SOAH DOCKET NO. 952-13-5210

LOST PINES GROUNDWATER CONSERVATION DISTRICT

APPLICATION OF END OP, L.P. FOR WELL REGISTRATION, OPERATING PERMITS, AND TRANSFER PERMITS	)	STATE OFFICE OF ADMINISTRATIVE HEARINGS

HEARING ON REMAND

Friday, November 7, 2014

BE IT REMEMBERED THAT at 9:00 a.m., on Friday, the 7th day of November, 2014, the above-entitled matter came on for hearing at the Bastrop County Courthouse Annex, 804 Pecan Street, Bastrop, Texas; before MICHAEL O'MALLEY, Administrative Law Judge, and the following proceedings were reported by Lou Ray, Certified Shorthand Reporter.

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* There is a duplication of the use of the number 5 between the Hearing on the Merits and the Hearing on Remand

P R O C E E D I N G S

FRIDAY, NOVEMBER 7, 2014

(9:00 a.m.)

(Exhibit Applicant End Op Nos. 51 through 108 marked)

(Exhibit GM Nos. 5 through 9 marked)

JUDGE O'MALLEY: Good morning. Today is Friday, November 7, 2014. We're in Bastrop, Texas. We're here today for the remand hearing in Docket No. 952-13-5210, Application of End Op, LP, for Well Registration, Operating Permits and Transfer Permits.

My name is Michael O'Malley. I'll be the Administrative Law Judge presiding, and I'll take appearances of the parties. Let me begin to my left here, and we'll just go down the tables.

MR. GERSHON: Yes, Mike Gershon with the law firm of Lloyd-Gosselink on behalf of Aqua Water Supply Corporation.

JUDGE O'MALLEY: Thank you.

MR. LEIN: David Lein and Robin Melvin from Graves Dougherty Hearon & Moody on behalf of the Lost Pines General Manager.

JUDGE O'MALLEY: Thank you.

MS. REESE: Stacey Reese with Stacey V. Reese Law, PLLC, and my Co-Counsel Russell Johnson of

McGinnis Lochridge --

JUDGE O'MALLEY: Thank you.

MS. REESE: -- on behalf of the applicant.

JUDGE O'MALLEY: Let's go off the record.

(Discussion off the record)

JUDGE O'MALLEY: Okay. Off the record the parties indicated that they waived opening statements. Is that correct?

MR. LEIN: That's correct.

JUDGE O'MALLEY: And we're ready to move to evidence. So we will begin with End Op and your direct case.

MS. REESE: Your Honor, End Op calls Mr. Paul Thornhill.

(Witness Thornhill sworn)

JUDGE O'MALLEY: Please be seated.

WITNESS THORNHILL: Test one, two, three.

(Laughter)

JUDGE O'MALLEY: Go ahead, Ms. Reese.

PRESENTATION ON BEHALF OF THE APPLICANT

PAUL THORNHILL,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MS. REESE:

Q Mr. Thornhill, please state your full name for

the record.

A Paul D. Thornhill.

Q Do you have any relation -- are you related to Mr. Mike Thornhill of Thornhill Consulting, Inc.?

A Not at all. A mere coincidence.

Q Is a true and correct copy of your CV in Exhibit 51?

A I do not have the exhibit.

MS. REESE: One second, please. Let the record reflect that I've handed Mr. Thornhill End Op's exhibit binder with Exhibits 51 through 108 and also a copy of the GM exhibit binder.

Q (BY MS. REESE) Is this a true and correct copy of your CV, Mr. Thornhill, contained within Exhibit 51?

A Yes.

Q Tell us about your degrees and licenses?

A I received a bachelor of science in civil engineering from University of Texas at Austin in 1971, I received an MBA from the University of Texas at Austin in 1991, and I'm a registered professional engineer in the State of Texas.

Q When did you obtain your engineering license?

A About 1977.

Q If you look on Page 4 of Exhibit 51 where your CV is, does that list your employment history?

A Yes.

Q And so you've had quite a bit of experience working as an engineer throughout your career. Why don't you tell us about your experience at the Texas Water Rights Commission back in the '70s. What was the nature of your work there?

A When I first got out of school, I went to the Water Rights Commission, which is the predecessor to the current TCEQ. My main function was to perform water availability analyses for surface water supply permit applications and also to perform dam safety analyses.

Q What is Espey? After you left the Texas Water Rights Commission, you went to Espey. What is that?

A Espey, Huston & Associates was a mid-size engineering firm that eventually had nationwide offices. I worked there as an engineer then as a vice-president. When I left, basic consulting for public and private clients.

Q What was the nature of the work that you did while you were there?

A Me personally, I continued to work on various water resource projects for public and private clients. I was also a part of the management team managing the firm.

Q Did you conduct any reservoir feasibility

studies during your time there?

A Yes, I did.

Q Did that includes a project for the Guadalupe-Blanco River Authority and the Upper Guadalupe River Authority?

A Yes, those were two of our clients.

Q And they are located in what part of Texas?

A The Guadalupe River Basin, the next basin west of here. Both of them are in that basin.

Q In connection with conducting your engineering services and studies over the years, did you regularly publish reports that were relied upon by your clients and used in proceedings similar to today's?

A Yes.

Q Tell us about your experience at LCRA. After you left Espey, you went to CH2M and then -- which, by the way, what was your work like at CH2M? Similar to the work at Espey?

A Yes, CH2M Hill was a much larger national and now international consulting firm. I was there for about nine years as I recall, again performing basic water types of projects myself, as well as participating in the management of the firm. I was a vice-president there, too.

Q And then you moved on to LCRA, the Lower

Colorado River Authority. Could you tell us what LCRA is or does?

A LCRA is an entity created by the state Legislature back in the '30s. They essentially manage all the Highland Lakes, including the dam that creates Lake Austin, which they don't own but they operate for the City of Austin. They also generate electricity, perform various transmission services for electric transmission, manage parks, do water quality sorts of things.

Q And it looks like you moved up the ranks at LCRA. Tell us briefly the positions that you held there and the nature of your work there.

A I was -- when I first came in, I was chief engineer of what was called WaterCo at the time, which was the entire water side of LCRA. I was promoted to the manager of WaterCo, about two years later is my recollection, which was essentially the responsibility for all the staff and all the facilities of all the Highland Lakes, all the hydroelectric generation, all the irrigation districts, all the water and wastewater utilities. I'm sure I left something out, but it was basically the entire water side of LCRA.

Q And who was your boss when you were at LCRA?

A I reported directly to Mr. Beal, Joe Beal, who

is sitting here.

Q When you were working at LCRA, did you -- did the nature of your work include experience -- any experience in rates or establishing rates?

A Yes.

Q What about risk management?

A Yes. The final couple of years I was the chief risk officer for all of LCRA, including the electrical generation and transmission.

Q And what does that mean, "risk officer"?

A Essentially, the way I interpreted it and the function I performed, was to look at all the activities of the organization, cause there to be an evaluation of the risks that those activities faced, and then to develop or implement plans to ameliorate those risks as best we could, everything from rate risk to chance of a power plant catching on fire.

Q During your time at LCRA, did you negotiate water supply contracts and particularly a contract with SAWS?

A Yes.

Q And tell us what SAWS is.

A SAWS is the -- San Antonio Water System is the acronym. They essentially provide all of the water and wastewater services or -- I assume it's all. It might

be just predominant share of water and wastewater services -- to San Antonio in the Bexar County area.

Q Did you participate in the negotiation of any groundwater rights during your time at LCRA?

A Yes, we purchased a couple of very significant groundwater rights.

Q Did you -- were you involved in negotiating the details --

A Excuse me. Excuse me. You said "groundwater." I'm sorry. I was thinking of surface water. I did participate in the purchase of a groundwater option to drill 20 wells on the property of Pierce Ranch. That was -- as far as I know, that was the only groundwater purchase that I was directly involved in.

Q Thank you for clarifying for the record.

Did you -- were you involved in negotiating any deals with the City of Austin for a long-term water supply?

A Yes, I was.

Q So you retired from LCRA back in 2008. Correct?

A Yes, August of 2008.

Q And what have you been doing since you -- since you retired?

A Well, besides working in my garden, I have

created an engineering company called Paul Thornhill Engineering, and I use that as the vehicle to perform various consulting assignments. When people approach me and ask me to be involved in projects, I evaluate them and decide whether I will. So I've been working part time basically since 2008.

Q Have you ever given expert testimony?

A Yes, I have.

Q And in what types of proceedings and what was the nature of your testimony?

A When I was at the Water Rights Commission is the first time I ever gave testimony. I probably testified in -- I don't know -- 25 or 30. I guess they were similar to what we're doing today, but they were directly in front of the Commission in those days. They were -- when someone asked for a permit, there would be a hearing in front of the three Commissioners. I testified on behalf of the staff, the Executive Director.

When I left there and began consulting, I was -- as a result of the studies I was doing, I was asked to sometimes defend those studies in an administrative proceeding or a court. So I testified in federal court a couple of times. I think it's state district court in Kerrville. I'm not sure of the title

of that court, and I would guess probably -- I don't know -- a half dozen times.

Q Have you testified before the Texas Legislature?

A Yes, in the form of either the Senate or House Natural Resources Committee. I can't remember which. Maybe both. I testified regarding aquifer storage and recovery as a technology that Texas should consider.

Q And have you been an expert -- admitted as an expert in a court of law on surface water?

A Yes.

Q Have you been admitted as an expert in a court of law on groundwater?

A Yes.

Q Given your education, your prior employment, particularly at LCRA, and the Texas Water Rights Commission and your recent resulting work, do you consider yourself to be an expert in the Texas water resources industry?

A Yes, I do.

Q Do you consider yourself to be an expert in long- and short-term water supply planning, evaluations and permitting?

A Yes.

Q Do you consider yourself to be an expert in

water feasibility studies, water supplies and project management?

A Yes.

Q What about water supply contract negotiations?

A Also.

Q Do you consider yourself to be an expert in the cost of various regional water supplies?

A Yes.

Q Is the expertise in this industry the reason you were retained as an outside consultant in connection with the End Op project?

A I believe so.

Q And tell us when you were engaged on the End Op project.

A It's my recollection that last fall, about a year ago, maybe 13 or 14 months ago, I was approached by some folks with an entity called Cap Rock to perform due diligence as they considered participating in some form in the End Op project. That was it.

Q Was it your understanding that the Cap Rock group was interested in becoming an investor in the End Op project?

A Not until much later, and I've never been asked to be an investor. They asked me would I be interested in being a participant once they had make the decision

to go ahead and invest in the project.

Q I asked you a slightly different question, Mr. Thornhill. I was -- I was asking you what was the purpose of Cap Rock engaging you? Was it to evaluate the feasibility of the project because they were considering becoming an investor in End Op?

A I'm sorry. Yes, they -- that was my understanding. I was working specifically for -- it was called Cap Rock. I understand that to be a group of investors. I don't know much about the details of what they are.

Q Okay. So you said that you conducted some due diligence. Did that work involve identifying potential buyers of the End Op water?

A Yes.

Q Did that work involve analyses of how much it would cost End Op to provide delivered water making certain assumptions?

A I'm sorry, could you repeat the question?

Q Sure. Did that work involve evaluating the cost for End Op to deliver water?

A Yes.

Q Did your work involve the analysis of the availability of the groundwater in the Simsboro?

A Yes.

Q And why did you study that?

A In order to understand was there sufficient water to supply the 46,000 acre-feet that's subject to this hearing.

Q And what did you conclude when you evaluated the availability of the groundwater in the Simsboro?

A That there is a lot of water under Lee and Bastrop counties within this district and much more than what we were requesting or the sum of all the other requests that have been received.

Q How were you compensated during this due diligence period when Cap Rock engaged you?

A In the due diligence period, I had an arrangement where I was paid $250 plus expenses for my activities.

Q And ultimately did Cap Rock decide to invest in the End Op project?

A Yes.

Q And what was your role in the project once they became an investor?

A They asked me to continue to consult with them, to continue to be a part of the project, and also began asking me would I be interested in participating in the project.

Q Okay. How have you been compensated and by

whom since you completed your due diligence?

A Beginning in about March of this year, the checks that I received in payment have been from an entity called End Op, so I'm assuming I'm being paid by End Op.

Q And you had testified earlier that March was around the period of time in which you completed your due diligence?

A Yes. I mean, I think that's the time that the actual purchase by Cap Rock into the End Op project occurred, and after that we moved forward as End Op, not Cap Rock.

Q And what was the purpose of you continuing on after you completed the due diligence?

A In essence the -- I would summarize it as a continuing need to perform evaluations, to answer questions, to basically point it towards being able to market this water if permits were achieved.

Q And are you continuing to be compensated at $250 an hour by End Op?

A Yes.

Q Have you received any other compensation in connection with your outside consulting role?

A No.

Q Have you been offered any other compensation in

connection with your outside consulting role?

A Yes.

Q And what is that?

A About June, May or June is my recollection, the partners of -- or what I call the partners, the group of individuals that I'm working with, asked if I would be interested in a participatory share of 2 percent of some part of the project. I'm not sure exactly what the details would be. We've talked about it back and forth. But as we sit here today, that has not been consummated. I've not agreed to it. And, frankly, I'm not sure what the offer is.

Q All right. Are you taking on any other role other than as an outside consultant for End Op?

A Yes.

Q And what is that role?

A They've asked me to fill the position of chief executive officer for a -- doing business as business extension of End Op, which is called Recharge, and I've agreed to that. So in addition to my engineering firm today, I am the CEO of an organization called Recharge.

Q And approximately when did you become the CEO of Recharge?

A About a month ago.

Q And how are you being compensated in your role

as CEO?

A No different. There is no special compensation. I continue to bill the hourly rate that I previously had, and we're -- I assume that we'll continue to talk about the 2 percent participation, and that's all as far as I know.

Q Okay. Is the offer to have an interest in the project, other than as an outside consultant on an hourly basis or in your role as CEO of Recharge, contingent upon your testimony here today?

A No.

Q So in other words, End Op didn't say they would revoke this offer of interest if you didn't testify in a certain manner today?

A Correct; they did not.

Q Is this expertise that you've testified to, is this the expertise that you rely on to provide your testimony here today?

A Yes.

Q And the subject matters and the specifics of your testimony, are they outlined in Exhibit 51, specifically Paragraphs 2 and 3 under the designation of experts of Exhibit 51?

A Yes.

Q Okay. So these are the -- the topics that you

intend to give opinions on today. Correct?

A Yes.

MS. REESE: Your Honor, End Op tenders Mr. Thornhill as an expert on the matters identified in Paragraphs 2 and 3 on Exhibit 51.

JUDGE O'MALLEY: Are there any objections to Mr. Thornhill being designated as an expert?

MR. LEIN: No, Your Honor.

JUDGE O'MALLEY: Okay. Mr. Thornhill will be so designated.

Q (BY MS. REESE) Did you prepare a report in connection with your testimony today?

A No, I did not.

Q Why not?

A There simply wasn't time.

Q Did you prepare a written report in connection with the due diligence that you conducted on the End Op project?

A No, I did not.

Q I think it would be helpful for the court, because you didn't provide a written report, for us to do a quick overview of the opinions that you intend to provide today. Is that okay with you?

A Yes.

Q As you understand it, Mr. Thornhill, what are

the issues on remand in this proceeding?

A The -- I forget the exact wording, but it's basically the need for additional water over a 5-year period and a 30-year period.

Q And actually it's --

A I guess the wording is beneficial use is what I'm remembering, the beneficial use for water over the 5-year period and the 30-year period.

Q Does the amount of groundwater put to a beneficial use during the 5- and 30-year period sound familiar to you --

A Yes.

Q -- in terms of what you were asked to evaluate?

A Yes. I read the language, but I just -- I'm sitting here and I just can't remember exactly what it said.

Q No problem.

Tell us what "beneficial use" means to you.

A To me, you know, "beneficial use" is a definition that's contained in the Water Code that says if a use falls within the categories that the Water Code describes, municipal, irrigation, industrial, mining and some others, that if the use falls within those categories, it is deemed to be beneficial use.

Q Is it your opinion that End Op intends to put the water to a beneficial use?

A Yes.

Q And what use is that?

A Municipal.

Q A public water supply in other words?

A Public water supplies are usually municipal. They might have some power or something, but usually that's municipal, yes.

Q What is your understanding, based upon the remand questions, of exactly what it is that you were directed to do? Is it to determine whether or not the water will be put to a beneficial use, or is it to determine a specific amount that will be put towards -- to a beneficial use during a specific time period?

A What I was asked to do is do both, essentially look at the remand question, as I understood it, and then also to develop the information about the actual need for water during those time periods.

Q Is the need to demonstrate a particular amount of water in a 5- or 30-year period a requirement under Texas law to obtain a permit as far as you know?

A No.

Q Nonetheless, how did you go about determining an amount in a 5- and 30-year period?

A I went to the data that's publicly available on the Water Development Board website regarding regional planning, and I downloaded a bunch of data and information and basically did some calculations using that data.

Q Did you analyze the population -- projected population growth?

A Yes, I did.

Q Did you analyze projected water demand growth --

A Yes.

Q -- based upon population?

A Yes, I did.

Q Did you review anything else or analyze any other information?

A Regarding the specific demands, that was the source of my data. I also looked at the risks associated with continuing reliance on the existing water supplies. I also looked at costs, would our ability to deliver water be cost effective compared to what my understanding of the potential customers' current costs were and then some other things along those lines.

Q You made a distinction between the term "demand" and what you were asked to do. Could you

explain why you were careful about using the word "demand"? What do you mean by that?

A "Demand" is simply the term of art that I use to describe a customer or a user's water use. It's the full amount of their use, it's the growth in their use. It's all these issues associated with their use. So when I use the word "demand," I'm not trying to distinguish between the remand language. I believe they're essentially the same concept.

Q Did you form an opinion in conducting your analysis on what the appropriate horizon for planning for water is?

A Well, I think I had an opinion before this if that's, yeah, what you're asking. The -- to me, the appropriate quote-unquote horizon is at least 30 or 40 years, better 50 years, which is what the state has adopted, 50 to 55 years, that's what they've adopted in the regional planning. But when I was at LCRA, I recommended to the General Manager and the Board and we unofficially adopted a 100-year planning horizon. We were entering into contacts with customers, such as the City of Austin, that would last a hundred years, and so I thought the only responsible way to plan for that kind of need was to also plan our water supplies for a hundred years. So my opinion, a hundred years is the

appropriate level, but I can understand why shorter terms might be used by others.

Q Shorter terms such as 50 --

A No. In a municipal use, I think 30 years is the absolute minimum for long-term planning, essentially coinciding with the duration of the debt that might be taken out in order to pay for a project.

Q Do you have an opinion on the population growth and the water demand growth in Travis and Williamson Counties?

A Yes.

Q And what is that?

A Based on the information that has been put out over the last 15 years or so by the Water Development Board, I see continuous projections of growth. And every time they update them, they continue to say it's still going to grow beyond the current planning horizon in terms of both population and the conversion of that population into water demands. Both will continue to grow at a fairly rapid rate.

Q Do you have an opinion about how End Op's project could fulfill that project growth in demand?

A Yes.

Q What is your opinion?

A I believe that a project like ours or our

project specifically where we're -- if we obtain the permits, we would have 46,000 acre-feet, would be considered as a very attractive alternative or replacement for current water supplies amongst many potential customers in Travis and Williamson County. And I think fundamentally the water would be provided in such a manner that it would be -- those entities would want to use all of that water from day one if they decided to go into this kind of project.

Q In connection with analyzing the population in demand growth in projected water demand, have you identified any potential customers or users for the End Op project?

A Yes.

Q And who are those?

A After looking at the information that I looked at, I identified four municipal users, City of Austin, Round Rock, Cedar Park and Leander, as well as LCRA as being potential customers.

Q And would LCRA actually use the water themselves?

A If LCRA were the customer, they would not use the water themselves. Their role is to be a wholesaler and intermediary between the water supplies and the customers. So, no, they would not. They have a

de minimis amount of use at various facilities, like watering the grass at the general operation complex. But generally what they do is they sell their water on to the retail user.

The four entities that I mentioned, the four cities, are all retail customers or all -- excuse me -- firm water customers of LCRA, so that the chain would be the water could either flow directly to those customers or flow through LCRA to them. Both are valid.

Q And the potential customers that you mentioned, those four municipalities, what is their current source of water supply? It's being provided by LCRA in part. Could you tell us more specifically about that?

A In Austin's case, essentially 100 percent of Austin's water comes from the Colorado River. Legally part of it comes under water rights that the City owns apart from LCRA, but it's all from the same physical source, the Colorado River and the Highland Lakes.

In the case of Round Rock, Cedar Park and Leander, they all have contracts with LCRA, but they have other sources, for example, with Brazos River Authority, and some of them even have a few wells of their own.

Q In connection with the work that you performed for your testimony today, have you opined on the risks

or uncertainties associated with relying on surface water supplies?

A Yes.

Q And what opinions have you formed?

A My opinion is that we are either right on the cusp of or are currently in a Drought Worse than the Drought of Record. And that based on that, the reliability of the firm yield supply from the Highland Lakes is going to be reduced, and that provides a risk to customers or to LCRA regarding how much water they can assume will continue to be available on a firm yield basis from that supply. The ongoing drought basically has created an issue that I think will call that whole question very, very soon.

Q So what would a user of primarily surface water do when they're faced with such an ongoing drought as, in your opinion, we're experiencing?

A I think they would do what they've done historically and what I've seen them do. First they would go to their supplier, which up until a few years ago was me. They would say, "What are you going to do to solve this problem if the firm yield of your lakes is less than what you thought? What projects would you bring to bear that would supplement your water supply such that I can continue to receive the water from you

that I have contracted for, and how much are those projects going to cost me?"

I would also, if I were that customer, independently go evaluate could I develop additional sources or supplies on my own that would be either complimentary to or more cost effective or both to my continued use of the water from LCRA.

Q And what kinds of alternative or supplemental supplies would be reviewed or considered?

A Well, clearly the subject of today's proceeding, additional groundwater or adding groundwater as a source if you didn't already have it, but also you might look at other off-channel reservoirs commonly before you get to the step of trying to go to a new physical project. You would also look at conservation and reuse and those various strategies.

Q Is groundwater -- is groundwater more resistent to drought than surface water?

A I believe it is.

Q How so?

A The fundamental difference is surface water stored in a reservoir or flowing down a river is subject to evaporation, so you lose quite a bit of that water to evaporation. Water stored underground is essentially zero loss. And so there's some other minor issues, but

fundamentally it's the difference in evaporation between the two sources.

Q Have you opined on the current cost of water for these potential customers that you've identified?

A Yes.

Q Have you opined on the costs for End Op to deliver water to these particular customers?

A Yes.

Q And what did you conclude?

A I believe we can deliver water to Cedar Park, Leander, Round Rock and Austin and LCRA at rates that will be attractive to them when I compare what they are currently spending to develop their current water supplies.

Q Have you opined on the prerequisites necessary before a potential buyer will enter into a long-term water supply agreement?

A Yes.

Q And what do you believe those prerequisites to be?

A The shorthand that I have used, and I'll share it here, is if people came to me at LCRA and asked me would I be interested in purchasing water. I would ask three fundamental questions. I would say, "Do you have the leases? Do you have the permission and legal right

from the ground" -- excuse me -- "from the landowners who actually own that water to come to me and offer me that right? Show me the leases."

The second question I would ask is, "Do you have the permits, or what is the status of your permitting with the groundwater district or districts that would control access to that water?" And third, "Can you tell me the price of your water? How much is it going to cost?" And those three fundamental questions, that's essentially what the dialogue boils down to.

Q In connection with your due diligence, did you evaluate those factors that you consider prerequisites to enter into a long-term water supply agreement?

A Yes.

Q And what did you conclude when you analyzed the groundwater lease rights?

A At the time I first began the due diligence, the agreement between End Op and the landowners was in the form of an option. It's my understanding that there's now been a conversion to the full lease status for 42 of the 46 landowners, and we're still working on the last four. So the leases are in place for 42 of the 46. Options are in place for the other four.

Q And is it your understanding that before we got

to this proceeding today that the district had deemed End Op's applications administratively complete?

A Yes.

Q And in connection with doing so, is that an analysis of whether or not End Op has the right to construct wells in connection with the project?

A You mean right from the district or --

Q Rights themselves from the private landowners?

A Oh, yes. Yes, they have agreements in place that allow them to put wells on these landowners' property.

Q When did you first learn about the End Op project? Was it when you were asked to conduct due diligence on behalf of Cap Rock?

A No. I -- I believe -- and I would say that Mr. Limmer came to see me at LCRA years ago before I left in the early stages of this project and described what he was doing, and would I at LCRA be interested in this water. And I asked him the three questions that I just elaborated on, "Do you have leases? Do you have permits? What's the cost?" He couldn't provide that information to me, and I think that was essentially the first time that I heard of this project.

Q For those who don't know, tell us who Mr. Limmer is.

A Frankie Limmer is -- my understanding is the -- well, he's one of the former partners. I don't know who all the partners are of End Op, but he was to me the spokesperson for End Op at the time I met with him.

Q Do you have an opinion on the most efficient way to contract for water supplies?

A Yes.

Q And what is that opinion?

A Well, I think the most efficient way is to what I call baseload, which is that you would purchase the full amount, some amount that would last a very long period of time. You would not look at it piecemeal. And if you could avoid it, you would, for example in our case, lease the water, purchase the water, all 46,000 acre-feet, for a period of 30 or 40 years. That way you can plan for, and the development costs of delivering and treating that water are the most economical.

Q Is that consistent with the need to obtain long-term financing to complete such a project or construct such a project?

A Yes, that's part of it, and that's usually the primary driver in costs. You at least want to enter into contracts with folks such that your revenue stream matches your debt service stream so that you can assure the bondholders that you will be able to pay them.

That's 30 or 40 years usually, depending on where and how you sell the bonds. Many contracts, though, go much longer than that, like the contact we did with the City of Austin when I was at LCRA, 100 years.

Q What impact, if any, does the five-year permit term have on a project like End Op's and the ability to sell 46,000 acre-feet?

A If I were a customer of this water and what I've been working on trying to provide an answer for is the question that if you're saddled with a five-year permit term, what does that mean in terms of your ability to renew that permit and what are the risks that that brings to me? Fundamentally I want to see, as a customer, long-term permitting in place, 30 years or more. And so I would have a lot of questions. If -- well, I would have a lot of questions about it as a customer.

Q Have you studied the renewal permitting process in connection with End Op's permits at Lost -- pending at Lost Pines?

A I have read the rules. I've never been involved in a permit renewal with them.

Q And what is your understanding of how the renewal works?

A I'm not sure. I think that what would happen

is if the permit was fixing to expire, that there would be a reapplication, and you'd have to go through this whole process again.

Q In contracting -- in contract negotiations, you said you would have questions as a buyer. Do you think that that would deter a buyer from entering into a contract for the full 46,000 acre-feet?

A Yes. If the five-year term carried with it a much smaller amount, based on what I understand the remand question to be, then, yes, as a customer I'm going to say, "Wait a minute. You only got a permit for X. I want to buy Y. How can you deliver Y to me," you know, the larger volume. You asked for 46 and you only got whatever it was. So it's -- it's very important. Again, because as a customer, I'm going to be looking at my long-term costs for my total system, not just the next five years.

Q Are you familiar that End Op has committed to pay for the potential financial impacts on existing users in the Simsboro?

A Yes.

Q And in the projections of costs that you have prepared today, is the mitigation costs embedded within those costs?

A Yes.

Q From a buyer's perspective, is that a good or a bad thing?

A Pretty much it's a good thing.

Q Why so?

A Because it removes one of the issues that would -- I'm sure would come up in discussions, and that is there might be objections, there might be impacts, what have you done to mitigate those impacts. As far as I know, the agreement that we have is the only such arrangement that I'm aware of in a proceeding like this.

Q Have you studied the details of SAWS -- you mentioned earlier, the San Antonio Water System? Have you studied the details of their development activities --

A Yes.

Q -- in connection with forming your opinions?

A Yes, I have.

Q And what have you studied specifically?

A Specifically most recently I looked at the contract that SAWS is -- SAWS and an outfit called Vista Ridge have entered into that was approved by the SAWS board and by the city council within the last couple of weeks. I call it the Vista Ridge contract.

Q And why did you review that?

A That contract -- well, fundamentally because it

was available. I could get to it because they did a fairly unique negotiation process where it was all done in public, and they've posted the results of their negotiations on the website. So I could go there and get the actual contract.

Second, because of the way that contract is structured, it provides a very interesting and I would say almost unique approach to a buyer and a seller agreeing on terms. And so I wanted to understand what that approach was so that I could basically see if it applied to our project or could apply to our project.

Q And what did you conclude?

A I concluded that this is a -- fundamentally a -- to me will set the gold standard going forward because it is a very good contract for both parties. I believe the concepts embedded in that contract have direct applicability to the End Op project ability to deliver water to Austin or Round Rock or whomever. And so I think it's a very useful go-by.

I also know that if I were a potential customer of End Op, one of the first questions I would ask is, "Well, SAWS did this. Explain how your project would relate to the method SAWS and Vista Ridge used," and so I needed to be ready to do that.

Q What is the method that they used for -- what

is "innovative"? You used that term earlier about that particular contract.

A Well, the innovation is that -- two things. One, it was done in public, which is fairly -- I don't know of any other like that. But I think more importantly on the terms of the contract, it was the mitigation of risk to both parties that's embedded in the terms. Fundamentally SAWS has agreed to pay for the physical delivery of water or the ability to have water physically delivered to them in Bexar County. So SAWS has no ownership until the past 30 years of any other pipelines or wells.

Having Abengoa, which is one of the -- the Vista Ridge group which includes a company called Abengoa, have agreed to develop all the entirety of the project in return for a guarantee of payment. So in essence both parties have said if the water is deliverable or is actually taken by SAWS, Abengoa will get paid. And embedded in that is the concept that for certain expenses, which are subject to inflation like energy and O&M, SAWS agrees to pay those as a pass-through cost at their actual cost.

In essence what they've done in this arrangement is remove almost all of the risk to both parties because they're predefining who is going to pay

for what, they're predefining that the energy and O&M can actually increase in cost as energy prices go up in the future. And so that reduced the risk to both parties. They know what their costs are going to be as they go into this, and all that is on their website and in this contract that I pulled.

Q And contrast with -- that with what is the typical water -- long-term water supply agreement.

A Typically -- although there are some variations, typically if I were a water user, I would go find the water myself, buy the water from the source of supply, build the water plants, build the pipelines, build the pump stations, build them and own them myself and embed -- essentially take all the risk for that.

In this case, Abengoa, or the Vista Ridge consortium, has agreed to make the initial investment in return for a contract that says they will be paid. In some entities, like if I bought my water from LCRA like Austin and these others do, LCRA has incurred the cost of creating the supply, and they set a raw water rate, which as a user I go to them and say I want to buy raw water from you, but I'm still responsible for treating it and delivering it to a pipeline to my end users. So that's sort of a combination as opposed to a totally stand-alone project.

Q Obviously you're familiar with LCRA's water supplies given your tenure there. Have you kept abreast since you retired from LCRA?

A I've tried to.

Q And what are your conclusions with regard to LCRA's long-term water surface supply?

A I believe that the supply that I'm familiar with, when I was there, is at risk due to the ongoing drought and the probability that we're already in a Drought Worse than the Drought of Record. I'm also essentially pleased to see that LCRA has moved forward with the concept of constructing an off-channel reservoir downstream in Wharton County. It's very similar to a concept that I worked on for years when I was there.

Also, LCRA has, for the first time, begun to look at investing in groundwater supplies, specifically the Lake Bastrop property that LCRA owns around the Bastrop power plant. They apply it to the Lost Pines district for well permits and have received them. And as far as I know, that's the first major groundwater project they've engaged in.

Q Have you opined on the possible production amounts in the future for End Op water if permits are obtained?

A Could you ask the question again?

Q Sure. Do you have an opinion about the amount of water that End Op could sell if it obtained permits?

A Yes.

Q And what is that opinion?

A I believe we could sell all of it on the first day that the water could be delivered.

Q And, Mr. Thornhill, in forming these opinions that you've summarized for us, did you review, rely upon and/or prepare Exhibits 52 through 106?

A I relied on them, in part, and I prepared them all.

MS. REESE: Thank you. Your Honor, End Op moves to admit Exhibits 52 through 106.

JUDGE O'MALLEY: Okay. Are there any objections?

MR. LEIN: No objection.

MR. GERSHON: No objection.

JUDGE O'MALLEY: Thank you. End Op's Exhibits 52 through 106 are admitted.

(Exhibit Applicant End Op Nos. 52 through 106 admitted)

MS. REESE: And actually, Your Honor, I move to admit 51 as well.

JUDGE O'MALLEY: Okay.

MS. REESE: Thank you.

JUDGE O'MALLEY: Any objections?

MR. GERSHON: No, Your Honor.

MR. LEIN: No, Your Honor.

JUDGE O'MALLEY: End Op Exhibit 51 is admitted.

(Exhibit Applicant End Op No. 51 admitted)

MS. REESE: And for the record, I'd like to note that End Op has withdrawn Exhibit 107.

JUDGE O'MALLEY: Okay. We will note that for the record, that End Op Exhibit 107 has been withdrawn. And that takes care of Aqua's objection. Correct?

MR. GERSHON: It does. Thank you.

JUDGE O'MALLEY: Thank you.

Q (BY MS. REESE) All right. Mr. Thornhill, let's delve into the details of these opinions and what you've reviewed and relied upon and the assumptions you made in forming your opinions.

A Okay.

Q Do you need to take a break, or are you okay?

A No, I'm fine.

Q Okay. You just let me know if you need to take a break.

A Okay.

Q You testified earlier that the appropriate planning horizon for water is somewhere upwards of 50 years. Tell us a little bit more about why you have that opinion.

A Longer is better. Because it takes so long to develop projects, to obtain the permits and the financing, to construct them and get them into operation, that the longer term you can have is better.

Also, as I stated, the financing is usually 30 to 40 years. So at a minimum that would be the length of a project once it's built. But you have lead time you need to add on to that to get it going. 50 years, for example, which the state has adopted, would carry it beyond -- if you knew of a project today that you might need at the end of that 50-year period, you could begin the planning and the processing to get it underway.

If you were only planning for 30 years in the future, then by definition you don't know what's going to happen in the 31st year or you've put blinders on about it. It's just not a good way to go about it.

Most entities that I'm aware of have participated in and adopted the 50-year to 55-year planning horizon that the Texas Water Development Board is currently using. The exception would be both the

City of Austin and LCRA, to the extent we entered into a hundred-year contract.

Q Is looking at an amount in, say, for example, a five-year period, an amount used within the incremental five-year period, is that consistent with your opinion about the appropriate horizon for water planning?

A No.

Q Could you please explain?

A Well, fundamentally if I'm going to look five years in the future, that's a little bit of water that really doesn't solve my problem at all. I need to look 50 years or more in the future in order to do a cost-effective planning process and be able to understand what my water is going to cost and where I'm going to go to get it. I don't know of anyone, anywhere who uses a five-year planning process for water supply.

Q Do you know of an instance in which a user attempted to contract for an incremental need within a five-year period?

A I'm sorry, repeat the question.

Q Sure. Do you know of any instance in which a user attempted to contract for an incremental amount which was needed within a five-year period?

A Well, in an emergency situation, if I were -- if I had a pump break or a pipeline burst or a dam fail

in my system, I might go somewhere else and buy water for five years to fill in in an emergency. But in terms of -- as soon as I got that fixed, I'd go back to my prior status. So I -- that would be the only circumstance that I could foresee.

Q You testified earlier that the first step in identifying a water demand is to analyze and consider population growth and the projections and how they impact water demand growth. Did you analyze any population growth in Travis and Williamson Counties?

A Yes.

Q And is that demonstrated in Exhibit 52?

A Yes.

Q So what does Exhibit 52 tell us about the population projections for Travis and Williamson Counties?

A Well, for the county totals, if you look across the top -- top two lines of the graph, the data would indicate that there's a significant growth. You can compare decades -- these numbers are basically decade by decay from the Water Development Board. So between 2020 and 2070, Travis County's population is going to go up by about 60 to 70 percent. The Williamson County population is projected to almost triple in the same 50-year period.

Q And if you look at the 2015 to 2020 increase column on this table, how did you derive that information if the population projections are made in decades?

A Because these projections are made on the even decades, to get the five-year period from 2015 to 2020, I had to estimate the 2015 numbers. So I simply averaged the 2010 and 2010 -- excuse me -- 2020 numbers, then I subtracted that average from the 2020 number, and that gives the 2015 to 2020 increase column, which is the fourth one over basically.

Q So is the bottom line, if you wanted to just look at the increase in projected population from 2015 to 2020 for both counties, is that number demonstrated the 246,849?

A Yes.

Q Okay. Did you graph this information?

A Yes.

Q Is that what's on Exhibit 53?

A Yes.

Q You have, I see, in the middle of Exhibit 53, two projections. Why don't you tell us what you did here.

A Are you referring to the graph?

Q Correct.

A All right. In the middle of the page, there's a colored graph. Yes, the -- in essence, the top two lines, the green line and the blue line, are the Travis County projections from the year 2000 to the year 2070. The bottom two lines are the Williamson County projections from the year 2000 to 2070. The reason there's two lines for each is that they -- in the case of the top two lines, I'll use that as an example to explain it.

The blue line are the projections that were made for the 2011 regional water planning process, which was finalized in 2011, the water plan issued and that's the current water plan today as we stand. The Water Development Board, however, has issued the population and demand projections for the next round, which is ongoing right now, which will terminate in 2016.

So to read the graph that -- you see the label 2011 Travis, which is the blue line, then look at the label for the green line is 2016 Travis. All that is is an undate by the Water Development Board based on their current underring of what the populations are going to be. And if you look on the right-hand side, you can see the green line goes one more decade because in the -- in this round, they are extending the whole

planning process by 10 years. And every other time they do a plan, they extend it another 10 years into the future. That maintains a minimum 50-year planning horizon.

Q And when you look at -- and the ones on the bottom, the purple and the yellow, those are Williamson County. Correct? The purple and the red.

A The purple and the red, yes.

Q And when you look at the trends that are depicted here, what does that tell you?

A It tells me that just what I said from the prior exhibit, from the table. The bottom line, the projections have been and continue to be that both county's populations will continue to grow fairly rapidly. And, in fact, as they've updated the projections, compared to five years ago, they think it's going to grow even more than what they previously thought. And that's why the two curves -- you know, the current curves are higher than the prior curves.

Q You prepared information on the bottom of Exhibit 53 for a major -- the major WUG population. What does "WUG" stand for?

A "WUG" is water user group. It's an acronym used by the Water Development Board planning process.

Q And why did you track the population grown

specific to particular users?

A Again, in thinking about who the potential customers might be, I didn't want to just rely on the county total. I wanted to look and see what Austin, Cedar Park, Leander, in fact Georgetown and a number of others when I first started, but the purpose is to track the -- essentially as I began to focus on those four entities, what were their demands going to be.

Q Okay. And so the next step is to actually take those population projections and see how they translate to water demand productions?

A Correct.

Q And is that what is demonstrated on Exhibits 54, 55 and 56?

A 55 and 56 show that. 54 is -- well, I think the answer to your question is "yes."

Q Okay.

A Let's stop there.

Q Thank you.

So Exhibit 54 is just sort of the raw data. Is that correct?

A Correct. And that was the distinction I was going to make. This is -- this is an example of when I go to the website and download this massive spreadsheet and then sort the data by county and by water user

group, which are the second and third columns of this table, this is the data you get for the 2020 to 2070 decades. So if you look at the bottom of the page, the sum of those columns is down there at the very bottom. This is simply the raw data that I used from here on out.

Q Okay. And the tables in 55 and 56 basically graph the raw data. Is that correct?

A Correct.

Q So let's look at Exhibit 55. You want to tell us how to read this?

A It's very similar to the other graph. This is total demand by county, so this is everything. This is municipal, industrial, irrigation, mining, all of -- all uses. The upper two graphs are for Travis County. The lower two are for Williamson County. I duplicated the numbers at the bottom. It might help read the graph.

Q Okay. And is the trend that you saw with regard to population, that when the 2016 numbers came out they were higher than the 2011, is that trend apparent here when you look at the water demand growth?

A Yes, it's perhaps not as dramatic, but you can see, for instance, in the top two the gray line is slightly above the blue line. So five years after they made the projections, they made them again and they were

higher than what they did before.

Q Okay. If you look at the table at the bottom, how do we calculate what the total demand is then for Travis and Williamson County for 2020?

A Well, you go to the column entitled 2020 at the bottom and you add -- the ones I would use is the 2016 Travis of 291,000 and the 2016 Williamson of 121,000 that add -- you need to add those together, and that's about 410,000.

Q Okay. Did you do any graphing just strictly with municipal demand, the demand that End Op is going to provide the water for?

A Yes.

Q And is that on Exhibit 56?

A Yes.

Q So you read this chart very similarly to the previous one. Correct?

A Yes. I expanded this one a little bit. As I was noticing that the projections changed, I thought, well, what did they project back in 2006. So this chart has three planning projections on it, 2006, 2011 and the current 2016 projected demands. You essentially read it in the same way. You can see the differences between the demands made at the different planning periods, and you can see that in the latest round they've extended to

the year 2070. Before they stopped at the year 2060, but now they're going all the way to 2070.

Q Is the same trend that we have been seeing when the new projection come out apparent -- consistent on this chart as well?

A I'm sorry, could you ask it again?

Q When the 2016 numbers came out, are they higher than what the 2011 projections are?

A Not -- not always. For example, if you look at the -- let me be sure I'm answering you right. Yeah, the -- this is just municipal. This is not total demand. So if you look at the upper chart, in the year 2060, the gray line is the 2011 demand, the blue line -- or excuse me -- the source of the gray line is the 2011 demand projections. The blue line is below that. So unlike what we've seen in some of the other graphs, they're projecting a slightly lower municipal demand as they updated the demands.

Q And into the future, the demand is continuing to grow. Correct?

A Correct.

Q So how much is the total municipal demand in Travis and Williamson County for 2020?

A Well, again, you go to the column labeled 2020 and I would use the 2016 numbers, which are the bottom

two rows. Yes, that's right, the bottom two rows. So 228,000 plus 112,000 more or less, so 340,000 --

Q Okay.

A -- approximately.

Q What does that tell you when you compared it to the total demand that we just looked at on the previous exhibit?

A It's the, by far and away, the largest share of the total demand. I think the total demand was north of 400,000, this is 300,000, so it's about three-quarters of demand.

Q Okay. Have you conducted any analysis relative to a user's demand in terms of percentage of growth?

A Yes.

Q Is that what you can see in Exhibit 57?

A Yes.

Q And this is called 20 Municipal WUGs, and you've ranked them. Why did you rank them by 2070 demand?

A Simply as a matter of convenience. I was curious as to if I looked at the total demand at the end of the planning period, in other words, the farthest in the future that I had numbers, who was going to grow and by how much? So I simply took the raw data for each of these 17 water user groups, sorted and stacked it based

on the column that's headed 2070 from largest to smallest and essentially allows me to assess how much water each of them might need at the end -- you know, during and at the end of this 50-year period.

Q And so if you look at the column -- the second-column-to-last column on the right, that is in acre-feet, the growth in demand from 2020 to 2070 in acre-feet?

A Acre-feet per year, yes.

Q And then the furthest right-hand column is the actual percentage of growth during that time period?

A Yes, it's -- for example, to read that column, the 74 percent calculation is the column just to the left of that, 121,000 divided by the 2020 demand of 165,000. So that's how the table works.

Q And so was it a coincidence that the potential customers that you have identified are listed at the top of this table?

A Not at all. This table and others led me to those customers.

Q Okay. And so what does this tell you about the demand for Austin, Round Rock, Leander and Cedar Park, the four potential customers that you've identified?

A Well, the easiest way other than the fact that their demands are growing -- and I'll make an exception

to that in the second. Look at the second-to-last column, the 2020 to 2070 growth in demand.

Austin from 2020 to 2070 is projected to grow by 121,000 acre-feet, more or less, in demand. What that means is a project like ours would only be a small part of their current or future demands if you look at it from an incremental basis for the next 50 years.

When I looked at Round Rock, Leander and Cedar Park, Round Rock and Leander -- Round Rock is 39,000 acre-feet, Leander is 34,000 acre-feet in round numbers, those are smaller amounts over the next 50 years than the amount we are requesting from the district for our permits. But if you combine the two of them, they obviously exceed the amount.

The reason I looked at combining them is all of these entities -- all four of these entities take their water from the Highland Lakes. Cedar Park, Leander and Round Rock are all participants in a regional water treatment and delivery system called the Brushy Creek Regional Utility Authority. And so providing water to one of them my benefit the other, and I think it's very likely that a combination of one or more of these customers would be a very likely customer.

The exception that I spoke about a second

ago, if you look at Cedar Park, which is the sixth row down, you know, the sixth row down, the total demand over the next 50 years was only 2,000 acre-feet, about 9 percent. Cedar Park is landlocked from an expansion perspective. There's other entities all the way around it.

Pretty much if you look at the water demands across time, you should have fairly constant, a little bit of rise as they do infill. And what this tells me is that Cedar Park alone may not be as strong a candidate to be a customer as the others. They may still be because they share facilities with the others, but that's what I got from this table. It essentially -- the high probability customers remain Austin, Round Rock and Leander. Cedar Park is still a potential customer, especially if you group them together, but it's probably not as high or not as likely that they would be a customer as the other three.

Q Okay. If you took this project to the city -- the End Op project to the City of Austin, how do you think they would evaluate End Op's project?

A I think they would ask the same three questions I asked, "Do you have leases? Do you have permits, and can you provide a price?" They'd want to know how much water we could deliver, at what point in time, at what

price.

Q You testified earlier that, in your opinion, it's not appropriate to look at an incremental need in a five-year period for purposes of water planning or contracting. But nonetheless, did you actually calculate a demand growth for the 2015 to 2020 years?

A Yes.

Q And is that what is on Exhibit 58?

A Yes.

Q So tell us what the bottom line is about this information that you've compiled here.

A Based on my understanding of what the remand question was and how it might be answered explicitly, I took the -- actually this table shows all demands, but the one -- the rows that I relied upon are only the municipal. So the top series of rows is Travis County, the next one is Williamson, the bottom series of rows is the combined total.

So if you look at the combined municipal row -- and I'm sorry, the rows aren't numbered -- is about the 15th one down, but that first row under combined, you see there the calculations by decade -- or excuse me -- the projections by decade and also my calculations of the 2015 and then the 2015 to 2020 increase, as well as over on the right-hand side the

2045 to 2050. I had to calculate the 2045 column because, again, it was an odd decade. And I thought it would be easier to read -- maybe it's not -- but I pulled the numbers down into the smaller table at the bottom to reflect, I think, what would be a technical, literal response to what I understand the remand to be.

Q So if you look at the five-year municipal need total for 2015 to 2020, that's the 339,704 number. Correct? It's very small numbers, I understand.

A Yes, the -- and that comes from right above that. That column you'll find all four numbers that we're fixing to talk about are in the row labeled Combined Municipal going across the page.

Q Okay.

A So I just copied them down to the bottom to highlight them.

Q So this is every user in Travis and Williamson County of municipal -- for municipal use, the demand between -- in that five-year incremental period is approximately 340,000 acre-feet? Is that how you read that?

A I believe that's the need five years from now, not the incremental. That's the total need of all users five years from now, not the incremental need.

Q And so --

A The next row is the incremental need.
Q The 31,510 --
A Correct.
Q -- acre-feet?
A Correct. That's -- if you look in the municipal -- well, yes, the answer to your question is "yes."
Q And so that is less than the 46,000 acre-feet that End Op is asking for?
A Correct.
Q In your opinion, does that mean that End Op only needs a permit for 31,510 acre-feet?
A No.
Q Why not?
A Again, for the reasons we've been talking about, the normal planning horizon goes all the way out to 2070 or beyond for all of these entities, all of whom are participants in this regional planning process.

I believe that our project, because of the -- essentially the risk that the current supplies are placed under by the current drought, plus our ability to deliver an economically attractive alternative to them, that these customers would look kindly upon the full amount and, in fact, might even ask us why we couldn't deliver more.

Q So is it your opinion that the 31,510 acre-feet is not representative of the amount that End Op would be able to contract for?

A Correct. I think we could sell a lot more to one or more of these entities.

Q And then if you look at the 30-year out numbers, specifically the incremental demand from 2015 to 2045, that number -- do you have an opinion about that number as compared to the volume of End Op's use?

A Essentially it's almost ten times what we've requested. If you look -- as I understand the remand, the 30-year number was for the export permit. And the demand in just the next 30 years, the incremental demand, the increase in demand, is 450 -- 451,000, you know, roughly ten times what our permit request is.

Q Okay. You testified earlier, Mr. Thornhill, that you thought that we were in the worst drought of record. Is that correct?

A Yes, that's what I think.

Q Have you prepared any exhibits demonstrating and supporting this opinion?

A Yes.

Q And are those Exhibits 60 through 86?

A Yes.

Q Okay. So let's take a look at Exhibit 60.

What does this tell us about the drought?

A What 60 is is a snapshot in time of about -- looks like a couple weeks ago -- of the status of drought in Texas. This is available off the TCEQ website. It says Drought Impact on Surface Water because it comes from the TCEQ website, but this is a commonly used graphic to display the extent and severity of drought.

Essentially anything on -- just to explain how you look at it, anything that is not colored, all the white area, means there's no drought using the methods they use to compute a drought, no drought in existence. But anything that's colored, yellow, orange, red or brown, means some sort of drought exists. And the darker the color, the dark brown is the most extreme drought.

Q And this is a snapshot in time. Correct?

A Correct.

Q And are there different kinds of droughts?

A Yes.

Q Can you tell us a little bit more about that?

A Well, depending on what academic you talk to, there could be hundreds of kinds of droughts. But I boil them down, and I think the generic use of droughts, is you can have a -- a precipitation drought where you

simply have reduced precipitation and people are measuring the fact that the rainfall this year is less than it was last year or something like that.

You can also have an agricultural drought, I would call it, where farmers and those dependent on soil moisture measure the soil moistures and are very concerned about that because you could have a -- well, I won't explain.

And then the third kind of drought is the one that I think is most pertinent to this discussion, and that is if you are an owner of reservoirs and you are dependent on the water stored in those reservoirs, once the water level in the reservoirs begins to fall, you never know if they're going to -- you never know if they're going to go empty or not, and so you're constantly monitoring the status of your reservoirs, and I would call that a hydrologic drought.

Q And what causes a drought?

A Fundamentally, drought is a result of reduced precipitation. Higher temperatures result, which also drive up demands, and things like that happen. But fundamentally, a drought is reduced precipitation.

Q Are there impacts on the availability of surface water in times of drought or as a result of drought?

A Yes.

Q And what are those impacts?

A In essence, if you picture a raindrop falling onto the ground and running off into a river and that river then feeding into a lake, if it doesn't rain, that doesn't happen, so the lake level falls. It reduces inflows -- which is the term of art -- reduces inflows to the rivers and/or storage reservoirs that are available to capture those inflows.

Q Are there any other impacts on the availability of surface water?

A In a drought you mean or --

Q Well, you talked about -- so let's take a step back. You talked about inflows being reduced when there's no rain or less rain into the lakes and the rivers. And then when there's less inflows in there, what ultimately ends up happening in those lakes and those rivers?

A Well, the lake levels fall, which is what -- I'm sorry if I didn't say that. The impact is that like on the Highland Lakes, or Lake Travis and Lake Buchanan, if the inflows are reduced, that means there's not as much water coming in to make up for evaporation and releases and uses by customers, the lake levels begin to fall. That's certainly what we're seeing today. If it

rains and floods a lot, the lakes stay full, and you're generally not in a drought.

Q And are you allowed -- is every drop of water in the lake or the river available for surface water supply use?

A No.

Q Can you tell us a little bit more about that and approximately how you evaluate what is available versus what is actually in there?

A You have other uses that you have to meet, both regulatory driven and as a result of your operations. For example, permits today are usually contingent upon meeting certain environmental issues downstream. So many times you have to let a little bit of water go or a lot of water go out of your dams and reservoirs to meet those downstream needs.

The primary issue, I think, is the net of all those demands and the net of the municipal or industrial or a combination of demands you put on a reservoir is driven by the derivation of firm yield for that reservoir. And firm yield is a term of art that's used to describe how much water you can dependably get out of that reservoir if you had a repeat of the Drought of Record. The Drought of Record is essentially from the mid '40s to the mid to late '50s; '46 to '57 is what

I use. And so that tells you that -- a number. It says that if we had a repeat of the drought of the 1950s and you pumped continuously on your lake during that drought, this is how much water could you dependably get.

The TCEQ and its predecessor agencies have adopted that as the criterion upon which they issue municipal water permits to reservoir owners, firm water basically to reservoir owners. So LCRA's Highland Lakes, the amount of water that's available from them is dependent upon the derivation of the firm yield of those lakes. Firm yield is set by the drought standard that you've adopted to compute the firm yield, and historically that drought has been the 1950's. In my opinion, the current drought is worse than that, and the firm yield is falling.

Q Have you evaluated, in connection with coming up with your opinion that we are experiencing a Drought Worse than the Drought of Record, did you prepare any tables or graphs charting the severity of the drought over time?

A Yes.

Q Okay. And are those in Exhibits 61, 62 -- well, I believe it's just 61. What does this tell us about the severity of the drought?

A 61 is hundreds of snapshots. The prior graph, which was the State of Texas colored in, was one day out of one week. They do that weekly. If you look across the lower scale here, it's from the year 2000 to today. Those colors are the same colors -- or they are supposed to be the same -- depiction of the same drought conditions that are shown on the prior map but over this entire period of time.

So again, it says that if the color extends all the way to the top of the chart, that means 100 percent of the state was impacted by drought. So where you see white areas, again, there was perceived to be only partial or no drought. But over on the right-hand side, for example, if you look at about the year 2010 to the far right-hand column, you see that over 90 percent of the state in round numbers has been in some sort of drought for the last four years.

So you read this chart basically by, number one, how high up on the graph does it go. You also -- a handy tool I do, I just look at the purple. Purple is the absolute worst drought. It's called the exceptional drought. And if you look at the year 2011, 80 -- I believe the actual number is 88 percent of the state was in the exceptional drought category. The entire map that we previously looked at would have been

colored, almost 88 percent of it, dark brown. And so that's consistent with our understanding and the understanding of the public and my analysis of it, that 2011 is the worst -- that year is the worst year of drought in our recorded history as long as we've been keeping records. People say there were worse droughts long ago, but since 1940 that's clearly the worst drought we've ever had.

Q So what does this information mean for water plans?

A This is just a tool to increase awareness. It tells you that, yes, droughts happen. It tells you that you should be concerned. It's a good communication tool for the public to show them both the severity and the timing of these droughts. In terms of direct application, there really is none.

Q Okay. When do you think the current drought that we're in started?

A Everything I'm going to talk about is going to be what I would call a hydrologic drought as it affects the firm yield of a reservoir, the Highland Lakes upstream. In the case of the Highland Lakes, I believe the current drought that we're in started in March of 2008. That was the last date that both reservoirs were completely full.

Q Have you studied the impact of drought on surface water storage?

A Yes.

Q Is that what you have depicted on Exhibit 62?

A Yes.

Q And tell us what this is.

A This is a download from the -- a Water Development Board cite. The web address is at the top of the page there. But anyone can go there and look at this information. I simply downloaded it and printed it.

The Water Development Board tracks reservoir contents in 114 major reservoirs in Texas, and that's any reservoir that's more than 5,000 acre-feet in capacity. They put this plot out there -- I think they update it every week. I may be wrong about that -- where the color of the dot depicts the content of the reservoir relative to its permitted content; in other words, how empty is it? So a blue reservoir is essentially full. A dark brown reservoir could be empty. So the lake --

Q Tell us where the Highland Lakes are, the lakes that are the primary water supply source for the potential customers you've identified.

A Well, I wish I had circled them before we

printed this. But, you know, if you kind of look right in the middle of the State of Texas, right there where if you know where Travis and Burnet Counties are, there's two I would call it peach-colored larger dots that have three blue dots right next to them or on top of them. The one to the lower right is Lake Travis, the one to the left is Lake Buchanan. The blue dots are their attempt to depict Inks Lake, LBJ, Marble Falls and Austin. They're what we call the constant level lakes. So the reason they're blue is because they are artificially maintained full.

The only two lakes that are used for water supply are Travis and Buchanan, and so they are in the 30 to 40 percent range, that peach color, and that's correct. They're about 32 or 33 percent today.

Q And what about the red dots that are northwest of the Highland Lakes? Which reservoirs are those?

A River basins in Texas basically run from the southeast to the northwest. So although this doesn't show river basins, these are reservoirs throughout the state all the way up into the Panhandle. If you just go on kind of a 45 degree diagonal upstream from the Highland Lakes or to the upper left from where I described the Highland Lakes to be, there's a cluster of six or eight orange or red reservoirs. All of those are

in the Colorado River basin. They are all extremely low. From a reliable perspective, they're empty, and that's what this data shows.

If you sort of drew a line down the middle of the state vertically and looked to the left, virtually every dot to the left is 50 percent or less in capacity. If you look to the right, there are some that are lower, but in East Texas we continue to enjoy lakes that are much fuller.

So in a -- in a rough sense what this tells me graphically is the drought information I saw on the previous exhibits for the entire state averaged, this begins to tell me how is that drought geographically dispersed around this state from the perspective of reservoir content. And West Texas is suffering far more than East Texas is my conclusion.

Q The reservoirs northwest of Lake Buchanan and Lake Travis that you mentioned, in the same river basin as Lake Buchanan and Lake Travis, if those are very -- if their storage capacity is very low, what impact, if any, will that have on the storage capacity eventually in Lake Travis or Lake Buchanan? Is there a connection?

A Yeah, there's -- there's two connection. One is actual, and the other is potential. The first connection is, they will intercept any runoff that

occurs in West Texas. If they had a huge storm out there, it would fill these lakes first before it ever came to the Highland Lakes.

The second is, when I look at this information and look how it's changed over time and look at the situation that those reservoir owners have found themselves in, I believe that that line is moving to the east. The line of the yellow to orange to red is moving to the east. It waffles back and forth.

But just as we see that Travis and Buchanan are in the 30 percent range, immediately upstream of Buchanan is Ivie Reservoir. It's only about 15 percent full. It's the large -- the first large red reservoir that you encounter as you go upstream from the Highland Lakes, about a hundred miles upstream from Buchanan. And I -- my interpretation of that is there's a very real risk that this drought could extend to the east; our lakes could go dry.

Q Tell me about that red dot, the kind of square-looking large red dot in the Panhandle. What is -- what reservoir is that?

A If you -- if you look in the Panhandle and see the rows of counties, look at the second row of counties down. Right in the middle of the Panhandle, that larger red dot, is Lake Meredith on the Canadian River.

Q And it's bright red. Does that mean there -- that it is -- has zero percent or zero to 10 percent storage in it?

A For A period of about five years, it was less than zero. I believe they caught a little bit of inflow a couple of months ago. And the last number I saw was that they're 4 percent, but it's still a dark brown color.

Q So have you prepared a series of exhibits explaining how we got to this -- these severe drought conditions that we are currently in?

A Yes.

Q And let's take a look at Exhibit 66. This shows U.S. in different climate divisions. What division is Texas in?

A I don't know what Texas is in. I think it's just Texas.

Q Okay. Is it No. 6 on the map?

A Within Texas, Texas is subdivided into climate divisions. If you look at Climate Division 6, if you can read it, it's essentially the Edwards Plateau area that would start more or less where we are and extend to far West Texas. So for some of the stuff I did, I chose that as the appropriate area to look.

Q Okay. So let's take a look at Exhibit 63

and 64. You looked at that, again, Division 6. In 63 and 64 and 65, for Division 6, what does that tell you about the climate over time?

A Everything that we've looked at up to now has kind of been for the whole state. When you zero it down onto Climate Division 6, you're looking more or less at the watershed that feeds our area. It's not exact, but it's pretty close.

63 shows another depiction of drought. This is the Palmer Drought Severity Index, the PDSI. Basically anything that's green is non-drought, anything that is yellow is drought. And it shows that today we are in a pretty significant drought compared to history.

And just as a point of interest, if you look back to the time period between 1950 and 1960, if you use this index, you can see that the drought in the '50s would still be worse than the drought we're experiencing today.

Q Okay. And that was on Exhibit 63. Correct?

A Correct.

Q Okay.

JUDGE O'MALLEY: Ms. Reese, is this a good time for a break?

MS. REESE: Sure.

JUDGE O'MALLEY: People might be getting

antsy for water or the bathroom. Why don't we go ahead and go off the record.

(Recess: 10:55 a.m. to 11:12 p.m.)

JUDGE O'MALLEY: Let's go back on the record. Ms. Reese?

Q (BY MS. REESE) Mr. Thornhill, I'll just remind you that you're still under oath even though we took a break.

A Yes.

Q Right before the break, we were looking at Exhibits 64 and 65, and those were for Climate Division 6, which is specifically the region of Central Texas. Correct?

A Correct.

Q And what do these tell us about the precipitation and temperature in Central Texas over time?

A In general, if you look at the right-hand side of both those exhibits, you'll see the trend I'm going to talk about. From about 1990 to present, if you ignore the ups and downs and kind of visually compare the entirety of that graph, there's a downward trend in precipitation, which is consistent with the current drought.

If you turn to page -- or excuse me -- to

Exhibit 65 and look from about 1960 to present, there's been a semi-continuous upward trend in temperatures. Again, the most -- or the steepest increase in temperatures from about the year 2000 to today, I think those are both consistent with the current drought that we're in.

Q Have you studied what is going on specifically in Austin with regard to climate, precipitation and temperature?

A Yes.

Q And are those reflected on Exhibits 67 and 68?

A Yes.

Q Okay. So tell us what you learned when you graphed this information -- or obtained this information.

A Looking only for -- at Austin based on this data, and this data only starts in 1940 -- the other data went back a lot further -- Exhibit 67 shows a pretty sharp downward trend in rainfall or precipitation in Austin, starting in about 1990. To help the visual, I put a trend line -- that's the blue bar in there -- to show the downward slope of that period of time.

On Exhibit 68, the opposite is shown, that for the period 1990 to present there's been a sharp upward tick in temperature. And if you look at the

graph, it really started about 1970. Those are pretty much consistent with the Climate Division 6 data we saw before.

Q Have you analyzed the impact of a drought on the reservoirs, particularly in the Highland Lakes, over time?

A Yes.

Q Okay. And are those in Exhibits 69 through 72?

A Yes.

Q Okay. So let's start with Exhibit 69. You've got the total combined storage in Lake Buchanan and Lake Travis, again, those are two Highland Lakes in which a public water supply can be withdrawn. And you show the history of those -- storage in those two reservoirs. Correct?

A That's correct.

Q And what does this tell you?

A On Exhibit 69, to read that exhibit, the green line represents when the lakes are both full, slightly above 2 million acre-feet of total capacity. So when the blue line -- the blue wavy line that goes up and down when the contents are below the green line, the lakes are less than full.

And two things I would note. One, if you looked at the time period from about 2008 to today on

the far right-hand side, you see the lake levels falling pretty precipitously. And if you compare that back to the period of about 1945 to 1957, that's the Drought of Record, you see pretty much exactly the same trend, the lake levels falling at least as quickly, if not more quickly, than the Drought of Record.

Q And --

A Excuse me. I said lake levels. This is the storage, but it's analogous to the lake levels.

Q And when you look at Exhibit 70, you graphed that information in a different way.

A Right. Just look at the -- if you look at the right-hand edge of 69, that's what you get with Exhibit 70. It's the combined storage of both Travis and Buchanan but starting in the year 2005 instead of 1990 -- or excuse me -- 1940.

Q And what does this tell us about the storage in Lake Buchanan and Lake Travis?

A Again, that they are falling. I added notes to Exhibit 70 that the last time both lakes were full was March of 2008, and that's what the upper arrow depicts. Some people say that maybe the drought didn't start until 2010 because Travis was full in 2010, but Buchanan wasn't.

So by my definition of "hydrologic

drought" about the way these firm yields are computed, the current drought started in March of 2008. The lake levels depicted on here are consistent with what actually occurred.

Q And when you look at Exhibit 70 and 71, you've broken out -- or I'm sorry -- 71 and 72, you have broken out Lake Buchanan and Lake Travis levels individually --

A Yes.

Q -- for the same time period.

A That's correct.

Q And that's consistent with information that we've been presenting?

A Yes.

Q Let's take a look at Exhibit 73. This is something that is -- you obtained from LCRA's website. Correct?

A Correct.

Q And why is LCRA collecting this information and displaying it on their website? What do they use it for?

A This is something that we started when I was there. This depicts essentially a method of predicting what might happen if the hydrologic regime going forward from today were to be wet or medium or dry. And it's a method -- at the time we did it, it was a method of

communicating with the press and our board and various members of the public where we thought the lakes might go and what the risk of that was.

To read the graph, the left-hand column is the content in acre-feet, and you can see the little one up there at about 2 million acre-feet they're both full.

Going across the graph at the bottom, you see the dates, so this graph starts about a year ago. And I think this graph is about three weeks old, October 1st I see there. So this is about a month old.

The yellow line on the graph depicts October 1st, and so if you look about two-thirds of the way down, you see a solid blue line that is a little bit wavy. It goes from the left margin over to the yellow line. That represents the actual content of the lakes that was measured. From the yellow line, you see a fan of four -- four different dashed lines. If by a miracle it started raining again and we had wet conditions, the content would be predicted to follow the green line. If we have -- continue to have the extreme drought conditions we've been experiencing, the lake contents would continue to fall as that bottom red dashed line shows.

Q When you look at -- let's look at the historical blue line. Back earlier this year, I guess

maybe approximately May or June, it looks like it spikes up a little bit. What does that mean?

A Yeah, it's an interesting little phenomena that we had some rain in May -- it was May or June -- and the lakes ticked up. If you look at the website, they captured about 100,000 acre-feet, and that's that little bump in May or June on the graph here.

And then the lakes started falling again. It captured that little bit of water and started falling. If that little bump hadn't occurred, today we would be below 600,000 acre-feet in content. And the reason that is important is that this graph and other information is the basis on which LCRA would declare a Drought Worse than the Drought of Record. They've met two of three criterion. The only on that remains is when the water level in the lakes falls below 600,000 acre-feet, which you can see is just below that point on this graph, they would declare that drought.

So if you even start with the point we're at today on the yellow line, October of 2014, and look at that lowest curve -- or, excuse me, the lowest projection of content under extreme drought conditions -- even with that bump we fall -- we would fall to about 640,000 acre-feet by next spring. And if you added another six months to this graph at that rate,

I think clearly by late next summer, next year sometime, it's likely that the lakes would fall below the 600,000 acre-foot threshold. But we'd be there already if it hadn't been for that little bump back in May.

Q And what happens if the drought continues? Actually, could the lakes eventually go dry?

A Yes.

Q Do you have a specific example of where that very thing happened in Texas?

A Yes, I do.

Q Okay. Let's take a look -- is that behind Exhibit 79? There's a series of exhibits behind 79. Correct?

A Yes.

Q And they are separated by blue slipsheets?

A Correct.

Q Okay. let's start with the first page of Exhibit 79. This is Lake Meredith. Where is Lake Meredith on that Texas map with the brown dots we talked about earlier?

A It's the one in the center of the Panhandle two counties down from the northern boundary of the state.

Q The one that shows that's it's basically empty?

A Correct.

Q Okay. So did you prepare some information to

share with us on what happened to Lake Meredith and how it went dry?

A Yes.

Q Okay. Is that behind the second or the first blue slipsheet?

A The drought in groundwater?

Q Yes, that presentation.

A It's embedded in that. This has --

Q Okay.

A -- got a lot more information than that.

Q Okay. Well, that goes straight to my question is what was the -- did you prepare this presentation?

A Yes.

Q And what was the purpose for which you prepared it?

A Mr. Beal asked me to be an invited speaker before the Austin Area Research Organization. He's chairman of their water committee. He asked me to say whatever I wanted about drought and groundwater, so I prepared that and presented it to his group.

Q You did not prepare this in connection with due diligence on the End Op project, did you?

A No.

Q But coincidentally, there happens to be information here as well that is relevant to your

opinions that you formed today?

A Yes.

Q Okay. So could we all flip ahead to the slides -- about 12 slides in that says, "What happened in the Panhandle can happen in Central Texas." And, Mr. Thornhill, you prepared this particular slide. Correct?

A Yes.

Q And so tell us what you mean by "What happened in the Panhandle could happen in Central Texas."

A If the Highland Lakes went dry or were projected to go dry or we fear they would go dry, I think the situation that was addressed by the Canadian River Municipal Water Authority would be exactly analogous to the situation we face here. In essence, this -- this authority -- it's a river authority or a utility authority much like LCRA -- owned the water rights in Lake Meredith when it was built by the federal government. They got the water rights, and they developed a pipeline system shown on the right side of this exhibit to deliver water from Lake Meredith all the way down to Lamesa. This is about 350 miles, if I remember right.

If -- I believe that the facts of what they had to go through would be exactly analogous to

what we might have to go through if we believe the Highland Lakes are at risk.

Q And tell us exactly what happened to the lake levels in Lake Meredith.

A Lake Meredith went dry in 2011. At Buchanan -- if you look in the middle left side of the page, there's a small graph of content. Lake Meredith began to drop in about 19 -- well, about 2000, let's say, and then by 2011 was essentially empty. It stayed empty until just a few months ago when it's now 4 percent is my understanding.

About three years after that began, CRMWA initiated a strategy to replace the water or to supplement at the time they thought because they weren't sure they were going to run out, but it ended up being that they replaced entirely their entire -- the entire volume that they could depend on from Lake Meredith has now been replaced by groundwater, and they no longer use Lake Meredith for surface water.

Q Is there a graph that demonstrates the timeline of what happened to Lake Meredith in terms of the supplementation with groundwater?

A Yes.

Q Okay. And is that behind the second blue slipsheet a couple of pages in where the three tables

are?

A Yes.

Q Where did you obtain this information?

A This I downloaded directly from the CRMWA website.

Q Okay. So tell us about -- explain to us what these different bars using the light blue graphs mean --

A Okay. If you turn --

Q -- at the top.

A If you turn to the second page of what we were just talking about, there's three graphs. If you look at just the top graph to make it easy, this represents over time the CRMWA member cities usage. Look at the blue data sets. Starting in 1968, they began to use Lake Meredith, and I think that was when it was built. But by 2001 when the drought started, they -- that was the last year that they depended only on Lake Meredith. Starting in 2002 through 2011, they used more and more groundwater to where from 2012 to today they're 100 percent dependent on groundwater.

And I've talked about this with Mr. Kent Satterwhite, who is the General Manager, and basically it's -- they saw the lake levels falling, they saw the drought coming. They had for the first three years -- from 2001 to 2003 they had inflows that were the lowest

inflows on record to Lake Meredith. So they began planning immediately and pulled the trigger.

They had some groundwater already that they owned. But to implement the full project, they also bought huge groundwater rights from Boone Pickens' Mesa Water Company. He had been trying to sell that water for a period of time and CRMWA bought it from him.

Q Is this information that you presented to us on the story of Lake Meredith and how it went dry and now eventually CRMWA is 100 percent reliant on groundwater, is that useful in any way for water planners or water utilities to understand what happened in the situation?

A Absolutely. It's -- to me it's the type specimen case of what can happen to you if you do not have a diversification of supply and if you're totally relying on a single source and for any reason that source fails. The literal worst case is you can't rely on it at all for any additional water. And in this round of planning for the regional planning group up there, they're assuming zero firm yield from Lake Meredith and water available only from groundwater for that region.

Q Do you have a picture that you put together for us of what it actually looks like when a lake is dry?

A I do.

Q Okay. Particularly Lake Meredith?

A I do.

Q If you flip behind the next blue sheet, is that the picture that you obtained for us?

A Yes, I simply, in looking at the website for CRMWA in preparation for today, I found this picture. It was taken relatively recently; I'm not sure when. But essentially inside the lake looking at the upstream face of the dam, that large concrete or tower in the middle is the intake for the water that is then released downstream of the dam. If you look at the bottom of that tower, it's totally out of water. You can see the concrete base of it. And off to the left you see two black objects. Those are pumps with pipelines sticking down into the lake.

CRMWA, as the lake fell and got below the intake, they were forced to pump water uphill inside the lake to reach the lowest point of the outlet. And to me this is just a graphic illustration of the heroic efforts that folks are having to go to as these West Texas -- West Texas lakes dry up. They're doing the same thing down in Spence and Thomas and a couple other lakes down in the San Angelo area owned by CRMWD, the Colorado River Municipal Water District, in our basin. But this was a great picture, so I just added it.

Q Have you prepared an exhibit demonstrating your opinion that you stated throughout your testimony today that we are in a Drought Worse than the Drought of Record?

A Yes.

Q Let's look ahead. Is that on Exhibit 83?

A Yes.

Q Okay. And tell us what you have depicted there.

A 83 is to me the classic back-of-the-book look at what I would describe as a comparison of the current drought to the 1950s drought. The blue line represents the cumulative inflow into the Highland Lakes for the period 1947 to 1957. That's the dates on the bottom of the chart. In other words, we have records of how much word flowed into those lakes during those periods.

The orange line represents from March 2008, when the current drought began, through April. I prepared this chart some months ago, and it shows that there's a difference of 1.8 million acre-feet in inflows. But it also shows that prior to about the 1952 time frame, the curves are relatively close. And what that tells me is that the current drought and the historical drought were pretty much the same until we hit 1952.

There is a unique circumstance about the 1950s drought that most people aren't aware of, and that is that on September the 11th -- yes, September the 11th of 1952 -- a huge flood came down the Pedernales, partially on the main stem, and it -- that almost vertical bump that you see on the blue line, Lake Travis rose 56 feet in 12 hours, about 65 feet in 24 hours and essentially almost refilled. It was a massive flood.

Because that flood occurred, the calculated firm yield of the Highland Lakes is much higher than it would have been without that flood. So when I look at a graph like this and see that the orange line continues without that kind of a bump in it, and if, in fact, we extended the line to today, I think it would continue pretty much on that same slope. So today's difference might be well over 2 million acre-feet. I believe -- this fundamentally tells me personally -- and I would -- I have shown it to others and they agree -- that the current drought is worse than the Drought of Record in terms of inflows. I believe when the orange line and blue lines diverged in that September 1952 date, and that was the point at which this drought became worse than the Drought of Record.

Q And have you found a study that makes the same conclusions that you do in terms of reduced inflows in

storage in the Highland Lakes?

A Yes.

Q And is that in Exhibit 85?

A Yes.

Q So you did not prepare this exhibit?

A No, I did.

Q Mr. -- or Dr. Hoffpauir prepared this, and do you know, as you understand it, for what purpose?

A The City of Austin created, what's shown there in the middle of the title sheet on Exhibit 85, a water resources planning task force. And they retained Dr. Hoffpauir to assist them in assessing the impact of recommendations they might make for how Austin might respond to the current drought, and this is a presentation that he gave to that task force.

Q Do you know Dr. Hoffpauir?

A I do not.

Q And is this information publicly available?

A Yes.

Q And so you came across it. And then in reviewing it, can you tell us what is the bottom line from Dr. Hoffpauir's presentation?

A It's a very complicated study. But, bottom line, his study shows that if no action is taken, the levels of the Highland Lakes will fall below and stay

below 600,000 acre-feet if we continue to have a drought like -- that mimics the conditions of the last three years.

The second conclusion is that even if the task force recommendations are applied -- and there's probably 15 or 20 of them -- the lakes will still fall below 600 acre-feet, and LCRA will then declare a Drought Worse than Drought of Record. So these are consistent with what I independently looked at.

Q And in just a minute I want you to show me the two pages specifically that draw those conclusions. But before you do that, can you please tell me what is the significance of LCRA declaring that this drought is the Drought Worse than the Drought of Record?

A Again, the entire basis for LCRA being able to contract the sale of water to firm water customers is the firm yield. That firm yield is based on the 1950s drought. If the current drought is worse than that, the firm yield is less than it was based on the 1950s drought. And I believe that once LCRA declares a Drought Worse than the Drought of Record, there will be a scramble to recalculate the firm yield of the Highland Lakes. And, in fact, until the Highland Lakes refill completely, we won't know if that -- how low that recalculated firm yield will go.

But the actual declaration of a Drought Worse than the Drought of Record by LCRA is simply a relic of this criteria they set up. The only remaining criterion for that to be declared is 600,000. Even though they haven't declared that, it's my opinion that we're already well into a Drought Worse than the Drought of Record.

Q Show us specifically the two pages in here that support the conclusions that Dr. Hoffpauir makes that are similar to yours.

A Well, the ones I was thinking of when I said my earlier statement was Page 10. If you look in the lower right-hand corner, you see some white numbers there are page numbers. It might be most easily described by, let's say, Page 10 and Page 12. Page 10 shows if they do nothing, if Austin did nothing, where would the lake levels fall to under six different scenarios of projected inflows? And essentially if you look at that bottom graph, the way you read it is the bottom line is the worst inflow situation obviously. And even with the best inflow assumption, if they repeat the 2011 through 2013 hydrology, the Highland Lakes would fall below 600,000 by July of next year.

If you turn to Sheet 12, Page 12 of that exhibit, you see a similar graph. This graph, however,

has imposed upon it the strategies that the task force was looking at to create more water basically. And you can see that by July of 2015 the Highland Lakes still fall below 600,000 and say -- while they come back above, you see they continue to fall.

So my interpretation of this work is that this is -- the Highland Lakes, even if LCRA -- or excuse me -- even if the City of Austin imposed the various strategies that they were talking about, it really wouldn't help that much. The Highland Lakes would still fall below 600,000 sometime next year.

Q And what does the reduced firm yield do to users who rely on the Highland Lakes as a source of their water supply?

A I'm sorry, I couldn't hear the first part.

Q Sure. What does the -- what impact does the reduced firm yield have on users who rely on the Highland Lakes for their surface water supply?

A It's fundamental. All of the contracts that LCRA enters into are based on the firm yield of the Highland Lakes, plus any other sources of supply they have. I think it's by law, but it's my understanding by practice at a minimum, the TCEQ will not grant permits for municipal use unless they are based on firm yield, whether its run-of-river or stored or both.

So fundamental to that ability for LCRA to sell water to customers and those customers to rely on that water is an agreement that the water supply is based on a drought or a given risk standard. If the Drought Worse than the Drought of Record occurs, i.e. if I'm correct that this drought is worse than the 1950s drought, the firm yield has already been reduced. It's just a matter of calculating how much. And LCRA, Austin and -- LCRA and all their customers are going to have to enter into a very adult conversation about who gets how much water as that -- as that yield continues to be reduced.

Q Let's take a look at Exhibit 86, and can you briefly tell us -- this is your reflection of the reduced firm yield over time with regard to the Highland Lakes, and I think it includes some other information as well. Can you tell -- talk to us specifically about the Highland Lakes, which is in the middle of Exhibit 86?

A Yes. I'm aware of four different sources of calculation of the firm yield for the Highland Lakes. That middle box, if you look at the four columns, those are the four different calculations that I'm aware of. In the year 2010, LCRA submitted -- or excuse me -- published their water management plan, that current version, and that's the bold heading of that column.

The period of record that was used to calculate the firm yield was from 1950s drought, which is 1946 to 1957. The firm yield that was computed is 445,266 acre-feet, and that's the current number that you see commonly on the website and in the press.

In 2012, LCRA submitted an application to TCEQ to amend their water management plan, and in the appendix to that application, again using the 1946 to 1957 time period, LCRA computed a yield that is about 1.4 percent smaller than what they had previously said. I've never seen that number used anywhere else, but it's in there, a drop of about 6,000 acre-feet.

In May of this year, when TCEQ responded to LCRA's amendment request -- that's the right-hand two columns, TCEQ 2014 -- TCEQ did two different calculations in that response. They calculated the firm yield based on 1946 to 1957. They got 431,982 acre-feet, which is 13,000 acre-feet less than the 445 that we've been relying on.

They also calculated that from 2007 to 2013, if they used the current drought -- and they stopped their calculations as of December 31, 2013, so about 10 months ago -- the firm yield is 432,191. So it's essentially the same as the 1950s drought.

In my opinion, if they extended it to

today and included the last 10 months, that decline in firm yield would continue to exhibit and it would be down around 410,000 acre-feet.

Q And what do these negative percentages at the bottom mean?

A They're the reduction below the 445,000 acre-feet that's been the longstanding estimate of firm yield.

Q Okay. I'd like to shift gears now and go into last area of customer use, which is about cost. Did you prepare a series of exhibits relative to your analysis of the costs that End Op would charge to deliver water and the current cost for the potential users --

A Yes.

Q -- you've identified?

A I did.

Q Okay. And are those in Exhibits 87 through, I think, 102? Correct?

A Yes.

Q Okay. And within these exhibits, you've included all of the backup data for what you've looked at in the backup data supporting your calculations. Is that correct?

A Pretty much, yes.

Q Okay. But there are a couple of key exhibits

that we should probably go through. Is Exhibit 87 one of them?

A Yes, it's the summary of what I've done.

Q Okay. Explain to us what you did here on this table.

A This particular table is the comparison where I looked at the SAWS/Vista Ridge contact and how that was structured and compared it on the right-hand to -- if we were to sell Austin water from this project and essentially duplicated the terms of that contact, what would it look like all the way down to a price-per-thousand gallons for the water.

Q Okay. And again, why did you choose to look at the SAWS/Vista Ridge agreement as an example?

A As I said earlier, I think this is going to become the standard. I think it becomes a gold standard actually about how public entities might want to look at what I call public/private partnerships for water where you have a private entity and a public entity doing a project together. It's a very fair contract, in my opinion. It's been approved. It was in the process of being approved and has subsequently been approved by both SAWS and the city council of San Antonio. So I think any other city who is looking to buy water from an entity like End Op will look at that contract that SAWS

entered into and ask what will our project look like if we did it just the way they did.

Q So just to make sure I understand what you did, you basically looked at the publicly available information on the SAWS deal, you reverse engineered it to establish a methodology by which those costs were determined and then applied that to the End Op project?

A Correct.

Q And that is what is in the right-hand side of the table?

A Correct.

Q Okay. And what did you conclude when you applied the methodology to the End Op project with an assumption that the water would go to the City of Austin?

A That we could deliver water to them for $3.42 per thousand gallons in the first year.

Q Okay. And what does the number directly next to the left of the 3.42 in the blue box?

A That's this $3.42 converted to acre-feet, the price per acre-foot.

Q So if you wanted to look at apples to apples with the SAWS deal in terms of costs per acre-foot, you would look at the 1,113 as compared to the 2,239?

A Correct.

Q And what does this tell you about the End Op deal versus the SAWS deal? Why is the SAWS deal twice as expensive per acre-foot?

A Two reasons. The very small reason is that they're proposing to deliver slightly more water, 50,000 acre-feet versus 46,000 for us. The primary reason is the fact that their pipeline would be 142 miles long. A pipeline from our project to Austin would only be about 36 miles long.

Q What about to Round Rock or Cedar Park?

A To Round Rock, it's approximately the same distance. The delivery point that I've looked at would be approximately 36 miles away. To Cedar Park and Leander, I don't think this would apply exactly. We'd have to build in the extra pipe length into the cost.

However, those cities are all interconnected. Their water systems are interconnected at some level. And so until I understand better how they're interconnected, I can't say definitely that $3.42 would be a delivery cost to them. But for Austin and Round Rock, I think that's -- that's a pretty good number.

Q Okay. And that includes -- you looked at the cost to build the pipeline, you considered all these different factors, and the bottom line is $3.42?

A Correct. It's both the construction and the operation and maintenance and energy costs all taken into account in the first year would be $3.42 per thousand.

Q And that includes embedded within that the pre-commitment that End Op has made to pay for potential or financial impacts to existing user?

A Yes.

Q Okay. So let's take a look at what Leander, City of Austin, Round Rock and Cedar Park are currently paying for their water. Is that on Exhibit 88?

A Yes.

Q Okay. And again, you pulled this information. Just tell us very briefly how you found out what these cities are paying for their water.

A I went to the web and pulled copies of official statements from recent bond issues as well as the budgets for each of these entities. From them I extracted the information I needed to be able to calculate my estimate of what their current cost of water was per thousand gallons and per acre-foot, and that's what's depicted on these tables -- this table.

Q And how reliable, in your opinion, are these opinion statements that you primarily relied on?

A The official statement is to me the go-to place

for perfectly reliable -- or at least as reliable as you're ever going to get -- information. They are associated with the disclosure -- the full disclosure requirement of bond issuance through the SEC. The entities that are going to issue the bonds provide a lot more information there than they typically do in their budget.

When you go and look at the budget, you find data. But many times a city will combine numbers or mix the water and wastewater utility, and it's much more difficult to use. So I compared the two and picked where I thought the best data would come from. But I think the official statement is the best source.

Q Okay. So tell us what the bottom line is in -- with regards to your conclusions about their current cost of water.

A If you look just at the middle of Exhibit 88, that middle tier that says dollars per thousand gallons in bold and look at the row that says Total, the four cities are in the middle of the chart, and our project is over on the right-hand side. To read it, for example, the City of Austin is $6.13 per thousand. And you compare over on the right-hand side, our cost is $3.66 per thousand. Let me just clarify. That 3.66 includes a 7 percent transfer to the general fund.

If you look just above that, the $2.33 and the $1.09, that's the $3.42 we've been talking about. You add to that 24 cents for the transfer, you get 3.66. So it's -- it's the same number with just another factor added.

The $3.60, which includes the transfer to general fund, compared to the other entities, it's about 60 percent of what Austin currently pays. It's about the same, a little bit more maybe, of Cedar Park's cost. It is far less than Leander's cost, and about the same -- well, a little less -- a little more than what Round Rock's current costs are.

Q Why is Leander's water so expensive?

A In Leander's case, if you looked at the row of demands there at the top of the table, they're a fairly small utility that's growing rapidly. And what that means is, they've had to incur a lot of debt. They are participants in that Brushy Creek regional project. It's millions of dollars. And so you have the phenomenon of a smaller number of customers paying for a large project that's supposed to manage for growth, and so their unit rates are higher as a result.

Q Okay. You used -- throughout the rest of what you're going to show us, you used the City of Austin as the example or test case. Correct?

A Yes.

Q Okay. And did you perform any calculations of the impact of -- on their budget if the City of Austin decided to purchase End Op's groundwater?

A I did.

Q Okay. Is that in Exhibit 95?

A Yes.

Q Okay. This is just for 2013 using actual data -- correct -- not projected?

A Correct.

Q Okay. And what does this tell us about the impact on budget?

A If you look at the very bottom row of that table, the fundamental bottom line is that if you use 2013 as essentially a test year for if they didn't buy our water and they did, their rates would have to go up about 16 percent in order to pay for this project.

Q And do you know what the increase in rate was under the SAWS/Vista Ridge agreement?

A Purely coincidentally, they've announced that the projected rate increase was 16 percent. I believe that's for the first year, which is what this one is, too.

Q In your opinion, is this a reasonable rate increase?

A Well, if I had to pay it, I might wonder about it, but, yes. And it's not 300 percent is my point. I believe that because of the way this is calculated, this overstates what the actual impact would be over time to the utility's customers. But many times you have large rate increases such as this, they might be spread out over a number of years, but 16 percent is -- for a project like this is very reasonable.

Q And did you study the impact on City of Austin's budget for future costs and rates over time?

A Yes.

Q Okay. And let's take a look at those. That's in Exhibit 98 -- 97 and 98.

So tell us how to read Exhibit 97.

A The exhibit we were just talking about picks one year, 2013, and calculates what the cost to Austin was in that year and what our price to them would probably be for that year. This graph attempts to look at the next 30 years if we brought 46,000 acre-feet to Austin, they used all of it starting in year one, what would be the impact on their costs. And the way you read the graph is the left-hand side is the total annual cost of the water to Austin, and that's the red and blue line on the graph. You use the left axis.

The right-hand side of the graph is

that -- the red and blue line converted to dollars per thousand gallons. So the scale for the green and purple is the right-hand side of the graph. A little bit confusing, but it puts both these on the graph.

Q And what does -- what do you conclude when you look at it over time, the impact on cost?

A Costs will go up, regardless of whether Austin were to buy this water, but that the difference in cost between them buying it and not buying it is fairly small. And that's the difference between these graphs in both cases. That difference represents the cost -- the added cost of our project embedded in their total budget and cost is the difference between those two lines.

Q And what benefits would the City of Austin gain by purchasing End Op's groundwater in terms of their supplies?

A Yeah, two things. One, they would ameliorate the risks that we've been talking about that the Highland Lakes might have a reduced firm yield or even zero firm yield. Second, they would be able to diversify their supply.

Today they only have water out of the Colorado River, so they're totally at the mercy of that. If they did a project on their own and did not use LCRA,

they would have independent control of the financials of that project and not be subject to paying the overhead and other costs of LCRA. So it's both a physical risk and diversification issue with regard to the supply, as well as potential financial security and gains.

Q Okay. And Exhibit 98 is your projections of the rate increase over time if the City of Austin purchased End Op's water?

A Right. In essence, in the first year, the rate increase would be 12 percent, and the last year would only be 2 percent.

Q Okay. And let's take a look at Exhibit 101, and tell us what -- how you read this quickly and then tell us what is the net -- or what do you conclude when you look at this over time.

A This is part of the data I used to create the other graphs. In essence, the blue line on this graph is the projection of LCRA -- or, excuse me, it's the projection I made of the City of Austin's future costs to produce water. And the way I got it was the red -- the five red dots on the lower left side are actual historical numbers. I simply did a linear regression and projected those into the future, and that's the blue line.

The green line is the per-year cost of

End Op's water delivered to Austin, and so it would increase from $3.42 to $4.35. So these are independent as if only Austin and only recharge. These are my estimates of the per-thousand-gallon cost for each. These are not mixed together yet.

Q And what do you conclude about the net effect on the -- over time?

A Well, Austin's costs currently go up much quicker than the cost of buying water from End Op would go up. That's -- this blue line is steeper than the green line, bottom line, is the way you read that. Also Austin's costs are higher, which is consistent with what I computed for the individual year. Austin's costs are higher and will remain higher than the cost of delivering water from End Op.

Q Okay. We keep discussing this scenario of the City of Austin could potentially go back to LCRA if they -- to meet a demand and say, hey, you know, can you provide me more water, or the City of Austin could potentially contract directly with someone such as End Op. You've been discussing that scenario quite a bit today.

If the City of Austin hypothetically went back to LCRA and said, "I need some more water," does LCRA have additional water to provide?

A I believe they have water that they would commit. I do not believe they have the physical systems in place to supply it.

Q Okay. Did you prepare a graph that illustrates this or a table?

A Yes.

Q Okay. Is that in Exhibit 104?

A Yes.

Q And tell us how to read this information.

A Basically you just read it down the page. When I was asked the question, "Does LCRA have water to sell today," I went to the LCRA Board agenda book where they publish on a quarterly basis their assessment of all the water supplies they have and all the contracts they've entered into. So that information I think is one of the other exhibits.

So if you look at the first row, even today LCRA is saying that the firm yield of the Highland Lakes is 445,000 acre-feet. However, when you add in to their system and do the math of the value of the downstream run-of-river rights, which are Garwood and Pierce and Gulf Coast and Lakeside, they estimate the firm yield would be 600,000 acre-feet if they can have access to all those.

So the 600,000 is LCRA's estimate of the

total available supply if they implemented all current strategies, which means combining the Highland Lakes with those downstream run-of-river rights.

The next row shows that the maximum annual actual use -- in other words, how much water has actually been diverted, not how much has been contracted for -- is 283,000, but they've sold by commitment -- they've either committed to a use or sold -- 510,000 acre-feet.

So if you go down -- skip down to the summary at the bottom. The total supply under their current plan is 600,000 acre-feet gross. I'm simplifying, of course. They've committed 510,000 acre-feet of that. So theoretically they have about 89,975 acre-feet that they can continue to commit and not bust that 600,000 acre-foot level.

If you looked only at their use they have available, they've used about half of their commitment. So it's only about 47 percent. So they would have 317,000 acre-feet available.

My answer to this and the way I would interpret these numbers for a customer is: The Highland Lakes firm yield of 445,000, LCRA passed that a long time ago. They've already committed by contract to supply water to people far in excess of the firm yield

of the Highland Lakes. Their stated strategy to do that is add in the downstream run-of-river water rights, as well as, more recently, they've begun construction of a major off-channel reservoir down in Wharton County, about 150, 170 miles away. And they've also sought groundwater permits from this district, the same district in Bastrop. So they've begun to implement additional strategies.

But today, the Highland Lakes are overcommitted if that was what you looked at. LCRA recognized that, and they've already begun implementing strategies that previously they didn't consider doing for 50 years.

Q Okay. And I'm happy to report, Mr. Thornhill, that we are now at the last exhibit, 106.

A Okay.

Q This is LCRA's water supply resource plan from October 2010. And have you reviewed this?

A Yes.

Q And you have provided a lot of opinions here today about strategies that LCRA is using, different conclusions that you have drawn about their water supplies. And when you reviewed this, did you find support within this plan for many of the opinions that you've provided here today about LCRA?

A Yes.

Q Okay. And could you show us quickly where that support is? For example, I think you wanted to show me Page 22.

A Yeah, I thought 22 was interesting. It's hard to talk about this without having a complete understanding. But the question I had in my head is if somebody asked LCRA, "Do you have water to sell today," I believe a highly instructive response to that is contained in the middle paragraph of that page in the bold part where it says, "It is anticipated that projected firm demands may be met from the Highland Lakes until about 2030." So they're saying, in essence, that they expect to be out of water from the Highland Lakes in 2030.

The next paragraph down, the bold part says that, "If you assume they have the full 600,000 acre-feet, that should last, from a commitment perspective, until about the year 2080."

Q Okay. And is that -- let's take a look at Exhibit 25. Is that information reflected in a graph on Page 25?

A Yes, this is -- in this are a number of different proposed future projects. This particular graph has none of those in it. This is the baseline.

And if you look at the shaded blue area, that represents the 600,000 acre-feet of water supply. This isn't the lake content, by the way. It just happens to be 600,000 also, but -- so don't get those confused.

The firm yield of all of LCRA's current supplies is 600,000. And it shows that their actual use is projected to cross that by about the year 2080. This is what they said in words two pages before.

Q How does Page 33 support your opinion that you provided today?

A Well, 33 and some others, they -- what 33 is is just one of many scenarios that they had projected back in 2010 that they might do to supplement their supply. Build an off-channel reservoir was a theoretical back in 2010. In January of 2012, LCRA actually began implementation of the strategy shown pretty much on Page 33 by planning to build the downstream off-channel reservoir in Wharton County.

On this chart, it showed they didn't need it until about 2050 or 2060. They started it in 2012.

Q What does that tell you?

A That tells me they are very concerned about their water supply and are moving forward aggressively to expand it.

Q Okay. And on Page 36, this likewise is a

demonstration of LCRA implementing a strategy. What's shown here?

A 36 is an example of where the LCRA board actually was looking at projects very similar to what we're talking about for End Op; that is the use of groundwater -- delivering groundwater from a distant point back to LCRA or its customers.

Q And when did LCRA project that it would begin doing that in the 2010 plan?

A Again, about 2050 or 2060.

Q And have they started doing that today?

A Yes, they've applied for and obtained permits from the Lost Pines District in the order of -- I think it's 5,000 acre-feet in a normal year and 10,000 in a drought year.

Q Mr. Thornhill, I'd like to just go back to the questions that were remanded from the district for us to answer. Is it your opinion that the amount that would be put to beneficial use in the next five years is at least 46,000 acre-feet?

A Yes.

Q And upon what do you base that opinion?

A On the -- my understanding that a utility that would be interested in buying this water would look both at the security of their current supplies as well as the

cost of the water that we would offer to them. And I think they would be highly incentivized to seriously consider purchase of all this water on day one.

Q And given your opinion about the amount that would be put to use in the five-year period, what amount do you -- do you have an opinion -- or tell us your opinion about the amount that you anticipate to be put into use in a 30-year period?

A All of it; all 46,000.

Q Do you believe that it's likely a lot more in a 30-year period?

A Well, if we're limited to 46,000, that's all we've got.

Q Right.

A So maybe I misunderstand your question.

Q No, I don't think you did. Sorry, I got distracted.

(Laughter)

Q (BY MS. REESE) Is it your opinion that there are a number of customers who would contract for the full 46,000 acre-feet immediately or as soon as it becomes available?

A Yes. On a stand-alone basis, LCRA and/or the City of Austin could each individually contract for it all. If the other customers got together as a group or

a regional approach much like they've done for the regional water treatment plant, the combination of them could easily exceed 46,000. And I believe it's a strong possibility that some sort of a regional sharing of this water would actually occur.

MS. REESE: Thank you, Mr. Thornhill. I don't have anymore questions for you. I pass the witness.

JUDGE O'MALLEY: Thank you.

Mr. Gershon?

MR. GERSHON: No cross.

JUDGE O'MALLEY: No cross.

And how much does the General Manager believe --

MS. MELVIN: I kind of believe about 30 minutes, maybe more.

JUDGE O'MALLEY: About 30? Then --

MS. MELVIN: Do you want to take lunch and then do this?

JUDGE O'MALLEY: Oh, yeah. I think --

MS. MELVIN: Okay. And I really thank you because I would like a break early.

(Laughter)

JUDGE O'MALLEY: No, I --

MS. REESE: You can hear her stomach

growling.

JUDGE O'MALLEY: I think it's a better idea for everybody to go ahead a take the lunch break now. So why don't we go ahead and take the lunch break, and we'll come back at 1:15.

Let's go ahead and go off the record.

(Recess: 12:07 p.m. to 1:17 p.m.)

AFTERNOON SESSION

FRIDAY, NOVEMBER 7, 2014

(1:17 p.m.)

JUDGE O'MALLEY: Okay. Let's go ahead and go back on the record.

Mr. Thornhill, I'll just remind you you're still under oath.

WITNESS THORNHILL: Yes, sir.

JUDGE O'MALLEY: And I think we're ready to go to cross-examination. Ms. Melvin, will you be doing that?

MS. MELVIN: I will.

JUDGE O'MALLEY: Okay.

PRESENTATION ON BEHALF OF THE APPLICANT

(CONTINUED)

PAUL THORNHILL,

having been previously duly sworn, continued to testify as follows:

CROSS-EXAMINATION

BY MS. MELVIN:

Q Mr. Thornhill, it's good to see you.

A Thank you. You, too.

Q During your testimony, you mentioned that End Op has now converted so many option agreements into full lease agreements, 42 or 46 --

THE REPORTER: I'm sorry, Ms. Melvin. You're going to have --

MS. MELVIN: I've got to speak up?

THE REPORTER: Really speak up.

MS. MELVIN: Yeah, I will. Believe me, I can.

Q (BY MS. MELVIN) During your testimony, I think that you testified that of the option agreements that End Op has with landowners, that 42 of the -- 42 landowners have now converted those to leases. Did I understand you correctly?

A I would say it just slightly different. It's my understanding that of the 46 options, 42 of those have been converted to full leases, and they're working on the last four and expect to complete those soon.

Q Have you seen those leases?

A No, I have not. We'll, I've seen the options, not the leases.

Q All right. Do you know if those leases are the same ones that were -- are in the same form that was attached to the option agreement?

A I don't know.

Q During your testimony, you talked about the renewal process under the district rules. Have you had an opportunity to review the rules relative to the

renewal process?

A Yes.

Q I think what you testified -- and perhaps I misunderstood this, so please correct me if I did. I think you testified that you thought that when you applied for renewal, you have to start all over again?

A I may well have said that, yes.

Q Yeah. Let me show you -- this is Rule 5.7 of this district rules as they existed at the time that the application was filed that relates to renewal permits. And if you look at the Section (b) of that rule -- or actually Section (c), does it give you the considerations that the Board will consider in deciding whether to do a renewal?

A I assume yes. The title of the paragraph is Considerations, and there's a list of six items; so, yes.

Q Do you know if these six items are the same considerations that the Board considers under its rules when its looking at an operating permit for the first time?

A I do not.

Q Do you know if there's an opportunity -- notice and opportunity for a contested case hearing on a renewal application? Do you know if there's notice --

if there's an ability to request a contested case hearing on somebody's renewal application?

A I do not.

Q You mentioned that the mitigation proposal that End Op has put forward, to your knowledge, is the only one of its kind. Did I understand that correctly?

A Yes.

Q And what did you mean by that?

A It's the only one I'm aware of where an entity has agreed to pay for damages or potential damages to someone else as a result of groundwater pumping.

Q Are you aware that some other groundwater conservation districts have set up -- set up mitigation funds into which permitees pay?

A No, but you're triggering my memory. I think SAWS either did or attempted to do something similar as they were trying to develop a groundwater project once, but I don't know the status of that.

Q Would it surprise you that the Gonzales County Groundwater Conservation District -- or it may be the Water Conservation District, I can't remember; that one has kind of a funny name -- has rules that requires permittees to pay into a general mitigation fund?

A No, it would not. In fact, I would be gratified to learn that because I believe it's the

proper way to go, to provide mitigation is the proper way to go.

Q You talked about the SAWS and Vista Ridge project, and right before that you had talked about kind of the things you would consider if you or any water supplier were looking at a groundwater deal at that time.

In the SAWS deal, does Vista Ridge already have its permits?

A Yes.

Q What groundwater --

A It's -- Blue Water I think is the actual -- well, I'm not sure what name -- I was thinking of the name. Somebody in that consortium has permits that have been issued by the Post Oak/Savannah GCD.

Q And is that permit in the total amount that SAWS is contracting for?

A Yes. Well, let me -- let me correct that.

Q Okay.

A There is some -- I've read the permit language directly from what I understand to be a copy of the permits, and there's some question of -- I take it back. It was the date that was different. It was not the volume in the permits.

So, yes, my answer to your question would

be I believe they have permits in place for the full 50,000 acre-feet.

Q Thank you. Thank you for considering that.

You also talked about the LCRA's long-term strategies, and that one of them is they do look at groundwater supplies. Did I understand that correctly?

A Yes.

Q And isn't it true that the only groundwater supplies that they've obtained so far are what they obtained from the Lost Pines Groundwater Conservation District under permits issued by that district?

A That would be my understanding, yes.

Let me say that differently. I don't know of any other. If they exist, I don't know about them.

Q That's fair.

I'd like to call your attention to the exhibits -- to your Exhibits 54 through 59. My recollection of these, if I'm correct -- and please correct me if I'm wrong -- is that each of these exhibits shows projected water demand in Travis and Williamson Counties between now and 2070. Is that correct?

A Well, you included 59 --

Q Right.

A -- which we didn't talk about. That's Bastrop

and Lee County. But otherwise, the rest of them are for Travis and Williamson, yes.

Q Thank you. So it's 55 to 58 that we're really talking about.

In those exhibits, you're showing what the demand will be in those future years. Correct?

A I'm showing what the Water Development Board projects the demand to be, yes, ma'am.

Q Thank you.

Do these exhibits take into account the existing water supplies of these WUGs -- I love that word -- WUGs and other users that can be used to meet that demand?

A Demands are totally independent of the supplies. That's a two-sided equation. You develop the demands, then you look at how you're going to supply those demands, and hopefully they match. So none of these demands have anything yet in terms of the documents presented here to do with the actual supply that might meet those demands.

Q Do any of these have anything to do with the existing supplies -- do any of your exhibits have anything to do with existing supplies other than your exhibits about the -- about the potential for firm yield in the Highland Lakes?

A Well, there may be a page or two in some of the exhibits. We didn't cover everything. But I think fundamentally the information that's in my exhibits is focused on the demand. You made the exception of the Highland Lakes, obviously the supply from the Highland Lakes and the downstream water rights and all that, but I don't -- I don't think I included a table where I looked at the supplies, no.

Q Mr. Thornhill, are you familiar with the 2011 Brazos G Regional Water Plan?

A Somewhere between vaguely and very, but not -- not very.

Q Somewhere up there you should have a copy of our exhibits, that is the General Manager's exhibits. And if you'll look behind Tab No. 5, you'll find the regional -- Brazos G Regional Water Planning Area 2011 Brazos G Regional Water Plan.

MS. MELVIN: Your Honor, this is one of our filed exhibits. At this time, I'd like to offer it into the record.

JUDGE O'MALLEY: Are the any objections?

MS. REESE: No, Your Honor.

JUDGE O'MALLEY: Okay. The General Manager's Exhibit No. 5 is admitted.

(Exhibit GM No. 5 admitted)

MS. MELVIN: Okay. Mr. Lein corrected me. Why don't I just offer all 5 through 9? I offer 5 through 9.

MS. REESE: No objection, Your Honor.

JUDGE O'MALLEY: Okay. The General Manager's Exhibits 5 through 9 are admitted.

(Exhibit GM Nos. 5 through 9 admitted)

Q (BY MS. MELVIN) Mr. Thornhill, I'm going to ask you to turn to what is numbered in the -- this plan Page 4A-9. But if you look in the right-hand corner, there's a little bitty number down in the right-hand corner under where it says HGR. And the page I'm drawing your attention to -- see, teeny tiny. The page I'd like to draw your attention is Page 69 under that number.

A Got it.

Q On that page is a table that shows Williamson County, and it shows projected shortages. And I believe this shows projected shortages for municipal WUGs for project water shortages. Is that correct?

A Can I look at the prior pages?

Q Please.

A I believe your description is accurate. This is part of Table 4A-1, which starts on page -- however your numbering -- 66, so, yes.

Q Thank you.

What does the regional plan mean when it says "projected shortages"?

A It's my understanding, without going back and looking through the whole thing again refreshing my memory totally, the way the plan works is they determine the demands, then they look at the existing supplies, and the difference between the two is either a surplus or a shortage. And so if they determine a shortage, my understanding would be that would be the sort of information that's in this table, that they've looked at the existing supplies --

Q So --

A -- but not potential future supplies, and determine a shortage.

Q Excuse me. I don't want to interrupt you.

So on Page 69, what you're seeing is the Texas Water Development Board's projected shortages for Williamson County and Williamson County Municipal WUGs in the year 2030 and 2060. Is that correct?

A I'm sorry, the years you said?

Q 2030 and 2060.

A Oh, right. The two right-hand columns. Yes, that's correct.

Q I'd like you to look over at Page 78 in this

same Exhibit 5.

A (The witness complied.)

Q The table there called Williamson County Surplus/Shortages, does that show what you were talking about, which is that they take the demand, they subtract existing supplies, and they get either a surplus or a shortage for each of these water users?

A Okay. Could you restate your question?

Q Yes. Does this show -- as we just discussed, is this another table showing for these water users in Williamson County either a surplus or shortage of the ability of existing supplies to meet demands in the years 2030 and 2060?

A Well, reading the introductory paragraph, which is why I hesitated for a second there, the -- it appears to me this table -- that there's a surplus that's blacked out and not shown. The only numbers in this table are the shortages.

Q Thank you.

But I think there may be one -- a couple of exceptions to that. Would you look down and see the City of Hutto there?

A City of Hutto, yes.

Q Doesn't it have a projected surplus in 2030 --

A You're right.

Q -- of 3,397?
A And Granger does, too, right above it.
Q Exactly.
A Chisholm Trail does, too, now that I look at the numbers.
Q And if you look down at Manville --
A Okay. I stand corrected.
Q -- Manville WSC does as well?
A Manville, yes.
Q So it does show -- I don't know what's blacked out.
A Now that you brought that to my attention, I don't know either.
Q It says -- Mr. Lein points out to me that it says on the right of those "See Lee County for plan" or something like that when they're blacked out.
A Yes.
Q As you know, some of these people are on two -- in two counties. Correct?
A Or three or four some of them.
Q Yes.
A Depending on where the -- I understand it now. Yes, I agree with Mr. Lein if that's what he said, that for Aqua, they probably addressed Aqua only in the Lee County plan rather than parceling it out to the

individual counties that they might serve in.

Q Thank you.

Would you look at Page 110 -- that's in; the little numbers -- of this same exhibit?

A Mine jumps from 105 to 93. Should I keep going?

Q That's weird. Yeah, keep going because mine doesn't do that.

A Okay. Well, let's see.

Q It's like this. It's a bad copy.

A This one?

Q Yes.

A Yeah, I just noticed those two pages, 105 to 93.

JUDGE O'MALLEY: Yeah, it does.

A Then you keep going from 93 and you end up here.

JUDGE O'MALLEY: Is it just out of order?

MS. MELVIN: We'll certainly be willing to submit another copy of this, Your Honor, because mine has the full thing. So it sounds like maybe we've got a copy that's messed up in some way.

Q (BY MS. MELVIN) But you have found 110. Is that correct?

A I think I'm on the same page you just showed

me. Yes, ma'am, it's 110.

MS. MELVIN: All right. Your Honor, we're happy to substitute another copy we've got right here for the one that's up there. Mr. Lein, I believe, is just checking and found out it has the right numbers.

Is that correct?

MR. LEIN: Where was the jump?

MS. MELVIN: 93 to 105.

MS. REESE: I have to object now. Did you provide me an incomplete copy?

MR. LEIN: I sure hope not.

(Laughter)

MS. REESE: Just kidding. I know it's publicly available, and no problem.

WITNESS THORNHILL: It's this page if you need to find -- I'm sorry, I just noticed it.

MR. LEIN: No, I appreciate it. Thank you.

WITNESS THORNHILL: It goes from here to here.

JUDGE O'MALLEY: This is going to be the court reporter copy.

Okay. Go ahead, Ms. Melvin.

MS. MELVIN: On table -- thank you.

Q (BY MS. MELVIN) On Page 110, there's Table

4C.39-1, Summary of Recommended Water Management Strategies Involving New Sources of Supply in the 2011 Brazos G Regional Water Plan. Are we on the same page?

A Yes, ma'am.

Q Based on your understanding of the regional plan, what does "recommended water management strategies" mean?

A In the -- once they've identified a strategy and they have a portfolio of those that the regional planning group is recommending as being the primary or most likely strategies, those become the recommended strategies.

Q And those are strategies that will address any shortage now or in the future that they've identified?

A Yes, that's their purpose, is to add to the existing water supply.

Q And could you look at this table and show me if anywhere it shows a recommended water management strategy that involves providing water from the Carrizo-Wilcox Aquifer to Williamson County?

A Well, I believe if you look at the bottom of the first page, the BRA system operation, Lake Granger Augmentation, if you look at that footnote on Page 112, it's development of groundwater from the Carrizo-Wilcox. You specifically asked if it said Williamson County.

BRA serves in Williamson County and serves the entities that I was talking about in Williamson County. So I don't know if that exactly answers your question or not.

Q Well, it does. And let me be fair to you and ask you to look at Page 123, which describes that strategy -- or ask you, does it describe that strategy?

A Okay. I don't have a 123.

JUDGE O'MALLEY: Does that go into Exhibit 6?

MS. MELVIN: I'm sorry, that's Exhibit 6. Yes, Exhibit 6, Page 123. These are sequentially numbered. I apologize.

A Okay. I'm on 123.

Q (BY MS. MELVIN) And if you look down at maybe the sixth line under 4B-5.5.2.1, it says, "This alternative will add 54,390 acre-feet per year by augmenting the long-term firm yield of Lake Granger groundwater pumped from the Trinity Aquifer and the Carrizo Aquifer." Did I read that correctly?

A Yes.

Q Does it say in here how much water they're going to pump from the Carrizo Aquifer and where it's going to come from?

A Well, just in that part -- I haven't read the whole thing -- but just in that part, it gives -- the

way I would read this is the 54,390 is the sum of the Trinity and the Carrizo. I don't know what the individual split would be.

Q Let me ask you to turn over again in Exhibit 6 to Page 134, letting me be fair to you again here. Actually if you look at Page 133, it has a strategy called Carrizo-Wilcox Aquifer Development.

A Yes, on 133. I have it.

Q Right. If you look at 134 under 4B.15.1.1, it says, "This option is an alternative to the Lake Granger conjunctive use project." Is that correct?

A Yes.

Q And it says, "The maximum shortfall for Williamson County from 2050 to 2060 is estimated to be 35,000 acre-feet per year." Is that correct?

A Yes.

Q And what is -- is there a term of art in these regional plans about an alternative water management strategy as opposed to a recommended one?

A Yes.

Q And what is the difference between those two?

A The plans many times include already identified alternatives that, upon further review, might be substituted or added to the recommended strategies. When they -- when they develop a recommended strategy

list, it's not final, fixed and never changing. Many times they propose other alternatives that you might want to consider.

Q Right. So there's recommended, but then there's additional water management strategies. Is that how you would put it?

A Yes, I would agree with that.

Q Can I ask you to go to Exhibit 8 and look at Page 212?

A Table 411?

Q Correct.

A Okay. I have it.

Q When it says "2010 Needs, 2020 Needs" and so forth, is that the same as shortage as it was used in the Region G plan? And, by the way, for the record, Exhibit 8 is the 2011 Region K Water Plan. Let me give you a minute to look on the previous page --

A Yeah, that's where I'm looking.

Q -- under Travis County.

A Okay. I -- repeat your question, please?

Q When it says "2010 Needs, 2020 Needs" in Table 4.11, is that the same as the shortages we were talking about in the table in the Region G plan?

A I believe so.

Q This table shows that Austin does not need any

additional water until 2050. Do you agree that's what it shows?

A Yes, that's what it shows.

Q And do you have a different opinion?

A Yes.

Q And what is your opinion?

A My opinion is Austin will be continuously assessing their alternatives, and they will -- a need for water by Austin is driven not just by this plan, which assumes certain plans in place, but by the availability of additional water from projects like the End Op project that we're discussing here today.

And the need that is described in this report, while it's an important and valuable piece of information, assumes that Austin would continue with the recommended strategies -- or excuse me -- the current strategies that they have in place, one of those being in Austin's case a continued reliance on the LCRA water as their sole source. And so if that is at risk or threatened, that's another reason I believe Austin would seek additional or supplemental supplies.

Q To your knowledge, do any of the water management strategies considered in this report include providing Carrizo-Wilcox water to the City of Austin? And if you'll look at Page 217, I believe that's the

start of a spreadsheet that identifies water management strategies.

A This is a 12-page small font spreadsheet. Do you want me to look for Austin in here or --

Q If I told you that there is no Carrizo-Wilcox water management strategy for the City of Austin, does that sound likely to you?

A I don't remember one, but it's been a long time since I studied this table in detail.

Q Well, thank you. I think that's the best you can do on that. And, yes, this is a little small for my eyes as well.

Have you ever spoken to anybody in the City of Austin water utilities about the availability of this Carrizo-Wilcox water?

A No.

Q Okay. Have you ever spoken to anybody at the City of Round Rock -- Round Rock water utility about the availability of this water?

A No.

Q Have you ever talked to anybody at the City of Cedar Park water utility about it?

A No.

Q Have you ever talked to anybody at the City of Leander water department?

A No.

Q Have you ever talked to the Brushy Creek Regional Water Authority about that?

A You mean the Brushy Creek Regional Utility Authority?

Q Oh, utility authority, yes. Thank you.

A No.

Q You're correct.

Do you know -- you've mentioned that some of these entities have come together to form the Brushy Creek Regional Utility Authority. What has the Brushy Creek Regional Utility Authority done, to your knowledge?

A They're a -- an entity created in a partnership of some sort. I'm not sure of the legal status or what kind of partnership it is legally. But what they've done is construct a surface water treatment plant that's designed to take water out of Lake Travis out of the Sandy Creek arm, pump that raw water up to the treatment plant and then disperse it to the three customers.

Q Okay. I'm going to ask you a little bit about the Highland Lakes firm yield just so that I'm sure that I understand it.

My understanding of firm yield -- and correct me if I'm wrong -- is that you take the

reservoir and you assume that inflows are going to be -- evaporation and so forth is going to be just like it was during the drought of record, which I think you said in this case is '48 to '57. Is that correct?

A '46 to '57, but --

Q '46 to '57. And so you take those numbers and you see how much would be available every year during that period. Is that the firm yield?

A You used the work "exact" before.

Q Yeah, "exact" is probably better.

A As best you can, you look at the historical record of inflow, evaporation and the storage capacity that's in the lake, because over time they can fill up with sediment, so that changes, and a number of other more detailed issues that you might consider, like seepage through the dam that could be a loss or water theft out at the lake. There's a lot of detail that you get into.

But fundamentally you take a reservoir, you take the inflows to the reservoir that would come from the river and you do that on a daily or monthly basis. Daily is better than monthly; it's more accurate. You estimate the evaporation directly from the surface of the reservoir, and it gets bigger and littler as it fills up and shrinks. And you calculate

that in on a daily or monthly basis.

And when you operate the entire period of record that you have, and in our case just assuming for a moment it goes from 1940 to today, you run that whole period of record -- today we use computers. We used to do it by hand -- but you run that whole period of record and determine what period of time where the reservoirs last full versus when do they next fill up. And you do that by putting an artificial demand on the lake and you just keep increasing the demand until you get to the point that when the lake is last full and next fills up, it just went dry in between, like the day before the flood came and filled it back up, that demand that you've artificially put on the lake is your firm yield.

Q So when you do the firm yield, you use all of these historical things that you just talked about, but you don't actually use your historical demand. Is that correct?

A Correct.

Q Now, could you explain -- you talked about what firm yield water -- or firm water is under the LCRA rules. Can you explain what interruptible water is?

A Yes, interruptible is -- essentially it's a different classification. It's water that was made available but subject to curtailment or full

interruption at LCRA's behest. The source of that water is that when the firm demand on the lakes is less than the firm yield, in other words, the actual use is less than the firm yield, theoretically the surplus water could be sold on an interim basis to someone else. So essentially that forms the basis of the interruptible water.

Q And you showed us several different calculations that have been done over the years by LCRA and by the TCEQ staff of the firm yield of Lake Travis and Lake Buchanan, both historically and, I think, one was like a 2010 to 2013 time period. Do those take into account any releases for interruptible clients?

A No. The methodology would be they were pure firm yield analyses would be my understanding.

Q Would it affect the firm yield reservoir if there had been releases for interruptible supply in the --

A No. The firm yield calculation --

THE REPORTER: Interruptible supplies --

MS. MELVIN: I'm sorry. I put my hand up here.

Q (BY MS. MELVIN) In the historic period -- interruptible supply in the historic period.

A Okay. Now I've lost my train of thought.

Would you ask the question again?

Q You were going to say no. I know you started on that.

Would historically -- would the fact that perhaps interruptible water had been released change the firm yield calculation?

A No. The firm yield calculation is a theoretical calculation to use as a standard in water permitting and, like I testified, for contracting in LCRA's case. The fact that you have interruptible water added into an actual demand pattern has nothing to do with -- well, it doesn't affect the calculation of the firm yield at all.

Q It treats all of it as firm yield, everything that you're artificially making the demand on?

A No, there's no connection between the two. The firm yield is a -- is a theoretical calculation of how much water you could take on a constant basis, year after year, without running short from that reservoir. As soon as you start talking about actual operations where you might add in interruptible water or some other demand pattern, 99 percent of the time that is never considered in a firm yield calculation. In firm yield you will sometimes -- the reason I said 99 percent -- you will apply a municipal demand pattern many times to

that demand in the lake, so that on an annual basis, it's lower in the winter than it is in the summer. But again, every year you repeat the same pattern. Usually it's just a flat demand.

Q But interruptible releases in real life do make a difference to the combined storage of the reservoirs?

A Absolutely.

Q Is that correct?

A Absolutely.

Q When is the last the LCRA made an interruptible release? Do you know?

A I think at some level they still do today, but the main change in LCRA's operations was following the 2011 worst year of drought on record where they had released -- I don't know -- 400,000 or so acre-feet to the irrigators. The LCRA Board declared that they would make no more such releases.

There are exceptions to that, like part of the Garwood water right requires, by contract, additional releases, but -- so I think they're making some sort of interruptible releases, but they are much curtailed today.

Q Correct. And so did that last interruptible release have an impact on the combined storage in the aquifers?

A The combined storage of the aquifer? What -- I'm sorry?

Q Or the water levels as we -- I'm sorry -- the combined storage of Lake Travis and Lake Buchanan.

A Yes, it was a direct demand. The lake levels fell as a result of it. Yes.

Q Thank you.

A couple other very short questions. In one of your exhibits -- and I'm trying to figure out which one it is right here -- 104, Exhibit 104. This is End Op exhibits. I believe your opinion of this exhibit was that the LCRA has already committed more than the firm yield of those two reservoirs. Is that correct?

A Correct.

Q Under Total Commitment of Firm Water, three down, there's a category called Reserve for Future Uses, 50,000 acre-feet. Has that water been sold to anybody?

A No, I don't think it has. When I was last there, it had not.

Q Earlier in your testimony you talked about beneficial use. Is that correct?

A Yes.

Q And what beneficial uses were?

A Yes.

Q Now, you and I are familiar with the

considerations that the Texas Commission on Environmental Quality makes when it's deciding whether to grant a water right, and one of those is the proposed appropriation is intended for a beneficial use. Are you familiar with that?

A Yes.

Q Did you know that the language about beneficial use in Chapter 36 of the Water Code is different?

A No.

Q Finally, I just want to clarify something that came up right at the end that I thought I understood, but maybe I didn't. I believe what you said was -- is this correct -- that if 46,000 acre-feet a year of permits were granted to End Op, then they could -- then somebody would purchase that water on day one. Is that correct?

A Yeah, that was probably a little extreme because I couldn't deliver it to them, you know, depending on how you define "day one." But the first day that it was physically possible, with all the laws and equipment and pipelines and pumps in place, theoretically I think the demand would begin on that day and continue.

Q And are you saying --

A It would be -- "base loaded" is the term of

art. We would baseload this project.

Q So you're saying that -- by "baseload," you mean this, which is you would expect the users to start using 46,000 acre-feet that day?

A I expect that. I think it's -- my expectation is based on a -- that it would be a high probability. Once you put in a system like this and the water is available to be delivered and the payment is -- under the SAWS/Vista Ridge contract is that whether SAWS takes it or not, they pay for it, similar to the take-or-pay contract concept; that I might as well take the water and reserve my other sources rather than pay for water that I'm not using out of the pipeline. So, yes, I think there would be a great incentive to go ahead and take that water from day one.

Q Are there other sources that the City of Austin uses for its water supply now where it's already built a big facility to make use of those water supplies --

A Do you mean --

Q -- like Water Treatment Plant No. 4?

A Yes. In order to use the water out of Lake Travis, that water must be treated. Austin has three major water treatment plants. They used to have four, Davis and Ullrich being the old ones. They just finished construction of the first phase of Water

Plant 4 -- well, let me take that back. I don't know if it's fully finished or not. But they're building Water Plant 4 -- what they call Water Treatment Plant 4 on Lake Travis. All the water Austin uses must run through one of those plants.

Q But it's your testimony, as I just understood you, that if the City of Austin had this 46,000 acre-feet physically available to it, it would take this water instead of the water out of the Highland Lakes?

A Yes.

Q Okay. It's the same as your testimony for Cedar Park?

A Yes.

Q Why?

A Again, Cedar Park is a little different than the others because they're pretty much land locked and their demand is not going to go up that much. So for Cedar Park to be incentivized to take the water, it would require that they see that this water is less expensive than continuing to use their existing facilities. That means they would have to weigh the savings that would occur by shutting down or not participating in a portion of the Brushy Creek Regional Utility Authority plant, for example, against the value added by this water.

And I -- again, with Cedar Park, since their demand is less than 46,000, there's no way they could do it themselves. But if they were part of a regional approach that might be shared by Round Rock, Leander, Cedar Park, Austin, however they got themselves together, I believe the full amount could be sold into that market very easily.

Q Well, let's consider Leander and Cedar Park and Round Rock together just for purposes of these questions, if you would, kind of one of your -- kind of regional authorities.

A Okay.

Q Do those -- do those three cities have contracts with BRA?

A I think they all do, yes.

Q Do you know what they pay for the BRA water they purchase even if they don't use it?

A No, I don't.

Q Do those cities have contracts with the LCRA?

A Yes.

Q Do they pay for the water they purchase from the LCRA even if they don't use it?

A I think the way that works, they pay a reservation fee, which is 50 percent of the use fee. I'm pretty sure that's my memory, yes.

Q Did you look at whether or not the BRA water that those entities get is less expensive than the End Op water?

A No, I did not.

Q I also think that you told me that some of those entities also get some groundwater?

A Yes. I don't know the volumes. It's my impression that those are from work I've done in the past, but I didn't look it up for this proceeding. But the volumes of groundwater are fairly low. When Round Rock first started, it was 100 percent groundwater. In subsequent years, they've bought water from BRA and then from LCRA, so they've added to their groundwater basically.

Q But it's still your testimony that if I were the City of Round Rock, I would baseload off the End Op project and not my BRA contracts?

A That's what I said, yes. To explain that again, I think Round Rock's number, if I remember right -- well, I can't remember the number now. But Round Rock -- all of these entities are going to have to assess that when we bring this water supply to them permitted, with a cost, which is the information they need, they're going to have to assess that against the projects that they have and the projects that they're

planning to do to continue to supply water.

I believe our water is going to be competitively priced where even Cedar Park, who it doesn't look like they need a whole lot of new water, would be incentivized to look at this water. And the way they would look at it is to compare their share of the cost of the regional -- the Brushy Creek Regional Utility Plant and all their other costs and all the alternatives to them. And so if they ended up with, in your example, that they could go to BRA and somehow get more water and they deem that a better option than our water, they would probably go with BRA. They might do both. I don't know.

MS. MELVIN: Thank you; that's all the questions I have.

JUDGE O'MALLEY: Ms. Reece, redirect?

MS. REESE: Yes, Your Honor, just a few questions.

REDIRECT EXAMINATION

BY MS. REESE:

Q In the GM's exhibit, these regional water plans, does any of the information in these plans change your opinions today?

A No. I used them myself to reach my conclusions.

Q And is this the only thing you considered in reaching your conclusions today are the plans that are the GM's exhibits?

A No.

Q And why not?

A Well, I considered all the other stuff we've talked about: The cost, the drought risk caused by a Drought Worse than the Drought of Record, quite a few other factors.

Q When were these plans that Ms. Melvin asked you about, when were they put into place?

A The way it works, each region creates its own plan, submits it to the Water Development Board, the Water Development Board creates a statewide plan. And it's my understanding that the regional plans are due the year before. So I think -- well, let me look -- yeah, these -- if you look in the lower corner of their exhibits, the pages of these exhibits, it says July 2010. So that's when that regional plan for that region was put in place. They were incorporated into the 2011 Water Development Board plan, which covers the whole state. It's just their administrative process to roll it all up.

Q And is there more accurate information available today than what is available in these plans,

the 2011 plans?

A With respect to population and demand numbers, there is new and -- or different data that's been proposed. I think the judge is still out on whether it's all more accurate. What I have seen is that every time they do another cycle of planning, those numbers tend to change, and that was part of what I showed in some of my exhibits.

Also there is an appeal process. "Appeal" may be too strong of a word; it's not a legal process. But there's a process by which when the Water Development Board puts out their raw numbers, which are the numbers from the 2016 projections that I've used, once those are put in front of each of the regional planning groups, those entities have the right to challenge those numbers or offer different numbers, and then they go through this process that they evaluate that and they recommend up to the Water Development Board whether they should be changed.

So when you say, you know, more exact or more precise, you know, there is that process going on. This year's cycle is pretty mature. It's almost over. So I don't know where they are in any of the challenges. I don't have any idea if anyone has challenged those 2016 numbers or not.

Q And when will those 2016 numbers come out?

A The regional -- if they stay on the same pattern, the regional plans for each region, there will be a draft and then a final. The final would be out in the year 2015 and the final would be out in 2016.

Q If --

A I'm sorry, I said that wrong. The regional final would be out in 2015, but the State's rollup into the State Plan would come out in 2016. That's why I used 2016 to describe all of this.

Q As far as you know, based on your expertise in this area, do the projects specifically need to be identified in a regional plan in order to obtain a permit from a groundwater district?

A As far as I know, it doesn't.

Q Is it your understanding that the exhibits that were actually provided by the General Manager of the regional plans, that they were excerpts from the comprehensive plan?

A Yeah, based on the fact the pages aren't continuous.

Q So even aside from that, even the copies that they contend are the entire copies of what they intended to be the exhibit, those don't comprise the entire Reason G and K plans for 2011, do they?

A No. They're each about 800 pages. Each volume is about 800 pages, if I remember right.

Q And upon your review of the entire plans Region G and K, let me ask you, have you reviewed other sections of the Region G and Region K plans that were not provided as exhibits by the GM?

A I think so, yes.

Q And based upon your review of the entire plans, the 2011 Region G and the 2011 Region K plans, are the concepts of the implementation of groundwater, such as the End Op project, contemplated within those plans?

A Yes, there's a -- there's a couple of projects that are very similar where water is moved from multiple counties away back to an end user.

Q And, in fact, isn't one of those concepts LCRA contemplating the importation of groundwater aside from the importation that it has undertaken with regard to Lost Pines but additional water above and beyond that? Isn't that concept in the plans?

A I recall that there's a couple of projects proposed. And, frankly, I'm struggling to remember exactly where they are. When you said LCRA, I know that LCRA has considered, like in their water resources plan, the importation of groundwater, and I know that plan is referenced in the regional plans. So by extension I

think they are. It's -- the water resources plan that LCRA did is directly cited, and some of their examples are included in a document that I've reviewed recently. That's my answer.

Q Okay. At the time that in 2011 when the SAWS came out, was the End Op project specifically included in a different region's plan?

A A predecessor to this project was included in the Region -- what would it be -- L plan, which serves essentially the area south of the San Antonio area, where through GBRA water would be delivered from this same -- excuse me -- this same area over to San Antonio, if I remember right, yes.

Q And when you say "the predecessor project," is that because you're referring to -- because you were not involved during that time, and the Cap Rock group, in your view, is the new investors in the new project with End Op? Is that your understanding?

A I certainly was not involved at the time. I didn't understand the second part of your question.

Q I'm trying to understand if you are -- let me ask it a different way.

The Region K project that you're specifically with, the project that's specifically in the Region K plan, you referred to that as being the

predecessor to this project. What did you mean by that?

A I mean, the concept of the project is the same, taking water from the Simsboro in this area and delivering it some distance away. It's my understanding from conversations with folks that End Op had entered into negotiations and had a contract with GBRA for GBRA to be the intermediary, and that was the plan essentially that was in that version of the regional plan.

Q Why have you not talked to the particular cities that are -- that you've identified as potential customers for the End Op water?

A I'm going to start Monday --

Q Why?

A -- figuratively, I mean.

Q Why have you not done so up to this point?

A The reason is we've only recently developed this information in the last few weeks. Just coincidentally it was the same time frame getting ready here. But we were on a path to develop this kind of information that we could go to these customers so I could answer those three questions, "Do you have leases, do you have permits and do you have a price?" To get a price, I needed to get where I am today. Now I'm ready to go talk to them.

Q And you would need a permit in order to meet all of the three prerequisites. Correct?

A To walk in with the perfect presentation, yes. But I anticipate that we'll begin discussions very, very soon -- if not literally Monday, you know, very quickly because, in my experience, it sometimes takes many months to put the information out there, it takes time to get comfortable. So even the fact that we don't have the permits, I would explain to the potential customer the process that we're in and what's going on. But I do have leases and a price, so I've got two of the three. The people that came to me historically didn't have any of them. So I think I'm ready to go talk to these folks.

Q Let's go back to the district rules for just one minute. It seems like there may be confusion about the renewal process for a permit. And regardless of what that process is, in terms of whether we renew a permit, is the subject to a contested case hearing or not because I believe that's what Ms. Melvin was getting at in her questions.

So putting that aside, is it your understanding that if End Op obtains a permit for -- an initial permit for less than 46,000 acre-feet, if End Op wants more than what was initially in the first permit,

do they have to go back and start the application process over?

A Well, I'm not certain of the legal niceties. There might be some appeals and stuff in there. I don't know how that works. But I've always assumed that if the permit was only granted partially, that if you wanted to come back for the rest of it, you either appeal that or you come back with a fresh permit application and start over.

MS. REESE: Thank you, Mr. Thornhill. No more questions.

MS. MELVIN: You Honor, we'd like to ask you, as we did in our submission of documentary evidence, to take a judicial notice of -- official notice -- official notice of the entirety of the regional plans for Region G and Region K. We have provided the links to all those on the Texas Water Development Board site. I just want to make sure all that is available to you if you want to look at the rest of it.

JUDGE O'MALLEY: Do I hear any objection to that?

MS. REESE: No, Your Honor.

JUDGE O'MALLEY: Okay. We'll take official notice of the entire plans for -- it's the

regional plans for G and K?Mr. LeinG and K, yes, sir.

JUDGE O'MALLEY: Okay. Then that -- I will take official notice of those.

MS. MELVIN: Thank you.

JUDGE O'MALLEY: Did you have any recross?

RECROSS-EXAMINATION

BY MS. MELVIN:

Q I just want to ask you two questions, Mr. Thornhill. Would you look at Exhibit 7 of the General Manager's exhibits? It's under Tab 7. I know there's a lot of paper.

A I'm there.

Q When you prepared your exhibits and you said the 2016 populations of demands, is this the information from Texas Water Development Board that you used for the 2016 demand?

A Not exactly. And the only reason I waffle is this is for Region G. I looked at Region K and, you know, this -- this is sorted by a planning region, not by a basin or whatever. But the individual water utility groups that are in the Region G planning area in here would be the same as those that I looked at. Again, some of those, like Austin, overlaps into two regional planning areas. So if Austin is in here, the number would not be the same. You've got to be careful

when you're sorting and stacking these numbers that you have the same geographic areas.

Q I agree.

Would you look under Tab No. 9?

A Okay.

Q That says 2016 Regional Water Plan, Municipal Water Demand Projections for 2027 in Acre-feet. Region K, Lower Colorado --

A Yes.

Q -- did you look at these numbers?

A You've prompted that the prior one was for Region G. This is for Region K. They're adjacent to each other. So I think if you looked at both these sets together, you would find the numbers that I used.

MS. MELVIN: Thank you. That's all my questions.

JUDGE O'MALLEY: Anything further from this witness?

MS. REESE: Nothing further, Your Honor.

JUDGE O'MALLEY: Thank you, Mr. Thornhill. You may be excused.

WITNESS THORNHILL: Thank you.

JUDGE O'MALLEY: Mr. Johnson, you're going to be doing the next witness?

MR. JOHNSON: Yes, Your Honor. We call

Mr. Joseph Beal.

JUDGE O'MALLEY: Okay.

(Witness Beal sworn)

JUDGE O'MALLEY: Please be seated.

Go ahead, Mr. Johnson.

MR. JOHNSON: Thank you, Your Honor.

JOSEPH J. BEAL,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. JOHNSON:

Q Would you state your full name, please?

A My name is Joseph J. Beal.

Q Can you briefly describe your educational background?

A Yes, sir. I have a Bachelor of Science degree in civil engineering from Texas Tech obtained in 1968 and an MBA from The University of Texas at Austin in municipal finance and construction management that I received in 1974.

Q Can you give us a brief description of your employment history since graduation from Texas Tech?

A Yes, sir, I began my career as a staff engineer at Forrest & Cotton consulting engineers in Dallas. I worked there until I went on active duty in the U.S. Army in 1968. I served in the Army for two years.

And when I returned back to the U.S., I went back to work for Forrest & Cotton Consulting Engineers. I worked until 1974.

And then was employed by the Texas Water Quality Board, which is a previous agency to TCEQ. And there I worked for two years and created the Galveston Bay project, which was a -- one of the first waste load allocations for the Houston Ship Channel.

In 1976, I joined the firm of Espey, Huston & Associates, which was a small engineering and environmental consulting company at that point. I worked there for almost 20 years. I was senior vice-president. And when I left the company, it was a large national and international engineering and environmental consulting company.

Then in 1995 I joined the Lower Colorado River Authority as the head of all of the water and hydroelectric portions of the entity. And in 1999, I became general manager of LCRA. I served as general manager under the Board until 2008. In 2008 I retired.

Since that point in time, I've been president of Beal Consulting, Inc., and I work on projects from time to time through that entity.

Q Mr. Beal, prior to joining LCRA in your work as a consulting engineer with both Forrest & Cotton and

Espey-Huston, what types of projects did you work on or were you responsible for?

A I generally specialized in water resources projects. I did work for river authorities, municipalities, water utilities. I worked for the electric utility industry on water supply projects, various industries for water treatment, water supply projects. I designed water treatment plants. I designed pump stations and large diameter pipelines.

Q Is it fair to say that you assisted clients on occasion in locating and developing additional water resources?

A Yes.

Q And did you become familiar with the planning process that these entities would engage in as they considered whether they needed additional water resources?

A I did.

Q Did you participate in those planing processes?

A I prepared the plans.

Q And all of your employment background and history is reflected in your CV that is included in Exhibit 51. Is that correct?

A Yes.

Q You know, at this point, I think it's safe to

say that you -- your expertise in water resources is the basis of your testimony this afternoon. Correct?

A It is.

Q Do you consider yourself to be an expert in the areas identified in Exhibit 51 laid out in Paragraph 2 of that exhibit? If you would take a look at that.

A Yes, I do.

Q And do you have opinions on the 12 items listed in Paragraph 3 in Exhibit 51?

A Yes, I do.

MR. JOHNSON: Now, Your Honor, at this time, we tender Mr. Beal as an expert on the matters identified in Paragraphs 2 and 3 of Exhibit 51.

JUDGE O'MALLEY: Thank you. Are there any objections to Mr. Beal testifying as an expert?

MR. LEIN: No, Your Honor.

JUDGE O'MALLEY: Mr. Beal may testify as an expert.

MR. JOHNSON: Thank you.

Q (BY MR. JOHNSON) Mr. Beal, let's talk about your tenure at LCRA briefly. What were your -- you mentioned that you were responsible for basically all of the water -- water aspects of LCRA. Did that include planning regional water supplies for LCRA?

A It did. My responsibility was to not only

operate the reservoirs for flood control and water supply, but I was also responsible for determining what our current and future needs were going to be and where we were going to be looking for additional water.

Q So during the tenure of your employment at LCRA, did you consider there to be a need for LCRA to develop additional water supplies for the region?

A I did. And what drove me to that specifically was information that you heard in previous testimony about the nature of the reservoir-filling flood that occurred in 1952 during the last drought. I was concerned about whether or not we would have a hydrologic situation exactly like that in the future, and so I began to look for additional water supplies.

Q So is it safe to say that after you joined LCRA in 1995, supplementation of supply from the lakes became an issue of concern for you?

A Yes.

Q And what did you do while you were at LCRA to attempt to develop additional water supplies?

A A number of things actually. No. 1, we made conservation a much more focused area. We also began to look for senior water rights to see if we could purchase those water rights. And indeed we ultimately purchased the Garwood irrigation rights and then the Pierce Ranch

irrigation rights, and those were put into our portfolio of water supplies.

We -- in the area of conservation, we came up with some pretty innovative methods of agricultural conservation. We employed Texas A&M to create a different variety of rice that would use less water, because that's primarily what was grown in the irrigation districts. We assisted the farmers in laser leveling their land, which made for more efficient irrigation. We constantly looked for ways to reduce the amount of water that was used for irrigation so that we could have more water for other purposes and -- and all of these at a cost.

We looked at underground water, underground water resources, both up here in the Carrizo-Wilcox as well as in the Gulf Coastal Aquifer. And ultimately, after I became general manager, we entered into a project with the San Antonio Water System to jointly create a massive amount of additional water that could be utilized by both our basin and by the San Antonio Water System. And that project envisioned off-channel storage facilities, a number of them in the lower part of the basin, enhanced conservation techniques for the irrigators, a massive underground water supply in the Gulf Coastal Aquifer that could be

utilized during drought conditions.

And we obtained legislation to be able to create that project, and it was going to be our long-term water supply composed of -- of all of those elements that I just described. It was an innovative plan. We took the political risk to do it because I was so concerned about having enough water for our basin in the future.

Q And had that project been pursued and ultimately completed, would it have substantially increased the available water supplies for LCRA?

A Absolutely.

Q And you felt the need for those additional water supplies as you were general manager of LCRA prior to 2008. Correct?

A I did.

Q What happened to that project?

A Ultimately the Board of LCRA determined that they would not proceed with the project. This was after I retired and they elected to notify SAWS that they were not going to go forward with the project, and did not.

Q So when you left in 2008, you felt like the SAWS project would address the future water needs of the LCRA region through this project. Correct?

A I did. And, in fact, the reason that I felt

like I could retire is because I had achieved a goal that I set about some eight years before, which was to ensure that LCRA was going to have the water that it needed in the future. And from a professional standpoint, I felt like I had done my job, I had provided water for the region and I could retire, and so I did.

Q Now, given that the project has been terminated, the contract has been canceled, how does that leave LCRA in terms of future water needs based upon your experience there as general manager?

A Well, I'd like to share high and dry, but I guess low and dry.

(Laughter)

A The -- my worst fears have come to pass. The reservoirs are at almost all-time lows. The data tells me that the drought that we are in is worse than the drought that was experienced by Texas in the late '40s and '50s, and I remember that drought. I was here and old enough to remember it.

The -- the outlook for LCRA at this point from a surface water supply standpoint is about as bad as it's ever been. And you layer on top of that that there's two, if not three times, as many people that LCRA has to serve, the water supply situation is, in my

opinion, dire for LCRA.

Q (BY MR. JOHNSON) Now, let me take you back just a little bit, Mr. Beal. When the Highland Lakes were built, were they built to meet a five-year need?

A Oh, no. The first lake that was built was Buchanan, Lake Buchanan, and it was -- that dam was completed in 1937, and it was to be a long-term water supply reservoir for the entire basin. When it was built, it was projected to supply water for 60 to 70 years in the -- in the future.

The LCRA, soon after they built Buchanan, built Lake Travis, and that dam was complete in 1942. It is a flood control reservoir, but it's also a water supply reservoir. And it, too, was -- it was built so that the LCRA would have very, very long-term supplies, mush greater than five years.

And then the intervening lakes were built. They are really not water supply reservoirs. They're hydroelectric facilities primarily that could be used for water supply. But, no, these -- the people that had the vision to build these dams and reservoirs built them for a supply that they saw well over 70 years in the future.

Q Could those reservoirs have been built in five-year increments to meet immediate five-year

demands?

A No.

Q Why not?

A Well, you can't build just a portion of a -- of a dam. You've got to -- you've got to build the whole thing. Just like you can't build a portion of a -- of a water transmission line. You have to build the whole thing.

About the only -- about the only way a water utility could build a five-year kind of project -- and this really is not all that feasible -- but if you're sitting right on top of an aquifer and all you have to do to get water is put a well in, then you might be able to build something for a water supply for five years. But even here in Bastrop, we're contemplating -- and I'm on the city council in Bastrop -- we're contemplating permitting a well through this district. And when that well gets put in, it will be a water supply that will go about 20 years for the City of Bastrop.

Q And that's the way water resource planning and development works. Correct?

A Yes.

Q Now, you were here for all of Mr. Thornhill's testimony. Is that right?

A Yes. I listened patiently.

Q Did you -- first of all, I know you know Mr. Thornhill. Do you trust his expert judgment?

A Absolutely. He's one of the best engineers I've ever worked with.

Q Was there anything in Thornhill's testimony concerning both the circumstances of demand, the circumstances with regard to the lakes or the costs -- potential cost of delivery of this water to the Williamson and Travis County area that you disagreed with?

A No.

Q Specifically you heard his testimony concerning the existing supplies in Travis and Williamson County and their vulnerability. Did you agree with his testimony?

A I do.

Q And also the project delivered water costs, have you reviewed that information?

A I have reviewed it, and I do agree with it.

Q What's the significance, in your view, of the -- of the vulnerability of the existing supplies to the marketability of this project?

A I think the fact that we are experiencing the drought that we are experiencing makes this water much

more marketable. People within the Austin area I know, because I -- I talk to the business community there a lot -- they know that we have a vulnerable water supply when we have a single source, and that single source is dependent on rainfall. And so I believe that a -- an underground water supply, an additional water supply for this area, is very marketable. The one thing I'm concerned about is that there's not enough of it to meet the future demands.

Q Now, let's talk briefly about your engagement in connection with the End Op project. How did you first become involved in the analysis of the End Op project?

A I was approached a year ago to see if I would have an interest in helping Cap Rock evaluate a business opportunity that they felt they had to participate in the End Op project. And so ultimately I agreed to provide consulting services through Beal Consulting. And I suggested to them that they also employ Mr. Thornhill, and the two of us then began to do due diligence for Cap Rock.

Q And that due diligence, I would assume, would include an analysis of the various factors that go into whether or not this project is feasible. Correct?

A It did, yes.

Q One of those would be the sustainability of the resource for the long term. Correct?

A Yes, sir.

Q Did you satisfy yourself that the End Op project in this area would be and could be sustainable for the very long term?

A Yes.

Q Another aspect of that is the potential cost of delivery of the water, the product. Did you examine that?

A I did.

Q And did you determine that the cost was competitive and would make the project feasible?

A I did. And one of the things that drives that competitive cost is the fact that the amount of treatment this water will have to have before it goes into the Austin system, or any system, is minimal as compared to the cost of treatment of surface water from the Colorado River.

Q Now, do you consider that to be an important factor in the analysis that any buyer would undertake in examining this water supply?

A Absolutely.

Q And how does that relate to the major water user groups in Travis and Williamson County? Are they

on a different supply that requires treatment?

A They're on a supply that does require treatment.

Q And, therefore, they have to incur a treatment cost in connection with the required water before they can deliver it to their customers?

A Yes, sir.

Q This water can be delivered to customers with minimal treatment?

A That's correct.

Q I'm assuming that you also assessed and looked at the need for this water and the opportunity to, in essence, market this water to customers. Correct?

A We did.

Q And what did you determine there?

A We determined that there was a definite market to include LCRA, the City of Austin and the various entities within Williamson County.

Q Did you prepare any kind of written report, or was this just an oral presentation or discussion with a client?

A Primarily an oral presentation. I did calculations and I -- I did research.

Q Once Cap Rock became involved, did that change? Well, were you still engaged by End Op to assist in this

project?
A I'm sorry, ask that again.
Q Let me ask it a better way.
A Okay.
Q Cap Rock did become involved in the End Op project. Correct?
A Yes, they did.
Q And did you transition into working as a consultant for the End Op entity after that occurred?
A Yes, I did.
Q So you continue to work as a consultant for End Op today?
A Yes, I do.
Q And you charge them an hourly rate?
A I do.
Q And that is?
A $250 an hour. That is -- that's my standard rate.
Q And you've been asked to head up the End Op effort to market this project. Is that correct?
A That's what they've asked me to do.
Q So you will be the principal person interacting with these potential purchasers or partners in trying to achieve an agreement to deliver this water to this region. Correct?

A I will.

Q And based upon this -- this engagement, do you believe you'll be successful that you can conclude an agreement with entities in Travis and Williamson Counties to deliver this water within the time frame specified in the permit, which is one year from the date of issuance?

A Yes, I believe we will be successful. And the reason I think we will be successful is that there is a real need for this water, and the water can be provided at a very competitive price. And, so, yeah, I think we'll be successful.

Q And let's get right to the chase. The referral on this matter was to take evidence on the amount of groundwater from this project that will be put to a beneficial use during a five-year operating permit term. Based upon what you know, what is your expectation with regard to how much water will be delivered and used or will be put to a beneficial use during the five -- the first five-year term of this operating permit?

A I think all of this water -- if it is permitted, it I think all of this water will be used within that first five-year period --

Q And what --

A -- all 46,000 acre-feet.

Q And why do you believe that to be the case?
A The water is at such a competitive price that it's -- it's not going to -- certainly for the City of Austin it's not going to adversely impact their rate structure. So it's -- from an economical standpoint, it's got a good attribute. I believe it -- because there will be some significant expense to drill the wells and to build the pipeline, and since it will be built for full size, all 46,000 acre-feet, I think that wherever this water finally gets used that it will be used on an on-going basis because it is cheaper -- particularly for Austin -- because it is cheaper in total cost than what Austin is seeing today for water. I believe that they would utilize all of it. And I would suspect that there will be political pressure that this water be utilized because of the need for LCRA to stretch its surface supplies as far as it can, and it is LCRA that currently has the contract with all of these users up in this Austin region.
Q Now, it probably goes without saying, but would you expect that the same amount of groundwater will be put to a beneficial use during the 30-year transport permit term?
A Yes, I do, for the -- for those same reasons.
Q So let's talk about now that you've

transitioned into this position of actually being responsible or being tasked with the responsibility of End Op marketing this project to the users. Have you had any discussions prior to this hearing with potential purchasers?

A I have.

Q And who have you had discussions with?

A I've had a couple of visits with Phil Wilson, who is the general manager of LCRA today. I've had discussions with the -- with the board chairman of LCRA and with the individual director that is in charge of the water committee of LCRA. I've had conversations with the Williamson County Judge, who has a concern about future water supplies for Williamson County.

And I have had conversations with Greg Meszaros, who is the manager of Austin Water Utilities. I have not talked to him specifically about this End Op water. I have talked to him about the need for Simsboro water to be water that would augment their current supplies.

Q In your discussions with LCRA, did you get the impression that they felt there was an immediate need for up to 46,000 acre-feet of water delivered to Travis and Williamson County?

A The last time I talked to Phil Wilson he said,

"Get a permit and then come and see me." So, yeah, there's interest there.

Q How about in your discussions with the county judge of Williamson County? Did you come -- did he indicate that he felt there was a need for this 46,000 acre-feet in Williamson County in the immediate future?

A He did. And, in fact, I asked him if he would write me a letter that would tell me that he was interested in this water for Williamson County. His response was I would much rather have the full Commissioners' court publicly ask you. And I asked him if he wanted me to write a resolution that he could utilize for the Commissioners' court. He did. We did -- I did. I provided that resolution to him about 10 or 12 days ago. It was scheduled to be acted upon at the Commissioners' Court last Tuesday. One of the Commissioners had a death in her family and could not be there, and the Judge wanted the full Commissioners' Court to consider that resolution. So the Commissioners' Court took no action.

Q Do you expect the Commissioners' Court to consider that resolution in the future?

A Yes, I do.

Q And do you expect them to adopt that resolution?

A I believe that they will.

Q Let me ask you to turn in the exhibit binder to what's been marked as Applicant's Exhibit No. 109. And let me ask you as you're flipping to that exhibit, is this the resolution that you described?

A It is.

Q And that would have been considered at the Williamson County Commissioners' Court meeting this week but for the absence of one of the Commissioners?

A Yes.

Q And it will be considered in the future?

A Yes. They -- it was on the agenda. They retired to executive session. The county attorney came out and told us that the Judge did not want to take action because one of the Commissioners was not there, and so they took no action.

Q Once this project is permitted, what is your plan for meeting with these entities to market this project and strike an agreement?

A We will immediately began to -- begin to have our formal visits. You know, just as soon as -- as soon as its permitted, we'll have something that they can use. I'll begin to have additional discussions with these potential users immediately.

Q Now, let me ask you to -- first of all, you

heard Mr. Thornhill testify about the agreement between the San Antonio Water System and the Vista Ridge group, otherwise known as Abengoa and Blue Water. Are you familiar with that agreement?

A Yes, I am.

Q Are you familiar with -- generally familiar with the SAWS system in light of your contract with -- LCRA's contract with SAWS?

A Yes.

Q And have you, as part of that, looked at SAWS' incremental demand for water over time?

A Yes.

Q The SAWS/Vista Ridge project calls for the delivery of 50,000 acre-feet of water when the project is completed and obligates SAWS to take and use all of the water that is capable of being delivered. Does SAWS have an immediate need for 50,000 acre-feet of water?

A No. Their -- their incremental demands, their annual increases in demands, would be significantly less than 50,000 acre-feet per year.

Q And why would they agree to take 50,000 acre-feet if their incremental demands, say, in the next five years, were only 10,000 acre-feet?

A Because that's what a water utility does. They'll look out if they -- if they can, and San Antonio

has had difficulty looking out at a -- at a long-term future. But when they can, they will look out more than 30 years, 50 years, some cases a hundred. And if they can afford to tie up a long-term supply, that's what they will do. That is what San Antonio -- or what SAWS was going to do with the project that was envisioned with LCRA. That project included a much, much larger pipe than what's being considered for the Vista Ridge project that would go from near Bay City all the way to San Antonio.

So consistently SAWS has looked far beyond what they need for the next five years. They've looked far beyond that to try to find long-term supplies.

Q Now, the San Antonio Water System is almost exclusively dependent upon one source of water. Correct?

A Yes, sir.

Q And does that one source of water have some vulnerability issues similar to the vulnerability issues that the Highland Lakes have?

A Well, it may be even more vulnerable. I call it a federal drought. The federal government declared -- ultimately the federal government caused there to be a limitation on the amount of water that could be withdrawn from that aquifer.

And so here you had a major city in Texas that thought that it had a long-term water supply tied up, and then all of a sudden it didn't, and that's when they began to scramble to try to find water.

Q So using the analogy, they have a single source of water supply that could be substantially interrupted because of drought in order to protect the federal endangered species. Correct?

A Yes.

Q And that is similar to the situation in the Highland Lakes with regard to vulnerability to drought. Correct?

A Yes.

Q Are there other analogous situations, particularly in the Panhandle, with regard to this vulnerability of existing supply and substitution of a groundwater supply to meet that -- that need?

A Yes. In fact, it's -- it's going on as we speak just to the west of us here in this part of the Colorado basin. Mr. Thornhill testified about the CRMWA, C-R-M-W-A, system, which has gone from a surface water supply to now a underground water supply piping water hundreds of miles simply because their surface water supply has dried up.

It's a little known fact, but if you go

just above Buchanan Dam and Lake Buchanan, the next reservoir you hit on the Colorado is Ivie Reservoir. Ivie is controlled by the Colorado River Municipal Water District, and they've been building lakes -- that district has been building lakes for almost as long as LCRA has been building lakes. And I might add that LCRA tried to stop them every time they could because LCRA was concerned about water being cut off from -- from their reservoirs.

But all three of their major reservoirs are experiencing this same situation. I think the Ivie Reservoir today might have 15 or 16 percent of its available volume. Spence caught a little bit of water very recently. J.B. Thomas is dry, and that feeds all of that Permian Basin area. Midland/Odessa, Big Spring, Sweetwater, they're running out of water there.

Q And have they looked at replacing that surface water supply with groundwater supply?

A Yes, groundwater supplies. And for Big Spring, they're going to take sewage from their sewage treatment plant and pipe it directly into the system, which I think would be hard to do in Austin, Texas.

Q One would think.

So in other parts of the state where there were reservoirs that had yields that were calculated to

be sufficient for future demands, entities using that water, developing that water, have been required to develop supplemental or substitution supplies because of the drought?

A They have, including underground water.

Q And when they do that, do they build the entire project so they can deliver those supplies to meet that demand?

A They do.

Q Again, they don't build those projects in increments?

A They can't.

Q So let's kind of sum up here. Once a permit is issued, you will be negotiating, you will be marketing this project to Travis and Williamson County water users specifically. Correct?

A I will.

Q And given the information that Mr. Thornhill has developed, do you believe that you will be successful in marking this project to Travis and Williamson County water users?

A I do believe that.

Q And assuming that you are successful in doing that, is it your opinion that they will use 100 percent of the available water supply within the first five

years?

A I think they will.

MR. JOHNSON: Thank you. That's all the questions.

JUDGE O'MALLEY: Okay. Mr. Johnson --

MR. JOHNSON: Oh, I'm sorry. We seek to admit Exhibit 109.

JUDGE O'MALLEY: What about 108? Has that been admitted?

MR. JOHNSON: No. We have not offered that.

JUDGE O'MALLEY: Are you withdrawing it or --

MR. JOHNSON: We'll withdraw that exhibit.

JUDGE O'MALLEY: Okay. Are there any objections to End Op's Exhibit 109?

MS. MELVIN: Not as described.

JUDGE O'MALLEY: Not as described?

(Laughter)

MS. MELVIN: Not as he testified to, a resolution that he drafted --

JUDGE O'MALLEY: Okay.

MS. MELVIN: -- Commissioners' Court. With that understanding, I've got no objection.

JUDGE O'MALLEY: Okay.

MR. JOHNSON: Your Honor, we would ask that we be allowed to supplement the record with the resolution of Williamson County in the event they adopt the resolution.

JUDGE O'MALLEY: Before the record closes you mean?

MR. JOHNSON: Yes.

JUDGE O'MALLEY: Okay. Well, that's -- we'll talk about that when we come up with the record close date and that type of thing.

But with regard to End Op Exhibit 109, that's admitted.

(Exhibit Applicant End Op No. 109 admitted)

MR. JOHNSON: Thank you.

JUDGE O'MALLEY: Mr. Lein, are you doing the cross? I saw you taking notes, so that's why --

MR. LEIN: I'm a habitual note taker.

MS. MELVIN: I may as well. Mr. Beal --

JUDGE O'MALLEY: Ms. Melvin, you're going to be doing it? Okay.

MS. MELVIN: I will.

CROSS-EXAMINATION

BY MS. MELVIN:

Q Good afternoon. I believe that you testified

that the LCRA/SAWS, San Antonio Water System project, included a number of off-channels reservoirs. Is that correct?

A Yes, ma'am.

Q And I understood Mr. Thornhill to testify that the LCRA is going forward with an off-channel reservoir -- I don't know if it's one of those off-channel reservoirs -- right now. Is that your understanding?

A Yes.

Q Could you explain how an off-handle reservoir makes more water available?

A The concept is that when there is excess water in the river, like after a major rainfall event, and if that water is not needed downstream of a particular point, then a low head, large-volume pump would pump water from the river into an off-channel storage facility.

A prime example of one is the pond at the South Texas Nuclear Plant. That's a very large off-channel storage facility.

Technically you dig and fill. You take the spoil that you take from digging the hole and you build up a levy, and you create a facility that can store that water that otherwise would make it to the

Gulf. Then that water is used and it takes the place of water that would have been either run-of-river water that comes down the river or water that was stored in the Highland Lakes.

And then as that reservoir is drawn down, when you have the opportunity to refill it again, you top it off, and fill it again after and keep using it.

Q Thank you.

Do you think that the LCRA reservoir that LCRA is building right now is a good idea?

A Oh, I think any additional water supplies for LCRA is a good idea. I don't know how that off-channel storage facility is going to solve the problem that Austin and Williamson County has now with the Highland Lakes situation. Had it been built a number of years ago, then it's possible that it could have made a difference because it might have been used for irrigation purposes that stored water was used for.

Q And as you explain it, that's because you could use water out of that reservoir for irrigation instead of releasing the water from Lake Travis and Lake Buchanan. Is that correct?

A Yeah, water in an off-store -- in an off-channel storage facility would be utilized for a multiple of uses. There's industrial uses down there as

well, the nuclear plant, the old Celanese plant. They call it something else now. But there's a number of water users in that lower basin, and that stored water could be used for any of those.

Q And that's why an off-channel reservoir we're talking about, is down in the basin, could actually help provide water supplies to the City of Austin, for example?

A Yeah, if -- if there were water to conserve or not use within the Highland Lakes.

Q Uh-huh.

A The off-channel storage facilities that were envisioned in the SAWS project were going to be utilized not only for irrigation purposes, but as a storage facility to pump water to San Antonio.

Q Thank you.

You mentioned that you're on the Bastrop City Council and Bastrop currently has an application pending at the -- at the district. Are you referring to their application to produce 2,000 acre-feet per year from the Simsboro Aquifer in Bastrop, County Texas?

A Yes.

Q I know you have a lot of experience in this. If you were to start today and build a pipeline from the End Op wells where they're located in Bastrop and Lee

Counties to the City of Austin -- to a place where you could deliver it to the City of Austin in a place where they can take it and use it, how long do you think that would take?

A Well, it depends on how heroic you wanted to be to get it built. You know, when I was young and in Dallas, I watched the City of Dallas water utility lay a major waterline from the Red River to Dallas, and they did it in a year. They didn't bury it. They just put it on top of the ground because they had to.

But realistically, once the design was done and the right-of-way was obtained, you could probably -- with multiple contractors you could probably build that pipeline project in a couple of years.

Q And that's after the design was completed and after you got the right-of-way. Is that what you just said? I'm just clarifying.

A If you started now and you had a public entity that could get the right-of-way, you could probably get that pipeline and well field completed in about a two and a half year period.

MS. MELVIN: I have no further questions, Your Honor.

JUDGE O'MALLEY: Thank you.

Redirect, Mr. Johnson?

MR. JOHNSON: We have no further questions, Your Honor.

JUDGE O'MALLEY: Can Mr. Beal be excused?

MR. JOHNSON: He may.

JUDGE O'MALLEY: Okay. Thank you, Mr. Beal.

WITNESS BEAL: Thank you, Judge.

JUDGE O'MALLEY: Was one of these notebooks yours?

WITNESS BEAL: This one is.

JUDGE O'MALLEY: Does End Op have anything else for their direct case?

MS. REESE: No, Your Honor. We rest our direct case.

JUDGE O'MALLEY: Okay. Thank you. This is probably a good time to take a break, so why don't we go ahead and take about a 10-minute break and we'll come back.

MS. MELVIN: We won't have a direct case, Your Honor. I just wanted to let you know that.

JUDGE O'MALLEY: Okay.

MS. MELVIN: Other than things we've already introduced --

MR. LEIN: Right.

MS. REESE: Try not to seem too excited.

(Laughter)

JUDGE O'MALLEY: Okay. Well --

MS. MELVIN: That doesn't mean we shouldn't take a break.

JUDGE O'MALLEY: No, I think probably we need to take a little bit of a break, and then we'll come back and we'll work on a schedule.

MS. MELVIN: That sounds good.

JUDGE O'MALLEY: Okay. Let's go off the record.

(Recess: 3:03 p.m. to 3:14 p.m.)

JUDGE O'MALLEY: Why don't we go ahead and go back on the record. Before we went off the record, Ms. Melvin announced that the General Manager did not have a direct case.

MS. MELVIN: We are not going to -- we're not introducing any witnesses, Your Honor.

JUDGE O'MALLEY: Okay. We've already admitted your exhibits.

I think we're ready to develop a schedule, a briefing schedule. I'm trying to contemplate the best approach here. Based on your cross, it's hard to tell whether you're contesting the remand evidence put on by End Op. I'm not sure where we are exactly. There's a couple of ways we can go about it. I'm trying to think

of a way when I'm writing something up to make it easy for the District Board. So if it's not truly contested, they're not thinking --

MS. MELVIN: I'm not sure -- it's true we contest it.

JUDGE O'MALLEY: It is?

MS. MELVIN: Yes.

JUDGE O'MALLEY: Okay.

MS. MELVIN: There are many of the things that they -- that they testified to that we don't agree with.

JUDGE O'MALLEY: Well, that's what I'm trying to get at. There's a lot of evidence here, but the issues themselves are fairly limited, but the evidence that's -- I understand a lot of this you're contesting. I didn't know the issues themselves. Do you know what I mean?

MS. MELVIN: Yes.

JUDGE O'MALLEY: Obviously there's parts of that evidence based on your cross you disagreed with or you contest you think is not accurate, but I didn't know generally how much you're contesting the issues. Do you know what I mean?

MS. MELVIN: I understand them to be saying that they will use $45,000 on what we have been

calling day one -- 45,000 acre-feet on day one. We contest that.

JUDGE O'MALLEY: Okay.

MS. MELVIN: Okay. 45,000 in 30 years, we contest that.

JUDGE O'MALLEY: Okay. So the -- so is the best approach just to do the standard -- is there some things that can be stipulated to?

MS. MELVIN: Yes, there probably are. Much of the testimony today we probably could have stipulated to.

JUDGE O'MALLEY: Okay.

MS. MELVIN: And I'd be happy to try and do that with them.

JUDGE O'MALLEY: Okay. Well, and you're right. It wasn't prefiled, so you really had no idea what it was going to be, so it was hard to make stipulations. I can understand that.

So do we want to just do the standard briefing approach where we do initial briefs, reply briefs, and then with the reply briefs you can attach proposed findings of fact, and with the reply briefs you can also submit stipulations?

MS. MELVIN: That would be fine with us, Your Honor.

JUDGE O'MALLEY: So the first initial brief would be a standard initial brief. You cite to the evidence and you break it up by these two issues.

And then the reply briefs would come in, and those would include the -- obviously the reply to the initial along with findings of fact and conclusions of law and any stipulations.

MR. JOHNSON: I think we're comfortable with that, Your Honor. I mean, I would expect you to ask us to present to you proposed findings and conclusions in our initial filing, but however you want to do it.

JUDGE O'MALLEY: You can do it in the initial or -- or the reply. The standard way is to normally do it in the reply briefs --

MR. JOHNSON: That's fine.

JUDGE O'MALLEY: -- because the other side isn't commenting typically on your findings and conclusions of law. It's just your arguments and so forth, so they're not like disputing. I don't want someone coming back and saying, "No, I disagree with their Conclusion of Law No. 2 for these reasons."

MR. JOHNSON: Understood.

JUDGE O'MALLEY: That's just -- I'll pick which ones. We often change them anyway, but it gives

us some basis to go by.

But as Ms. Melvin indicated, a lot of it can be stipulated to.

And I guess, Mr. Gershon, are you contesting End Op's present -- their --

MR. GERSHON: I'll be clear. Aqua is not protesting any of the issues that are framed up in the scope of the remand.

JUDGE O'MALLEY: Okay. You're not contesting the issues, so you're not --

MR. GERSHON: The facts, whatever.

JUDGE O'MALLEY: Okay. So you're -- okay. So you're not in any disagreement with what End Op presented?

MR. GERSHON: We are -- that's correct.

JUDGE O'MALLEY: Okay. So you probably won't be --

MR. GERSHON: We're not -- we're not weighing in.

JUDGE O'MALLEY: So you probably won't be filing a brief or --

MR. GERSHON: It would be mostly nonsubstantive, just to be clear about Aqua's position --

JUDGE O'MALLEY: Okay.

MR. GERSHON: -- in light of our settlement.

JUDGE O'MALLEY: Okay.

MS. REESE: That's fine. We're not opposed to you filing something brief.

JUDGE O'MALLEY: That's fine. Well, why don't we go ahead and come up with deadlines? It appears that the transcript, by agreement, will be ready on the 14th of November.

Ms. Melvin, is the district trying to take this up at any future meeting, or are they just waiting until whenever it's ready?

MS. MELVIN: I think that they're waiting til your -- I'll call it proposal or remand for lack of a better report or whatever you want to call it, that they won't take this up until they get that from you.

JUDGE O'MALLEY: When is -- and when is their next meeting?

MS. MELVIN: Their next meeting is November 19th, so that's --

JUDGE O'MALLEY: That's -- that's obviously out.

MS. MELVIN: Totally impossible, yeah.

I believe their meeting after that -- is it December 17th?

(Discussion off the record)

JUDGE O'MALLEY: While we were off the record, the parties agreed on the following briefing schedule: The initial briefs will be due December 12th. The reply briefs will be due January the 9th, 2015. And with the reply briefs will be the -- any findings of facts and conclusions of law and any stipulations of the parties.

Anything else before we go off the record?

MR. LEIN: No, Your Honor.

MS. REESE: No, Your Honor.

MR. JOHNSON: No, Your Honor.

JUDGE O'MALLEY: Okay. We will conclude this hearing and go off the record. Thank you.

(Proceedings concluded at 3:27 p.m.)

C E R T I F I C A T E

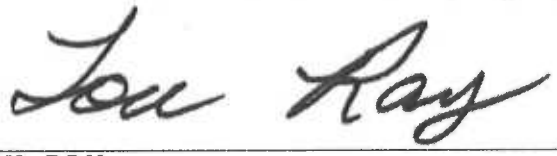
STATE OF TEXAS)

COUNTY OF TRAVIS)

I, Lou Ray, Certified Shorthand Reporter in and for the State of Texas, do hereby certify that the above-mentioned matter occurred as hereinbefore set out.

I FURTHER CERTIFY THAT the proceedings of such were reported by me or under my supervision, later reduced to typewritten form under my supervision and control and that the foregoing pages are a full, true, and correct transcription of the original notes.

IN WITNESS WHEREOF, I have hereunto set my hand and seal this 14th day of November, 2014.



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