STATE OF LOUISIANA
DEPARTMENT OF NATURAL RESOURCES
OFFICE OF CONSERVATION

WATER RESOURCES COMMISSION
NINTH REGULAR MEETING
THURSDAY, DECEMBER 8, 2016
BATON ROUGE, LOUISIANA
11:00 A.M.

LASALLE BUILDING - 1ST FLOOR
LABELLE ROOM
617 NORTH THIRD STREET
BATON ROUGE, LOUISIANA 70802

REPORTED BY:
LAURA QUINETTE, CCR, RPR
BATON ROUGE COURT REPORTERS, LLC

APPEARANCES

COMISSION MEMBERS IN ATTENDANCE:

KYLE F. BALKUM
LOUISIANA WILDLIFE & FISHERIES

HONORABLE GLENN BRASSEAUX
MAYOR OF CARENCRO, LOUISIANA MUNICIPAL ASSOCIATION

SENATOR NORBERT "NORBY" CHABERT

DAVID D. CULPEPPER
GEOSCIENTISTS WITH EXPERTISE IN GROUNDWATER RESOURCE MANAGEMENT

MARK S. DAVIS
TULANE INSTITUTE ON WATER RESOURCES LAW AND POLICY

ANTHONY DUPLECHIN
CAPITAL AREA GROUNDWATER CONSERVATION DISTRICT

JOHAN FORSMAN
LOUISIANA DEPARTMENT OF HEALTH & HOSPITALS-OFFICE OF PUBLIC HEALTH

PAUL D. FREY
LOUISIANA LANDOWNERS ASSOCIATION

KAREN GAUTREAUX
THE NATURE CONSERVANCY OF LOUISIANA

LINDSAY K. GOUEDY
SPARTA GROUNDWATER COMMISSION

CHRISTOPHER P. KNOTTS, PE, FASCE
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

BENJAMIN MALBROUGH
LOUISIANA RESIDENTIAL CONSUMERS

BRADLEY E. SPICER
LOUISIANA DEPARTMENT OF AGRICULTURE AND FORESTRY

COMISSION MEMBERS IN ATTENDANCE (CONTINUED):

ELLIOTT B. VEGA
DEPARTMENT OF ENVIRONMENTAL QUALITY

LINDA G. ZAUNBRECHER
LOUISIANA FARM BUREAU FEDERATION

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(Meeting is called to order at 11:04 a.m.)
MR. SPICER: I would like to call the Louisiana Water Resource Commission to order. Matt, could you do the roll call?
MR. REONAS: Yes, sir. Mr. Balkum?
MR. BALKUM: Present.
MR. REONAS: Mr. Bishop?
Mr. Brasseaux?
MR. BRASSEAUX: Here.
MR. REONAS: Mr. Chabert?
MR. CHABERT: Here.
MR. REONAS: Mr. Cormier?
Mr. Cramond? Mr. Culpepper? I know he's here.
Mr. Davis?
MR. DAVIS: Here.
MR. REONAS: Mr. Duplechin?
MR. DUPLECHIN: Here.
MR. REONAS: Mr. Forsman?
MR. FORSMAN: Here.
MR. REONAS: Mr. Frey?
MR. FREY: Here.
MR. REONAS: Ms. Gautreaux?
MS. GAUTREAUX: Here.
MR. REONAS: Ms. Gonzales?
Ms. Gouedy?

MS. GOUEDY: Here.
MR. REONAS: Mr. Graves? Mr. Gray? Mr. Guidry? Mr. Harris? Mr. Ieyoub? Mr. Knotts?
MR. KNOTTS: Here.
MR. REONAS: Mr. Malbrough?
MR. MALBROUGH: Here.
MR. REONAS: Ms. McConnell? Mr. Pratt? Mr. Spicer?
MR. SPICER: Here.
MR. REONAS: Mr. Sutcliffe? Mr. Vega?
MR. VEGA: Here.
MR. REONAS: Ms. Zaunbrecher?
MS. ZAUNBRECHER: Here.
MR. REONAS: Mr. Zaunbrecher? Mr. Chairman, we have 14, so that is a quorum. And I know Mr. Culpepper is -- oh, there he is right there. So we have 15, so that is a quorum and we can proceed with any action items as needed.
MR. SPICER: Thank you. I might mention that Secretary Harris couldn't make it today, so I'm filling in as Vice Chair for the Commission. All of you received the copies of the previous meeting, the December 8th meeting [sic]. You've reviewed them and I would like a motion to approve those?

MS. GAUTREAUX: Approve.
MR. SPICER: Ms. Gautreaux.
MR. KNOTTS: Second.
MR. SPICER: And Chris Knotts, second. Any discussion? Those in favor?
(AYE, in unison.)
MR. SPICER: Minutes are approved. The next item on the agenda is David Borrok with the University of Louisiana at Lafayette who is going to address the group regarding stress analysis of Louisiana's water supply and implications for water management.
I might mention to the audience, if you want to make any comments, we will have time before we adjourn and you can do that. Please fill out a card available at the entrance of the room.
MR. BORROK: Can you hear me if I stand here like this?
MR. SPICER: Yeah.
MR. BORROK: So I appreciate being invited to be able to come back and tell you a little bit more about a project I think I spoke to the Commission about at a high level when we started this a couple of years ago. Since that time, we have a few new results and some things I wanted to share

with you that we've been doing. I'll talk a little bit about a large scale analysis of water budgeting and stress in the State and then talk a little bit more specifically about the southwest part of Louisiana and some of the things we've been doing there.

I do want to start by saying there are a large group of people who have been helping on this project, PIs from various places, including some from McNeese State University. And so I just want to make sure everyone realizes that this isn't all me here, particularly if there is something wrong, you know, with one of the -- so the motivation for the work that we got funded through the National Science Foundation was that in the last probably 10 to 15 years it's come to light that despite abundant rainfall in the southeast part of the United States, particularly the coastal zones, the Gulf Coast and the Atlantic Coastal areas, there's an overuse of groundwater even though there's a lot of rainfall and, particularly, surface water, even to the extent that we have a lot of floods and all of this. In fact, you can see on the diagrams there, the bottom one, we have the most annual precipitation in this area of anywhere in the United States. But, at the

same time, the upper diagram indicates that we've lost more groundwater than even some areas of the southwest part of the United States, which is typically the areas we worry about water resources. And this is in the last ten years.

So although we have the surface water, we aren't using it to the extent that we're using groundwater. And the opportunity then exists to look at ways to manage surface water where we may offset some of this groundwater use. So that's a certain motivation and the opportunity we pitched to the National Science Foundation in order to receive this funding.

The approach that I want to talk about now involves water budgeting. A lot of people have done this in various fashions and I'm not going to get into the details. More or less there's no right way or wrong way to do this, but what you can see in the diagram are the water supply side of the water budget and the water demand or the water withdrawal side of that budget. I might just try to pick this up a little bit.

So on the water supply side, we have surface water and there's different ways of estimating how much surface water is available. And

the estimate of groundwater availability is basically how much it gets recharged on an annual basis. So if we take more than we replenish, then we'd say it's excess that you're taking.

Water withdrawal, of course -- we have estimates going back in time every five years with water withdrawal, surface water and groundwater separated by sector, which a lot of you already know. So these are the bases for the kinds of information we can get.

We can develop this into a water supply stress index. And in its simplest form, it's simply water withdrawal, both surface and groundwater, or water demand you could call it, divided by the amount of water available. So it's a simple ratio. If the ratio were to be one, you would have used all the water available. If the ratio is below, there's very little stress. If the ratio is over one, you would be basically using more groundwater than is available to you for recharge. So that's how the ratio works.

We went ahead and added a component into that equation to satisfy environmental flow because typically you can't use all the water that's there for extremes or surface water volume would dry up and you'd have no riparian habitats, et cetera,

et cetera. So you have to account for the water that's necessary to satisfy the ecosystems. In this case, it's a fraction of the available water, and typically you can set it at something like .5. You can do the research and actually figure out what it needs to be, which is something we're working on currently, but that's sort of river specific, location specific.

That's just a dummy variable. We could say 50 percent of the available surface water we need for the environment. And, again, I'm not here to tell you about the procedures for how to do these sorts of things. I'll give you a couple of quick examples just to show you why I think it's important to, I guess, get to the levels of what I would call management scale for these things.

Typically, when you do these sorts of budgets, you're doing it on a large scale, maybe a parish scale or larger watershed scale and what we might call an uptake scale that combines multiple parishes perhaps. And then most of the large scale work that's been done and published is even a larger scale, regional scales. So what we've done in this case is gone down to a smaller watershed scale where a parish might be divided into perhaps 20 or 25

smaller watersheds, and we call that the management scale. So there's different ways you can just aggregate things.

In this particular example we would have surface water used for irrigation on a parish scale distributed here and that's what's available to us or estimates that are available and then we can use various techniques, like, for example, taking into consideration the area of cropped land within each of the parishes distributing the water demand throughout that. So there's various ways you can do this, and this is an example of what you get when you go down to that sort of a level.

Another example is industry from the parish scale to small watershed scale. Another example here, power plants and power plant water use. In this case, they're pinpoints, so instead of looking at the parish scale distributing all the water throughout the parish or watersheds, you can look at it in that catchment where they actually exist.

For groundwater we did something a little bit different for that aggregation and disaggregation. You work again on the parish scale for the amount of water demand, so we have available to us the well registration database. So we know

about all of the wells that use water in the State, or most of the wells anyway, and so we also know the sectors for those wells and we can disaggregate the water demands on a parish to the available wells within each of those parishes.

We can even weight it by casing size and some other things if we wanted to do that. And if we do those things, you get a distribution like you see here. Ultimately, we could build it back up to the small watersheds, but it's nice because we have that sort of an individual well scale.

Now, the flip side of this, the other side of I guess the denominator of the water stress index is the availability, and there's different places to get water availability information. One of the ones that we used is the National Hydrography Dataset, which has 25-year averages from the State, both annual and monthly. And we can also get groundwater recharge. We can do it ourselves. In this case, we just took it from a previous public report for the State. So this tells us our water availability. Then, we put all these things together and we can look at what is the stress on the individual watersheds throughout the state of Louisiana.

So this is one of those first diagrams

indicating where the most stress is within both surface water and groundwater combined in the State. You can see typically the white areas here that are below .06, there really is no stress or limited stress. In all the white areas really low stress and the blue areas really very low stress as well. It's only when you start to get into the warmer shades of colors do you get really higher amounts of stress.

So, in general, I think probably it looks like the State is in pretty good shape compared to somewhere like Texas or the Las Vegas area or something like that. But there are some areas where you have more stress than others where you might want to be concerned about. And that's one reason and the title of this talk I said "Implications for Water Management." And the implications are it's good to see on a small scale where you have stress and where you don't have stress and where you might be able to do things to alleviate that sort of stress.

I will mention some of the red colors along the Mississippi here deal with industry. And one of the things we haven't done in this particular analysis yet is we didn't consider consumptive use versus flow-through. So a lot of these industries will use water that will flow back through to the

rivers and that wasn't included in this particular analysis. So some of these red areas in here may not actually be red ultimately when we do consider that.

Now, that's interesting, but when you do this on a surface water versus groundwater scale, things change rather dramatically. And what we do here is basically in the water stress equation either you only look at the surface water availability versus surface water demand or you only look at groundwater availability versus groundwater demand. So on the left it's surface water and, again, things are in relatively good shape, but on the right is groundwater. So anything you're seeing there in red, budget-wise, is an overdraft. And so on an annual basis, those areas -- and certainly I would say there could be some outliers there that may not be real, but the big chunks of things that you see here are. We're overdrafting a lot of our aquifer systems, particularly in the southwest part of the State.

You can also do things where you say, okay, well, now that we have this water stress analysis we can aggregate a backup and look at individual aquifer systems. We can do something like this where we evaluate the stress in those aquifers. So on average, the Chicot aquifer, the Mississippi River

and the Alluvial aquifer have the highest stressors of aquifer systems, which is probably not news to everybody. They're the most highly used aquifer systems as well.

This is another aspect of it and one that's in the next year and we plan to get into it a little bit further. And, I guess, one of the points is the small scale is very important from a spacial nature, but we also need to have a scale on the time scale, on a smaller scale because there are seasonal deficits and seasonal stressors with water as well. So this diagram, although complicated -- I'll walk you through it -- attempts to delineate some of that seasonal stress.

So what we have here is an analysis just in Acadia Parish right here as just an example. This is the average stream flows of all of the streams and the individual watersheds. There's probably about 25. There could be 30 watersheds. And the variability of that stream flow is indicated by these arrow bars right here. So you get a lot more variability clearly in the winter months and then sort of base-flow conditions in the summer and you get less variability, which one might expect. So this is basically indicating seasonal variability of

flow within a larger area that if you averaged it, it wouldn't capture all of those differences.

And then moving down here what we did in the middle panel and the bottom panel is look at two different scenarios of water used. In this case, there's a lot of irrigation in Acadia Parish, and so we were able to ask farmers when do you use the water, which months do you use the water and assign the water demand during those months as opposed to averaging it out through a year. And what you see here with all of these thin-traces -- thin-trace lines here are the calculated water stress on this access and a function of months on this access for each of the individual watersheds.

So you have some of the little watersheds that -- you know, they all are dynamic. They're all moving. There's a function of the months, but some of them have very high water stress and some of them have very low water stress. So even within the individual parish, it's important to understand this variability and so we can tease that out a little bit.

I'm not going to go into the second scenario. It's another scenario of irrigations. So the take-home point here is spatial and flow

variability in the stress analysis is going to be really important.

All right. Another thing one could do, and we've attempted this a little bit and there are some drawbacks to it, and it's mostly data. It's a data-driven thing. If we had enough data, we could do these things, is that we can integrate water quality into the stress analysis. So demand sectors for example -- a good example would be the irrigation crop sectors might not be able to have water of a certain quality. In this case, maybe it's limiting a certain amount and crops won't grow. And so if you have water in certain areas of a certain salinity above the threshold range, that would mean that water isn't usable for its particular user type in this particular area.

So we can try to quantify that by using an approach like this where we have the chemical data available to us and we create a ratio function, if you will, of the sum of the number of measurements of some sort of water quality parameter X that's over a threshold value and then divide that by a total number of measurements of that water quality parameter. X, in this case, could be salinity and you can measure salinity in a variety of ways,

different parameters, and the threshold would be where it's unacceptable. Above those limits would be unacceptable. And then we can plug this into our water stress calculation, basically taking the unacceptable water out from surface water and groundwater individually.

And here's an example of how that works. So in this case, we thought let's look at the X being chloride, a proxy for salinity in this case. We look at a threshold for chloride of about 500 milligrams per liter, similar to 1300 Micro Siemens per centimeter or 800 milligrams per liter depending on how you want to look at salinity. We can see for surface water all of these individual dots are measurements of chloride over the last 50 years or so. And surface water, all of these dots are measurements of chloride in the last 50 years or so in groundwater. And we can get our function of chloride here above a certain threshold, say 500, and you see where we have values that are too high for use for a certain sector. In this case, the red and the orange ones are -- you're getting more stress in these areas. And they're along the coast, as you might imagine, because we have more saltwater nearer the coast and that adds to the stress of the water

systems in those areas.

We can add that approach to our existing water stress analysis, and this is before adding the water quality with the chloride threshold that we did, after we did it, and the difference. So you can see the additional stress. It can actually factor in water quality along the southern part of the State in this area. So that's another thing you can do. And I'm not going to get into a lengthy discussion about what you can and can't do with this approach. It's data driven, but if there's not enough data and enough spatial resolution, it starts to fall apart. So you have to take some of that into consideration.

But the nice thing about this approach and the framework and the reason I wanted to present this today is it can be used in a variety of ways. And so if you have all of the information and it's up and running, we can do things like statistical analysis or probability analysis. We could even look at -- ask the question, for example, what is the probability of having stress over a certain amount in any given year. So it's almost like a climate analysis or something like that.

And it turns out that based on the demands and the available water in various watersheds,

there's different probabilities that those can get stressed in different years. So under the same drought condition one watershed may be more stressed than another. We can examine various climate scenarios, and we've been doing some of that, and various water demand scenarios. So we've been doing some of that as well.

We do have a manuscript that just got accepted for publication. I can send you the accepted manuscript if anyone is interested in learning more about the framework. And it will also be publically available shortly.

Other things, just to finish up here, this is kind of getting back to the area where we started. We've sort of expanded the framework for the analysis for the State. But this is the Chicot aquifer area that many of you are familiar with. I just wanted to share with you a couple of things that we've been working on here. Here we've been able to get a little bit more specific. We've been able to ask the question about what opportunities actually exist for surface water to replace groundwater in some of these areas.

So we've done things statistically like looking at usable surface water resources in the area

and figuring out where groundwater wells are in relationship to those usable sources, what percentages of wells and their -- how much water they take from the groundwater with an aquifer could be replaced by that surface water source given various infrastructure or an attempt to do so.

So we can ask those questions, but another thing I think is nice and we've learned a lot from -- I have to say sometimes if you don't know the answer, it's better to ask the people who are actually using the water sometimes. And, in this case, we did try to do that. So we went out to some of the areas that have high rice farming, agricultural. Vermillion Parish, Jefferson Parish and Acadia Parish and our social scientists for the project interviewed 68 farmers in these areas. These were all onsite interviews. And so the important part about this is we can ask the farmer about why they use surface water versus groundwater, what are the factors involved and we can sort of match that up with quantitative analysis like we did in the stress analysis and say are these things jibing with each other, where are the opportunities for changes. Some of them -- and maybe perhaps it's obvious to you, maybe not. They weren't necessarily to me -- but

what I found is that in the end is that one of the big take-home points is that the reliability of that surface water is really a big factor.

So it's really the seasonal deficits that drive the fact that people need to use groundwater more than surface water and perhaps a little bit of the fact that once you've already got the groundwater well, it's pretty easy to pump for it. So that extra mile to go and get that surface water is not necessary. So reliability is a factor, but then when you look at it on a farm-to-farm basis, with the exception of a couple of farms, there's almost no investment in any sort of infrastructure to come back to the reliability issue.

So there's no temporary storage facilities for water on a local scale or a larger scale and so reliability is a problem, but there's nothing permanently done about that sort of a problem. So no one is really interested in doing that. One reason is, of course, you perhaps have to take valuable land out of production to make an area to store water with enough water to solve that surface problem. So these are some of the issues that we ran into.

I'm going to skip some of this in the interest of time. But we have talked about solutions

into some of the next steps that we've been doing, talking with farmers, other groups about essential solutions and just sort of brainstorming these and looking at, in this case, opportunities for building surface water storage capacity on some of these farms and finding areas where it can benefit the farmers and also perhaps other areas where it could also mitigate flooding and things of that nature. So it's an integrative approach.

I'm going to skip to the last one just in the interest of time. I'll just say in this last slide here, we've even had a lot of students come out and work, which I think is really fun. This is the architecture and design students who worked on various water sustainability problems on an individual farm basis and came up with very interesting thoughts about things like adding riparian habitats, farming areas, hunting areas, tourism, things of that nature integrated into these sorts of approaches.

Then I'll just leave you with that. I thank you for your time and will be happy to answer questions if we have time. Thank you.

MR. BALKUM: I appreciate that presentation. Very good. I was wondering more about

your environmental flows and if you factored that into some of your projections. Sometimes it's difficult for us to determine. I'm wondering if you've looked at assumptions like our neighboring state of Texas uses.

MR. BORROK: It's in infancy. So I probably don't know as much about it as you do. You've looked into it in a lot of detail. One of the things that we've done -- well, I guess, where we started is with salinity. And we did that largely because we could look at things like the vegetation in coastal marshes and so we have some indices or things of that nature. And we can do some hydrologic modeling where we can say, for example, the Chicot River if we pull out 20 percent of this water for agriculture that we hadn't been pulling out previously for whatever purposes, what will happen to the salinity using the hydrological model, and how much further will that salinity potentially travel up the coast and affect these marshlands.

So it's kind of a vegetative approach as opposed to some of the other approaches we've looked into, fish populations and all those other things, but that was our first pass.

MR. BALKUM: We certainly appreciate

your analysis on stress. That's certainly key. It seems like when the water demands in the summer months or streams are running rather slow that we keep in mind the fish and water population. Thank you again for the presentation.

MR. BORROK: You're welcome. Thank. you.

MR. SPICER: Any other questions? Mark?

MR. DAVIS: It was very interesting as always. Two quick questions. First of all, in the groundwater model, have you modeled saltwater intrusion in the Gulf and then groundwater quality --

THE COURT REPORTER: I'm sorry. I can't hear you.

MR. BORROK: I think I can answer. His question was about whether we were modeling for saltwater intrusion of the groundwater and the short answer is, no, not really. It's not a -- we don't have a groundwater model like a regular hydrologic model. This is more of a budgeting framework analysis and so we haven't done that. The water quality aspect of it asks a little bit of where those lines or boundaries are, of course, but it isn't going to be able to predict into the future. It

would be more of a scenario analysis or something like that.

MR. DAVIS: I'd like to follow-up with you on that. Other work that we're doing, and seeing some models develop, I think we do benefit from it to be informed. And the other question I have, in looking at the environmental flows, are you considering the anticipated needs, for example, in the Coastal Master Plan, which is largely a plumbing plan, for water to go places it doesn't presently currently go?

MR. BORROK: Well, the short answer, again, is not really. But at the same time, we have -- actually, we even have proposals out to look at that exact thing and sort of match up the Coastal Master Plan and water needs with what's happening in the upper catchments eating those coastal things. So there's multiple feedback there that could perhaps be better constrained. One, the boundary condition for how much water is coming down into the coastal zone, which will change dramatically based on the needs of those other catchments in those communities, but also what happens in the coastal zone will determine how much salinity will come back northward perhaps and impact farming and things of that nature. So those

are problems that we're working on, but we have barely scratched the surface.

MR. DAVIS: You're not alone. Thank you.

MR. SPICER: Any more questions? Thank you, David. Next on the program is Chris Knotts to discuss the review and update on the Red River Compact.

MR. KNOTTS: Good morning. At the last meeting I had mentioned the Red River Compact and I'm not sure if everyone is aware it exists, but I just wanted to give a little history on it, what it does and to make everybody aware of that. The Red River Compact Commission was authorized by Congress in 1955 with a four-state interstate federal compact. It took a little while to get going, but the first meeting was held in New Orleans in March of 1956. The Compact was signed by member states to resolve and prevent disputes over waters of the Red River Basin that are shared between Arkansas, Louisiana, Oklahoma and Texas.

The document, at that time, specified certain flows through certain streams at a minimum and had procedures if those minimum flows went below those minimums. And through the history of the

Compact, we've exercised some of those procedures that we are currently doing through today.

The Signatory States acting through their duly authorized commissioners, after years of negotiations -- it started in 1955, and you'll see it took a while to negotiate those agreements, but they agreed to an equitable apportionment of the waters of the Red River and its tributaries.

So there are commissioners in each state, two from each state recommended that Congress -- the Compact be adopted by the respective State Legislatures and approved by Congress. Two commissioners in Louisiana by statute are the DOTD chief engineer or the designee serving as the chief designee. And, just recently, longtime Commissioner Mr. Arthur Theis asked to be replaced. Mr. Theis signed the commissioned document in 1978 and served until early this year. So people valued his input.

But it was adopted in May 1978 and signed at the Denison Dam, which is I believe a dam on the Texas-Oklahoma border. It was ratified by the states after that. So it started in 1955 and initially ratified in Louisiana in 1978. I could not find Arkansas, but we believe that was also done in 1979. So roughly 23, 24 years later that came to fruition,

consented to by Act of Congress.

And it's to promote interstate comity and remove causes of controversy between the affected states by governing the use, control and distribution of the interstate water of the Red River and its tributaries. Like I said, there were minimum standards set up for distribution of all the streams that cross interstate boundaries, even cross some of the regions that I'll get to in a second.

It promotes an active program for the control and alleviation of natural deterioration and pollution of the Red River Basin. So it provides the means for an active program for the conservation of water, protection of lives and property from floods, improvement of water quality, development of navigation and regulation of flows in the Red River Basin and provides a basis for the state or joint state planning and action by ascertaining and identifying each state's share in the interstate water and apportionment.

So the Red River Basin is there, obviously, in four states. We have different Reaches. It's hard to say -- if you look at the state boundaries, Reach I goes a little bit through New Mexico and Texas and Oklahoma. Reach II has Oklahoma, Texas,

Arkansas. Reach III has Arkansas, Texas, Louisiana and Reach IV is just us. So in a little more detail, Reach III is broken out into sub-basins for management. Reach II, Reach III, and that's one of the first ones we entered into, and Reach IV is just us. So we're the only entity that is only a receiving entity, not one that has to fulfill all the requirements downstream.

Some of the issues we're having right now are rivers and streams coming out of Arkansas, the Boeuf. The Interstate Compact says it's supposed to be 40 cubic feet per second. If you look at the years, there are years -- many days that the river did not meet that minimum standard. And then below that you'll see the days that the USGS gauges that the stream had zero flow. There are many different causes and inputs as to why you have zero flow. It could be from lack of rainfall. In many cases, it's irrigation for agricultural purposes, but the Compact had the minimum standard -- minimum flow rate, excuse me.

Bayou Bartholomew had many days below the Compact. It did not have zero flows except in 2015 and that was a low rainfall event period. That one had 80 CFS and Bayou Macon has 40 CFS, no zero flows,

many, but less days of low Compact standard.

All of those streams come out of Arkansas. The issue we're having right now is per the Compact when the flows in those streams get to twice the minimal flow standards, the upstream state is supposed to take measures to demonstrate to the downstream state what flow they're getting into the basin. That hasn't happened with Arkansas. We're working through that right now with the Compact through various efforts, but I don't know exactly where that will end up. We're trying to avoid suing the state of Arkansas, but it's been discussed.

And if you look at various climate models, withdrawals in upper basins are supposed to increase in the Mississippi Alluvial Valley by 180 percent. Arkansas has heavy agricultural. Without some other measures, we see this problem getting nothing but worse.

So with that, a quick overview of the Red River Compact Basin and the Red River Compact Commission and its purposes: We meet once year. The meeting rotates through all four states. Next year Louisiana will host the meeting in Shreveport. So if anybody is interested, it would be as close as it's going to get to us in 2017. I'll take any questions.

MR. SPICER: Any questions for Chris?

MR. DAVIS: What is Louisiana -- since in discussions with Arkansas about, you know, getting these minimum flows we're entitled to, what steps have we actually taken to ensure that we are preserving our right to this? I realize you mentioned possible litigation. I've never seen a Compact that at least didn't require it. What steps are we taking?

MR. KNOTTS: Well, the Compact requires that, like I said, when we get to twice the minimum flow, the upstream state is supposed to take measures to quantify what inflow they're getting. So take for example -- back up real quick.

The Boeuf River, it says 40 CFS. Well, if the receiving entity is not getting 40 CFS, the Compact then says that you have to demonstrate to me that I'm getting 40 percent of what you're getting. That's what Arkansas hasn't done. They have not taken the measures to gauge or otherwise measure the input to demonstrate to us that on these periods where I'm going below the Compact standard of zero flow that they're getting nothing or below the Compact standard.

So we've been working through the

Engineering Committee of the Red River Compact trying to come up with a methodology to demonstrate what their inflows are. There's the surface water. There's the groundwater component to it from groundwater wells adjacent to the streams pulling groundwater out for agricultural purposes, which then increases the outflow through the beds and the streams to replenish that groundwater. And all those various things are being looked at.

Several years ago -- this is the DOTD because of the vestige of the Department of Public Works years ago being folded into the Department of Highway. We did not believe that it was our purview to enter into legal discussions with the state of Arkansas, so we got the Attorney General's office involved and we now have an Assistant Attorney General serving the Commission. So we're letting that play out in the Engineering Committee, but we're nearing the end of it.

MR. DAVIS: I've never seen water willingly given by states to states who are downstream without essentially, you know, some aspect of assistance. I'm not suggesting that litigation is the right way to go, but I'd also point out to the Members that one of our charges here is to help the

state of Louisiana develop water policies and water laws for sustaining that. If the Compact on the Red River hinges on federal law and Louisiana, for example, cannot say with its own waters that we would never send them to another state --

THE COURT REPORTER: I can't hear you.

MR. DAVIS: -- but federal law, particularly this Compact, allows the state of Louisiana to say we will not share this water. I'm not saying we need to do that. We need to know we have a bigger legal toolbox for how we manage water on these rivers subject to --

COURT REPORTER: Subject to what, sir?

MR. DAVIS: -- these compacts.

MR. KNOTTS: And to further complicate the issue, the streams in Arkansas, the Corps of Engineers came in after the Compact was built and built some weirs for vegetation control in streams to create artificial pool spaces. They did not include base-flow components in those weirs. So when you get into a period of lower rainfall coupled with agricultural withdrawals and you go below the crest of the weir, you go into a zero flow condition.

We believe, and we discussed it internally, that if the weirs were modified to include a

base-flow condition, a base-flow component to that design, that we could resolve this matter. There's some legal oddities inside the state of Arkansas, the Arkansas Natural Resource Commission and various other components where we were told that while one entity may want to do something they don't have the legal authority in Arkansas to cover it, so our Attorney General has been involved in that. You probably know all of that.

MR. DAVIS: Thank you.

MR. BALKUM: Chris, I want to thank you and your staff for sending periodic reports to our agency and monitoring the flow conditions. And you probably know this, but Bayou Bartholomew is one of those few streams that occasionally does not meet the minimum flow criteria, but as a state we believe that it has the most fish and mussel diversity in the State, so it's a very interesting stream. Thank you.

MR. KNOTTS: It's a complex issue. We're not giving up on it, but it's not going nearly as quickly as any of us have hoped. But we're not getting discouraged and we'll keep trying to come to some resolution on this.

MR. BALKUM: And if we can assist you, let me know.

MR. SPICER: Thank you. Any other questions for Chris? Thank you, Chris. Next on the agenda is the report by the U.S. Geological Survey Research Projects in Louisiana by John Lovelace.

MR. LOVELACE: Thank you. Good morning, if it's still morning. I have a brief overview of several studies, three studies, that the USGS has undertaken in the past year -- began in the past year. A couple of the studies started in October of 2015 and one of them started up in October of 2016. All of these studies have an overlap in Louisiana. They're regional studies.

The first one is called the MAP program. It's the Mississippi Alluvial Plain Project. It is to address some concerns, particularly about groundwater, but also about surface-water resources in the Alluvial Plain area. The study is the result of concern about significant groundwater-level declines and reductions that are resulting in reductions in base flow in streams within the Mississippi Alluvial Plain, particularly in areas of Arkansas, including the Cache River and Grand Prairie and also in kind of the heartland of the Delta area of the Mississippi.

What we found and what -- Congress has

funded this study. Senator Cochran is one of the people involved in obtaining the funding for it, appropriating the funding. What they found was that water managers, planners, and stakeholders don't have the basic resource information you need that's necessary for effective decision-making at a regional scale.

So the overall goals of this study are to assess groundwater availability in the Mississippi River Valley Alluvial and to develop decision support framework for management decisions. We have three specific objectives that have been broken down a little bit into various sub-tasks. One -- the first is just to gain some basic knowledge about the system. To do that we're going to establish and enact enhanced groundwater and surface-water monitoring and a data plan; update water use estimates and evaluate different methods to predict water use; increase the resolution of simulated surface-water system. We have a surface-water system model; utilize multiple methods to better estimate recharge in the basin; and then improve our understanding of the geohydrologic framework.

The second objective has to do with system evaluation. Once we put a lot of this basically

together, we can look at a system scale and determine what data we know less about and what data is more important and then the value of that data and use that information to determine where and when to collect additional information and also identify potential future scenarios. One of the big concerns is the impacts of drought resulting from future climate change.

And then the third thing, which is going to be of big interest to actual managers in the area, is to be able to input user-defined scenarios in the system. The goal here is have basically a web-based tool for anyone in the public to go in there and basically fool around with the model, change up variables, change up information and be able to run these scenarios and get actual output and then look at what could happen in the future.

So the basis of the study, in large part the basis of it, will be using information on the structure from the Mississippi Embayment Regional Aquifer Study (MERAS). It's basically a model -- originally it was a model of the Sparta aquifer, then it came to include the Mississippi River Alluvial, and also the one cohesive model for how the Sparta and Alluvial interact. So we're going to take that

existing model and enhance the Mississippi River Alluvial aspect of it. And basically this is showing you all the different inputs of what's going on that will eventually result in that web-based decision work tool.

That top center there through monitoring groundwater levels, monitoring surface water stream flow, you can satellite imagery and things covered on the ground, data to develop the Water Balance Model. You're collecting geophysical data, better defined as hydrogeology, and doing some monitoring in the farmlands, particularly in the farmlands to better establish how much water is being withdrawn, when and where it's being withdrawn for irrigation.

So there's a big team of folks working on this. There's a big team working on water budgets, statistical analysis and modeling for hydrogeologic framework and also the geophysics. If you're interested in any particular aspect of this, I can put you in touch with the people that are doing a lot of that work. The group is from all over the U.S. A lot of them are in Mississippi, in Tennessee and Texas.

Just the work that's going on right now is primarily some of the geophysical mapping. They're

doing river surveys, airborne surveys using geophysical equipment to try to determine the extent and thickness of the aquifer with a vertical and spatial variability of the aquifer.

Now, these are typically -- in these kind of alluvial environments, you have a lot of sand and clay intermixed. And they'll use that information to determine the best way to model the aquifer to be one layer of many layers and also extract some information out of the aquifers.

And here's just some pictures of what they're doing. They're going out -- you can't really see it in this picture, but they are towing some line with geophysical sensors behind this boat out in the river and they're trying to determine what the interaction is between the river and the aquifer. In some cases, the river is already sized -- the riverbed is sized into the aquifer and there is a direct hydraulic connection there. So when you're pumping down the well -- or irrigating, heavily irrigating, in some cases they're actually pumping down some of these rivers and you get decreased flows. They're trying to look at specific rivers and determine where this could be occurring and use that as part of the model.

They're doing the same thing on land in different areas, trying to get a better handle on physics, and they've been doing some airborne surveys using equipment similar to this. And what they'll get out of this eventually is a lot of different cross-sectional data that they can put together to give us a better handle on what the actual structure of the aquifer is like.

Another thing they have been pursuing is looking at water use and instrumenting farms, instrumenting wells within line flowmeters. So we have data on when and how much water is being used to irrigate. Irrigation is big use in these areas and typically we don't have -- in the past, we've relied on information provided to us from farmers on how much water they're using. This will give us much more concrete information. And this year, they will be expanding this program, Flowmeter Program, into Louisiana and Mississippi. So we will be looking for farmers that are interested in having flowmeters on their wells.

They are also starting to put together some initial estimates of a water budget looking to evapotranspiration, runoff and recharge based on the amount of water that's going into the basin that's

precipitation or irrigation. And they'll probably come up with some primary estimates and some annual water budgets. And they will be going into much more detail on these, breaking them down to monthly, so monthly water budgets.

The website has been set up for the MAP program. If you need more information, I just kind of hit the tip of the iceberg here. The contact is Wade Kress. He's the project chief. We can quickly put you in touch with any other people working on it.

But a second project is the Coastal Lowlands Aquifer Study. This one started up in October, although we've been working on work plans through much of the summer and fall. It is shown in the brown area here. It's a large regional aquifer study wrapped around the Gulf Coast all the way down to Brownsville, Texas and over to the Pensacola, Florida area. And it's showing the relationship between the Coastal Lowlands and the Florida Aquifer there in the purple and also the Mississippi Embayment and the Mississippi Alluvial Plains. You can see it's part of a very large regional aquifer system. The Coastal Lowlands itself is a very large area and pretty much covers the southern two-thirds of Louisiana.

This is something -- this is the USGS thrust to look at these big aquifers, regional aquifer systems. It's something that Congress has asked us for, an updated status on the availability of the U.S.'s groundwater resources and to assess how those resources have changed over time and then develop tools to forecast regional response.

Again, this is going into a groundwater model. It will also incorporate groundwater and surface-water interactions and impacts it. It will also have a subsidence component, at least in certain areas.

Our objectives here are to document the effects of human activities on water levels, groundwater storage, and discharge to streams and other surface-water bodies; explore climate variability impacts; and evaluate the adequacy of data networks to assess impacts and deliver data needed for models.

So this is one of many studies that's been going on, these large regional studies. The areas in the tan, they're the ones that have been completed. The lighter green ones are ongoing relative to the Coastal Lowlands. And for this, it's very similar to the Mississippi Alluvial Plain Program. We're

looking heavily at the water budget and trying to estimate current and past groundwater use, storage, recharge; construct the groundwater model; estimate primary aquifer properties; simulate predictions; and use those predictions to evaluate an existing regional groundwater monitoring network.

It's a five-year study. It started this year. We're right now putting together the hydrogeologic framework and we're relying heavily on information from previous models that have been done piecemeal across the area as well as additional geophysical data that's available and then putting together some of the model input information, water use and aquifer ballistics. We have to start publishing results within the next couple of years.

The principle modelers on this and leading the project on this are Linzy Foster and Brian Clark. Linzy is in Texas and Brian is in Arkansas.

Then the third study, the Red River Focus Area Study, is part of a group of focus area studies that the survey has been pursuing across the U.S. This is part of the Obama Administration initiative called the WaterSMART Program, which means Sustain and Manage America's Resources for Tomorrow. Funding was allocated by Congress to the USGS and the Bureau

of Reclamation. The USGS used this funding to create this national water census with the goal of developing new water accounting tools and assessing water availability at regional and national scales.

Red River Basin is shown there near the center. The orange areas are areas where there's ongoing studies. The blue are basins where they've completed the studies. And most of these studies have some very similar characteristics where these areas do have similar issues going on. There's increasing water demands, which typically have gone into interstate water conflicts and have resulted in disruption of water aquatic ecosystems. There's concerns about drought, flooding, groundwater declines and stream flow alterations.

So these studies are focusing on water availability, trying to determine if there is adequate water to meet current needs as far as both the quality and timing, both human and ecological needs and then relate this water -- that there's water available to meet future needs.

So there's a map of the Red River Watershed. We divided it -- well, it's pretty much divided into two distinct areas, an upper Reach, which is above the Lake Texoma Dam that Mr. Knotts

mentioned, and then a lower Reach below that dam that is more important to Louisiana.

There's four major elements to this study: One is the compilation of water use data. The second is groundwater modeling. There's surface water modeling and environmental flows. All of these are interconnected. The water use data is fed into the surface and groundwater model and the results of those models feed into the ecological flow evaluation.

For the water use part, we are refining what we typically put together for county level down to HUC-8 watersheds trying to come up with better methods to estimate irrigation withdrawals. We're cataloging interbasin transfers within the basins to try and estimate consumptive use and return flows for various water use categories. And, like I said, this information will lead into groundwater and surface water modeling. We're going back and estimating groundwater withdrawals from 1995 to 2015 from the Seymour River to Red River Alluvial aquifers for a groundwater model and then estimating water use from 1980 to 2015, surface water use, that will go into the surface water model.

Now, the groundwater modeling effort is

strictly above the Denison Dam and Lake Texoma, looking at particularly the Red River Alluvial and Seymour aquifers. That's kind of leveraging off of some other ongoing studies in Oklahoma and Texas and will include surface water and groundwater interaction and use that to look at future hypothetical scenarios.

Just to map where the aquifer systems are, they are along the Red River and some of the major tributaries, Salt Fork and North Fork. And then the surface water monitoring is actually part of a nationwide effort to develop a Prescription Runoff Modeling System and it's going to go into more detail in this area and we'll be able to predict flows in ungaged areas, which would possibly be helpful to understanding some of those border state line flows from Arkansas into Louisiana. And we'll be able to use this information again to simulate possible future scenarios such as drought and flooding and then use the information with this coupled with the groundwater model.

The project chief from this project recently changed. It was Kristine Blickenstaff and now it's Jennifer Wilson. They are both over in Texas. They did a three-year study and we are now

just over a year into now. And that is it.

MR. SPICER: Thank you, John. Any questions for John? Thank you.

MR. LOVELACE: You're welcome.

MR. SPICER: The next item on the agenda is the report on some of the Bayou Lafourche Projects from Ben Malbrough.

MR. MALBROUGH: Thank y'all for giving me an opportunity to come. I want to apologize in advance. I don't have any extremely elaborate graphs and charts, but I just wanted to come and give everybody an update on what we've been doing down at the Bayou, information critical for the projects for the residents we serve there.

My name is Ben Malbrough. I'm director of the FreshWater District. This is just briefly who we are, kind of the significance of Bayou Lafourche, and then, ultimately, the bulk of the presentation will be what we're doing and where we are planning to go in the near future.

The FreshWater District was formed in 1950 by the Legislature with the main purpose to provide freshwater to the water purification facilities and to the residents that we serve. Back when we were formed, it was just comprised of Ascension,

Assumption and Lafourche Parish and, back in 2013, Terrebonne Parish actually voted themselves into the district as well and these are the commissioners of the 12 commissioners that make up the board.

So this is the geographic region that we serve, the western portion of Ascension Parish, all of Assumption, all of Lafourche and all of Terrebonne. And as I said, we were formed mainly to provide freshwater as a source of water to the purification facilities for probable use. Of course that has been expanded and I'll get into that, but it is also a big economic provider to the region.

I've highlighted a picture of Port Fourchon here, but, actually, all of the businesses in this region rely solely on Bayou Lafourche for their water. But I would like to highlight Port Fourchon because they are singly probably our biggest customer. They utilize about 70 million gallons of potable water, and this is not the water that's being utilized in the actual facility itself. This is being loaded up in Shreveport and being taken 90 miles offshore to be used in exploration and production. And I don't have to tell you-guys what kind of role that area plays for the region.

Then as of the late '80s and early '90s,

there's been a big push to tie Bayou Lafourche back into the Mississippi River not just for potable water, but also to be utilized as a restoration tool to combat specifically saltwater intrusion that's really taking over the southern Terrebonne and southern Lafourche areas.

So before I get into the project, I think it's important for everyone who is not very familiar with this to go back in time quickly -- I'll try to flip through these fast -- but to understand the history of northern Bayou Lafourche and how we got into this situation and what we're really working to convert.

In the late 1800s, Bayou Lafourche used to naturally flow out into the Mississippi River with estimates of 10 to 20 percent of the Mississippi River flow coming down Bayou Lafourche. It was a major commerce port for the region getting goods in from the Mississippi River and over down into New Orleans.

Obviously, with that unconstricted opening, came flooding and other issues along the Bayou that really shook the history later. But one of the important things was in the late 1800s the railroad built a bridge across Bayou Lafourche, which

facilitated both unrestricted flow, but also allowed for navigation. And I highlighted this. You'll see later on in the presentation that this railroad bridge has really been a hindrance in all of our operations.

But going forward, in the early 1900s, there was enough pressure from the landowners and the residents from the spring floods to dam off Bayou Lafourche. So in 1904, they utilized the existing port buffer at the head of Bayou Lafourche to permanently dam it off. The intentions back then were to build a lock structure later on, but that obviously never came.

In 1934, obviously, there's no influx of water from the Mississippi River. The train track that was built in the late 1870s started to have some stability issues with its expanded use. So, in 1934, the railroad actually built an urban embankment across Bayou Lafourche, so a levy essentially built on Bayou Lafourche by one 5'x 6' box culvert to alleviate back flooding into the City of Donaldsonville.

With the formation of the FreshWater District in 1950, the Department of Public Works built the pump station along the river there. In

1955, they added two more 100-foot diameter culverts through the railroad embankment. That pump station is built with an approximately 500 cubic feet per second capacity. And this, for all practical purposes, is the configuration that the northern portion of Bayou Lafourche has seen up until just recently.

So to fast forward, I put this slide up here. I won't go through all of these dates, but I did highlight the important ones. My presentation specifically is on some of the projects that we've implemented on the Reintroduction Project, so I'll focus on that.

As I said, in the late '80s and early '90s there really became a push to tie Bayou Lafourche back into the Mississippi River to utilize it as a freshwater conveyance channel to get some of the freshwater nutrients down to the lower Terrebonne and Barataria basins of the wetlands that were really starving for it.

This project began in the early '90s as a conceptual project and it was authorized, de-authorized. The State picked it up and the Department of Natural Resources. So I highlighted in 2006 that the Department of Natural Resources

released what we call the Phase 2 Mississippi River Reintroduction to Bayou Lafourche Project. That's kind of the Holy Grail, per se, that we work every day to try to implement.

I circled September of 2008. So Gustav makes landfall and it's an extremely unfortunate incident, but it was beneficial to the FreshWater District in that it really brought a sense of urgency to implementing some of these projects. The Bayou went septic for approximately 30 days or so, so it really gave the will to begin implementing some of these project components that had been talked about and studied for so long. So that was a major turning point.

This is -- the project I'm talking about, some of the major components in it that I highlight are a pump station. So our existing capacity is 500 cubic feet per second. The analysis and the reports and all of the work that was done determined that the most feasible amount of water we could push down Bayou Lafourche from the Mississippi River in Donaldsonville was somewhere in the ballpark of 1,000 to 1,500 CFS. So, obviously, our existing pump station is not adequate. So that would have to be modified and/or completely built anew.

With a hundred or so years of neglect, obviously, the channel silted some naturally and also non-naturally. So the conveyance capacity of the actual Bayou wasn't near what it needed to be. So the project lays out approximately 30 miles of channel dredging that needs to take place between Donaldsonville and Thibodaux.

Of course, the railroad embankment, this is a picture of the actual embankment. I don't have -- so this is the railroad up in Donaldsonville and these are the existing culverts that are there. You can't really see the little box culvert that was originally put there, but it's somewhat irrelevant because it stays filled mostly.

This embankment causes an operational hindrance to us now at 500 cubic feet per second. So certainly moving forward, expanding our pumping capacity, something definitely has to be done to this crossing in Donaldsonville. And then there's the weir that was installed in Thibodaux in the late '60s to secure the freshwater supply to the lower residents and the residents of lower Lafourche Parish and, ultimately, that structure will have to come out as well.

So these are the main components. There's

other annular components within the project, but these are the big ticket items that were laid out in that 2006 report. So some of the projects have already been implemented. As I said, when Gustav made landfall, it really opened a lot of people's eyes to the importance of getting more freshwater down Bayou Lafourche.

In 2008, with some state surplus money, CPRA was able to dredge the first six miles of Bayou Lafourche from Donaldsonville down to Belle Rose and this was a major milestone for us because it literally opened up the floodgates for some of the work that was shortly there to follow. We were able to get some CDBG money from Gustav to do some pump station upgrades. Some of the original pumps from the 1955 station were still there. They were still working, surprisingly, but certainly we were able to recognize some deficiencies going in and upgrading the pump station.

So then the projects we have underway, building off of successes from that state surplus money and dredging what we call Phase 1 dredging, CPRA allocated 20 million dollars of their state CIAP money, which is the Coastal Impact Assistance Program. It's basically some oil revenue sharing

that brought about 500 million dollars to the State. We were very fortunate enough to get an original allocation of 20 million to continue the dredging that was completed in 2011. And you'll see as we go forward that that original grant or that original allegation has grown significantly and has allowed us to do some really good stuff along the Bayou.

So the first portion was the channel dredging that we continue. From Belle Rose -- we were able to get approximately 11 or 12 miles, 11.8 miles of channel dredging from Belle Rose down to the Napoleonville. Another project that we did was the Saltwater Control Structure that the Fresh Water District had originally put in in 2003. And Company Canal had to be moved and relocated actually further north into Bayou Lafourche because we were obviously seeing continued saltwater intrusion and it was really threatening the water treatment plant down in Lockport. So that structure was moved.

We have the Donaldsonville drainage project. Obviously, when the City of Donaldsonville's draining infrastructure was built, there was little to no influx of water from the Mississippi River. So any time we increased pumping into the Bayou, we actually endangered back flooding

into the City of Donaldsonville. So we have the project on the books and we've gotten funding and we're going to be moving on that project this year to alleviate some of the drainage issues back into Donaldsonville, which will allow us to increase our pumping capacity as well.

And then there's the railroad bridge that I talked about several times. This is kind of our crown jewel. This is a project -- and some of the folks listed are here, Karen and Chris and Norby and Milton, and y'all have been very familiar with some of the stuff that we're doing along Bayou Lafourche. And Chris especially, going through some of the project files of things, there's pictures of him working on this with a young lad.

It was recognized very early on that we could not be successful in doing what we needed to do without addressing that railroad crossing in Donaldsonville. In the first mile, like I said, it didn't have the capacity for us to pass our existing water through it, much less expand. So we were very, very fortunate in working with the railroad through the CF money to secure construction dollars. And that project is underway and will be completed at the end of this year. It's actually going to be an

open-span bridge. This project, like I said, it's been talked about and analyzed for over 20 years, since the inception of this whole program. So this is a really big milestone for us now, because as we go forward, there's nothing in our way that really poses a real hindrance to completely finishing out the Reintroduction Project.

I wanted to put a little snapshot in here because, like I said, it's something we're really, really proud of. This is the existing -- this was the embankment before we received the construction dollars. I'm looking north, so on the other side is the Mississippi River. This was at eight o'clock and I made sure to leave the time stamps to show you how impressive this was.

You know, this was a project that for 20 years it was just too hard, it was impossible, it was too expensive, we can't get it done, we don't want to interrupt the train service through the city. It was all kinds of issues that delayed this project. And, you know, with the opportunity that the CF money presented us, we potentially funded this project solely at no cost to the railroad. There was only one caveat and that is it had to be completed by the end of -- December 31st of 2016. So it was a very

aggressive timeline. So low and behold they figured out a way that it could be done for much cheaper than originally anticipated.

So I put these pictures up. This was at 8:25 in the morning on Thanksgiving, just a couple of weeks ago. That's the last train passing over the existing tracks in Donaldsonville and you see just nine minutes later they started ripping the tracks up.

This was later that afternoon. They started doing some excavating, getting down to the piles that had been driven. And this is the next morning. They had already begun constructing. Half of the bridge is compete. Later that evening, on Friday, the bridge is, for all practical purposes, done. I don't have a time stamp on this one, but this is 8:00 Saturday morning. The first train passes back over the brand new bridge.

So this is really, really due to -- and this is how it stands today. Obviously, they had excavated everything under it, removed all the infracture below it. So this is going to allow us to pump year-round all of our existing pumping capacity. But, also, it removes the biggest hurdle that we had in this whole project. Now we can pass our

anticipated increase in flow through this bridge without any impediments in the City of Donaldsonville.

And so a few other projects we have underway, building on some of that, is we already began the analysis and design of the pump station up in Donaldsonville. That project is underway. It started the beginning of this year. We're hoping to have some conceptual plan to put together to go to the Corps to begin a quarry beginning by the end of this year. So that's moving forward. And then we also began the analysis to take the weir out in Thibodaux.

So it's been a really, really aggressive and exciting three years for the FreshWater District. We began a lot of this work in 2014 and on December 31st, 2016, when the Department tells us we have to put our shovels down, we'll have installed approximately 32 million dollars into this project in Bayou Lafourche. So it's been really fun. It's been a really exciting time and I think all of the residents in the parishes that we serve are really going to reap these benefits. So, obviously, it's all exciting and we're high fiving each other right now, but we still have a long way to go.

We still have to dredge in Napoleonville. We're about 15 miles into about 35 miles worth of dredging that needs to be done. We obviously have to address our flow constraints with either the expansion of our existing pump station or a new pump station altogether. We obviously have to remove the weir, which is something we initiated, and some water control structure we're looking at to alleviate some emergency situation.

That's really it. That's what we've got going on. Stay informed. We have a website and I try to post enough stuff on Facebook to keep everybody updated. And if anybody has any questions, I'll go be glad to attempt to answer them.

MR. SPICER: Thank you, Ben. Does anybody have any questions for Ben?

MR. BALKUM: First of all, as someone who pounded their head against that wall for a long time, I'd like to congratulate you for the railroad bridge. I wasn't sure I would see that in my lifetime. It's a remarkable accomplishment. We talked about the dredging going on in Napoleonville. I remember there was --

THE COURT REPORTER: I'm sorry, I can't hear you.

MR. BALKUM: -- people who had pushed the little homemade levy and pushed them into their backyards by decreasing the cross section of Bayou Lafourche and there was a study that to determined what the State owned and didn't own. Has that been resolved, where the limits of ownership are?

MR. MALBROUGH: So when the money -- when the state surplus money was allocated to the first dredging, that was obviously the first thing that needed to be done and they started that effort back in 2008 and it was a joint effort between the Department of Natural Resources, the Office of State Lands and the Attorney General's office. And they spent a lot of time and a lot of money and a lot of effort on determining where they believe those lines are -- and we've actually had Matt from the head of the Bayou in Donaldsonville down to the intercoastal in LaRose -- what the State Land's office believes are the state-owned water rights and also the right-of-ways. Mark and I were talking about that right before this meeting. I don't think there's anyone along the Bayou who lives there who believes those lines, and it's certainly a struggle that we have to contend with every day. But, you know, they're there and I guess that could be argued. They

haven't been taken to the argument of the courts yet. It wouldn't surprise me if someone did. Hopefully, we'll be finished implementing the project when that happens.

But, yes, that's something that comes up every day because one of the big things is, you know, people want to build things on the Bayou and we certainly want them to do that, but we want them to do that in a way that doesn't impede anything that we're trying to do and it doesn't add cost to our main dredging project that we have to do further down.

So at 1,000 CFS, okay -- and I think this went into some of the analysis for determining those lines -- most, of it, if not all of the work that needs to be done from a dredging perspective is done within the State Lands' office, their own waterlines.

MR. KNOTTS: That's the way I remember it too, at 1,000. Also when you take a weir out -- people that are concerned that the water level would go up way high in Donaldsonville hadn't realized that the weir was bringing artificially high pools above that. You take the weir out and the water level in Donaldsonville I think is around a foot maybe.

MR. MALBROUGH: It goes down. You

know, you really start to see -- the impacts obviously for the weir in Thibodaux are 16, 17 miles north of that. As you go further up in Donaldsonville because of the geography -- the topography of the Bayou is very steep in Donaldsonville and then the slope gradually levels off all the way down to the Gulf. So the impacts of the weir are not as significant to the City of Donaldsonville as they are as you go further south.

MR. KNOTTS: When you remove the weir, you put more water -- the impact is not as great because it flows downstream.

MR. MALBROUGH: Right. So the fully implemented project is that actually the water surface elevation in Donaldsonville goes down, whereas the water surface elevation just above the weir and just below will go up.

MR. BALKUM: Great presentation, Matt. Thank you.

MR. MALBROUGH: Thank you.

MR. SPICER: Thank you. Any other questions?

MR. CHABERT: Yeah. First, Ben, thank you for all your hard work that you did. It's a different operation than, you know, previous to you

arriving. And the Commissioner needs to really be commended as well as a lot of the folks from Terrebone who decided to become full-fledge members of that. You know, they get the majority of their drinking water from Bayou Lafourche.

One thing I appreciate is you going back. It was a hell of a presentation from a visual standpoint. The Bayou Lafourche was cut off from the Mississippi when-ish?

MR. MALBROUGH: 1904.

MR. CHABERT: And when was Bayou Terrebone cut off from Bayou Lafourche, when-ish? I mean, just for point of discussion.

MR. MALBROUGH: You know, it's difficult to tell, but I want to say it was sometime -- Chris, you might be able to help me with that. It was sometime maybe in the '40s or '50s.

MR. KNOTTS: I want to say early '50s.

MR. CHABERT: 1950s?

MR. KNOTTS: Yes.

MR. MALBROUGH: Yes.

MR. CHABERT: So that is obviously one of the main problems for coastal land loss in the Terrebonne basin is all that stuff. One of the major charts or maps or whatever we see constantly from

CPRA is the deveining, if you will, of all of the tributaries from the Mississippi River and from the central tributaries, if you will, the Atchafalaya to the west of the Mississippi and from the east. I mean, all of that degradation in that entire floodplain basically exists from those two events, right, which is basically traced back to Bayou Lafourche being cut off from the Mississippi and Terrebonne being cut off from Bayou Lafourche.

As we move forward, as the district moves forward, I'm going to encourage you and the Commissioners to really take a -- I know your budget constraints, but once these, you know, physical projects are completed and issues concerning the size and the pumping capacity of the Donaldsonville pumping station are addressed, the reintroduction of fresh water, not so much sediment, but if possible sediment, for that whole area is going to have to really be almost a Bayou Lafourche solution in some way because as a lot of folks here know, the science and the money just isn't there to get what we need from the Mississippi in the east or the Atchafalaya in the west. It gets very, very close to where we need it to be, but it doesn't get to where we need it to be. The only true solution is to try to get it

back to as close to natural as we've been in the not so distant past. So that's -- I think the FreshWater District is going to play a big role going forward into finding the solution of really getting that freshwater back to the central part of our coast, so good luck.

MR. SPICER: Karen?

MS. GAUTREAUX: Well, thank you, Ben, for that presentation. As a person who was around on the public task force, then called the Breaux Act, who passed that FreshWater Reintroduction, it's been very -- there's been a lot of report in terms of recognition and the multiple benefits and it was a little bit frustrating when it got kicked because Terrebonne didn't have freshwater benefits. So all that you did and all of the people who worked hard on this project, congratulations on the job that you're doing. I look forward to the updates in the future about new progress. Thank you.

MR. MALBROUGH: Thank you.

MR. SPICER: Any other questions for Ben?

MR. DAVIS: Yeah. I would like to echo what Mr. Chabert and Karen and Chris said. This has been an extraordinarily long road, but it can't

be where it ends. I think you're right. You know, this is like a patient with circulatory problems. We really have to get the circulation working.

I wanted to -- you and I were talking about it beforehand, but I think the Commissioner just needed to know, Bayou Lafourche, as far as navigable streams, you know, people that live there have private rights of ownership and they're subject to a levy servitude. You know, if you think that the levies along the Mississippi River were built by the Army Corps of Engineers, you're largely wrong. They were built locally and there was no money paid for the land to do it. That was essentially part of the servitude. Obviously, it's a flood-control servitude more than purely levies, and clearly what we're really talking about here is managing these systems really to reduce not only stream flooding but coastal flooding.

So I think we need to make sure that we understand the full suite of rights and tools that we have and that we need to start educating other people about that they have a privilege of living where they live and working where they live because people used these civic tools to make it possible. Now, it's our turn, and I think we have to make sure that, you know

we understand it. It's not true on every stream, but it is true on navigable Bayou Lafourche. It's one of the most historical navigable streams.

MR. CHABERT: One more thing. In terms of the FreshWater Reintroduction Project and Master Plan, this is certainly one, right?

MR. MALBROUGH: Yes. We were in the 2012 plan and we're optimistically going to be in the new plan that will be released in January.

MR. CHABERT: Thank you.

MR. SPICER: Any other questions for Ben? Thank you, Ben. Very good presentation. Next we're going to have the Office of Conservation Agency Report. Matt Reonas is going to give that report.

MR. REONAS: Thank you, Mr. Chairman. I do want to run through sort of some updates on what our agency has been at work doing. We've kind of covered several different spheres here. First off, I'm going to talk a little bit about education and then we tap into some legislative issues. So I'm going to bounce around a little bit.

First off, I do want to let the Commission know that we are at work on sort of the annual report. This project sort of started -- it's not really -- we're not really tasked to doing it, but

we've sort of been doing updates ever since the 2012 report came out and so we just try to do periodic updates to the Legislature and the Governor's office and it's sort of turned into an annual report. It's usually not very long. It's usually under ten pages and then some appendages, but it does talk about what the Commission has done, it's actions, activities, issues that have been debated or discussed or presented during the Commission's meetings through the years.

So we are at work on that if any of y'all want to contact me about it and we can discuss those. But we're looking really at probably having this ready by mid January. We go through a review period and pass it around the Commission and then sort of take those edits and we'll float this out probably in February to the Governor's office and the Legislature. But, again, it just sort of recaps what the Commission's been doing, its activities, topics that have been brought before the Commission and then, of course, any actions, resolutions, things of that nature that the Commission has acted upon.

Then switching gears here, I'd like to sort of talk a little bit about education. An important sort of development has come up recently. Obviously,

it's been in the works for a little while, but the State Department of Education recently released the new or the first draft of the new science content standards and this has been in the works for several years.

I've had a number of conversations with staff over in the Department of Education, but these came out at the end of last week, first part of this week. I started looking at them on Monday, so I really haven't had a chance to go through them very thoroughly and give sort of a strong analysis of what this Commission's interest would be in new content standards.

But having said that, I did pull the environmental standards and these would be at the high school level. And these things are of interest to this Commission particularly in terms of talking about natural resources, evaluating sustainability, evaluating relationships between management, how we manage for sustainability, what the environmental standards are for the State's management plans. So I would like to, on behalf of the Commission, go through and but together some comments and forward those on to the Department of Education and their review committee for consideration.

Again, I can -- the comments are accepted through January 6th, so a pretty tight timeframe. And, again, these content standards range from essentially kindergarten all the way up to high school. And, again, Gary and I were talking about this earlier in the week, but the interest of this Commission in terms of water resources management are pretty strong in here. They're covered. And really what the content standards are -- and you have to think of this probably from an educator's point of view -- the content standards are the big goals, what we want to get across.

So I'll just pull one of these. That will be the easiest thing to do. So for Environmental Science I -- this is again high school -- analyze the performance expectation, analyze and interpret it to identify factors, effects, sustainable development and evaluate the effectiveness of natural resource management of Louisiana. That's the performance expectations. That's the big goal. And then it goes on to provide a clarification statement: Understanding functions and values of the very ecosystems and environments of the state; supply nonrenewable mining products and profitable agricultural commodities; examples of key natural

resources, include state waterways and marine life found; and then regions of agriculture, high concentrations of minerals and fossil fuels and so on.

So there's plenty of -- within that broad goal, there's plenty. And, again, that's just one of the performance expectations. There's a number throughout there and for each grade level. So within that broad set of expectations are big goals. There's plenty of room for opportunity. The emphasis -- in talking with the Department of Education staff, the emphasis is on basic scientific literacy, understanding how to read graphs, construct graphs, evaluate evidence, understand models, create models. All of these things are key points of any kind of science educational curriculum going forward, engineering and technology. So this is a big step forward, in my opinion. Again, having watched the process a little bit and then seeing the final draft or the near final draft, I think it's a big step forward for Louisiana.

The important thing for this Commission, and certainly for all of the agencies represented here, especially state agencies, is that from an educational point of view you again have these big

goals, these big content standards, performance expectations, but how you get to those goals is varied. And teachers are going to need a curriculum. They're going to need lesson plans that move them towards the performance expectations to get them to achieving these content standards. So, for me, that's the exciting part.

Of course, we work a lot in curriculum here in the Office of Conservation, strictly in the Baton Rouge area. And I'll talk about that in a minute, but we're already doing a lot of that in the curriculum we've developed locally. So I'm excited about it and I would like to, if it's not -- I'm not sure if the correct move here is to ask for a resolution or any sort of an okay just to move forward on behalf of the Commission based on the recommendations from the 2012 report to put together some comments and send those on to the Department of Education based on this Commission's interest. Brad, I don't know if that's the correct --

MR. SPICER: I don't think we need a resolution. I just think we need an agreement to have you move forward with this.

MR. REONAS: Okay. That sounds fine. Well, I'll circulate my comments once they're

completed and, again, it's a pretty steep amount of material. Again, as I said, I got one from kindergarten all the way through high school. So there is a lot of information out there. I did enclose in your packets the "How to Read" the content standards, if y'all get a craving to go out and dig through these yourselves. But, again, coming from an educational background myself and looking through them, there's a lot of material in there that meets the goals that this Commission established back in 2012 with the 2012 report for educating about water resource management. So I'm excited about that. But the real goal now is really going to be providing a curriculum and developing those lesson plans that meet these goals.

So sticking in the realm of education, we did actually reach a pinnacle in our local campaign. We released on Halloween our Waterman video. So I've included in each of your packets a copy of our DVD. It's online as well. I don't know if we want to take 12 minutes to view it, Brad, but it is online at our Water-Wise.

MR. SPICER: Maybe not.

MR. REONAS: No, no. That's fine. So we were excited about it. It's a very

tongue-in-cheek sort of production. Again, to give you some background, in 2012/2013, the previous commissioner, Commissioner Welsh, mandated or asked that we put together a local curriculum on groundwater here in Baton Rouge. I saw it as an opportunity, as sort of a first-step committee developing a larger statewide plan, and hopefully we can get to that.

We did end up putting together a curriculum. One of the first things we did was our classroom poster. I know I've presented this before. This is the second addition with some updated stats and we have some of those outside, if anyone wants to take them. Of course, we did adult education brochures as well and we have a large curriculum, environmental science and earth sciences curriculum. We dropped down to the fifth grade as well and we have some math and social studies components also.

We also wanted to do something that was fun for the students and so that's where the idea of this video came through. Again, it runs about 12 minutes. It's the idea that we have these kids, young students, and they get transported to Waterman's H20 HG and there they learn all about groundwater and surface water in the Baton Rouge area and the

different facets of that.

So, again, it's very tongue-in-cheek. We had very good reception. We went up to Scottlandville Pre-engineering Middle School up there and had good reception. Of course, I was watching the kids. None of them -- they were all engaged in it, which I was glad for. Again, we try to make it relevant to them, but also connect our curriculum, which we hope will be continued to be used in classrooms locally.

So I do have a DVD. If any one of you know any science educators and you aren't keen to keeping it in your collection, please pass that along. That's our goal to try to get each of the science teachers here in East Baton Rouge Parish a copy of this and, of course, it's online as well. But it is applicable across the area, the Southern Hills area around Baton Rouge, the Capital Region. So, again, this was a project that we were really excited about and glad to get it released.

We initially kind of scheduled it for early September. Of course after the flood in August, maybe having Waterman so close to that was perhaps not the best idea, but we were glad to get a release of it and have it out there. So our goal again is to

keep moving forward with our workshop and eventually try to take this statewide in terms of groundwater education to provide a curriculum and lesson plans to meet those new content standards that are coming forward.

Now, switching gears a little bit, one that kind of -- we do periodically get legislative updates. So there are three pieces, one Act and two House bills or House resolutions that we have an interest in, and this Commission should obviously have an interest in it as well.

The first one is Act 362 from earlier this year and we, in the Office of Conservation, from our position with the Oil Spill Coordinators Office, have somewhat of an interest in this project, but it's really a CPRA project. And it's really just getting started, but it's Natural Resources Damage Restoration Banking. It's kind of a really fascinating idea. The goal really is to generate private investment in the Coastal Master Plan projects. And I think as everybody that's involved in coastal issues knows -- I mean, the big issue there is money and how to move forward with some of these projects. This is a way of creating a set of credits that private investors could then trade on

the open market for responsible parties in oil spills. Of course, I think it's -- the goal here, again, is to provide some -- provide opportunities for people, investors to help build these projects and for any of these responsible parties involved in future oil spills to be able to at least get some credit for helping rebuild the coast.

So the planning process is underway. Again, that's -- the Office of Conservation isn't greatly involved in it. Again, it's more of a CPRA project, but it's something that we did want to bring out in front of the Commission if some of you weren't aware of it. And we do have the contact information. It's simply here in our presentation. It's mitigation.banking@la.gov.

Again, I do want to, I guess, note that all of these presentations, we'll have those up via pdf on our website and we'll circulate those, a notice of that probably tomorrow or Monday. So all of this information will be available.

So an interesting -- I think CPRA is in the mist of developing the rules and regs of its own time. Again, it's not something that the Office of Conservation is deeply involved in, but it is something we did want to bring out in front of this

Commission for those that may not be aware of it.

The other two bills -- or the other two pieces of legislation and current resolutions the Office of Conservation and DNR have a little bit more interest in, the first one is HCR 110, the management of scenic -- natural scenic rivers through energy management. This was by Representative Carter and it is how natural scenic rivers are being utilized for hydraulic fracturing in oil and gas development generally.

So the lead agency on this is the Department of Wildlife and Fisheries. DNR is acting in sort of a supporting role here developing a lot of stats on groundwater and surface water used across the board. I would like to note that the 2015, 2016 numbers in oil and gas development, about 85 percent of the total water usage is from surface water sources. Again, going back to Haynesville Shale, the agency's interest was in trying to move operators from groundwater used in delicate or stressed areas. In northwest Louisiana, the groundwater systems there aren't as robust as elsewhere in the state, so that was a concern. But, again, our most recent stats, 2015 and 2016, about 85 percent of that water usage is from surface water, surface water sources.

Again, the report is due in March. I'm sure it will be probably available before then or at least the work -- drafts of it will be available before then. Kyle, did you --

MR. BALKUM: Yeah, Matt. I just want to bring it to the attention of the Commission, we have a meeting next week with some of the staff at DNR to work through and kind of find out where the agency is for things right now. Thanks for bringing that up.

MR. REONAS: Yes. So, again, that report is in the works and will be available soon. The next one is strictly Office of Conservation. This is HCR 115. This was again by Representative Carter. It's on the sustainability of groundwater use in the Southern Hills system of southeast Louisiana. Again, Conservation is the lead agency on this groundwater interest.

So what we're doing at this point in time is going back and evaluating all the water level data from the USGS that's available. Again, going back to the importance of that water level network, we're pulling all of that information. We're also evaluating water use across the region, looking at sustainability. And, again, the Southern Hill system

is a large system. You're talking about a system that covers geographically about 14,000 square miles in Mississippi and Louisiana and ten separate aquifers within the system. Some of them have been more productive and more robust at different places than others. But, again, a large, very robust, productive system. This supplies groundwater for public supply across at least ten parishes in southeast Louisiana, depending on how you count it. Then, of course, all the industry and agriculture in those parishes as well, or a large percentage of industry. So we're looking at all of that ourselves.

The U.S. Geological Survey is also developing a groundwater resources pamphlet that we're going to have as a support document. And, again, this is also set for -- the deadline is in March, March 1st, but we're looking to try to finish this up by the end of December internally, at least get it under review by then and then hopefully have it out probably in January, depending on how it goes. But that's essentially strictly an Office of Conservation project. And, again, for example, we had a couple of the USGS potentiometric maps from some of -- from several of the aquifers within that system. So that's that project.

I believe in terms of speaking of the Capital Area and the Southern Hill system -- I guess I can take any questions right now, but I do want to take this moment to transition over to -- we have the Chairman of the Capital Area Groundwater Commission available to kind of talk about the direction that that group is going. But I can take any questions right now on any of these topics, the education, the annual report or any of the legislative subjects.

MR. SPICER: Any questions for Matt?

MR. BALKUM: You did a good job.

MR. REONAS: Thank you, Brad. So I'd like to introduce the new chairman of the Capital Area Groundwater Conservation Commission, Barry Hugghins. Barry is taking over as chairman, I guess, effective -- well, you're interim chair.

MR. HUGGHINS: I'm the chairman elect for 2017.

MR. REONAS: Right. So, again, that's a district that comprises five parishes here in the Capital Area.

MR. HUGGHINS: Good afternoon. I appreciate the opportunity to come and speak and I'll be very brief. I'm sure y'all have sat here long enough. I am the new chairman of the Capital Area

Groundwater Conservation Commission. We protect the groundwater in a five-parish area around Baton Rouge.

Our challenge is very simple. We have had saltwater encroachment across the Baton Rouge fault. Currently, we are managing the pumping in such a way that the withdrawals minimize the amount of saltwater that comes across. We are in the process of installing some monitoring wells. We have worked quite extensively with USGS on miles development and with Dr. Frank Tsai at LSU on developing a model of groundwater transport so we can understand exactly what happens as water moves through the Southern Hills aquifer in the Capital Area and as water is withdrawn.

We have worked also with Baton Rouge Water Company. They have installed a scavenger well for the 1,500-foot aquifer sands not too far from here at the Lula pumping station. That system seems to be working very well and I believe we have a very good handle on the issues that we're facing. I don't think we're in any immediate danger of running out of water in the Capital Area, but certainly it's something that's critical to our area and we need to stay around and talk about it. I'll be happy to answer any questions that you might have.

MR. SPICER: Do we have any questions? Okay. Thank you. Any more comments, Matt?

MR. REONAS: No.

MR. FREY: Mr. Vice Chairman, before you go to public comments, I wanted to commend the Conservation staff, Matt, Gary, John for putting together a very robust agenda. I think it was very informative, at least from my perspective it was. One of the things that's concerned me over the years as we sit through things and talk about water budgets and water codes, et cetera is that we haven't had a lot of good information relative to the water budgets.

We had a -- I want to say about three years ago we had a presentation from Kai Midboe with the Water Institute relative to the importance of water budgets and the fact that we don't need to get the cart before the horse. We've got to find out how much we've got, how much we're using before we get into talking about codes and regulations, et cetera. So I'm glad to see we're getting that in the agenda, things we can hear as a Commission and get our teeth into.

With that said, going back again to one of those older meetings, we had a workshop where we

heard a number of presentations and had a lot of feedback. One that stuck in my craw was a comment by Pat Credeur with the Louisiana Rural Water Association. Pat mentioned that a number of these rural water systems were still fighting a leakage problem. And I don't remember the number he quoted, but it was several million gallons and I want to say that was on a daily basis, which, you know, if that's correct, we've got to do something about that.

I don't know what's been done. I'd like to encourage the staff and this Commission as a whole to charge someone with looking at that and see what we're doing and are we making any progress in regard to that leakage issue. Because if we're losing that water due to leakage, we need to determine whether we can, you know, create some incentives or close that drip. So I just wanted to throw that out before we moved on.

MR. SPICER: Thank you, Mr. Frey, for your comments. Any other comments? Do we have any comments from the public? We don't have any cards here. If not, then we're ready to adjourn.

(Meeting is adjourned at 1:07 p.m.)

REPORTER'S CERTIFICATE

I, LAURA QUINETTE, Certified Court Reporter in and for the State of Louisiana, Registered Professional Reporter, do hereby certify the foregoing 86 pages.

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Baton Rouge, Louisiana, this 27th day of December, 2016.

Laura Quinette, CCR, RPR
CCR No. 2014011, RPR No. 73367