NEW JERSEY CLEAN WATER COUNCIL

PUBLIC HEARING

- - -

IN RE: :

WATER POLICY AND CLIMATE CHANGE :

:

:

:

- - -

LOCATION: NJDEP Public Hearing Room
401 East State Street
Trenton, New Jersey

DATE: Monday, December 7, 2009

TIME: 9:00 a.m. to 11:43 a.m.

- - -

GUY J. RENZI & ASSOCIATES
Certified Court Reporters & Videographers
Golden Crest Corporate Center
2277 Route 33, Suite 410
Trenton, New Jersey 08690
(609) 989-9199 1-800-368-7652

P A N E L:

RUSSELL FURNARI, Chair

JESSICA SANCHEZ

PAMELA GOODWIN, ESQ.

MARJORIE KAPLAN

CAROL COLLIER

DAVID ROBINSON

NANCY WITTENBERG

ROBERT BRESLIN

AMY GOLDSMITH

GEORGE BARKUN

ANTHONY MCCRACKEN

LOU MASON NEELY

RAYMOND ZABIHACH

JAMES COSGROVE

JIM REQUA

ANTHONY VALENTE

FERDOWS ALI

ELLA FILIPPONE

STANLEY V. CACH

I N D E X

MR. FURNARI: Good morning, everyone. I'd like to welcome you here today to the Clean Water Council 2009 public hearing. We will be discussing today the issue of water policy as it is tied in and linked to climate change. There is a flyer sent out with some specific topics that we will be asking for information on, and they cover the cross-functional areas of many of the water issues that the State faces on an ongoing basis.

I'd like to welcome first for some opening remarks, Assistant Commissioner Nancy Wittenberg. Nancy is here to welcome everyone to the DEP for this hearing. She's been involved with water and water enforcement issues for some time, and I'd like to ask her to come up and say a few words.

MS. WITTENBERG: Good morning, everybody. I wasn't supposed to be doing welcoming remarks this morning. Commissioner Mauriello was supposed to do them, but as I'm sure you all appreciate in this time of transitioning and change, the Commissioner is actually meeting with the transition team right now, so he had to

do that. And when the transition team calls, we

go. So that's where Mark is, but I'm actually secretly glad that he couldn't do it and I had to do it, because I think this is a really, really good topic. And the Clean Water Council always comes up with good topics, so I wasn't surprised. And I sort of watched the pathway leading to this topic because the Clean Water Council, unlike other groups of people, love to reply to all. So I get all -- everybody's responsive e-mails, so I sort of watched the thread of this one come about. And it was an interesting discussion as to how they got here.

So in addition to welcoming all of you, I always want to make sure I thank the Clean Water Council.

Thank you, Russ, for chairing it.

This is truly one of the Department's most important advisory groups that we have. And we take what the Clean Water Council says and does seriously and we listen to their recommendations, and they're always very thoughtful. And it's important for us to sort of constantly have this sort of outside help to keep us moving ahead and being smart about things.

25 The topic today is a really

1 interesting one for a number of reasons. Clearly,
2 the climate change issues are crucially important
3 to the State, to the nation, to the world, to New
4 Jersey. And New Jersey's been a real leader in
5 this venue for quite some time. We've been out
6 there very early. We were sort of going back and
7 for with Governor Schwarzenegger to see who could
8 do, like, the most important things earliest. And
9 that sort prompted all of us with East Coast/West
10 Coast thing. And Schwarzenegger usually got out
11 there first. He got more of the attention, but
12 that's probably because he's a movie star and
13 Governor Corzine was not.
14 So we've done a lot. Governor
15 Corzine signed the Global Warming Response Act and
16 the Global Warning Solutions Fund Act, two very
17 important pieces of legislation for us that have
18 set us on a path. New Jersey is part of the
19 Regional Greenhouse Gas Initiative, also called
20 RGGI, which is very controversial, regional cap
21 and trade sort of program to get at greenhouse gas
22 emissions. And New Jersey's also has a very
23 strong voice in the national debate on climate
24 change. We're constantly submitting comments on

things. We're constantly engaging in litigation

that has to do with these things. We are a very key state in the debate going forward, something that I and I'm sure everybody else has been very excited and proud of.

We have very stringent goals in New Jersey for greenhouse gas emissions. The Global Warning Response Act set these goals. For those of you who haven't heard them, we chant them like the mantra here, but we're supposed to get to 1990 levels by 2020, and then 80 percent below 2006 levels by 2050. Those are huge numbers. Huge numbers.

Now, the first goal was sort of a cheat for us, since we were well on our way to get there. And to get there is Regional Greenhouse Gas Initiative will get us there, along with our very aggressive Energy Master Plan in New Jersey, along with what we already had in place with California car or Low Emission Vehicle Program. We had these three things in place, so we were pretty much on our way to that first goal.

It's the second one that's going to be the real heavy lift for us as a state. The 2050 goals are very stringent and will require a

lot of changes: Personal changes, lifestyle

changes, and things like that.

The Global Warming Solutions Fund Act was the one that's telling us that we're getting all of this money, hopefully, from the auctions that are part of the Regional Greenhouse Gas Initiative. And that money, we are going to spend in New Jersey to sort of get us to, most importantly, to reach that 2050 goal.

It's very expensive to do this stuff. Anything you do, any program you put in place cost a lot of money. So the fact that we have this stream of money and legislation that directs us to spend it and how we spend it will be very helpful to New Jersey. So we have a statutory framework in New Jersey which puts us in really good shape.

So what's interesting about today is really not all of that because we've been focusing all of our efforts on controlling greenhouse gas emissions. We've not really been thinking about the effects of climate change and what we're going to do about that. For those of you who have seen the 2012 movie, the effects of things can be really extreme. But we haven't

really thought about that as much yet.

What we've been doing is on the controlling the emissions side. We've been doing a lot, as I said. We're working on getting inventories of emissions in place. We're setting up reporting systems, developing training programs, looking at other regulatory changes needed. We're writing our own rules to implement these things. We're looking at how we invest money in renewables, which are a key part of our efforts going forward; developing energy conservation programs in concert with water public utilities; looking at more efficient cars and trucks. You know, basically, we're looking at the carbon footprint of everything. You know, that was like the buzz word, carbon footprint, carbon footprint. But almost everything we do, we start to look at how we can tie it to climate change and have positive effects from that, how much we recycle, how we manage our landfills, how we manage our wastewater treatment plants. But, again, all of these things are about moving forward and addressing and trying to minimize climate change.

What I'm thinking we're talking

about today is what we need to do to respond the

impacts of climate change. Water supply, water quantity, water quality in New Jersey, of course, we all know -- preaching to choir -- is fundamental to everything we do. And we in the Department of Environmental Protection have been working very hard on these issues forever. And as the years go by, it gets harder and harder. We have increased development, we have more people, we have more pollution, and the struggles become greater. Protecting the quality and ensuring we have adequate and safe supplies is one of the core missions of this Department. These goals have come increasing difficult and increasingly expensive to meet, which is why, again, I think today's topic is so important.

The risks of climate change to our water resources and how we manage our infrastructure and how we can address these risks as we go forward. Being proactive is always, always the better way to be about these things. When we try to react, we never get as much -- it's never as positive a result in the end.

The two questions posed for today, or at least my sort of interpretation of them, are

what are the risks posed by the increasing

variability of climate and weather events? And what changes in water management policies are needed so that we can respond to these and protect ourselves? Heavy lift questions, not easily answered.

The interesting thing about climate change, and I always have to remind myself of this and watch more of, I guess, Fox News, is that there's a lot people who are not buying into climate change and who still believe it's not happening. And even if it is happening, we're not responsible for it; it's the natural cycle of things, it would have happened regardless of industry and development and cars.

And I tell you that because I just want to read you part of an e-mail I received. I'm only reading part of it because part of it was not really readable.

"I am very disappointed and actually shocked that you would participate in this" -- this, being this hearing, addressed to me.

"All of our water quality protections are based upon weather extremes so there are absolutely no risks!!!! Low flow

condition is a low flow condition. A storm event

is a storm event. Maximum day water usage is maximum day water usage. A BS form like this just fuels the whacko right-wingers with more fodder in their quest to prove government is lying about causes of climate change.

"Also, although significant climate change is irrelevant as current" -- I should edit this, but I won't.

"Also, although significant climate change is irrelevant, as current procedures would address any climate change, we now have a law that requires that the government impose requirements that supposedly will prevent significant climate change."

I get a lot of these -- not a lot. I get a handful of these. But it's an interesting position for us to be in. Whether you buy it or not, what I say to people is there's no harm in minimizing emissions of things and there's no harm in becoming more efficient and smarter about how we live our lives on this planet. So even if we're dead wrong and there is no such thing as climate change, anything that comes out of these discussions is positive and is good for all of us.

25 And we could be wrong. The science seems pretty

1 prevalent to me, but I do get e-mails like this.
2 So I think we have our work cut out for us,
3 because anything we do will be expensive. And in
4 this day and age, all budgetary impacts are big
5 deals for us, and we have to address them
6 seriously.
7 So, again, I want to thank the Clean
8 Water Council. I am so appreciative of all the
9 work you do. I see your e-mails going back and
10 forth. We do take your recommendations very
11 seriously. We have three really good
12 presentations today. We're going to talk about
13 what's actually going on in New Jersey with
14 climate change and what kind of changes we're
15 saying, how it's impacting our water resources,
16 and what we're doing in New Jersey with our Global
17 Water Response Act and other efforts to address
18 water policy issues related to climate change.
19 And then equally important, if not more important,
20 is hearing from all of you. And maybe the person
21 who sent me the e-mail is in the room and will
22 come up and expand upon that.
23 So I thank you all for coming, and I
24 thank you again. Have a great hearing.

MR. FURNARI: I'm now going to step

back. I knew Nancy had to leave as well. As she said, transition interviews are today, so she has one coming up later. I appreciate her taking time to come and provide us with the thoughts of the Department.

Now I'm going to go back and do some introductions. I will start with myself. I'm Russ Furnari. I'm the Chair of the Clean Water Council. I represent the New Jersey State Chamber of Commerce, and I worked in the employ of PSEG.

MS. SANCHEZ: Jessica Sanchez, first vice-chair of Clean Water Council. I represent the Delaware Raritan Basin Commission.

MS. KAPLAN: I'm Marjorie Kaplan, and I'm the manager of the DEP Office of Climate and Energy.

MS. COLLIER: Carol Collier, Executive Director, Delaware River Basin Commission.

MR. ROBINSON: David Robinson. That's me (indicating).

MS. GOLDSMITH: Amy Goldsmith, New Jersey Environmental Federation, State Director.

MR. BARKUN: George Barkun,

representing New Jersey Business and Industries

Association.

MR. MCCRACKEN: Tony McCracken. I'm a public member and Assistant Director of the Somerset County Planning Board.

MR. ZABIHACH: Ray Zabihach, representing the New Jersey Association of Counties.

MR. COSGROVE: James Cosgrove, I'm the environmental representing New Jersey Board of Professional Engineers.

MR. REQUA: Jim Requa, New Jersey Department of Community Affairs.

MR. VALENTE: Tony Valente, representing New Jersey Department of Labor.

MR. CACH: I'm Stan Cach with the New Jersey Department of Environmental Protection, the liaison to the Clean Water Council.

MR. FURNARI: Thank you.

Before I move on and introduce our first presenter, I'd like to add a few of my own thoughts.

This has been a question and an issue we have discussed as a Council over a number of years. It has not been an issue that came to

light recently and was proposed as a hearing

topic. It was actually -- it's actually be in debate for quite some time. We've gone back and forth about the potential issues that may be impacted by the changes that we see happening around us and information that we're receiving from various scientific sources and also some of the policy decisions that are being made on a national level, whether it be by EPA or by other federal agencies that might impact and have a role in how the State of New Jersey will need to react and address issues as they come up.

One of my personal concerns really in this is that I, first of all, do believe that climate change is happening and it's happening faster than it would naturally. I think there have been additional inputs into the system. I agree with my CEO when we talk about the issue. And I think that the science clearly states that there's been an aggressive change in how fast climate change is happening.

But taking it out of that, there are policy decisions that have to be made and investments made into things that have to do with water that oftentimes take a long time to

implement. We've been talking for a number of

years about infrastructure and the need for good financing to protect that area. And that's an important part of all of this. All of those things take proper planning, take long foresight; and I think that's an important aspect of the discussion we are having today. Those are my thoughts.

I'd now like to introduce our state climatologist, Dr. David Robinson. He is the Chair of the Department of Geography at Rutgers University. He has a doctorate from Columbia University, where he's also an associate research scientist at the Lamont-Doherty Earth Observatory, which he did prior to joining Rutgers.

Dave's research is very heavily focused into climate and its related attributes. He's been involved on a national level with the intergovernmental panel on climate change. He's also involved with the National Academy of Sciences, NOAA, and other national research council panels.

He has a very important role in looking at the impacts of climate and how they will address or focus on the State of New Jersey.

David.

MR. ROBINSON: Good morning, everyone.

Thanks, Russ, and everyone up front and everyone in the audience for coming this morning to talk about one of my favorite subjects: Climate.

Suffice it to say, it's a very interesting time in this state to be a climatologist. It's the front page. Climate is on the front page of the Star Ledger today. Climate was on the editorial page of the New York Times and the Wall Street Journal and a myriad of other places in the last couple of weeks due to some thievery of e-mail messages over in England involving scientists from around the world. I have a feeling probably a couple of my e-mails are in that cue as well. But it is an interesting time. But let's Jersey-fy it this morning.

I do global research. I'm on the IPCC. I am a polar scientist studying snow cover, arctic sea ice and the like. But today I'm going to put on my state climatologist hat and put a New Jersey focus on this climate change situation and, in particular, look at water and where we are

water-wise.

Whether it be drought -- and I see this picture again up at Spruce Run Reservoir back in March. March, which is more striking of, 2002. In the lower right, that's Main Street of Manville, not with Floyd, but with the April 2007 flood, which was the second largest flood on record in the Raritan Basin; number one being Floyd back in '99.

This is an outline of where I'm going -- there are a couple slides for each, a little precipitation regime perspective here. New Jersey climate, where we've been primarily in the hundred years, where we are at this moment, what lies ahead, what does the future hold, the next century, decades, ahead for New Jersey's climate. A little bit on impacts, although that will be discussed by the other speakers as well, so I'll stick a little more to the science. And then just what we're doing in State Climate Office and what needs to be done on a statewide basis to keep our eye on things.

We are generally a precipitation-rich state. We have a pretty equal distribution of rainfall year round, an inch or

two more during the summer months than during

winter months, but we have no dry, dry season. We're not like on the West Coast where if we don't get our rains by April we have to wait next fall or winter to perhaps get them. And that means we have the potential of coming out of a drought at any time. But, of course, we can slide into a drought compared to average conditions at any time as well. So the figure on the left is average January precipitation in the state; top right is the average July precipitation, July and August being the two wettest months of the year. You might try that trivia on some friends. They're going to say, "Where is the mud?" And that's where the rub is when we're not just talking about water today, we have to talk about temperatures, we have to talk about evapotranspiration, because it's the whole water equation. It doesn't just involve precipitation, although we're going to lean more towards the precipitation side this morning.

So most of the time we have enough precipitation. However, sometimes there's a bit too much. And, again, this is the April '07 storm. What's rather remarkable about this storm

is our numbers suggest it's the seventh greatest

rainstorm in the last century in New Jersey. And it's the only one that didn't occur between July, late July and mid-fall when the ocean temperatures are warmest and it's easier to get that moisture out of the ocean and dump it on New Jersey. So how we were able to get this much moisture out of a cold Atlantic Ocean and drop it on New Jersey is quite remarkable. Must mean the climate is changing, right? Not necessarily. And there's another take-home point here.

As we're talking about these events today and any individual event, any individual season, any individual decade, that doesn't answer questions, particularly as you bring it more locally. So if you bring things more locally and you bring things for a shorter temporal period, your uncertainty as to what is causing that rises. As you expand in time and in space and you begin to see signals, that's when you gain more confidence in what might be going on and be able to look at attribution factors as well.

So it's difficult to look at one event, one relatively small, although very important state, and try to make definitive

statements about climate and climate change.

That was a wet one. But sometimes we have too little. We have been fortunate not to have major drought conditions in the state for about seven years now. That first slide you saw. There it is again. But we only have to go back to '63. I wish I had a better picture. That's a dry riverbed of the Delaware, just a half mile or mile from here. And every once in a while, it doesn't take a lot of dryness, but we go through several dry months. And it really provides -- helps stoke the flames, if you will, of potential fire around the state, particularly in the Pinelands.

But generally, we have enough water to sustain freshwater wetlands. Now, this is wetlands both brackish as well as freshwater.

And if I may give an advertisement, you see right below the map, Mapping New Jersey, if you haven't done your holiday shopping yet, either from Amazon or Rutgers Press, this is a new atlas of New Jersey, the first one in decades and decades, and it's very reasonably priced -- I'm not getting paid for this -- yes, I am the editor of the environmental chapter in it and it's loaded with Rutgers geographers, including the

25 cartographer from my Department and emeritus

1 professor from my Department who are two of the
2 three leads. But it is a wonderful, wonderful
3 atlas. And this is just one of Mike's maps from
4 it.
5 So we've got the freshwater
6 wetlands. And we have enough precipitation to
7 sustain river flows. There are the river basins
8 and some of the major rivers in the state. And
9 also to sustain groundwater. Difficult to see
10 through the Pinelands there, but you can imagine
11 what lays in the thousands of feet of sand. And
12 the reservoirs of North, Jersey which you can pick
13 out there. They're not all reservoirs, but some
14 of the lakes and reservoirs of North Jersey.
15 But how are we going to sustain
16 these levels? How have we done in the past? What
17 about day? And what about tomorrow?
18 This is the last hundred years of
19 precipitation and temperature. Precipitation
20 here, temperature here across New Jersey on an
21 annual basis, which isn't always the best way to
22 look at precipitation and temperature. We'd like
23 to look more seasonally, but just two graphs here.
24 And we can see averages, averages, and just this

25 past decade average. But New Jersey is getting

1 wetter, from about 44 inches a year to about
2 47 inches a year. And this decade's even been a
3 little wetter. We've actually been a little
4 wetter for this year. But New Jersey is getting
5 wetter. That's 5, 6, 7 percent wetter in the last
6 several decades than earlier in the century.
7 But let me also point out the
8 variability. Look at the major years where we
9 busted through our rain gauges. Yet others where
10 dust was collecting at times in rain gauges.
11 There's the huge drought of the mid-'60s.
12 Now, with that has also come
13 warming. And you can see long-term average
14 temperatures have risen about a degree from the
15 early part of the century to the last three
16 decades of the century, and we're in the midst of
17 a very warm decade now. Look back last month, it
18 was the fourth warmest November on record in New
19 Jersey, and August was the fifth warmest. These
20 are records going back to 1895.
21 Again, does that mean the climate's
22 changing? No. Interesting, as these things keep
23 mounting.
24 Where are we today? This is the

last 12 months of precipitation. Departures in

New Jersey, the green is above normal precipitation; the red is below. Look how dry we were last winter. Very dry winter. Driest February on record. We just went through one of the wettest summers on record. And the fall has been up, and the last month down a bit.

And we're not the only ones doing the monitoring here, we climatologists. The hydrologists -- this is the drought page from right within DEP. And this is the worst, if you will, conditions in the state right now up in the northwest where precipitation is a little low, groundwater is a little low. The reservoirs are fine, and the 90-day stream flows are doing all right. So we're okay today. That's good news going into the winter as we recharge things more fully for next summer.

So where are we headed? Based on accumulation of a variety of different climate models -- and you'll see all different numbers here. The next century -- this century, I should say, by the end of the century, we should be 3 to 5 degrees Celsius, 4 or 5 to 8 or 9 degrees Fahrenheit warmer in New Jersey. Precipitation, we

25 believe, is going to remain steady or increase.

1 But look at the runoff figures. A quarter less,
2 20 percent more. How does that make any sense
3 when we're talking about equal or greater
4 precipitation? Well, remember, we have to factor
5 in the temperatures as well as the precipitation
6 and then also the seasonality of the
7 precipitation. But there is this battle. When
8 it's warmer, you have more precipitation, more
9 water in the atmosphere, generally more
10 precipitation if you can have a trigger to get it
11 out of the atmosphere. But when it's warmer,
12 there's more evaporation. So there's this balance
13 that can influence what river flows, groundwater
14 storage, surface water storage might be.
15 Regardless of the sign, the models
16 all suggest there's going to more variability.
17 Let's just cut right to the variability. Yes,
18 it's going to be a variety of other factors, but
19 it appears the climate is going to become more
20 variable. Has it already, given these yo-yos from
21 dry winter to wet summer, warm, a little bit of
22 cold thrown in once a while. You look around the
23 world, it snowed in Houston last week. One of my
24 colleagues was in Stockholm, and they had no snow

25 in Stockholm, but there's snow in Houston. But

1 wait. I just saw a forecast for Houston, it's
2 supposed to be 82 degrees there tomorrow. And
3 this kind of yo-yo -- but we've always had
4 variabilities. And when you're talking extremes,
5 by definition they're rare. Therefore, you need a
6 long enough period of time to be able to tease out
7 a signal amongst all those extremes. But we're
8 seeing a lot of extremes that on a global basis
9 that may signify the climate is changing. There's
10 more energy in the system and, therefore, more
11 variability.
12 It looks like precipitation extremes
13 will change during the course of this century
14 where a 1 in 20 year precipitation event may
15 happen 1 in 8, 1 in 10 years. These are general
16 numbers derived for the US from observations in
17 the past and models for the future. That could
18 lead to more floods and droughts simultaneously.
19 Again, we have examples of this.
20 I was in this building on
21 September 16, 1999, at a drought year and got
22 stuck in a flood, Floyd, coming from the meeting.
23 So we've seen these extremes.
24 Again, is that climate change? No,

not precisely. When we look back 20 years from

now, we may say that the '90s and the early part of this century we were beginning to exhibit more signs of extremes and greater variability in New Jersey's climate, but it's too early; it's too early to tell.

But if you live along the Delaware and you had three of your seven greatest floods in the century within a two-year time in the middle of this decade, the Raritan's had its top two floods of the last century or more in the last decade; you wonder. But again, the word uncertainty emerges.

This balance of rainfall and evaporation, where will it come out? Sea level -- the reason we talk about that -- and, yes, we're talking freshwater today, but sea level obviously has an impact down near the coast.

Will water demand change? I'll leave that for everyone else here and all the economic, ecologic and others we have on dais here and in the audience. Plenty of expertise on that.

This is a figure on sea level change. Some of you may have heard that the Intergovernmental Panel of Climate Change --

25 believe me, it was one of the most contentious

1 issues with the last IPCC report. It was very
2 conservative on projections of sea level rise this
3 century down to a little less than half a meter.
4 Well, there's been recent studies suggesting that
5 that might be off, and the prevailing number
6 you're starting to see now is a meter, 1.2 meters
7 this century. So that's a big difference and
8 something we're really going to have to keep our
9 eye on in coastal New Jersey.
10 Impacts. There are a variety there.
11 Public water resources, Russ has already said;
12 water supply, water quality, competition for
13 water, as well. I'll leave that to Marjorie and
14 Carol to discuss.
15 Some thoughts on water quality risks
16 from a changing climate. The variability, your
17 groundwater, your base flow, your surface flow,
18 sustaining an adequate supply of water, movement
19 of non-point pollutants into streams. If the
20 variability that the number of downpours versus
21 lighter rain change, that can have an impact.
22 Certainly that, and just flow changes would impact
23 stream chemistry, impact on the ecosystem, both up
24 in the freshwater wetlands and as you get down

near the sea with changing freshwater inputs into

these brackish bays and estuaries as sea level rises. Interesting factors there. Increasing erosion perhaps, and then, aforementioned, sea level rise.

So just quickly what we're doing with the State Climate Office in cooperation with DEP, USGS, so many -- US Foresters, so many other agencies, we're gathering data. We're working with decision-makers, stakeholders to develop products. And we have outreach in teaching programs, and we're all involved on various different levels with state, federal, local folks regarding climate, just applied climate in general and specifically with climate change.

We maintain a water watch page where we pull in data and information from all different sorts of sources. We have a network monitoring conditions around the state. That was yesterday, one hour. We're pulling in data from that many stations, as you see on the map, and more. We also have a volunteer precipitation observing program called CoCoRAHS, and that has been in place for almost two years. We have over 300 volunteers signed up around the state. I have

leaflets if you'd like to sign up. And on a daily

basis, people go out and with a $25 rain gauge, measure rainfall, they stick the ruler in the ground -- 18 inches of snow. That's beautiful, man, especially when that was my backyard. Then we put together daily maps. This is part of a national program. We're the only state where we've actually ramped up these colorful maps. This is the rainfall on December 3rd. So December 2nd and December 3rd last week, the rainfall in the state, it was a heavy one.

I guess I'm doing okay time-wise, but I know my time is up, and I'd like to thank Clean Water Council and DEP for having me down here today. I'm happy to talk to anyone about it here today offline other times.

I do have to apologize. I have 70 students eagerly awaiting my presence at noon up in Piscataway, so I'm going to have to scoot out of here about 20 of 11 or so. But I hope to participate a little bit before that time. And you know where to reach me. I love and hate e-mail. So thank you very much.

(Applause.)

MR. FURNARI: I would now like to

introduce our next presenter, Carol Collier who is the Executive Director of the Delaware River Basin Commission. She has been there for over 11 years in that position. She's also worked at the Pennsylvania DEP. She's involved with the Governor's Environmental Commissioners. She's Executive Director of that program. She's also been involved with the Southeast Pennsylvania Regional District as a director. She previously worked there before that at BCM Engineers as an environmental engineer and is involved on a variety of climate change task forces. She's also on the EPA's State and Tribes Climate Change Council.

One of the things that we're trying to do is bring different views, and Carol is involved at the DRBC with primarily one of their top issues is dealing with management of water resources, not only those that affect New Jersey, but those that affect the entire Delaware River Basin. It's been an interesting few years. We have worked on quite a number of things together that relate to floods, to droughts, and I appreciate her thoughts.

MS. COLLIER: Good morning,

25 everyone. Just one correction. I'm not an

1 environmental engineer. I have a biology and
2 planning background, but I work well with
3 engineers.
4 I want to talk about water
5 management. And most of my contacts will be with
6 the Delaware Basin, so just to set that, it is the
7 other shore of New Jersey, the western shore. And
8 what's significant is even though it's a fairly
9 small area, one, it provides water to 15 million
10 people, 7.7 million in the basin itself, but then
11 half of New York City as well as Central New
12 Jersey. And the other great byline that we like
13 is that it's the longest undammed river east of
14 the Mississippi. So when you look at the
15 metropolitan area, which it's located, it's a
16 amazing incredible resource that we have here.
17 David talked about extremes. And,
18 yes, we are going to be working more on the
19 extremes as we get into climate change effects,
20 but that's also what we're doing now. The one
21 thing I've learned in this job -- been there
22 11 years, which is hard to believe -- but there is
23 no such things as averages in water management.
24 We're always dealing with extremes.

And this is our basin area back in

the '60s. Driest part in the nation, right? And parallel -- actually, it wasn't here DRBC in the '60s, this is a picture of one of New York City reservoirs 2001, lowest it has been since it was constructed.

But the last six years, we've been the wettest part of the nation. You see this blueberry color here. And unfortunately, we've had a lot of floods due to that. The flood of record was back in '55, still the flood of record, but we had three major floods 2004 to 2006. So almost 50 years without a major flood, and, boom, we're back into it, really changing our priorities.

David already mentioned this, but what we're basing our work on is we are going to have increased temperatures. Equal or increased precipitation but greater intensity of the storms when we get that precipitation. What I heard, and I'd like to confirm this with David, is that we may be getting more precipitation in the winter months than the summer, which means we can have floods and droughts, both extremes.

Another thing to consider when we're

thinking about the critters is that the spring

melt is earlier. And USGS did a study up in New England looking at salmon runs and the spring melt, and the high flows are occurring almost a month earlier than when the salmon is running, so we're getting off of sync there. And then I will also talk about the impacts of sea level rise.

A number of areas I want to go through, and I'll go through quickly because I know we have a lot to cover, the energy water issue. We've got to look at the water footprint, flooding biological impact, water quality, and water supply.

This is from Hightower out of the national lab saying that water demand can almost triple since 1995, and part of that will be by carbon emission requirements attached to the energy uses. And even when we look at alternatives, you look at biofuels, just the irrigation water that's needed, fertilizers that are needed, definitely has a water impact.

And something new to our area, Marcellus Shale natural gas flow drilling. It is not in New Jersey, but it's right above New Jersey. Natural gas is really important to our

national security, our energy sources. It's

cleaner than coal and oil, but we need to do it smartly. Because when we look as we get closer, here, that little gold line is the boundary of the basin, Marcellus Shale comes up Pennsylvania and New York. One of the things that is done, one, it takes 2 to 5 million gallons of water to fracture a well. You have to open up the shales to get the gas out. And I think, actually, that can be handled. We just need to do it smartly. But when the wastewater comes back out of the well, not only does it have additives in it, but total dissolved solids, the salts. Drinking water standards are 250 milligrams per liter. What's coming out of some of these wells, 200,000 milligrams per liter. So who do we treat this? How do we take care of it? Knowing it's a value, but we've got to do it smartly because you all are downstream.

We also have a special protection waters program, keeping the clean water clean. The whole nontidal part of the Delaware is in this. We are very proud of this because the existing water quality is better than standards and we want to keep it that way, even with gas

well drilling. And as you know, headwaters are

the most sensitive areas of the watershed. So if we're going to protect the water down here, we need to protect the water in the headwaters, including keeping those lake contiguous forests intact and looking at what we can do.

It was interesting. Philadelphia has an intake right across from New Jersey American's intake. They did a source water study looking at vulnerability. The number one issue that they said was change of land use, potential loss of forest in the headwaters. That is their highest concern were their water intake.

Okay. Flooding. We've talked about that. We are -- I think we're going to see more. And, of course, along the Delaware we've got old river towns. We have people living in the floodplains. You all know we've been working on that from the 2004, 2006 flood, working with USGS, the Corps of Engineers, NOAA. We're actually are rolling out next week on the 15th the results of a flood model looking at the impacts of the reservoirs on the floods. We also have been working with a subcommittee or flood advisor task force looking at floodplain management,

benchmarking basin states as well as outside the

basin on how we can better manage our floodplains.

Citing of water and wastewater plants, especially wastewater. Where are wastewater plants? They're right next to the river, right, as low you can go. So we need to think about that with infrastructure impacts.

Okay. Biological impacts. I have a couple of slides looking at these. What's happening with our wetlands, vegetation changes, increased invasive species, the spring thaw, I already mentioned, and just these wonderful things like our horseshoe crabs, the Red Knots, you know, what's going to happen to our symbiotic relationships.

Believe it or not, the Upper Delaware is a world class trout fishery. People come from Montana to fish in the upper Delaware. But if we're going to have warmer waters, can we hold on to those cold water fisheries. Should we be asked to release more water from the reservoirs to maintain that cold water fishery? Or should we work with nature and say, "Hey it's getting warmer. We need to think differently."

We also have an endangered species

25 that Fish and Wildlife is soon to come out with an

1 analysis of what water flows and temperatures of
2 waters are needed for that.
3 Wetlands. Danielle Kreeger is here
4 from the Delaware Estuary Program. You know, we
5 have an incredible resource in the estuary
6 contiguous wetlands. I think John Teal said it
7 was -- the estuary was the greatest continuity of
8 wetlands anywhere. But as we have sea level rise,
9 we need to be strategic on what is just going to
10 be lost, what can we really preserve, which
11 wetlands can march inland as the sea level rises.
12 And this one I find really
13 interesting. This one is from Union of Concerned
14 Scientists, and we need to think terrestrially if
15 we're going to look at protecting our water
16 resources. This is existing terrestrial. And
17 this is the State of Pennsylvania. I'm sorry I
18 don't have all of New Jersey there. But the reds
19 are your typical deciduous trees: Maples,
20 cherries, oaks, et cetera. These others are five
21 different models all showing that at the end of
22 the century we're going to have more evergreens,
23 more pines, more firs. Think of Virginia, think
24 of North Carolina. They are deciduous. And think

of our headwaters. You know, those trees don't

just pick up their roots and walk north. The deciduous trees are going die and then the evergreens are going to take over, so what does that do during that transition to protection of our headwaters or anywhere?

Water quality. The temperature is going to go up, which means dissolved oxygen goes down. That's a problem.

Suspended sediment. We're going to have more intense storms. We're going to have more erosion. And because of these fluctuations in flashiness, we need to think about what our low flow conditions are going to be.

Talking to the Academy of Natural Scientists, they're concerned about greater water borne pathogens and phytoplankton blooms and what does it do to our regulatory policies. Think anti-backsliding. If nature is backsliding, what do we do? Should we adapt? How do we handle these nature-directed changes? Should we require point sources to have higher -- or not as high temperature waters, or do we just change the water uses? A lot of questions we need to address as we go through this. And one of the issues is we

don't know. We really need to do some scenario

testing.

Here's the big boy. Water supply. And there are a couple of different things I'd like to talk about, but we are going to have prolonged droughts. We're going to increased evapotranspiration, loss of snow pack, sea level rise issues and infrastructure issues.

Snow pack. Again, this is from Union of Concerned Scientists. The red outline shows where you would get 30-day average of snow on the ground now. The white is, I think, later in the century where it is likely to still have snow on the ground. Notice there's no snow on the ground where our reservoirs are. And if you're a water supply person, you know that snow pack is your friend. You know that the water just soaks into the ground is the best thing for recharging reservoir, and we may not have it.

When you look at infrastructure, I'd like to recommend to you New York City plan. They have done an excellent action plan, and these are some of their slides where they've looked at treatment plants that may be inundated. They're using a 14-foot surge as their benchmark. And not

only floodgates, we're looking at where motors and

pumps are located. And at this Rockaway plant, 25 feet below sea level are where their pumps are. So they are going through looking at their pumps and in this one taking this pump and elevating it from 25 below sea level to 14 feet above sea level. Some things we need to be looking at.

Sea level rise. As was mentioned, at least in this analysis, I'm using one meter rise by 2100. There was an analysis done by University of Pennsylvania. One of the professors there was on the review committee for IPCC. And one of the things we have to deal with is not only sea level rising globally, but as I understand it -- I'm not geologist -- but as the glaziers left New England, New England is rebounding and we're still sinking a little bit. So we've got sort of the double whammy.

And I need to put this in context. Right now in the Delaware, New York City has three huge reservoirs, 271 billion gallons of water can take up to 800 million gallons a day to New York City. But we need to look holistically because at the other end of the basin, we have Philadelphia intake and the New Jersey American intake. And

back in the '60s when we had those droughts -- you

saw David's pictures -- we had the salt line within eight miles of those intakes in a 12-mile tidal excursion. We never want to get there again.

So when we look at water management, not only do we look at the New York City reservoirs, but DRBC owns water in two reservoirs in Pennsylvania that we can call for the release to make sure there's enough water in Trenton, 300 CFMs, to keep the salt line down below those intakes.

The utilities also have water in Merrill Creek which they can be called to release to maintain that flow. But this study done, again, by University of Pennsylvania, and this is based on the one meter, here are those water supply intakes. Here's the drought of record in the past. Here's where we try and keep the salt line where the water push down to Trenton. By 2050, if you have a high tide and a drought of record, it can be four miles upstream of the intakes. Again, this is the Pennsylvania study. I don't believe it was peer reviewed. But by the end of the century, possibly seven miles above.

25 To me, that says, hey, we'd better be looking at

1 this more carefully.
2 We also have sea level rise pushing
3 with groundwater issues and groundwater wells and
4 also septic tanks. If we're going to push up the
5 freshwater and push up the water level, we've got
6 water supply and wastewater issues.
7 Adaptation to climate change is now
8 inevitable. The only question is will it be by
9 plan or by chaos? I'm a planner. I want to do it
10 by plan.
11 The things I think we need, one, are
12 my drought and floods of records that I use in my
13 model correct, or do we need to change those? How
14 do we look at potential risks? People say we need
15 downscaled models. That could take a while.
16 Could we also right now look at
17 probabilities and what they call the cone of
18 uncertainty, look at a worst case, not so worse
19 case, combine them and see what the sensitivities
20 are and what we need to move forward. When we're
21 looking at these changes of climate change, we
22 need to overlay with them with other things that
23 are already happening, increased demand, increased
24 impervious cover, all that good stuff.

And then how do we do this? We

can't just jump to more reservoirs and flood control. We need to look at increased demand, water conservation, stormwater management, and my last slide, we need to do these assessments. We need to figure out how to get teams together, states, and federal agencies. Hopefully the DRBC. Look at the goal we want, protect our watersheds, and then look and what we can do through better conservation nonstructural and then if we need them, structural.

And I think that will be it. Thank you.

(Applause.)

MR. FURNARI: Thank you, Carol.

Our third presenter is Marjorie Kaplan. Marjorie is the manager of DEP's Office of Climate and Energy, the primary mission of which is to facilitate the Department's -- address the mitigation and adaptation of policies related to climate change.

In addition, in her recent work, she's established climate change policies for the Department. Dr. Kaplan has over 20 years as a scientist at DEP and including managing,

designing, a broad range of science policy

research projects pertaining to wetlands, forestry, watershed management, impervious coverage, and land use.

I'd like to invite you up and give a New Jersey perspective to these polices and issues.

MS. KAPLAN: Good morning. I think David and Carol did a great job. So I'm going to sort of breeze through so I don't bore you with a lot of the same data.

Russ mentioned the mission of our office, and these are things that I'm going to try to go through very quickly and outline.

Before I forget, the things you're looking for and information that we have, the State actually has a global warming website. It's www.nj.gov/globalwarming. And our office also has a website. So if you go to DEP, just put our website up dep/oce.

We're a very new program. We're less than a year old. And it's pretty exciting, but it's also pretty daunting.

You posed the question to us in your -- Clean Water Council said to us, how do you

look at the high priority risks in water. So when

you look at a framework for climate risk assessment, one of the things I think we just haven't talked about, because I don't want to talk about all the things we have talked about, are the fact that a lot of the data gets put together global climate change models that represent climate through time, coupling ocean data, atmospheric data, land and ice surface data, and then that married to emissions scenarios. So I'm not sure if everybody is aware of that, but I just figured I'd mention that. Emission scenario look at demographic information, social information, economic, technologic, and environmental assumptions. So very often we have these low emissions and high missions scenarios. I thought I needed to mention that.

I'm going to skip through many of these because we talked about what we're going to need to look at. We need to pattern and rate of climate change the frequency, the potential impact, the adaptation, the cost, time frame.

What I will mention is that we know that the greenhouse gas has enhanced human activities, making the atmospheric blanket

thicker. The natural levels of greenhouse gas is

being supplemented by human actions. Although some scientists argue that 350 parts per million of CO2 in the an atmosphere is the appropriate level to avoid irreversible injury impacts. Others say 550 parts per million is the more realistic number by the end of the century. We're now at about 390 parts per million. And prior to preindustrial times, we were at 225.

And these are all the end points that Carol and Dave so elegantly showed us. The global mean temperature's been rising.

One of the things that wasn't mentioned, you can see the blips going out further. Global temperature has risen over time. This is the rate of change from IPCC data. But one of the things that I will mention is that Carol and Dave both mentioned the climate impact assessment which takes the IPCC data and regionalizes it, that there's been about a half degree Fahrenheit increase per decade from 1970 to 2000 in the northeast. So that's just another little tidbit of information.

So we've mentioned what the risks are, what the key impacts, and obviously these

25 constitute the key risks because you asked us what

1 the key risks are. Water supply, quantity and
2 quality, further at risk. Obviously, all these
3 other impacts to human health, ecosystem,
4 infrastructure and energy. I'm going to try to
5 move forward so I can get some of the things that
6 the Department is doing because I think that's
7 kind of a missing link here.
8 This is just from a global picture
9 of hydrologic impact.
10 So it's important to emphasize to
11 you -- and I want to thank Jeff Hoffman also from
12 the New Jersey Geological Survey who's also a
13 colleague here. We work closely with him. He
14 asked if we could emphasize this to you as well.
15 It will affect the three components of water
16 supply, the source; the collection, treatment, and
17 distribution; and the water demand.
18 Again, the northeast climate impact
19 assessment found all these impacts more frequent
20 days with temperatures above 90 degrees Fahrenheit,
21 longer growing seasons, increased heavy
22 precipitation. One of the things that Carol
23 showed you, shifts. And one of the other shifts,
24 the global shifts that we are seeing is your heat

index, that people are going to feel this is more

like South Carolina potentially or possibly under high emissions scenario, Virginia, by the end of the century in terms of heat index, so you can understand that.

This is from New York City. And Carol was good at showing you the plan New York City data. This is the range of changes over time slices. The time slices here in decades. The baseline is 1971 to 2000, about 55 degrees Fahrenheit. And the maximum and minimum values are across 16 global time change models. They're showing as the black horizontal line, and 67 percent of the values are in the shaded area. And basically what we're emphasizing here is that temperature changes from the New York City climate showing that they're going to be implications if you have a longer growing season. If you have a higher temperature, you have a longer growing season, more evaporation, less runoff, more demand for lawn irrigation.

Similarly, with respect to precipitation, averages may not be so dramatic, but there are more extremes predicted, as was noted: More floods, more droughts, so more

storage is going to be needed to carry water over

from wet periods to dry periods. And so, therefore, water managers are going to have to, obviously, evaluate the adequacy of the surface water supplies and storage capacity. This is a snapshot of what we have today in the state.

We've mention sea level rise. And just to emphasize, everybody's on the same page, about the one meter rise or three feet by 2100, that's generally accepted. And one of the things that wasn't mentioned is that most coastal wetlands in the Mid-Atlantic would be lost if sea level rises a meter in the next century.

It's hard to be the third speaker, because I'm pick out the things that you didn't mention. I was trying to listen to you and scribble on my notes here at the same time. So I'm not trying to be boring as I could be.

From Professor Rick Lake who is a colleague of all of ours at Rutgers, he's taken our data and his data and put it together and listed the projection sea level rise by 2100. You can see here is the manmade obstruction. This map shows the distance from existing title waters manmade structure, that structure being building

and county or large roads. And the map identifies

areas where gradual sea level rise would have the broadest impact for beach, dune, and salt marsh communities. The data obviously are a little bit older. It's from 2000 data. How much more development may or may not have been since then would also impact this picture.

Carol mentioned aquatic ecosystems impacts. And one of the things I'll just mention is that in the northeast, conditions of low stream flow are projected to last an a month longer by late century under the higher greenhouse gas scenario and that biological indicators are showing things obviously. Fish communities composition sensitive to climate change, and, obviously we would see impacts on cold water fish.

When we have changes in air temperature, this will influence changes in water temperature, changes in precipitation. The timing and the amount both affect water quantity and quality and timing of flows. There will be increasing atmospheric CO2. And these alterations clearly have effects that ripple throughout aquatic ecosystem.

So you asked us also in your second

question -- you posed two questions to us,

correct?

MR. FURNARI: Correct.

MS. KAPLAN: What are the changes to the water management policies are needed to increase flexibility and adapt this management and how will this State meet the challenge?

And I guess I'll just talk in more broader terms. We are working on, obviously, mitigation, which is prevention of emissions. In the terms of sequestration here, I'll talk about it in terms enhanced uptake by natural systems in terms of sequestration and then obviously adaptation which is trying to make us climate resilient.

Just to give you a little context, the United States emits 20 percent of the world's emissions. New Jersey is about two percent of the United States emissions and less than a half percent of global emissions. We now have not a goal, but actually a limit. That word goal should say limit. That's a statutory limit in the Global Warming Response Act to stabilize our emissions to 1990 levels by 2020 and to reduce our emissions 80 percent to our 2006 levels by 2050.

25 So those numbers up there, the 123

1 million metric tons that we want to get to by
2 2020, 25.5 million metric tons by 2050, those are
3 numbers now that we've got to really try to meet.
4 And those are hard numbers.
5 To give you some context. How do we
6 figure out what we've got. We've also by the
7 Global Warning Response Act we're required to do
8 an inventory of our emissions. And the pie chart
9 on the left are the actual values. The box on the
10 right provide you with the percentages of those
11 totals. This provides an opportunity to establish
12 our baseline, and now we can track our ability to
13 meet it. You'll see that the largest contributor
14 to greenhouse gases in New Jersey is the
15 transportation sector at 38 percent, followed by
16 the electric generator sector, followed by the
17 residential commercial sector, followed by the
18 industrial sector, the waste management sector,
19 other highly warming gases, things like
20 refrigerants. And the other in that total means
21 things -- releases from agriculture and land
22 clearing. And then we're able to offset about 5
23 percent of our emissions through our forests and
24 our wetlands.

So what are we actually trying to do

about this? Well, as I mentioned, we have a statute, the Global Warming Response Act, it's followed an Executive Order. It set our statewide greenhouse gas limits. And then we also as part of that statute which required our inventory also required to us to develop a report to the Legislature. And that report is supposed to provide recommendations to say how do you get to these limits.

So we released a draft of that report last December, and we followed that by an enormous number of state programs in the winter, and we received an enormous number of comments. And a lot of the comments, a real lot of the comments focused on, believe it or not, the transportation and land use sector, which I think might be of some interest here in terms of cover issues, sprawl issues, and in terms of those issues related to water. I think they -- trickle down to water quality and water supply.

So we now also are putting together our final report. And one of the things we did was commission economic impact assessment as well as trying to look at emissions reductions values.

25 And in the report, we recommend three core actions

1 to get us to 2020 goal. And that would be
2 implementation of the Regional Greenhouse Gas
3 Initiative, the Energy Master Plan, and Low
4 Emission Vehicle Program. And all those things
5 together would get us to the 2020 goal.
6 To just give you a brief outline,
7 the Regional Greenhouse Gas Initiative that Nancy
8 Wittenberg mentioned is the first mandatory cap
9 and trade program in the United States, and we
10 regulate the power sector, the electric generating
11 sector. Their emissions are capped through 2014.
12 The cap is then going to be reduced by 2 and a
13 half percent each four years, 2015 to 2018, for a
14 total of 10 percent.
15 The Energy Master Plan is the energy
16 vision for the State. It talks about things like
17 a thousand megawatts of offshore wind installed by
18 2012; 3,000 megawatts onshore 2020; 900 megawatts
19 of electricity from biofuels and biomass; and 1500
20 megawatts of cogens, and 30 percent electricity
21 from renewables. And the motor vehicle program
22 establishes fleet-wide averages green gas emission
23 standards.
24 Beyond the core recommendations,

there are the host of other recommendations and

related actions in key sectors, including terrestrial sequestration and water recommendations.

With respect to the water recommendations, we are looking at things like reducing energy consumption and associated greenhouse gas emissions by adopting mandatory statewide watering limits that address setting irrigation on landscapes on properties. These limits apply to all water users regardless of the water source. And I'm assuming that they're related measures pending in the Legislature. I think I saw Michele in here. I'm not sure if she's still here, but she can answer those questions better than I.

We also have measures in the way we do green buildings to develop guidelines for all commercial and residential buildings and methods for water conservation and related energy reduction. Waste management measures would help reduce the carbon footprint of public water supply on wastewater treatment facilities by helping to provide financial incentives for energy efficiency.

25 Under terrestrial sequestration in

1 protecting our forests we have measures related to
2 no net loss of forests, state funded projects and
3 tree replacement requirements in areas that relate
4 to how we work in a CAFRA zone. We can recommend
5 whether the legislature fixed them up or not.
6 It's something that will be decided.
7 I would be remiss if I didn't
8 mention the fact that there's federal legislation
9 pending that you've all heard about. Terry Boxer
10 and wax mark I and in those federal bills.
11 There's also provisions related to energy
12 efficiency, water sense program, and related to
13 research to assist drinking water utilities in
14 adapting to effects of climate change.
15 So Nancy mentioned the Global
16 Warming Solutions Fund Act. That's pretty
17 exciting for us. We've been spending a lot of
18 time on that because last week we participated in
19 our fifth quarterly auction of the RGGI emissions
20 proceeds. The auction brought in $55 million to
21 the state so far. The proceeds from that are
22 distributed according to the statute.
23 Sixty percent of that goes to end-use energy
24 efficiency combined with power and renewable

energy projects and loans and grants in the

commercial industrial sectors. That's administered through the Economic Development Authority. There's been a huge response to that program, and we've been helping EDA in developing their score and criteria about how they're going to allow projects to be funded. Twenty percent is to go to the Board of Public Utilities to support programs to reduce utility cost and demand for low or moderate income residential electricity customers, and 20 percent coming back to our department to support local government to enhance greenhouse gas emissions reductions measures. It's split out, 10 percent there and then 10 percent comes here for programs to enhance forest stewardship and tidal line restoration. It provides important opportunities to sequester carbon.

With regard to the latter, we're developing a tidal land restoration plan for the department and how to spend these RGGI funds as a companion to a forest stewardship program because they both will sequester carbon. We expect about $5 million a year for at least the first five years. It's a federal program, which we strongly

support federal programs.

The investment here recognizes the fact that biological sequestration brings a host of other important co-benefits in the form of ecosystem services, including water quality protection and water supply protection.

Even if all the emissions were stopped, obviously, we need to do adaptation, the Global Warming Response Act does not permit us -- it permits us to develop -- our report actually is saying you need to develop a plan, lay out a framework in the early stages of a plan formulation. We expect to coordinate with other ongoing efforts, especially with some of the folks -- many of the folks in this room are working with it, such as the Water Supply Master Plan. We've got a number of groups that we've set up in internally. We have an adaptation research group. We have a group that's looking at basic research questions. We're working with David. Actually, I think we're going to be speaking to you tomorrow. We have a group looking at temperature and precipitation issues. Global models can't address local climate issues, such as aerosols, black carbon, land use and cover change,

usual effects and those sorts of things. But

they're important questions that we need to start to continue to look at. We can't wait for all the answers, but we need to funnel those processes and move them in and move forward in our adaptation planning.

The public release of the water supply plant will include acknowledgment of climate change as part of a future management plan water supply in the state, and we're planning on including that.

I think I'm running out of time. So I just want to mention to you the fact that water use in the State is about a trillion gallons per year. If it gets hotter and population increases go up, then conservation measures slow down. Water demand is sensitive to climate change. The northeast has not devoted as much attention as the arid west to reducing water demand from consumers and industries. As a result, a region has an opportunity to reduce the average amount of water for industrial changes in water supply or our population continues to grow. Water management should be an integral element of adaptive water resource management in the state's of climate

25 change.

1 And I just want to also mention, in
2 conclusion, that climate change is going to alter
3 the distribution, quantity, and quality of water
4 by affecting precipitation, air, water
5 temperature. The adaption of the statewide plan
6 infrastructure and allocation to meet the needs of
7 its population. We actually have commissioned a
8 study that's being led by City University,
9 although David and many colleagues at Rutgers are
10 involved in that study, as well as folks from
11 Columbia, on climate change and economic impact on
12 New Jersey. But it's expected to yield -- cost
13 for climate change for specific sectors including
14 the water sector. It's going to be a first cut,
15 and it's going to actually provide a vulnerability
16 mouth (ph) as well to the best that we can at this
17 time. But it's a start. But we know that given
18 the projected impacts, the cost of inaction, we
19 believe, is greater than the cost of mitigation
20 adaptation.
21 So I think what my message to you is
22 that we have to keep on moving. We can't stay put
23 and wait for all the data. We have to move
24 forward an adaptation plan. One of the things I

did want to mention is that the coastal management

program worked very closely with our office, and they are doing some fabulous work in terms of using looking at our data and looking at providing tools to local governments. And some of those folks are here and can answer questions on that as well.

Thank you.

(Applause.)

MR. FURNARI: Thank you.

We're now going to move on to the public testimony portion of the hearing. I would just remind anyone if you want to testify, there was a list that was being collected outside at the desk. Please sign up if you haven't already. And I will also remind everyone that there's a five-minute limit on the testimony, and we do request that you submit written comments as well or just -- if you don't want to speak today, you can also just submit written comments. The information on where to submit it is in the flyer.

Our first speaker is Jenny Vickers, New Jersey Environmental Federation.

MS. VICKERS: Good morning. My name Jenny Vickers. I'm communications coordinator of

the New Jersey Environmental Federation. Today,

I'm going to testify on smart, clean, and green, 21st century water management. I'm going to start with a quote, the Intergovernmental Panel on Climate Change 2007. "Water and its availability and quality will be the main pressures on, and issues for, societies and environment under climate change."

Thank you for having me here today. Thank you for the opportunity to testify on this important topic that is at the very heart of New Jersey's sustainability.

New Jersey Environmental Federation is the New Jersey chapter of Clean Water Action. Our founder first wrote and helped pass the 1972 Federal Clean Water Act.

New Jersey and the world water future present tough challenges exciting opportunity to respond to the impacts of climate change. If done right, we can not only solve our water problems, but also open a green door to revitalizing our cities and towns. If we don't take the right action, we will face degraded water quality and scarcity of supplies regardless of climate change, and our cities will be further

under water due to flooding and sea level rise

because of climate change.

New Jersey Environmental Federation consisting of a hundred member groups and 100,000 individual members report 21st century smart, clean, and green integrated water management approach that can restore New Jersey's water resources and ecosystems, reduce energy use, and improve the economy, public health, and the quality of life for residents.

Later in my testimony, I'll give concrete examples of state municipalities and communities implementing this approach, which include green groups, green harvesting, green gardens, urban forests, beneficial reuse, and other projects that help to reduce impervious cover and stormwater overflows as well as enhance aquifer recharge.

Our problem. Our aging and outdated water infrastructure based on 19th and 20th century technology has not only led to the destruction of natural resources, but also has been a detriment to our economy. For the most part, our current large-scale systems for supplying drinking water, treating wastewater, and

handling stormwater for cities and towns are

conventional, centralized big pipe systems. They use and waste too much energy, water, and money. They're causing long-term ecosystem destruction, such as dewatering even in relatively water regions in the northeast. With these systems, we succeeded at undoing nature's number one instinct, which is to keep water local and naturally filtered on the land, in tree and plant cover and in the aquifer.

For example, parts of Newark and Camden currently experience chronic flooding. Neighborhoods find themselves underwater with sewage backing up into basements. Research scientists say that climate change can put some coastal areas underwater.

In order to protect and prepare ourselves, the fund change impacts implement smarter, cleaner, greener, and cheaper solutions to water management, a 21st Century innovative approach. This is a water system plan designed that helps a requirements of the triple bottom line; economic, social, and ecological profits, which are simultaneously maximized. The system use, treats, store, and reuse water more

efficiently so that even when applied on a smaller

scale, positive impacts apply. It can save a municipality and ratepayers millions of dollars over their counterparts.

In addition to environmental protection and cost savings, new infrastructure designs will create billions of new jobs, ranging from science and engineering to manufacturing, installation, and management in low income urban neighborhoods. According to the Federal Highway Administration jobs decoder, for every 1.25 billion spent on green infrastructure, almost 10,000 more jobs will be created than with a traditional approach.

In order to achieve these multiple benefits and create new jobs in New Jersey, we must change our style of approach for planning, regulating, and managing our water systems to a 21st Century approach, one of which agencies stakeholder community leaders, water management practitioner and others working with an integrated framework to share knowledge, save resources, and solve problems.

Examples of this abound throughout the US with state municipalities and communities

25 are engaging in green infrastructure and

1 innovative approaches to water management. I've
2 included many examples in my testimony, but I'm
3 just going to go over three today: California,
4 Philadelphia, and the Solaire Building in downtown
5 Manhattan.
6 California is working toward the
7 implementation of green infrastructure and low
8 impact development also called LID approaches.
9 According to state studies by 2030 green
10 infrastructure and LID implementation of
11 California will save 405,000 acre feet of water
12 per year, enough for 800,000 families; save up to
13 1,225,000 megawatt hours of electricity per year,
14 enough to power 103,000 buildings; and prevent the
15 release of up to 535,000 metric tons of CO2 per
16 year. Well, that's 97,000 cars.
17 In LA, they have a green roof
18 program that provides 15 percent green roof
19 coverage that will provide a 5 to 9 degree heat
20 island reduction and additional cost saving.
21 Close by us in Philadelphia, they
22 have what's called the Green City and Clean Water
23 Initiative. To help resolve their infrastructure
24 issues and reduce the volume of CSO discharges,

the City could have chosen to send billions to use

a traditional approach, new pipes and storm drains. Instead, they chose to invest 1.6 billion in innovative green water management approaches to restore and preserve stream corridors, water treatment, state water pollution control plants, and to green one-third of combined sewer areas in stormwater at the source.

This investment is providing multiple benefits and wet water quality improvements, including a citywide annual CSO volume reduction of over 6 billion gallons. In addition, tree plantings are providing 4 million in property value.

The last example is the Solaire Building in Battery Park City in downtown Manhattan. It's the nation's first green residential highrise building. It achieved the highest level of LEED building certification, gold. In addition to New York other environmental benefits, the Solaire is designed in a way that allows it to use 50 percent less potable water than a similar size residential building. None of the potable water is used outdoors. A block water system is included in the building and recuperates

25 a hundred percent of the wastewater and supply a

1 cooling tower and toilets. The building also
2 includes a roof top garden, a vegetated roof that
3 corresponds to over half of the site area. And
4 the soil rests on a water retention layer, helping
5 the vegetation to absorb the stormwater before it
6 reaches the infrastructure. The rest of the
7 stormwater is recuperated thanks to arrangement
8 for many to stock ten gallons of this water in the
9 basement in tanks for the treatment system. The
10 water is then used for the irrigation of the roof
11 top garden.
12 There's no reason we can't do this
13 in New Jersey. Our regulatory framework is just
14 as outdated as our infrastructure. Several years
15 ago, the Clean Water Council held a public hearing
16 on beneficial reuse that DEP partnered with water
17 supply workers to address this issue in the
18 State's Water and Master plan, but no concrete
19 action was taken to remove regulatory impediments.
20 So in conclusion, it's important to
21 recognize that water management in the 21st
22 century will require higher level of
23 interdisciplinary collaboration of all public
24 engagement. There are people pioneering these

greener approaches across the country. The work already exists. The basic question is their drive to integrate a more modern approach into their community begs the question why New Jersey is still investigating 19th and 20th century industrial solutions.

So we believe that New Jersey, with support from the federal government and, of course, ratepayers and taxpayers to be making investments moving forward that will give us the biggest bang for our buck. Or will we be literally cementing in the old unsustainable approaches of the past that deny us critical tools to build a better more economically viable healthy future.

Thank you.

MR. FURNARI: Our next speaker is James Pfeifer. I don't see David.

Jeff Tittel. I don't see Jeff either.

Let's see, Abigail Fair, New Jersey Association of Environmental Commissions.

MS. FAIR: Thanks. Thank you. It's a pleasure to be here.

Many of you may not know NJAEC, New

does. We work with local municipal environmental commissions. We provide training to try to give them tools to give information and good advise to their local town. We also try to keep them up to date on programs that DEP has to protect the environment. We encourage them to make comments to DEP, relevant comments. And I try to keep on top of the state regulatory programs.

To address the issue today, it seems to me that with the climate change, those who are charged with protecting the public interest into irreplaceable environmental assets which are at great risk must be given the ability to do so. We cannot keep cutting budgets, we cannot cutting keep cutting staff and expect to have results.

The stormwater program is a good example. We had a so-called permit efficiency task force. I think it was two years ago. And we have a storm water program. It was the first in 20 years. It had been implemented appropriately for four years from 2004 to 2008, and there are two tracks. One was for management, and that was municipalities had to start getting on top of maintaining existing development. The other track

was trying to keep on top of new development so it

wouldn't result in bad stormwater management.

For four years, the standards for new development rested with the watershed division. The permit officials said, yeah, four years means nothing. We're just move it over to where the municipal maintenance department. So that's pretty disruptive for a group of people who tried to do a good job.

Another example of water quality management plan, it's been around since the Clean Water Act was passed. There are a lot of things going on now where people apparently didn't know that there was such a thing. In the late '70s, early '80s, the water management plan established regional areas and there were very large conceptual plans, and they were amended out of all recognition in the '80s by developers and others.

DEP did something very smart. In 1990, they adopted regulations that said, Municipalities, we'd really like you to help us. You should be responsible for infrastructure for the zoning that you have in place. So they passed rules. There was terrible compliance. So finally, 15 years later, Bruce Campbell said, hey,

25 forget it. It we're going to erase all -- come

1 into compliance. Everybody who testified, mostly
2 business, said, you're right, but we need time.
3 Okay, now it's 2009, and we had new
4 rules put out last year. Everybody is
5 complaining, oh, my, God where did these come
6 from?
7 Excuse me. I'm very exciting about
8 this because the new rules for wastewater
9 management planning tried to prevent extension of
10 infrastructure into environmental sensitive areas
11 which will be impacted by climate change. So
12 these rules are very, very important. There's a
13 lot of cooperation going on with the counties.
14 Some counties aren't playing, but I wanted to
15 bring that to your attention. I think it's a very
16 important process. It's not new.
17 And my recommendation, however, for
18 global warming is that protections with just
19 regulation is very misleading. It merely allows
20 us to nibble away slowly at our natural resources
21 until eventually there won't be much left to
22 protect. We are especially in danger. Now, with
23 the global warming and some of the effects that it
24 will have. We need to draw a clear line around

those assets and strictly say no for those areas

that are going to be under water, according to predictions. I'm not sure exactly when 2050 might be a timeline.

DEP staff have got to be given the ability to say no and to protect those resources that will, in fact, be underwater that we will need cushions to protect the public, we need to protect the resources.

So anyhow, hopefully, we can move forward. I'm very impressed with what DEP is doing. And I thank you very much. We will need every bit of the work you're doing. Thank you.

(Applause.)

MR. FURNARI: Thank you.

The next speaker on our list is Marie Banasiak, New Jersey Farm Bureau.

MS. BANASIAK: My name is Marie Banasiak, with New Jersey Farm Bureau. And I'd like to thank you for allowing us to give our testimony today.

We at New Jersey Farm Bureau are watching the climate change issue closely. New Jersey farmers are not strangers to variability. Generations of experience has taught farmers that

they need to adapt in order to manage their risks

and remain profitable. Farmers frequently make management decisions that are driven by variations in climate, weather, environmental conditions, regulations, and changes in market forces. These management decisions are part of an ongoing adaptation process that farmers can carry out as part of reducing risks.

Policies that can help agricultural land owners adapt a climate change and minimize impacts to the environment, including water quality and supply should include the use federal farm bill programs. Appropriate use of farm bill programs can play a key role in mitigation and adaptation strategies if they assist in gaining water quality and water supply benefits. These programs can accomplish this by providing incentives for farmer to engage in a breadth of conservation practices.

Though this is not an exhaustive list of examples, other more specific agricultural adaptive management approaches to climate change may include: Increased use of and improved effectiveness of integrated pest and crop management to effectively manage weed, disease,

and insect pressure on crop populations in ways

that minimally impact the environment, reduce production input cost and contribute to profitable deals. Planning for additional infrastructure to support irrigation and drainage, if needed, climate change may require agriculture to make investments in these in order to adapt to extended periods of dry weather and increased precipitation.

Development and use of localized monthly and/or seasonal climate forecasting and crop models to reduce production risks. Development and use of crop variety and species which are either tolerant or resistant to pests, disease, weed pressure, temperature, and precipitation, among others. This could be accomplished through funding research at the New Jersey Ag experiment station.

Greenhouse gas reductions are targeted to help reduce the effects of climate change. Agriculture can help attain greenhouse gas reductions through increased farm energy efficiency and conservation. These opportunities can produce input cost for producers to support the use of renewable energy sources. Therefore,

we must continue farmer opportunities under

renewable energy cost share incentive programs.

Soil conservation and management practices can be used to sequester soil carbon which helps to reduce atmosphere carbon dioxide levels and build soil organic matter, including soil health and its ability to store water, reduce erosion and runoff.

At present, New Jersey policies and greenhouse gas reductions do not support and provide opportunities for agriculture potential rule in greenhouse gas reduction and soil carbon sequestration. This is lacking in both the draft Global Warming Response Act recommendations and in the Regional Greenhouse Gas Initiative.

Risk management tool such as financial management and crop insurance can help producers mitigate the risks associated with variable weather as well. Financial management planning can help producers realistically evaluate the production costs and help make a better plan how to adapt to variable yield impacted by environmental factors and market forces. Crop insurance can help to financially protect investments from disaster and help them to recover

from loss faster.

Further incentive and investment in next generation technology may also aid in adaptation. Therefore, we need policies that will support engagement in adaptation now in order to determine effective means of management risks associated with climate change. Research through land grant university should include the evaluation agriculture adaption strategies such as those indicated before and in regard to real benefits and costs.

Farmers should be encouraged to bring their practical knowledge into this assessment in order to explore a range of adaptations greater than those usually explored by scientists and policymakers and to verify that those adaptation strategies will be realistic and achievable. Policy must also remain flexible to adapt to a changing knowledge base.

Federal financing now pending in Congress offers agricultural opportunities to protect natural resources and stimulate the economy through carbon offsets program. Under a national cap and trade program, agricultural carbon offsets can provide a low cost compliance

for capped industries creating a potential source

of revenue for some farmers. It also provides environmental co-benefits through offset project practices that include as an example more efficient use of manure and nitrogen fertilizer, soil health benefits such as increased organic matter, microbes and soil carbon, all which help to improve water quality.

Finally, we recognize that agriculture's ability to adapt to climate change will not come without costs. Policies must support the analysis with the potential impact of climate change on agriculture, taking into account economic response experience by farmers. Agricultural economists can assist in evaluating the benefits and costs of applying these adaptation strategies to mitigate risks associated with changing weather, water availability, and variations of other factors. It will take technical, educational, financial assistance to help farmers shift to more efficient production practices that meet the goals of sustainable production.

We look forward to continue dialog with the Department on the impacts of climate

change on agricultural and agriculture's role in

mitigating these effects. Working with our colleagues at the Department of Agricultural, Rutgers Cooperative Extension, local soil conservation districts, and various supporting agencies in the USDA.

Thank you.

(Applause.)

MR. FURNARI: The next person is John Miller, Association for Floodplain Management.

Emmanual Charles, USGS.

MR. CHARLES: Hello. I'm a hydrologist with the US Geological Survey's New Jersey Water Science Center. And I'm going to highlight the water quality issues that result principally from sea level rise and to a less extent on some other effects of climate change. So the main climate change effects I'm considering are continued sea level rise, the steady increase of the 20th century is projected to continue. Estimates to the year 2050 range from an increase of one half a foot to two feet. More intense storms are projected. This is less certain at sea level rise, but the consensus is that we will see

an increase in storm intensity. More and possibly

more prolonged droughts are projected. Again, this is less certain than sea level rise, but the consensus is a increase. Sea level rise and more intense storms combine to increase the vulnerability of low lying coastal waters, primarily by storm surges and salinity encroachment that goes along with storm surges.

I should note that even if we consider sea level rise by itself with no change in storm intensity, the result is still considerably further reach for a storm surge because of the low gradient in coastal areas. And also should note that although it's not the primary focus of my topic, droughts increase stream water -- decrease freshwater stream flow, and that allows saline waters to migrate upstream and in estuaries.

So I've looked on the proposal which is other USGS scientists in the northeast, and the focus was basically public water supply intakes and the vulnerability of those, the salinity encroachment from storm surges, and to a lesser degree risk because of droughts. I also focused on municipal wastewater treatment plants being

basically flooded out by storm surges, disabled.

The side effects of municipal wastewater treatment plant being disable is that when they're shut down, basically untreated wastewater would be released and damage estuaries and damage ecosystems.

Although not a focus, I do want to note the vulnerability of near shore ecosystem from both drought and storm systems. So the best example of infrastructure being affected by storm surges and saline encroachment is probably the 1991 October storm, that northeaster, a very large storm surge, went from Barnegat Bay up to Metedeconk River to the Brick Township MUA and the pushed saline water over the protection dam before the pond. And this is about five miles upstream that this occurred. So this was much further than it of happened in that area on the river.

By the time the Brick Township MUA realized what was going on, the saline water had already pushed over the dam and was starting into the infiltrate the drinking water. They shut things down, but because there was saline that had already come into the pond, it took some time to get that cleaned up and restore the entire

25 situation.

1 Ultimately, part of their remedy was
2 to build a reservoir pond. Fortunately, they also
3 have groundwater supplies that they were able to
4 switch to that, augment that shut down.
5 So how does one address this
6 vulnerability? How should we plan and prepare
7 public water supply facilities and wastewater
8 treatment plants for the effects of climate change
9 specific to direct impact to sea level rise?
10 Number one, we can identify and
11 assess the facilities of interest, the greatest
12 vulnerability in New Jersey. To do that, we would
13 essentially start and assess, make sure we have
14 the best, accurate, and uniform data quality about
15 the facility that includes elevation data,
16 protection dams, good location data, and also note
17 the population served as part of our vulnerability
18 assessment.
19 Number two, examine what FEMA flood
20 inundation maps tell us and what USGS's SLRP
21 model, which is a sea level rise program tells us.
22 Apply New Jersey specific sea level rise and storm
23 surge data in order to calibrate our vulnerability
24 model to the historical record of storm surges,

that way it's sort of test of our vulnerability

model.

And then finally, we can take that model and apply it forward to the year 2050 when you incorporate all the sea level rise factors.

And then finally, with this information in hand, we can encourage authorities facilities identify as being most vulnerable to plan better for physical protection, early warning systems, like in the case of Brick Township MUA would have prevented the shut down filtration plant recovery operation. Things like contingency plans, plant upgrades, and possible new construction. Thank you.

(Applause.)

MR. FURNARI: The next speaker is Glen Carlton, USGS.

MR. CARLTON: My name is Glen Carlton from US Geological Survey. I'm going to talk to you about stationary is dead.

All the climate change models predict that runoff in streams and rivers in northern latitudes are going to increase as a result of hypothetically global climate change. And Chris Milly, a leading climate change model at

25 the USGS up at the Geophysical Fluid Dynamics

1 Laboratory in Princeton told us that he has
2 recently titled "Stationary is Dead." He and his
3 coauthors concluded that water managers can no
4 longer assume that the future can be predicted by
5 looking at the past. For example, you cannot
6 accurately predict what the hundred year flood
7 magnitude or drought frequency or severity will be
8 by simply statistically analyzing past data.
9 When I was 18 years old, somebody
10 said something about the hundred year flood is
11 overdue. And I thought, oh, wow, I guess there's
12 like this biblical cycle, you know, every hundred
13 years. I didn't realize -- going to college paid
14 out off. I learned that the hundred year flood is
15 statistically one in a hundred years you're going
16 to have a flood of that magnitude. Or said
17 another way, there's a one percent chance in any
18 given year you're going to have a flood of that
19 magnitude. The way you calculate that, the
20 physical frequency, is looking at past data. But
21 you assume that that's a static data set. If it's
22 not a static data set and actually flood
23 magnitudes are increasing, then you will
24 underpredict the magnitude of future 100-year

floods.

Some people along Delaware River learned this the hard way where in 2004 we had the greatest flood in 50 years. And people that got flooded said, "Well, this is the time to redo my kitchen that I've been wanting to do because I got another 50 years before the next one," and were very devastated six months later they were flooded by an even greater flood; and then 15 months later, an even greater flood.

However, there's another pitfall, which is that immediately some people said, "Aha that's all the development in the Delaware River or development in basin." That's not the case. The development has not been that great.

Other people said, "Aha, this proves that global climate change is happening and that we're seeing increased floods because of that." We also cannot say that. You need to very carefully look at the statistics and analyze them using robust methods, because if you do a simple Excel plot of Delaware monthly mean flows or annual flows, Excel will show you a nice trend line going up. Aha, it's happening. Well, actually, you can take a completely random data

set and find a trend line.

Statistically, that trend line is not significant. It is not significant. So we don't know yet if flows are increasing. We're still looking at the data.

Dr. Robinson talked about, I'm sure -- I missed it, his presentation, but he has shown that actually precipitation does appear to be increasing in northern New Jersey. And the global climate model show that far northern, North Canada, Siberia, Alaska, are, in fact, seeing increased runoff. And Chris Milly likes to look at runoff because precipitation could increase but evapotranspiration could also increase, so your net runoff would be the same or lower. In fact, runoff is already increasing, as has been predicted by the climate models.

In the northeast, the climate models are not uniform in predicting that this will be the case. In the central US, they're more uniform predicting that is perhaps likely that they will, as better data comes in, show that in the northeast, New York, Pennsylvania, New England are going to see increased precipitation. New Jersey data seem to indicate that, but the jury is still

25 out.

1 So we need to apply rigorous
2 scientific methods rather than just sort of
3 grabbing something and saying, "Aha, this proves
4 it" or "Aha, this does not proof it."
5 Similarly, droughts are predicted to
6 potentially increase in severity or frequency.
7 But, again, we don't have enough information yet
8 to be sure that the predictions are showing up or
9 that it's already happening.
10 So, again, I want to say that
11 stationary is dead, you cannot assume simply
12 looking at past existence that the future will be
13 the same as it's been in the past. And we need to
14 look at this rigorously and scientifically rather
15 than just shooting from the hip.
16 (Applause.)
17 MR. HOCKREITER: Good morning. My
18 name is Joe Hockreiter. I'm also a hydrologist.
19 I used to be with the US Geological Survey.
20 Glen, in five minutes, your comments
21 are on the state of the science of climate change,
22 I think, was fantastic. I commend you for that.
23 And to be able to do it in five minutes. I
24 submitted -- I will be within in five minutes.

I submitted written commentary to

the group today, so I encourage you to look at my written commentary.

For the last three years, I've been following closely the work of the State of New Jersey and the Water Supply Advisory Council and the development of State's Water Supply and Master Plan. The last time that we had a version of the Water Supply Master Plan was 1996. This version is long overdue, and we all agree on that. And while I've developed some significant differences of opinion with the development of aspects of that plan, I'm here today to acknowledge that what Michele Putnam and her team have done in the development of that draft plan, which will probably come out next year, is significant. And it's an honest, real attempt at revamping the plan to put science in the forefront and water resource decision-making.

There are three aspects of the plan that I would like to talk about briefly today. Infrastructure, improvements, and development of alternative water sources is one. Water reuse is number two. And water conservation is number three.

Recognizing, and I certainly agree

with -- I know people much more qualified to make these statements than I, but the clumped nature of the likely future precipitation patterns is going to require us to look at the way we fund, select infrastructure improvement projects in the future, so that we can capture that clumped runoff more effectively, so that we can enhance aquifer recharge particularly in the central and southern parts of the state, and we can do effective water system interconnects.

We know from looking at the data that the north, the central, and the south regions of the state, because of their geology principally, respond differently to drought. And we need to not only look at water interconnects within those regions, but also across those regions.

A lot of the infrastructure improvements that are anticipated by the Water Supply Master Plan, in my opinion, have a lot of old thinking in them, and we really need to break that open and start looking at some new ideas.

Water reuse involves the recovery of treated wastewater for a variety of purposes. In

25 the last 25 years, we've been very, very good at

1 improving stream quality by building large
2 regional wastewater treatment plants. So we can
3 declare success on the water quality side.
4 Unfortunately, the unintended consequence of that
5 was that we've taken water that used to be used in
6 a location to sort of disposed of in a location.
7 And now we've brought all that water to central
8 locations, and we've actually enhanced the once
9 used and out model. And oftentimes where that
10 water ends up instead of recharging the systems
11 from which it came is it goes to the ocean and is
12 essentially wasted.
13 Water conservation. Mandatory
14 measure for doing things like odd-even watering,
15 incentives for equipment upgrades, public
16 awareness training; it amazes me in looking at
17 this issue how simple and fundamental it is, how a
18 tremendous value that it can produce in terms of
19 recovering water, and politically how difficult it
20 seems to be to implement it effectively.
21 The State's Water Supply Master Plan
22 cannot mandate action in these areas. And my
23 paper is a call for taking the recommendations and
24 guidelines in that plan and developing the

political will, the enabling legislation to take

some of these scientific recommendations and actually do something about it.

I don't believe that we can't find the political will to solve these problems. And if we just focus on those three areas with some smart legislation and some smart follow-up, we can accomplish a goal a long way towards addressing the concerns of providing safe, reliable water in the 21st Century, even with the challenges our climate change are likely to put in front of our water resource managers.

Thank you very much.

(Applause.)

MR. FURNARI: Julia Barringer, USGS.

MS. BARRINGER: I'm Julia Barringer. I'm a geochemist at the USGS. I have written testimony that I will BE submitting. I just discovered a typo in it, to my embarrassment.

In any case, what I wanted to talk about very briefly is processes that are going on with regard to water quality. I'll just give you an example of something that we've been working on that demonstrates it rather well, I think.

Within about the last two decades,

scientific research increasingly has shown the

importance of bacterial activity in geochemical processes. And I am not talking about pathogens now; I'm talking about microbes.

There are the number of very recent studies that have shown that bacteria are involved in the release of arsenic from geologic materials. And they can do that in two ways, actually, it's been shown. When bacteria get their energy, they're transferring electrons from one place to another. And they can transfer them to arsenic and reduce it. In other words, becomes a more negative charge on the arsenic which allows it to be released from where it may be absorbed to materials. And they can also take electrons from it and oxidize it. So these are both methods by which arsenic can be removed from geologic materials.

In fact, Rutgers University PhD student, Daniel Ryne (ph) recently did a study showing that arsenic can be pulled from sulfide minerals, such as pyrite and arsenopyrite by oxidation.

We've been working -- USGS and the NJDEP, we've been looking at the release of

arsenic from some intercoastal plain glauconitic

code. Those glauconitic codes, which basically parallel the Delaware River -- there's a whole series of sort of narrow outcrops of these glauconitic codes. And, of course, the streams that go to the Delaware, that have their discharge to the Delaware, are going to be running across the sediments. So we've been looking at those.

The glauconitic sediments -- and glauconite, by thew way, is a mica-type mineral. They've been shown to contain quite a lot of arsenic by John Dooley of the New Jersey Geological Survey, two of his publications. And so what we've been looking at is how the arsenic in those sediments is released to shallow groundwater which then discharges to the streams. The two streams we looked at are Crosswicks and Raccoon Creek.

Currently, there are microbiologists at Rutgers, Dr. Lilly Young and some of the students, that are identifying the bacteria that are involved in the release of the arsenic. We did publish -- the early parts of this study earlier this year in a abstract for the Geological Society of America meeting, and what we found are

25 several factors that are involved in the process

1 of arsenic release, at least in our particular set
2 of streams. What we found so far is that the
3 greater amount of organic carbon in the ground
4 water discharging from beneath the stream bed, the
5 higher concentration of the arsenic in the
6 groundwater. The reason for this is the organic
7 carbon is a nutrient for the bacterial communities
8 that are there below the streambed.
9 The release of the arsenic currently
10 appears to be promoted by microbial reduction of
11 arsenic. That is it's having electrons added to
12 it. Because what we found was the reduced form of
13 arsenic in the groundwater. The groundwater then
14 discharges to the stream. And then interestingly
15 as it gets into the stream, which, of course, is
16 much more oxidizing atmosphere, the arsenic is
17 oxidized then. And because there's a lot of iron
18 actually coming out of the sediments along with
19 it, that also gets oxidized. In fact, if you were
20 to collect some of the groundwater and then stick
21 it in a jar and watch it for a few minutes, it
22 would turn orange as the iron precipitates, and
23 that takes a lot of the arsenic out with it. So
24 we don't see very much arsenic in the surface

water. Where it is is on the sediments, which, of

course, then can be picked up, the smaller ones, and transported during periods of high flood.

So that's what we found so far. And what we also found was that when we sampled during different seasons that the largest amounts of arsenic that came out into the groundwater which is discharged into the stream were during warm water and also dry weather. The dry because the more precipitation you have, the more the shallow groundwater is going to be diluted. The warm weather, of course, is going to promote the growth and activity of bacterial -- various form of bacteria, including those that are releasing arsenic from the sediments.

So what I'm suggesting is that this is a type of process that goes on. There are many other examples now of how bacteria do move metals around. And another example would be methylation of mercury. That is a bacterial process. It's a byproduct of bacterial metabolism. And so this is something we need to think about if we're going to be having higher temperatures and perhaps longer periods of warmer temperatures and what this kind of impact will be on water quality.

I have -- in the testimony, I have a

whole list of references that may be of some interest to people, too.

That's it. Thank you very much.

(Applause.)

MR. FURNARI: Bill Wolfe NJ PEER.

MR. WOLFE: Good morning. My name is Bill Wolfe, I'm the director of a group known as a New Jersey PEER. That's an acronym for Public Employees for Environment Responsibility. We work with public agencies' staff to promote scientific integrity and compliance with environmental laws. I'm a former DEP employee.

I didn't prepare testimony, but I'll submit some written thoughts based on the presentation today. I came here to listen to learn. But I was impressed by a few things that jived with some of the things I had been thinking about coming in.

In prefacing my remarks, I'd just like to kind of rebut some of the things I heard from both the Builder Association and, unfortunately, the USGS. And I don't think it was intentionally presented this way, but it deals with the issue of dismissal of what was

characterized as shooting from the hip or what

I'll call advocacy or what the DEP is charged with, which the public interest and public policy, and trying to differentiate those objectives from a pure and narrower scientific perspective.

I know enough of science to know that there's quite a bit of uncertainty inherent in everything from the data through the modeling and never mind the application and implementation. But for a scientist to stand up and dismiss a perspective that would urge more conservatism or better protection or more respect for the uncertainty, therefore, a more humble and precautionary approach, I think is totally inappropriate. And I don't think it does good service to the Department and public interest's perspective here today. It certainly doesn't do good service to my agenda, which is an advocate for the environment and public health. And I, frankly, don't think it does a good service to science itself to have that type of approach. I understand the need for rigor and scientific evaluation. I respect that. But by the same token, the scientific community to understand their role in a public policy process.

So with that said, I was just going

to make -- the points that were made, I thought, by all the presenters dealing with extreme values, variability, and uncertainty. And my interest is seeing that those concepts get incorporated in the Department's planning and regulation and policy development. And the three areas I would like to mention and that I would encourage the Water Supply Advisory Council to make specific recommendations to the Department to flush out, because that's the role of the Council, is in three program areas. And, frankly, I picked up a fourth because it may be too late. The Water Supply Master Plan apparently is too far gone to incorporate the kind of thinking -- I heard Marjorie say that the recommendation would be that this was a future management challenge, if I'm quoting you correctly. If I'm not, please clarify that. But the Water Supply Master Plan is clearly one of the four program areas.

The first I would deal with would be the stream flow assumptions, and the static thinking is right on point here because the stream flow statistics provides the technical and statistical and databases for calculating a

25 similar capacity and, therefore, you have water

1 quality standards. NJPDES and TMDL issues that
2 need to be revised. I believe under the Clean
3 Water Act and under the EPA federal regulations,
4 and under the State DEP regulations and the Water
5 Quality Standards Program and in the NJPDES
6 program, there is specific provisions for
7 identifying and incorporating numerically this
8 issue. And it's a mandated; it's not a
9 discretionary issue. And it is what is known
10 as -- it deals with scientific uncertainty, and
11 the term is -- my brain just froze. Margin of
12 error -- margin of safety. Excuse me. I was
13 talking earlier before. Thank you for reminding
14 me. I'm getting old. Margin of safety. There's
15 margin of safety and there's reserve. Reserve is
16 a planning function for additional growth. But
17 margin of safety is specifically designed to deal
18 exactly with the problem we're confront with,
19 which is scientific uncertainty and inherent
20 variability that we know we're going be increased.
21 So those concepts, those scientific
22 ideas can be flushed out numerically within 10 to
23 20 percent margin built into all the modeling and
24 all the calculations of a similar capacity and the

25 water quality assessment permits and you name it.

1 So that needs to be formally incorporated. And
2 you should urge that if it is formally
3 incorporated, it's transparently incorporated,
4 it's explicitly incorporated, and it's numerically
5 incorporated. Four different things. Please
6 consider that.
7 Second point is with respect to the
8 passing flows and safe yields. Obviously, the
9 same statistically issue and data issue was
10 present there and how we derived those numbers.
11 They all have to be reconsidered. Therefore,
12 going forward, I would assume there be a mechanism
13 in place, whether it's a judgment call or whether
14 it's numeric, there needs to be something in the
15 regulatory structure that captures that. And you
16 should recommend the Department not just give this
17 lip service, but actually modify regulations and
18 modify current permitting practices.
19 The third point is with respect to
20 hydrology and the basis for calculating the
21 floodplain and delineating the floodplain and
22 flooding risks. And, obviously, we know that they
23 are all variable. And I don't think that the
24 Department's current -- both the regulations and

how they're implemented adequately address those

risks.

My last point -- and I see Stan looking at the watch, so I'll move right along. The last point is what I'll call what Eliot Spitzer has written about and been on C-SPAN lately about is this idea, what he calls the regulatory charade. Let's avoid getting bogged down in the regulatory charade. And I'll use the Builders Association testimony as an example of the regulatory charade. The regulatory charade is where the regulators say, "Oh, we know have a problem, but we don't have authority to do anything. We can consider it, we can write papers about it, we can do research, we can have work groups like this, but we can't actually implement it because we don't have legal statutory authority. We've got do go over to the Legislature and get a package. That is what Spitzer calls -- and Spitzer is a former Attorney General in New York, he's an attorney, he's been a regulator and a litigator and a governor. But that is what he calls the regulatory charade, where the regulators point the finger, knowing that they cannot get the authorization from the

Legislature because the Legislature is captured by

regulated entities and pay-to-play and all that other good stuff. But let's not hide behind the regulatory charade and avoid taking explicit regulatory action. That's irresponsible.

And the last point is that the Department, in 2004, already from a regulatory perspective put in place a definition of greenhouse gases as a pollutant regulated under state Air Pollution Control Act. You have to wade into Page 140 on the Department's greenhouse gas report to find that. Marjorie did not mention it. It is the mechanism under which you could go forward with the regulatory agenda and actually implement things. The Department's already defined it, already adopted the regulation. Now you need to incorporate that regulatory authority in the existing regulatory program. So, again, I'll give you the specific citation. Marjorie, I'm sure, could call that one up, but it's technically a air contaminant known as the State Air Pollution Control Act regulation.

And lastly, what should frame our whole entire approach here is the precautionary principal, and that is prudent public policy as

25 well.

1 Thank you.
2 (Applause.)
3 MR. FURNARI: Fred Akers, Great Egg
4 Harbor Watershed Association.
5 MR. AKERS: Hi. I'm Fred Akers, I'm
6 the river administrator for the Great Egg Harbor
7 River, which is one of four federally designated
8 wildlife scenic rivers in New Jersey. And my
9 participation with the federally designated
10 wildlife scenic river takes me to Washington,
11 D.C., from time to time. And I am really
12 impressed with our federal legislators and their
13 proactivity on this issue. And I just came here
14 today basically to kind of cheer us all on, and I
15 have a very short statement I'm going to read.
16 Thank you for recognizing the
17 likelihood that accelerated climate change will
18 add additional risks and stress to the already
19 stressed water quality and water infrastructure in
20 our state. The predictions of higher average
21 temperature and with more intense storms
22 intermixed with longer periods of drought combined
23 with sea level rise are cause for serious concern
24 about the potential impacts of climate change on

water resources and related infrastructure.

Back in October of this year, Dave Chanda and Margaret O'Gorman and other leaders for the Preservation of New Jersey's Habitat for Fish and Wildlife held New Jersey's first climate change workshop to talk about the impacts of a changing climate on our wildlife and natural communities. The two buzz phrases in this workshop were "vulnerability analysis" and "adaptation." And we would recommend that the Division of Water Quality focus on the vulnerability analysis for water quality.

From a watershed perspective, stormwater management, wastewater treatment, stream flow depletion, and aquifer recharge have been a continual challenge in this state to mitigate the negative impacts of development on both water quality and water supply.

Given the history of the increase and degradation from these preexisting causes of stress, we suggest that the first line of defense against the new stresses of climate change should be an increased application and enforcement effort of existing Department water rules and regulations across the board.

1 the rank and file staff at DEP, remove political
2 considerations from DEP permitting and regulatory
3 actions, and improve the scientific basis of
4 regulatory decisions are measures that we would
5 support for better performance on water issues.
6 These are exactly quoted measures from
7 Governor-Elect Chris Christie's website. And we
8 hope that he successfully appoints them.
9 Thank you.
10 (Applause.)
11 MR. FURNARI: Nicholas Tufaro,
12 American Society of Landscape Architects, New
13 Jersey Chapter.
14 MR. TUFARO: Ladies and gentlemen,
15 thank you for giving me the opportunity to address
16 the Council today. I'm the present chapter
17 president of the New Jersey Chapter of the
18 American Society of Landscape Architects. And I'm
19 really not here to try to present any kind of
20 scientific testimony on climate change. I'm not
21 here to scold members of DEP for their failure to
22 act in any way inappropriate in enforcing the
23 regulations that are in effect right now. And I'm
24 definitely not here to try to say that there is no

such thing as climate change. I'm here to offer

an assistance from landscape architects in New Jersey, as we have done -- and I'd like to give you some examples of some of the acts that we have taken here as a representative of the landscape architecture profession in the State of New Jersey.

About three years ago we sat and talked with Richard Lathrop, who is the director of the Remote Sensing Center at Cook College, now the School of Environmental and Biological Sciences. Dr. Jean Marie Hartman, who is the acting head of the Department of Landscape Architecture, as well as people from the Bloustein School. And we said back then, you know, we'd really would like to do something about addressing climate change specific to New Jersey. And, believe me, everybody at that session absolutely jumped on me and said, "This is fabulous. This is something we wanted to do. What can we do? How can we integrate the program?"

There's a very big push in Rutgers University to cross-seminate the different disciplines so that that concept that was brought up by one of the prior speakers, that is obviously

a challenge at DEP. The silo impact of different

departments and different divisions not really talking to each other and actually interacting in terms of regulation, enforcement, and research is something that's being challenged at Rutgers as well. And what arose out of that discussion was that Professor Lathrop had a full semester on data analysis basically expanding on some of the work that was presented here by Dr. Kaplan and specifically keying into Cape May County.

And this year, the environmental design studio at the school or environmental and biological sciences is doing a full analysis and assessment of that information to address what will happen or what potentialities are there and what risk to the environment are there in Cape May County in the case of sea level rise that will occur or is potential going to occur from climate change. And the specific intent there is to create planning tools for the adaptation for those communities.

If you've seen -- and I'm sure many of you have, because this is obviously a very educated audience and Council in terms of this issue. But the changed landscape of Cape May

County is probably going to be one of the most

dramatic areas where climate change, especially even if we predict it out to 2100, will definitely alter livelihood, alter community character, and call for some very strong challenges for the Pinelands Commission, as well as many other groups in terms what is being called in the industry retreat planning, because, quite honestly, we're going have to start talking the outer banks of New Jersey at that time.

So landscape architects are here because we're interested in this topic, and we understand that it's critical for us to be able to address this project and to make the applications that are necessary to address the kind of research that's being done.

And I just want to thank the Council for bringing this issue up again. It certainly is very timely. And, again, we are here to assist and hopefully to help get the information out, because basically this is more than just regulation, this is more than just information; this is really adaptation of lifestyle. And that has to happen right from the very basic educational framework.

25 I thank you very much for your

1 attention.

2 (Applause.)

3 MR. FURNARI: Thank you.

4 Joy Farber, Office of Smart Growth.

5 MS. FARBER: Good morning. I'm Joy

6 Farber, Chief Counsel for the Office of Smart

7 Growth, which is staffed at the State Planning

8 Commission. A member of our staff also sits on

9 the Council, Jim Requa.

10 I'm pleased to be at this year's

11 hearing to discuss the impact of climate change on

12 water quality and how we should manage the risks

13 posed to a vital resource. I will say I was not

14 pleased to be one of the last speakers, but it's

15 important that what this testimony is, is heard by

16 people such as yourselves and me so that we can

17 integrate it and have it result in meaningful

18 actions. So I'm glad actually to have heard all

19 the testimony. It has been very impressive.

20 The State Planning Commission is a

21 public body, similar to this Council, which is

22 charged with preparing the State Redevelopment

23 Plan on behalf of the State. The State Plan, as

24 it's commonly, has been crafted to provide

guidance on land use to all entities responsible

for development of infrastructure. It is intended to be used at influencing how decisions are made on how to invest on infrastructure, design of regulatory programs, and implementation of land use controls at all levels of government. Many state agencies responsible for land use regulation, including DEP, are members. My oral remarks today are on behalf of the Commission and they are supplemented by detailed written testimony which I will send electronically.

Access to adequate amounts of clean water is a matter of life and death. This is not an overstatement; it is a fact. This access is threatened by the changes in climate that we have seen and believe are related to emission of greenhouse gases, such as carbon dioxide, from a variety of sources. The greatest emissions, as we have heard, are manmade, such as burning fossil fuels, especially coal.

The climate changes that we have noticed involve instability in the weather. Also, we heard about that this morning. And these include generally higher average temperatures. That belies the fact that there are also a vast

25 increase in the number of very hot days that we've

1 already experienced. This is an existing reality
2 and also a trend. The past 10 years have been the
3 highest temperatures, I think, in the past 100.
4 That's reality. That's here now.
5 The impacts of climate change worsen
6 the already difficult challenges; keeping drinking
7 water sources clean and available when needed.
8 It's not possible to talk about drinking water
9 protection without also talking about land use.
10 Development of land involves a little bit of
11 education, adding impervious cover, and new demand
12 for drinking water, each of these things is a
13 burden on our drinking water supply. And the
14 transportation sector, we've heard, is one of the
15 largest sources of manmade greenhouse gases.
16 Creating new developments that are
17 remote from mass transit or centers of commerce
18 and existing population centers forces single
19 occupancy vehicle dependence. It can be a vicious
20 cycle.
21 In order to address the risks, we
22 need to do three things. First, we need to reduce
23 the risk of climate change proactively by
24 protecting forests and farms. Especially

important are those lands in and around water

sources, both surface and ground.

Second, we need to implement both the strategies outlined in the State Plan to focus development and structure upgrades in centers mostly in and around existing population. This will also reduce the emissions believed to be responsible for climate change. This needs to be accompanied by increases in availability of and investment in infrastructure for transportation and giving people options other than single occupancy vehicle travel. Achieving these results must be done fairly so that the costs are shared equally by our citizens rather and few. We know we need protect land and we also know we can't take it without providing compensation. How to do that is the gap that regulations just can't meet, and planning is one way to do that.

The third thing we need to do is improve how state agencies work together. We need to share information on existing natural resources and infrastructure assets, and together set priorities for capital investment and infrastructure and regulatory programs for natural resources. We need to simplify our approach. We

need to do this in an open and transparent fashion

with opportunities for public access and input.

We invite the Council members to attend meetings of the Commission to provide input on related issues, such as updating the State Plan and developing agency functional plans and developing agency functional plans that dovetail with one another and are consistent with the State Plan.

I encourage you use of the commission meetings as forums so we can together decide priority actions and commit to get funding to pay for these actions.

With all due respect, further study of the problem is not a priority. We are already experiencing impacts that need to be addressed now. You can always shoot holes in science. I think the other side is what we need to look at. We need to try to create assurances through that other science, political science, doesn't inappropriately determine our decision in this matter.

Before I was with the State, I was working for Land Trust. And I'll just give you a reality check. One thing we were doing was

working with Blue Acres and the Army Corps of

Engineers the buy land on the banks of a river that gets flooded out in a storm event. It's pretty dramatic what happens in these cases. And people say, "How are we going to fund what you are suggesting? This is a very expensive proposition." My answer is we're already spending the money. We're spending it retroactively. We need to flip-flop that and spend it proactively.

I was working with a woman trying to negotiate purchase of her home with the intention of demolishing it and re-vegetating the riverbank to protect against the worst flooding aspects. Unfortunately, I don't know, maybe a year before I met her, there had been a flood event. The banks overflowed. Her basement was getting filled with untreated sewage that was in the water that the water treatment plant had pumped out because they just didn't have the capacity. Well, her husband valiantly spent that night trying to keep that water from reaching the upstairs of their home, and the next day he died of a massive heart attack.

So we're not just talking about loss of money. It cost a lot of money to get those

emergency vehicles out, to get people evacuated,

to pay to bulldoze the mud and debris and to rebuild homes and lives. So we are paying. We're just maybe not spending our money wisely.

So in the end, I guess if I can leave you with one thing, it is a sense of urgency. Dr. Martin Luther King once said, "We are faced with the fact that tomorrow is today. We are confronted with the fierce urgency of now."

I close my remarks with a challenge. Our problems are multifaceted. Our solutions must be holistic. Join me and the Commission in holding future public meetings to plainly state our goals, justify our approach, set aggressive targets so we can focus infrastructure investment, and regulate our land use to protect our water while improving our land use patterns and enhancing our lives.

Thank you for your time.

(Applause.)

MR. FURNARI: Ed Clerico.

MR. CLERICO: Hi. I'm here this morning representing the New Jersey Chapter of the United States Green Buildings Council.

We've heard some good analysis of

25 why we have a cause for concern and we heard some

1 good ideas about how there's new alternatives
2 available. I want to tell you that the
3 alternatives that are affective, affordable, safe,
4 and readily implementable right now.
5 Part of the core of the US Green
6 Buildings Council is a program LEED, Leading
7 Energy Environmental Design, which really reaches
8 to go beyond regulation. Regulators don't need to
9 fear. We need regulation. But in the future, we
10 have to reach beyond it quickly. And I pick up on
11 the theme of urgency. The status quo can't
12 continue. And there are existing models that
13 demonstrate much higher levels of performance than
14 what we have with our existing methodologies. We
15 need to find ways to implement them. So we're
16 making a couple of basic recommendations with
17 regards to water as it fits into sustainability.
18 We need some incentives. We
19 encourage incentives. Move the paradigm in this
20 direction. Things simple, like replacing
21 insufficient plumbing, driving forward water
22 conservation and implementing water reuse and
23 waste reduction.
24 We need regulations revised. We

know they might take time because regulations can

sometimes stand in the way as opposed to encouraging innovation. If you don't have time to revise regulations, let's just do some waivers, let's do something to get this ball moving. It should include all aspects of water, stormwater wastewater, water supply. It has to be holistic. It should include solutions that are not necessarily regional but are on site and include recharge and passive alternatives, such as wetlands. We know how to make them work.

There was a comment before about once used, once through. I don't believe that that's actually a reality. Carol Collier put a map up of the Delaware River before that showed all the intakes. That would be a much more informative map if it also showed the discharges. Because the reality is, it is all going around. We're all using it over and over again. Let's do it in a planned systematic manner. We can do that right now.

Let's not just look at water; let's look at energy and water at the same time. We know that our water resources has been consuming eight quadrillion BPUs of energy. We treat water

coming in, we add energy, we mess the water up, we

take it out, we add energy so somebody can take it back in and add more energy. We have to get that that's not a sustainable model.

If you're looking for guidance, there's a lot going on. Just in case you don't know, the Electric Power Research Institute just completed a blueprint in new water paradigm. The power industry is obviously very interested in this subject matter. The five components sustainability goals we should be striving for neutrality and restorative initiatives around sustainable goals and creating those goals and sustainable operating principles which don't exist today. Innovative technological architecture is going to look different than the architecture we've experienced in the past and the adaptive management approach is to make that all effective.

In essence, we just want to say there are things we can do. We can do them quickly. We'd love to help, and we can't afford the status quo.

Thank you.

(Applause.)

MR. FURNARI: We don't have anyone

else signed up.

Is there anyone else who would like to give testimony?

Thank you all for coming, and this concludes the hearing.

(Deposition concluded at 11:43 a.m.)

C E R T I F I C A T E

I, Lisa C. Bradley, a Certified Court Reporter and Notary Public of the State of New Jersey, do hereby certify the foregoing is a true and accurate transcript of the testimony as taken stenographically by and before me at the time, place and on the date hereinbefore set forth, to the best of my ability.

_____

LISA C. BRADLEY, CCR, RPR

CCR NO. 30XI00228700

DATED: February 4, 2010