the imagination to see these waste products could very easily find their way into local groundwater, directly exposing people, by ingestion of the water or by inhaling dust that comes from the local landfills, or from roads and fields where it is been spread."

He states, "A significant amount of this hydrofracking waste is being imported from outside New York, primarily from our neighboring Pennsylvania.

"Trucks cross New York State borders on a daily basis, carrying this highly dangerous waste into our state, even while we deliberate whether to allow this practice to occur within our own borders.

"We have already put many of our citizens," he feels, "at risk."

"I am in the process of amending my hydrofracking legislation, Senate Bill 4220, to prohibit the acceptance, disposal, and processing of fluid, including drill cuttings used in hydraulic fracturing processes.

"I am also the sponsor of legislation, S4616" -- Senator Avella, he goes on to state -- "which will remove the current exemption from hazardous-waste classification given the drilling fluids, produce waters and other wastes associated with the exploration, development, or production of crude oil, natural gas, or geothermal energy."

He "finds no reason why waste products from oil and natural gas activities that meet the definition of 'hazardous waste' should not be

subject to the same laws, regarding generation, transportation, treatment, storage, and disposal, as other hazardous waste products."

"The risk of catastrophic danger to the environment, the health of New York State residents, and adverse economic impacts, as a result of hydraulic fracturing, far outweigh the potential for job creation and promotion of natural gas alternatively to oil."

Respectfully submitted.

Read into the record today, 12/12/2011.

Tony Avella, 11th Senatorial District.

Now, with that said --

[Applause.]

SENATOR GRISANTI: -- we'll move forward from there.

And one thing I want to remind everybody of, and this is something that I myself and Senator Gallivan, we talked about: While somebody's testifying, or even after their testimony, I really don't want to get into, either people booing or clapping, or -- or one side or the other.

We want to conduct this hearing in a fair manner to all those that are going to be speaking; to all those that are going to give testimony.

And, I was at some of the hearings in the past. I was present in some of the hearings that they had in Albany.

And, to be honest with you, I find it quite distasteful when somebody just, you know, out of the blue, either yells, or says certain things.

Because, if it happens, and it gets out of hand, I'm going ask that you leave the hearing room so we can move forward with the people that we have, that are going to be testifying here today, both, pro and against this practice.

Okay?

With that, Deputy Commissioner, I appreciate you giving me the time to read that into the record.

You may proceed.

Thank you.

EUGENE LEFF: Good morning.

Chairman Grisanti, and Senator Gallivan, thank you very much for this opportunity to testify about wastewater and cuttings that result from natural gas extraction using high-volume hydraulic fracturing, also referred to by the initials "HVHF."

My name is Gene Leff. I'm a deputy commissioner at DEC.

Commissioner Martens sends his regrets that

he was unable to be here today.

SENATOR GRISANTI: Okay.

EUGENE LEFF: For nearly four years, DEC has been intensively studying the potential environmental impacts of the use of high-volume hydraulic fracturing to extract natural gas from shale formations in New York State.

We just completed four public hearings on the revised draft Supplemental Generic Environmental Impact Statement, referred to as the "SGEIS," that would govern natural gas exploration using this process, and we have received more than 14,000 comments already on the draft.

We previously received approximately 13,000 comments on an earlier draft in 2009.

The latest draft builds on, and greatly improves upon, the 2009 draft.

We learned much from the experience in other states, as well as from insights offered by commenters.

As a result, we have identified many measures to protect our drinking water, our air, our land, and our streams.

We have added significant protections recommended by scientists, engineers, and our

colleagues at the Department of Health, to ensure that any gas drilling that takes place is undertaken in a manner that protects public health and the environment.

The SGEIS fully examines the potential environmental impacts of wastewater that will result from high-volume hydraulic fracturing, as well as the potential impacts of cuttings generated by drilling in deep wells anticipated to be used for the development of the Marcellus and Utica Shales.

As its name indicates, high-volume hydraulic fracturing uses large volumes of water, combined with certain chemicals and proppants, to, quote, stimulate a geologic formation and free the natural gas for extraction.

DEC anticipates that each individual well will be fractured, using between, approximately, 2 and 8 million gallons of water.

After the pressure is released of fracturing, the fracturing fluid that returns to the surface is known as "flowback water."

[Slide being shown.]

And in the slide that you can see on the side, we have two columns:

One referring to flowback water. And we'll

be talking about production brine, in the other column, a bit later.

Now, flowback water is typically recovered within the first two or three weeks after fracturing. And, of the total volume of flowback, as much as 60 percent returns within the first four days.

DEC has estimated, that between 216,000 and 2.7 million gallons of flowback, per well, would be generated.

Next slide, please.

[New slide being shown.]

Data reported by the Susquehanna River Basin Commission, the "SRBC," confirms that less water than may have may have previously been anticipated returns to the surface after fracturing is completed.

The SRBC data indicate that only, roughly, 8 percent of the total fluid volume is recovered.

In addition to less water being returned, gas companies are now recycling most of the flowback water.

[New slide being shown.]

Recycling includes the removal of metals from the flowback water, either on site and at a

centralized facility.

The recycled water is combined with fresh water, and the fracturing-fluid mixture is adjusted, based on the chemical makeup of the wastewater, and then used again in a fracturing process.

Next slide, please.

[New slide being shown.]

All wastewater generated at a well site will be required, under our SGEIS, to be collected in steel tanks.

And we have, a slide on the left of this slide, are steel tanks of the type that I'm referring to.

This was deemed necessary, to prevent the risk of spills, and to reduce or eliminate air pollution from volatile organic chemicals found in flowback water.

And you may have read, Senators, of complaints in other states, of air pollution near well pads.

Frequently, this resulted from the use of open-air impoundments for wastewater which would not be utilized in New York State.

If an operator seeks to store flowback in an impoundment in a centralized location to serve

multiple well pads, this could be an exception. It would be subject to site-specific review, and discretionary approval process would be necessary, as well as, an individual permit for the construction of the impoundment, under our SPDES law.

The tanks used for flowback water would be required to be removed from the site within specific time frames shortly after fracturing operations are completed.

The tanks are required to have secondary containment, to protect against tank or equipment failures, spills, leaks, or fluid releases.

The well pads themselves will be subject to engineered stormwater controls.

In addition, DEC has proposed a series of buffered distances between the edge of the well pad and sensitive resources.

[New slide being shown.]

Over time, water from the target formation is produced with natural gas and returns up the wellbore. This water is commonly referred to as "produced water," or, "production brine."

And the slide we're now showing, again, shows on the right, some of the characteristics of

production brine, and how we intend to treat it.

"Produced water" volume, or, "production brine," is highest in the first 15 to 90 days after hydraulic fracturing, and then decreases over time.

It is very salty, and contains a high concentration of total dissolved solids.

Produced water may also have naturally occurring radioactive materials, known as "NORM," which may contribute to the buildup of scale on production equipment.

If that occurs at certain levels, as determined by the Department of Health, a radioactive-materials handling license will be required, primarily for the protection of workers.

In the Susquehanna River Basin, of 1.6 billion gallons of fresh water delivered to well pads in the basin, only 42 million gallons, or 2.6 percent, required disposal according to the SRBC.

That's because, so much of the water is being, either, retained in the geologic formations deep in the ground, or, being reused or recycled in the process.

Although the volume of wastewater which

requires disposal is expected to be reduced as a result of recycling, there still will be significant quantities of wastewater that will be generated.

And as to this, DEC will not issue any permit for drilling until it is satisfied that the wastewater will be sent to a properly permitted facility, either here in New York or in other states.

(New slide showing.)

Applicants will have to provide DEC with their disposal plans before any drilling permit is issued, including contingency disposal plans.

At this point in time, besides recycling, the disposal methods anticipated to be proposed, for both flowback water and produced water, are injection and disposal well -- injection into disposal wells or processing at water treatment plants.

And, here, we are showing in the slide some of the main requirements for wastewater treatment plant, "WWTP," approval.

But, before I address that, first, I want to refer to the disposal-well option.

These are frequently used in other states, including Ohio and Texas, but they are uncommon in

New York.

Disposal wells must be permitted if they are proposed, by both EPA and DEC. They would require a site-specific review under our SEQRA law in New York. And that's been our State's policy since at least since 1992, for oil, gas, and solution-mining issues.

However, disposal of wastewater at a well permitted in another state is an acceptable means of disposal as well.

For a wastewater treatment plant to receive any new waste stream, including flowback water or production brine, it must go through a longstanding review process, pursuant to the Clean Water Act, and the State Pollution Discharge Elimination System, "SPDES," program which requires permits.

Any plants that wish to accept flowback would have to have a DEC- or EPA-approved pretreatment, or mini pretreatment, program.

First, the plant needs to know the makeup of the waste stream.

A technical engineering analysis must be done. This is known as a "headworks loading analysis."

This must be undertaken, to determine if the

facility is capable of accepting the waste while continuing to meet its limits on effluent.

The operators must also determine whether additional capacity to accommodate this waste exists at the plant.

[New slide being shown.]

DEC sent a letter to all wastewater treatment plants in 2008, reminding them of the requirement to undertake these reviews, and to work with DEC, to ensure that they would be able to meet discharge limits and permit requirements.

And we have reiterated the procedure in the SGEIS. This is in our Appendix 22.

DEC may modify a facility's SPDES permit to allow for acceptance of this source of wastewater, and include additional permit limitations and monitoring requirements associated with the wastewater, to ensure compliance of all relevant standards.

The SPDES permit would also be modified to include limitations on the levels of NORM -- "naturally occurring radioactive material" -- that can be discharged to the facility, to ensure that there are no effects on sludge disposal of the facility.

Additionally, pretreatment would be required before material is brought to the facility.

And as you know, Senators, robust enforcement authority is available to ensure -- to assure compliance with SPDES permits.

Presently, there are no plants that are authorized to accept wastewater from high-volume hydraulic fracturing in New York.

[New slide being shown.]

However, a facility dedicated to the treatment of wastewater from the drilling industry may be proposed, and existing plants may seek to address these industrial wastewaters, or, other technologies could be developed to treat such wastewater as the use of this technology continues.

For example: A new private facility was recently permitted to receive HVHF wastewater in Pennsylvania.

So, I've discussed the publicly operated treatment facilities, and now mention the private facilities which would play an important role in this wastewater disposal process.

[New slide being shown.]

Now, the diagram that we're showing now is, obviously, not legible to people in the back of this

hall, but what we wanted to do --

[Inaudible audience comments.]

-- we wanted to show you the process that a publicly operated treatment plant would have to go through to get authorization from DEC to accept HVHF wastewater.

It's an extremely careful, intensive process.

And, at each of these steps in the process, if our standards are not met, it's, "Go back to square one. You cannot get authorization to accept this wastewater unless you satisfy all of these requirements."

[New slide being shown.]

Moving on to the subject of solid cuttings:

When a well is drilled, rock cut by the bore is returned to the surface along with any drilling fluids used.

Here, I'm not referring to hydraulic fluids -- hydraulic fracturing fluids; but, rather, water, or other fluids, that are used to drill the wellbore in the first place.

The rock that comes up is known as "cuttings."

The fluids, in this instance, do not contain any additives of the type used in fracturing fluids

that have raised concerns.

These materials are generated well before the well is fractured, and they do not come into contact with fracturing fluids.

Next slide, please.

[New slide being shown.]

Cuttings are directed to tanks that are part of a closed-loop system.

And the slide now shows, on the right side, such a closed-loop system.

Now, it is possible to use a reserve pit, which is pictured on the left side, for cuttings, and the fluids that are utilized in this very early stage, which do not contain any toxic materials.

Cuttings can be disposed of on site if the drilling has been done with water, or simply with air; that is, without the use of oil or polymer-based fluid or mud.

If polymers or oil are used, the cuttings are considered "solid waste" under our regulations, however, they are eligible for disposal in an ordinary municipal solid-waste landfill.

Again, they do not contain the toxic materials that are associated with fracturing.

[New slide being shown.]

Cuttings from the Marcellus formation may contain pyrite.

And slide now refers to that substance.

Pyrite is a natural mineral that is found in the Marcellus formation, and can result in acid rock that could potentially leach into groundwater.

To prevent any potential leaching of acids, any on-site burial of cuttings would be permitted, under our SGEIS, only if an acid drainage plan is submitted, and approved by DEC.

The plan would require management and reclamation of the impacted area of the site as well.

Basically, the acid-drainage plan requires that some lime or limestone, or other base, is used to neutralize the acid.

Cuttings from the Marcellus formation may also contain naturally occurring radioactive material, or "NORM," as I mentioned.

This is due to the high organic content of the formation, and is typically in the form of uranium, thorium, and their decay products.

However -- and this is what I want to stress -- the concentrations of radioactivity, while somewhat elevated, are similar to those naturally

encountered in the surrounding environment.

Our experts have reviewed the data on the levels of NORM, as well as, experts from the Department of Health, and they are confident that NORM from cuttings is not a public-health concern.

All the wastes, including wastewater and cuttings, will be tracked using a system similar to the one that we have in place for medical waste.

This will ensure that DEC can monitor the movement of wastes from cradle to grave.

Some members of the public have misunderstood the SGEIS on this point.

We are not saying that these wastes are medical waste; rather, we are adapting a tracking procedure that was developed for medical waste, for this new purpose.

Also, the wastes are treated as industrial waste, and any transportation from the well pad to a disposal site must be done by a DEC-permitted hauler.

All of these issues are fully discussed in the SGEIS.

As was previously pointed out, Commissioner Martens has recently extended the comment period for the draft SGEIS, and proposed

regulations, through January 11th.

We encourage the public to provide us with detailed comments on waste disposal, on the mitigation measures that we have proposed, as well as all the other issues that have been raised by this subject.

Last, I want to stress that it is important that proper oversight and enforcement of all aspects of gas drilling, including the management of wastes, be provided.

This is key to ensuring protection of public health and the environment.

Commissioner Martens has convened an advisory panel on HVHF, which was tasked with developing recommendations on state and local resource needs to properly oversee, monitor, and enforce conditions for HVHF in New York.

We expect those recommendations to be issued sometime in 2012.

Thank you.

I am happy to answer any questions you may have, and appreciate your interest and engagement on this important issue.

SENATOR GRISANTI: Thank you, Deputy Commissioner.

Naturally, we do have quite a few questions.

If you can go back to the slide that showed the open pit?

The one on the left, where it's got a reserve pit, now, you're saying that that is, basically, just for cuttings; is that correct?

EUGENE LEFF: That's for cuttings, and the fluid that's used to drill the well initially.

Yes.

SENATOR GRISANTI: Which there is no contact, prior, with fracking fluids?

EUGENE LEFF: That's correct.

SENATOR GRISANTI: Okay.

Now, isn't it true that, in Pennsylvania, let's say, in the past, that there was those holding ponds that were holding waters for fracking fluid?

EUGENE LEFF: I believe there were holding impoundments for fracking fluid that had been utilized, and was flowing back to the surface.

And that is what we are not permitting under the SGEIS.

SENATOR GRISANTI: Okay, so we're clear: So, as far as those open pits that may have fracking

fluids, and what may have happened in Pennsylvania, is, some of those lying ponds may have had cracks, where you had this fluid leaking into potential well sites, the buffer zone may have -- not have been at a distance that New York has, that would create some of those problems with regards to some people living in those areas.

Is that correct?

EUGENE LEFF: Yes, that is correct, Senator.

SENATOR GRISANTI: What -- can you explain, briefly, what the difference is, between what the DEC is doing, with regards to the fracking fluid and the cuttings, as compared to what was done in Pennsylvania?

EUGENE LEFF: As you know, Senator, there were a series of articles in the "New York Times" that discussed that subject.

And what the "Times" pointed out, was that, fluids of the type that we've discussed, flowback water and production brine, were taken, in Pennsylvania, to treatment facilities.

There was no report indicating that pretreatment was required at those facilities.

We would require pretreatment.

There was no indication that a headworks

analysis was conducted at those facilities.

We would require that type of analysis.

Only after all of those diamonds in the process that we outlined have been satisfied, would a facility in New York be able to do anything of the nature that was attempted in -- that was done in Pennsylvania.

And, so, the result of what was done in Pennsylvania, was that there were reports that contaminants actually went through the treatment facilities, had not been stopped or eliminated by the facility, and actually entered receiving waters, where, in fact, drinking water may have been extracted.

That process would not occur in New York State because the treatment facility would be violating its permit by discharging contaminants in that manner.

With respect to cuttings as well, I'm not aware that Pennsylvania had an acid-drainage requirement.

We would also impose careful requirements on the acceptance by our municipal landfills of cuttings, to make sure that high levels of radioactivity do not exist in those landfills.

In fact, we are proposing, and the SGEIS points this out, a specific limit on the radioactive reading of any cuttings.

It's a "15 picocuries per gram" limit, which is below what the studies indicate is the level at which any risk would occur.

SENATOR GRISANTI: Okay.

Now, you know that we recently passed in the Senate, and also in the State, a water-withdrawal bill and water-withdrawal regulation.

EUGENE LEFF: Yes.

SENATOR GRISANTI: And, due to the large amounts of water that may be required to frack some of these wells, what are some of the steps that are taken in order to comply with that particular avenue, with regards to the water-withdraw bill?

EUGENE LEFF: For the HVHF process, we have identified specific ecological limits on the withdrawal of water from our rivers, streams, and other sources.

We're requiring very careful measurements to be taken, to make sure that the amount of water extracted does not reduce the flow in those streams to levels that become harmful to the biota -- the animals, the invertebrates, et cetera -- who rely on

those streams.

SENATOR GRISANTI: And the -- I mean, we know in the past, the DEC's been severely cut, as far as, with the number of people; the people that are able to do any sort of permitting, inspectors, so on and so forth.

Is it the plan, either through the DEC or through legislation -- because it's that I'm for -- to make sure, that, if this procedure is to go forward, that the cost for the permitting, or any sort of cost, is earmarked to the DEC, to be able to hire additional staff, to hire additional people to look at these permitting processes, to do the inspections, to have testing done of the wells, both, prior, during, and after any of these well pads are put into place?

Is that something, that, in the SGEIS report, has been talked about: to move forward to strengthen the DEC, so it can have a handle on this, and not have things slip by?

EUGENE LEFF: As you know, the Commissioner has convened an advisory panel --

SENATOR GRISANTI: Right.

EUGENE LEFF: -- and tasked it to look at the staffing levels that will be required to do the

various important tasks that you just mentioned, Senator, and, to identify specific revenue sources that would be earmarked to pay for that additional staff.

The Commissioner has said: If we don't receive that revenue for that purpose, we will simply not issue any permits that we cannot adequately monitor.

And, so, we need the cooperation of the Senate, and the other arms of the government, to make sure that that adequate staffing is funded.

SENATOR GRISANTI: Now, you mentioned that, as of right now, there is no facility in New York that can handle any flowback water.

Is that correct?

EUGENE LEFF: They are not presently authorized to do so.

They could, possibly, if they do the adequate study, they may well have the ability to do it with minor modification to their facility.

It would depend on a review of each individual facility. And those that would require some new construction or modification of their process would have to do that work in order to accept those fluids.

SENATOR GRISANTI: And you're saying, at the present time, in Pennsylvania, there's a private facility that has recently surfaced, that is doing that?

EUGENE LEFF: That's correct.

SENATOR GRISANTI: Prior to that, they were sending the flowback water to Ohio, to dispose of it in wells?

EUGENE LEFF: As well as, sending some of the water to their own publicly operated treatment plants.

SENATOR GRISANTI: Any idea on the cost of -- what creating a private facility, to treat the hydraulic fracturing fluid, what the cost would be on a private facility?

EUGENE LEFF: I don't know that -- the answer to that, but I'm convinced that those investors and those corporations that went ahead, did that calculation, and determined that it was a profit-making operation.

SENATOR GRISANTI: Okay.

Now, one of the things that people talk about is, hazardous waste, or some of the waste, that may be in this flowback.

Do you know, are you able to tell us, how the

hazardous waste is classified, or regulated, in New York State now?

EUGENE LEFF: Many of the same precautions that we apply to hazardous waste are applied, under the SGEIS, to some of the wastes generated from this process.

In general, if hazardous waste has been generated, it must go to a designated type of landfill, or, other disposal facility.

We have been very careful about identifying what needs to go to such a special facility; and what can, from the hydrofracking process, go to a municipal solid-waste landfill.

The key is, we looked at the particular wastes here, and their characteristics, and have adopted the measures that are necessary for this particular waste stream in all its different forms.

SENATOR GRISANTI: Okay. And in the SGEIS, it talks about protocols of disclosing what the chemicals are in the water? Is that correct?

EUGENE LEFF: That's correct.

SENATOR GRISANTI: Okay.

EUGENE LEFF: And if I may add: In order for a treatment facility to accept wastes of this kind, they would have to be informed of precisely what is

in the wastewater, including the additives that have been used in the fracturing process.

SENATOR GRISANTI: Okay.

Now, you talked about, uhm, that you're going to track this as if it was -- you know, I'm not saying it is medical waste -- but, what made you go by that particular procedure of, from cradle to the grave, of tracking this as if it were medical waste?

Is it just that, that there's a procedure in place already, right now?

EUGENE LEFF: Well, it was obvious to us that there was a concern about proper disposal. And, we want to have the ability to verify that all the waste that's generated from this process has been properly disposed of.

SENATOR GRISANTI: Okay.

And, when we saw that site about an open-loop system and a closed-loop system, what does the DEC prefer? Actually, a closed-system?

EUGENE LEFF: Well, we have authorized, for the cuttings, either, of the open or the closed.

SENATOR GRISANTI: Okay.

EUGENE LEFF: So --

SENATOR GRISANTI: And that's based on your -- the DEC, and others, that have basically

stated, that, in those cuttings, that there's not any hazardous materials?

EUGENE LEFF: That's correct.

SENATOR GRISANTI: Okay.

EUGENE LEFF: Now, there is the potential for higher levels of radioactivity, and that is going to be monitored when those materials are then brought to a landfill.

SENATOR GRISANTI: Okay, a landfill that's designated to handle that?

EUGENE LEFF: That's correct.

SENATOR GRISANTI: Okay.

Now, do you know if, uhm -- if we're receiving any of this material from Pennsylvania and disposing of it in landfills here?

EUGENE LEFF: At the present time, I don't believe that the wastewater from Pennsylvania is being disposed of in New York State.

And, I'm not aware -- yes, there are cuttings that have been accepted in the Chemung landfill, but I'm not sure whether they originated in Pennsylvania or New York.

SENATOR GRISANTI: Okay.

And are those cuttings the same cuttings that we're referring to, that do not have -- or, they may

have a higher radioactive material, but, you're saying, it's not enough to -- in your studies, to cause health concerns?

EUGENE LEFF: That is exactly right.

SENATOR GRISANTI: Okay.

And at the present time, I mean, is no hydrofracking wells -- well, no permits have been issued?

EUGENE LEFF: For high-volume, hydrofracking --

SENATOR GRISANTI: Right.

EUGENE LEFF: -- that's correct.

There is, and has for a considerable amount of time, been hydraulic fracturing in lower volume of water uses, vertical wells. And that has been conducted without any significant problems of any nature.

SENATOR GRISANTI: Okay, well, let's touch on that for a minute, because I know that the EPA, in Wyoming County, came out with a site-specific problem with one of the -- I'm assuming it was a vertical well there, in Wyoming County, that had issues.

SENATOR GALLIVAN: Wyoming State.

SENATOR GRISANTI: Wyoming State.

I'm sorry.

-- in Wyoming State.

What was the difference that would be different, between New York and what they did in Wyoming State?

EUGENE LEFF: Well, the report issued by EPA last week, on Pavilion, Wyoming, was really shocking, in indicating the poor practices with respect to the cementing of the wellbore used in Wyoming.

There were instances, where there was inadequate cement around the pipe, or casing, that's used to get down into the formation.

Now, that's a very serious problem, because, whatever materials, such as the fluids used in hydraulic fracturing, or gas itself that may be in the subsurface, can then move alongside the casing, up to the shallow areas.

And EPA hasn't reached a conclusion yet, about whether that was the precise cause, but, there was contamination of drinking water in Wyoming.

The EPA said, it may have been due to the insufficient cement. It may have been due to the permeability of the rock in those locations.

And I might say, in New York State, in the

vicinity of the Marcellus Shale, we have very different geology; less permeable than was present in Wyoming.

And it may, they thought, have been due to the creation of fractures that extended up into the shallow drinking-water areas.

One of the crucial differences in New York, is that, we will not issue a permit, under the SGEIS, for any drilling proposed to be closer than 2,000 feet below the ground surface.

What they had in Wyoming, in this instance, was drilling at 1,200 feet below the ground surface. And there was only a separation of a few hundred feet between the drilling process that was going on and the drinking-water wells.

Under our SGEIS, there must be at least 1,000 feet of separation.

And that's a very big difference.

SENATOR GRISANTI: Okay, so, basically, it's the depth, and, as well the casings; which I know, in Pennsylvania, they would have a layer of steel and a layer of concrete.

And, in New York, they're talking about having a triple layer under the SGEIS report.

It's something, you know -- or, a topic that

was at another hearing: It kind of goes below the skull.

But, that's, basically, the difference between -- another difference between Pennsylvania and New York?

EUGENE LEFF: Yes, it is.

SENATOR GRISANTI: Okay.

Now --

EUGENE LEFF: And if I could add, in connection with your earlier question, Senator, the need for staff comes into play here.

We want our staff from our regional office in this area, to be out at the well pad to check that cementing, to make absolutely certain that it's been done.

In Pennsylvania, they didn't send staff to do that.

And we have proposed to the advisory panel, several key parts, points in the process, at which we have to have DEC staff at the well pad.

SENATOR GRISANTI: Okay.

Now, one of the other areas that -- that is asked about, or questions are sent about, with regards to this water, is the potential for, either, spills, or trucking accidents, or something along

those lines.

And I know the SGEIS touched on this a little bit.

What are -- what do you plan on proposing with regards to, either, the prevention of these spills, or potential for trucking accidents, with regards to this fluid?

EUGENE LEFF: Well, any transporter, as I mentioned, must be permitted under our existing regulations, so there are very careful requirements, as well as DOT regulations on transporters of material of this nature.

There will also have to be a transportation plan submitted by the operator of a well pad, that indicates the routes that are -- to be used for transportation. And that would be subject to our approval as well.

We also recognized that there could be a need to amplify the local spill-response staffs that exists.

And the advisory panel is going to consider that, and determine whether special revenues needs to be raised, in part, for that purpose as well.

SENATOR GRISANTI: The -- they talk about the brine water being used on some roads for de-icing.

And -- and you've heard of that.

I mean, is that an appropriate way to reuse this fracking water?

Or, is it regulated?

Or, is it something that is considered?

EUGENE LEFF: Well, let me distinguish between the two types of water that we referred to earlier.

The flowback water would not be permitted for that road-spreading use.

We are open to the possibility, depending on the particular characteristics of the production brine.

There is a potential that the radioactivity would be low enough, and the other constituents of the production brine would be sufficiently low, that, upon review of all the data, we would make an individual determination that a particular quantity of production brine could be used in road spreading, only after its safety has been verified.

SENATOR GRISANTI: Now, there's a -- and I know you didn't have a chance to look at it, but you said it was interesting enough, that came out of RIT, and, it's something that is being run through other colleges as well; and that's the -- that

airborne remote sensing technology, that we talked about, that would actually be able to sense, not only air, but, the technology is so advanced, for well-site development, particularly flowback waste, rapid assessments of any impact of surface or near-surface releases.

And I take it that's something -- I believe it's been submitted, but that's something that seems to be another avenue of assurances for the public, for the environment -- in protecting the environment.

Would you agree?

I know you just had a chance to look at it briefly, but --

EUGENE LEFF: It is possible that this could become a component of the precautions that are taken.

It appears that, what RIT is doing here is still in a prototype, or pilot phase, research and development, and, is not ready to be deployed.

But, certainly, anything that -- like this, that could contribute to the protection of groundwater and air would be looked at very carefully.

SENATOR GRISANTI: Well, I'm going to go over

my notes a little bit here, that I made.

I know that Senator Gallivan may have some questions, so I'll turn the mic over to him at this point in time.

SENATOR GALLIVAN: Thank you, Chairman.

I do have several questions, Commissioner, and I'm going to bounce around just a little bit.

If we could go back to the - you mentioned Chemung County as a recipient of, you believe, cuttings, although you don't know what their source is.

Why is that?

EUGENE LEFF: Why...?

SENATOR GALLIVAN: Yeah, why don't you know what the source of the materials is?

EUGENE LEFF: Well, I don't have that information with me today, but, we have very carefully reviewed the Chemung County situation.

In fact, Commissioner Martens issued a lengthy opinion -- or, decision, in an administrative proceeding, relating to it. And it certainly has all that information in it.

SENATOR GALLIVAN: So I -- so the -- in the permitting process for the landfills, is that something that's required -- when the various trucks

are bringing in the materials, they're required to identify where they came from?

EUGENE LEFF: Yes, they are.

SENATOR GALLIVAN: Or not?

EUGENE LEFF: Yes, they are.

SENATOR GALLIVAN: Okay, thank you.

Now, you mentioned -- or, we've talked about the cuttings, and we've talked about how they've been analyzed, and they don't rise to the level of producing any public-health concerns.

For the layperson, like me, what is that level, and how do you get to that point?

And, what then puts them over the edge that would make them a public-health concern?

EUGENE LEFF: There was a study by the Argonne National Lab, that generated a level of 50 picocuries per gram, which is the unit for measuring radioactivity of this type.

And at that 50, "five oh," level, there was some evidence to support a risk of health impacts.

What we have done is, worked back from that level, to make sure we don't get close to it.

And, so, we will make sure that the levels that go into a landfill or go into a wastewater treatment facility are well below that. A fraction

of that.

And if I may, this is the basic method that we utilize to set standards for air pollution.

And I'm just not -- not talking just about DEC, but, EPA, all of the states; air pollution, water pollution; we have studies that indicate what the level at which you may see a health impact is, and we work back from that, to limit emissions into the air, discharges into the water.

In all cases, we make sure that the levels that we're permitting are well below the level at which some study indicates a possible health threat.

SENATOR GALLIVAN: Do you regularly test that, or monitor that, at the different landfills?

And let's be specific with, Chemung.

I mean, which I understand, it's part of how you treat other materials.

EUGENE LEFF: There will be monitoring of that nature, yes.

SENATOR GALLIVAN: Is there now?

EUGENE LEFF: There is at the Chemung landfill, yes.

SENATOR GALLIVAN: Do we have to be concerned about the cumulative impacts of the radiation?

I mean, the -- meaning, the volume, not the

individual content of each load that's brought?

EUGENE LEFF: It could be an issue if a landfill asked us for permission to create a separate part of the landfill that was only taking fracking cuttings.

In that case, what we call "a monofill," you might get such a concentration of this material that the normal limitation would be exceeded.

But what we're looking at, at Chemung, and what we expect at most -- at these landfills, generally, is that, the cuttings will be stored, will be disposed and placed, with the municipal solid waste, and commercial waste of all types, and that we will not have that type of cumulative effect.

SENATOR GALLIVAN: Is the designation of these cuttings as "industrial waste," was that something that was designated prior to our concerns in New York State?

EUGENE LEFF: Well, that's a designation that we adopted, that has been in place for -- under our solid-waste regulations for many years.

And when we address this particular waste stream, it appeared that this was the suitable category to address, and regulate, this waste

stream.

SENATOR GALLIVAN: I've heard conflicting reports -- reports/rumors --

I haven't seen anything in print, so I don't know.

-- but, what about, in Pennsylvania; do they still receive these cuttings in their landfills?

I had received some information that Pennsylvania might no longer be allowing this disposal.

EUGENE LEFF: I had heard that the treatment facilities were no longer accepting the waste from this -- the wastewater, but I'd -- I believe that was not a binding directive --

SENATOR GALLIVAN: I'm asking about the cuttings.

EUGENE LEFF: -- and I don't recall any similar restriction being imposed with respect to the cuttings in Pennsylvania.

SENATOR GALLIVAN: But you're not completely aware --

EUGENE LEFF: I'm not certain.

SENATOR GALLIVAN: Which is okay.

With the cutting -- what's being received in Chemung County, and maybe in some other places in

the state, am I to understand correctly, that it is just solids?

EUGENE LEFF: That's correct. They cannot accept wastewater.

SENATOR GALLIVAN: Okay, thanks.

Let me move to the medical-waste tracking system, mostly because I'm not familiar with it.

Are you able to take us through the process?

I mean, you're going to use a process similar to the medical-waste tracking system?

EUGENE LEFF: It will be similar.

There will be special forums --

SENATOR GALLIVAN: Can you take us through the steps?

EUGENE LEFF: Yes.

Upon the generation of waste at the well pad, the operator of the well pad would be required to fill out a DEC form, specifying what the nature of the waste is, the volume, and the characteristics of the waste.

Similarly, when the waste was transferred to a hauler, the operator of the truck would be required to also fill out a "waste form," documenting the same types of information.

Upon delivery of the waste to a facility for

disposal, the operator of the facility would have to fill out a form as well.

All of these forms would be required to be retained by those individuals, those entities.

And, DEC would have the ability to review, at any point, any of those documents, to verify that all of the requirements of the regulations and SGEIS have been satisfied.

SENATOR GALLIVAN: I mentioned at the beginning, my district included Livingston County as well.

And, if you remember, going back a number of years, there was a mine collapse --

EUGENE LEFF: Uh-huh.

SENATOR GALLIVAN: -- a salt-mine collapse.

And what came out of that, was some ongoing testing and treatment of the brine water.

Well, a year or so ago, I visited a plant of -- a water treatment plant in Livingston County.

And they indicated that they were involved in -- I may not be terming it right -- a demonstration projection? an experimental-type project? where, under the auspices of the DEC, they treated 300,000 gallons of fracking water that came up from Pennsylvania.

I have several questions.

First: Is that accurate -- or, is it accurate?

Secondly: If it is, what were the results of that, if you know?

EUGENE LEFF: Well, we are aware that there was hydraulic fracturing fluid that was received in Canandaigua, perhaps. I'm not sure which facility you're referring to, but there were about six facilities, that we are aware, accepted vertical drilling wastewater.

I'm not aware of any high-volume hydraulic fracturing wastewater from any location, any state, that was accepted in New York.

And we don't believe that was the case.

But, we are not aware of any violation that occurred in connection with those earlier examples of treatment of wastewater from vertical processes.

SENATOR GALLIVAN: When those six plants that were accepting the wastewater --

EUGENE LEFF: Yes.

SENATOR GALLIVAN: -- was that done in conjunction with DEC, or is that something they were doing on their own?

EUGENE LEFF: Well, they are required to

report to DEC.

And, frankly, I don't know the history of each of those instances --

SENATOR GALLIVAN: I understand.

EUGENE LEFF: -- and I can't verify what the interaction with the agency was at that time.

SENATOR GALLIVAN: Can you -- going back to the -- the wastewater, the cuttings --

I've reviewed the report. I don't have 1,100 pages committed to memory, though, so, forgive me.

-- but, can you talk about some of the specific enforcement activities as it relates to the byproduct?

I mean, site visits; physically, people sitting there looking at pieces of paper, how much will they be on site? -- assuming you have the necessary resources for that.

I certainly understand that -- and it's very clear you don't have the resources now to proper-regulate any type of activities, in the calling upon the Legislature to fund it.

So, assume you had sufficient resources for just this exercise: Can you take us through some of the regulatory activities, related to the water and

the cuttings?

EUGENE LEFF: With respect to the water, we would verify the integrity of the system that was transmitting the water from the wellbore to the tanks.

We would verify -- we had seen in the slide, the blue tanks that would store this water.

There has to be piping. That has to be secure from the wellbore to these tanks.

We'd check, to make sure all of that was intact.

There has to be secondary containment, or barriers, around these tanks.

We would ascertain that the secondary containment was properly constructed, and that it was intact.

There would be monitoring of the transfer from these tanks to the trucks. Not every truck, obviously, but there would be some inspection of that nature.

That would all be done at the well pad.

But, at the publicly operated treatment works, certainly, all of the processes that I mentioned of review of data would be conducted. And, we would have to ascertain on site, that the --

any conditions or modifications of the permit for those facilities were being observed and properly applied in the field.

With respect to the cuttings, it would be important to verify that the cuttings were properly transferred to the landfill, and that the measurements were being taken, to ensure that high levels of radioactivity were not permitted in those landfills.

Those are just some of the many steps that would be taken.

SENATOR GALLIVAN: Can you go back to the slide that showed the closed- and open-loop?

I know you touched on this just a bit, but my last question has to do with the open-loop system and the reserve pit.

What happens at the very end?

So, the drilling has taking place. Eventually, this whole area gets closed up, and people move on and drill somewhere else.

But, what happens with what's in that pit?

And how do we make sure that that's not a concern?

EUGENE LEFF: Well, that pit has to be closed in a short time frame.

I don't have the days, but it's in those 1,100 pages.

And, within that number of days after the usage has ceased, that will have to be also disposed of, and that requires very careful measurement as well.

If there is a residue at the bottom of the pit that has concentrated, the characteristics in the cuttings --

For example, it's possible you could have a higher level of radioactivity at that point.

-- then that material, that residue, would have to be taken to a low-level radioactive-waste facility.

And there are such permitted facilities, or, to a special facility for -- under our RCRA -- federal RCRA laws.

Similarly, the lining would have to be disposed of, again, depending on its characteristics.

And, the water -- any remaining water, of course, would have to be disposed of as well.

SENATOR GALLIVAN: Okay.

Thank you.

SENATOR GRISANTI: And staying with that:

Is the lining itself -- I mean, what sort of requirements are there, with regards to the lining?

Because, if you're talking about a concentration that could potentially mean a higher level of radiation --

Which, if it's not concentrated, you're saying it's not a health concern.

-- but, it is possible to concentrate in an area, towards the end stages of it, what procedures or requirements are there with regards to the lining, that we saw in Pennsylvania was a problem, where they -- it would either split or crack, and then that particular fluid would leak out into the public, and into the community, where -- whether it's fracking fluid, or not, if it has concentrated levels of radiation, that could be a concern.

So, what are the requirements that are -- they're talking about with regards to that?

EUGENE LEFF: I believe what our SGEIS says about that issue, is that, our existing regulations, under our "solid-waste facility" law, must be applied to the construction of the liner and the pit.

And that -- our regulations are extremely stringent on that score, and are designed to ensure

that no liquid can pass through the liner.

I might add, that there's a requirement, to make sure that the rock is disposed in a manner that the rock itself doesn't jeopardize the integrity of that liner.

SENATOR GRISANTI: When Senator Gallivan asked you the question on monitoring, whether it's pipes, or what have you, from this flowback well, that same, I take, procedure would be in place when these facilities, or the recycling, reusing, the process for the wastewater, there's got to be monitoring, I'm sure of that.

When you have the flowback come back, these companies are reusing some of this fluid, is it the same procedure, to make sure that, whether it's in pipes, there's no leaking, there's -- there's -- how is that regulated by the DEC as well?

And like I said, you probably don't have enough people to do that, which is -- I'm happy to hear that you're saying, Well, we're not going to issue as many permits until we have a strength of people to monitor these particular situations.

But, that seems to be one the reasons why we're having this particular hearing, is focusing on the water; is that, that was a concern in some areas

in Pennsylvania, that even though you're recycling and reusing this water, some of it has a potential of still leaking or spilling.

And that's something that, you know, you don't want to have happen.

So, was that -- is that what you were talking about, with regards to Senator Gallivan's question, as far as, making sure that these pipes are sealed, and everything else?

EUGENE LEFF: That's certainly the general type of concern.

You know, Commissioner Martens was asked by the Governor to go to Pennsylvania and visit the site where -- we were all shocked to hear -- I believe it was May, possibly April, of this year, there was a serious incident at a well pad.

This was in the township of Leroy, in Bradford County.

And one thing that occurred, that contributed to that incident, was that, the berm, or wall, surrounding the well pad had not been properly constructed. Or, at least, it was not constructed in a way that would withstand the kind of very heavy rains that had occurred over that period of time.

And what happened was, the -- that corner of

the well pad sloughed down, and that, barrier, or berm, no longer operated.

So, there was, in addition, a mistake made at the well itself, that resulted in fluids being -- pouring out of the wellbore.

They would have been contained by that barrier, but it had not been built sufficiently to withstand the heavy rains.

And, so, we're going to make sure that these well pads are inspected, to make sure they are capable of withstanding the conditions they're going to be subjected to.

And, it's very important that all parts of the process be checked out before these operations occur.

SENATOR GRISANTI: You know, you mentioned -- you mentioned the weather.

It brings up a couple of things in mind.

Can you touch, briefly, on the stormwater controls that you're talking about in that SGEIS report, as well as the flood zones, which could be a problem? -- especially with, just happened recently, with the tropical storm that hit part of the area in the Southern Tier, and along the East Coast, where there could be a problem.

Can you touch on those for us a little bit?

EUGENE LEFF: Certainly.

With respect to the flooding, the SGEIS, even in its draft form, before those serious hurricane and tropical storm occurred, placed the flood plains out of eligibility for well pads using this process.

So, there will be no well pads in the 100-year flood plain.

We also were concerned to find out what happened in Pennsylvania, so we made inquiries with the Pennsylvania Department of Environmental Protection.

And, apparently, the industry got warnings of the impending storms, and made sure that their operations were secure.

And, in fact, there were no incidents that were relayed to us by the State of Pennsylvania -- the Commonwealth of Pennsylvania, indicating any accident or spillage or flooding that compromised the environment or public health as a result of those storms in Pennsylvania.

Which was very good news.

But, we are continuing to analyze that issue.

I want to make clear: Not only are we continuing to accept comments, we're still looking

at all of the issues, to see if there's anything else that needs to be done here, to make sure that we have fully protected drinking water and air and our land.

And, what was the first part of your question, Senator?

SENATOR GRISANTI: The stormwater controls.

EUGENE LEFF: Yes.

We are requiring a special permit for stormwater. It will be a general permit for hydraulic fracturing.

It will specify, and we've published -- at the same time as the September draft of the SGEIS, we published what that permit would look like.

And we invited comment on that as well.

There, we're addressing issues, such as, runoff of sediment from the construction of the well pad, construction of the roads, and, specified many of the precautions that have to be taken, which are very similar to the precautions that we require at any building site.

SENATOR GRISANTI: Okay.

Now, you touched on this a little bit, with regards to Senator Gallivan's question, with the -- the closing of a drilling site, or a pad.

And, will the DEC require post-drilling water-quality test, or water samples, or water supplies, near the drilling site?

Is that something that -- that you're going to take care of? Or is the industry going to have a burden on that?

Or -- or, who's -- who's going to take care of that?

EUGENE LEFF: Well, we're requiring monitoring of drinking-water wells on a periodic basis.

SENATOR GRISANTI: Okay.

The, uhm --

EUGENE LEFF: And, that, by the way, would be done at the expense of industry.

SENATOR GRISANTI: At the expense of the industry? Okay.

EUGENE LEFF: That's correct.

SENATOR GRISANTI: The -- in Ohio, they talk about these disposable wells being utilized to dump this fluid, in Ohio.

Is that something that was looked at here in New York?

Is that something that's feasible; pumping the water deep into the ground?

Does -- do you feel it's safe?

Something that we're not going to look at in New York? We're not interested in doing anything along those lines?

EUGENE LEFF: We would take a look at any proposal of that nature, but, there are limitations.

I'm not fully versed in what the geological concerns are with respect to that, but, we have not ruled it out.

It has, apparently, not been as easy to do a suitable deep injection well in New York State, as it is in Ohio, for example.

SENATOR GRISANTI: Okay.

All right, so that's something that's not on the table right now?

You would rather find other methods, or other alternatives?

EUGENE LEFF: It's something that is a possibility that we would have to look at.

SENATOR GRISANTI: Okay.

And, you know, this is a topic that -- the flowback water itself, and some of the production waste, it's not classified as hazardous waste, and -- or regulated as such.

Are there other chemicals that are exempt

from that particular title?

I mean, I'm just trying to figure out why the DEC decided not to classify flowback or some of the production as hazardous.

As some people are pushing for in Senate language, or so on and so forth, as if you're classifying this as hazardous waste, that's got to be treated completely different than just sending it to a facility.

EUGENE LEFF: Well, I believe it was the federal government that made that initial decision.

And, that, several years ago, that, once that decision was made with respect to federal regulation, that our own regulatory process was conformed to the federal practice.

Part of the reason for that is, is that, we operate state regulatory programs as delegated programs from the federal government. And to the extent we do that, we're required to follow the federal government's rules.

SENATOR GRISANTI: Got you.

Did you have anything further?

SENATOR GALLIVAN: Yes.

Commissioner, one more question, and it goes back to the regulation and tracking of whether it's

the cuttings or the wastewater, and the comparison is made to medical waste.

And, you may have answered it and I'm just not clear on this.

So, we're keeping track of the materials as they're moved along, from the site to wherever they go: to the treatment facility; to disposal.

Similar, in my language of the law-enforcement background, a change of custody of the materials.

EUGENE LEFF: Uh-huh.

SENATOR GALLIVAN: So there are, DEC regulators then take the paperwork and they look at it, and they see that it's properly filled out after everything is completed; right?

EUGENE LEFF: We're not going to do that for every single shipment.

We have the ability to request, or, inspect and request copies of that material, but we're not going to routinely collect all of those records.

SENATOR GALLIVAN: Understood, but it's available. And, then, when it's looked at --

EUGENE LEFF: That's correct.

SENATOR GALLIVAN: -- we say, that, yes, this was handled properly, from cradle to grave.

EUGENE LEFF: That's correct.

SENATOR GALLIVAN: But, what -- here's the question that I'm getting at: What if they don't properly dispose of it?

EUGENE LEFF: Uh-huh.

SENATOR GALLIVAN: Is there any check, from somebody just lying on the sheet of paper, or crumpling it and throwing it in the garbage?

So we know, when it lands somewhere in the grave, there's a chain of custody. And you look at the paperwork and you can see all of it.

What if they just -- what if somebody takes something and dumps it wherever they want, and this is thrown in the garbage?

EUGENE LEFF: As you know, Senator, there are opportunities to commit crimes in all aspects of our society.

We have criminal laws on illegal disposal of hazardous waste.

The waste that is not exempt from hazardous-waste regulation could just as easily be disposed in a midnight dumping situation.

And what we've done, as you know, for many years, is to create imprisonment, and significant fines, for anyone who commits such a crime.

And one of the things we are projecting, is the need for more staff in our law-enforcement division.

We need environmental conservation officers who are out in the field spotting those examples of criminal behavior.

And, it's no different from any other environmentally risky substance in our society.

Those criminal actions are, theoretically, possible. But, we have to enforce, and punish, any activity of that nature.

SENATOR GALLIVAN: Let me ask it a slightly different way.

Do we know, through the proposed regulations, and this particular process, that, a site --

These aren't real numbers.

-- produces a million gallons of something?

A million gallons of wastewater, for sake of discussion.

Do we know that?

EUGENE LEFF: Yes --

SENATOR GALLIVAN: I mean, through the proposed regulations, and various audits, you're able to determine that right at the site?

EUGENE LEFF: They are required to record the

volume of water that they send for disposal.

I cannot tell you myself, but I could find out, whether they're required to keep a log, in general, of all the volumes that are generated by the well.

SENATOR GALLIVAN: So, we know some wastewater would go for disposal, some will be recycled?

EUGENE LEFF: Yes. The large --

SENATOR GALLIVAN: Is there any other places that that water can go?

EUGENE LEFF: Well, if we're talking about water that's generated up, out of the pipe, that can either be reused or disposed of.

That's correct.

SENATOR GALLIVAN: Okay.

Do the companies -- the drilling companies have to keep track of what is recycled?

So, if you do an audit, should they have somewhere on paper, what is disposed of, what is recycled, and that should equal 100 percent?

EUGENE LEFF: I don't know the answer to that question; whether they're -- whether we are requiring the volume reused on the site.

SENATOR GALLIVAN: Okay, what I'm getting at

is: At the site, if, somehow, through audits, through the regulations, through the paperwork, if you have the ability to know all the wastewater being produced, or all the cuttings being produced, in doing it at the other end, having a mechanism at the other end, by checking the company's paperwork, to match it up, so that, one million equals one million, wherever it was, whether it's recycled, whether it's properly disposed of?

EUGENE LEFF: We will have records of the volumes of cuttings, the volume of wastewater, that is sent for disposal. And, we will have access to the records of the receiving facilities.

And we could make that comparison, yes.

SENATOR GALLIVAN: Do the haulers of the materials have to be permitted as well --

EUGENE LEFF: Yes, they do.

SENATOR GALLIVAN: -- by the DEC?

EUGENE LEFF: They do, yes.

SENATOR GALLIVAN: When they're permitted, are they permitted -- do they have to identify, specifically, where they're going?

For instance: Is a hauler permitted to go to three different facilities, or, able to go to any permitted facility, or site?

EUGENE LEFF: Well, first, the permit I was referring to is a standing permit that they get, that is good for lengthy period of time.

They don't need to come to us for a permit for each waste-disposal trip.

Once they've got their standing permit, then they're required to keep the records of each trip, that we referred to earlier, as being similar to what the records in the medical-waste area are.

SENATOR GALLIVAN: And the obligation is on the hauler to properly dispose of it?

EUGENE LEFF: That's correct.

SENATOR GALLIVAN: But, then, of course, that gets backed up by them keeping records to indicate such?

EUGENE LEFF: That's correct.

And that's subject to penalties, under our state law.

If there is a discrepancy, or a disposal that is not proper, under our regulations or the SGEIS conditions, those haulers would be subject to penalties, including high fines and revocation of their permit.

SENATOR GALLIVAN: Okay, thank you.

EUGENE LEFF: You're welcome.

SENATOR GALLIVAN: Senator.

SENATOR GRISANTI: Just, last question: The, uhm -- do we know how Pennsylvania is classifying their flowback water?

Are they classifying it as hazardous, or are they following the federal model as well?

EUGENE LEFF: They follow the federal model.

SENATOR GRISANTI: Okay. All right.

I have nothing further.

I want to thank you for providing the information with regards to -- for this particular hearing, and answering our questions.

As I said, we're trying to have it very pointed to specific topics, but I know that, in the SGEIS, certain, specific things regarding water, and what's happening, I think we're, kind of, just a little bit of broad stroke.

But I think, now, you know, some of the questions that I had with regards of that, I appreciate your candid and truthful answers with regards to such.

And I appreciate the fact that the DEC has decided to extend the comment period to January 11th, to get more input.

So -- and I appreciate you driving down here,

and taking the time.

And, thank you for your testimony.

EUGENE LEFF: You're welcome.

Thank you.

SENATOR GALLIVAN: Appreciate it.

EUGENE LEFF: Thank you very much.

SENATOR GRISANTI: We're going to move forward.

John Wood.

John, good afternoon.

Thank you for appearing today to give testimony.

Whenever you're ready to proceed, go ahead.

JOHN WOOD: Thank you, Senator Gallivan, for hosting this hearing.

And, Chairman Grisanti, for your environmental leadership, for your sponsorship of Senate Bill 4616 in the last legislative session, and for the invitation to assist this Committee's examination of hydraulic fracturing wastewater issues.

My name is John Wood. I'm the legal fellow with the Natural Resources Defense Council.

NRDC is a national not-for-profit environmental organization, with more than

200,000 members in the state.

NRDC has worked over for 40 years to protect New York's people and environment.

For the past several years, we have dedicated substantial efforts to the issue of proposed new natural gas development in New York State, urging that the State take an extremely cautious approach, and ensure that no new drilling is allowed to proceed, unless, and until, it can be demonstrated to be safe.

Today's hearing will illuminate many issues of concern regarding hydraulic fracturing wastewater.

To make the most of this opportunity, I recommend the transcript of this hearing be submitted to the Department of Environmental Conservation as a public comment on the revised draft Supplemental Generic Environmental Impact Statement for natural gas development.

Hydraulic fracturing wastewater management is among the most vexing issues faced by states, such as Pennsylvania, West Virginia, and Ohio, which are currently developing their shale formations.

It would be highly imprudent for New York to move forward with proposed new hydraulic fracturing

without a plan in place to deal with the billions of gallons of wastewater that will inevitably be generated by this activity.

According to the Department of Environmental Conservation, Commissioner Joe Martens, currently, no wastewater treatment plants in New York are equipped to treat or permitted to accept wastewater with the range of contaminants expected to be in fluids produced by high-volume hydraulic fracturing.

Natural gas drilling operators are not wastewater management experts.

Without guidance and regulatory enforcement and proper wastewater management, could jeopardize public drinking-water supplies and public health, and impair aquatic ecosystems.

In addition to a general discussion about the nature of hydraulic fracturing wastewater, I'll answer three questions:

What are the primary disposal options for hydraulic fracturing wastewater, and the environmental and human and health concerns associated with each option?

What is DEC doing on the ongoing review, under the State Environmental Quality Review Act, with respect to the regulation of hydraulic

fracturing wastewater?

And, lastly: How does Senate Bill 4616, relating to the uniformed treatment of waste from the exploration, development, extraction, or production of crude oil and natural gas address the problems associated with hydraulic fracturing wastewater?

To save the suspense, I'll answer, in brief, these questions right now.

There are limited options for hydraulic fracturing wastewater disposal, and each disposal method poses significant challenges to the environment and human health.

New York lacks the infrastructure for, and DEC has no regulatory plan to deal with, the prodigious amounts of potentially hazardous wastewater that will be generated from hydraulic fracturing.

Finally, the bill introduced last year in the New York Senate, passed in the Assembly as Assembly Bill 7313, to provide for the uniform treatment of wastewater is a critical development, as it would close the existing loophole on federal and state law.

Senate Bill 4616 would require hydraulic

fracturing wastewater to be disposed of according to the same practices that apply to waste from every other industry.

NRDC encourages to you reintroduce and quickly pass this bill in the coming legislative section.

Now I'll discuss the nature of hydraulic fracturing wastewater in terms of quality.

I recently watched a video on the Independent Oil and Gas Association of New York website, where a vice president of one of these companies claimed that the additives they use are edible.

Many of the chemical additives used in hydraulic fracturing fluid are known or probable carcinogens.

In April of this year, United States House of Representatives' Committee on Energy and Commerce released a report, summarizing the volume and content of hydraulic fracturing drilling-fluid products used by 14 of the nation's leading companies.

Between 2005 and 2009, the oil and gas service companies used products containing 29 chemicals that are known, or possible, human

carcinogens regulated under the Safe Drinking Water Act for their risk to human health, or listed as "hazardous air pollutants" under the Clean Air Act.

The BTEX compounds -- benzene, toluene, xylene, and ethylbenzene -- [unintelligible] safe drinking water are contaminants and hazardous air pollutants.

Benzene, specifically, is a known human carcinogen.

And in the year -- in the period of study, there are 11.4 million gallons of products containing at least one BTEX chemical used.

Furthermore, flowback water is high in total dissolved solids, chloride, surfactants, gelling agents, and metals from spent gel and foam fracturing fluids.

Typical classes of parameters present in flowback fluid are:

Dissolved solids, like sulfates and calcium;

Metals, such as magnesium, barium, and strontium;

Suspended solids;

Mineral scales, like calcium carbonate and barium sulfate and bacteria;

Friction reducers;

Iron solids, such as iron oxide and iron sulphide;

Dispersed clay finds, colloids, and silts;

And, acid gasses, such as carbon dioxide and hydrogen sulphide.

The chemical additives are only one piece of the problem of hydraulic fracturing wastewater because the water used in hydraulic fracturing comes into close contact with the shale formation during the well stimulation process. When it returns to the surface, it may contain a variety of formation materials that can make wastewater treatment difficult and expensive.

The production brines often contain relatively high concentrations of sodium, chloride, bromide, and other inorganic constituents, such as arsenic, barium, and other heavy metals, total dissolved solids, naturally occurring radioactive material, and all of these significantly exceed safe drinking-water standards.

So, both the chemical additives and the formation materials lace the wastewater generated by hydraulic fracturing, rendering it unsafe to discharge without extensive treatment.

Now, to give the problem of hydraulic fracturing wastewater its due respect, we should also consider the issue of volume.

I'll use DEC's estimates for future development of the Marcellus Shale to build this scenario.

Marcellus development is projected over a 30-year life cycle. The average year would see 1,600 or more wells.

The amount of water consumed in each well is projected between 2.4 and 7.8 million gallons, and the average well consumes 4.2 million gallons of water.

Between 9 percent and 35 percent of hydraulic fracturing wastewater returns to the surface.

Assuming one so-called "frack job" occurring in every well in the state, hydraulic fracturing operations would ultimately generate between 18 and 71 billion gallons of wastewater over the next 30 years.

If each well is fracked twice over its 30-year life, we'll see between 36 and 142 billon gallons of hydraulic fracturing wastewater generated in New York.

And, at different times, the chemical

compounds in this wastewater differ; and, so, it will require extensive monitoring during the flowback process to know exactly what's in the wastewater.

So, wastewater quality and quantity pose capacity challenges to New York's limited wastewater management infrastructure, which I'll discuss next.

There are few disposal options in New York, and it's among one of the most critical questions New York faces when deciding whether to open up our shale formations, is, what to do with the huge quantities of toxic, potentially radioactive, wastewater that comes from fracked wells.

Existing wastewater infrastructure in this state is simply not designed to accept wastewater of this sort produced by hydraulic fracturing activities.

There are four main disposal options: Underground injection, recycling, publicly owned treatment works, and privately owned wastewater treatment facilities.

With any of these methods, water must be shipped from the drill site to the treatment or disposal facility.

Suppose 2 million gallons of wastewater are

generated with each frack job, and, with the capacity of a water tanker truck averaging about 5,000 gallons, each frack job would require 400 truck trips from the drill site to the wastewater treatment facility, which may be in an entirely different state, perhaps as far away as Ohio or West Virginia.

Now, that will occur no matter which option we choose.

Now, for underground injection, the risks associated with this method are: Aquifer contamination, toxic plumes, insufficient storage capacity, and, of course, the risks involved in shipping hazardous waste from New York to Ohio or West Virginia.

Deep-well wastewater injection is regulated by the U.S. EPA, and is regarded by some experts as marginally better than sending wastes to treatment facilities.

But Government Accountability Office study found instances of drinking-water contamination from cracked or poorly plugged injection wells.

Underground injection of wastewater may be linked to induced seismicity, or manmade earthquakes, resulting from high-pressured fluid

injections, a rash of which have occurred in Texas, Arkansas, Ohio, Oklahoma, Nebraska, and even England, conspicuously close to hydraulic fracturing fluid injections.

For publicly owned treatment works, "POTWs" are basically designed for municipal sewage. They rely on biological processes and simple chemicals, such as chlorine, to treat wastewater.

Because these facilities are not designed to treat hazardous waste, sending hydraulic fracturing wastewater to them could create pass-through problems that jeopardize the water quality of receiving water bodies.

The combination of bromide from the shale formations and chlorine from the treatment plant can create trihalomethanes in public water supplies, which are linked to cervical cancer and birth defects.

Treatment of this wastewater may increase water costs to end-consumers.

Our neighboring states have been trying to figure out how to deal with mounting evidence that hydraulic fracturing wastewater was sent to overburdened facilities and discharged into nearby rivers without adequate treatment.

Without adequate regulation, surface and groundwater bodies could be contaminated with high salt levels, heavy metals, volatile organic chemicals, radioactive materials, and cancer-causing compounds.

And, further, pretreatment, as has been discussed, simply does not solve the capacity issue in terms of volume. Many of these treatment facilities are currently operating at capacity already.

Privately owned wastewater treatment plants are another option as an alternative to public treatment works.

These are massive construction projects for which New York has little to no experience.

Centralized privately owned treatment plants present a host of human health and environmental impacts that simply were not analyzed by DEC.

Notably, drilling operations from the entire region around a privately owned treatment works would, foreseeably, ship their wastewater by truck or pipeline to this facility, which will cause truck-traffic impacts, and, in the case of pipelines, ecosystem fragmentation.

There are also serious questions about the

energy intensity of treatment technologies at industrial wastewater treatment facilities.

And, let me make a point about the publicly owned treatment works.

Uhm, we have -- NRDC has documents on file, obtained through our Freedom of Information law requests, that suggests that the towns of Auburn and Watertown have accepted hydraulic fracturing wastewater treatment facilities, as late as 2009, with the approval of the DEC.

Just a corrective point.

And, as far as recycling goes, while wastewater recycling is, at least in theory, a positive development, because it reduces waste and conserves fresh-water resources, ultimately, there's a highly concentrated toxic waste left over that still needs to be disposed of somehow, but it is still exempt from hazardous-waste rules.

Waste injected over and over again is, typically, more toxic than when it's first used.

There is little information available from industry about exactly what technologies they're using to recycle wastewater; and there is scant verifiable information from industry on how much waste is actually being recycled, since they don't

that have to report these numbers.

Of course, some companies claim to be recycling 100 percent of their wastewater; while others say, the high salt levels make that claim implausible, if not impossible, because of the likely corrosive effect that that water would have on their equipment.

Recycling may also be energy intensive.

For the moment, claims by industry that recycling wastewater will ameliorate the concerns raised here must be regarded with skepticism.

And, there are also possible impacts resulting from temporary storage tanks proliferating as operators wait for a backlog of disposal permits as they generate the waste.

Now, I'll discuss DEC's approach to wastewater under SEQRA.

In short, the DEC has no meaningful plan to address the massive problem of hydraulic fracturing wastewater. It is of serious concern that they're preparing to issue permits to drill without having a regulatory plan in place for dealing with this.

The United States EPA, as well as DEC, have both stated that traditional publicly owned wastewater treatment works are not capable of

processing waste generated from hydraulic fracturing operations.

For this reason, it is a concern that DEC says "flowback water may be sent to POTWs" in the same section in which they conclude that "the high concentration of TDS present in this source of wastewater may prove to be inhibitory to the biological wastewater treatment systems."

Of all 1,500 pages of DEC's environmental impact statement for hydraulic fracturing in their proposed regulations, DEC never lays out a coherent wastewater management plan, and it fails to analyze the risks involved in each of the different disposal methods.

Commissioner Martens has suggested that waste should simply be shipped to Pennsylvania or Ohio.

Another glaring omission from DEC's environmental impact statement, which should be a concern to everyone, is the failure to conduct any health-impact assessment whatsoever, despite the fact that allowing hydraulic fracturing in New York means that billions of gallons of carcinogen-laced water will be pumped into New York lands, shipped over New York roads, or disposed of, somehow, in New York wastewater infrastructure.

NRDC hopes the Senate's leadership will correct defects such as this, by calling on the DEC to analyze the health impacts of hydraulic fracturing before issuing permits for it.

The closest thing to a wastewater plan is DEC's proposed ad hoc manifest system, which would enable regulators to track the transport of wastewater, which may assist in the prevention of illegal discharges, but in no way does this qualify as an adequate risk-mitigation measure.

To quote, "DEC's waste-tracking procedure is similar to that which is required for medical waste even though the hazards are not equivalent."

Since, quote, "manifesting is not required for non-hazardous industrial commercial waste," it is strange that DEC proposes a manifest system for hydraulic fracturing waste, in spite of their regulatory position that it's not hazardous, and in despite of the fact that DEC uses the word "hazard" to describe it.

If hydraulic fracturing wastewater is hazardous, then DEC should regulate it as much.

Because DEC has not proposed a wastewater management plan for hydraulic fracturing wastewater, apparently, its strategy is, to wait and see, for

industry to decide which disposal method they prefer; at which point, DEC would then conduct an analysis of the corresponding environmental impacts.

This post hoc assessment of impacts is a violation of the purpose of SECRA, which requires government decision-makers to analyze significant adverse impacts before taking actions that would bring them about.

Now, what can the Senate do?

Hydraulic fracturing operators currently enjoy a loophole in environmental law, exempting the waste generated by their activities from regulation as a hazardous substance, despite the fact that it contains hazardous constituents.

Last session, Senate Bill 4616 would close this loophole.

By way of context, the Resource Conservation and Recovery Act, Subtitle C -- or "RCRA" -- creates a federal program that mandates hazardous waste from -- that manages hazardous waste, from cradle to grave.

There are Subtitle C regulations for the generation, transportation, treatment, storage, and disposal of hazardous wastes.

However, waste, quote, "uniquely associated

with the exploration, development, and production of natural gas at primary field operations, such as produced water or spent hydraulic fracturing fluids, are exempt from regulation under RCRA, Subtitle C.

Because of this exemption, most shale gas-extraction wastewater is, by legislative fiat, not, quote, hazardous within the meaning of RCRA; hence POTWs receiving exempt oil- and gas-extraction wastewaters would not be receiving hazardous wastes, and, thus, would not need to meet RCRA permit requirements.

NRDC has petitioned the EPA to update RCRA, to regulate exploration and production wastes, which would include waste streams generated by Marcellus Shale drilling.

In the meantime, states can, of their own accord, regulate these waste streams.

This is an opportunity for New York to seize.

There is also a loophole at the state level.

Oil- and gas-development wastes are currently excluded from the environmental conservation law, the definition of "hazardous waste," through DEC's regulatory disposition.

This exclusion could either be removed through regulatory amendment or superseded by

statute.

The ECL defines "hazardous waste," broadly, by characteristic.

It means: A waste, or combination of wastes, which, because of its quantity, concentration, or physical-chemical, or infectious characteristics, may cause or significantly contribute to an increase in mortality, or an increase in serious irreversible or incapacitating reversible illness, or pose a substantial present or potential hazard to human health or the environment, when improperly treated, stored, transported, disposed, or otherwise managed.

Clearly, hydraulic fracturing wastewater fits this characteristic.

It is by regulatory fiat that natural gas development wastes are currently excluded from the statute's application.

This is so, despite the fact, that under the statute's expansive definition, these wastes may pose a substantial hazard to human health and the environment.

Senate Bill 4616 closes this loophole.

In order to bring natural gas development waste back under the purview of New York's hazardous waste management program, the regulatory exclusion

must, either, be removed through an amendment to these regulations or superseded by an act of the Legislature.

DEC, of course, could commence a new rule-making, in light of this substantial evidence demonstrating the hazardous nature of these wastes, in terms of their quantity, concentration, or physical-chemical, or infectious characteristics.

Alternatively, the Legislature could overcome this regulatory stalemate on this issue by amending the relevant sections of the ECL, to require the DEC to consider whether natural gas development wastes are potentially hazardous.

Senate Bill 4616 would require the uniform treatment of wastewater, regardless of its source. If it tests as hazardous, it must be regulated as hazardous, even if it came from hydraulic fracturing operations.

This historic and completely commonsense legislation does a couple of critical things.

First: It levels the playing fields so that the oil and gas industry is subject to the same rules that govern, pretty much, every other industry in the state.

Now, even though much of the waste it

generates is hazardous, the hydraulic fracturing industry gets a free pass that exempts its waste from the transportation, tracking, treatment, storage, and disposal requirements that apply to other industries' wastes.

Second: This legislation shifts the cost of water cleanup, from the taxpayers who have to pay increased rates due to contamination of public water supplies, to the industry actors who generated the waste.

Now, representatives of the natural gas drilling industry may decry such regulations as cutting into profit margins by unnecessarily increasing the costs of doing business for waste that isn't hazardous, but, they cannot have their cake and eat it too.

If hydraulic fracturing wastewater is not hazardous, then Senate Bill 4616 would not, in any way, impact their business.

If hydraulic fracturing wastewater is hazardous, there's no good reason why it should not be regulated as such.

If this raises the cost of doing business, it is proper that these costs are borne by the industry rather than by the public.

Thank you for this opportunity to testify today about the issues of paramount importance to New York's environment and health.

We look forward to working with the Committee, to ensure that the risks associated with wastewater generated by hydraulic fracturing are properly evaluated and addressed before any new natural gas development is permitted to proceed in New York State.

SENATOR GRISANTI: Thanks, Mr. Wood. I appreciate it.

You know, you mentioned the, uhm -- you mentioned the possibility of disposal options; whether it's underground injection, publicly owned treatment work plants, or so on and so forth.

In the research, and something that you were looking at, I know that you have a brief scenario, which one of those, if this were to move forward, would be preferable?

JOHN WOOD: Well, I'm not about to endorse any one of these disposal methods.

SENATOR GRISANTI: All right.

The, uhm -- I mean, I understand you have -- I mean, recycling, basically, there's still going be an end product in recycling; correct?

JOHN WOOD: Correct.

SENATOR GRISANTI: And the privately owned wastewater treatment plants, as we know -- I don't believe we have any, that was testified to, in New York, that should be, actually, taking any of this fluid.

In fact, Pennsylvania just came up and said that they have one in the Southern Tier.

And the underground injection was something we just asked the Deputy Commissioner, who said that it's something they would look at, but it doesn't seem, because of the depths and the geological formations, that that's even possible in the state.

And, you know, I understand your concerns with regards to, you know, if it's hazardous waste, it's hazardous waste, and it needs to be regulated.

That question was asked.

And, they're going by a federal regulation that was put in place, and that's why they're following those rules.

So, in a nutshell, if -- really, until it's labeled -- in your opinion, until it's labeled "hazardous waste," and you figure out a disposal method, it's something you feel strongly against, that this should not be happening in New York State.

Correct?

JOHN WOOD: That's correct, Senator.

SENATOR GRISANTI: Okay.

The, uhm -- and not to get into a big dissertation -- the -- so your concern is, truly, the reason why, in concerns that were brought up, you're -- specific to this hearing, is the water, and issue of the flowback water, and the chemicals that are in the water.

It's not the procedure of casings, or how many steel around the casing. That strictly has to do with the water.

Is that correct?

JOHN WOOD: Well, there are myriad issues involved, but the quality and volume of the wastewater generated is certainly a paramount risk.

As I suggested -- as I said -- and these are from DEC's numbers -- there are billions of gallons that will be --

SENATOR GRISANTI: Based on DEC's own numbers, or own formulas, that you took out of the SGEIS report?

JOHN WOOD: That's correct.

SENATOR GRISANTI: Yeah, because I've seen those numbers.

Okay.

Well, like I said, I appreciate you coming here today.

You've raised very important concerns with regards to, you know, this process, you know, if it goes forward.

And I hope that, uhm, you know, some of the things that we touched on, with regards to the Deputy Commissioner who testified, still may not answer all your questions, but, it's a concern that's raised. And it's something -- which is the reason why we're having this hearing.

So, I appreciate you coming here today.

JOHN WOOD: Thank you for the opportunity.

SENATOR GALLIVAN: Mr. Wood, thank you for your testimony.

I have one question.

In listening, and looking through your testimony, which you provided us, you talk about existing wastewater infrastructure in this state simply not designed to accept wastewater of this sort.

You mention, on number of occasions, that the DEC, through their proposed regulations, has not properly dealt with it; that -- or, properly dealt

with it or properly addressed it.

Public treatment plants aren't equipped.

Private treatment plants, none in New York. And they're, just -- they're huge, very expensive projects.

I guess my question is: Is it your opinion that wastewater from hydraulic fracturing can be properly dealt with?

That it just hasn't to this point yet, in New York State?

JOHN WOOD: I think the opinion, is that, properly dealing with it is prohibitively expensive.

SENATOR GALLIVAN: Okay, let me ask it different.

I understand that point.

If money was no object, which, of course, it is --

JOHN WOOD: Right.

SENATOR GALLIVAN: -- but if money was no object, is it your opinion that the wastewater can be properly treated, or not?

JOHN WOOD: I don't believe that there's any way of removing all of the possible deleterious consequences from this wastewater.

Certain companies that assist in the

recycling of wastewater can -- at least they suggest, that they can remove the heavy metals.

But, that's not all of the concerns.

And, a lot of the constituents in this wastewater would disrupt the biological systems that are used in publicly owned treatment works.

Currently, the EPA is developing pretreatment standards for wastewater before sending it to POTWs.

I think it would be advisable for the DEC to at least wait, and see what the EPA suggests about these pretreatment programs, before proceeding with this.

SENATOR GALLIVAN: Okay, thank you.

SENATOR GRISANTI: And that's something they plan on coming out with in 2012?

JOHN WOOD: I believe it's 2014, under the Clean Water Act.

SENATOR GRISANTI: 2014? Because I heard something about preliminary results coming out in 2012.

But, that's something we can look at.

JOHN WOOD: Uh-huh.

SENATOR GRISANTI: All right, Mr. Wood, again, I appreciate you coming here, and giving your

testimony.

Thank you very much.

JOHN WOOD: Thank you.

SENATOR GRISANTI: We have, uhm -- is Tom Johnson here?

Mr. Johnson, whenever you're ready, just, for the record, state your name, area you represent, and we can move forward.

Appreciate it.

THOMAS JOHNSON: Okay.

Good morning -- or, I guess it's afternoon.

My name is Tom Johnson. I am a vice president of Alpha Geoscience, in Clifton Park, New York.

I am a hydrogeologist with 33 years of experience in geologic, hydrogeologic, and as an environmental consultant.

Alpha Geoscience is engaged throughout New York, and other parts of the U.S., in projects involving water contamination and treatment to clean the water and return it to the environment for reuse.

I appreciate, and thank, both, you, Chairman, and Senator Gallivan, and other members of the Standing Committee on the Environmental

Conservation, for organizing this hearing, to further explore this important opportunity for New York, and for allowing me to speak today.

I would like to address two statements today that I have often heard as reasons why gas drilling should not be allowed in New York State.

These are: "Hydraulic fracturing will contaminate drinking-water aquifers"; and, "The water cannot be cleaned once it is contaminated."

Neither of these statements is based on scientific fact, and I'd like to explain why.

A combination of several principles of geology and physics prevent migration of hydraulic fracturing fluids from the deep target fracture zones.

Hydraulic fracturing would occur at depths of a few thousand to several thousand feet in New York if horizontal drilling and high-volume hydrofracturing proceeded in New York.

In contrast, drinking-water aquifers are no deeper than about 800 feet; and, in fact, most drinking-water wells are completed at depths of a few hundred feet.

Two criteria are necessary for the hydraulic

fracturing fluids to reach the aquifers, and neither criterion is met.

First, there would need to be a pathway for the fluids to travel through the thousands of feet of overlying low-permeability rock.

"Lithostatic pressure" is the pressure that is exerted by overlying rocks.

This pressure is so great in the zones that would be drilled and fractured, that neither natural nor man-made fractures remain open.

This is why sand, or other materials, known as "proppants," are necessary to be pumped into the ground to hold the man-made fractures open.

This is also one of the reasons that gas in the deep geologic formations remains in place until a well is drilled.

In addition to this requirement that there be a pathway, the pressure in the fracture zone must be greater than the pressure in the aquifer for any upward flow to occur.

The pressure in the drilled borehole is raised temporarily, enough to fracture the rock during the hydrofracturing process; however, the entire hydraulic fracturing of a single well takes only one day, after which, the pressure is released,

to allow the gas and fluids from the rock to flow into the borehole.

Once the well is producing, the gas and other fluids will flow only towards the borehole, which offers a path of least resistence.

These fundamental scientific principles preclude hydraulic fracturing fluids from flowing upward into drinking-water aquifers.

Additionally, New York has had a redundant casing-and-cementing program in place for more than 20 years.

The absence of groundwater contamination, despite thousands of oil and gas wells being drilled in New York, demonstrates the adequacy of this program to protect the waters of the state.

This casing-and-cementing program is further strengthened in the revised draft SGEIS, and it provides the necessary protections to prevent groundwater problems that are being reported in other states and highlighted in the media.

In regards to water treatment, critics of gas drilling have stated, there is no way to clean the so-called "flowback water" that returns to the surface after the hydraulic fracturing process.

In fact, millions of gallons of industrial

wastewater are processed and treated every day in this country to remove contaminants in much higher concentrations than what is found in flowback water.

Standard water-treatment technologies that have been developed to treat water from landfills, chemical plants, plating facilities, mills, quarries, petroleum refineries, and a range of other industrial and commercial businesses, are equally applicable, and effective, in treating flowback water.

Many private water-treatment companies and facilities are operating in Pennsylvania, as you've hear, and in other states, where high-volume hydraulic fracturing currently is being performed.

These businesses and facilities are not the same as the publicly owned wastewater treatment plants that we've heard about this morning, and that have been the focus of media attention, as being inadequate for treatment of hydraulic fracturing fluid.

There are a variety of treatment methods being used, but the process generally consists of removing suspended solids and organics, and then precipitating the undesirable metals.

The low level of radioactive material, known

as "NORM," precipitates with the metals to form a sludge, which is disposed at permitted, regulated landfills, as we heard from the Deputy Commissioner.

Studies and monitoring have shown that the radioactivity in the sludge is not present at levels that constitute a health concern to workers or the public.

90 percent or more of the treated water is reused for subsequent hydraulic fracturing jobs after this preliminary treatment.

Water that contains too much salt and dissolved solids often is disposed in deep injection wells that are permitted under both federal and state regulations.

A lesser-known fact, is that a crystallization technology has been refined and developed to treat the brine, or, the salty water, that is currently disposed in the injection wells.

The crystallization process produces distilled water, salt that can be used in water softeners and livestock feed, and a liquid brine that can be used for road de-icing and dust suppression.

There is no sludge or liquid discharge from this crystallization treatment process.

Commensurate with the start of horizontal drilling and high-volume hydraulic fracturing in New York, private businesses will build wastewater treatment plants at strategic locations to effectively and safely treat flowback and produced water.

The water treatment industry is just one example of related businesses that provides permanent jobs to support the energy industry.

Finally, I would like to address the effect that the current delay in New York State to permit horizontal drilling and high-volume hydraulic fracturing has on businesses and jobs.

As a small business owner, I expect that my company, likely, could hire, anywhere from three to five geologists to support drilling activity in this state.

These jobs represent a potential growth for my small business, of 20 to 30 percent of our core business, that is not being realized because of the delay.

Additionally, my company is involved in a partnership to develop water treatment plants that I've described.

Unfortunately, we cannot wait for this

opportunity to develop in New York, and we plan to initially build up to four plants in Pennsylvania.

We anticipate that each plant will employ approximately 12 to 15 people in permanent, well-paying jobs.

It is likely that one or more of these plants will be located in northern Pennsylvania at locations that may then preclude the need to build similar plants in southern New York.

There's no doubt that the delay to allow horizontal drilling and high-volume hydrofracturing has caused, and continues to cause, businesses to locate in Pennsylvania that might have located in New York.

The likelihood increases, as the delay continues, that more jobs and businesses will not be realized in New York, and may be permanently lost.

I respectfully urge our elected leaders to facilitate the process to finalize the revised draft SGEIS, and associated regulations, that allow horizontal drilling and high-volume hydrofracturing to proceed in New York in a safe, responsible manner.

The DEC has proven, for many years, that it can, and will, effectively regulate the oil and gas

industry.

That concludes my comments, and I thank you very much for allowing me the opportunity to speak here today.

SENATOR GRISANTI: Thanks, Mr. Johnson.

I appreciate the fact that you have submitted testimony, and explaining such.

I just have a few questions for you.

The -- you know, you've heard testimony from the Deputy Commissioner, and -- there's only been a couple -- and Mr. Wood, basically talking about that there's -- does not seem to be a safe alternative.

So, I take it, those four things that he cited, Mr. Wood, the last speaker, based on your being a hydrogeologist, would say that, yes, we can treat in these facilities, whether you do it by private, public, or what have you?

It's your belief that this wastewater can be treated?

THOMAS JOHNSON: Yes, it is my belief that it can be effectively treated, and disposed.

This country has had, for many, many years, a deep-injection-well program, as I said, that's been regulated by states, and the federal government.

It's not widely known by the public,

certainly, but there are thousands of wells, deep injection wells, many of them located in the western New York, where all kinds of industrial waste are injected into the ground -- deep into the ground, well below drinking-water aquifers.

That program is not as vital here in the northeast because of the geology. The western geology is more suitable for that.

There are wells in Pennsylvania.

There are a few deep disposal wells in New York.

However, Ohio has better geology, and there are many more deep disposal wells in Ohio than there are in Pennsylvania and in New York.

And that, right now, is where a lot of that wastewater is being taken by the oil and gas industry for disposal from the Marcellus play.

SENATOR GRISANTI: Now, we're talking -- we're talking, that when you have a well pad that's drilled, you're talking about -- what is your estimate on the percentage of water that's going to -- that stays in the ground, and then what comes back up through a flowback?

THOMAS JOHNSON: Well, the general estimates are, about 10 to 30 percent will flow back.

However, I think, practically, what's being seen right now, is that, that number is really on the low end.

And I believe the Deputy Commissioner's testimony said something in the range of 9 or 10 percent actually flows back, and the rest remains underground.

SENATOR GRISANTI: And is it true, what your testimony is saying, that, based on New York's, sort of, revised regulations on the casing, and the types of the cement versus steel in casings, and the regulations that are in place -- because -- I mean -- I agree with you, that it's -- it's -- because it's several thousand feet down, and under the geology of the different layers of rock and formation, very difficult for the water, besides gravity, of coming back up, unless it's following that path of the casing pipe.

But, still, I mean, accidents can happen, and you could have casing that breaks, and water can come back up, and it can still find its way, whether it's in stream, or even if there's a buffer zone, it can still have the potential of finding its way into a well, or -- or something along those lines.

Correct?

THOMAS JOHNSON: Yes.

And, DEC has had more extensive casing-and-cementing regulations than other states, for quite awhile, since the 1992 regulations were implemented.

And, we've seen that these regulations have served very well in protecting the groundwater resources.

Other states have not had as good regulations. And, in fact, that, those lapses in regulation are exactly what caused the problems in Dimock that we've all heard about.

And, with respect to the situation in Wyoming right now, if you dig into that report, you'll see, also, that there's some pretty strong suspicion that the casing and cementing was at least part of the problem that they're starting to see out there.

So, it's important to realize that the vertical wells that have been drilled in this state, for years, are drilled exactly the same way as the upper portion of a horizontal well. The casing requirements are the same.

So, that, if we've been doing it safely for many years, that will not change, as far as the upper portion of the well that penetrates through

the aquifers in the first few thousand feet of the vertical rock that is drilled.

SENATOR GRISANTI: Okay.

And you talked about -- you saw the photos that the Deputy Commissioner had here, regarding these open pit, and these ponds.

And he was talking about, however long -- and it's different water, but however long it stays there, it can have a higher concentration of radioactivity, more so than what has been stated to be a non-cause of effect for health concerns.

But, there is that potential of, depending on length of time that it stays in these holding ponds, and it could concentrate, you would agree with that assessment?

THOMAS JOHNSON: Yes, sir.

Both, in holding ponds, and, in the case in New York, will be held in the steel tanks, anyplace water stays for any period of time, there is the possibility for concentrations to build up.

And, that is why the SGEIS has provisions to monitor that, so that we'll be able to protect the workers and the public.

SENATOR GRISANTI: Yeah, would that then be treated, then, as hazardous waste, if it gets to

that high of a level?

THOMAS JOHNSON: That's a little beyond my area of knowledge, so I'm going to --

SENATOR GRISANTI: Would you -- would you -- I mean, would that be something that you would consider?

If it reaches that extreme, it should be considered as hazardous waste?

THOMAS JOHNSON: I'm not sufficiently well-versed in the hazardous-waste regulations, so, I'm going to ask -- I'll pass on that.

SENATOR GRISANTI: The, uhm -- and you're involved in Pennsylvania right now, with regards to specific well pads, and testing, and work that's being done in Pennsylvania?

THOMAS JOHNSON: I am not directly involved, no.

SENATOR GRISANTI: Not directly.

Okay, not directly involved.

Okay, I thought you were.

THOMAS JOHNSON: We have plans to do some work, and build some plants in Pennsylvania, but that has not come to fruition at this time.

SENATOR GRISANTI: Okay.

All right, I appreciate your testimony here

today.

And, I'll turn it over to Senator Gallivan, if he has any further questions.

SENATOR GALLIVAN: Thanks for being here today, Mr. Johnson.

I have two questions, one in each area of your testimony.

The first has to do with contamination, or potential contamination, of drinking water; and, specifically, the aquifers.

You testified about lithostatic pressure that is so great, that the geology, essentially, would prevent the contamination of the aquifers, however many feet above where the horizontal drilling has taken place.

And, also, that the hydraulic fracturing of the single well will take about one day.

Is there any risk of any flow of those hydroflack -- hydrofracking liquids, during the process, migrating upwards?

THOMAS JOHNSON: No, there's not, because of the short duration that the pressures are raised, and because of the monitoring that occurs during that process.

The energy companies are very interested in

making sure that the fractures don't extend any further than necessary because they don't want to fracture areas beyond the target zone where they're trying to draw gas from.

So, this is a process that's monitored with sophisticated equipment, to make sure they know how far the fractures are propagating.

Again, the distance we're talking about, generally, is four to six thousand feet, probably, that the Marcellus zone will be developed and fractured.

And, the drinking-water aquifers, the maximum depth is about 800 feet.

So, you've got several thousand feet of rock above -- or, between where the fracturing is occurring and the drinking-water aquifers.

SENATOR GALLIVAN: Second has to do with the actual treatment of the water once it's contaminated.

And it's certainly your testimony that the water can be treated; correct?

THOMAS JOHNSON: Yes.

SENATOR GALLIVAN: Would it be your opinion -- do the chemicals that are used in the hydrofracking solutions, that the drilling companies

have indicated as proprietary, is it your opinion that they need to be disclosed, in order for the water to be -- the wastewater to be properly treated?

THOMAS JOHNSON: Well, I think they should be disclosed.

And I believe the SGEIS requires that they be disclosed.

What is interesting about some of the discussion and debate that is ongoing, is that, the chemicals that are actually added to the water for the fracturing process are in extremely small quantities.

And, in fact, the compounds that are coming back up in the flowback water, in the highest concentrations, are the naturally occurring minerals that are in the rock.

So, as the water is injected into the rock, and it stays there for a period of time, as the rock is fractured, those natural compounds leech out of the rock and into the water, and are present at much higher concentrations than what is actually added for the fracturing process.

So, some of what you've heard about the barium, the strontium, the calcium, the sodium, the

magnesium, all of these compounds -- and the salts, are all natural, and are what comes out of the rock during the hydrofracturing process, and are not the compounds that are added during the hydraulic fracturing.

SENATOR GALLIVAN: Okay, thank you.

THOMAS JOHNSON: You're welcome.

SENATOR GRISANTI: I have nothing further.

I appreciate you submitting your testimony, and being here today, and taking questions from myself and Senator Gallivan.

Thank you very much.

THOMAS JOHNSON: Thank you.

SENATOR GRISANTI: Paul Drof.

PAUL DROF: Okay, well, good afternoon, Chairman Grisanti and Senator Gallivan.

My name is Paul Drof. I am the executive director of the Niagara Falls Water Board.

I would like to thank you for the opportunity to testify at this hearing.

By way of background: The Niagara Falls water board is a public benefit corporation created in 2002.

We have approximately 19,000 residential, commercial, and industrial accounts throughout the

city of Niagara Falls, and also in surrounding communities.

The Water Board is a financially self-sustaining entity, with an annual operating budget of approximately 25 million.

Our revenues are generated through the sale of potable water, as well as wastewater treatment services.

Last year, the Water Board's total water production was more than 6.6 billion gallons, with a daily average of 18.2 million gallons per day.

The Water Board owns and maintains nearly 550 miles of water and sewer lines throughout our service area.

Chairman Grisanti, I would like to take this opportunity to thank you for your leadership in holding this hearing to examine solutions to flowback water produced through the hydrofracking process.

The proper treatment of flowback water is a key issue as New York State continues to vet the efficacy of permitting horizontal drilling and high-volume hydrofracking in the Marcellus Shale formation.

Needless to say, it is imperative these

materials be managed in a way that focuses, first, and foremost, on public health and safety, as well as the protection of the environment and natural resources.

The Niagara Falls Water Board has been closely following the DEC's draft regulation process; and, in fact, we are preparing our comments for submission.

We feel the DEC has done a thorough and responsible job of developing a framework for the safe treatment of flowback water and production water.

The Water Board wholeheartedly supports this approach.

As you know, the Niagara Falls Water Board operates a unique, physical-chemical activated carbon wastewater system.

The facility was built in the 1970s, specifically to handle organic, electrochemical, metallic, and high-solids waste streams from some of the country's largest industrial and chemical manufacturers, as well as remediation of Superfund sites within our service area, including the Love Canal.

What this means, Senator, is that our

facility has treated, is treating, and will continue to treat contaminants that are as complex and difficult as the contaminants that result from hydrofracking.

Furthermore, the Niagara Falls Water Board has an approved U.S. EPA industrial pretreatment and enforcement program.

We also have a longstanding U.S. EPA- and DEC-approved hauled-waste program that regularly accepts chemical wastewater for treatment from throughout the region, not just from our service territory.

The bottom line, is that we responsibly handle heavy industrial waste as part of our day-to-day operation. It's what we do.

Suffice it to say, the Water Board has a long history of treating chemicals and other industrial wastes in compliance with applicable environmental law.

The Water Board has met with DEC officials to discuss our capabilities and treatment processes.

We have also commenced studies to evaluate our wastewater treatment plant's capabilities to properly and safely treat flowback water.

Based on the information provided by the DEC

to date, we have made certain conservative assumptions about the levels of treatment the Department will require for the constituents of concerns, or, the "COCs."

With that, we have conducted several bench-scale studies targeting these constituents.

The results have been encouraging.

Our preliminary results demonstrate significant removals of these COCs.

As you will see in these pictures, we have effectively pretreated the flowback water before it is even treated in our unique facility.

Another option to treating this pretreated water may be to reuse it at the wellhead.

This reduces the use of potable water for fracking purposes, and does not require discharge to local waterways.

[Photograph being shown.]

The first photo you see shows water from a wellhead in Pennsylvania.

It's the brackish-colored water here on a six-paddle stir.

[New photograph being shown.]

The second photo shows the initial flocculation of that water, and the initial stages

of cleaning it.

[New photograph being shown.]

The third picture shows the final product of the pretreatment operation at our facility in our wastewater treatment plant.

This, again, is pretreatment before it would even be introduced to the publicly owned treatment plants.

Just to make that: this is a pretreatment.

We eagerly await further guidance from the DEC as to the level of treatment needed to safely address the constituents of concern.

In addition, we continue to assess the economic impact of treating flowback water on our operations.

We are confident, that once we know the mandated treatment requirements, we will be in a better position to assess the viability of our efforts to pursue this initiative, including, options to build infrastructure, and for reuse of the water at the wellhead, resulting in no discharge to local waterways.

What is our interest in the development of the Marcellus Shale?

The State's decision to move forward with the

exploration of natural gas in the Marcellus formation presents a significant opportunity for the Niagara Falls Water Board.

Our Board believes that we may be poised to be in a unique position to provide a solution to the issues of properly treating flowback water from hydrofracking.

Mr. Chairman, as the State Senator representing parts of Niagara County, especially Niagara Falls, you have witnessed firsthand the decline in business and population in that region.

The Water Board has been hard-hit by this decline.

We have been faced with significant losses due to the downsizing of the industrial base and the loss in population.

We need to find new and additional revenue streams to make up for these significant losses.

Marcellus Shale may provide the Board with an opportunity to take advantage of an underutilized asset that is uniquely designed to treat complex waste, such as flowback water.

We see the development of the Marcellus Shale as a unique opportunity for the Water Board to offset these losses, and stabilize the water and

wastewater rates for our customers in our service area.

We also see it as an opportunity to enhance and reinvest in our wastewater treatment facility and related infrastructure.

In conclusion: Drilling and exploration in the Marcellus formation in New York is a unique opportunity for both the State and the Water Board; however, it must be done right.

The regulations promulgated by DEC must ensure that the treatment of flowback and production water from the process of hydraulic fracturing will protect public health and safety and the environment, including, our employees, and those employed by the drilling and exploration industry.

With proper regulation and focused upgrades, we believe that the Niagara Falls Water Board wastewater treatment plant can treat flowback water and production water as an interim or long-term solution, and may allow for the recycling and/or recovery of treated flowback and production water to the well pad for reuse.

It also provides an exciting opportunity for public-private sector partnership, related to job growth, and infrastructure investment.

I would like to thank you for hosting this hearing.

I appreciate the opportunity to testify before this Committee, and I'm available to answer any questions that you may have.

SENATOR GRISANTI: Okay, thank you, Mr. Drof.

Just, briefly, the photos that you brought here, now, this is flowback water that was taken from Pennsylvania?

PAUL DROF: That is correct.

SENATOR GRISANTI: Okay.

And you're saying it's pretreated. It's not gone through a, uhm -- any sort of, what, stage in your facility. It's just something that --

Can you explain that a little bit, what you mean by the "pretreatment stage"?

PAUL DROF: Okay, we were looking at the possibility of the treatment of flowback water.

We recognized unique requirements of this; and, as such, we've designed a pretreatment facility to, one, handle material, segregate it from the main public treatment works, provide for a high level of treatment before it's even introduced to the rest of the facility.

So, we'd have the ability to regulate that

particular flow outside the publicly owned treatment works.

SENATOR GRISANTI: Do we know -- where it's got "pretreated," where it's showing clear --

PAUL DROF: Uh-huh?

SENATOR GRISANTI: -- do we know what chemicals are still in, what seems to be clear water, compared to --

PAUL DROF: Yes.

We -- we've produced, looking for what they call the "NORMS."

We've look for the barium, the strontium.

And we also looked at turbidity; the total dissolved solids, and those items.

We sampled the water prior, and to the water afterwards, and went through 136 priority pollutants that were done on that constituent of the water, before treatment, and after treatment.

So, we do have some results of where we could be.

SENATOR GRISANTI: Okay, but, in the pretreatment stages of, right there, there's still chemicals that are in that water that looks clear?

It's --

PAUL DROF: That is correct.

SENATOR GRISANTI: -- that's not drinkable at that point?

PAUL DROF: At this point, no, it is not drinkable. This is pretreatment stage.

It's done in a lot of industries, to get to a stage before it could be discharged to a publicly owned treatment works.

SENATOR GRISANTI: Okay.

Now, from the Southern Tier, where there's proposals for fracking, and -- and -- in case people don't know -- we're considering where Niagara Falls is, that's quite a distance.

And you have proponents regarding -- there's estimates of how many trucks it would take to clear one well pad.

It would be significant truck routes to -- to get from wherever a potential well pad is, up to Niagara Falls for potential treatment, if you're able to meet whatever the guidelines of the DEC is looking at.

What other alternatives do you have, that would put you in a -- in, let's say, a different position than a privately, you know, built facility, so on and so forth?

PAUL DROF: Okay, well, we are on approved

truck lines. We have a corridor that's highly industrialized in Niagara Falls that's used to the traffic of trucks.

And, again, as New York State develops the fields, it's not going to be a lot of volume to begin with. They're going to have to crawl before they can even walk, and walk before they can run.

So, if it follows the Pennsylvania model, you're maybe going to have 8 to 10 wells in the first year.

So, it will be a ramping up of the need for the treatment facility.

Our facility's unique, because, not only are we on a truck line, we are also a rail spur, and we have three rail spurs that enter the facility.

We used to use it for handling a liquid chlorine. We no longer use that as a disinfection method.

So, we can bring the material in in tankage, which would be 90,000 gallons at apiece, versus, a liquid tanker truck, which is anywhere from five to seventy-five hundred gallons.

We would also propose, that, as we move forward in this, there is a brine pipeline that was developed for the hypochlorite business, which was

the Olin-DuPont facility, which originates in Batavia, and actually enters into the city of Niagara Falls.

Those rights-of-way still exist.

If we're looking at a long-term solution, and the removal of truck traffic, and the capability of spills, we may want to look at, uhm -- looking at that as a future alternative, uhm, to redevelop that pipeline for usage for hydrofracking water, to bring from the well, and back to the wellhead for reuse.

SENATOR GRISANTI: What is the -- where does the pipeline actually go?

I mean, I know it's in the Falls --

PAUL DROF: It --

SENATOR GRISANTI: -- but where does it spread out from there?

PAUL DROF: It just goes, from Batavia, directly to the Olin-DuPont facility, at this point in time.

We -- I can give you a trace of where it goes.

SENATOR GRISANTI: So you would need significant infrastructure to expand that pipeline to other areas in the -- especially in the Southern Tier, or southern part of New York?

PAUL DROF: That would be correct.

Or, it could be a truck head, that all the truck would go to one pinch point. Those trucks then can be offloaded, and regulated by the DEC before it's entered into the pipeline.

So, you could have a pinch point before, and at the end, of the pipeline, to make sure that the material that was introduced is the same material that comes out at the end of the pipeline.

SENATOR GRISANTI: Now, you're saying, in Niagara Falls, that you have certain federal requirements that have already met, or certain, uhm -- that allows to you proceed forward.

What makes, uhm -- what makes your treatment facility different from the private ones that are being built, let's say, in Pennsylvania?

PAUL DROF: Well, very similar.

We're different from most facilities.

99 percent of the facilities throughout the United States are biological in nature.

And I think it's been discussed before, that those treatments facilities are, maybe, inadequate to handle this.

Niagara Falls, because of its industrial past, and legacies, has developed a

physical-chemical wastewater treatment plant which is made to take this material.

We also use activated carbon to remove the organic materials that may be another issue there.

Since we have this facility, the type of chemicals that come in, such as the high solids, the metals, do not affect the biological biomass to achieve treatment because we have none of that existing.

So, that's what makes us unique.

We are, basically, a large-scale facility that's underutilized. We currently are a 48 MGD, or, "million-gallon-per-day," facility, that's running about 25 million gallons a day.

So, again, it's an underutilized public utility, that would take some, as you said, investment to make it better, but we feel that it's being a viable alternative in biological facilities that are there.

SENATOR GRISANTI: So you're only running at half a capacity right now?

PAUL DROF: That's correct.

SENATOR GRISANTI: The, uhm -- what are some of the chemicals that, uhm -- you know, you mentioned Love Canal. There's other things.

What are some of the chemicals that you've actually treated there before?

PAUL DROF: Well, we have whole -- our permit is quite extensive, that was issued to us by the DEC, along with the Joint International Commission, and the Canadian government, because we discharge into an international waterway.

We monitor for volatile organics, semi-volatile organics, heavy metals, a lot of the priority pollutants.

We're also required to do toxicology testing, for both vertebrate and invertebrate species, to make sure that our discharge does not affect the biota in the receiving stream.

So, we are under very strict guidelines.

We currently also have a headworks analysis and a rail system, which looks at what we can accept at the head of the plant, what those volumes would be, and how it would affect us at the end.

We also report any truck waste to the DEC through the Part 364 permitting process, that was mentioned by the DEC.

We currently give the State all that information, once a year, of what we've accepted: volumes, and where they originated.

SENATOR GRISANTI: So, are you fully familiar with the chemical makeup that's in the flowback water that's coming back from these sites?

PAUL DROF: We know of one particular type.

Their flowback water can change. The chemicals, or the constituents, are -- may be unique to each type of drilling.

We're hoping, now, as the process becomes more transparent, that those amounts will be available to us, to look at, and be able to treat them on a better basis.

Again, it's a hauled waste. It has a constituency that's much more predictable than what's being discharged to us by the various industrial sites throughout the city, which, again, by themselves, may be easily to treat. But, when they're put into a pipeline, and have time to react, they can -- what we -- react at the head of the plant is considerably different than what the plants are discharging.

So, I think we have the experience, and the background, to be able to look at this, and do a good job at it.

SENATOR GRISANTI: So you're saying, it's not so much as the chemicals that are added to the water

and sand mixture to do the fracking; it's, once that process underground actually takes place, that additional chemicals, that their the reaction, causes a combination of additional chemicals that come back in the flowback water?

PAUL DROF: That could be a possibility, that you'll be creating things that you've never -- you weren't intending to.

And that's why we would look at each load coming in, prescreen it before it's accepted, to make sure it meets the criteria for treatment.

SENATOR GRISANTI: Okay.

Well, they had mentioned -- I think Deputy Commissioner had mentioned, that it's got to be disclosed, what the chemicals that are being used.

And this particular water that you got from Pennsylvania, were the chemicals disclosed to you, as to what they were, and then you can figure out exactly what you got rid of?

Or, are you at a stage, where, you know, we still need to do additional work to get rid of additional chemicals that are in the water?

I mean --

PAUL DROF: This is a very preliminary stage.

We received flowback water from one or two well sites. We moved that together.

We analyzed that, since we didn't have the information of what the raw feed water was, so that's why we did an entire scan for priority pollutants and all the constituents that we had seen in the literature.

Again, we treated, and looked at various compounds that we considered to be the marker compounds.

We found the best treatment that we could render.

And, at that time, we did another scan, to look at all those priority pollutants at the final to end, to see:

One: Are they there?

Two: Did we remove those? -- and, how successfully we were with removing those.

And that was a preliminary bench test.

It was not -- the next phase would be, to look at a pilot test of some size.

In other words, to ramp it up to larger size, to see whether or not the assumptions that were made, or in the bench testing, translate to an actual pilot facility.

SENATOR GRISANTI: Okay.

So, it's basically -- so, it's still a work in progress until -- like I said, you need to know what this chemicals are --

PAUL DROF: Well, we need to --

SENATOR GRISANTI: -- to make sure you got rid of them all?

PAUL DROF: Yes, sir.

And we need two things:

One: To know what the chemical disclosure is;

And, two: To see what the State DEC will come as their final targets of where they'd like to be for the treatment.

Then we can look at:

Can we achieve those treatment goals?

At what cost?

And, whether or not that is a model for us to proceed.

SENATOR GRISANTI: Okay.

All right, thank you very much.

SENATOR GALLIVAN: What do you do with the contaminants that are removed?

PAUL DROF: Currently, right now, the contaminants --

SENATOR GALLIVAN: Well, in this project that you did here.

PAUL DROF: Right here?

They were sent back to Pennsylvania for disposal.

It was only, about -- I think we have only received about 5 gallons of flow.

SENATOR GALLIVAN: How -- this water that you got, or that you did in this project, how was it -- upon receipt, or, at your last stage, where the water is clear --

PAUL DROF: Uh-huh?

SENATOR GALLIVAN: -- how was that different, or how does it compare, to the chemicals that you had been treating over the years, from the Superfund -- like the Superfund-site chemicals?

PAUL DROF: It's very applicable to what we've seen in the past, historically, and what we continue to see today.

SENATOR GALLIVAN: Again, in this project, you compare -- go back to your experience with the Superfund chemicals, what the plant was built for, and now we look at this particular project.

Is there anything that stands out, that is so different than what you're equipped to do?

THOMAS JOHNSON: Well, we're --

SENATOR GALLIVAN: Or any more problematic than what you've done in the past?

PAUL DROF: We're concerned about the NORMS -- the "normally occurring radioactive materials" -- to see whether or not we'll be concentrating them in the coagulation process.

So, we're looking at that.

We're also concerned with the total dissolved solids; how that would affect the waterways, and those high volumes, because, since they're dissolved, they're very difficult to remove from the solution.

We've done an excellent job with turbidity, excellent job with suspended solids. We've done a good job with the barium and strontium.

And those were the compounds that, whether or not it would be effective to treat. And that's how we decided that we'd like to proceed to the next stage, because we had success in treating those.

Again, our concern is, we need to know what New York State is going to require for us to do.

Based on that, we would remodel the original bench scale, and then try to translate that into a pilot plan, to see if it is effective.

SENATOR GALLIVAN: Okay, thank you.

Go ahead, Mark.

SENATOR GRISANTI: But at the present time, until those models are put in place, you really can't go forward on it, because you don't know exactly what -- what's going to be required from the DEC?

PAUL DROF: That's correct.

And we've never accepted fracking water at this point in time.

This was just a laboratory-scale exercise, to see whether or not, uhm -- what the material was consisting of, whether or not we could render treatment, and how effective that treatment would be.

Recognizing the fact that we'd like to use this as a pretreatment system, that we'd have to make some investiture into our structures, and that we'd have to spend money to do it correctly.

What we don't want to do is dilute the material.

We'd like to treat the materials so that there's no question as to what happens to the constituents as they drop out.

SENATOR GRISANTI: Is there any estimate on

what the cost would be to -- if you had to upgrade your facility, to actually treat the water?

Is there any talk about a cost analysis of what it would cost to treat?

PAUL DROF: Well, initial figures, of course, where these are -- they vary quite a bit, is, if we would look at about a million gallons of treatment per day, to put in holding facilities, and improvement to the rail lines, and all the other items, would be about five to six million dollars, for a basic pretreatment facility prior to introduction to our regular wastewater facility.

SENATOR GRISANTI: I got you. Okay.

All right, I appreciate you coming.

Thank you very much.

Thank you for giving the testimony today.

PAUL DROF: Thank you very much.

SENATOR GRISANTI: Is Katherine here?

KATHERINE NADEAU: Good afternoon.

My name is Katherine Nadeau, and I am the water and natural resources program director for Environmental Advocates of New York.

I would like to thank the Senators for convening this hearing, and for inviting me to testify today.

Environmental Advocates' mission is to protect our air, land, water, and the health of all New Yorkers.

We monitor state government, evaluate proposed laws, and champion policies and practices that will ensure the responsible stewardship of our shared environment, and, to make New York a leader.

So, as we sit here discussing fracking today, I just want to point out that some of my testimony has been covered by previous speakers, so, I'll kind of jump around a little bit, to not beat on issues that have already been discussed.

SENATOR GRISANTI: Yeah, we actually have most of the testimony that's submitted in writing.

So, yeah, if you could paraphrase?

You know, it might be --

KATHERINE NADEAU: Great.

SENATOR GRISANTI: Okay.

KATHERINE NADEAU: Great, thank you.

So, fracking, as we've discussed at length this afternoon, is a process, that, if allowed to proceed, as proposed currently by New York State officials, it would industrialize much of Upstate New York, and, undoubtedly, lead to accidents, spills, and air and water contamination.

Just last week, the Environmental Protection Agency released preliminary studies, pointing to water contamination caused by fracking.

This was discussed earlier.

I only bring it up now, just because this is an issue, where the industry has said, over and over and over again, that fracking doesn't contaminate water supplies. It's not contaminating groundwater.

Whether or not the exact scenarios hold true in every state across the nation, this is an issue that cause those -- calls, excuse me, those claims into question, for sure.

So, as we discuss this, we need to keep in mind the sources of the information, and where this is all coming from.

So, New Yorkers know that contamination can happen.

And, we understand that fracking cannot happen at the scale and the pace projected by the Department of Environmental Conservation, which, as said, is up to, and including, 1,600 wells drilled per year, without serious consequences, especially to our waters.

So, so far, DEC has issued three drafts of

the Supplemental Generic Environmental Impact Statement for public review, two for public comment.

And despite improvements in the process as it's gone along, much more analysis on waste production, transport, and treatment remains, and additional mitigation measures need to be evaluated if any fracking's going to be permitted in New York State.

And, New Yorkers are rightfully concerned that improperly treated waste will pollute the state's waters.

And, based on reports from Pennsylvania, and other states in the nation, these concerns are well-founded.

So, my testimony really focuses on how fracking waste is classified in New York, and making sure that, if it is, in fact, hazardous, it's classified as hazardous; making sure that we're prohibiting fracking waste treatment at the state's publicly owned treatment works; and, DEC resources.

These are not Environmental Advocates only concerns as related to fracking, but, just given the scope of the hearing today, this is where I'm focusing my testimony.

So, the first part of my testimony relates to

how much fracking waste may be produced.

And I think NRDC covered this fairly well, but I will just say, that this is a tremendous amount of wastewater anywhere.

On the order of billions of gallon per year.

Hundreds of billions of gallons over the projected 30-year play -- 30-year, excuse me, life of the play in the modeling that DEC has done so far.

And, right now, we are in a tricky situation, because these wastes are not considered hazardous, even if, in fact, they are.

And we are allowing them to be -- or we may, excuse me, under the DEC's proposals, allow them to be treated at facilities that are ill-equipped to do so.

Now, first, under State regulations, has -- drilling waste is just, by definition, not hazardous waste.

As Mr. Leff said, from the Department of Environmental Conservation, it is treated as industrial waste.

He's claimed, that this is because the federal government doesn't classify the waste as hazardous waste either; and that, therefore,

New York State has tied our regulations to the feds.

This is -- this is a case where the DEC can, and should, go far beyond what the federal government is doing.

And this happens all across our regulations, and in our laws now.

If you look at the Clean Air Act, if you look at the Clean Water Act, these are both delegated programs in New York State, where it's the State's responsibility to carry these out.

And, in both cases, we have standards and requirements that go beyond what the federal government has -- has provided for.

And this is because, upon careful examination, the State has realized, that, if we're going to protect our resources, we need to set in place the most stringent standards possible.

So, this is something that the State -- there's plenty of precedent for it, and the State should do it in this case as well.

So, because they're not -- and, you know -- and I want to -- and, what -- again, what does this really mean, because they're not classified as hazardous waste?

First of all: When it comes to

transportation, they're not required to have the same level of manifest systems;

And, when it comes down to disposal, they're not required to be treated at facilities specifically constructed and designed to handle these -- the toxicity of these wastes.

Just for an example: I went through the Supplemental Generic -- excuse me, the revised draft Supplemental Generic Environmental Impact Statement, and went through the State's hazardous-waste regulations -- just like, I'm sure a lot of other people in this room have done -- and, to look at, you know, if this waste coming off the wells is, in fact, hazardous, and why.

And one of the contaminants, one of the chem- -- one of the toxins, that is listed in State regulations -- hazardous-waste regulations, is barium.

And, it's the concluded that, barium, at levels of 100 milligrams per liter, or more, would be considered hazardous, by definition, under State regulation.

Then went to the States draft plans, and went to industry studies themselves, and said: Okay, so, if this is the case, do we have any studies that

prove that we've got levels of barium in the waste that would trigger the standard?

And, we do.

According to an industry study of eight Marcellus Shale wells, identifying the northern counties in Pennsylvania with comparable character to New York play area, the level of barium detected in flowback fluid ranged, but -- on day one of the flowback, the first day that the water was coming out of the well, the median level there was 387 milligrams per liter.

So, clearly above the "100 milligram per liter" standard in State regulations.

And then, on Day 14, and 15, the amount of barium detected in flowback fluid varied as well; but, again, the median level was 1,835 milligrams per liter, far exceeding the State's standards for hazardous waste.

So, if this were created by any other industry, you know, General Motors, General Electric -- anybody else in the state -- this would be considered hazardous waste.

But because, by definition, it is not.

The State looked at tests coming from Pennsylvania and West Virginia. And, again, there

were varying levels of barium detected; but, the median level there -- detected there, was 1,450 milligrams per liter.

So, this is -- you know, a lot of these wastes clearly would fall under the category of "hazardous."

Another problem with the fact that this definition rules the amount of treatment as hazardous waste, is that, we're not only talking about what might come down the road with high-volume hydraulic fracturing.

Under current drilling in New York State, under the current hazardous-waste loophole, these exemptions, that means we're not looking at what's happening with the waste being created now, either.

Getting back to the transport for a minute here: The DEC, as has been discussed at length, has proposed a tracking system for fracking waste.

They keep saying it's similar to the medical-waste system.

And, you know, that's -- that is indeed the case.

And this is a great example of good public relations, because everybody hears "medical waste," and goes, "Ah!" because it sounds gross.

But, this doesn't live up to the standards of what would be required under hazardous-waste regulations; and in one particular point, specifically for the medical-waste tracking system, the medical-waste generators, transporters, and handlers, all have to report, all have to keep the manifest systems, but they have to -- excuse me, the manifest tracking forms.

But, they have to, those entities, keep the forms on site, and are available at the request of the Department of Environmental Conservation.

Under hazardous-waste regulations, it -- those have to be reported to the State.

They're put into a database. And, that way, anybody -- you, me, anybody in the public -- can go, and look and see, what's, in fact, happening with this waste.

This is a big problem, especially with DEC's staffing and resources being what they are, at historically low levels.

This means that we've got a very important check in the system, in the proposed system, which would be missing, if the State goes forward, not counting this as hazardous waste.

Now, that's just on the transport.

That's to say nothing of what actually happens to the waste once it arrives at the facilities, and how it's treated -- how it would be treated there.

Moving on a bit to the other issue I identified today, is, treating waste at the publicly owned treatment works; the municipal sewage systems.

A big problem with treating fracking waste at these plants is the levels of total dissolved solids in fracking wastes.

Total dissolved solid are, essentially, salts, they're metals. And, they are found at -- in fracking wastes at levels 1.6 to 6.6 times the levels found in seawaters.

This is incredibly, incredibly salty waters.

Sewage plants aren't designed to remove these types of salts.

They -- salts in -- in fact, according to the Supplemental Generic Environmental Impact Statement:

"Salts, and dissolved solids, may not be sufficiently treated at municipal treatment and/or treatment technologies not designed to remove pollutants of this nature."

So that means, if these wastes are disposed,

and sent to these types of plants, the best that we could hope for is that they would be diluted. That, the waste would go in, and that they would pass through the system, diluted.

This leads to lots of other problems when you get into cumulative impacts.

If you've got more than one plant treating fracking waste on the same water body, now you run into problems, like what was seen in Pennsylvania, where, all of these wastes add up, because they don't disappear once they go into the ecosystem. In fact, they just keep getting worse.

The DEC went on, in the Supplemental Generic Environmental Impact Statement, to question -- to further question whether or not this should be treated at our municipal treatment plants.

And, I quote:

"There's questionable available capacity for POTWs in New York State to accept high-volume hydraulic fracturing wastewater.

"Further, because of the inability of biological treatment systems to remove certain high-volume hydraulic fracturing additives and flowback water, as previously described, POTWs are not usually equipped to accept influent containing

these contaminants.

"The potential for inhibition of biological activity and sludge settling, and the potential for radionuclide concentration in the sludge, impacts sludge-disposal options."

So, if we take this apart, the State is questioning the capacity -- how much? -- which, basically, means two things.

First: Can the plant handle it?

Is there, literally, capacity? Is there room in the pipes?

Secondly, it also gets at the ability for the receiving water; the capacity of the receiving water, to handle this type of waste, and to take that on.

The State then went on to say:

"Because of the inability of biological treatment systems to remove certain additives --

Again, the TDS being one of these.

-- "they're not usually equipped to accept the influent" -- "they're not usually equipped to accept these wastes."

And then, third, "The potential for inhibition of biological activity."

And this is something that the gentleman from

Niagara Falls had touched upon.

We've got most of our treatment plants in New York State relying on biological systems; meaning, that these are bacteria that break down the waste.

These are bugs.

And they rely on having certain water-quality standards within those systems in order to properly break down municipal sewage.

If we start allowing very, very salty waste to enter this system, without being properly treated, if this goes in, we run the risk of, essentially, shutting down the plant, making the plant itself unable to treat other wastes.

And because fracking wastes would, presumably, be just one portion of waste that any of these plants are accepting, if this is allowed to go forward, then we run the risk of the plant not being able to treat the waste it was designed to treat, and that communities rely on for treatment.

In Pennsylvania, this -- they ran into all sorts of problems.

The industry admitted as much in a "Post Gazette" article, where they said that, you know, natural gas industry is a contributing factor

to elevated levels of contaminants in various rivers.

So, based on the State's concerns regarding the questionable available capacity, the potential of inhibition of biological activity in sludge settling, and Pennsylvania's experience, and citizen opposition to the practice, municipal treatment plants in New York State should not be permitted to accept fracking wastes.

In my testimony, I go on to just touch on the issue of recycling and reuse.

I would just like to echo what I said before, you know, this is promising. The more that can be recycled and reused, the better.

If this industry is going to operate, you know, we want to make sure that they are using as little fresh water as possible, and polluting as little water as possible.

However, at the end of the day, you still have contaminants that need to be dealt with.

So, in the coming session, there are a couple of things that the Senate can work to do.

First: Passing Senate Bill 4616, as had been said before.

And, Senator -- we appreciate the Senator's

support for this.

This -- you know, this is a bill that's given "three trees" in Environmental Advocates' rating system.

It's been designated a "superbill" by the environmental community, showing the community's strong support for this measure.

And, it's a very basic, and a very reasonable, action to ask these companies to take; that, if the waste would be classified as "hazardous waste," to treat it as such.

Secondly: The Senate can act to make sure that municipal treatment plants are not accepting fracking waste.

Third: The New York State Comptroller is advancing legislation to establish strict liability, as well as the Spill Cleanup Fund.

This gets at the problem of, you know:

What happens if something goes wrong?

What happens if a company does not act in -- does not act as a good actor in New York, and then moves on?

It gives New York an ability to go back, and make sure that there is a fund in place, to provide for any cleanup that happens.

Assemblyman Sweeney is carrying this bill. And it's something that the Senate should consider as well.

And then, finally, on the issue of DEC funding and staffing: You know, as the Senators are both well aware, this is an issue that the State -- excuse me, funding and staffing issues are plaguing the DEC, from top to bottom, and in every -- every division within the agency.

They're operating with fewer staff than they were in the 1980s; yet, the responsibilities of the agency to protect our water, our communities, has only increased.

We are at a very critical time right now, as everybody's considering looking towards the next session, and looking towards the budget.

As a member of the Fracking Advisory Panel, the Environmental Advocates is looking at this issue closely, and participating in discussions with other stakeholders about how this should move forward.

But what has become clear, is that, industry should not be externalizing the costs of oversight, and of running a system that is, essentially, designed to cater this one industry's needs.

This is something that industry needs to take

a strong lead on as well.

So, that is, in a nutshell, my testimony.

I appreciate your time. I appreciate your leadership on this.

And, I'm happy to take any questions.

SENATOR GRISANTI: Yeah, we're going to ask you some questions.

We got to take a break for a few minutes. They have to change some of the technical and audio, so...

[Discussion at Chair's table.]

[Pause in the proceeding.]

[The proceeding resumed, as follows:]

SENATOR GRISANTI: We had a brief break to change some of the audio, which was good, so...

Katherine, the couple questions that I have, is, you had mentioned -- you had mentioned about the possibility -- in particular, you mentioned about the Niagara Falls not being able to -- if they were to treat this, then they may not be able to treat other --

KATHERINE NADEAU: Right.

SENATOR GRISANTI: -- you know, what they were normally set up for.

KATHERINE NADEAU: Right, right.

And I wouldn't -- I wasn't speaking specifically about the Niagara Falls facility, because they do have specialized treatment systems.

SENATOR GRISANTI: Okay, that's what I want to differentiate.

So you're talking about the facilities that you feel that just treat regular --

KATHERINE NADEAU: Right.

SENATOR GRISANTI: -- what they're set up to do, that if they were to do this, it could jeopardize what they were originally set up for in the beginning?

Okay.

KATHERINE NADEAU: Absolutely.

And that's most of the -- most of the facilities in the state are based on -- the biologic treatment systems are just meant to treat sewage, and that's what they're based upon.

SENATOR GRISANTI: Okay.

I have heard in testimony in other hearings, that a lot of the companies in Pennsylvania are doing a lot more recycling than they were in the past.

They would only, you know, maybe do two times pass-through, but some of them are recycling, and

carrying it from wells to wells.

But, again, the concern with that is, is the storage;

The concern is, still, you know, the water coming out from the flowback, from the casings.

And, at the end, you're going to have, pretty much, because of its sitting, a higher concentration, I think, of chemicals, and that's also a concern.

I would take it, you agree with that?

KATHERINE NADEAU: Yeah, absolutely.

Absolutely.

SENATOR GRISANTI: Okay.

And, uhm -- and it's -- you know, I was kind thinking the same thing in my head, when it was mentioned about: Well, we're following the federal guidelines on this, with regards to hazardous waste, but -- so that's why we're doing it.

When I know, just being in the Senate, that New York State, on various occasions, has gone so much higher above the federal requirements, from Medicaid, to other issues, that you don't really need to -- you know, to stay at that same level.

And I think it's something I think that the DEC has actually, you know, starting to take a look

at again.

KATHERINE NADEAU: And just on that point, if I may: The one thing that I would say, is that, folks concerned about this issue are looking to the feds for a lot.

The Environmental Protection Agency is doing their study on how fracking impacts groundwater and water supplies.

They're the studies that the EPA is doing out of Wyoming.

So, the feds do have more resources, they have more abilities at their disposal, when we're looking a what's going on, on a national level, and taking some of those lessons and applying them to New York.

So, there's definitely a role for the feds to play, but, again, it should be, as it has been in environmental law all along, the floor, and not the ceiling.

You know, the feds set the minimum standards.

But we can look here in New York, and we can say: You know, what? We need to do better to protect our waters --

SENATOR GRISANTI: Yeah, and I know -- and I said it before, that I know that there's going to

be some preliminary reports coming out in 2012.

Somebody mentioned '14, but I think that's a final end study.

And I understand what happened in Wyoming.

And I understand that -- in New York, that's not a case that that would happen here, based on the depths, and buffer zone, so on and so forth.

But there's -- the EPA is still doing their particular -- their study, and still moving forward.

I've also heard that, you know, there may be a reduction in the type chemicals that are actually used in this process.

And I want to say, more greener chemicals, but, I mean, chemicals, and, nonetheless, the sense, that if -- if you're reducing something, that's always, uhm -- that's always of good importance, too.

KATHERINE NADEAU: Absolutely.

SENATOR GRISANTI: The salinity of the water, could a public treatment facility, or a retrofitted public facility, in your opinion, work as, or in conjunction with, like a desalinization unit, a facility to work with clean, or getting rid of the saltwater?

Do you see that as a potential?

KATHERINE NADEAU: There are -- yeah, there are different treatment systems out there that specifically go after salinity.

The problem that they encounter so often, is that there are super energy-intensive; and, therefore, they wind up being very, very expensive.

And, you know, this makes sense. Otherwise, if not, you know, we could -- all of Long Island could be drinking out of the ocean, and we could do it --

SENATOR GRISANTI: Right.

KATHERINE NADEAU: -- you know -- or, where there is ocean. Not just Long Island. I don't mean to pick.

But, you know, we could be looking at this as a real option, but it comes down to expense.

And, again, if that's something that the industry wants to take on, and can, you know -- can reduce these pollutants down to the point where they are not a problem, that's something that makes perfect sense.

But, at this point, it's not being proposed in New York State; and, therefore, we shouldn't be allowed this -- we shouldn't allow this waste to be treated at municipal treatment plants in

New York State.

SENATOR GRISANTI: Gotcha.

Okay, I appreciate your testimony.

And, I'll turn over to Senator Gallivan.

SENATOR GALLIVAN: Just one question, going back to the manifest system that had been testified about --

KATHERINE NADEAU: Right.

SENATOR GALLIVAN: -- earlier, and you testified earlier as well.

And, you talked about the differences between, what's being proposed and the requirement of the manifest system right now for hazardous wastes.

And, the major difference is, where the fracking forms ultimately go, and then -- to the DEC, versus, kept by the industry.

KATHERINE NADEAU: Yes.

SENATOR GALLIVAN: And then, ultimately, be made public.

Are there other significant differences, that you're aware of?

KATHERINE NADEAU: That's the most -- for the tracking system alone, that's the most significant one that I've come across in my research so far.

Because, both the hazardous wastes and the medical systems would require the generators to know: How much waste is being transported? You know, who's transporting? Where it's going to? Signatures at both ends.

That sort of thing.

So, so far, in my research -- and I'm not saying I won't find something else -- but, so far, that's the biggest difference.

SENATOR GALLIVAN: Okay, thank you.

That's all.

SENATOR GRISANTI: Okay.

Thank you very much for coming in today.

KATHERINE NADEAU: Thank you.

SENATOR GRISANTI: Can we have, Paul Hartman, please.

And I know, Mr. Hartman, that you have a pretty lengthy testimony. It will be submitted in the record.

You know, as I said before, paraphrase as much as you possibly can.

PAUL HARTMAN: Sure.

SENATOR GRISANTI: Okay, thank you very much.

PAUL HARTMAN: Thank you, Chairman.

Chairman Grisanti, Senator Gallivan, other

members of the Senate Environmental Conservation Committee that will see or hear our testimony, thank you for the opportunity to address you today on the matter of produced water and drill-cuttings disposal as it will relates to natural gas drilling and hydraulic fracturing.

My name is Paul Hartman. I am the director of state government relations for Chesapeake Energy System.

Chesapeake Energy is the second-largest producer of natural gas, a Top 15 producer of oil and natural gas liquids, and the most active driller of new wells in the United States.

Due to time constraint, my testimony today will focus on Chesapeake's water recycling and reuse program: Aqua Renew.

And I am very pleased to hear today, environmental advocates advance water recycling as a major solution to the water issues.

It has been an issue of major concern to the State of New York, and to the industry as a whole, and I hope to illustrate today how we have approached to solve the water-disposal problems.

Water is an important and highly valued resource, and Chesapeake takes its use very

seriously.

One of the major advances in the process of developing our natural gas resources in recent years, that has resulted in significant conservation of our water resources, is the advent of recycling and reuse of flowback and produced water by the industry.

Water recycling, particularly in neighboring Pennsylvania, has been transformed from a trend to an essential operation procedure.

Recycling produced water reduces the impact on local water supplies, which translates into less truck traffic, which means reduced road infrastructure wear-and-tear from water tanker trucks.

Founded on the concept of water recovery and reuse, Chesapeake's Aqua Renew program is utilizing state-of-the-art technology in an effort to recycle produced water.

This naturally occurring water is generally laden with various minerals that travels from the producing formation, through the wellbore, to the surface, with natural gas, during the completion of production operations.

The quality of produced water, as was

mentioned earlier by others that have testified, differs greatly with the varying amounts of salt, sand, or silt, depending on the formation from which it -- it's found.

Due to its normally high salt content, reuse and completion operations had been considered impossible by the industry for a very long time.

Chesapeake began to intently focus on water reclamation and conservation after the 2006/2007 drought in the Barnett Shale in Texas.

The drought had an obvious effect on Chesapeake's drilling and completion activities, as well as surrounding communities.

From that experience, Chesapeake's -- and Chesapeake's involvement with the Barnett Shale Water Conservation and Management Committee, the company entered into an agreement with the City of Fort Worth, to study evaporation systems as a potential way to reduce the amount of produced water being injected into saltwater disposal wells, which was the preferred disposal technique at the time.

Using an evaporative reduction and solidification system to capture heat generated by natural gas compressor stations, an energy source that would typically be wasted, a portion of the

produced water is then filtered and reduced to water vapor.

The resulting clean vapor is then released into the atmosphere where it enters the normal hydrologic cycle.

Since this preliminary reclamation project, Chesapeake's focus on reuse of water has become a company-wide endeavor, stretching from the Barnett Shale in north Texas to northern Pennsylvania.

In fact, the Aqua Renew program is helping to change the longstanding industry assumptions that produced water is unusable.

As referenced previously, it was a longstanding supposition that using anything other than fresh water would harm the ultimate productivity of the well.

As a result, operators have previously only used fresh-water resources in drilling-and-completion procedures.

Chesapeake decided to challenge and test that theory, and see if it was true; or, if there was, in fact, a limit as to how much recycled water could be used without compromising well production.

At each well site, produced water is

collected and stored in on-site holding tanks before being transferred to a central filtration location.

Our current methods of fluid treatment use both chemical and physical methods.

The fluids from our drilling operations are treated through a filter press which requires some chemical additions to adjust fluid parameters, such as pH.

Aqua Renew also uses fluctuating agents to assist in removing solids from the fluid.

The physical treatment utilizes a backwashable system which filters out the suspended solids larger than 20 microns.

The filtered water is then either stored in on-site tanks or transported to the next well scheduled for hydraulic fracturing, commonly referred to as "fracking."

The water is tested for salt content, total hardness, to determine at which rate it can be blended with fresh water to ensure proper quality and quantity for reuse.

Chesapeake still has to mix the recycled produced water with fresh water in order to ensure the proper mixture for fracturing, but every gallon of produced water that is filtered and reused is one

less gallon of water that has to be permitted at a disposal location, and one less gallon of fresh water that has to be sourced.

To date, Chesapeake still has not found a limit on the reuse of recycled water.

In fact, the company's northern and central districts of the eastern division operations are treating and recycling 100 percent of the initial produced water from the flowback process.

We believe that water can be recycled indefinitely, as it's mixed with fresh water during the fracturing process.

The fracturing process uses an average of 6 million gallons of water per well, depending on several factors.

Through the second quarter of 2011, Chesapeake had four Aqua Renew sites recycling drilling and production fluids in Pennsylvania, under an OG-71 permit issued by the Department of Environmental Protection, Oil and Gas Division.

This past summer, the Commonwealth changed the permit requirement to require a new permit, the WMGR123, which is managed by the waste management division of the Pennsylvania DEP.

All future fluid-processing sites will

require an MRG123 [sic].

I have included a copy of this permit with my testimony, for your reference.

The OG-71 permit will remain available in Pennsylvania; however, allowable activities under this permit will be limited to the utilization of the recycled water on the well pad at which it was processed.

Chesapeake has established a program of periodic measurement of the radioactivity of the recycled water, and has found no increase in radioactivity over background data.

We also measure the radioactive level of every load of solids which has been filtered from the produced waters, as required per our permit, and have found no load of solids which exceed the limits set under the state operating limit.

Currently, all filtered solids are trucked to a rail siting in Meshoppen, Pennsylvania, and taken to Ohio for disposal in the landfill.

The filtered solids are once again checked for abnormal radioactivity at the landfill before final disposal.

On average, this process is able to filter and reuse more than 10 million gallons of produced

water a month in the Marcellus Shale.

In 2010 alone, Chesapeake recycled 83 million gallons of produced water.

With such large volumes of recycled water, the company's seen more than just environmental advantages.

Our accounting department has estimated that this aspect of the process is saving an average of $12 million a year in the eastern division alone.

The program is garnering results like these throughout our shale plays; and, subsequently, the Aqua Renew program is expected to continue to grow.

Chesapeake is always evaluating new technology on our own, and through partnerships, like the one we have with the Barnett Shale Water Conservation Group, and others.

Currently in Pennsylvania, our biggest challenge to enhancing our recycling and reuse efforts, is obtaining the permits for the development of additional fluid processing sites, and avoiding the potential for exceeding current filtration capabilities.

However, I must take the opportunity to appeal to the Committee, that innovation of the technological advancement are only possible through

a flexible regulatory and statutory regime that does not lock industry into yesterday's technology, best practices, or common practices.

In April of this past year, the Pennsylvania DEP requested that all natural gas operators cease delivering wastewater from shale-gas extraction to permitted wastewater treatment facilities in the Commonwealth.

Chesapeake, and all operators active in the Marcellus Shale Coalition, have made extensive efforts to meet that objective, predominantly through the expansive reuse and recycling of produced water.

Meeting the goal of near-universal recycling and reuse can be impeded by burdensome and overly prescriptive regulations, or legislative-stipulated best-management practices.

I would advise the Committee to examine the overall impact of any new proposals in regards to wastewater retreatment, recycling and reuse, to determine the effectiveness of the policy, and the creation of any additional barriers to sound water management and conservation practices that have been developed by industry leaders, such as Chesapeake, over the past several years.

Please keep in mind, that only five to six years ago, the conventional wisdom dictated that produced water could not be recycled and reused.

And, today, in our Marcellus North operations we are, in fact, recycling and reusing 100 percent of the initial and produced water from the flowback process.

In closing: It is with great pride that Chesapeake can share with you that the filtration recycling process we are utilizing is working quite well in Pennsylvania.

Utilization of recycled water in our fracturing process has not had a negative impact on well productivity, and our fluid waste treatment capability creates a closed-loop system which has no impact on the fresh-water rivers and streams in Pennsylvania.

I thank you for the opportunity to address the Committee today on this important issue.

Please rest assured, that Chesapeake stands ready to assist the Chairman and members of the Committee on this, and any other issues pertaining to the responsible development our natural gas resources.

SENATOR GRISANTI: Thank you very much.

Do you know if, uhm -- do you know if other oil and gas companies are, uhm -- I don't know, being, somewhat, as your company, is with 100 percent recycling?

PAUL HARTMAN: There are a number of companies that have achieved 100 percent at this point in time.

As of the directive from DEP, regarding disposal at public wastewater treatment facilities, I believe the industry was at about 70 percent, industry-wide, recycling reuse.

That number has increased dramatically.

I don't have the current figure, but it is well north of 70 percent at this time.

SENATOR GRISANTI: All right.

And, then, if you're recycling the water at some point, there's got to be an end product; correct?

PAUL HARTMAN: The end product that we have right now is the solids that are filtered out. And those are disposed of at landfills.

SENATOR GRISANTI: Okay.

PAUL HARTMAN: We currently are evaluating the effectiveness of the water and reuse of the

refracturing.

At this point in time, we don't see a time where that water's not going to be useful for us for that purpose again.

SENATOR GRISANTI: Okay.

The [unintelligible] disposal landfills, is there still -- are you still disposing in Ohio as well?

PAUL HARTMAN: Yes.

SENATOR GRISANTI: Okay.

PAUL HARTMAN: We are disposing a little bit of our produced water from our southwest Pennsylvania operations, in Ohio.

SENATOR GRISANTI: Okay.

And you saw -- I mean, you were here earlier.

And when you saw, like the open pits, as far as what they're talking about, and -- and, uhm -- the cuttings -- this is besides the frack water -- what are you doing with that regards, with regards to cuttings, and so on and so forth?

PAUL HARTMAN: We use a fulcrum (ph.) closed-loop system for our flowback water, as well as for our drill cuttings.

So, we are operating on that closed-loop system currently.

SENATOR GRISANTI: All right, so you're not -- it's not what they have here in New York, where they showed, like some of the areas are using an open-pit system?

PAUL HARTMAN: We are not using an open pit in our processes in the northern Marcellus.

SENATOR GRISANTI: All right, so -- basically, so everything's closed; it's contained?

PAUL HARTMAN: That is correct.

SENATOR GRISANTI: Is the regulations in Pennsylvania sort of less restrictive than they will be in New York, as far as, if someone called for, like, a double containment, so on and so forth?

PAUL HARTMAN: It's important to note that the standards and the regulations that we have been operating, as an industry in New York State, have exceeded most other jurisdictions for a number of years.

The proposals prior to the original SGEIS draft that was put out in 2008, we were operating at a higher standard than many jurisdictions across the country, in New York State, under the current guidelines.

When you add in the additional Supplemental Generic Environmental Impact Statement

requirements, we'll be at a level far exceeding anything that's even been contemplated in other jurisdictions across the country.

With that said, Pennsylvania began significant development of the Marcellus about four years ago.

They have been evaluating the process as development has increased.

They have responded to, what they have deemed as, deficiencies in their operations. And, they have responded to suggestions from industry, as to how better to implement some best-management practices in a, either legislative or regulatory framework.

SENATOR GRISANTI: All right.

So, it's -- it would be fair to say, then, in the beginning, then, Pennsylvania was basically saying: Okay, let's move forward this procedure.

But, then, as they're moving forward, they're seeing that certain things weren't working properly, and they implemented changes, or put additional regulations on, in order to, uhm -- you know, to take care of any downfalls or shortcomings?

PAUL HARTMAN: There have been a number of issues that the State has -- the Commonwealth has

decide they'd they needed to address, and enhance their regulations, over the last couple of years.

SENATOR GRISANTI: Have they expanded, as they have done here in New York; whether it's, buffer zones from specific well sites?

Or -- or, in Pennsylvania, do they have sort of a continuing moratorium, and you can't drill within these certain watersheds, so on and so forth?

PAUL HARTMAN: There are established buffers in most jurisdictions across the country, that range in size, depending on who put those buffers in place.

Pennsylvania began this process a number of years ago, with buffers in place.

They are currently reviewing those buffers.

And there is a number of bills that are pending before the legislature, that would increase buffer zones.

SENATOR GRISANTI: Okay, but New York still is ranked high in regulation on buffer zones, and as far as --

PAUL HARTMAN: The -- the -- I would place New York in a category of having more, uhm -- more things that there are buffers from.

Some of the distances are greater in New York

than they are in existing jurisdictions.

There are a couple of buffers, to my understanding, that may be larger in other jurisdictions.

SENATOR GRISANTI: Okay.

The, uhm -- so, the recycling of the water -- and that's something that we've heard environmental advocates talk about, we've heard other groups talk about it -- that, you know, if you can do it, it's the way to go.

Have you noticed in your company, a -- sort of a -- a -- taking some of the chemicals out of the equation that are added, saying these are needed, are you seeing that more so in, uhm -- what you're doing in Pennsylvania, that some of the chemicals that we're actually using, or what's being fracked and what's coming back, that you're able to, either, not use some of those chemicals, or you're able to, by recycling, minimize any effect?

PAUL HARTMAN: Well, the important thing to -- yes, we are.

And the important thing to realize, is that, each geological formation of which we are extracting this resource has its own complexities, and requires certain additives, based on the geology, to produce

a productive well.

What we have found through our experience in northern Marcellus, is that we are able to reduce, somewhat dramatically, the amount of additives that were necessary to produce the well at a highly performing rate.

So, we've been able to go from 14 additives in our fracturing process, to, roughly, about 6, on an average fracturing job in the northern Marcellus.

SENATOR GRISANTI: Okay.

And according to DEC, those additives, or those, chemicals, are going to be disclosed --

PAUL HARTMAN: Yes.

SENATOR GRISANTI: -- anyways?

PAUL HARTMAN: That is one of the largest misun- -- misconceptions about our industry.

The fracturing fluids are disclosed, in their totality, to the regulatory agent, under the SGEIS.

And under the current GIS, we are disclosing those chemicals to the State of New York. They have the formulations. They have the number of chemicals.

We are also publicly disclosing, through a joint venture with the Groundwater Protection Council, and the Interstate Oil and Gas Compact

Commission, of which New York State is a member, all of the chemicals that are used in every fracturing job that we do in the Marcellus, publicly, on a website called "FracFocus," where we disclose the maximum concentration of every chemical used in that process.

Now, the reason for disclosing the maximum concentration, is that, it gives the public full knowledge of what the extreme amount of fluid would be contained in that process.

But, at the same time, it protects the federally protected proprietary trade secrets of the formulation that many of our service providers have asserted on their specific chemical formulations.

So, this way, we get the maximum amount of knowledge out into the public domain without giving the compact, specific chemical formulations.

SENATOR GRISANTI: Okay.

The, uhm -- but, in New York, are they going to take that same approach, by exempting out the proprietary interests?

PAUL HARTMAN: In New York, all of the information, in its totality, will have to be provided to the agency.

The agency, at that point in time, will be

able to provide that information, as necessary, to emergency responders, or other individuals, that need to have the exact chemical composition.

SENATOR GRISANTI: What about facilities that are trying to treat it?

They would need that information as well.

PAUL HARTMAN: That information I don't have readily available, but it's something we can look into and get back to you on.

SENATOR GRISANTI: Is there something -- do you utilize the, uhm -- in Pennsylvania, the private facility that's trying to clean up the fracking water?

There's a facility that just opened there recently; correct?

PAUL HARTMAN: We are not currently. Although, we have been in discussion with a number of private entrepreneurs about private facilities that are either being investigated to come on-line or looking for details on how to build those facilities.

We are currently doing all of our recycling in-house.

SENATOR GRISANTI: Okay.

I have nothing further at this point.

I'll pass it to Senator Gallivan.

SENATOR GALLIVAN: With your recycling program and reuse program, do I understand correctly that -- from your testimony, that whatever waste there is, is limited to solids?

So, you have no liquid waste --

PAUL HARTMAN: Correct.

SENATOR GALLIVAN: -- that's transported off of your site?

PAUL HARTMAN: That is correct.

We are maintaining the fluid for additional fracturing jobs, following that -- that initial processes.

SENATOR GALLIVAN: How much additional water do you need -- you've indicated that you're reusing 100 percent of your liquid, after you're removing certain contaminants out of it, but then you need to add some fresh water to the process?

PAUL HARTMAN: Correct.

SENATOR GALLIVAN: And can you put that in percentage terms?

PAUL HARTMAN: Yeah.

The top end, right now, that we're able to reuse recycled water in a new fracturing job, we're using 20 percent recycled water and about 80 percent

fresh water.

That is the current mixture that's -- that we've required -- that is required to effectively do the next fracturing job.

We hope to be able to continue to refine the process, and maximize the amount of recycled water that we're using in additional fractures.

But, it's also important to remember, that we're getting a smaller percentage of that water returned, between, you know, 10 and 18 percent returned water.

So, we are always going to be at a deficit of recycled water for additional fractures.

SENATOR GALLIVAN: Okay, thank you.

Good.

SENATOR GRISANTI: The, uhm -- you know, if -- if you guys are doing 100 percent recycling, have new figures been, sort of, estimated then, on how much new water won't be necessary, because of the fact that you're doing 100 percent recycling?

PAUL HARTMAN: Well, we've -- we've -- we've recycled 83 million gallons of water, thus far, in the northern Marcellus.

So, that's 83 million gallons of water that we did not source for additional fractures.

SENATOR GRISANTI: And I take it, if it's a 30-year well, that's -- that could be a huge amount of water that's actually saved?

PAUL HARTMAN: Well, at this point in time, we don't anticipate refracturing the wells.

We are -- based on the production of the wells, often, initial fracturing job, we don't anticipate having to come back and refracture those wells.

SENATOR GRISANTI: Okay.

All right.

All right, I appreciate your testimony.

Thank you very much.

PAUL HARTMAN: Thank you.

SENATOR GRISANTI: I know you have a lot of information here. That will be put into the record.

I just ask you to paraphrase as much as you can, because we still have other speakers to get through, and I don't know if they're going to throw us out of here by the time we said.

So, I don't want to take that chance, and cut somebody off at the end.

ROBERT DUTHIE: You're correct.

I will paraphrase.

SENATOR GRISANTI: All right.

ROBERT DUTHIE: I will paraphrase.

SENATOR GRISANTI: Thank you.

ROBERT DUTHIE: Good afternoon, Chairman Grisanti, and Senator Gallivan.

I am Robert Duthie, president, Synergena, Incorporated.

And, it's J.R. Red, Incorporated. Synergena is the division.

I'm a bioengineer, by profession.

Today I will introduce you to an advanced industrial wastewater treatment, and technology.

The technology is: Nanophotonic decontamination purification.

"Photonics" is the application of light, whose basic energy unit is photon.

SIAD is a patented process, incorporating a specific combination of proprietary light waves, operating simultaneously, to decontaminate, purify, and sterilize.

I led a team over the past 30 years, combined with Roswell Park doctors and University of Buffalo researchers, along with many other institutions around this country, to develop this process.

Interesting, as we've heard about the medical-device industry, we began in the

medical-device industry, with successful and validated use of this SIAD technology equipment produced by Synergena over two decades ago.

I also heard quite a bit about solids.

We began by micro-cleaning.

We did organic and inorganic decontamination and sterilization of medical equipment. Medical equipment and implant equipment.

We removed the contaminants.

This research and trials were done at nationally and internationally recognized institutions: Roswell Park, Cleveland Clinic, UCLA, University of Buffalo, Veterans Administration, and others around the country.

About 10 years ago, we advanced this technology from -- and tried it in liquids.

We were funded by the State of New York, federal government; and we had successful studies in the fields of food, beverage, and agricultural purification.

Excuse me.

Weapons-grade biological and chemical decontamination, after the 2000 -- 9/11 of 2001, and, industrial wastewater remediation.

Clients in this field included everyone, from

Tropicana, to Boeing.

Just recently, we finished our last study of a benchmark, hazardous industrial waste hydrocarbon, phenols, and PCB.

That is attached in your folder there.

Why is this important?

We changed PCB-contaminated water from the transformer industry into drinking-grade water.

Not environmentally sound water that you just release, but, drinking, human-consumption water.

About a year ago, hydrocarbon-contaminated shale drilling and hydraulic fracturing flowback water was brought to my attention.

Hydrocarbon-contaminated water contains hydrogen-and-carbon compound, which is non-polar; and water, which is a polar.

Hydrocarbons and water do not mix, but are extremely difficult to separate, and require industrial water treatment.

Simple hydrocarbons, such as methane, ethane, propane, butane, are found in natural gas.

Horizontal shale drilling and hydraulic fracturing flowback water contains natural gas.

Horizontal shale drilling --

Let me repeat that: Horizontal shale

drilling. Not vertical.

-- horizontal shale drilling and hydraulic fracturing flowback water is carbon-contaminated industrial wastewater, and requires industrial wastewater treatment.

Again, I am here to introduce you to a new technology. An advanced industrial wastewater technology.

We call it "SIAD."

That stands for: synergistic isogenis active decontamination.

It is value added.

It is value added to the industry, in that, the watered recycling and industrial water treatment facilities conducive to reducing transportation and water costs.

It is value added to the community. New equipment, manufacturing, and sales opportunities for New York State.

It is value added to the environment, because we can produce clean water and clear air.

Both the stationary and mobile industrial SIAD wastewater treatment systems and facilities, we hope to be operational and located in communities and on industrial sites, producing clean water and

pure air.

SIAD is a New York green technology and manufacturing initiative for a global market.

SIAD is made in the U.S.A.

Synergena is a local company.

We can address solids, we can address radioactive, our research.

And we are prepared to work jointly with these companies, to use our research and technology to improve the quality of life in New York State.

And I offer that today.

Thank you for your time.

And if you have any questions, which I imagine you will.

SENATOR GRISANTI: Thank you, Robert.

You know, in looking a this earlier, it seems, is that, because you've been in this industry for so long --

ROBERT DUTHIE: Yes.

SENATOR GRISANTI: -- that some of the -- as you said, with the PCBs, some of the things that you've cleaned, you're saying are -- and filtered, are a lot harder to filter and clean than this?

ROBERT DUTHIE: That is correct.

That is correct.

SENATOR GRISANTI: In a nutshell, what you're saying is --

ROBERT DUTHIE: We are --

SENATOR GRISANTI: -- what we've done in the past, with the hydrocarbons and cleaning, is, something that was more difficult, you're able to do.

You feel you can do this, as far as the flowback water?

ROBERT DUTHIE: Yes.

Again, I refer to the medical-device industry.

In the medical-device industry, we use benchmark organisms and chemicals, with the FDA.

Once those are remediated, you can do the lesser amounts.

Again, that's what we did with the chemicals here.

That's why the phenols and the PCB was so important.

It is, literally, impossible to break down the PCBs in the water.

In fact, it's so impossible, that we now have a working relationship with one of the large electrical-transformer companies in the nation,

internationally, that's looking at this process.

What we see in the hydraulic fracturing water is, applying our knowledge of what we've used already, and it's called "technology transfer from the medical-device industry," including, what we know about quality assurance in the medical-device industry.

It is interesting, that when you talked of the regulatory and the control factors, in the medical-device industry -- again, which I've been a member of for 30 years -- we are controlled by the FDA.

When we ship out any medical-device equipment that is contaminated, or it is -- it is rubbish.

We are responsible.

We are responsible for that transportation.

We are responsible for, on down the line, right into the facilities, their pits, and so on.

When the FDA inspector comes in -- I don't know if you're familiar with an FDA inspector.

An FDA inspector will come into your facility -- a hospital, or so on -- show you his credentials and flash his sidearm.

FDA inspectors are the only inspectors that are allowed that.

SENATOR GRISANTI: I didn't know that.

ROBERT DUTHIE: Yes. It is scary.

You don't mess with FDA.

They take, and they will go over your records, and you better have your quality assurance in place, at every sequence down that line, is validated, and verified.

Or you're responsible, and they will shut you down immediately.

SENATOR GRISANTI: Now, when they talk about -- and you were here this morning, when they talk about, you know, whether it's public or private facilities, being able to, uhm -- trying to clean this water, you're saying that that could be possible, but that your technique --

ROBERT DUTHIE: My technique is one of a series of techniques.

In our mobile units that we designed, we use a separation process; a filter -- course-filtration process, similar to what Chesapeake just explained.

Our nanophotonic SIAD process, which removes it -- reduces the hydrocarbons.

You don't totally remove it. You get down below levels that are hazardous.

And then you do the final filtration process,

which is 1 to 2 microns, and you come out with close to a drinking-water standard; which, after we've finished this process, we are able to recycle the water in a vertical well, which is, when you start drilling the well, you have to use a pure water.

I'm sure everyone will agree on that, because you're going to be penetrating the aquifer.

SENATOR GRISANTI: Got you.

Okay.

Well, I appreciate your testimony here today.

I'll turn it over to Senator Gallivan.

SENATOR GALLIVAN: No more questions.

Thank you.

SENATOR GRISANTI: Okay.

Thank you very much.

ROBERT DUTHIE: Thank you.

SENATOR GRISANTI: Brian, please.

Good afternoon, Brian.

How are you?

BRIAN RAHM: How's it going?

Go ahead?

SENATOR GRISANTI: Go ahead.

BRIAN RAHM: All right.

My name is Brian Rahm. I'm a post-doctoral associate with the New York State Water Resources

Institute. We're at Cornell University.

Thank you for the opportunity to participate in this discussion.

I'll move on with my testimony.

So, my testimony will address the following subjects:

One: Pertinent wastewater and cuttings data from Pennsylvania related to similar issues potentially faced by New York;

Two: Wastewater acceptability at publicly owned treatment works, or, "POTWs," in New York, with an emphasis on recommendations provided by New York Water Environment Association.

It's a professional group, which I'll say "NYWEA," instead;

And then, three: Wastewater treatment capacity in the Southern Tier of New York, and thoughts on future development.

Throughout, I will try to highlight some language from the revised draft Supplemental Generic Environmental Impact Statement, or, what I'll call the "SGEIS," as well as some New York regulations.

So, Point Number One: Pertinent wastewater and cuttings data from Pennsylvania related to similar issues potentially faced by New York.

Some of this has been talked about by previous speakers. I'll just go through it quickly.

I just want to outline some definitions, real quick, so you understand what I'm going to talk about, subsequent.

Brine and frack fluid, also known as "flowback," and, "produced water," includes water for hydraulic fracturing.

In the Marcellus Shale, frack fluids consist of water, again, mixed with approximately 8 to 15 chemical additives per well.

According to the Susquehanna River Basin Commission, which is this interstate body in charge of regulating water withdrawals in the Susquehanna River Basis portion of New York, Pennsylvania, and other states, they have data from 2008 to 2011, where they say, that about 10 percent of the water injected into each well returns to the land surface within 30 days.

It's an average.

And the rest remains underground.

Once the well's in production, relatively low volumes of produced water, or brine, will continue to come to the surface.

This is different from drilling muds.

Drilling muds include fluids used during the drilling process, to cool and lubricate the drill bit and motor, and to transport the cuttings to surface.

Overall, mud volumes are not high compared to flowback, but can contain chemical additives and metals, and things, that do require treatment.

And then, finally, cuttings -- according to the SGEIS, rock chips and fine-grained rock fragments -- removed by the drilling process and returned to the surface as part the fluid.

So with these definitions in mind, there are a few treatment options, or disposal options.

These have also been covered by some previous speakers.

We have, number one, I'll say: On-site or off-site industrial treatment facilities;

Two: Reuse, with pretreatment, on-site or offsite.

I want to make the distinction that, a lot of times, when we talk about reuse, or recycling, it goes through a treatment process first, and then they reuse it.

And, generally, I know some companies have tried to reuse without treatment.

And I think, from what I've understood, their results weren't particularly good.

So, usually there's some sort of treatment involved in the reuse.

So, three: Underground injection via federally regulated deep wells.

There's been a lot of discussion about those.

And, four: Publicly owned treatment works. Again, "POTWs."

So, in Pennsylvania, it is possible to get information on trends, in terms of wastewater treatment and disposal, because of recent establishment of a statewide tracking system.

No state in the region, other than Pennsylvania, has yet reported data on wastewater management, although, West Virginia is in the beginning stages of this.

So, it's not clear if these numbers will translate directly to New York, but they do provide some trends that might be relevant, if we're trying to, you know, learn lessons from our neighbors.

New York has proposed such a system, although it's not exactly the same.

So, how are certain Pennsylvania wastes being handled?

This is based on Pennsylvania DEP information from January to June of 2011.

It's a publicly available database. It goes back a few years, but not very far, because, again it's something they just set up.

Now, in terms of brine and frack fluid, according to the database -- which is an industry self-reported database, so I can't necessarily vouch for the numbers, exactly -- but, according that database, roughly half is reused for subsequent frack jobs.

Again, likely following industrial, or some other form of treatment.

And the SGEIS does support this, by saying that reuse is expected to be significant in New York.

Roughly, one-third of the water, the brine and frack fluid from Pennsylvania, is sent to industrial treatment facilities.

None of those facilities, according to the database, are located in New York.

About 5 percent of the wastewater does go to deep injection wells, mostly in Ohio, but also in other states, like West Virginia.

Less than 1 percent, according to the

database, is going to POTWs, all of which are located in Pennsylvania.

Again, we've heard, the Pennsylvania DEP has asked operators to voluntarily stop going to POTWs.

There's some evidence in the database that this has been occurring over the last couple years.

I think this is, probably, just one of several reasons why that trend is happening.

As far as drilling muds and other liquid wastes, in terms of where they're being disposed of, it's roughly split between, what they're calling "reuse and industrial treatment facilities."

And then, again, you have, about, 1 to 2 percent, each, for POTW ands landfills, in terms of the drilling muds.

Solid-waste, or the cuttings, are almost exclusively going to landfills.

Most of those landfills are in Pennsylvania. It's about 60 percent.

But, there's a significant amount of cuttings also coming to New York. Again, according to the database, that number's at, about, 30 percent of cuttings.

So, it's worth mentioning, that treatment of

these wastewaters, even at sophisticated industrial facilities, usually leads to some sort of byproduct -- a solid or concentrated liquid waste -- that usually needs to handled, either by, landfill, or, again, some sort of deep-well injection, or other form of treatment.

New treatment technologies are being developed by a growing water-service industry in Pennsylvania, although, many are not in yet in wide use.

I think we heard about some crystallization technologies earlier.

So -- okay, so that's Point One.

Point Number Two: Wastewater acceptability at POTWs in New York, with --

And I'm going to be talking about some recommendations that were provided by NYWEA, which is a group that I had a chance to work, in making some of these recommendations, as well as with other issues related to Marcellus Shale.

So, I want to briefly give an engineer's perspective on this. Some of these recommendations are a little technical.

I apologize for that.

So, according to NYWEA: Existing or new

POTWs that utilize physical-chemical treatment processes may have the ability to successfully treat specific shale-gas wastewaters.

However, only two such systems currently exist in New York.

And we just heard from Paul Drof, from Niagara Falls, being one of them.

Successful treatment depends on the ability to understand and characterize waste composition over time, and the capabilities of the specific treatment system it's being sent to.

Biological treatment plants, the vast majority of facilities in New York, likely will not be able to accept wastewaters without significant pretreatment, with the possible exception of some drilling muds that may be less complex than some of the flowback in previous waters.

If treating shale-gas wastewaters were to be an option, NYWEA recommends that each POTW wishing to accept this kind of waste, review their facility, they examine the types of wastes that they're accepting, and their treatment capabilities, and see if they can meet the regulatory obligations.

They also suggest revisiting the assimilative capacity of receiving water bodies.

So, those are the streams, the rivers, that those plants are discharging into, in terms of, particularly, TDS or salts.

So, can those rivers or streams accept any further loadings of these kinds of constituents?

Sometimes that's the case, and sometimes it's not.

Pennsylvania, in particular, is already in bad shape when it comes to TDS in their streams.

So, confirmation that it can protect the treatment-plant personnel and equipment from harm and damage.

Something that maybe isn't talked about as much, are the actual workers themselves; making sure that they're safe.

Analysis of the effect the wastewater may have on treatment-plant sludge and residuals -- those are solids -- and whether the POTWs can cost-effectively manage and dispose of them.

NYWEA also recommends that POTWs confirm they have the authority to stipulate monitoring requirements, as well as the ability to reject the wastewater that does not meet those requirements.

Lastly, NYWEA recommends that POTWs give consideration to testing each load of new

wastewater, especially for radioactivity.

The revised draft of the SGEIS, as well as some of the new proposed regulations in Part 750 of NYCRR, address some of these concerns, by requiring that each batch of wastewater leaving a well pad be tested for TDS, NORM, and BTEX; requires testing for influent and treatability at both public and private facilities; fluid disposal plans; and things like wastewater-volume monitoring.

I think that still leaves an open question, in terms of DEC personnel for inspection and enforcement of these kinds of regulations.

The regulations do have some pretty progressive terms in there; but, again, you know, it's always a question as to whether we're going to have the personnel doing what we say we're going to carry through on.

So, I just leave that as an open concern.

And, finally, Point Number Three: Wastewater treatment capacity in the Southern Tier of New York.

So, so far, I've provide some information on how wastewater and cuttings are dealt with in Pennsylvania. And I've outlined some considerations relative to the use of POTWs in New York.

However, it is clear that POTWs are not being

extensively used in Pennsylvania.

Again, that's less than 1 percent of their wastewater.

And that their use in New York entails a variety of concerns, that we've heard about this morning.

So, what is the available POTW capacity in New York, and will they matter going forward?

According to the SGEIS, the DEC performed a basic analysis, to determine the potential available capacity of POTWs for accepting this kind of wastewater.

And given a number of, not always realistic assumptions, that were generous, the analysis did still find that there's questionable available capacity, quote/unquote, for POTWs in New York State to accept high-volume hydraulic fracturing wastewater.

So, even with a scenario that assumed that a lot of this would be able to go forward, they still found that capacity was lacking.

At WRI, we've also performed a similar analysis in the Susquehanna River Basin, specifically; so, more in the Southern Tier than the whole state.

Again, assuming the facilities have the ability and inclination to do so, which, very many will not, results of our analysis support the idea that capacity is limited, due to a combination of public-infrastructure size and regulatory constraints, such as those proposed in the SGEIS.

In reality, there are additional reasons to think that POTWs will not be extensively utilized in New York.

For example: No POTW currently has TDS-specific treatment technologies.

That would be the thermal-distillation or crystallization technologies.

And, so, that's a reason to think that they're not going to be highly used here, because they would need to invest in those kinds of technologies in order to meet the requirements.

These analyses, together with evidence from Pennsylvania, suggest that industrial treatment facilities have a greater ability and capacity to treat these waste streams.

And it leads me to conclude that POTWs will not really be acceptable for industry within the regulations New York is likely to adopt.

Encouraging establishment of purpose-built

industrial treatment facilities, either on-site or offsite, has several key advantages over POTWs:

The technology is more appropriate;

They have greater capacity;

In terms of oversight, assuring compliance of, what may be a smaller number of industrial facilities, compared to a larger number of POTWs, is, perhaps, more manageable for DEC staff.

And, then, something that's, sort of, equally important here: Planning and finance.

From a planning perspective, private facilities may be built at a pace and scale concurrent with the development of the shale, and may have more flexibility than public entities, in choosing business models that accommodate the volatile nature of extractive development.

We talk about 30 years of development, but there's really no way to predict, with any certainty, exactly where the drilling's going to happen, exactly at what times, what the price of gas will be over that time.

It would be nice to know, but we really don't.

So, just offer the following conclusions:

One: Due to a combination of evolving

regulation, expanded industrial treatment infrastructure, and advancements in treatment technologies, a large majority of shale-gas wastewater in Pennsylvania is being handled by private industrial treatment facilities with an increasing model of reuse.

Solid cuttings from Pennsylvania development are almost exclusively sent to landfills, both in Pennsylvania and New York.

Treatment of most --

So, Conclusion Number Two: Treatment of most shale-gas wastewaters is not appropriate at POTWs utilizing biological processes, which is almost all of them in New York.

That being said, these wastewaters are treatable, but only under carefully controlled circumstances, using appropriate technologies with well-trained professionals and adequate regulatory personnel.

That's a lot of caveats.

So, this likely means, sophisticated physical-chemical processes, perhaps like the ones in Niagara Falls, with some form of thermal-distillation technology, or its equivalent.

Three: POTW treatment capacity in New York

is limited, even under the most permissive policy scenarios.

Given the relatively stringent regulations New York is likely to adopt, use of POTWs would not represent a viable treatment disposal option for the shale-gas industry.

Private facilities purposely designed, and located within areas of significant shale-gas development, could treat wastewater without putting public facilities and taxpayers at risk.

Lastly, I would like to offer a general comment in support of gathering as much data on these important issues as possible, in the event the development moves forward in New York.

In the SGEIS, the DEC proposes many new measures and data-collection requirements, but it's not clear, to me at least, who will organize and analyze this data, to what extent it will be made public, and how it will feed back into policy and management decisions in the future.

I would urge the State to be diligent in its approach to data collection, analysis, and presentation in the upcoming years, so that all stakeholder have access to good information, and so New York can critically evaluate its approach to

complex development issues.

Thank you for your time.

SENATOR GRISANTI: Is it your concern, then, with regards to the public facilities, and it was testified to before, that -- that if they're not, uhm -- if they're not geared to accept this type of fluid, then it could jeopardize what they're initially set out to do in the first place, with just regular treatment of the local community's water?

BRIAN RAHM: I think that's true.

A biological system can be sensitive to unexpected impacts coming in the influent. And if they're designed to treat this kind of wastewater, a biological system is not going to handle that particularly well.

SENATOR GRISANTI: Okay.

BRIAN RAHM: You wouldn't want to kill off your biological system. It's going to stop treating the waste it's meant to do.

SENATOR GRISANTI: Right.

And that would exclude, I think there's, what, two in the area of Niagara Falls, and I think there's also one in the, uhm --

BRIAN RAHM: North Tonawanda is the other

one.

SENATOR GRISANTI: -- North Tonawanda is --

BRIAN RAHM: They're both in the same --

SENATOR GRISANTI: No other facilities?

BRIAN RAHM: -- Buffalo area.

Not to my knowledge, no.

SENATOR GRISANTI: Okay.

And what's your take on what the -- the industry talking about recycling; utilizing that water?

Which is also, probably, a technique for now. And, at some point, you've got to -- it's going to be treated at -- to some capacity.

But, uhm, that would also take a burden off, as far as having to treat the water as well, right, to some extent?

BRIAN RAHM: It would do, what? I'm sorry?

SENATOR GRISANTI: Take the burden of treating all that water, to some extent, because you keep recycling the same water over and over again?

BRIAN RAHM: I mean, it -- you are the only getting, again, as we said in the last talk, like, only 10 to 20 percent of that water back.

So, you do still need quite a bit of fresh water.

That depends on the fact that you're drilling as many wells in the future as you were in the past, so, that -- those percentages stay as they are.

I think that you are seeing, and especially in northern Pennsylvania, these new industrial treatment facilities popping up. And, some of them have quite good technology.

And that is taking some of the burden off, but, you know, you can't relieve the entire burden because you're always going to need some make-up water.

SENATOR GRISANTI: I understand that -- for the water itself, you're saying that would be the way to go, is -- in your opinion?

BRIAN RAHM: Of the options that are currently available, that seems to be one of the best ones I can see.

You're basically saying, that the investment in that facility is a private one. It's -- you know, if it doesn't go well, it's also a private risk. The industry is assuming the risk, as opposed to a public entity.

I would hate to see taxpayers put in money at a public facility, even to upgrade it, and then, to not have it, either, perform as it was expected; or,

for 10 years from now, for the industry to move on to whatever becomes, you know, the next big play, maybe up in Canada. And, suddenly, the idea that we're going to have drilling here for, 30, or 50 years, doesn't actually pan out, because it's hard to say.

SENATOR GRISANTI: Got you.

BRIAN RAHM: There's a risk involved with that.

And, it's different to ask -- you know, a private risk versus a public risk, are two different things.

SENATOR GRISANTI: Right.

I got you.

All right, I appreciate it, then.

I'm going to pass it over to Senator Gallivan.

SENATOR GALLIVAN: All set.

Thank you.

BRIAN RAHM: Sure.

SENATOR GRISANTI: Thank you.

John Conrad, please.

John, good afternoon.

How are you?

JOHN CONRAD: Good afternoon.

Senators Grisanti and Gallivan, thank you for including me in today's proceedings.

My name is John Conrad. I am a hydrogeologist and environmental consultant with Conrad Geoscience Corporation, a PVE Scheffler company, with offices in Pittsburgh, the Pittsburgh area, and Poughkeepsie, New York.

I have some comments to share regarding management of wastewater produced as a result of natural gas production and hydraulic fracturing.

First, I'd like to make a few comments to provide a little bit of context, and to demonstrate the scale of the challenge that wastewater represents.

Natural gas already underpins New York's economy and long-term energy strategy.

By next year, the Marcellus Shale will be the largest natural gas play in the U.S., which means, now, more than ever, in my opinion, natural gas can help New York meet its energy, economic, and environmental challenges.

New York now uses more natural gas than 46 other states.

Although New York is one of the world's largest consumers of natural gas, we import about

95 percent of the supply we need from other states and from Canada.

And with the Marcellus Shale, we now have the opportunity to meet those needs by extracting the gas beneath our feet.

Our reliance on natural gas is likely to continue to grow.

The U.S. Energy Information Agency estimates that U.S. consumption of natural gas will increase by 60 percent over the next 30 years, and reliance on shale-gas sources, like the Marcellus Shale, will triple over the next 15 years, even assuming massive investment in renewable energy sources, like wind, solar, and geothermal, during that same period.

And, natural gas is key to the U.S -- U.S.'s strategy to reduce greenhouse-gas emissions.

It's a cleaner burning alternative to coal-fired electricity generation.

Natural gas is a reliable backup for renewables, like wind and solar, which are available only intermittently.

And because natural gas is storable and transportable, it can replace oil as a heating fuel and as a motor fuel.

About produced water: After a gas well is

hydraulically fractured, some of the fracturing fluid returns to the surface with the flow of gas.

And as we've been talking about today, we call this "produced water," or, "brine."

Produced water continues to flow to the surface during the life of the well.

Because the Marcellus Shale was deposited in a marine environment, it contains larger quantities of salt, which leaches into the fracturing fluid.

And, consequently, produced water contains high concentrations of dissolved solids, such as chloride, and may contain other substances, such as metals and hydrocarbons, that are also present in the shale.

A single Marcellus well will use approximately 5 million gallons, perhaps more, of water for hydraulic fracturing.

And of that amount, as much as 20,000 to 25,000 barrels might return to the surface during the initial flowback period following hydraulic fracturing.

Once it is producing gas, a Marcellus well will generate an additional 1 to 5 barrels of water each day, and might generate 5,000 to 15,000 barrels of water over the life of the well.

And it's this long-term production of water that represents one of the bigger challenges before us when it comes to shale-gas wastewater.

Existing environmental regulations in New York prohibit surface discharge of untreated produced water; so, as more and more gas wells come online, our ability to process produced water becomes critical.

There must be sufficient wastewater management capacity to handle the increasing flow of produced water.

So, if New York is going to realize the full benefit of its shale-gas resources, the development of sufficient treatment capacity must keep pace with natural gas development.

This Committee has correctly identified waste management as a central issue for unlocking the benefits of New York's shale-gas resources.

I believe that the demand for water management associated with natural gas production could bring much need capital investment to New York, and lead to a new era of technical innovation.

And we've already heard today about some of these innovations that are occurring already in

other parts of the Marcellus play.

So the good news is, that technologies already exist for safely managing produced water.

In fact, we already handle much more hazardous waste streams generated at commercial and industrial facilities across this state.

Produced water from shale gas does not have the hazardous properties of, say, the concentrated solvent and metals' waste from various manufacturing and other industrial processes.

The bigger challenge has more to do with the amount of wastewater that will eventually be generated.

The problem that needs solving, when it comes to shale-gas development is a quantity problem, not a technological problem.

Assuming that water remains the fracturing fluid of choice, which seems likely, there are numerous options for produced-water management.

All are discussed in the SGEIS.

I'll touch on just a couple before I take questions.

Treatment and reuse, we've just finished talking about that today.

This approach allows gas-well operators to

simply reuse water produced during the flowback period by diluting it with clean water and using it for fracturing more gas wells.

Reuse may entail modest pretreatment to remove suspended solids or adjust PH, et cetera.

Some operators are reporting that they are reusing as much as 80 to 100 percent of their initial flowback water.

Reuse, of course, depends on there being upcoming fracture-stimulation treatments needed within a short distance of those wells.

Thermal processes are also known to work for these concentrated salt waters.

Thermal processes are effective at treating highly saline brine, but this technology is energy-intensive, and, therefore, can be costly.

It may be possible to set up thermal treatment systems at solid-waste disposal facilities equipped with landfill-gas power plants.

In these cases, heat is used to evaporate or crystallize the brine, and the residue is landfilled, or converted to concentrated chloride solutions that can be then used for road de-icing.

Crystallization can be used to achieve a zero liquid discharge, where all resulting liquids

can be reused or safely discharged.

A crystallizer plant might generate distilled water, and salable salt products, such as pelletized salt that can be used in water softeners or other applications.

At landfills that are already converting landfill gas to energy, it might be possible to use the waste heat from these systems for brine evaporation, an opportunity to use an otherwise wasted resource, and increase the cost-effectiveness of landfill-gas-to-energy operations.

Most produced water from the U.S. oil and gas operations is simply disposed of by returning it to deep geologic formations through injection wells.

The federal EPA regulates injection wells through the Underground Injection Control program, which is part of the Safe Drinking Water Act.

Injection wells associated with the oil and gas -- with oil and gas production are designated by EPA as Class II injection wells.

And there are, approximately, 144,000 Class II injection wells in the U.S. that inject more than, about, 2 billion gallons of brine every day, in the U.S.

Ohio has approximately 180 Class II injection

wells, which, today, are used to dispose of much of the produced water from the Marcellus -- from Marcellus wells drilled in Pennsylvania.

The advantage of deep injection, is that it eliminates risks and impacts associated with treating and disposing of waste at the surface.

The siting, design, and operation of Class II wells is rigorously controlled by state and federal regulatory agencies, and the disposal zones must be demonstrated to be isolated from fresh-water aquifers.

For these reasons, disposal by deep injection is considered to be highly protective of shallow underground sources of drinking water.

Until now, there has been little demand for Class II injection wells in New York, but it is reasonable to assume that this technology will provide at least part of the wastewater management solution in coming years.

And I'll end there, and answer any questions that the Committee might have.

SENATOR GRISANTI: Okay, John, appreciate it.

Just a couple of questions, John.

There was some testimony earlier, about, these deep injection wells may not be so easy to get

at in New York State, because of the geology and the rock formations underneath, compared to Ohio.

Would you agree with that?

JOHN CONRAD: It's uncertain.

My company is one that is studying the geology of New York, and Pennsylvania, for the purposes of injection; so, it remains to be seen.

There are places where it looks promising, that there could be at least some injection.

SENATOR GRISANTI: Okay.

And I noticed on here, too, you have, reuse is always a good thing, if you're going to reuse it.

And then we talked -- I think somebody talked about that earlier, the thermal distillation, as far as it being very expensive.

JOHN CONRAD: Right.

SENATOR GRISANTI: Probably, extremely expensive.

But I appreciate your testimony here today.

Let me put on the record, and --

I don't know if Senator Gallivan has any questions?

SENATOR GALLIVAN: No questions.

Thank you.

JOHN CONRAD: Thank you.

SENATOR GRISANTI: Okay, thank you.

We could we have, Larry, please, Shilling.

Good afternoon.

How are you?

LARRY SHILLING: I'd like to thank Senator Grisanti, and the members of the Environmental Conservation Committee, for the opportunity to brief the Committee today on the issue, and for allowing us to share our expertise in managing the waste and resource challenges associated with shale drilling.

My name is Larry Schilling. I'm regional vice president for Casella Waste Systems, Inc.

I am responsible for all of the company's operations in New York, Pennsylvania, and Vermont.

Casella Waste Systems provides collection, recycling, energy, organics, and disposal services throughout, what would be considered rural northeastern U.S., as well as the Boston area.

We serve communities throughout Pennsylvania, New York, Vermont, New Hampshire, Massachusetts, and Maine.

We were founded in 1975, and are headquartered in Rutland, Vermont.

We employ approximately 500 people

in New York State.

We have been part of the New York State's resource management efforts since 1995, and have formed extensive and successful private-public partnerships with several Upstate counties, providing operating expertise and economic risk management for all-inclusive county solid-waste infrastructures; more specifically, managing disposal and recycling assets for Clinton County, Ontario County, and Chemung County.

We have worked extensively as well with New York State Department of Environmental Conservation on leveraging proactive integrated waste-management approaches, such as, the first single-stream recycling processing facility in New York State, to help New York State shape a resource conservation future.

As for the question of whether or not to ban -- a ban on shale drilling should be lifted in New York, we are not here today to take a position on that issue, which we recognize has many facets.

Instead, we are here today to give the Committee a sense of how the waste stream associated with the shale drilling can be managed safely within New York State's regulatory approach.

As we all know, drilling for natural gas has occurred for decades in New York State.

We have, on occasion, disposed of customers' drill cuttings for many years.

When the level of activity around this waste stream began to grow at our facility in Chemung County, which, as you know, sits very near the border of Pennsylvania and the Marcellus Shale activity, we thought it prudent, and desirable, to learn as much as we could about drill cuttings and -- as a disposal material.

We thoroughly investigated the environmental, health, and safety impacts of drilling disposal in furtherance of our responsibility to effectively and safely manage this material once it came through the gates of our facilities.

These studies were conducted with the involvement and cooperation of resources at the DEC.

The DEC has been engaged in the evaluation of many of the issues we identified, which has been extremely helpful while we proceeded with developing an approach that worked for us, our personnel, and the environment.

After extensively studying -- extensive study, we were able to identify a number of

best-management practices for drill-cutting transportation and disposal, which we've now implemented.

We keep all material more than 6 feet from the bottom of the landfill;

We keep all material at least 10 feet from the landfill's final cap;

We installed radiation detectors at the incoming gate of our facility;

We track this waste separately;

We chemically test and confirm that this waste is appropriate for disposal in a municipal solid-waste facility through an extensive, special waste-approval protocol;

And, we require that all transporters of this waste be licensed, and that all loads delivered to us be manifested.

The radiation detectors have verified our research and analysis that drill cuttings do not present any significant health, safety, or environmental issues.

For example: To date, the radiation detectors have only alarmed twice; and neither alarm was caused by drilling waste.

In the first case, the driver of the

collection vehicle had recently received radiation therapy related to cancer treatment, and was found to be the source of the alarm.

In the second instance, the responsible load was found to contain municipal solid waste only, and, in fact, was contaminated with medical-treatment waste likely from a patient that had been released and sent home from a hospital.

No drill-cutting loads have set off an alarm at any of the detectors at any of our three landfills in New York State that have accepted these wastes.

Overall, we do not view this waste stream as any more or less challenging than any other waste we accept for disposal.

Many waste streams require special handling or tracking, and this waste is no different.

Our study of this issue continues, since this industry has emerged at a level we expect will be steady for at least the next two decades or more.

We are currently researching alternative transportation and material-handling methods to reduce traffic, both at the well sites and around our facilities.

A benefit for all.

Through our relationships with natural gas production companies, we also learned that they were looking for proactive waste and resource management solutions for the treatment, disposal, and acquisition of water.

The significance and longevity of the shale play has caused us, once again, to thoughtfully and extensively analyze and research opportunities to manage flowback and produced water.

With our background and commitment to resource renewal, we have decided to pursue water-treatment services for the industry.

After extensive research, we have formed a joint venture with Altela, an Albuquerque, New Mexico-based company.

Altela has developed a technology that treats flowback and produced water through heating, condensing, and distilling the highly brackish drill wastewater, essentially, mimicking the billion-year-old process of producing rain.

Much of the wastewater winds up as a highly purified distilled water.

The remaining component is a salt water that can be combined with other material at our landfill to produce a solid that can be landfilled, or,

turned into other beneficial-use products.

The DEC's draft Supplemental GEIS on drilling has suggested that distillation is one of the best, if not the best, treatment solutions.

Altela's technology has been operating at a plant in Pennsylvania since January 2011, and is proving to be highly successful.

Our plan is to locate this technology at our landfills.

The benefits of doing so are significant, particularly from an environmental-impact perspective.

Drilling companies can bring their wastewater directly to one facility, and leave with distilled or recycled water to return to their drill sites.

This one-stop service would reduce the need for water withdrawal from our lakes and streams and transportation-related carbon emissions.

Landfill staff are already trained and experienced in managing lagoons and water storage, as demonstrated by our need to deal with leachate that is produced at the landfill.

Extensive groundwater monitoring systems are already permitted and monitored extensively by the company and the DEC at our landfill facilities.

And, the wastewater-treatment process would be powered by the energy we produce from harvesting and converting methane gas from our landfill; meaning, the process is near carbon-neutral.

The bottom line: In our view, is that wastewater from drilling can be managed safely, and with a measure of innovation that advances New York State's resource sustainability goals.

In fact, in the larger picture, waste from the natural gas industry does not present any challenges that are any different than any other industry we serve.

Through innovation, technology, and existing regulatory protections, New York State is more than equal to the task of managing these waste streams proactively, safely, sensibly, and without any risk to the public health.

Again, thank you for the opportunity to share our experience and expertise with the Committee.

SENATOR GRISANTI: Thank you, Larry.

The, uhm -- it seems, by harvesting that energy, and converting methane gas, that's where -- because we were talking about this earlier, that it's very cost -- costs a lot of money to do certain procedures.

But, you're actually --

LARRY SHILLING: Yeah, because we have --

SENATOR GRISANTI: -- working within your own system?

LARRY SHILLING: Exactly.

We have to collect the methane anyway.

And, at some facilities, we produce electricity.

SENATOR GRISANTI: Right.

LARRY SHILLING: And off of those engines, the exhaust gas is 1,000 degrees, coming out of the exhaust. So, that has a lot of capability of driving the process of distillation.

Other facilities, we don't have energy plants yet, but we have flares.

So, we have a gas supply that is not from fossil fuel, but from the landfill, and that can be used to drive this process as well.

SENATOR GRISANTI: Okay.

Well, I appreciate your testimony.

Further, I will turn it over the Senator Gallivan.

SENATOR GALLIVAN: Just a couple of questions about the cuttings that are disposed of at the Chemung landfill?

LARRY SHILLING: Yes.

SENATOR GALLIVAN: And you instituted a number of different, specific procedures, in addition to what you're doing with other waste.

So, while you're still complying with these procedures, do you keep the cuttings all in one location, or is it spread throughout the landfill?

LARRY SHILLING: It is mixed in with the rest of the waste.

SENATOR GALLIVAN: And the testing that is done, it's at the incoming gate.

Do you regularly test throughout the landfill for radiation?

LARRY SHILLING: No, we haven't tested throughout the landfill.

The, uhm -- you know, where the trucks come in, at the scales, they run through the radiation detectors for that.

SENATOR GALLIVAN: Okay.

Now, you made -- in your testimony, you talked about, the steadiness, or level, if this goes forward, for at least the next two decades or more.

Do you have the capacity to handle the cuttings for two decades?

LARRY SHILLING: We do.

I mean, the level of activity will be something that will change.

We manage facilities, and we have, you know, quite a bit of capacity, from a landfill standpoint; as well as the ability to increase that capacity as time goes on.

So, we would -- we would gauge our capacity with the needs of the market.

SENATOR GALLIVAN: Under the current proposed regulations, will anything change for you?

Will you have -- will you have additional restrictions, or additional recordkeeping responsibilities, than you have now, or will they remain the same, or less?

LARRY SHILLING: We implemented some of those changes that are proposed in those regulations early on.

So, it is worth mentioning, that, when I mentioned that -- in my testimony, that we work with the DEC, we produced several -- a couple documents; several hundred pages of information.

Went out and did our own studies, and developed these best-management practices, really, long before the DSGEIS even came out.

So, this is not very different.

What we're doing today is the same as what's in the GEIS.

SENATOR GALLIVAN: So, you're doing this today, essentially, adopting best practices; but, in the future, what you're doing will be required?

LARRY SHILLING: Correct.

SENATOR GALLIVAN: I mean, if the proposed regulations stay as-is.

LARRY SHILLING: That's correct.

SENATOR GALLIVAN: And --

LARRY SHILLING: So, the thing that will change is, today, we have our own form that we track drill cuttings with, that the driver carries with them.

Tomorrow, when the DSGEIS is approved, we'll use a State form that is issued by the DEC.

SENATOR GALLIVAN: Okay.

Thank you.

SENATOR GRISANTI: Thank you very much.

LARRY SHILLING: Thank you.

SENATOR GRISANTI: Do we have -- is Sandra here?

DR. SANDRA STEINGRABER: Senator Grisanti and Senator Gallivan, and distinguished members of the Committee, thank you for convening this hearing on a

topic that is of urgent concern to all New Yorkers.

As we consider whether to permit or prohibit high-volume horizontal hydrofracking in our state, it's essential that we understand the fate of the toxic waste that is necessarily generated: Where does it go? Who is exposed? What are the health effects?

My name is Sandra Steingraber. I serve as a distinguished scholar in residence at Ithaca College. And, my Ph.D. is in biology, from the University of Michigan.

My field of study is environmental health, and I'm the author of three books on the topic, the most recent of which, investigates the impact of fracking on children's health.

Last month, I received a Heinz Award for my work on health in the environment. I am devoting the $100,000 prize money to the fight against fracking in New York State, and I hope my testimony today will help explain why.

Hydraulic fracturing relies on pressure, water, and high-volumes of inherently toxic chemicals to shatter the bedrock beneath our feet.

Once shattered, the bedrock releases more than just bubbles of gas. The rock itself releases

inherently toxic materials that have been bound together with the shale for 400 millions years, and this toxic waste from fracking takes three forms.

The first are, vapors, such as benzene and toluene.

Benzene is a known human carcinogen.

Toluene is a potent reproductive toxicant, with the power to extinguish human pregnancies.

Now, I'll return to the issue of reproductive health effects at the close of my remarks.

These volatile organic gasses also combine with tailpipe exhaust to create smog, and this kind of air pollution is lethal.

Exposure to smog is definitively linked to stroke, heart attack, diabetes, and premature death.

In children, it is linked to premature birth, asthma, cognitive deficits, and stunted lung development.

Last May, and again in October, I provided testimony before the New York Assembly on the potential health effects of air pollution created by fracking.

And, today, I'll focus on the liquid wastewater.

As with air contaminants, the present

technology does not ensure public health; nor does the draft Supplemental Generic Environmental Impact Statement provide a regulatory framework that would compel such technology.

Of course, what brings us together today is the slight-of-hand legal exemptions that classifies dozens of the chemical constituents used in fracking fluid as hazardous, but spares the flowback fluid from wearing the same label, even though it contains those very chemicals, along with a bunch of others.

By any definition known to toxicology, wastewater from fracking operations is hazardous.

Hydrofracking fluid is -- was sprayed in a forest in West Virginia. It defoliated and killed more than half the trees, and elevated the sodium and chloride levels of the soil by fiftyfold.

When spilled on the ground, fracking waste sows baroness where nothing will grow.

Those ancient Roman conquerors who salted the earths of their enemies would be impressed with this.

Fracking wastewater is also radioactive.

According to the DEC's own findings, flowback waste contains Radium-226 at more than 200 times the safe limit for discharge into the environment, and

more than 3,000 times the safe drinking-water standard; and, yet, the SGEIS does not ensure that this truly hazardous fluid is treated as truly hazardous substance, nor does it attempt to make it less hazardous.

The volume of wastewater generated by fracking is immense, and it's really hard to visualize.

In the Marcellus Shale, between 4 and 9 million gallons of water are required to frack a single well.

At least 1 million gallons return to the surface as wastewater.

62,000 wells are envisioned for New York State.

And if all those wells are fracked only once, which is a highly conservative assumption, the total amount of wastewater generated is 62 billion gallons.

Now, to visualize that amount of water, consider that 500,000 gallons of water go over both sides of Niagara Falls every second.

The amount of wastewater that would be generated in New York State from fracking, if we decide to permit it, is equal to the volume of water

cascading over the Niagara Falls for 35 straight hours.

So, imagine standing in front of the Niagara Falls for 35 hours.

And, now, imagine that all the cascading water that you see is radioactive and full of toxic chemicals; and, your job, is to figure out where to put it so it won't come into contact with any person or any body of water or the soil or the air, forever.

And keep in mind that our neighbor Pennsylvania is already generating a "Niagara Falls" worth of wastewater of its own, and will be competing with us for storage space.

The "Where to put it?" question is not adequately addressed in the draft Generic Environmental Impact Statement, which does not put forth a comprehensive plan for waste disposal; nor explicitly prohibit fracking waste from entering sewage treatment plants.

Deep injection wells are one repository for fracking wastewater, and the nearest ones are in Ohio.

How much fracking wastewater can be shoved in the underground rock formations of Ohio?

One Niagara Falls of wastewater? Or two?

I have not been able to find an answer to this question in they geological literature, and neither can I find it in the SGEIS.

Certainly, citizen opposition to the importation and deep-well injection of fracking wastewater in Ohio appears to be growing, especially now that earthquakes are an officially recognized risk of fracking-fluid injection.

Unlike fracking itself, the creation of injection wells to store the resulting waste is not a jobs creator.

As the town councilman of Mansfield, Ohio, noted last week: "The promise of four or five jobs isn't necessarily worth living with a chemical dump site for hundreds of years."

This comment came in response to a "no" vote by the Mansfield City Council to a Texas company that proposed to drill two injection wells for Pennsylvania-based fracking waste.

Meanwhile, in Youngstown, Ohio, seven protesters were recently arrested for blocking trucks at a brine injection site.

As one of them explained, "We have a responsibility to take a stand.

"If these companies are poisoning our water and our air, they are the real criminals, and not us."

Such actions raise another question.

Even if the subterranean landscape of Ohio could hold all the toxic waste Pennsylvania and New York can send it, should we in New York State move forward with the energy plan that hinges on the successful transfer of large amounts of hazardous waste to a place where residents are willing to lay their bodies in front of trucks to prevent that transfer?

Now, a lot has been said today about filtering and recycling and reusing wastewater.

I just want to point out, that the laws of thermodynamics still apply here, "Newton's Law," that says, "Matter cannot be created, nor destroyed."

So, although, through filtering, reusing, and recycling, you may actually reduce the volume of water, the mass of all the toxic chemicals that are in the wastewater still remain; they're just more concentrated, so that, when you truck them off, and they still need to be disposed of, somewhere, you have even more poisonous substance.

A few weeks ago, a letter was sent to Governor Cuomo from dozens of cancer advocacy organizations in New York State, from Buffalo, to Long Island, demanding that a rigorous health impact assessment proceed, and inform the decision whether or not to open our state to fracking.

I've included a copy of this document in the appendix of my testimony.

So, I just point out here, that the SGEIS does not prohibit the use of cancer-causing chemicals in fracking fluid.

The word "children" does not appear in the SGEIS.

Lung cancer from radon exposure is not a topic taken up by the SGEIS, even though radon is the second-leading cause of lung cancer, responsible for 21,000 cases a year in the U.S.

The words "breast cancer" do not appear in the SGEIS, even though the international -- the Institute of Medicine's new report on breast cancer identifies benzene and radiation exposure as two chemical exposures that are -- have the strong evidence likening them to breast cancer.

A new human rights' assessment of hydrofracking was released today by the

Environment on Human Rights Advisory.

And I've brought a copy for you.

It details 26 human rights norms of concern, relevant to fracking, ranging from, security of person, to the right to -- of prior, free and informed consent.

The report concludes, that:

"Viewed in lights of human rights standards, these facts may raise liability concerns for the New York State Department of Environmental Conservation."

So, I'd like to close now by putting a personal face on the human rights issue.

In 1979, at the age of 20, I was diagnosed with bladder cancer.

My diagnosing physician asked me about my possible exposures to toxic chemicals.

I didn't know then that his questions would become my life's work.

Years later, I returned to my hometown in Illinois, and investigated an alleged cancer cluster there, of which I was one data point.

Among other things, I discovered that there were dry-cleaning fluids in the presence of the drinking-water wells.

The underlying geology of the area should not have allowed that to happen, but there it was.

I came to appreciate how little we really know about the unmapped landscape below the ground which has intimate unseen connections to the world aboveground. It's not just an inert lump of rock.

Now, at the time of my diagnosis, I was heartened, because the newspaper headlines were full of a story -- stories about a woman named Lois Gibbs, in a place in Upstate New York called "Love Canal."

And I was so impressed that had a single woman could organize a community, that not only prevented further exposure to toxic waste that had been buried years before, but she was able to actually compel changes in our federal environmental laws to assume that all Americans are protected from such exposures.

Fracking, literally, turns the earth inside out.

It turns precious fresh water in the earth's surface into poison, and then buries it in fractured geological strata where it is no longer part of the hydrologic cycle.

In its place, it brings toxic rocks, heavy

metals, poisonous vapors, and radioactive substances, and mass amounts of wastewater, out of earth, which then requires permanent containment on the surface of the earth for time and memorial.

Fracking could easily become Love Canal on a epic scale; and there is nothing in the current SGEIS that indicates the lessons of Love Canal have been remembered, and applied.

I said I would end with a topic of reproductive health.

This is an emotional topic, so I wanted to put it near the end of my remarks.

A lot's been said here about the amount of dissolved solids and sediment that end up in the water.

When that water is chlorinated, you end up with disinfection byproducts.

I know a lot about these because they're a cause of bladder cancer, as well as colon cancer.

But what I want to talking about now, is that when the -- total dissolved solids are chlorinated for drinking water, for sewage treatment, and you produce hundreds of these chlorination byproducts, many of these also have the power to interfere with prenatal life and end human pregnancies.

In fact, this is even admitted in the SGEIS itself, Section 6, page 46:

"Disinfection byproducts have been identified in a number of medical studies as a factor linked to early term miscarriage."

I hope this disturbs you as deeply as it disturbs me.

The admission that fracking waste generates chemicals that can extinguish pregnancy is deeply distressing.

Whether you look at this as evidence for harm, as I do, as a planned-parenthood issue, a woman should be able to plan a parenthood, and carry it out, without other people's chemicals interfering;

Or, from a right-to-life perspective, as many members of my own very conservative family do, who believe very deeply in the question of fetal sanctity.

The question of what the dissolved solids are doing when they're chlorinated, and how it might be affecting the prenatal life of women in New York; if it's ending pregnancies, and harming fetuses, this is a question that needs to be answered.

If we frack New York, are we ending

pregnancies, and will babies die?

I urge you to take this up.

Thank you.

[Applause.]

SENATOR GRISANTI: Thank you very much, Sandra.

Do you have in knowledge, if, uhm -- do you have any knowledge, that -- if, in Pennsylvania or Texas, they've done any impact health statements?

DR. SANDRA STEINGRABER: There has been some work on health impacts in Texas, but none of them were done as a prerequisite for permitting fracking; so, they were after-the-fact studies.

So, we know, for example, in the areas of -- the gas patch in Texas, that we see the transfer of volatile organics into people's indoor air space, and we can actually measure those chemicals in their blood and urine.

We know that some of the symptoms that these people are experiencing -- numbness, nausea, and so forth -- are known health effects of the particular chemicals that they're -- have been exposed to.

There's some emerging data from Texas on breast cancer and fracking, showing that women who live in the most intensely fracked areas of Texas,

their breast-cancer-incidents' rate is actually going up.

Which is in interesting, because, throughout the U.S., as well as the rest of Texas, breast-cancer incidents, happily, now is on the decline.

So, these are correlative data.

I would not, as a scientist, want to claim that these are definitive proof of anything, but they are certainly clues for further inquiry that we need to pay attention to.

And --

SENATOR GRISANTI: Okay. And I --

DR. SANDRA STEINGRABER: Yeah.

SENATOR GRISANTI: Okay, I appreciate your testimony today.

I don't know if Senator Gallivan has any questions?

SENATOR GALLIVAN: No.

Thank you.

DR. SANDRA STEINGRABER: You're welcome.

SENATOR GRISANTI: Thank you.

Frank Miller, please.

FRANK MILLER: Good afternoon.

SENATOR GRISANTI: Whenever you're ready.

FRANK MILLER: Okay.

My name is Frank Miller. I'm the president of Lake Country FracWater Specialists, and the original founder of the company.

I have over 36 years of experience in water and wastewater treatment, power generation, food and chemical processing, pharmaceutical manufacturing, pulp and paper manufacturing, and consulting, engineering, design.

As part of this experience, I've held the position of:

Director of engineering for a Fortune 500 company;

General manager, and production manager, of several chemical manufacturing plants;

And, technical director in the paper industry;

As well as, engineering manager of an engineering firm, specializing in industrial processes, design, and development.

Previous to Lake Country, I was founder, and president, of Innovative Environmental Products, Incorporated, of Rochester, New York.

The mission of IEP, and now Lake Country, has been to develop an environmentally sound green

technologies that maximize reuse and recycling of waters, minimize waste, make hazardous waste non-hazardous, and, ultimately, can create marketable product from waste.

I hold two patents that include, the recovery of industrial and agriculture wastes for water reuse, and, mitigation of environmental impacts by the resultant solid waste.

Additionally, I currently have multiple patents pending related to unique wastewater treatment and precipitate-separation technologies designed for treating Marcellus fluids and waste.

Lake Country FracWater Specialists is a small start-up company, with operations in Livonia, New York, and, Tioga, Pennsylvania.

This business start-up is a direct result of Marcellus development.

Treating hydraulic fracturing wastes in wastewaters is a new business venture, with considerable opportunity for many other entrepreneurs.

You will hear today that there is no way to dispose of Marcellus waste in New York today, but the oil and gas industry is no different from other industries.

All processes create waste, and it has been a trademark American business to learn to handle all waste in an environmentally safe manner while pursuing opportunities to create beneficial businesses from waste streams.

At Lake Country, we have successfully developed -- <coughs> -- excuse me -- we have been --

Sorry. Just need to get a drink of water.

[Pause in the proceeding.]

[The proceeding resumed, as follows:]

FRANK MILLER: At Lake Country, we have been successful in developing technologies to perform our stated mission, in primarily mobile systems, which may also be readily adapted to semi-permanent or permanent systems.

Our mobile systems allow for cost-effective treatment of waste at a well site, resulting in recycling and reuse of the water, as well as mitigating truck traffic.

In addition, because our systems are mobile, they do not require the high capital costs and long-term land-used impacts associated with brick-and-mortar treatment plants.

We have developed and commercialized a series

of technologies, most of which are patent-pending, specifically focused on oil-and-gas-development industries.

These include the following:

Removal of barium and strontium from hydraulic fracturing flowback water, produce a product -- to produce a product, which is barium sulfate, a weighting agent in drilling muds, and clear brine for recycling of the water in subsequent fracks.

Another system is:

Treatment of oil-based drilling wastes, recycling and reuse of waste from bentonite, and cutting wastewaters from pipeline-boring applications;

Treatment of drilling fluids from top-hole operations, and saline concentration reduction of high TDS -- "total dissolved solid" -- drilling wastewaters, to accommodate safe storage, and disposal and economic reuse.

In each of these technologies, our goal is to take problematic waste products, or potentially hazardous materials, and render them non-hazardous through chemical reactions or other means.

In some cases, the materials are suitable for

reuse, or for an alternate beneficial use, in their new form.

Additionally, these technologies may also provide an opportunity for both public and private water treatment plants, to integrate them into their headworks, in order pretreat certain oil-and-gas-field wastes, such as heavy metals, before treating the wastewaters for eventual discharge.

Lake Country also has an additional exciting technology that will be integrated into our water treatment systems, or as a standalone process for management of drilling waste cuttings.

This product has EPA approvals as absorbent material, and has ability to lock in hazardous wastes, such that the waste can be treated as non-hazardous, and be place in a landfill instead of a hazardous-waste treatment plant or disposal site.

As a point of information: The primary reason why there are no systems in place in New York for management of Marcellus development waste streams is because companies are not willing to invest here until there are certain -- until they are certain that New York is indeed moving forward with permitting the development of this resources --

this resource, and the regulatory framework for that development is finalized and clear.

The current situation does not mean that we do not have the technology and the expertise to treat any and all waste from Marcellus development.

In fact, our mobile platform for our treatment systems are adaptable, and will allow for rapid deployment into the play once Marcellus commences development in New York.

With regard to the need for new legislation, I submit, and it's the opinion of our board of directors, that there is no identified need.

New York already has substantial authority to monitor the transport of waste, monitor the disposition of waste, and has a robust system in place for discharge limitations for both surface and groundwater discharges.

From my exposure to regulations in place, and pending, across several energy-intensive state and -- states, and in two foreign countries, New York already has some of the strictest environmental regulations on development of oil and gas resources.

It is my opinion, that we need to be very careful about opposing new legislation that may

create unintended consequences, and blunt technological innovations and advancements with regard to water reuse and treatment.

As an example: The hazardous-waste bill, which was proposed last year, would have treated all oil-and-gas-field wastes as hazardous.

This action would have deemed non-hazardous waste -- some non-hazardous wastes as hazardous; meaning, that recycling and reuse of the hydraulic fracturing flowback water would not have been possible, based upon a regulatory definition.

In addition, it would have resulted in taking valuable space in a hazardous-waste facility for materials that are not hazardous.

That space could be put to a better use for important hazardous waste.

Finally, because the waste would not have been able to be recycled and reused, the waste would need to be transported to "hazardous" facilities, resulting, exponentially, in more truck traffic.

From my perspective of this industry, there are technological advances happening as we speak.

The industry has made great strides in drilling, and extending laterals and horizontal wells.

In my opinion, the evolution of technologies to treat and reuse water and waste from the Marcellus is equally as impressive.

We need to be cautious to not prevent, and to be proactive, in allowing the advances in technology to continue without legislative and regulatory constraints that will hamper environmental progress.

We hope that New York will move forward expeditiously to improve Marcellus development for the benefit of its citizens.

Having adequate technologies and systems to treat Marcellus fluids and waste is not an impediment for approval.

I appreciate your time, and will welcome questions.

SENATOR GRISANTI: Well, thank you, Mr. Miller.

Can you just briefly explain, in a little more detail: You talk about removing barium and other raw chemicals from hydraulic fracturing flowback water?

How are you doing that?

FRANK MILLER: We have a sequential precipitation process, whereby, we inject certain chemicals that react with the barium, and turn into

a barium sulfate, which is a drilling mud.

Of the deep-water horizon, the material that was used to kill that well was barium sulfate.

We actually manufactured that as part of process, out of frack water. Flowback water.

SENATOR GRISANTI: Okay, are you able to -- so, some of the waters that you have, do you know what all the -- all the chemicals that are in the water?

FRANK MILLER: Yes.

We have done research on water from multiple locations across Columbia, Mexico, West Virginia, North Dakota, Pennsylvania, New York, and Texas.

And, there's a lot of consistency in the types of water, and there's variations.

But, we understand the variations, and the consistencies, and we have multiple stages.

Our water-treatment processes are modular.

For example: The systems that we're going to be sending to Columbia have seven different, individual chemical-treatment modules in them, that include, precipitation; oxidation through ozone; hydrogen peroxide, followed by reverse osmosis.

So, there's multiple, different -- depending on the particular waters that we're going to be

treating, we have multiple, different modules that we would provide.

SENATOR GRISANTI: These mobile units, how, uhm -- how -- what's quantity of water they can treat?

FRANK MILLER: They're typically in modules of 2,500 barrels, which is 100,000 barrels a day.

And in the cases where they need larger quantities, we just have additional modules that we provide.

They're all about the size of a horse trailer.

SENATOR GRISANTI: All right.

I appreciate that.

I don't know if Senator Gallivan has any questions?

SENATOR GALLIVAN: No questions.

SENATOR GRISANTI: No questions?

Okay.

Thank you very much.

Is Sarah here?

Hi, Sarah.

SARAH ECKEL: Hi.

SENATOR GRISANTI: Hi, Sarah.

How are you?

SARAH ECKEL: I'm doing well.

My name is Sarah Eckel. I'm the legislative and policy director for Citizens Campaign for the Environment.

CCE is an 80,000-member, non-profit, non-partisan, advocacy organization. We work throughout New York to protect health and the natural environment.

We want to thank both of you for sitting through this long day, and holding this important hearing on waste and fracking.

Too often, unfortunately, waste, in all forms, related to drilling, or not, is -- and especially if it's associated infrastructure, is "out of sight, and out of mind."

However, we know drilling wastes can be toxic, caustic, and hazardous.

And, in New York, liquid and solid waste, as discussed today, coming off that drill pad is classified as, industrial waste, not hazardous waste.

We know that the transportation, storage, and treatment of the waste can pose significant risks to the public health and the environment.

And, unfortunately, New York's plan to deal

this waste is not clear.

I'd like to say, that, you know, a lot has been talked about recycling, and the benefits for that today.

And just to remind you, that, with all those benefits from recycling, we're still not mandating that recycling. So, we still have to figure out what to do with the waste coming off that pad, unless it's mandated.

I talked briefly about drill cuttings in my testimony, but I think that's been covered extensively today, so, I'm just going to skip down to production brine.

The concentrated fluid that comes off of the gas-well pad, called "production brine," due to Marcellus Shale's marine origins, we know that it's really high in total dissolved solids.

Every day, 300 to 6,300 gallons of brine can be generated.

And, we need a -- we need secure on-site storage and disposal for all of that production brine.

A lot has been talked about Marcellus's marine origins, and the total dissolved solids associated with that.

I would just also like to remind you, that, this document doesn't just deal with Marcellus Shale. It also deals with Utica Shale, and other shale formations.

So, one of the gaps that we're looking at in this document, is the fact that we don't really know what constituents are associated with those shale formations.

We really just talk a lot about Marcellus.

The flowback fluid that comes off of the well is contaminated with chemicals used for fracking, and any contaminants from the shale itself.

The combination of chemicals used depends on the specific geology. And, of course, company preference, as was discussed at length; that they have proprietary information in chemical formulas.

Proper treatment and disposal of the liquid waste poses a great risk.

And as we've said, current water-treatment infrastructure cannot meet the existing demand in increasing treatment capacity for radioactive and corrosive hydrofracking waste.

Over the next 20 years, New York State needs $36.2 billion to address its aging and failing wastewater infrastructure needs.

And this does not account for fracking.

So, when we're looking at the gaps, and what we need to address, that's a huge number that we still already have to take account for.

The composition of flowback water changes over time.

And this is from the DEC's document:

The concentrations of dissolved solids, chloride and barium, can increase;

Levels of radioactive -- radioactivity can increase;

Calcium and magnesium increase;

Iron concentrations increase;

Sulfate levels decrease;

Alkalinity decreases;

And, concentrations of metals can increase.

The DEC attributes these changes to shell formations, frack fluids, and operations control, but what it clearly demonstrates, is that we need a waste-disposal plan that accounts for the fact that this fluid composition is going to change over time.

As discussed before, radioactivity in Marcellus Shale is a product of normally occurring radioactive materials.

The DSGEIS includes well sampling from

13 conventional wells already drilled in New York State, that are Marcellus wells.

The production brine coming off of these wells all exceed --

Well, that's not true.

-- 80 percent of them exceed EPA safe-drinking standards of 5 picocuries per liter.

So, we're already exceeding those standards now. We need to figure out what to do with this waste.

The DSGEIS fails to identify the facilities that are going to treat and dispose of that liquid radioactive waste.

And, in addition to the high levels of radiation coming from production brine, flowback fluid is positive for Radium-226 as well, with levels that range between 2.58 and 33 picocuries per liter.

Radon is -- occurs naturally as a decay product of Radium-226.

We've all heard about radon, and the build up that is -- causes a lot of problems in homes.

Radon exposure is the second-leading cause of lung cancer, as mentioned by Dr. Steingraber.

And, from the National Academy of Sciences,

15,000 to 22,000 Americans die every year from radon-related lung cancer.

Radon in drinking water causes an additional 180 cancer deaths annually.

Almost 90 percent of those projected deaths were from lung cancer, from the inhalation of radon released to the indoor air from water.

About 10 percent were from cancers of internal organs; mostly stomach cancers from ingestion of radon in water.

Long-term exposure to radium can increase the risks of developing several diseases, including, lymphoma, bone cancer and diseases that affect the formation of blood, such as leukemia and aplastic anemia.

External exposure to radium's gamma radiation increases the risks of cancer to all tissues and organs at varying degrees, and the greatest health risk from radium is exposure to its radioactive decay product: radon.

As we all know, throughout New York, our local municipalities are taking a strong stand on dealing with hydrofracking.

And it's pretty easy to understand why.

Because the demands on our local

infrastructure are growing, we're already facing huge infrastructure needs, as I discussed before.

And to be able to deal with these upgrades, that's going to fall on the shoulders of our local municipalities.

Pennsylvania's Department of Environmental Protection stated, that:

"Oil and gas wells disgorge about 9 million gallons of wastewater a day in Pennsylvania.

"According to industry estimates used by the DEP --

Oh, sorry. This is from a few years ago, but...

-- "by 2011, that figure is expected to rise at least 19 million gallons, enough to fill almost 29 Olympic-size swimming pools every day.

"That's more than all the state's waterways, combined, can safely absorb.

"I didn't know that. Even our water-program people hadn't any idea about the volumes that would be used," said Dana Aunkst, who headed -- the head of DEP.

We clearly need to know where this waste is going, if they were dealing with such -- Pennsylvania is blessed with the number of

fresh-water resources, as we are, and they are having a problem dealing with this as well.

So, just a couple of recommendations that I know have been mentioned already today:

CCE also supports Senate Bill 4616, which would classify waste that comes off of a drilling pad as hazardous.

And I just want to clarify one point: If it meets the State definition of "hazardous."

It's not just going to just, across the board, classify waste as hazardous if it doesn't meet that definition.

Another positive point, is that, is that we deal with, retroactively, waste that's already being generated. So, it wouldn't just deal with high-volume hydraulic fracturing.

CCE believes that DEC's proposed waste manifest program that's been discussed today, should require that the waste manifests are regularly reported back to DEC.

As discussed, those are in the hands of the truckers; and, sometimes they reported back, and sometimes they're not.

In order to make this process transparent and publicly accessible, we need those waste manifests

to regularly go back to DEC, regardless.

CCE encourages the Legislature to prohibit the treatment of wastewater at municipal treatment facilities.

I know that you've discussed this at length today.

And we also believe that New York State should prohibit the use of toxic and carcinogenic chemicals.

We all know that those chemicals are out there, and we have the power to stop them from coming into our state to be used.

We should do that.

And, thank you, again, for the opportunity to speak today.

I'll take any questions that you have.

SENATOR GRISANTI: Thanks, Sarah, appreciate it.

I don't have any questions for you.

I'm familiar with Citizens Campaign, and the topics.

And, I appreciate your testimony here today, and submitting your testimony, and focusing on those areas that, uhm -- which is the reason why we had the hearing, and -- to begin with.

So, I appreciate you being here today.

SARAH ECKEL: Absolutely.

SENATOR GALLIVAN: Thank you.

SARAH ECKEL: Thank you.

SENATOR GRISANTI: Is Walter here?

[Inaudible] quite a lot here.

Just ask you to paraphrase as much as you possibly can.

I appreciate it.

WALTER HANG: Thank you for the opportunity to comment on the environment, the one public health concerns of natural gas drilling, wastewater, and hydrofracturing wastewater problems in New York.

I commend your efforts because I believe this issue warrants New York's utmost concern.

For decades, New York has failed to identify, investigate, and clean up gas-drilling wastewater hazards reported at hundreds of sites.

Toxics Targeting has compiled detailed data from the New York State Department of Environmental Conservation's "hazardous-substances' spills" database, regarding gas-drilling wastewater releases that have, reportedly, impacted homes, waterways, drinking-water wells, and natural resources.

New York's existing gas-drilling wastewater

problems could be vastly exacerbated if Marcellus Shale horizontal hydrofracking is permitted to proceed without adequate safeguards.

I urge you to require that the problems I will document today be fully resolved before New York's de facto horizontal-hydrofracking moratorium is lifted by the adoption of a final Supplemental Generic Environmental Impact Statement.

I would note that approximately 7,000 gas-production wells in New York generate flowback and produce wastewater.

A comparable number of oil-production wells in the state also generate produced water.

There is currently no regulatory system to track those wastewaters from, quote, "cradle to grave," close quote.

As a result, the volume and fate of those wastewaters is unknown to environmental authorities.

You've heard a great deal about the constituents in the wastewater.

I would note, that, the total dissolved solids that have been reported in gas-drilling wastewater generated in Pennsylvania is up to 413,000 parts per million.

The key thing about TDS is it's soluble in

water.

In contrast, the petroleum hydrocarbons, notably in the diesel range, have been reported up to 72,600 parts per billion in gas-drilling wastewater generated in West Virginia.

This is insoluble in water. And as we've heard so much, contains benzene, reportedly, up to 660 parts per billion.

Many of these constituents resist biodegradation and toxic at extremely low levels of exposure.

For example: The maximum contaminant level for benzene in New York State drinking water is only 5 parts per billion.

That's 5 seconds in 32 years.

You've heard a lot about the natural occurring radioactive materials.

I would note, that Radium-226 has a half-life of 1,600 years.

These are very toxic, very persistent compounds.

I would note, that while a great deal of attention has been focused on flowback concerns, contaminant concentrations in produced water are often higher for all three contaminant categories.

In short, both flowback and produced wastewaters are highly complex mixtures of hundreds, if not thousands, of inorganic, as well as organic, compounds.

To date, those wastewaters have yet to be fully characterized by analytical studies.

I want to focus on three categories of gas-drilling wastewater problems that we've had in New York.

Massive gas-drilling wastewater releases are documented to have been caused by hundreds, and perhaps thousands, of spills, accidents, and other uncontrolled discharges in New York.

Gas-drilling wastewater spills, up to 100,000 gallons, have been reported to DEC in a single incident.

Many spills are never cleaned up in strict compliance with remediation requirements.

Shockingly, there is no specific regulatory requirement even to report gas-drilling wastewater releases in New York.

As a result, a full scope of this problem is unknown.

In contrast, petroleum releases are required to be reported to DEC's hotline within two hours; or

fines up to $25,000 can be levied per day of noncompliance.

I've given you a series of actual DEC data for national fuel gas, wells, et cetera, that have been reported.

You can see: Brine-tank overflow due to apparent equipment failure. Materials flowing over land into local creek. Doesn't meet standards.

And, the problem occurred in 1997.

So, you can look at all of those data. I've posted them on the Internet.

Perhaps the most shocking thing that I've discovered in the last two years, is that, DEC has long-approved land spreading of gas-drilling wastewater for dust control, winter de-icing, and road-bed stabilization.

DEC's Beneficial-Use Determination program has approved natural gas wastewater to be spread, untreated, on roadways at farms, residential and business properties, a summer camp for children, a water treatment plant, the Chautauqua County Fairgrounds, state lands, as well as, areas adjoining critical water-supply sources, including, a major reservoir, and sole source, and primary aquifers.

And these include: Chemung, Thompkins, Broome, Tioga, Chenango, Steuben, Cayuga, Cortland, Madison, Genesee, Chautauqua, Cattaraugus, Allegheny, and other counties.

In Chautauqua County alone, in 2010 to 2011, 1,322,450 gallons of gas-well production brine were spread.

You can review those documents.

Contrary to DEC's assertion that the BUD program requires the gas-drilling wastewater to be spread safely, DEC's own data refute this assertion.

You can read examples that I posted.

The Tuscarora brine application, June 21, 2010, quote:

"Caller states, town is using brine from gas wells to control dust on dirt roads, and are applying it way too heavy, causing runoff to ditches and streams.

"Also concerned about his well, and what might be in the brine."

Close quote.

And this spill still does not meet applicable standards.

In short, gas-drilling wastewater should have

been banned from land-spreading decades ago, when spraying waste all on dusty roads was outlawed, along with burying garbage in open pits.

It is inconceivable the DEC still authorizes spreading of this toxic radioactive material on roadways and watersheds all over central, southwestern, and the Leatherstocking's Region of New York.

And I've presented a map for your review.

You've heard a lot today about the contribution of gas-drilling wastewater to publicly owned treatment works.

I want to note, that, tens of millions of gallons have been discharged in New York in recent years.

These POTWs are neither designed, constructed, nor maintained, to be able to break down and remove gas-drilling wastewater pollutants.

This is an extremely important public-policy matter that must be fully resolved prior to permitting horizontal hydrofracking in New York's tight shale.

The gas-drilling wastewater is fundamentally incompatible with this, quote, "secondary," close quote, biological treatment systems employed at,

virtually, all municipal treatment systems in New York to break down human sewage.

These, quote, "activated sludge," close quote, and, quote, "trickling filter," close quote, or biotower systems promote the growth of bacteria that degrade human-wastewater components.

Many of the constituents of gas-drilling wastewater resist biological degradation, and, quote, "pass through," close quote, into receiving bodies of water, concentrate in residual biosolids, or sludge, and compose hazards to treatment plant workers.

It is entirely appropriate that you're hearing is being held today in Canandaigua, because the Canandaigua wastewater treatment plant, reportedly, received 177,000 gallons of gas-drilling wastewater generated in Pennsylvania by EOG Resources, Inc., without knowing the source of the wastewater.

The facility, reportedly, stopped accepting all gas-drilling wastewater in September 2009.

Prior to that time, it had, reportedly, accepted gas-drilling wastewater for up to nine years.

Canandaigua exemplifies how toxic

gas-drilling wastewater has been discharged to POTWs in New York's Finger Lakes Region without approved pretreatment, and in contravention of pretreatment in other regulatory requirements.

This illustrates the fundamental inadequacy of New York's enforcement efforts regarding this concern.

I wanted to note, that EPA has undertaken extensive investigation of gas-drilling wastewater going to POTWs that are not equipped to regulate it, to manage that material.

These efforts occurred after more than 850,000 local residents near Pittsburgh could not drink water drawn from the Monongahela River in the autumn of 2008, after gas-drilling waste discharges caused unacceptably high TDS levels in the river's ambient water.

Local POTWs were, reportedly, accepting gas-drilling wastewater up to 40 percent of their influent.

And I've, again, posted extremely detailed technical comments that have been provided by EPA to DEC.

Basically, we're in a de facto moratorium in New York with regard to horizontal hydrofracking in

tight shale.

And I believe that it is absolutely imperative that the concerns I have summarized today are fully resolved prior to the permitting of horizontal hydrofracking in New York's tight shales.

As you know, there is an executive order; it's very onerous.

And I do not believe that DEC has fulfilled the requirements to, basically, protect New York from horizontal hydrofracking.

I would suggest that you review a coalition letter that has nearly 11,000 signatories, calling for the revised draft to be withdrawn.

Among the concerns that are referenced in that letter:

We've asked Governor Cuomo to ban gas-drilling wastewaters from being discharged into publicly owned treatment works designed for sanitary waste, and, we've requested that strict pretreatment standards be adopted.

This is very important. We've heard a lot about recycling.

Gas-drilling wastewaters, including flowback, as well as produced water, or, brine, are currently exempted from extremely stringent GA effluent

limitations, designed to safeguard drinking water drawn from the ground in New York.

So, the GA effluent limitations were adopted decades ago, because so many people, particularly on Long Island, have only one source of water -- that's from the ground -- and hundreds of wells were impacted.

So, currently, the gas-drilling wastewater can be reinjected into the ground, as fracking fluid, or as cutting fluid, only because there is an exemption from those very strict GA effluent limitations.

The revised draft SGEIS fails to eliminate this exemption, even though gas-drilling wastewater is documented to contain pollutant concentrations that would vastly exceed applicable GA effluent standards.

For example: Benzene reported in gas-drilling wastewater, up to 660 parts per billion, is only allowed at 1 part per billion in permitted groundwater discharges.

Finally: I suggest that the land spreading of the toxic drilling wastewater also be banned.

And I would note, that the horizontal hydrofracking issue, as you've heard, is really

deep-well injection, because, up to 95 percent of the fracking fluid, reportedly, remains in the ground.

In New York, deep-well-injection permitting requires individual environmental impact statement review, not the generic EIS review that DEC is currently undertaking.

In short: The entire premise of the SGEIS permit-guideline proceeding is specious.

This is another reason why DEC's efforts are inadequate, and warrant starting the process all over again.

And I would note, that these exemptions should be lifted by regulatory fiat. They don't need new laws to be passed.

And I've given you data that I compiled for the Niagara Falls wastewater treatment plant.

I personally sampled this effluent in 1981, as part of a landmark study of the Niagara River.

So, while that facility does have granular activated-carbon treatment, that's, again, only for the insoluble compounds.

And you can see, many of the compounds pass right through, including, benzene, phenol.

So, there's no panacea, and that carbon would

not take out the total dissolved solids, including the various toxic metals that you've heard about so much today.

Thank you very much.

I appreciate the time.

And, if you have any questions, I'll try to answer them.

SENATOR GRISANTI: Just briefly --

[Applause.]

SENATOR GRISANTI: -- what you have listed here in Niagara Falls, from the -- can you explain that a little bit, the 1981 figures that you have here?

WALTER HANG: Yes.

So, basically, as you know, that is an area that is very unusual, because it has many industries that were originally alike.

Many fewer today, unfortunately, then earlier.

So you can tell that many of these compounds are volatile organic compounds; notably, benzene. These are very common industrial solvents and intermediates.

They're also turning up in wastewater that's discharged on-line to the treatment plant.

Unfortunately, the activated carbon doesn't take out anything.

The most important thing to realize, when it comes to toxic organic compounds, that means, they're principally made out of carbon and hydrogen.

They're very toxic at extraordinarily low levels of exposure.

So the standards are frequently, 5 parts per billion, 10 parts per billion, 50 parts per billion.

Those are minuscule levels, and they're just passing through, into the receiving body of river.

And the Lower Niagara is an impaired water body. It's on the National 303(d) Registry of Impaired Water Bodies.

So, this system is not taking out these toxic organic chemicals and heavy metals.

And if the gas-drilling wastewater would discharge into this plant, it would similarly pass through, concentrate in the solids, and potentially pose a hazard to the workers.

SENATOR GRISANTI: Got you.

I appreciate that. Thank you.

I don't have any other further questions.

I don't know if --

SENATOR GALLIVAN: Nothing else.

WALTER HANG: Thank you so much.

SENATOR GRISANTI: Thank you very much.

Well, that's going to conclude our Senate hearing that we had here, scheduled for today.

I want to, again, thank those that spoke and gave testimony, and submitted testimony.

I want to thank those that came to listened.

Once, again, there's a lot of information that -- on the specific issue, with regards to the water, and the disposal of the water, and what some are claiming could be treatment; whether it's hazardous waste, whether it's not hazardous waste.

But, these are all important factors that myself and Senator Gallivan -- that were not covered to the extent as they were in these broad-based hearings that were done throughout the state.

So, we wanted to be very specific, because that's what I kept hearing, is the issue of the water.

"What are you going to do with the water?"

"There's a lot of water. There's a lot of materials left over from, whether it's the wells or the flowback water."

It got to -- you know, it got to the point, where, you know, we're talking to each other, and we

said: You know, we got to get some specific answers as possible, with regards to that issue.

And I'm glad that the testimony that was presented here today will be in the record.

It's something that the DEC has to take a look at; has to move forward on it.

But, I just appreciate it.

And, I'll say good night to you, but I'll turn it over to Senator Gallivan, to say a few words.

SENATOR GALLIVAN: I, too, would like to thank you for being here; for the people that presented testimony, and the people that had the patience, as we moved along, to wait your turn.

Clearly, this is an issue of our times; and, perhaps, the most significant thing that we will face in our time in the Senate.

So, it's not something we take lightly.

And, from my perspective, this was meant to be information-gathering.

As we continue to go forward, we'll continue to do that.

I know we mentioned it a little bit earlier: If people had written testimony to present, you can leave it with us.

Or, you could, certainly, connect with our offices, or through our website.

If you just go to NYsenate.gov, you can get to each of us personally, and submit attachments, or individual comments.

But, I'd like to thank everyone for their time.

And, Senator Grisanti, for continuing the work.

And I can assure you, he is traveling throughout the state, conducting numerous hearings.

But, thanks for your leadership, and your work on this. And, coming into our district, and, an area, like I say -- said earlier:

We're in the heart of the Finger Lakes; and, our lakes and our waters are very important.

So, thank you.

SENATOR GRISANTI: Okay.

Thank you very much. Appreciate it.

Thank you.

[Applause.]

(Whereupon, at approximately 4:11 p.m., the public hearing, held by the Chair of the New York State Senate Standing Committee on Environmental Conservation, concluded.)