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STATE OF NEW MEXICO  
ENERGY, MINERALS, AND NATURAL RESOURCES DEPARTMENT  
OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING CALLED  
BY THE OIL CONSERVATION COMMISSION FOR  
THE PURPOSE OF CONSIDERING:

COPIES

APPLICATION OF LIGHTNING DOCK GEOTHERMAL Case No. 15357  
HI-01, LLC, FOR APPROVAL TO INJECT INTO A  
GEOTHERMAL AQUIFER THROUGH THREE PROPOSED  
GEOTHERMAL INJECTION WELLS AT THE SITE OF  
THE PROPOSED LIGHTNING DOCK GEOTHERMAL POWER  
PROJECT, HIDALGO COUNTY, NEW MEXICO.

and  
APPLICATION OF LIGHTNING DOCK GEOTHERMAL  
HI-01, LLC, TO PLACE WELL NO. 63A-7 ON Case No. 15365  
INJECTION-GEOTHERMAL RESOURCES AREA,  
HIDALGO COUNTY, NEW MEXICO

REPORTER'S TRANSCRIPT OF PROCEEDINGS  
COMMISSION HEARING  
Volume IV  
October 8, 2015  
Santa Fe, New Mexico

BEFORE: DAVID R. CATANACH, CHAIRPERSON  
ROBERT S. BALCH, COMMISSIONER  
PATRICK PADILLA, COMMISSIONER  
BILL BRANCARD, ESQ.

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This matter came on for hearing before the  
New Mexico Oil Conservation Commission on Thursday,  
October 8, 2015, at the New Mexico Energy, Minerals, and  
Natural Resources Department, Wendell Chino Building,  
1220 South St. Francis Drive, Porter Hall, Room 102,  
Santa Fe, New Mexico.

REPORTED BY: ELLEN H. ALLANIC  
NEW MEXICO CCR 100  
CALIFORNIA CSR 8670  
PAUL BACA COURT REPORTERS  
500 Fourth Street, NW  
Suite 105

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## 1 H E A R I N G I N D E X

2 PROTESTANT AMERICULTURE  
3 CASE-IN-CHIEF:

4 WITNESS JAMES C. WITCHER (cont'd)

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6 By Ms. Henrie	Cross-Examination 46	Recross	Further
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E X H I B I T I N D E X

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(None.)	

1 (Time noted 8:41 a.m.)

2 COMMISSIONER CATANACH: We call the meeting  
3 back to order this morning, and turn it over to  
4 Mr. Lakins again. Do we have any business to take  
5 care of?

6 MR. BRANCARD: Yes. Mr. Lakins has provided  
7 Mr. Witcher's resume. Do you want to introduce this as  
8 an exhibit?

9 MR. LAKINS: Yes, sir.

10 MR. BRANCARD: Any objection?

11 MS. HENRIE: No.

12 MR. LAKINS: That would be Exhibit Z.

13 COMMISSIONER CATANACH: Exhibit Z would be  
14 admitted as evidence.

15 (AmeriCulture Exhibit Z was offered and  
16 admitted.)

17 MR. LAKINS: And just as one other  
18 procedural matter, I did hand one slide, which is the  
19 water table isotope slide, which is Exhibit Y...

20 JAMES WITCHER

21 having been previously duly sworn was, was further  
22 examined and further testified as follows:

23 DIRECT EXAMINATION (resumed)

24 BY MR. LAKINS:

25 Q. Good morning, Mr. Witcher.

1 A. Good morning.

2 Q. Kind of just to sum up in one sentence what you  
3 were talking about yesterday about the hot water to the  
4 southwest not being the source of fluoride. There was a  
5 kind of a lengthy discussion about that. Could you just  
6 kind of sum that up?

7 A. Okay. Yesterday, we spoke about the potential  
8 for a southwest source of geothermal energy that was  
9 tied in with a possible magma and a high temperature  
10 resource. And it's also being characterized as having  
11 leaked fluoride into the near surface shallow ground  
12 water resource.

13 And I don't believe that's the case. And there  
14 is another way to view that. And one of the ways to  
15 view that is a situation that we see in the Rio Grande  
16 Valley quite frequently. At the end of all the  
17 basins -- and a great example of this would be at the  
18 end of the Albuquerque Basin near San Acacia before it  
19 dumps into the Socorro Basin -- you have an salinity  
20 increase.

21 And what this is is that moderately deep water in  
22 the basin fill upwells over a structural high and you  
23 can think of it as a spillway over a dam. And it flows  
24 southward into the next basin.

25 And usually when that happens, there is a plume

1 of chemical water and also it contains high fluoride. I  
2 have done extensive work in Mesilla Basin and in the  
3 area in southern New Mexico, and we see the same  
4 phenomenon. In fact, the water quality goes down in a  
5 huge way at the narrows El Paso when you dump water out  
6 of the Mesilla Basin into the El Paso Basin.

7 And I think that this is the same phenomena that  
8 is going on where you have water from the upper Animas  
9 Basin flowing through a structural high area into the  
10 next basin to the south.

11 And these areas, they are structurally high  
12 because they represent combination zones, as we call  
13 them, which means that the structures in one basin  
14 change to go to the next basin. And so you have to have  
15 differences in the strain that takes place there. So  
16 you usually have a structural high, and the ground water  
17 flows over the top of these things and it carries the  
18 salinity into the next basin.

19 Q. I am going to show you what is Lightning Dock  
20 Exhibit 11, the first page from that. Could you speak  
21 to this in the context --

22 A. Yes. And this is the example of what I was  
23 speaking of. To the south, you see kind of that hook  
24 shape area there. And that's the water that is flowing  
25 out of the Upper Animas Basin into the southern or the

1 Lower Animas Basin to the north. And I believe that  
2 that is just merely upwell saline or more saline water  
3 with higher fluoride content flowing south.

4 And, then, of course, once you get up to the red  
5 area, where you have the KGRA, then you have the actual  
6 geothermal water mixing with the shallow ground water.

7 And that is where you have your highest floridiae  
8 contents. And that would be the only area that  
9 geothermal's really contributing to the high fluoride.

10 Q. Very good.

11 One of Lightning Docks' exhibits, it was their  
12 Exhibit 8, was a Piper diagram from Mr. Miller. Do you  
13 recall that?

14 A. Yes, I do.

15 Q. Did you take a look at that?

16 A. Yes, I did.

17 Q. Did you compare it with any other Piper diagrams,  
18 particularly the one from Exhibit 6, the geology and  
19 geothermal waters of Lightning Dock that's on page 27 --

20 A. Yes.

21 Q. Yes?

22 A. Yes.

23 Q. Did you prepare a slide?

24 A. Yes.

25 Q. As part of your --

1       A. Yes, I prepared a slide with those two figures in  
2 already given exhibits.

3       Q. And it was a comparison of the two Piper diagrams  
4 that are already in evidence?

5       A. Yes. Using the same data, by the way.

6       Q. Is that this comparison?

7       A. Yes, it is.

8       Q. Could you tell us what you saw from comparing  
9 those two?

10       A. When I saw Dr. Miller's Piper diagram, I looked  
11 at it. And what he is mapping there on the diagram with  
12 his water samples is a sodium chloride water. And  
13 geothermal waters and most of the waters in the Animas  
14 Basin are sodium sulfate waters.

15               So I thought, Well, this is strange.

16               And so I went and recalculated some of those  
17 numbers with data that I had. And I saw what he had  
18 done. He switched the sulfate numbers for chloride and  
19 then plotted up the sulfate numbers as chloride in the  
20 diagram.

21               And this is an error that can happen. And I've  
22 done things like this myself at different times. But  
23 here is the problem with this, is that it gives you a  
24 completely different interpretation of what is going on  
25 in that Animas Basin in terms of chemistry.

1           When you plot it up as a sodium chloride water,  
2 what you end up with is almost a linear trend between  
3 end members you got on the right-hand side; with the red  
4 waters you have -- you have the geothermal water and  
5 then on the blue you have the colder water in the basin.

6           And what ends up happening is you get almost a  
7 linear trend that suggests you only have two end members  
8 and that everything represents a mix of cold water and  
9 geothermal water. And that's just not the case.

10           If you look on the left-hand side, that diagram  
11 was plotted up properly and that's out of Circular 177.  
12 And as you see, there is a huge scatter of data there,  
13 which tells you that there's not just one source of  
14 salinity. And even a fluoride source, which would be  
15 the geothermal, there's several sources of fluoride in  
16 there.

17           And one of them I just mentioned, which would be  
18 that discharge out of the basin upwelling over a  
19 structural high to the south and then flowing into the  
20 basin. And there may be other sources, which can  
21 include evaporative processes that take place on the  
22 Animas Playa. And each one of the aquifers out there,  
23 they have a different chemical regime, too.

24           So this is an important distinction to make here.  
25 And I think that using Dr. Miller's Piper diagram, the

1 interpretation that comes out of that is completely  
2 wrong because the data was plotted wrong.

3 MR. LAKINS: I move to admit slide, Piper  
4 diagram slide, comparison of the two documents already  
5 in evidence, as AmeriCulture Exhibit AA.

6 COMMISSIONER CATANACH: What number would  
7 that be?

8 MR. LAKINS: AA. We are at Z, so what would  
9 be the preference for the Commission?

10 COMMISSIONER CATANACH: AA, that would be  
11 fine. Any objection?

12 MR. ROGERS: No objection.

13 COMMISSIONER CATANACH: Exhibit AA will be  
14 admitted.

15 (AmeriCulture Exhibit AA was offered and  
16 admitted.)

17 By MR. LAKINS (cont'd):

18 Q. Mr. Witcher, for some reason, the exhibit book  
19 that I had for the witnesses is not here.

20 A. Okay.

21 Q. So I'm going to show you a document that is  
22 AmeriCulture Exhibit K.

23 MS. HENRIE: Charles, I have an exhibit book  
24 I can give you.

25 MR. LAKINS: Sorry? What?

1 MS. HENRIE: Do you want me to give this to  
2 the witness?

3 MR. LAKINS: That is not necessary.

4 MS. HENRIE: Okay.

5 BY MR. LAKINS (cont'd):

6 Q. Have you seen this letter before, Mr. Witcher?

7 A. I have. It has been some time ago, but I have  
8 seen it. And I did read it.

9 Q. I want to bring your attention to the second page  
10 where there is a notification requirement in this  
11 letter -- this is the top of the second page of the  
12 exhibit -- where it requires notification of -- from the  
13 sampling wells. Can you read that okay?

14 A. Yes.

15 Q. -- "with the exceptions of fluoride exceeding a  
16 concentration of 17 milligrams per liter."

17 Do you think that that is an appropriate trigger  
18 for the monitoring wells exceedance?

19 A. I don't. And the reason I feel that way is that  
20 the highest concentrations that have been measured out  
21 there that I am aware of is 12 to 15 milligrams per  
22 liter. And so I don't understand where the  
23 17 milligrams per liter would come from. It doesn't fit  
24 with the measured data.

25 One of the things that I understand where that

1 number may have come from is analyses that have been  
2 done with an EPA computer program. And they may have  
3 been using the wrong statistical method to check this  
4 out. If they use a normal distribution, a Gaussian  
5 normal distribution on this, you might come up with  
6 something like that.

7 But, usually, these chemical constituents like  
8 fluoride, they actually plot up as a log normal type  
9 distribution. So not having seen how that works -- and  
10 I am not familiar with that program, so I can't speak to  
11 that. But those are just some thoughts I have.

12 I just think 17 milligrams with what has been  
13 measured just doesn't seem reasonable to me.

14 MR. ROGERS: At this point I would like to  
15 move to strike that answer. The witness tells you he is  
16 not familiar with the data or the underlying matter, so  
17 the opinion is irrelevant and should not be allowed.

18 MR. LAKINS: I think what Mr. Witcher just  
19 testified to is he doesn't know the underlying basis of  
20 where the 17 number came from. He hasn't been apprised  
21 of how OCD calculated that number or where -- or if that  
22 number was given to OCD by applicant, as an example; but  
23 based on his understanding of the existing fluoride  
24 levels out there, with the highest being less than that  
25 number, that his opinion is that that is an

1 inappropriate trigger number to use. That was his  
2 testimony.

3 COMMISSIONER CATANACH: I think we would  
4 allow that.

5 MR. LAKINS: I believe that this letter K  
6 has already been admitted by my notes.

7 MS. MARKS: Yes, it has.

8 MR. BRANCARD: I believe it has.

9 MS. HENRIE: No objection.

10 MR. BRANCARD: If not, we will admit it  
11 again.

12 MR. LAKINS: Ms. Henrie, actually, it would  
13 be helpful. If you have that extra exhibit book -- do  
14 you have that exhibit book? Would you mind, I am  
15 changing my mind.

16 MS. HENRIE: What would you like, Charles?

17 MR. LAKINS: Exhibit G.

18 MS. HENRIE: I do have it.

19 MR. LAKINS: Thank you.

20 BY MR. LAKINS (cont'd):

21 Q. Mr. Witcher, I want to turn your attention to  
22 Exhibit G in that book, the sequence of figures from  
23 John Shomaker and Associates. Have you seen those  
24 before?

25 A. Yes, I have.

1 Q. Could you describe to us what you see in that  
2 sequence of diagrams?

3 A. Well, what you see is that after geothermal  
4 operations commenced and injection in well 55-7, the  
5 shallow monitoring wells, there were distinct rises in  
6 the water level that started to take place.

7 And it grows from 2.4, or thereabouts, up to as  
8 high as -- it seems like I recall as high as five or  
9 six. This would be a water level change.

10 Q. And what does that represent?

11 A. It represents mounding of the shallow ground  
12 water after injection at 55-7 began.

13 Q. Are you aware of any recent surveys concerning  
14 AmeriCulture's wells?

15 A. Yes, I am. AmeriCulture's wells were surveyed by  
16 a surveyor to determine the elevation of the well head  
17 measurement site to give groundwater level measurements.

18 Q. Based upon your review of that survey information  
19 and those slides, do you believe there's a groundwater  
20 mound near AmeriCulture's Well A-444?

21 A. There is no groundwater mound at the AmeriCulture  
22 Well A-444, and there's also no trough in between the  
23 monitor wells and the ground water for the Well A-444.

24 Q. I want to turn back to kind of where we left off  
25 yesterday at this slide. And if you could speak to me,

1 speak to the Commission about your opinion upon  
2 permeability within this area, the geologic resource,  
3 based upon your information and kind of speaking from  
4 this slide.

5 A. Okay. The unit that you see down there in blue,  
6 that is Paleozoic limestone. It's my opinion that that  
7 has overall very low permeability.

8 And I base that on the fact that there's --  
9 isotopic data shows there's been no geothermal  
10 interaction with carbonate rocks. And those are  
11 carbonate rocks.

12 And also we have core that we cored in  
13 AmeriCulture 2. And they are fractures, but they are  
14 healed up with calcite. And so there is no  
15 permeability, fracture permeability there.

16 The permeability is up in the upper part of the  
17 tertiary volcanics. And then there is good permeability  
18 in the silicified Gila conglomerate or basin fill  
19 material, however you want to characterize that.

20 The yellow unit, it has overall permeability in  
21 areas.

22 But the way I would look at this, in looking at  
23 this diagram, I see three different reservoirs there. I  
24 see an outflow plume reservoir, which has different  
25 chemistry, different lithology, and it has different

1 overall characteristics. And that is the orange unit  
2 that you see up there, the QTG. And that's your outflow  
3 plume reservoir.

4 And then you have a reservoir in the horst block  
5 that 55-7 taps into. And I view that as a reservoir  
6 caused by the damage zone of that fault that you see.  
7 With a fault zone you have a damage zone that sometimes  
8 can reach out hundreds of meters away from the fault.  
9 It becomes a lot of times more intense as you get close  
10 to the fault. That's characterized by a lot of  
11 fracturing.

12 The fault itself can be a core zone, they call  
13 it. It is characterized by a clay gouge or even  
14 slickened sides, and it can be rather impermeable.

15 And then you have, the other side of that fault  
16 is 45-7, and there is some question as to whether that  
17 is actually the same fluid that is what's tapped into by  
18 55-7. Some of the chemical analyses that have been  
19 reported by Lightning Dock show low TDS.

20 And one of the first analyses that they show had  
21 TDS that was actually lower than the -- and it was  
22 explained as having been contaminated by drilling mud.  
23 But the water well that they were using to make drilling  
24 mud actually had a higher TDS than what was shown in  
25 this analysis.

1           But looking at the silica concentration in this  
2 water, you take that silica concentration and you do a  
3 geo thermometer calculation, and it comes up to be 300  
4 degrees Fahrenheit, which tells me that water was in  
5 contact with the formation, for sure. And if it was  
6 just a matter of dilution, that doesn't work.

7           I've heard another explanation from Mr. Janney,  
8 Oh, this is just water that is contaminated by deionized  
9 water from the sampling.

10           Well, that wouldn't explain -- that wouldn't  
11 explain the high silica concentration. The only way you  
12 get that is that water has to be in contact with the  
13 formation.

14           And at high temperatures, silica dissolves rather  
15 quickly. And you can take quarts and it will dissolve  
16 rather quickly in 150-degrees C water.

17           So I have a question of really what we're  
18 doing -- the chemistry also comes in, is reported the  
19 same as 55-7, but we have water that is flowing across  
20 that fault zone or being forced across that fault zone,  
21 so maybe that's all we are seeing there.

22           So I have some questions there about that. And I  
23 don't understand what I have seen, and I haven't seen a  
24 decent explanation for that.

25           The other thing I would like to point out is that

1 Dr. Shomaker discounted the fact that this reservoir is  
2 compartmentalized or that there's a barrier off to the  
3 west side there. And that barrier is that fault zone.  
4 And their own data shows this.

5 The injection well, 55-7, if you calculate the  
6 pressure that they are putting on there, in terms of  
7 head of water and then you take the draw down at 45-7,  
8 you've got a head distance across that short distance  
9 between 450 and 500 feet, over a distance of maybe 800  
10 feet. That is a huge hydraulic gradient. There is a  
11 barrier there. And the only reason water is flowing  
12 across there the way it is is because they have put a  
13 lot of pressure on it.

14 And so, essentially, what I have been maintaining  
15 all along out here is that this system has -- the  
16 geothermal system is compartmentalized and there's at  
17 least three different reservoirs there. There's one on  
18 the downthrown block, one on the upthrown block, deep,  
19 and then there's a reservoir, an outflow plume  
20 reservoir, up-shallow.

21 Q. What is your opinion? Their proposal is gravity  
22 injection between 150 and 1,500 feet at four proposed  
23 locations at four proposed locations.

24 A. That's correct.

25 Q. Do you think that that injection protocol would

1 result in that injected waters making it to the  
2 production zone or the production well based on your  
3 knowledge of the geology of the area?

4 A. I don't believe the claim that all that water  
5 would reach the reinjected zone. In fact, there may be  
6 very little of that water that would reach the injection  
7 zone.

8 And in reference to this cross section, we can  
9 cite right now two of their monitoring wells -- or their  
10 injection wells. One of their injection wells would be  
11 out there about where 36-7 is on the projected line with  
12 regard to that fault.

13 And so that is out there in the basin fill.  
14 That's in fresh water. And it's also highly permeable.  
15 It's going to be a lot more permeable than the bedrock  
16 beneath that.

17 And so that water is going to take the path of  
18 least resistance. And with gravity or putting pressure  
19 on it, either way, that is what is going to happen.

20 But with gravity I don't believe it will ever  
21 reach the bedrock geothermal deep reservoir.

22 Q. Just to back up quick.

23 MR. LAKINS: Exhibit G, I move to admit  
24 Exhibit G. That was the sequence of slides.

25 COMMISSIONER CATANACH: Any objection?

1 MR. ROGERS: No objection.

2 MR. BRANCARD: I know of Mr. Lakins' other  
3 witness; it says these are figures --

4 MR. LAKINS: Sorry?

5 MR. BRANCARD: These are figures coming from  
6 a report. Can you tell us what report this was, who  
7 submitted it, who received this report?

8 MR. LAKINS: It's Shomaker's report, Mr.  
9 Shomaker's report -- I'm sorry. It's an excerpt from P,  
10 the groundwater monitoring report that is part of the  
11 OCD file.

12 MR. BRANCARD: So these figures in G should  
13 have been at the end of P?

14 MR. LAKINS: They are part of the report P,  
15 yes. Basically, it's an excerpt from P.

16 MR. BRANCARD: Yes, they are in P. Okay.

17 COMMISSIONER CATANACH: Exhibit G will be  
18 admitted.

19 (AmeriCulture Exhibit G was offered and  
20 admitted.)

21 MR. LAKINS: Thank you.

22 Q. Mr. Witcher, move on to your next sequence of  
23 slides in your presentation. This total conductive heat  
24 loss, could you describe this slide and how it's used?

25 A. Yes. What I have here is -- it starts off with

1 the concept of four days long, which is just a  
2 calculation of conductive heat flow.

3 That equation down at the bottom -- there's a  
4 font thing with those arrows pointing down and it's not  
5 correct. There should be an integral sign there.

6 Q. Here?

7 A. Yes. That's just an error with PowerPoint. But  
8 that should be an integral sign.

9 Q. Okay.

10 A. So the idea here is that you have an upflow zone  
11 and then it goes into an outflow plume, and heat is lost  
12 conductively above the water table towards the surface.

13 And if you have enough heat flow data across  
14 something like this that you can actually sum up all  
15 that heat and calculate the total heat loss of that  
16 system -- and that's what I have done at Lightning Dock  
17 with the available data.

18 And I've used estimated thermal conductivities.  
19 You can get a more precise number by having a very dense  
20 heat flow or temperature gradient hole analysis. And  
21 you can have measured thermal conductivities. But this  
22 is probably, I would say, certainly within 10 to  
23 20 percent of what the actual, precise number would be  
24 when we look at it.

25 The thermal conductivities that I have used are

1 1.8 for the basin fill and they would be 2.2 for  
2 volcanics. And these are numbers that fit in with  
3 databases that I have for the area that are all of New  
4 Mexico that contain several hundred analyses. So I'm  
5 not -- I feel confident that we've got a number that is  
6 workable here.

7 Heat flow is basically the product of the thermal  
8 conductivity and a temperature gradient. And that  
9 temperature gradient is determined by making detailed  
10 measurements in a bore hole, with depth. And you plot  
11 that up and you calculate what the temperature gradient  
12 is, and then multiple that times the thermal  
13 conductivity, and you get a heat flow.

14 Can we look at the next slide?

15 Q. Certainly.

16 A. And when you add up everything and contour it up,  
17 you end up with a total heat loss over the top of that  
18 system of less than 10 megawatts thermal. And so that's  
19 a significant number.

20 What that means is is that you're probably not  
21 going to be able to sustain an electrical power  
22 production anywhere close to ten megawatts or exceed  
23 that, for sure, with a small reservoir like you have  
24 here. And you have conversion inefficiencies too to  
25 convert that to electricity.

1           So this forms a basis to evaluate just how much  
2 electrical power and what the size of this resource  
3 actually is. And this is a very small heat flow  
4 anomaly. It is very intense and very hot, but in the  
5 overall picture of things, when you look at other  
6 anomalies across New Mexico, it is pretty small.

7           Q. Let me ask you a question. What would that ten  
8 megawatt thermal heat loss represent in terms of gallons  
9 per minute of 155 C water?

10          A. What that would represent, if you took 155  
11 degrees sea water and took the fluid -- or the thermal  
12 properties of water, and to get an energy flux of ten  
13 megawatts thermal, you'd be looking at about 270 to  
14 300 gallons per minute of flow.

15           And so that's a very small flow that may be  
16 coming into the bottom of the system. In reality, the  
17 actual flow is probably more than 300 gallons per  
18 minute. It could be two or three times that, maybe even  
19 a little more. But, nonetheless, it is a very small  
20 amount of water.

21           And the reason you have such an expansive area  
22 there is if you flow in 300 gallons per minute, which  
23 that could be happening, too -- it may be the minimal  
24 amount -- is that if you operate this system for 20,000,  
25 30,000 years, it will heat up a huge volume of ground.

1           And we know this system has been operating for a  
2 long time, because you see it in the temperature logs.  
3 In the outflow plume, you get a temperature log that is  
4 conductive -- it's linear at the top and then it goes  
5 isothermal, which means it doesn't change with depth.

6           And then after it gets down to a certain depth,  
7 it reverses and goes to a lower temperature. And, then,  
8 at some depth further down it starts to increase.

9           Well, we call that a rollover. The rollover that  
10 we see at Lightning Dock is very small, which means that  
11 this system has been operating for a long time, so the  
12 ground underneath that is heated up.

13           It ends up getting a linear gradient to the water  
14 table, and then it's almost basically isothermal, and  
15 the rollover is pretty small in the outflow plume. And  
16 then it basically goes isothermal all the way to the  
17 bottom of the system; in other words, the temperature  
18 doesn't change.

19       Q. Move on to your next line. Could you tell me --

20       A. Now, this is the calculation that we use to  
21 calculate that mass flow rate. Just to show you the  
22 numbers.

23       Q. Okay. And this next one?

24       A. What I did is Mr. Bowers reported there were  
25 several calculations on the power potential of the

1 Lightning Dock Geothermal system, that one was made by  
2 the U.S. Geological Survey. He mentioned another that  
3 was done by Geothermics.

4 I am familiar with those particular calculations.  
5 And I basically used the same method, which was a  
6 volumetric method. But the key with this volumetric  
7 method, there's huge changes that can take place and it  
8 all rotates around the size of the reservoir.

9 And my reservoir information that I can place on  
10 this is a productive reservoir at 155 or 150 degrees  
11 Centigrade, is very small. And we are looking at much  
12 less than what the earlier analyses used.

13 And so you end up with a much lower potential for  
14 electrical power. And a number that comes up here is  
15 right around two megawatts of electrical power  
16 sustainable for 30 years. And so I think -- I fear that  
17 if you try to produce 13 megawatts out of this system,  
18 that it is going to -- it's certainly not going to be  
19 sustainable and it is going to harm other people that  
20 are using this geothermal resource in the vicinity.

21 Q. Let's shift gears a little bit. Back to well  
22 A-444.

23 A. Okay.

24 Q. Did you collect samples from A-444?

25 A. I did.

1 Q. And do you recall what you -- when that was?

2 A. I collected two samples -- a couple of times and  
3 it was basically almost a year apart each time and this  
4 was after production had started.

5 Q. Did you collect in January of 2014?

6 A. I did.

7 Q. And did you collect in July of this year?

8 A. Yes, I did.

9 Q. And back in January of 2014, which was the month  
10 after operation began, do you recall what the fluoride  
11 level was in well A-444?

12 A. It was 3.4 something milligrams per liter. I  
13 don't remember the exact number.

14 Q. Does 2.43 sound correct?

15 A. Yes, it does.

16 Q. And do you recall what that level was in July of  
17 this year?

18 A. It had risen to 3.5 or 3.6-something.

19 Q. Does 3.59 ring a bell?

20 MR. ROGERS: Objection, leading. It would  
21 be faster if Mr. Lakins would testify.

22 Q. Do you recall what the TDS --

23 MR. ROGERS: Objection, leading.

24 MR. BRANCARD: He has to ask the question  
25 before you call leading.

1 MR. ROGERS: Or he can just testify.

2 MR. LAKINS: Is there an objection to be  
3 ruled on?

4 COMMISSIONER CATANACH: Can he answer the  
5 questions without you --

6 MR. LAKINS: I will do my best, sir.

7 BY MR. LAKINS (cont'd):

8 Q. Do you recall what the TDS level of the A-444  
9 back in January of 2014 was?

10 A. As I recall, it was 977 milligrams per litre.

11 Q. That is below the water quality standard?

12 A. Yes.

13 Q. Do you recall what it was in July of 2015?

14 A. It was 1,019, I believe.

15 Q. The number was above the water quality standard?

16 A. Yes.

17 Q. Mr. Witcher, I would like to draw your attention  
18 to Exhibit P. There is map --

19 A. I don't see a map in Exhibit P here.

20 Q. I'm sorry.

21 I will put it up on the screen for you.

22 A. That works.

23 Q. Point out the location of Monitoring Well 5. All  
24 right. Do you recall the fluoride level reported in  
25 Monitoring Well 5 prior to the Fire Plan Commission?

1       A. I don't recall the exact number, but it was less  
2 than three milligrams per liter.

3       Q. Do you believe that discharge from AmeriCulture's  
4 operations could explain low fluoride levels in any of  
5 the monitoring wells?

6       A. No.

7       Q. I will take you back to this diagram of yours.

8       A. Okay.

9       Q. I think you had mentioned that there were --  
10 scratch that question.

11             What tools were used to ascertain this diagram?

12       A. Well, what I've -- this is just a general  
13 conversation. It's based upon experience in what is  
14 known in the literature, too.

15             And so I just described -- you know, these  
16 geothermal systems always have these components. There  
17 is always a recharge, there is a deep flow path, and  
18 then there is an upflow, and in New Mexico, in our  
19 geologic settings, we have a region that we call that  
20 hydro geologic windows that has great hydrologic  
21 permeability.

22             And then you have an aquitard that caps the  
23 deeper reservoir. And then you will have an outflow  
24 plume, where this system discharges into the shallow  
25 ground water.

1           But in the field, to actually see all the  
2 features that you see here in the field, without a lot  
3 of drill hole data -- and if you would do an  
4 exploration, you would probably run a set of geophysical  
5 surveys to try to narrow down some of this stuff.

6           Heat flow, we have already seen how that can be  
7 applied. But another great -- another great exploration  
8 tool in the geophysical toolbox is resistivity surveys.  
9 And that would provide a lot of very valuable  
10 information. For instance, the hydro geologic window  
11 where it's hottest would show up -- and it's very  
12 permeable -- would show up as very, very low  
13 resistivity. And this aquitard region out here, if it  
14 wasn't clay, if it was a carbonate unit, it would show  
15 up as a fairly high resistivity.

16         Q. Are you aware of any resistivity studies that  
17 have been conducted concerning the Lightning Dock  
18 Geothermal area?

19         A. There was one that was reported by Lightning Dock  
20 in the Kenneth Bowers report that was given out  
21 recently. And it's a dipole-dipole resistivity, two  
22 lines.

23           The other is a study that was done years ago, the  
24 same sort of technique, by AMAX, who was one of the  
25 original leaseholders. They did a resistivity basically

1 from the highway near the church out across the  
2 geothermal system. And that is another survey.

3 And that survey is publicly available on a DOE  
4 website. That information was contributed by AMAX to  
5 EGI at the University of Utah, and they contributed it  
6 to a DOE website.

7 And I have downloaded that and looked at it.

8 Q. What did it show?

9 A. Basically, the same configuration that we see in  
10 this diagram up there. It shows an upflow zone, which  
11 would be the fault zone, with low resistivity. And then  
12 at depth, it shows higher resistivities abounding that.  
13 And it also shows the outflow plume in the reservoirs  
14 low resistivity.

15 Q. Now this particular resistivity survey, was this  
16 one of the slides that you had prepared for this  
17 hearing?

18 A. Yes, it is.

19 Q. And this was a document that you found publicly  
20 available?

21 A. Yes.

22 Q. It had input from AMAX, the original leaseholder?

23 A. Yes, it did.

24 And I also point out that that profile was also  
25 published in the late '70s, a simplified version of it,

1 the same information that's published in the New Mexico  
2 Geological Society Field Conference Guidebook.

3 Q. This particular resistivity survey that you  
4 looked at, what does it show?

5 A. What it shows is the deep reservoir, which would  
6 be the same as the upflow zone reservoirs. And it shows  
7 the outflow reservoir, and then it shows the confining  
8 units on each side and beneath that unit in terms of  
9 resistivity.

10 Q. Did you see that same resistivity survey in any  
11 of the documents from Lightning Dock?

12 A. Yes. They had two dipole-dipole resistivity  
13 surveys done. This was in the Kenneth Bowers report  
14 that was presented. One of the profiles is on the  
15 southern end, the very southern end of the Lightning  
16 Dock system. And the other is on the northern end.

17 And the northern end survey coincided almost  
18 exactly with the earlier AMAX survey.

19 MR. LAKINS: I would like to put this survey  
20 up on the screen. May I be permitted to do so?

21 COMMISSIONER CATANACH: Is that an exhibit?

22 MR. LAKINS: I want to make it one.

23 This is one of the slides that was in  
24 dispute -- and, technically, there were only three new  
25 slides, not 19.

1           The bulk of our slides actually included  
2 diagrams from Lightning Dock with Mr. Witcher's comments  
3 on it. And two of the new slides have been admitted.  
4 This is the third slide, which, technically, is a new  
5 slide.

6           And it's the resistivity survey, that is  
7 public information that Mr. Witcher obtained, and that  
8 had input from AMAX, the original leaseholder.

9           It's very relevant information.

10           COMMISSIONER CATANACH: Any objection?

11           MR. ROGERS: Yes. The same objection.

12           COMMISSIONER CATANACH: Just the general  
13 objection?

14           MR. ROGERS: No. I will be happy to go into  
15 more detail, if you would like.

16           Public information is not a reason to avoid  
17 the deadline. Public information would be a reason to  
18 observe the deadline. It is apparently a study of  
19 decades old, and so on. I would urge you not to accept  
20 it because it is late.

21           MR. BRANCARD: Can you just put the slide up  
22 so the Commission can see what you are talking about?

23           (Pause.)

24           MR. BRANCARD: And this is from what  
25 document?

1 MR. LAKINS: Mr. Witcher would have to  
2 answer that question.

3 MR. BRANCARD: You don't know where you got  
4 this from?

5 MR. LAKINS: Mr. Witcher obtained it and he  
6 provided it to me. He knows the source. In fact, he  
7 just described the source.

8 MR. BRANCARD: He said there was some report  
9 from a long time ago and that's not very helpful.

10 MR. LAKINS: Several reports, this was a  
11 DOE, this is a document from the Department of Energy  
12 that is currently available on the Department of  
13 Energy's website, and --

14 MR. ROGERS: May I remove my objection and  
15 move on? Objection removed. Thank you.

16 COMMISSIONER BALCH: I do have one comment  
17 on this. When you present something and you don't have  
18 the reference data on the slide, it's not very useful  
19 for anybody that follows this record later on.

20 MR. BRANCARD: Or for the Commission if it  
21 wants to review the record. You need to give us a  
22 citation to a document, et cetera. Where you just put a  
23 slide up with data -- I admit that a lot of the slides  
24 you were trying to present, Mr. Lakins, were slides from  
25 other documents that had been submitted to the

1 Commission. But because you didn't put that indication  
2 on the slide, the Commission had no idea.

3 So anytime anybody here uses information,  
4 you need to give us a source as to where this is coming  
5 from. Okay?

6 You are giving us a lot of technical data  
7 here, but it is coming either from people saying they  
8 read something and they think they remember what it was  
9 in that document or here is one picture out of a, I  
10 don't know, out of a 500-page report -- with no context  
11 to it.

12 So we need sources for all these data if you  
13 are going to do this.

14 MR. LAKINS: I hear you loud and clear. And  
15 I will supplement the record as soon as I am able to,  
16 which would be tomorrow, to provide the source data with  
17 precision.

18 MR. BRANCARD: And there are several  
19 diagrams here. So it may have come from different  
20 reports or different pages or --

21 MR. LAKINS: Understood. I will do that.

22 MR. BRANCARD: Okay.

23 MR. LAKINS: Because the objection has been  
24 withdrawn, I would like to move to make this Exhibit BB.

25 COMMISSIONER CATANACH: Exhibit BB will be

1 admitted.

2 (AmeriCulture Exhibit BB was offered and  
3 admitted.)

4 COMMISSIONER CATANACH: And do we have this?

5 MR. LAKINS: I'm about to give it to you.

6 BY MR. LAKINS (cont'd):

7 Q. Mr. Witcher, if you could first explain the  
8 diagram on the left, please.

9 Let me back up. Are both of these from the same  
10 source?

11 A. They are actually from the same document. It is  
12 just a one-page document. It is just this survey line  
13 and the field data and the calculated model match.

14 Q. What does the diagram on the left reflect?

15 A. Pardon me?

16 Q. What does the diagram on the left reflect?

17 A. The diagram on the left represents a modeled  
18 resistivity profile, using the field data that is  
19 presented in the upper right-hand corner. That upper  
20 right-hand corner, that is what is called a pseudo  
21 section. And in the field while you are measuring your  
22 voltage potentials between your electrodes, using Ohm's  
23 Law, you calculate a resistivity and then you mark it,  
24 depending upon what your electrode spread is. And so  
25 you end up getting these 45-degree angle measurements at

1 depth and you plot that up.

2 This is later placed into a computer program and  
3 modeled. And on the left-hand side is the actual model  
4 results. The lower right-hand is another pseudo section  
5 that basically just tells you how well the model -- the  
6 models is an iterative process.

7 And so that model in the lower right-hand side  
8 gives you how close it is to the actual field data, so  
9 that you have some idea of confidence in what your model  
10 results are.

11 Q. From your review of this resistivity model, does  
12 that help to give you a better understanding of the  
13 subsurface geology and the reservoir's locations that  
14 you describe?

15 A. Yes. What you are seeing here is -- you see a  
16 red zone travels -- it goes almost from top to bottom.  
17 It has a 4 Ohmmeter of resistivity. And then it kind of  
18 curves off to the right. That is your outflow plume and  
19 that is where the hot wells existed. That's over there  
20 by the greenhouse area. This is a projection.

21 The 4 Ohmmeter represents that fault zone that  
22 45-7 and 55-7 are imbedded into. And the 30 Ohmmeter  
23 zone, that's bedrock that is fairly impermeable. And it  
24 has much higher resistivities.

25 And then the 20 resistivities and the 10

1 resistivities, that is basin fill material out on the  
2 other sides and maybe saturated volcanics.

3 And then the 4 resistivities that are kind of  
4 horizontal on either side, those are finer grain basin  
5 fill materials that have a lot of clay.

6 Resistivity can be related to rock type, it can  
7 be related to porosity, it can be related to  
8 temperature, and it can be related to porosity. And so  
9 that is how this is interpreted.

10 But what you see here is -- it really sort of  
11 mimics the model diagram that I show for a typical  
12 geothermal system. All the elements, we can see those  
13 in here.

14 Q. This one?

15 A. Yes.

16 And I also point out that this survey for  
17 dipole-dipole resistivity is quite long. They are  
18 looking very deep, and deeper than what you normally  
19 would do on something like this.

20 So the resistivity values that you get on this,  
21 because you are looking at a large profile and large  
22 electrode distances and deep, is that you tend to  
23 average out what the actual resistivity values are.

24 So the high resistivities that you see there, if  
25 you did a shallower survey, they'd be much higher

1 resistivity. Say, the 4 resistivity over there, it  
2 would end up probably being a much lower resistivity.

3 I would also point out that with really hot water  
4 you can get resistivities less than half a millimeter,  
5 and it just sticks out. But we are not going to see  
6 that here with the length of this profile. But we  
7 certainly see the big picture. And this is really kind  
8 of an average sort of picture.

9 Q. Very good.

10 Do you have an opinion, Mr. Witcher, as to an  
11 approach to what could be done to accomplish Lightning  
12 Dock's objective -- and on that what I would like you to  
13 kind of focus on is, do you have an opinion as to  
14 whether or not an intermediate-depth well approach that  
15 is not connected to the shallow ground water would be a  
16 more appropriate approach than a shallow injection  
17 proposal that is the subject of this hearing?

18 A. I would like to go back to the three-reservoir  
19 concept that I was talking about. I think if you are  
20 going to produce from one reservoir, you need to inject  
21 in that same reservoir, otherwise you run into this  
22 barrier problem, and over time -- that's not a stable  
23 situation.

24 It was described by Dr. Shomaker as an  
25 equilibrium. I wouldn't call it an equilibrium at all.

1 It's in a steady state right now.

2 But you take 45-7 -- there's significant drawdown  
3 in their deep monitor well to the south, which is 47-7.  
4 And so that cone of depression is probably continuing to  
5 grow.

6 It is just that the water level in 45-7 is in a  
7 steady state right now. But if it hits another barrier  
8 out there, another fault, it's going to suddenly change  
9 again.

10 So I think if you produce from 55-7, you need to  
11 inject in that side, in that reservoir. And if you  
12 produce the 45-7, you need to inject in that reservoir.  
13 And it needs to be at the same depth, the same chemistry  
14 of water, and the same reservoir.

15 Q. Let me ask you this. Could you tell us your  
16 opinion about the impact on the resource temperature to  
17 AmeriCulture's wells based on the proposed injection?

18 A. The proposed injection, one of the wells would be  
19 very close to Well 63-7, in fact, almost right at the  
20 same place. And if they are allowed to do that, that is  
21 certainly going to end up cooling the AmeriCulture No. 2  
22 and 1 wells with time.

23 Q. Anything further to add, Mr. Witcher?

24 A. I do not.

25 MR. LAKINS: I pass the witness.

CROSS-EXAMINATION

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BY MS. MARKS:

Q. Mr. Witcher --

A. Yes.

Q. -- I will try and be brief. I only have a few questions for you.

You have been here throughout this hearing; is that correct?

A. I have.

Q. Okay. So the Commissioner for the Hildago Soil and Water Conservation District at the September 11th hearing commented on high fluoride levels that have always existed in the Lightning Dock Geothermal area. I am not sure if you remember the comment of the Commissioner.

A. I do.

Q. And in AmeriCulture Exhibit P, there's a data value for fluoride of 15.46 in 1993 for the Burgett Well; is that correct?

A. Yes.

Q. And there are other values in that same Exhibit P?

A. I'm not sure I have this Exhibit P.

MR. LAKINS: If he could make sure that he is actually looking at the document that you --

1 THE WITNESS: Actually, I may have it. I  
2 just didn't look far enough in here.

3 MS. MARKS: I will stand with you. It is  
4 right here (indicating).

5 THE WITNESS: Okay.

6 COMMISSIONER CATANACH: What are you looking  
7 at, Ms. Marks?

8 MR. LAKINS: What page are you on?

9 MS. MARKS: Summary of Alluvial Geothermal  
10 Ground Water and Analytical Results, it is a sample  
11 report.

12 MR. BRANCARD: It is in the first part of  
13 Exhibit P in the 2015 report.

14 MR. LAKINS: Does it look like that? Is  
15 that what we are looking at?

16 MS. MARKS: Yes.

17 MR. LAKINS: Mr. Witcher, can you read that  
18 okay?

19 THE WITNESS: Yes.

20 BY MS. MARKS (cont'd):

21 Q. So there are other values for this well. In  
22 1986, for example, 12.5 milligrams per liter of  
23 fluoride, 9.95, 11, 11, 12 milligrams per liter in 2015;  
24 is that correct?

25 A. That's what it shows here. I would question

1 whether it is the same well or not. They are not  
2 designated as the same well.

3 Q. But this is AmeriCulture's exhibit, correct?

4 A. Yes, it is.

5 Q. And in 1993 -- I mean, you had said you were  
6 familiar with this area. So that 15.46 value, did you  
7 sample this --

8 A. I did not.

9 Q. But in 1993 that would not be unfamiliar or in  
10 1986 would that be a number you would have been familiar  
11 with?

12 A. Yes.

13 Q. And Pro UCL is the standard federal program used  
14 by the EPA and actually developed by the EPA to  
15 establish background threshold for contaminated size or  
16 alternative value concentrations; is that correct?

17 A. I am not familiar with that program and I don't  
18 do environmental work and I don't do EPA type stuff.

19 Q. Okay. So you have never been onto EPA's website  
20 to know how to calculate alternate background  
21 values for --

22 A. What I assume is they are talking about an  
23 anthropogenic contaminant. We are not talking about  
24 that here.

25 Q. I can bring you down from the EPA's website -- I

1 can read you to you from the EPA -- I can bring it down  
2 to you, if you would like, if that would help.

3 MS. MARKS: Would it help Counsel and  
4 Commissioners, just a little FAQ about what Pro UCL is?

5 MR. BRANCARD: He said he is unfamiliar with  
6 it, so...

7 MS. MARKS: Okay.

8 Q. If OCD used the same software used by the EPA to  
9 develop a monitoring plan that is in AmeriCulture  
10 Exhibit K, would you have an objection to that?

11 A. Yes.

12 MR. LAKINS: Objection, speculation. He has  
13 testified he doesn't know about it. And it is asking  
14 for speculation.

15 MS. MARKS: So you would have an objection  
16 to using --

17 MR. LAKINS: I have an objection on the  
18 table.

19 COMMISSIONER CATANACH: Can you rephrase it  
20 or withdraw it?

21 MS. MARKS: He has an objection to using a  
22 software he's unfamiliar with, so the entire testimony  
23 regarding OCD's --

24 COMMISSIONER BALCH: Are you reporting to  
25 the reporting limit in the OCD letter?

1 MS. MARKS: Correct.

2 COMMISSIONER BALCH: His objection to that  
3 reporting limit?

4 MS. MARKS: Correct. And so if OCD used a  
5 software with which Mr. Witcher is unfamiliar, I don't  
6 understand the basis for his objection to the thresholds  
7 developed by OCD, if he's unfamiliar with the software.

8 COMMISSIONER CATANACH: I believe his  
9 testimony was that it was due to his knowledge of the  
10 levels out there that were lower than 17.

11 Do you want to elaborate on that?

12 THE WITNESS: That's actually a good  
13 synopsis of it. We had never seen measured values of  
14 17 milligrams per liter. And they were all in the --  
15 the highest were in the 12 to 15 range.

16 BY MS. MARKS (cont'd):

17 Q. And so the software or whatever calculation you  
18 used, would there be any sort of standard deviation?

19 A. I didn't do a calculation. I was just looking at  
20 the data.

21 Q. Okay. I'll move on from that.

22 I think at either the September 10th or  
23 September 11th hearing, Mr. Domenici and Mr. Lakins  
24 asked Mr. Bowers and, perhaps, some other Lightning Dock  
25 witnesses a number of questions and referenced the

1 AmeriCulture discharge. Do you remember that?

2 A. Yes.

3 Q. There are a number of questions referencing the  
4 AmeriCulture discharge. And I think that was discharge  
5 waters come out of the fish farms operations?

6 A. Yes.

7 Q. Have you ever considered the effect of the  
8 discharge of this water, perhaps the cold water or  
9 whatever effluents come out of the fish farm operations,  
10 how this affects the resource and how that may be  
11 affecting the resource? Have you ever done that  
12 analysis?

13 A. I haven't done that analysis. But to give you  
14 another answer to that is that where this discharge is  
15 taking place is in the outflow plume, downstream in the  
16 outflow plume, and it doesn't affect the deeper resource  
17 to the south.

18 Q. It doesn't affect the constituents in the water,  
19 the temperature, or anything?

20 A. I wouldn't know that because I haven't done any  
21 measurements on that.

22 Q. Okay.

23 MS. MARKS: I have no further questions.

24 MS. HENRIE: I have a few questions.

25 CROSS-EXAMINATION

1 BY MS. HENRIE:

2 Q. And I'm just going to kind of go through the  
3 slides, Mr. Witcher. But I have them out of order, so  
4 my apologies on that.

5 MR. LAKINS: Michelle --

6 MS. HENRIE: Do you want to put them back on  
7 the --

8 MR. LAKINS: Yes. Tell me the sequence you  
9 want to --

10 MS. HENRIE: Why don't you go back to the  
11 beginning, and we will roll through until we hit.

12 MR. LAKINS: Okay.

13 MS. HENRIE: Thank you for doing that.  
14 Let's stop there.

15 BY MS. HENRIE (cont'd):

16 Q. So I'm a little confused by that visual, Mr.  
17 Witcher, just because there is cold water on top of the  
18 hot water outflow plume. And I am confused about how  
19 you can measure heat flow through a cold layer, A, and  
20 then, B, I am also confused because my understanding of  
21 the history out there is that there is hot water at  
22 surface.

23 And so can you just talk a little bit about this  
24 depiction of cold water overlying the hot water?

25 A. What you are looking at, I have it dotted.

1 That's not set in stone. This is a diagrammatic  
2 representation of a model of basically how it works.

3 And you are correct, the hot water is at the  
4 surface. And the way you measure heat flow above that  
5 is you take the heat flow measurement or the temperature  
6 gradient that's above the water table, and that's how  
7 you get a conductive temperature gradient.

8 If you measure in the water, you have the flow of  
9 water that causes the temperature gradient to change.  
10 And what we are interested in is the conductive  
11 temperature gradient. And so that's how that's done.

12 Q. Okay. But you do agree that there is hot water  
13 at the surface?

14 A. Oh, yes.

15 MS. HENRIE: Let's keep going, Charles.  
16 Okay, right there.

17 Q. On this slide, I was just confused about the ring  
18 fracture which I believe is the dashed line.

19 A. That's correct.

20 Q. Did you map that?

21 A. I didn't. That's not a map sort of thing. That  
22 is an interpretation based upon the core that we got in  
23 AmeriCulture 2. And the concept was described in some  
24 detail by Elston and Beale and Logsdon in 177.

25 And Elston showed a ring fracture zone that

1 crossed in that immediate area. But they didn't really  
2 specify exactly where it was. And I am really not  
3 specifying exactly where it is right there. I just know  
4 it is east of AmeriCulture Well 2 because of the rocks  
5 that we cored.

6 What we cored -- one of the units that we cored  
7 was a ring fracture zone rhyolite that was identical to  
8 the rhyolite dome over Pyramid Peak. And that's a ring  
9 fracture zone intrusion.

10 Q. Is it a rhyolite, because Elston puts that ring  
11 fracture to the west of the --

12 A. He does. And I put it to the east based upon the  
13 new information that we found in our core.

14 Q. Thank you for that clarification.

15 MS. HENRIE: Keep moving forward, Charles.

16 Q. So that's what you found in AmeriCulture 2?

17 A. That's correct.

18 Q. And that goes all the way down to the 2,100 feet?

19 A. We didn't core all the way to 2,100 feet. We  
20 encountered a drilling problem. It seems like drilling  
21 problems crop up frequently.

22 And so we ended up having to pull up some junk  
23 out of the hole. And then we went back in with a rotary  
24 and completed the lower part of that hole. But we got  
25 core for most of that lower part of the hole.

1 Q. And was that drill to be a dry extraction hole?

2 A. This hole was a part of an EGS funded research  
3 project, DOE. And I think one of the ideas that I had  
4 coming into this is I was interested in testing whether  
5 or not that carbonate unit down there had permeability.

6 A lot of time carbonate units, if they have been  
7 subaerially exposed in their geologic history, they get  
8 a phenomenon called karsting, which is cave formation in  
9 simple terms, but the permeability goes sky high.

10 And you have a huge volume of that out there.  
11 And so the idea of one of the things was to see if that  
12 existed. And it turns out that it didn't.

13 And this is why we ended up doing the isotopes,  
14 to see if we could see if it confirmed what we saw in  
15 the core and it did.

16 Q. Help me. Karsting is when water is in  
17 relationship to limestone and it kind of carves out  
18 caverns?

19 A. Exactly.

20 Q. Okay. Was that a GRAD-funded, G-R-A-D, project?

21 A. Yes, I believe so.

22 Q. Let's keep going.

23 MR. LAKINS: A what-funded project?

24 MS. HENRIE: GRAD, G-R-A-D.

25 MR. LAKINS: Okay. I just didn't quite hear

1 you.

2 MS. HENRIE: You can keep going. I don't  
3 have any questions there. Keep going. You can keep  
4 going. We already talked about that one. Let's keep  
5 going. Okay. Let's stop there.

6 Q. Mr. Witcher, I'm looking at -- this is Lightning  
7 Dock Exhibit 4, which is your 2001 report. And I can  
8 give you a copy if you need to refer to it.

9 My reading of that report is that it shows very  
10 high permeabilities, in other words, if the water can  
11 come up, it can go back down, too.

12 Can you just comment on that? There's kind of  
13 some confusion about permeability out there, and I  
14 wanted to get your opinion on that.

15 A. Okay. The AmeriCulture 1 well that the pump test  
16 was conducted on -- the hydro geologic unit or the  
17 geologic unit we were testing was really that silicified  
18 Gila conglomerate unit. And we weren't testing any of  
19 the lower units in that particular hole.

20 Q. That is like a 400-foot well?

21 A. Yes.

22 Q. Has there been a pump test on State Well No. 2?

23 A. There has not.

24 Q. I cut you off. What are your conclusions about  
25 permeability out there?

1       A. In terms of location --

2       Q. Just in general with the reservoir that the  
3 geothermal system --

4       A. I think the outflow plume reservoir for that  
5 fractured Gila conglomerate, it's been silicified,  
6 that's got good permeability. And the basin fill units  
7 out there, they have good permeability.

8               Carbonates units out there, from what I have  
9 seen, I don't see any significant permeability in those  
10 units at all. In the core, when we were looking at the  
11 volcanic units in AmeriCulture 2 Well, some of those  
12 units, in the upper part, show some very good  
13 permeability.

14               There were some units in there that were  
15 hydrothermally altered, and they didn't show very good  
16 permeability, so it's kind of sketchy there.

17               So I guess to rank it, the alluvium would be good  
18 permeability. Silicified Gila outflow plume, that's  
19 good permeability. The volcanics is sort of an  
20 intermediate sort of thing. And then the carbonate  
21 units is going to be poor.

22               And the only unit that I could put a number to,  
23 would feel comfortable with giving an estimate, would be  
24 the units in the basin fill and that silicified unit,  
25 because there is some pump test data and drawdown data

1 that's available for that, so an estimate could be made.

2 Q. And that is going to be based on that State Well  
3 2 core?

4 A. No. The upper parts I just stated, where there  
5 is confidence with good permeability, would be the pump  
6 tests that have been historically --

7 Q. On State Well 1?

8 A. Well, State Well 1, and then there's other wells  
9 down in the area, you know, in that shallow alluvium.

10 Q. Burgett wells?

11 A. There was one Burgett well that was tested years  
12 ago by Dr. Lansford at NMSU. And so that's the only  
13 other analysis that I know of that's been done in the  
14 shadow reservoir. So just those two.

15 Q. Lansford -- did I get that right?

16 A. L-a-n-d-s-f-o-r-d.

17 Q. Okay.

18 A. He was actually -- I'm not -- he wasn't a hydro  
19 geologist. He's actually an Ag. economist that worked  
20 over in the Ag. college. They were doing a study on  
21 direct use, agricultural-type uses.

22 But he may have had one of the civil engineers  
23 come over there and do that. That's probably the case.  
24 Just to give you some history.

25 Q. I didn't know about that, so thank you.

1           So we presented -- Roger Bowers presented  
2 testimony about prior reservoir estimates --

3           A. Yes.

4           Q. -- and those included Circular 790, which I think  
5 you said you were familiar with.

6           A. Yes.

7           Q. And the Geothermics, which I think you said as  
8 well?

9           A. Yes.

10          Q. And Geothermics estimated productivity at 9.3  
11 megawatts. The prior one was up like 24 megawatts.

12          A. Sure.

13          Q. That was back in 1979.

14                 And then David Blackwell came in and did a few  
15 studies. And he ended up estimating megawatts greater  
16 than 15. And then the Isor report, which was the  
17 Icelandic guys, they came in and looked at the reservoir  
18 and it came in between 19 and 35 megawatts.

19                 And so what I am hearing you say is that you have  
20 opinion about the reservoir characteristics, reservoir  
21 engineering, and you disagree with the prior studies?

22          A. Let me give you the differences between these.  
23 The only studies that I am aware of as to exactly how it  
24 was done in any detail was Geothermics and the USGS.

25                 The other studies, those were proprietary studies by

1 Lightning Dock. I don't have access to that.

2 Q. So you are just saying, yes, you disagree with  
3 them?

4 A. No, I'm not. Let me explain. I'm saying that --  
5 the Lightning Dock studies, I'm not going to comment on  
6 that, because I have never seen them.

7 Q. Right.

8 A. The Geothermics study, it's my understanding, if  
9 I recall correctly, is they were using a lower reservoir  
10 temperature. They weren't using 300-something  
11 Fahrenheit. I think they were using a 280- or  
12 270-degree cutoff.

13 They were also using a much larger reservoir  
14 volume than what I see. And, in fact, all the  
15 differences in these estimates, they all tie into what  
16 temperature you use as your reservoir temperature and  
17 what volume you use as your reservoir temperature.

18 And my criteria for the volume that I describe  
19 was that the only two wells that are tapping 300-degree  
20 water is 55-7 and 45-7. And as far as I know, they are  
21 the only ones that have tapped that kind of water.

22 And the --

23 Q. We respectfully disagree with that.

24 A. Okay. Well, if you have data that's different,  
25 then that's where you are at. But I don't have access

1 to that.

2 Q. Mr. Witcher, you have a lot of disagreements with  
3 Elston Circular 177 --

4 A. Yes.

5 Q. -- have you written those up, published them,  
6 gotten them peer reviewed, any sort of reason to  
7 believe that other people agree with your perspective on  
8 Elston?

9 A. I have published the thoughts on the geology  
10 there and where that ring fracture zone is located --

11 Q. Is that the 2008 article?

12 A. Yes, that's the 2008 paper.

13 Q. And that was an exhibit in the last proceeding?

14 A. Yes.

15 Q. And, if I recall, there are references to --

16 A. And that's a peer-reviewed paper. And Elston  
17 looked at it, and I talked to him.

18 Q. And that's the only one?

19 A. Yes. On the chemistry, I have not, and --

20 Q. How about on the estimates about heat into the  
21 reservoir and the size of the reservoir?

22 A. I have not.

23 MS. HENRIE: Thank you. I don't have any  
24 more questions.

25 MS. GAULT: I would like to ask him a

1 question.

2 QUESTIONING BY MS. GAULT

3 MS. GAULT: Mr. Witcher, do you know if  
4 there is any study or data prior to Lightning Dock  
5 operation study about the size of the natural plume?  
6 Because that's what concerns us. And if there is no  
7 data about it, would you recommend to do some kind of  
8 baseline as soon as possible before they go into more  
9 production, more injections, so we will know what's  
10 going to happen to our plume, if it's going to increase,  
11 if it's going to affect more people?

12 And the reason I am asking is when  
13 Mrs. Shannon was saying -- by the way, there was  
14 confusion about what Ms. Shannon is when she was here.  
15 She is a Commissioner of Hildago County, but she was  
16 representing Hildago Soil and Water Conservation  
17 District when she was here, not really as a  
18 commissioner.

19 MS. MARKS: I am going to object because  
20 this is testimony.

21 MS. GAULT: She is a commissioner. But she  
22 is -- of Soil and Water Conservation, and she  
23 is responsible for the --

24 MR. BRANCARD: I think we are aware of that,  
25 because the district is the party and not the county.

1 MS. GAULT: Okay. Sorry about it.

2 But her concern about the heavy -- we all  
3 know that we have fluorine in these waters there,  
4 because the people there have brown teeth. We know  
5 that.

6 What we are concerned is that it's going to  
7 be aggravated. I know that Mr. Miller was saying that  
8 you can't contaminate what is already contaminated. But  
9 nobody in our area is suffering from dental fluorosis or  
10 from skeletal fluorosis. And we just want to know, if  
11 we don't know the size of the natural plume, we don't  
12 know how aggravated it could be from their operation.

13 So I want to know if you think that there is  
14 a way that we can at least obtain some kind of baseline  
15 for the natural plume, so we know how -- if it will get  
16 worse or not. Because I believe Mr. Miller said nothing  
17 would happen; it is contaminated and it will stay  
18 contaminated, nothing will be aggravated.

19 For us, what really worries us is that it  
20 will be worsening, especially if it's going to be  
21 injected into the alluvium. We don't know where it will  
22 end up, how far and wide it will go, if it will extend,  
23 west, south, north.

24 We are not very smart, but that's our  
25 question.

1 MR. BRANCARD: Just try to confine yourself  
2 to asking the witness a question. Thank you.

3 MS. GAULT: Okay.

4 So I am asking if you think that we should  
5 have a baseline study or do we have one?

6 THE WITNESS: I am not sure there is  
7 anything out there that I would call a baseline study.

8 To answer your question, I would answer that  
9 in two parts, I guess. One is is that the ground water  
10 in the immediate area needs to be monitored constantly.  
11 And, certainly, some of that is going on.

12 I would also recommend that before any  
13 shallow injection is done, it would probably be a good  
14 idea to do a detailed numerical ground water model to  
15 actually see what happens.

16 MS. GAULT: Do you know if the wells that  
17 OCD was requiring, the monitoring wells, would suffice  
18 or do we need something more than that?

19 THE WITNESS: No. You would probably want  
20 to have, you might have another monitoring well. But I  
21 would think that you'd need a -- you would need some  
22 sort of model to even be able to site your monitor  
23 wells.

24 MS. GAULT: Okay. Thank you very much.

25 MR. LAKINS: Before I forget, I move to

1 admit Exhibit B, which is Mr. Witcher's slides.

2 COMMISSIONER CATANACH: Any objection?

3 MR. ROGERS: Those are the ones submitted  
4 timely?

5 COMMISSIONER CATANACH: Yes.

6 MR. ROGERS: No objection.

7 COMMISSIONER CATANACH: Exhibit B will be  
8 admitted.

9 (AmeriCulture Exhibit B was offered and  
10 admitted.)

11 EXAMINATION BY COMMISSIONER PADILLA

12 COMMISSIONER PADILLA: Mr. Witcher, just a  
13 few questions. I had some questions about your  
14 testimony regarding the fluoride source. Can you  
15 elaborate a little bit more on that? On one of the  
16 slides that was put up showing a little snake-looking  
17 thing --

18 THE WITNESS: Yes, I remember that.

19 COMMISSIONER PADILLA: You said the red is  
20 the only area where the geothermal contributed to the  
21 high fluoride. And then you seemed to indicate that the  
22 structural -- the discharge from the structural high  
23 accounted for the remainder. Is that the sole source in  
24 your opinion or are there other sources --

25 THE WITNESS: I don't know if that would be

1 the sole source. But I would certainly say that a major  
2 source of the fluoride in the overall basin that was  
3 mapped there is actually a flow that's a deeper flow  
4 that is coming out of the basin to the south in the  
5 Lower Animas Basin. It flows up over a structural high.

6 And that water carries higher salinity and  
7 higher fluoride. And then that would flow southward and  
8 mix with the water in the same basin that the Lightning  
9 Dock Geothermal resource is.

10 And that's what I see is mapped there with  
11 that kind of hook. And I hope that answers that.

12 COMMISSIONER PADILLA: It does.

13 As a followup, would you say that one or the  
14 other is the primary contributor in the fluoride?

15 THE WITNESS: I would say that the main  
16 contributor of fluoride is the -- the geothermal system  
17 at Lightning Dock is the main contributor to fluoride to  
18 the north of there. To the south of there, the main  
19 contributor is probably this outflow from the basin to  
20 the south that's nongeothermal.

21 COMMISSIONER PADILLA: And continuing with  
22 the fluoride. Ms. Marks touched on the 17 milligrams  
23 per liter being high. Do you think that that should be  
24 a different number or possibly a lower number? Can you  
25 quantify that for us?

1           THE WITNESS: I would suggest that it ought  
2 to be a lower number. In other words, it ought to be  
3 based on, you know, a particular site or well or user.  
4 For instance, the AmeriCulture site, you know, any  
5 threshold or exceedance value on that ought to be  
6 designated as a site-specific number, not an overall,  
7 general thing using the entire basin.

8           COMMISSIONER PADILLA: So you disagree with  
9 the blanket designation of that 17?

10          THE WITNESS: Yes, sir, I do.

11          COMMISSIONER PADILLA: Okay.

12                 Moving to the size of the anomaly, we did  
13 hear testimony from Mr. Bowers about the Isor estimates  
14 and several others, putting that, you know, more or less  
15 over 15 megawatts. Did you put the number at 2  
16 megawatts --

17                 THE WITNESS: I placed it sustainably at 2  
18 megawatts --

19                 COMMISSIONER PADILLA: So, in your opinion,  
20 are we already kind of at the threshold for this  
21 geothermal --

22                 THE WITNESS: I think we are very close,  
23 yes.

24                 COMMISSIONER PADILLA: As a follow-on to  
25 that, any expansion of geothermal in your opinion,

1 whether it be AmeriCulture or Lightning Dock, would be  
2 detrimental?

3 THE WITNESS: I think that the production of  
4 that deep reservoir for 300-degree Fahrenheit, with that  
5 particular reservoir, would be detrimental.

6 COMMISSIONER PADILLA: Okay. And my last  
7 question goes back to the discharge for A-444, I  
8 believe, the federal well.

9 THE WITNESS: Yes.

10 COMMISSIONER PADILLA: I just want to get  
11 your opinion on this. You said that that discharge was  
12 not affecting the anomaly. I am wondering if you have  
13 an opinion whether it is affecting specifically that  
14 well -- if you can -- you are probably very familiar  
15 with that well -- and if that discharge has any  
16 potential, in your opinion, to cool down that well  
17 specifically and not the anomaly as a whole.

18 THE WITNESS: The discharge that you see is  
19 that green area that extends from that greenhouse. It  
20 is actually not the discharge from the well. It is  
21 actually discharge from --

22 COMMISSIONER PADILLA: Surface discharge --

23 THE WITNESS: -- surface discharge to the  
24 east. That is hard to judge, because what is happening  
25 there is a lot of that water that is placed on the

1 ground is lost through evapotranspiration. And that's  
2 why you had the vegetation. And then some of it  
3 certainly soaks down to the water table.

4 But in terms of being able to cool the  
5 temperature there, I don't -- I just -- I think the  
6 dynamics of what's going on deeper in terms of the heat  
7 going through there is going to -- is going to overprint  
8 any cooler seepage that may be coming through that --

9 COMMISSIONER PADILLA: Do you think the fact  
10 that's lower fluoride water could affect the fluoride  
11 level of that well?

12 THE WITNESS: That is certainly possible.

13 COMMISSIONER PADILLA: Based on the same  
14 mechanics?

15 THE WITNESS: Uh-huh.

16 COMMISSIONER PADILLA: That's all I have.  
17 Thank you.

18 EXAMINATION BY COMMISSIONER CATANACH

19 COMMISSIONER CATANACH: Mr. Witcher, just a  
20 few. I am looking at your exhibit -- this exhibit and I  
21 am trying to get a handle on it. The black area that  
22 you have outlined, is that your interpretation of the  
23 extent of the geothermal reservoir?

24 THE WITNESS: It's a rough extent and just  
25 in a planar cross section. On the east side, it may

1 extend deeper. I am not sure how the permeability in  
2 that well changes with depth.

3 COMMISSIONER CATANACH: So what are the heat  
4 sources? Is it the tertiary volcanic section?

5 THE WITNESS: The heat source is actually  
6 the geothermal water itself. To explain these systems,  
7 they're what I call invective-type geothermal systems.  
8 It's actually a very large ground water flow system in  
9 bedrock. And the recharge may be tens of miles away.  
10 But there's head differences between where it discharges  
11 and where it recharges.

12 And it circulates very deeply. And in the  
13 process it heats up with just the background heat in the  
14 crust. The temperature gradients in that area are  
15 probably 35-degree C per kilometer.

16 And so if you have a 10,000- or 12,000-foot  
17 depth, you are starting to approach -- you are well over  
18 250 degrees Fahrenheit. And so if that water finds an  
19 opening or a hydro geologic window where it could flow  
20 rapidly to the surface, it will carry most of the heat  
21 with it back to the surface.

22 COMMISSIONER CATANACH: So the heat source  
23 for these reservoirs is deeper than what you've got  
24 mapped here?

25 THE WITNESS: Absolutely. It is actually an

1 overall flow system. And to tap into that you might  
2 have to drill a well to 15,000 feet. And there may not  
3 be -- and it may be just in a few fracture zones where  
4 the flow is.

5 And so it is not the sort of thing you --  
6 with our knowledge of these systems and the tools that  
7 we have to explore for them, it is not the sort of thing  
8 you go chasing. So you try to find it where it is  
9 shallowest where the upflow is. And Lightning Dock is  
10 one of those places.

11 COMMISSIONER CATANACH: So in relation to  
12 the injection wells that are being proposed, it is your  
13 interpretation that that water injected at those depths  
14 is not going to get down deep into that reservoir?

15 THE WITNESS: I don't believe it will. The  
16 best permeabilities are up shallow. And so I think any  
17 water that's injected or pressured, it is going to  
18 follow the path of least resistance.

19 And it probably will mound up some and then  
20 it is going to create -- certainly one of those monitor  
21 wells, I think, will probably create a whole new outflow  
22 plume in a small scale.

23 COMMISSIONER CATANACH: So you testified  
24 that you thought that intermediate injection would be a  
25 better solution. Now, how would that help in terms

1 of --

2 THE WITNESS: Actually, I wasn't in favor of  
3 an intermediate solution necessarily. I was in favor of  
4 if you produced from one reservoir, you inject in that  
5 same reservoir. And you also inject -- you don't try to  
6 inject across a barrier either. And that's what is  
7 going on right now.

8 COMMISSIONER CATANACH: So basically what  
9 you are advocating is that they inject into the same  
10 zone that they are producing from?

11 THE WITNESS: Exactly.

12 COMMISSIONER CATANACH: And would they be  
13 able to get what they needed from that type of  
14 operation?

15 THE WITNESS: I don't know.

16 COMMISSIONER CATANACH: Do you believe that  
17 injection at that shallow depth, that a lot of that  
18 fluid would travel laterally in the alluvium?

19 THE WITNESS: I believe so.

20 COMMISSIONER CATANACH: So you can't define  
21 what intermediate injection might be; you did  
22 characterize that, but you don't know what depths those  
23 might be?

24 THE WITNESS: I don't.

25 COMMISSIONER CATANACH: That is all I have.

1 I am going to let my esteemed colleague have at it.

2 COMMISSIONER BALCH: Can we take a break  
3 first?

4 MR. LAKINS: I was hoping that you would ask  
5 that question.

6 COMMISSIONER CATANACH: Okay. Let's take  
7 break.

8 (Brief recess.)

9 COMMISSIONER CATANACH: Let's go back on the  
10 record. Commissioner Balch.

11 THE WITNESS: I have one thing. I may have  
12 misspoken earlier on one of the questions. I was asked  
13 a question whether A-444 would -- that there's a  
14 discharge near there that would cause a temperature to  
15 decrease. And I may have answered yes thinking -- I  
16 don't know what I was thinking. But the answer would be  
17 no. It wouldn't happen.

18 COMMISSIONER CATANACH: Okay.

19 EXAMINATION BY COMMISSIONER BALCH

20 COMMISSIONER BALCH: To follow up on that, I  
21 think the argument that was made in that regard was if  
22 you're in these highly permeable alluvial sediments, why  
23 wouldn't dumping a bunch of that cold water on top of  
24 that well cool it down?

25 THE WITNESS: Let's look at the map.

1 The plume -- where the water is being dumped is in that  
2 green area. And the plume is flowing northward and the  
3 well is located laterally to the west of that. And so  
4 that wouldn't encounter any of the flow that would be  
5 taking place through there. The other thing is --

6 COMMISSIONER BALCH: Where is the A-444?

7 THE WITNESS: It is -- you see where the end  
8 of that green area, where it kind of fizzles out to the  
9 southwest near those houses?

10 COMMISSIONER BALCH: Yes.

11 THE WITNESS: That is where that A-444 well  
12 is.

13 COMMISSIONER BALCH: And that's the well  
14 that has been cooling?

15 THE WITNESS: That is the well that has had  
16 a cooling history in the past, yes.

17 COMMISSIONER BALCH: So if that outflow  
18 plume is roughly defined by the vegetation on the  
19 surface -- not the outflow plume -- the influent from  
20 the fish farm --

21 THE WITNESS: Exactly.

22 COMMISSIONER BALCH: -- cold water,  
23 relatively speaking, being dumped at the surface --

24 THE WITNESS: 40 gallons per minute --

25 COMMISSIONER BALCH: -- and then it flows --

1 THE WITNESS: It would flow northward out of  
2 there. In the subsurface, it would flow northward.

3 COMMISSIONER BALCH: Then how come the  
4 surface vegetation is kind of more or less due west?

5 THE WITNESS: Because that is the surface  
6 elevation; that's not the ground water elevation, the  
7 table elevation.

8 COMMISSIONER BALCH: And you are not going  
9 to have any recharge from that?

10 THE WITNESS: You could have some, yes.

11 COMMISSIONER BALCH: It wouldn't recharge  
12 the aquifer at all?

13 THE WITNESS: I would say it could recharge  
14 the aquifer some.

15 COMMISSIONER BALCH: And if it's headed in  
16 that direction towards the A-444 and there's some  
17 recharge from the surface, why would that possibly not  
18 have a cooling effect?

19 THE WITNESS: Because the ground water flow  
20 in that area is to the north.

21 COMMISSIONER BALCH: So one of my questions  
22 is, as I'm trying to get an understanding of this, what  
23 is the rate of flow of that shallow aquifer to the  
24 north?

25 THE WITNESS: I do not know what the

1 velocity of it is.

2 COMMISSIONER BALCH: Even in an approximate  
3 sense?

4 THE WITNESS: I couldn't tell you that  
5 answer.

6 COMMISSIONER BALCH: So it could be slow or  
7 it could be fast? I think it is apparent that it is  
8 flowing north in geologic time.

9 THE WITNESS: The hydraulic gradients in  
10 that outflow plume is to the north. And that would be a  
11 function of what that gradient is in terms of what the  
12 hydraulic conductivity --

13 COMMISSIONER BALCH: So there's a hydraulic  
14 gradient?

15 THE WITNESS: Yes.

16 COMMISSIONER BALCH: And the measure?

17 THE WITNESS: It's shown in these maps.

18 COMMISSIONER BALCH: It should be able to be  
19 calculated.

20 THE WITNESS: It could be calculated. I  
21 just haven't done that number.

22 COMMISSIONER BALCH: Do you have an  
23 envelope?

24 THE WITNESS: I hear you.

25 COMMISSIONER BALCH: I would think you are

1 going to have some potential at least for minimal ground  
2 water recharge anywhere you see that vegetation at the  
3 surface.

4 THE WITNESS: I don't disagree with that.

5 COMMISSIONER BALCH: All right. Let's go  
6 deeper. I think the source of the heat is probably a  
7 good question because it has to do with how much heat is  
8 available to the geothermal anomaly, right?

9 THE WITNESS: Yes.

10 COMMISSIONER BALCH: I will ask you some  
11 other questions later about the size of the anomaly.  
12 But whether it is large or small, that conduit is going  
13 to ultimately be the provider of the heat via  
14 groundwater circulation?

15 THE WITNESS: That's correct.

16 COMMISSIONER BALCH: You did bring up the  
17 possible idea that there may be a magma body or  
18 something deep down there. I think you may have this  
19 confidential exhibit.

20 THE WITNESS: No, I do not.

21 COMMISSIONER BALCH: It was supposed to be  
22 provided to Mr. Lakins, right?

23 MR. LAKINS: Actually, if I may speak to  
24 that, it was. And I thought Mr. Witcher took it with  
25 him, but he had given it back before we left that day.

1           COMMISSIONER BALCH: Well, I think that  
2 would be an interesting thing, and (inaudible) 45-7  
3 touches down in an intrusive rock.

4           So there's definitely at some age or time,  
5 apparently pre-Pennsylvanian in this particular case,  
6 you do have some magma moving in there, subsurface.

7           THE WITNESS: My argument is that there is  
8 absolutely no magma heat source out there, absolutely  
9 none. If that were the case, we would know about it.

10          COMMISSIONER BALCH: You are talking about  
11 micro-size --

12          THE WITNESS: More than that.

13          COMMISSIONER BALCH: Well, there were other  
14 components to that.

15          THE WITNESS: Yes. And when you intrude a  
16 magma, it's to be a large volume that it has enough heat  
17 to sustain a hydrothermal system. And to do that  
18 requires a large magma body that would almost have to be  
19 a rhyolite composition, something that is viscous that  
20 comes in not through a crack as a dike with a very small  
21 area and large surface area for heat loss.

22          COMMISSIONER BALCH: So the Socorro magma  
23 bodies is approximately 150 meters thick. And that is  
24 not a very thick body. And I think the interpretation  
25 is basaltic on top --

1 THE WITNESS: Pardon me?

2 COMMISSIONER BALCH: I mean it's liquid and  
3 then a mush.

4 THE WITNESS: Yes.

5 COMMISSIONER BALCH: That's 25, 75 meters  
6 approximately.

7 THE WITNESS: And it's probably basalt.  
8 That's not going to create a hydrothermal system --

9 COMMISSIONER BALCH: Okay.

10 THE WITNESS: -- that's going to sustain  
11 something --

12 COMMISSIONER BALCH: But if you do have some  
13 sort of a magma body, your argument is you are going to  
14 see it because of seismicity?

15 THE WITNESS: Yes, you will. But --

16 COMMISSIONER BALCH: I did look at a seismic  
17 map of New Mexico this morning when I was eating my  
18 breakfast. And if you look at the New Mexico map, you  
19 don't see very many events in the Lordsburg, Deming  
20 area.

21 THE WITNESS: No, you don't.

22 COMMISSIONER BALCH: If you dig a little  
23 deeper and you look at another study done by Randy  
24 Keller out of UTEP, with some assistance from scientists  
25 in Chihuahua, Mexico, with a more regional array than we

1 see of activity in that area. That's still regional.  
2 Nobody's put out a local array that I know of. Maybe  
3 you know differently than I do.

4 THE WITNESS: Industry put out a local array  
5 in the area and measured no seismicity. This was done  
6 in the 1970s --

7 COMMISSIONER BALCH: Do you know how long it  
8 was run for?

9 THE WITNESS: I don't. I just know they had  
10 seismometers right over a fairly large area.

11 COMMISSIONER BALCH: Okay.

12 THE WITNESS: To go back to the magma issue  
13 and the sizes that are required for --

14 COMMISSIONER BALCH: I am not sure you can  
15 use seismicity as a rule-out for an intrusive body of  
16 depth, because I am fairly certain the nearest permanent  
17 station is in El Paso. You are going to be detecting a  
18 (inaudible), so you are not going to see smaller micro  
19 earthquakes than that than maybe even two-and-a-half on  
20 any sort of a catalog of earthquakes.

21 THE WITNESS: I understand what you are  
22 saying. I would direct you to go read U.S. Geological  
23 Circular 726. It is a classic geothermal paper by Shaw  
24 and -- anyway, what they did is they did a study of the  
25 western U.S. for the magma bodies. And basically that

1 study identified every magmatic system that exists in  
2 the western U.S. and everyone of them was silicic magma  
3 body. And these things, they come to the surface.

4 COMMISSIONER BALCH: They are typically very  
5 shallow --

6 THE WITNESS: Yes. And they are very large  
7 volume. And that is almost what is required for a  
8 magmatic heat source. And they are very --

9 COMMISSIONER BALCH: Anything that is long  
10 lived --

11 THE WITNESS: Excuse me?

12 COMMISSIONER BALCH: Anything that is long  
13 lived. You could have a more localized anomaly. I  
14 mean, certainly if you look at the Rio Grande Rift,  
15 there's numerous examples of 2,000-, 10,000-, 50,000-,  
16 100,000-year-old surface of salt flow. More things like  
17 the Socorro magma body; certainly one of them probably  
18 resulted in the Carrizozo lava flow.

19 THE WITNESS: I don't disagree. Those are  
20 not going to be a heat source for a geothermal system.

21 COMMISSIONER BALCH: But whatever is causing  
22 that heat to be there.

23 THE WITNESS: That heat to be there is due  
24 to the extension of the crust. The mantle is closer to  
25 the surface, and there is a classic paper by Lockenbrook

1 that describes how that heat flow increases when you  
2 extend the crust.

3 And one of their areas that they were  
4 studying is the region in northern Nevada centered in  
5 the heat flow high up in that region upground  
6 Winnemucca.

7 And with high extension rates, they are  
8 accompanied by high heat flow due to just the thinning  
9 of the crust and the heat from the mantle.

10 And that's the case in the southern basin  
11 range in the Rio Grande rift also.

12 COMMISSIONER BALCH: So this area you're  
13 really kind of overprinting the Rio Grande rift along  
14 the base of the range?

15 THE WITNESS: Yes. Actually, there's a  
16 continuum almost between them.

17 COMMISSIONER BALCH: But I think we can  
18 probably agree that there is a thin crust in that area.

19 THE WITNESS: Absolutely. And so what you  
20 have is you have heat flows that average anywhere from  
21 80 to 100 milliwatts per meter squared.

22 And that is sufficient to create invective  
23 geothermal systems. And these are the type systems we  
24 see. And so you don't have to have a magma body at all.

25 To back up a little bit, taking a look at

1 something like the Socorro magma body, that's going to  
2 contribute heat to the crust, but that's not going to  
3 create a geothermal --

4 COMMISSIONER BALCH: It has a deeper root --

5 THE WITNESS: Exactly.

6 COMMISSIONER BALCH: -- that's the real  
7 source of the heat.

8 THE WITNESS: Right.

9 COMMISSIONER BALCH: And it has to  
10 continuously ebb and flow in order to be able to  
11 stabilize the liquid surface.

12 THE WITNESS: Exactly. And, over time, it  
13 could end up causing the regional heat flow around  
14 Socorro to increase by -- I don't know -- maybe five,  
15 ten milliwatts per meter squared.

16 COMMISSIONER BALCH: I think there is also  
17 some relationship to shallower geothermal anomalies in  
18 Socorro potentially because of that high heat flow. For  
19 example, the temperature in Woods Tunnel --

20 THE WITNESS: Actually, I know Woods Tunnel  
21 very well.

22 COMMISSIONER BALCH: So you know it's really  
23 the water coming out from Magdalena and flowing  
24 underneath?

25 THE WITNESS: Yes.

1                   COMMISSIONER BALCH:  And you're definitely  
2 going to --

3                   THE WITNESS:  And I managed the drilling of  
4 that test well that was done there several years ago.

5                   COMMISSIONER BALCH:  So you have the warm  
6 springs in Socorro.

7                   THE WITNESS:  Uh-huh.

8                   COMMISSIONER BALCH:  You mentioned earlier  
9 the higher fluoride content as you go from the Belen,  
10 Albuquerque Basin to the Socorro Basin --

11                   THE WITNESS:  Right.

12                   COMMISSIONER BALCH:  -- right there at San  
13 Acacia.  San Acacia has a very shallow bedrock there --

14                   THE WITNESS:  Exactly.

15                   COMMISSIONER BALCH:  And there is also  
16 geothermal springs in that area, some of them near the  
17 Rio Grande as well, so that could be contributing to  
18 fluoride concentrations right immediately below the  
19 San Acacia Dam.

20                   THE WITNESS:  I agree.

21                   COMMISSIONER BALCH:  I don't know where your  
22 measurements were taken.

23                   THE WITNESS:  I agree.  That's --

24                   COMMISSIONER BALCH:  But there's lots of  
25 evidence for hot circulating water above any sort of

1 magma body.

2 THE WITNESS: The Socorro geothermal systems  
3 in, say, the Woods Tunnel -- that's been modeled. Mark  
4 Person at New Mexico Tech has modeled that. Magma is  
5 not -- doesn't have to be involved at all --

6 COMMISSIONER BALCH: Nothing to do with  
7 magma. It's flowing underneath the river at the Socorro  
8 Peak.

9 THE WITNESS: Exactly.

10 COMMISSIONER BALCH: Which is a similar  
11 cauldron boundary to your cauldron over here --

12 THE WITNESS: Exactly.

13 COMMISSIONER BALCH: You have the ability  
14 for water to access deep hot rocks.

15 THE WITNESS: Exactly.

16 COMMISSIONER BALCH: I guess my question  
17 then is how do you get it to be so localized at  
18 Lightning Dock if that's the source of the -- if that  
19 would be an analogous source of the hot water,  
20 ultimately, things flowing down off the mountains,  
21 underneath the tertiary volcanic cauldron boundaries,  
22 and then up at Lightning Dock, why is it only pooling up  
23 at Lightning Dock?

24 THE WITNESS: If you go back to that map  
25 that we showed with the regional structural elements,

1 there are several things that come together there.

2 COMMISSIONER BALCH: This one?

3 THE WITNESS: Yes.

4 Yes, that little hot well is horst block.

5 And I view that as kind of an extensional accommodation  
6 zone that's associated with the change from that basin  
7 to the south to the basin to the north.

8 You also have that Pleistocene Fault. It  
9 seems to have a fault tip ending right there. And those  
10 are good favorable areas for increased open strain.

11 And then you've got the rain fracture zone  
12 that's overprinted that. And then you have this large  
13 west, northwest structural trend that comes across there  
14 that's got a very long history of fracturing.

15 COMMISSIONER BALCH: What would you say --  
16 are you talking about the -- never mind. You just have  
17 it as a kind of a thin band. But usually those sort of  
18 regional accommodation zones can be 100 kilometers wide.

19 THE WITNESS: They are not going to be that  
20 wide.

21 COMMISSIONER BALCH: I am talking about a  
22 Socorro accommodation zone is about 100 kilometers.

23 THE WITNESS: I don't know if it's 100  
24 kilometers wide. I would call it more like --

25 COMMISSIONER BALCH: More or less north and

1 south and in the Socorro magma body and runs into  
2 Arizona and up into Oklahoma. So I would call that a  
3 regional accommodation zone.

4 THE WITNESS: It's not an accommodation. It  
5 is only an accommodation zone right there at the Rio  
6 Grande rift. And in that sense --

7 COMMISSIONER BALCH: Splitting hairs.

8 THE WITNESS: Well, in a sense it is.

9 COMMISSIONER BALCH: So, anyway, you do have  
10 your tectonic accommodation zone from Larmide, you have  
11 your cauldron fracture zone, you have the termination of  
12 the Animas Valley Fault. Do you know if that fault goes  
13 subsurface at that point or does it actually end?

14 THE WITNESS: It ends right there. I've  
15 mapped it.

16 COMMISSIONER BALCH: Is it like a wrench  
17 fault?

18 THE WITNESS: No. It is actually a normal  
19 fault. And the way you map these when you are out on  
20 the surface -- you know all of our soils in this region  
21 form caliche. And so if you have a break on that,  
22 you'll get a topographic change there, but you can come  
23 down on that slope beneath it and you'll see lots of  
24 little pieces of caliche. And so it's very easy to  
25 follow on the ground, even if there's not a real,

1 distinct slope.

2 Because the older these faults get, you  
3 know, they tend to flatten out. A real young one would  
4 just be a real sharp --

5 COMMISSIONER BALCH: It may not be that it  
6 terminates there. It may mean that the more recent  
7 activations terminated in that area.

8 THE WITNESS: I think this fault has had one  
9 movement, and this is it, right here.

10 COMMISSIONER BALCH: One movement?

11 THE WITNESS: One movement.

12 COMMISSIONER BALCH: And that is going to be  
13 based on range tectonics?

14 THE WITNESS: It's based on range extension,  
15 yes.

16 COMMISSIONER BALCH: Prior to or overprinted  
17 by regional rift tectonics?

18 THE WITNESS: It's -- this is the latest  
19 extension that's taken place in the basin range in that  
20 area, so --

21 COMMISSIONER BALCH: So why wouldn't this be  
22 a reactivation of a spreading zone -- a reactivation of  
23 an existing basin range fault?

24 THE WITNESS: The reason I don't think that  
25 is because it doesn't have a gravity signature. And

1 these big basin range normal faults, they have a gravity  
2 signature. And this one doesn't, which makes me think  
3 it is very young and --

4 COMMISSIONER BALCH: That is what I was  
5 wondering about next.

6 I know I asked you this last time, but we'll  
7 put it back on the record. These are generated from  
8 Randy Keller's regional gravity data for New Mexico.

9 THE WITNESS: Yes. I downloaded off the --

10 COMMISSIONER BALCH: Did you also look at  
11 his online data site? He has a data site that goes  
12 along with that.

13 THE WITNESS: I didn't look at that data. I  
14 looked at the data set that the U.S. Geological Survey  
15 had online. And so that's the information I worked  
16 with.

17 COMMISSIONER BALCH: So all of the  
18 subsurface faults here, those all occurred from gravity?

19 THE WITNESS: Yeah, that you see in this  
20 particular area.

21 COMMISSIONER BALCH: Did you go out and  
22 acquire any more local data points than that rather  
23 coarse regional survey?

24 THE WITNESS: No, I did not.

25 COMMISSIONER BALCH: So there is going to be

1 a bit of an error margin on location of these faults?

2 THE WITNESS: Certainly.

3 COMMISSIONER BALCH: You do have a steep  
4 gradient, I mean, because you have two points near to  
5 each other, and one of them may not have been sampled.

6 They may have been sampled at different times using  
7 different methods, though the anomaly may have been  
8 calculated separately. That's a patchwork data set --

9 THE WITNESS: I hear you, yes.

10 COMMISSIONER BALCH: So when I was looking  
11 at the boundary between the Albuquerque and Socorro  
12 Basins, I went out and took about 30 data points myself  
13 to try and hone in on features of that scale.

14 So I think it is important to note that  
15 these can't really be definitively placed.

16 THE WITNESS: And I agree with that, and you  
17 are exactly right.

18 I just showed this the way it is to show  
19 what the broad regional features are here and where  
20 things are basically located. I wasn't trying to do any  
21 more than that.

22 COMMISSIONER BALCH: Well, but you were  
23 using them to define like your Hot Wells Horst, for  
24 example?

25 THE WITNESS: Yes. We see that in --

1                   COMMISSIONER BALCH: So there could be an  
2 error of margin in that size calculation?

3                   THE WITNESS: Yes.

4                   COMMISSIONER BALCH: And it could be large  
5 or it could be -- do you have a sense for what that  
6 range of variability might be?

7                   THE WITNESS: Well, we could be off  
8 100 meters, 200 meters.

9                   COMMISSIONER BALCH: Say 200 meters in any  
10 given direction; that dramatically changes the size of  
11 the anomaly.

12                   THE WITNESS: The Hot Wells Horst, I don't  
13 view that as the up flow zone in its entirety.

14                   I know information has been presented that  
15 says that. I think the upflow zone is a very, very  
16 small area. And you mention an intrusive that was shown  
17 on here --

18                   COMMISSIONER BALCH: It looks like the 45-7  
19 touches down --

20                   THE WITNESS: -- and that could play a role.

21                   COMMISSIONER BALCH: -- in an intrusive. So  
22 there's definitely --

23                   THE WITNESS: Because that's another way to  
24 have a hydro geologic window for great depth. And a  
25 classic example of that is the geothermal system at

1 Radium Springs in New Mexico.

2 COMMISSIONER BALCH: And I don't think we  
3 were presented any information on the age of that  
4 intrusive. It could be pre-Pennsylvanian. It could be  
5 anytime up until the present.

6 THE WITNESS: It wouldn't be  
7 pre-Pennsylvanian. It would probably have to be  
8 Jurassic and younger.

9 COMMISSIONER BALCH: Right.

10 THE WITNESS: But it may be associated with  
11 the ring fracture somehow, that caldera. But it could  
12 provide a nice little conduit.

13 COMMISSIONER BALCH: Did they ever get any  
14 of this cross section?

15 THE WITNESS: No.

16 COMMISSIONER BALCH: Just so we are looking  
17 at the same thing. I mean, certainly, you could  
18 interpret a large fault between 45-7 and 55-7. But,  
19 generally speaking, I don't see any large geologic  
20 changes from the AmeriCulture wells to any of the other  
21 wells that should be in the same up-thrown block, the  
22 upside of the normal fault that would offset the 45-7.

23 There's not a lot of things you can  
24 correlate across except for, perhaps, the Pennsylvanian  
25 limestones. If you were to hang this on the limestones,

1 I think you would be demonstrating that this whole area  
2 is pretty broken up.

3 THE WITNESS: Well, you also have to  
4 remember that the people that were out there logging  
5 these particular holes, they may have been geologists  
6 for a mud logging company that had no training in  
7 volcanics, and they come out of the oil field in  
8 Houston. And you just don't know what you are going to  
9 get. What I would like to see is geophysical logs and  
10 then you can --

11 COMMISSIONER BALCH: I would have to agree  
12 with you on that.

13 THE WITNESS: And then you can start to  
14 correlate --

15 COMMISSIONER BALCH: And, presumably, some  
16 of these would be available at the log library in  
17 Socorro to anybody. So I am surprised that nobody  
18 presented them.

19 But understanding of this is that Lightning  
20 Dock's part of it was built on geophysical logs, at  
21 least in part.

22 THE WITNESS: The State Well No. 2 was. And  
23 the other wells were drilled prior to -- they were  
24 drilled years ago and I wasn't involved.

25 COMMISSIONER BALCH: So maybe a gamma log or

1 a neutron count or something like that?

2 THE WITNESS: There wasn't even a gamma log.

3 COMMISSIONER BALCH: So it's really just  
4 based off of the log and drill reports?

5 THE WITNESS: Yeah, and the State 2 Well, we  
6 didn't run electric logs in there. We just ran --

7 COMMISSIONER BALCH: You said it was  
8 partially cored?

9 THE WITNESS: Partially cored.

10 COMMISSIONER BALCH: What interval was  
11 cored?

12 THE WITNESS: I would have to go to that  
13 report. We cored into the top of the Pennsylvanian  
14 unit --

15 COMMISSIONER BALCH: So around 1,600 feet?

16 THE WITNESS: -- and we started coring in  
17 the volcanics, which would be -- I want to say we start  
18 coring there maybe 800 feet. I would have to go look at  
19 that report. I don't recall that right off. But we got  
20 a substantial section of core.

21 COMMISSIONER BALCH: And it was all full  
22 core; it wasn't side walls?

23 THE WITNESS: No, this was continuous water  
24 line core.

25 COMMISSIONER BALCH: Refresh my -- remember,

1 I am a geophysicist, so I am an expert in geology  
2 necessarily -- dacite?

3 THE WITNESS: Yeah, I would call it a  
4 dacite.

5 COMMISSIONER BALCH: What is that?

6 THE WITNESS: It's a high silica. It  
7 doesn't have as much quartz in it, than, say, a rhyolite  
8 would. But it's high silica.

9 COMMISSIONER BALCH: So is it -- so it's a  
10 volcanic section?

11 THE WITNESS: It's actually an intrusive  
12 rock.

13 COMMISSIONER BALCH: It is intrusive?

14 THE WITNESS: It is intrusive.

15 COMMISSIONER BALCH: And is it then altered?

16 THE WITNESS: No. This stuff wasn't that  
17 altered and it really wasn't that fractured as I recall.  
18 And I don't recall from looking at the core whether we  
19 can say whether it was a sill or a dike. That is kind  
20 of hard to call when you got just two-inch core.

21 COMMISSIONER BALCH: And that is probably  
22 most certainly related to the Meir Cauldron. And that's  
23 why you placed the boundary more to the east?

24 THE WITNESS: Yeah, the main reason we  
25 placed the Meir Cauldron there was the first volcanic

1 unit that we cored into was a biotype rhyolite. And it  
2 was almost identical to the rhyolite that's found in  
3 Pyramid Peak, which is a fracture zone, rhyolite dome in  
4 the Pyramid Mountains.

5 And then after we cored through that, then  
6 we drilled through the outflow, ash flow tuff. We  
7 didn't drill through the ash flow tuff that would have  
8 been in the middle of the caldera. Those can be very,  
9 very thick. This was fairly thin.

10 COMMISSIONER BALCH: See, I think to really  
11 define the area you would like to have some better data,  
12 some 2D or 3D seismic...

13 THE WITNESS: That would just be fantastic.  
14 And there's a lot of structure I am sure in the  
15 Paleozoic units that is awesome. And the only way to  
16 see that would be with the seismic.

17 COMMISSIONER BALCH: So switching gears a  
18 little bit, to the reports of the silver isotopes, you  
19 said they appear to have spent -- appear to not have  
20 spent significant time in carbonates.

21 THE WITNESS: Yes.

22 COMMISSIONER BALCH: So really all these  
23 wells do have at least some limestone layers in them.  
24 So if you're circulating water to heat it at geothermal  
25 depth and then it's upwelling at the location of

1 Lightning Dock, they're going to have to pass through  
2 that carbonate?

3 THE WITNESS: Well, if you got an intrusive  
4 rock --

5 COMMISSIONER BALCH: That's true --

6 THE WITNESS: -- they don't have to.

7 COMMISSIONER BALCH: -- you can have a  
8 conduit.

9 THE WITNESS: The other way you get around  
10 it is if you have a major fault zone, in, for instance,  
11 45-7 to 55-7, that zone in there that I interpret as a  
12 fault. At depth across those carbonate units, it could  
13 be a silicified or it could be a jasperoid. We see that  
14 when you get out mapping faults in a region.

15 COMMISSIONER BALCH: So it could be  
16 fractured, and then there's not any contact between the  
17 water and the limestone matrix?

18 THE WITNESS: Exactly. And so where the  
19 upflow is is that it just squirts up through a  
20 silicified zone or intrusive rock. The main point there  
21 is that the limestone is not a reservoir rock;  
22 otherwise, it would show an isotopic signature.

23 COMMISSIONER BALCH: I think we both agree  
24 on that. You mentioned five dry geothermal wells that  
25 were used in part to contain your interpretation of the

1 geothermal anomaly. Could you find some map to place  
2 those five wells on for me?

3 THE WITNESS: I could point out two right  
4 now, 53-7 and 63-7. I wouldn't call those geothermal  
5 wells. I wouldn't necessarily call them "dry" wells.  
6 That was probably being a little exaggerating.

7 COMMISSIONER BALCH: Trying to use oil field  
8 terminology for your benefit?

9 THE WITNESS: But they are not productive  
10 wells.

11 COMMISSIONER BALCH: What are the  
12 temperatures at the base of those wells?

13 THE WITNESS: I don't know. I have never  
14 seen a temperature log on those wells. But I would  
15 assume if they were 300 degrees and highly productive,  
16 that they'd would be production wells.

17 COMMISSIONER BALCH: So you really don't  
18 know if they're dry --

19 THE WITNESS: I am pretty sure that they are  
20 because they have tried to inject in them. And in the  
21 injection records that they send to OCD, they are not  
22 taking much water.

23 In fact, one of them I think one month, they  
24 were able to inject less than ten gallons per minute.

25 COMMISSIONER BALCH: So going back to

1 injection, I think that is a little bit of a misnomer,  
2 it's more than just dropping water in these wells with  
3 gravity. Of course, you could have significant bottom  
4 hole pressure just from the weight of the hydrostatic  
5 column --

6 THE WITNESS: But that would be balanced by  
7 any water in the formation, so I don't know what the  
8 pressure difference would be.

9 COMMISSIONER BALCH: Well, I mean, the  
10 bottom hole pressure in the well is going to be equal to  
11 the weight of the -- the head of the fluid column --

12 THE WITNESS: Sure.

13 COMMISSIONER BALCH: And that's all it is.  
14 And once you get away from that, sure, it's going to be  
15 offset by reservoir pressure.

16 And if you have higher reservoir pressure,  
17 then you are going to have water being pushed back out  
18 of the well. And if you have lower, it is going to be  
19 sucked out into the formation.

20 So you are saying those rates are ten  
21 gallons per minute? In tests or --

22 THE WITNESS: No. This was a monthly  
23 report. I don't remember the exact number. But it was  
24 less than that. And I was just sitting there, Wow.  
25 Those aren't good wells.

1                   And it was -- I can't remember -- I don't  
2 recall the form number that it was on right now.

3                   COMMISSIONER BALCH: So your other three  
4 not-so geothermal wells, are they going to be off the  
5 map here?

6                   THE WITNESS: Yeah. The other one would be  
7 to the south, almost due south of 45-7. And that would  
8 be 47-7 that they are currently using as a deep monitor  
9 well. Apparently, it wasn't very productive or didn't  
10 have temperature or they would have done something with  
11 it.

12                  COMMISSIONER BALCH: About how far south is  
13 that?

14                  THE WITNESS: About -- no more than 1,000  
15 feet. Probably less than that.

16                  COMMISSIONER BALCH: And the other two?

17                  THE WITNESS: We've got three. The other  
18 one -- the other two would have been out to the west of  
19 45-7, out in the basin. And as far as I know, there has  
20 been no attempt to do anything with those holes.

21                  COMMISSIONER BALCH: I think we do have some  
22 maps. I think they are early in Lightning Docks' case.

23                  Do you have that map available to you? This  
24 is Exhibit 1.

25                  (Pause.)

1                   COMMISSIONER BALCH: So the well to the  
2 south of 45-7, the only well I'm showing on this map is  
3 17-7 to the southwest.

4                   THE WITNESS: Southwest, I believe that's  
5 the latest hole that was drilled.

6                   COMMISSIONER BALCH: So the not hot  
7 geothermal well is a different well that's not on this  
8 map?

9                   THE WITNESS: Yes. It is directly south of  
10 45-7, almost directly south. It's probably not as far  
11 south as that building or tank or whatever is shown.  
12 It's just south of 45-7. 47-7 is the designation of it.

13                   COMMISSIONER BALCH: 47-7 -- it looks like  
14 your Exhibit P would have that one on it.

15                   MR. BRANCARD: Right before that page you  
16 are on.

17                   THE WITNESS: Yes, that's it.

18                   COMMISSIONER BALCH: It doesn't have a  
19 scale. And is there anything to the east or north that  
20 you would consider to be a dry geothermal hole?

21                   THE WITNESS: Well, the 52-7, I wonder about  
22 that. That would be the other hole.

23                   COMMISSIONER BALCH: I am curious about the  
24 location of --

25                   THE WITNESS: It's actually on this map

1 also, this last one.

2 COMMISSIONER BALCH: Do you know how deep  
3 that well is?

4 THE WITNESS: I do not.

5 COMMISSIONER BALCH: And you mentioned that  
6 there were only two 300-plus wells in the Lightning Dock  
7 geothermal anomaly. They also happen to be the two  
8 deepest wells that we have available to us anyway.

9 Is it possible then if you drill another  
10 well to those same depths that you might find 300-plus  
11 degree water elsewhere?

12 THE WITNESS: I couldn't answer that.

13 COMMISSIONER BALCH: So there was extensive  
14 testimony earlier about the interaction of the plume as  
15 it comes up with the fresh water aquifer in the area.

16 And you do have significant dampening of the  
17 hot water due to that. And that plume has rather  
18 indefinite boundaries. Various times people have gone  
19 out there and done water quality sampling, and that's  
20 really what you have, is little snapshots in time.

21 It doesn't look like it's changing  
22 necessarily significantly over time. I don't think a  
23 study has been done since Lightning Dock has been  
24 operating. But I think the amount of water that  
25 Lightning Dock is using now is equivalent to what the

1 rose farm was using before approximately. So you may  
2 not expect to see a large variation there --

3 THE WITNESS: Well, there is a huge  
4 difference. The rose farm didn't produce 24 hours a  
5 day, seven days a week, 365 days a year. The only time  
6 the rose farm used hot water is at night in the winter  
7 and maybe on the coldest days in the winter.

8 And maybe on a cool evening or for a certain  
9 crop in a greenhouse, they might have done it a little  
10 bit in the summer. But maximum production would have  
11 just been in the coldest months of the year, so you  
12 really can't compare the two. The difference is in  
13 total output.

14 Q. So the current rate, whether you call it  
15 equilibrium or steady state, appears to be sustainable,  
16 at least in the near term. I mean, it has reached a  
17 place where the drawdown has stabilized and the  
18 temperature of the water has stabilized?

19 THE WITNESS: I would agree with that.

20 COMMISSIONER BALCH: That's equilibrium in  
21 my book. It may not be a permanent equilibrium, but it  
22 is an equilibrium.

23 THE WITNESS: In a snapshot in time, yes.

24 COMMISSIONER BALCH: Sure. I think the  
25 rates that they are producing are already greater than

1 the recharge rate that you mentioned. I think you  
2 calculated 277 gallons per minute recharge or  
3 approximately 300 --

4 THE WITNESS: Sure.

5 COMMISSIONER BALCH: -- based on the size of  
6 the anomaly. And at that point -- I am having a hard  
7 time figuring out how you can reach an equilibrium in a  
8 very small anomaly. I mean, they hit it within a few  
9 months, and then it stayed that way for more than a  
10 year.

11 THE WITNESS: Well --

12 COMMISSIONER BALCH: I think you might get  
13 to a place where you would start to see a gradual  
14 decline if you were actually depleting the resource.

15 THE WITNESS: I think that is what's going  
16 to happen.

17 COMMISSIONER BALCH: But over what time  
18 period?

19 THE WITNESS: I don't know. I haven't seen  
20 the drawdown curves or any of that they produced.

21 COMMISSIONER BALCH: You know, there was a  
22 lot of testimony early on from Cyrq that they try to run  
23 these things in an equilibrium fashion. They don't want  
24 to deplete the resource.

25 As a commission we're more used to dealing

1 with cases where the resource is there to be exploited.  
2 We want to make sure that is done efficiently and  
3 fairly.

4 So if it is really a temporary blip, that  
5 this is not a permanent geothermal anomaly but some kind  
6 of active source continuously replenishing it, over what  
7 time period -- would it just go away on its own? I mean  
8 that's a question that we might have to consider.

9 THE WITNESS: Their production is going to  
10 decrease the resource anyway. They are already mining  
11 heat out of that resource, because the water that is  
12 flowing into that resource can't keep up with it, and --

13 COMMISSIONER BALCH: And so when you did  
14 your calculation --

15 THE WITNESS: -- and where most -- and in  
16 that calculation where most of the heat is found is in  
17 the rock. And so you keep circulating and mining that  
18 heat.

19 And you can do that for very long periods of  
20 time. And that is effectively what's happening. And  
21 that's what happens on all large electrical power  
22 generation projects.

23 COMMISSIONER BALCH: So I would pose if that  
24 were to occur over ten years, then there would be an  
25 impact on your own operations and operations around you.

1 If that is more likely to occur over 100 years, maybe it  
2 is not such a big impact.

3 THE WITNESS: If it is over a 100 years, it  
4 probably won't be any impact at all. But this is a very  
5 small resource, and --

6 COMMISSIONER BALCH: The size of the  
7 resource is kind of my next series of questions --

8 THE WITNESS: Yes.

9 COMMISSIONER BALCH: -- particularly the  
10 recharge rate that you calculated, 77 gallons per  
11 minute. That is indicated in your slide to be a  
12 calculation and a minimum calculation.

13 THE WITNESS: Exactly.

14 COMMISSIONER BALCH: So any time you do a  
15 calculation, when you're trying to do some sort of a  
16 sensitivity analysis, you calculate the end point and  
17 then you calculate the place in that distribution, the  
18 beginning and the end points, that it's most likely to  
19 occur. So you presented us the bottom end, I think.  
20 What is the top end?

21 THE WITNESS: The top end, I don't know.  
22 But one way to figure that out would be for if we had  
23 better information on the amount of mixing of fresh  
24 water and the up flow of hot water.

25 And we've got good hydraulic conductivity of

1 the cross section, where the hot water -- or the cold  
2 water is flowing into the mixed zone. Then you could  
3 end up calculating, using that percentage to calculate  
4 another number for the amount of up flow that is taking  
5 place.

6 COMMISSIONER BALCH: So going back to oil,  
7 because we are a little more familiar with that. If you  
8 are calculating a reserve, you go in there, you estimate  
9 what you think the pore space is, the permeability, how  
10 much oil you can get to the well bore, using those  
11 characteristics of the rock and fluid in them.

12 And then you give a number that you think is  
13 your best guess and you apply your margins to that.  
14 They don't present necessarily the minimum value you  
15 could make; they present the expected value that they  
16 can make. What do you think an expected value might be,  
17 rather than the minimum calculation here, 277? And you  
18 have all the variables available to you, the size that  
19 you think the anomaly is, right?

20 THE WITNESS: The anomaly size doesn't have  
21 anything to do with the calculation in terms of the  
22 volume. What I am doing -- this is with the heat flow  
23 and so that number --

24 COMMISSIONER BALCH: So where is the water  
25 coming from?

1 THE WITNESS: The hot water?

2 COMMISSIONER BALCH: No. Where is the cold  
3 water that is being turned into hot water at depth?

4 THE WITNESS: Oh, that's recharging in a  
5 mountain range.

6 COMMISSIONER BALCH: So like I said, like  
7 the (inaudible), it's coming off the front of that --

8 THE WITNESS: Yeah, that could be tens of  
9 miles away.

10 COMMISSIONER BALCH: What is that recharge  
11 rate?

12 THE WITNESS: I don't know.

13 COMMISSIONER BALCH: Wouldn't that be -- say  
14 you have a large geothermal anomaly underneath, a  
15 containing layer; you've got a hole punched in that  
16 containing layer at Lightning Dock. The size may be  
17 under debate. But that's a place where that head can  
18 adjust itself from the mountain range to the east and  
19 the west to the level of the valley floor.

20 I mean, that rate is going to be your  
21 recharge rate of your hot water, isn't it? That is  
22 going to be -- that rate is going to be matched by -- if  
23 you think like a entomologist and you take away  
24 capillary effects and things like that, and you are just  
25 looking at pore spaces and permeability in a very simple

1 way, then you are just allowing all flow without  
2 resistance, right?

3 THE WITNESS: Uh-huh.

4 COMMISSIONER BALCH: That would be the  
5 maximum amount that they could draw down at Lightning  
6 Dock and produce. And they seem to think that is 3,000  
7 to 5,000 gallons per minute.

8 THE WITNESS: I don't know.

9 COMMISSIONER BALCH: I think if your  
10 estimate of the size of the anomaly is correct, they  
11 would really quickly run into a dry hole, a literal dry  
12 hole where the cone of depression is at the bottom of  
13 the well.

14 THE WITNESS: They would if they weren't  
15 reinjecting.

16 COMMISSIONER BALCH: Okay. So they are  
17 reinjecting right now at around 300 barrels per minute  
18 into the 55-7, right?

19 THE WITNESS: Uh-huh.

20 COMMISSIONER BALCH: And I think  
21 Dr. Shomaker testified that he didn't think the fault  
22 was a barrier to that well based on that?

23 THE WITNESS: I think their own data shows  
24 it's a barrier to the flow. That's a 470-foot --

25 COMMISSIONER BALCH: Where are they getting

1 the steady state of the equilibrium from in the water  
2 flow? I think you just told me it was because they were  
3 reinjecting. The water has to be able to get back into  
4 contact with the 45-7 well in some way for that to be to  
5 the case, right?

6 THE WITNESS: Yeah. And it is doing it  
7 through that fault zone. And that's why -- it's mounded  
8 up and that's why they're having the --

9 COMMISSIONER BALCH: You are saying it's not  
10 crossing the fault; it is coming down the fault from  
11 higher up?

12 THE WITNESS: No. I am saying you have a  
13 fault here and you're pulling out here causing a cone of  
14 depression. You're injecting here. It's causing a  
15 mound with pressure. And, eventually, that pressure is  
16 enough to force its flow through that fault zone that's  
17 semipermeable.

18 COMMISSIONER BALCH: So the weight of the  
19 fluid column in the injection well is high enough to  
20 overcome the low permeability of the fault zone?

21 THE WITNESS: Yes. That's clearly what's  
22 happening, and the --

23 COMMISSIONER BALCH: And it's doing it at a  
24 rate of 300 gallons per minute or so --

25 THE WITNESS: Well --

1                   COMMISSIONER BALCH: So there's some  
2 mounding, right? So it's not all going down there,  
3 that's what you are saying?

4                   THE WITNESS: Yeah. It's not all going down  
5 there and it's spreading out on that zone and then  
6 coming across.

7                   But they are also creating a cone of  
8 depression on the west side of that fault, because you  
9 got a significant drawdown at 47-7 in concert with 45-7.  
10 And 4707 is a ways to the south. So that gives you kind  
11 of a judge on what the size of that cone of depression  
12 is at the steady state.

13                   And then when they did their initial  
14 injection out there, they were doing gravity feed. And  
15 I think that they were only able to sustain that at 200  
16 to 300 gallons a minute. Then they pressured everything  
17 up, where they have a head now that's -- what? -- 65  
18 p.s.i. at the well head. That's not a gravity flow.

19                   And so they are forcing it to work. But how  
20 long that is going to sustain -- and we don't know how  
21 that cone of depression is actually operating out into  
22 the west. We don't know what is exactly going on with  
23 the mound in the horst block. There are two different  
24 reservoirs really.

25                   COMMISSIONER BALCH: I think the answer to

1 that question, whether it is two or one or the size is  
2 large or small, you answer it pretty quickly by  
3 Lightning Dock's development, and they are going to hit  
4 a wall if you are correct.

5 THE WITNESS: That's true. We are going to  
6 find out who is right.

7 COMMISSIONER BALCH: And not in a long  
8 period of time. It's going to be immediately apparent,  
9 I think, if they start trying to draw 3,000 gallons per  
10 minute.

11 THE WITNESS: And our worry is what's going  
12 to happen to other things out there?

13 COMMISSIONER BALCH: A valid concern.

14 We have been assured by Cyrq and Lightning  
15 Dock that they do have better data than we do.  
16 Unfortunately, it makes it harder for us to make our  
17 decision when we don't have that better data available  
18 to us.

19 And, perhaps, sharing it with your party  
20 would make it easier for you to understand their point  
21 of view as well.

22 THE WITNESS: Absolutely.

23 COMMISSIONER BALCH: But I can't imagine  
24 them making a business decision for that amount of  
25 capital if they didn't think it was going to work, at

1 least over a 30-year time period.

2 All right. Let's see.

3 If you look at your Exhibit G. This is the  
4 upwelling map. I think it is the very first page.

5 I think the injection interval in the 55-7  
6 is 1050 to 2349, because this cross section says it was  
7 plugged from 2349 till touchdown. You are noticing the  
8 upwelling effect from that injection well.

9 I'm trying to figure out how there can be --  
10 I think there has to be some contact between the shallow  
11 aquifer and the deep aquifer; otherwise, the shallow  
12 aquifer would be hot in the first place, right?

13 THE WITNESS: Yeah, there is a --

14 COMMISSIONER BALCH: The question is at what  
15 rate can you recharge from a shallow depth to a deeper  
16 depth?

17 THE WITNESS: That -- yeah.

18 COMMISSIONER BALCH: And the limestones  
19 which you think may be a permeability barrier, they're  
20 pretty low in the section.

21 I think you were opposed to intermediate  
22 injection depth and your argument was that the  
23 upwelling is --

24 THE WITNESS: I wouldn't say I'm opposed. I  
25 am in favor of injecting into the same reservoir that

1 you produce from, similar depths and...

2 COMMISSIONER BALCH: I think it may be hard  
3 to determine --

4 THE WITNESS: Yes.

5 COMMISSIONER BALCH: -- the boundaries of  
6 those reservoirs for a single reservoir as Lightning  
7 Dock is proposing.

8 THE WITNESS: I see three reservoirs out  
9 there. I see a separate outflow plume reservoir that's  
10 fed by a deeper reservoir. But I don't know where that  
11 feeder is.

12 And then I see 55-7 in a discrete reservoir.  
13 And I think 54-7 is in another discrete reservoir. And  
14 they are both associated with that fault zone that's out  
15 there.

16 COMMISSIONER BALCH: The AMAX Dipole  
17 Survey --

18 THE WITNESS: Yes.

19 COMMISSIONER BALCH: Any potential source  
20 data is notoriously --

21 THE WITNESS: I haven't reached it yet.

22 COMMISSIONER BALCH: That's a good way to  
23 put it. I mean, you could have a deep or a shallow,  
24 thin anomaly or a deep one and they're going to give you  
25 the exact same signature.

1 THE WITNESS: Exactly. There's no unique  
2 solution, unless you got some other information to tie  
3 in with it.

4 COMMISSIONER BALCH: You could loosely  
5 interpret this survey to give you approximately a  
6 four-square-kilometer area of that upwelling zone;  
7 that's one interpretation I think.

8 THE WITNESS: Uh-huh.

9 COMMISSIONER BALCH: Based off of just the  
10 contour interval, the resistivity, when you go back to  
11 kind of background levels. So it could be anywhere  
12 between four square kilometers and the half square  
13 kilometer that you're proposing.

14 And I think if you change those numbers by  
15 that much, you can end up with a very large difference  
16 in the geothermal potential of this resource, right?

17 THE WITNESS: I agree.

18 COMMISSIONER BALCH: And I wish they would  
19 have used a little more power or something and got us a  
20 deeper profile.

21 THE WITNESS: Well, I am not sure  
22 dipole-dipole would have been able to do that. There  
23 are always other techniques to use, though.

24 COMMISSIONER BALCH: I think those are most  
25 of my questions. Thank you.

1 THE WITNESS: Thank you.

2 COMMISSIONER CATANACH: Do you have any  
3 questions?

4 MR. BRANCARD: No.

5 COMMISSIONER CATANACH: Is there any  
6 redirect or any further questions of this witness?

7 MR. LAKINS: No, sir.

8 COMMISSIONER CATANACH: Any further  
9 questions?

10 MR. ROGERS: No.

11 COMMISSIONER CATANACH: Okay. This witness  
12 may be excused.

13 MR. ROGERS: Has there been any discussion  
14 about the lunch break?

15 COMMISSIONER CATANACH: Not yet.

16 MR. ROGERS: Were we to leave early, we  
17 might be better off getting in and back here.

18 MR. LAKINS: I concur.

19 MR. ROGERS: Let the record reflect --

20 MR. LAKINS: That's a rarity.

21 COMMISSIONER CATANACH: Come back at 12:45.

22 MR. ROGERS: Thank you.

23 MR. LAKINS: 12:45.

24 (Lunch recess taken from 11:30 a.m.  
25 to 12:50 p.m.)

1                   COMMISSIONER CATANACH: Let's call the  
2 hearing back to order and turn it over to Mr. Lakins.

3                   MR. LAKINS: Okay. I now call Damon  
4 Seawright.

5                   COMMISSIONER CATANACH: Could you please  
6 swear the witness.

7                   DAMON SEAWRIGHT  
8 having been first duly sworn, was examined and testified  
9 as follows:

10                   DIRECT EXAMINATION

11 BY MR. LAKINS:

12           Q. Good afternoon, Mr. Seawright.

13           A. Good afternoon.

14           Q. Please introduce yourself.

15           A. I am Damon Seawright.

16           Q. Could you summarize your education.

17           A. I received both my bachelor's of science degree  
18 and Ph.D. in fishery science, with an emphasis in  
19 aquiculture, from the University of Washington, Seattle.

20           Q. When was that?

21           A. The Ph.D. I received in 1995.

22           Q. Okay. Did you put that education and your Ph.D.  
23 to work?

24           A. Yes. I went right directly from my Ph.D. program  
25 to business. And we just celebrated our 20th

1 anniversary at our present location in Animas, and our  
2 facility is, indeed, an aquaculture facility. So, yes.

3 Q. Give me an overview; what is an aquaculture  
4 facility?

5 A. Aquaculture is the controlled cultivation of  
6 aquatic organisms for human benefit. And aquaculture is  
7 a burgeoning discipline. It now exceeds oceanic catch  
8 with respect to the production of fish for human  
9 consumption.

10 And we specialize in a subset of that, which is  
11 the production of tilapia. Tilapia is a warm water  
12 tropical fish, native to, in our case, northern Africa.  
13 And we grow a fish called Nile tilapia, which is the  
14 fastest growing of the 100-plus species and subspecies  
15 of tilapia.

16 We are a hatchery. We are one of the largest  
17 commercial hatcheries in the United States. Our  
18 clientele range throughout North America and outside of  
19 the Americas. We ship to England, we ship to Israel,  
20 Venezuela, Mexico.

21 Our role in the industry is to produce high  
22 performance Nile tilapia fingerlings that are free of  
23 disease for discriminating customers, primarily in the  
24 continental United States.

25 Q. In your current operation, kind of give me just a

1 summary overview of what you do with your wells?

2 A. With our wells?

3 Q. With your wells.

4 A. We have three wells that we utilize. One, which  
5 has been just alluded to during the last hearing, is a  
6 freshwater well, and I would locate it approximately  
7 here. It's in section 12. And it is what we call a  
8 cold water well. The temperature is about 68 degrees  
9 Fahrenheit.

10 And we utilize two other wells. One is  
11 denominated State No. 1. It's in the southern end of  
12 our state geothermal lease acreage.

13 And then we recently commenced the use of our  
14 federal well or otherwise called A-444, which has been  
15 mentioned numerous times throughout the hearing. The  
16 purpose of the cold water well is just bulk water  
17 provision.

18 The purpose of the state geothermal well is for  
19 thermal energy primarily. But the quality of that water  
20 in its blended form with the fresh water, the cold water  
21 is appropriate for growing fish directly in it, in our  
22 case, under the proper ratios.

23 Now, the federal well, we used -- we never used  
24 it for thermal purposes, but we've used it for water  
25 provision purposes between the years 2004 and 2009. And

1 we began using it again in August in a more modest  
2 degree.

3 Q. So you bring this water in and then it goes  
4 through your system and then you discharge it?

5 A. Yes. The water has -- each of these wells have  
6 interconnecting pipelines to our facility. All of them  
7 can actually go into a main water storage tank. But  
8 that water need not be routed through that. We can  
9 direct well water directly into our tanks that we grow  
10 our fish in.

11 And the flow rate coming out of our fresh water  
12 well is about 70 gallons per minute. The make and model  
13 of that pump has remained unchanged since we have been  
14 there in the past 20 years.

15 During the first year, we operated it  
16 intermittently. But since then, it has remained  
17 operational on about a 24/7 basis for about 20 years,  
18 except for two incidences when the pump burned up and we  
19 had to replace it.

20 With respect to the State 1 geothermal resource,  
21 that's run on a timer and on an as-needed basis  
22 throughout the year. It is used in the summertime,  
23 particularly in the evenings. And it is used throughout  
24 the day, intermittently in the winter, at a rate that is  
25 required for us to maintain appropriate water

1 temperatures for our fish.

2 Q. What is the magnitude of the discharge?

3 A. The magnitude of the discharge I would estimate  
4 at about 40 gallons per minute.

5 Q. And is that discharge to an area that has been  
6 discussed in that lower map where the surface vegetation  
7 is?

8 A. Yes. We have four main growing areas that have  
9 various functions. There are four locations of  
10 discharge, here, here, here, here. I'm sorry for the  
11 shakiness of that.

12 That water is discharged from those four  
13 locations, and the function of the systems at those four  
14 locations are different with respect to the lifecycle of  
15 the fish or production activities at those specific  
16 locations.

17 Q. So cumulative about 40?

18 A. I would estimate it at about 40. And the  
19 difference between the 70 that we are pumping in  
20 addition to the warm water that is also being added to  
21 the system in that 40 is going to be leakage in  
22 pipelines, which happens. The pipeline that we use is  
23 the one that was there originally for the rose business  
24 that we bought out when we purchased this facility.

25 Now, there's seepage from tanks, seepage from

1 pipelines. That would be my estimated flow rate. And  
2 it is an estimate.

3 Q. Between the last hearing and this hearing, did  
4 you make any attempts to obtain further monitoring well  
5 data?

6 A. Yes.

7 Q. What did you do?

8 A. On two occasions, we filed two IPA requests. And  
9 the first one was a very broad one that specifically  
10 requested all --

11 MR. ROGERS: Objection. Relevance.

12 Q. Between the last hearing and this hearing, did  
13 you attempt to obtain monitoring well data?

14 MR. ROGERS: Objection.

15 A. On two occasions --

16 COMMISSIONER CATANACH: I'll allow that. I  
17 don't understand what the problem with that is.

18 MR. ROGERS: Well, it's going nowhere, and  
19 it is introducing an additional issue as to why he  
20 didn't do it timely or otherwise obtain the information.  
21 The answer is he did not get any information, and it is  
22 just wasting time.

23 MR. LAKINS: The monitoring well data is  
24 very relevant and his attempts to obtain it are relevant  
25 as well. Because it's on the table that we don't have

1 it and the Commission doesn't have it. And the most  
2 recent data that was ascertained to have been obtained  
3 and the date of that data is relevant.

4 MR. ROGERS: Application was filed on  
5 June 1st, and he makes a public records request in  
6 between the last two hearings. There's no purpose for  
7 this, except prejudice. It is not relevant.

8 MR. BRANCARD: Let's see where Mr. Lakins is  
9 going with these questions.

10 MR. LAKINS: I can make an offer of proof on  
11 it to simplify things. There's a June 30, '15,  
12 monitoring well report that was requested and was held  
13 by OCD as being marked as confidential. That is the  
14 point. That is where I was going.

15 BY MR. LAKINS (cont'd):

16 Q. Mr. Seawright, did you file this protest to  
17 harass Lightning Dock?

18 A. No.

19 Q. Have you filed protests in the past?

20 A. Yes.

21 Q. Why?

22 A. To protect our interests.

23 Q. Give me a quick overview of what you've done and  
24 why.

25 A. In 2008, shortly after the acquisition of the

1 Lightning Dock KGRA by Lightning Dock Geothermal, their  
2 predecessor, Razor Technologies, they applied for --  
3 through the Oil Conservation Division they applied for a  
4 production injection couplet that involved the diversion  
5 of large quantities of water.

6 And there was considerable discussion internally  
7 within our company whether or not we would request a  
8 hearing on that.

9 We came to the knowledge that they intended on  
10 injecting cooling tower treatment chemicals into the  
11 ground along with their thermally-depleted geothermal  
12 water. And that was of sufficient concern for us to  
13 where we wanted to be involved in the process.

14 And so we requested a hearing. And as a result  
15 of that hearing, the GTHD-001 permit, which embodied  
16 many of the state statutes that we were previously  
17 either relying on, and they were successful in the  
18 acquisition of that permit. But we did request a  
19 hearing.

20 Q. Now, the last hearing, when we were here two  
21 years ago, you protested as well. Why?

22 A. To protect our interests.

23 Q. And this particular hearing?

24 A. Well, this particular hearing -- I have to  
25 actually reference the last hearing. The last hearing

1 culminated in an additional injection permit into wells  
2 53-7 and 55-7. And we were concerned that water  
3 injected into 55-7 would make its way into our state 1  
4 geothermal well, and we had evidence that supported that  
5 belief, evidence that we presented at hearing.

6 And in 20/20 hindsight, we now know as a result  
7 of the information that has been provided by Lightning  
8 Dock Geothermal to the OCD and embodied in the ground  
9 water monitoring report, that immediately upon the  
10 commencement of power plant operations, that water began  
11 to amound. And so, in fact, our contention was accurate  
12 and Lightning Dock's was inaccurate.

13 The present application is a -- it proposes to  
14 directly inject into the shallow ground water, rather  
15 than injecting into a deep injection well. And so we  
16 would naturally anticipate -- and this is the belief of  
17 our experts supporting us in the various disciplines  
18 needed to make this estimation -- that that is going to  
19 have a greater impact than the current mounding is  
20 currently having.

21 Q. I am going to ask you to turn to the second page  
22 of Exhibit J in front of you there, please. Can you  
23 tell me what that is?

24 A. This is an exhibit that I put together that just  
25 simply helps illustrate the physical proximates of some

1 of these wells as a figure at which to -- that I can  
2 talk around.

3 If you would show it, that would help.

4 Q. Give me one moment, then.

5 A. We included this figure for a variety of reasons.  
6 One of the aspects of this proposal I wanted to discuss  
7 is the physical proximity of the wells.

8 As I described previously on the smaller figure,  
9 this right here is called a domestic well. That is the  
10 use corresponding to the A-444 OSE designation.

11 Here is AmeriCulture State 1, AmeriCulture State  
12 2. Here is the nearest proposed injection well here.

13 Now, we conducted a 48-hour flow test the report  
14 from which is included in one of Lightning Dock's  
15 exhibits. I don't recall exactly which exhibit that is.

16 But during that test, it was conducted over the  
17 course of 48 hours. It involved the staged pumping of  
18 three wells. The first well for a period of 24 hours  
19 was State Well No. 1. And then to that we had a  
20 composite flow rate with another one of the wells owned  
21 by the neighboring rose production facility. And then  
22 we added a third well. I don't recall what sequence the  
23 two rose farm wells were added.

24 But one of the very interesting things that we  
25 observed, and it is one of the reasons that goes to our

1 concern with regard to this present application, is that  
2 that well here, when we began pumping this --

3 Q. What is the depth of that one?

4 A. It is cased down to 282 feet, cement at the  
5 surface. And then it's completed open hole to 399 feet.  
6 So it is open from 282 to 399.

7 Q. Keep going.

8 A. Now, the reason that -- just to back up a bit.  
9 The reason that we sited that well at that site was  
10 because the rose growing facility at that time had  
11 approximately 40 wells. He had his own drilling rig.  
12 He would bring his driller.

13 So his exploration was more practical than remote  
14 geosciences we've heard about. He actually just drilled  
15 down and found the hot water. And there were two; there  
16 was a very hot well here and he had a very hot well  
17 here. And so we simply drew a line between the two and  
18 came off the minimum distance from the line on our state  
19 geothermal lease, and that's where we placed that well.

20 But the target reservoir host is a highly  
21 silicified Gila conglomerate that has secondary faults  
22 and fractures within it. And so what we see is very,  
23 very high flow rates, but also -- there's connection,  
24 hydraulic connection between these wells completed in  
25 the same reservoir host.

1           When we pumped this well at 1,100 gallons a  
2 minute, we saw measurable drawdown in one of the Rosette  
3 wells 800 feet away within 11 minutes.

4           Q. The depth of that one?

5           A. Approximately the same. This distance here --  
6 and this is just, you know, probably a 500-foot  
7 distance -- we are very close to this well 63-A; we  
8 began to see impacts in this well.

9           Since the commencement of the power plant  
10 operation, the water level in this well, despite having  
11 remained essentially static during our duration there in  
12 Animas, has risen three-and-a-half feet. And we have  
13 seen corresponding changes in chemistry in nature much  
14 more similar to that of the geothermal water.

15           And so the purpose of this was to show the  
16 physical proximities; we are talking very, very close  
17 quarters. The impacts that were anticipated to see will  
18 probably take place more quickly than one would predict  
19 under other circumstances that don't involve these  
20 fracture permeability situations.

21           And so we expect effects of injection here to be  
22 seen here in very short order.

23           Q. Do you have a concern about the proposed  
24 injections causing contamination of your source?

25           A. Contamination with respect to A-444, the federal

1 well. The chemistry of our AmeriCulture well, we did  
2 see a change after injection. But the geothermal water  
3 there is quite similar, in my opinion, to that seen in  
4 the wells in and around this geothermal rose facility.

5 Q. Now you are talking about the A-444 in  
6 particular. But in your opinion are there regulations  
7 that you are aware of, state regulations that would be  
8 violated?

9 A. Absolutely. I will just give you an example that  
10 we found in Title 19, Chapter 14, 26.8.b, which states:  
11 All waters at present or probable future value for  
12 domestic, commercial, agricultural, or stock purposes  
13 shall be adequately protected by methods approved by the  
14 Division.

15 And there are two other relevant regulations that  
16 I would like to turn you to. And they are contained in  
17 Exhibit L.

18 And the reason that Exhibit L was included in our  
19 exhibit book was because of the GTHD-1 permit expired in  
20 April of 2014. And it was the determination of the OCD  
21 that, in fact, an injection permit was no longer  
22 required for them to continue to operate through the  
23 injection wells that they were previously using.

24 But in this determination there are highlighted  
25 sections. And I would direct you to the third page,

1 under Enumeration of Powers New Mexico. And I would  
2 also state that we are not the ones that highlighted  
3 this. This was the way it was given to us by the OCD.

4 And in Enumerations of Power, paragraph B, it  
5 says: "To prevent geothermal resources water or other  
6 fluids from escaping from the strata in which they are  
7 found into other strata." And we believe that's exactly  
8 what has happened in the case of the injection.

9 The applicant in the 2013 hearing made a  
10 representation which was embodied in the ultimate order,  
11 that the injection zone in T-55 was separate from the  
12 production zone of AmeriCulture state well.

13 We knew immediately the month after the  
14 commissioning of the geothermal power plant that that  
15 was not true, because water began mounding immediately.  
16 And we believe that constitutes the migration of water  
17 escaping -- of water from one strata in which they were  
18 found into another.

19 And there was also highlight, paragraph M, which  
20 is, "The Division has the responsibility to regulate the  
21 disposition of geothermal resources or the residue  
22 thereof and to direct the surface or subsurface disposal  
23 of such in a manner that will afford reasonable  
24 protection against contamination of all fresh waters and  
25 waters of present or probable future value for domestic,

1 commercial, agricultural, or stock purposes, and will  
2 afford reasonable protection to human life and health  
3 and to the environment."

4 Now, we are presently using the water from well  
5 A-444 for a variety of uses. It goes into a common  
6 water storage tank, its primary use, because we didn't  
7 even use that well before 2004.

8 When we recently commissioned that well, we just  
9 did it for water provision purposes. It goes into a  
10 main storage tank. That water definitely can make its  
11 way. It's not directly connected through plumbing to  
12 our domestic water use. But that water definitely can  
13 migrate into the shower heads and the water faucets and  
14 the toilets that we use there at the farm just because  
15 of the nature of the plumbing from the storage tank on.

16 Q. Let me back you up to Exhibit J. We were talking  
17 about the second page of that. But what's the first  
18 page of that?

19 A. The first page is really nothing more than that  
20 same map less the descriptors.

21 MR. LAKINS: I move to admit Exhibits J  
22 and L.

23 COMMISSIONER CATANACH: Any objection?

24 MS. MARKS: Which --

25 MR. LAKINS: J and L.

1 MS. HENRIE: Can I just, Mr. Chairman, ask  
2 where this highlighting came from. I believe he said  
3 from the Division. Do you know from who?

4 THE WITNESS: Yes. There was a site visit  
5 that we were paid by Oil Conservation Division, Carl  
6 Chavez. And the purpose of the visit, I think he was  
7 down to visit the Lightning Dock production facility,  
8 but he was there to actually observe the various  
9 discharges, because there was some -- they wanted  
10 clarity on the nitrate content of our discharge.

11 They were being discharged from the four  
12 locations. He wanted to physically see what those  
13 looked like. And when he arrived, he passed me a copy  
14 of this. It was highlighted. And, interestingly  
15 enough, the copy online is also similarly highlighted.

16 MS. MARKS: There's copies on line?

17 THE WITNESS: Yes. This is not -- I is  
18 taken directly from online. I mean, that is not a scan  
19 of what I was handed. I've certainly never modified  
20 that document in any way.

21 MR. ROGERS: Could we substitute just a  
22 clean copy? Wouldn't that be more appropriate? We  
23 would have no objection to a clean copy.

24 We don't know why the highlighting is placed  
25 on there. We don't know anything about the chain. We

1 don't know those circumstances.

2           Wouldn't a clean copy be more appropriate?

3 And we would have no objection to Charles doing that.

4           COMMISSIONER CATANACH: I mean, if we have a  
5 clean copy. I don't know. We would have to check to  
6 see --

7           COMMISSIONER BALCH: It sounded like the  
8 version on the Internet has the same highlighting.

9           MS. MARKS: It just seems odd to me that  
10 even the general counsel posted online. I don't know,  
11 that introductory paragraph there (inaudible). But it  
12 is, I guess, what it is.

13           COMMISSIONER CATANACH: I have no problem  
14 substituting a clean copy if we can find one, if we can  
15 obtain one.

16           Any other objections?

17           MR. ROGERS: No.

18           COMMISSIONER CATANACH: J and L will be  
19 admitted.

20           (AmeriCulture Exhibits J and L were offered  
21 and admitted.)

22           MR. LAKINS: I am trying at the very moment  
23 to delete the highlighting from the copy that I have and  
24 it's not working. If I can obtain a clean copy, I will  
25 provide that.

1 MR. BRANCARD: Otherwise, it's a regulation  
2 that we can take notice of anyway. You want to draw our  
3 attention to certain regulations, and that's fine.

4 MR. LAKINS: Yes. Let's move on.

5 BY MR. LAKINS (resumed):

6 Q. Now, Mr. Seawright, you talked about prior  
7 permits.

8 A. Yes.

9 Q. Do you have an opinion about whether the  
10 contamination you are concerned about would be a  
11 violation of any permits?

12 MR. BRANCARD: Mr. Chairman, you are asking  
13 an opinion question of a fact witness?

14 MR. LAKINS: Yes.

15 MR. BRANCARD: He is not qualified as an  
16 expert witness.

17 MR. LAKINS: All right.

18 Q. It is your opinion, do you believe that the  
19 present proposed applications will result in waste?

20 A. Yes.

21 Q. Explain that to me. Why?

22 A. Well, as Jim Witcher testified, we believe our  
23 temperature will decrease in our State 1 Well. And the  
24 OCD has expressed an opinion at one time through its  
25 Counsel David Brooks. It was during the 2013 hearing.

1 MR. ROGERS: Objection. Hearsay.

2 MR. LAKINS: It's in the document.

3 MR. ROGERS: So that it will be double  
4 hearsay then. Where is the document?

5 Q. (By Mr. Lakins) Do you want to point out where  
6 that is?

7 A. It is in the testimony.

8 COMMISSIONER CATANACH: Hold on.  
9 Mr. Brancard.

10 MR. ROGERS: Best evidence and hearsay.

11 MR. BRANCARD: Mr. Chairman, it's up to you  
12 if you think it's relevant. We don't follow the hearsay  
13 rule.

14 COMMISSIONER CATANACH: This information is  
15 in a transcript, did you say?

16 THE WITNESS: It's in the original court  
17 transcript.

18 MS. MARKS: That would be legal counsel for  
19 OCD as opposed to an expert from OCD. So you really  
20 can't cross-examine an OCD witness or legal counsel for  
21 OCD who is no longer an employee of the department.

22 I'm unfamiliar with the 2013 transcript. I  
23 didn't start with the department until September of last  
24 year.

25 MR. ROGERS: And best evidence. I mean the

1 issue is if he is going to quote some testimony that is  
2 important or relevant, it should be produced. And then  
3 I would have a hearsay objection. But before you get  
4 there, it's best evidence.

5 COMMISSIONER CATANACH: Can you withdraw  
6 that, Mr. Lakins?

7 MR. LAKINS: I'll withdraw that question.

8 BY MR. LAKINS (cont'd):

9 A. There is a reference in Exhibit C.

10 Q. Turn your attention to Exhibit C, the conditions  
11 of approval, No. 7. Now that particular conditions of  
12 approval and the waste definition included in that OCC  
13 order, could you read what that definition states?

14 A. It states, "Geothermal Waste: The operator shall  
15 minimize geothermal waste of heat from geothermal  
16 reservoir fluids treated and/or stored at surface and  
17 prevent the reinjection of high turbidity cool  
18 geothermal reservoir fluids treated and/or stored at  
19 surface back into the reservoir.

20 "Geothermal waste includes the inefficient,  
21 excessive, or improper management of reservoir thermal  
22 fluid production, use, or dissipation of geothermal  
23 fluid, heat, EG, transporting or storing methods that  
24 cause or tend to cause unnecessary surface heat loss of  
25 the geothermal resource and/or reinjection of cold

1 reservoir fluids back into the geothermal reservoir  
2 resulting in inefficient and/or decreased geothermal  
3 resource temperature."

4 Q. Given that definition that is in the OCC order,  
5 do you believe that the proposed application will result  
6 in waste under that definition?

7 A. Yes. Functionally, what is being proposed is  
8 what is contained within the example Gradeah, the  
9 parenthetical phrase, which states that reinjection of  
10 cold reservoir fluids back into the geothermal reservoir  
11 resulting in inefficient or decreased geothermal  
12 reservoir temperature, which is precisely our concern,  
13 is that the reinjection of cold reservoir fluids back  
14 into the resource is going to reduce our reservoir  
15 temperature. We believe that constitutes waste.

16 MR. LAKINS: We had exhibit -- we have C  
17 listed as an exhibit. And I'll -- normally the order of  
18 the Commission wouldn't be an exhibit. We ask the  
19 Commission to please take notice.

20 COMMISSIONER CATANACH: Are you asking us to  
21 take notice of the whole order?

22 MR. LAKINS: The whole order and, in  
23 particular, that definition in there. Otherwise, I'd  
24 move to admit the document as an exhibit, but I don't  
25 think that is appropriate since it is an order.

1                   COMMISSIONER CATANACH: I think  
2 administrative notice would be fine. The Commission  
3 will take administrative notice of Order R-13-675-B in  
4 its entirety.

5 BY MR. LAKINS (cont'd):

6       Q. Could you turn to Exhibit T, please,  
7 Mr. Seawright.

8       A. (Witness complies.)

9       Q. Could you tell me what that is.

10      A. It is a package containing the contents of an  
11 application to the Oil Conservation Division filed in  
12 April of 2002, specifically through Roy Johnson who is  
13 the supervisor of District 4.

14               And it contained a G-112 application. And that  
15 application had together with it all the required  
16 attachments that the OCD had requested from us. And  
17 that application eventually culminated in the granting  
18 of a permit which took the form of an administrative  
19 order of the Oil Conservation Division.

20               And this application was specifically for the use  
21 of geothermal fluid for a small modular geothermal power  
22 plant for AmeriCulture of approximately 1 megawatt net  
23 size.

24      Q. That is the power plant that has been talked  
25 about here?

1 A. Yes, it is.

2 Q. What is the purpose of that power plant?

3 A. To support the electrical power demand for our  
4 future and present expansion.

5 Q. Is it for selling, commercial sale?

6 A. No.

7 Q. Self-sufficiency?

8 A. Self-sufficiency by -- the plant would be  
9 interconnected with the grid out of necessity, and so  
10 naturally excess power would be sold, but that would not  
11 be an economic driving force for the decision to build  
12 it.

13 Q. And this application, I am going to ask you to  
14 draw your attention to the last two pages of that  
15 exhibit.

16 A. Okay.

17 Q. So this was an order from 2002 -- I take note of  
18 that date on the last page -- is that correct?

19 A. June 17th, 2002.

20 Q. And this administrative order was -- explain to  
21 me how this administrative order works in the scheme of  
22 your power plant.

23 A. Well, it is one of the key steps or one of the  
24 multiple permitting steps required for us to build and  
25 operate a plant of this type.

1           The regulations back then were fairly similar to  
2 the way they are today, safe and except for the  
3 statutory change that was made for water in excess of  
4 250 degrees.

5           Q.   Would that have affected this at all?

6           A.   No.

7           Q.   Why is that?

8           A.   Uh- --

9           Q.   What is the temperature of the well?

10          A.   The temperature of the well is 232 degrees  
11 Fahrenheit during the pumping test that I referenced  
12 earlier, under a flow rate of 1,100 gallons a minute  
13 approximately.

14          Q.   So describe the production injection protocol  
15 that is contemplated for this.

16          A.   I can show you best, if we move back a few  
17 pages -- if we go to page six from the front of the  
18 document, and this shows the ten-acre state geothermal  
19 lease that we have, the adjoining 15-acre piece of  
20 property. The production well is depicted with the  
21 arrow.

22                   And water would be produced from State Geothermal  
23 Well 1. It would be directed to our geothermal power  
24 plant, which could be either sited on our deeded land or  
25 our state land. We plan on having it on our state

1 property.

2 The thermally depleted water would be directed  
3 then through a pipeline to an injection well located in  
4 section 6 at about the midline. And the well location  
5 is shown there approximately a half mile north of the  
6 southern section line of section six.

7 Q. I think you heard Commissioner Padilla's point  
8 earlier that what's the difference between your proposal  
9 and what Lightning Dock's proposal is? What's the  
10 difference?

11 A. I could show you. If we turn to Exhibit V.

12 Q. Which?

13 A. V as in Victor, if you could put it up on the  
14 screen that might be helpful.

15 Now, as this is a generalized figure, so is my  
16 statement here. But we are -- the proposed location of  
17 our geothermal power plant is in the outflow plume. And  
18 the injection is also in the outflow plume.

19 Simplistically stated, the water that we would be  
20 utilizing is already there. And because of the strong  
21 northerly subsurface flow in the outflow plume at that  
22 point, if you don't use it, you lose it anyway.

23 Our operations within the outflow plume do not  
24 have an affect, according to the expert opinion of our  
25 experts, on production within the upflow zone.

1     Conversely, production within the upflow zone could,  
2     indeed, affect us in the outflow plume.

3             There is one important point that I would like to  
4     raise which is connected and that's -- we could just go  
5     back to the previous exhibit. This is Exhibit T.

6     Q. Do you want me to put T up on the screen? Are  
7     you asking that?

8     A. Yes, that would be helpful, actually.

9             And I would like to direct you to figure 4 which  
10    is 8 pages in. Keep going.

11            It is figure 4. There you go.

12    Q. This one?

13    A. Yes. The siting of our injection well, since our  
14    production well already existed, was the site of  
15    considerable dialogue between us and the then president  
16    of Rosette, Dale Burgett, and Roy Johnson of the Oil  
17    Conservation Division.

18            We sat around a table in our office in Animas,  
19    and Roy Johnson stipulated where he wanted --

20            MR. ROGERS: Objection. Hearsay.

21    Q. Go ahead and say what Mr. Johnson said.

22    A. Mr. Johnson had a requirement that within an  
23    approximate degree --

24            MR. ROGERS: Objection. Hearsay.

25    Q. It's an OCD requirement.

1 MR. BRANCARD: It's up to you --

2 COMMISSIONER CATANACH: I would like to hear  
3 it.

4 A. His objective was to have temperature and  
5 chemistry of the injected water match the chemistry and  
6 temperature of the water in the recipient reservoir  
7 host; and the silica, the regional silica concentration  
8 map that you see here, and there was an analogous one on  
9 the next page for chloride.

10 And if you turn to figure seven, figure seven is  
11 comprised of temperature contours of two meters' depth  
12 that came out of a publication in 1956 by a gentleman by  
13 the name Kinsinger. And it was a very thorough study.  
14 It's one that Jim Witcher could elaborate on. But it is  
15 based on that.

16 It was estimated that the resource temperature at  
17 the proposed injection site was approximately the same  
18 as our anticipated thermally-depleted power plant  
19 effluent at that time.

20 Now, the power plant project in 2002 was --  
21 contemporaneously, we were working with a company called  
22 Exergy. Exergy was a company that had intellectual  
23 property rights to an interest in developing a unique  
24 cycle. It was an ammonia/water cycle called the Calina  
25 cycle. And it's theoretically much more efficient.

1           The discharge temperatures were thus lower than  
2           typical organic Rankine cycle plants. And the  
3           anticipated discharge temperature was 135 Fahrenheit at  
4           1,100 gallons per minute.

5           And so that proposed injection site was going to  
6           be injected into an injection well that was designed by  
7           Jim Witcher based on his understanding of regional  
8           geology, but would be subject, of course, to actual  
9           drilling conditions once the drilling commenced.

10           The casing diameter was 13-3/8ths diameter cased  
11           to 150 feet, cemented to surface and screened to its TD  
12           of 300 feet, supposed to be operated by gravity.

13           I believe the order of the Division stipulated a  
14           maximum injection temperature of 20 p.s.i.

15           Q. So if I paraphrase correctly -- so all of this  
16           information was presented to the OCD that led to the  
17           administrative order; is that correct?

18           A. Yes. And it was uncontested by Lightning Dock  
19           Geothermal, Inc.

20           Q. They were --

21           A. Lightning Dock Geothermal, Inc., which is the  
22           current Lightning Dock Geothermal HI-01, LLC's,  
23           predecessor, was sent a certified copy of this, the  
24           certified mailing receipts included in Exhibit 2. And  
25           they did not request a hearing.

1           And as a result of our submissions and the  
2 termination of the OCD, who said it was in the interest  
3 of correlative rights, it was thus granted. And it was  
4 also in the interests of beneficial use of geothermal  
5 resources.

6           Q. So can I paraphrase what you said, which is that  
7 basically your power plant operation that's already been  
8 permitted by the OCD required injection and production  
9 injection essentially into like temperature and  
10 chemicals?

11          A. Yes, that was the stipulation. That was  
12 testified to Charles Jackson on September 10th as well.  
13 And he was integrally involved in this.

14           In fact, if you continue on in Exhibit 2, you  
15 will see the corresponding Office of the State Engineer  
16 permits that resulted from this effort.

17          Q. This was the permit --

18          A. Yes.

19          Q. -- that Mr. Jackson spoke to when he was on the  
20 stand. So you have a permit from the State Engineer  
21 to --

22          A. Yes.

23          Q. -- to use the water rights for this project?

24          A. Yes, at this time we required both an Office of  
25 the State Engineer permit for a nonconsumptive diversion

1 and we required a permit from the Oil Conservation  
2 Division as well. We acquired both.

3 What we are looking at here on the screen is the  
4 permit that culminated -- that resulted from our  
5 application to the Office of the State of Engineer after  
6 receiving the order of the Division.

7 Q. Do you have a concern, as Mr. Witcher had talked  
8 about, a potential decrease in temperature?

9 A. Very much so.

10 Q. Do you have a concern that that would impair your  
11 water rights?

12 A. Yes, we do. And I recognize that under  
13 testimony, Charles Jackson's testimony and Gale Sander's  
14 testimony differed on that point. Both are experts.  
15 Both did agree that it would ultimately most likely be  
16 resolved in court. But we have a deep-seated concern  
17 and we do believe that it is, in fact, part of our water  
18 right.

19 Q. I believe we already entered Exhibit T.

20 MR. LAKINS: Exhibit T has been admitted.

21 MR. ROGERS: I don't know.

22 MR. LAKINS: I have on my notes that it has.  
23 I just want to verify.

24 MR. ROGERS: No objection if it hasn't been.

25 COMMISSIONER CATANACH: If it hasn't been,

1 Exhibit T will be admitted.

2 (Exhibit T was offered and admitted on  
3 September 10, 2015.)

4 BY MR. LAKINS (cont'd):

5 Q. Mr. Seawright, you heard testimony about mounding  
6 near Well A-444; do you agree with that?

7 MR. ROGERS: Objection. No basis for this  
8 opinion.

9 MR. LAKINS: I think the foundation is that  
10 he has heard testimony that has been before the hearing.  
11 And my question is if he agreed with it. I'll lay the  
12 foundation for his answer to that question next, which  
13 is kind of standard.

14 MR. ROGERS: And my objection is you can't  
15 have a witness come up here and summarize what experts  
16 actually said. It is repetitive, it's wasteful, it's  
17 beyond his expertise.

18 MS. MARKS: I don't believe Mr. Seawright  
19 has been qualified as an expert in anything.

20 MR. LAKINS: I don't think it requires  
21 expert testimony to discuss the water levels that he  
22 knows of in his own wells.

23 MR. BRANCARD: Well, then, have him testify.

24 MR. ROGERS: The water levels, not mounding  
25 or not summarizing what he thinks he heard witnesses

1 say.

2 MR. LAKINS: We will move on.

3 BY MR. LAKINS (cont'd):

4 Q. Let me ask you to turn to Exhibit A,  
5 Mr. Seawright.

6 A. Can you put this up on the screen?

7 Q. Sure. Did you hear any expert testimony from  
8 Lightning Dock concerning correlative rights?

9 A. I did.

10 Q. Was it expert testimony?

11 A. I apologize. No, I heard testimony. Not expert;  
12 it was nonexpert testimony.

13 Q. Whose testimony was that?

14 A. Roger Bowers.

15 Q. Was he qualified as an expert in correlative  
16 rights?

17 A. No, he was not.

18 MR. ROGERS: Objection. Relevance. This  
19 witness has no business, no expertise or no purpose in  
20 suggesting that witnesses do or do not have expertise.  
21 He is not an expert in that, either.

22 This is improper questions. It is up to the  
23 Commission to decide who testified to what earlier and  
24 whether or not they are qualified, not this witness.

25 MR. LAKINS: We heard testimony about

1 correlative rights from a nonexpert. Mr. Seawright is  
2 entitled to give his opinion on his correlative rights.

3 MR. BRANCARD: But you are not asking him  
4 about that. Go ahead and ask him about that.

5 MR. LAKINS: Okay.

6 Q. Tell us what Exhibit A is.

7 A. Exhibit A is a figure progression that I myself  
8 developed to just give an overview of some issues of  
9 correlative rights. And it's in response to the  
10 historical practice by the applicant to simply list  
11 surface acreage as a defense that this would not impair  
12 correlative rights.

13 If you would put this up on the screen.

14 Q. Walk us through this.

15 A. This figure, it came from a Lightning Dock figure  
16 taken off the Internet. And it includes a  
17 representation of all of the geothermal leases, both  
18 state and federal, within our area.

19 Lightning Dock has two leases. Right here, this  
20 is a 640-acre federal lease. It is denominated  
21 NM-108801, I believe.

22 Q. Is that shown in the next --

23 A. No, it is right here. It shows. Right there.

24 Q. Go ahead.

25 A. And then the larger lease, which is approximately

1 2,500 acres, is the standard KGRA NM-34790 that we've  
2 seen.

3 And here is a state lease. It is owned by the  
4 Rosette facility. And then our state lease is here  
5 (indicating).

6 Now, what you see superimposed on here is the  
7 Kinsinger 1 meter temperature contours that are  
8 referenced from that 1956 document earlier. And it is a  
9 very -- in the opinion of our expert, a very  
10 conservative reflection of the horizontal extent of the  
11 geothermal resource.

12 If you would move to the next figure.

13 MR. ROGERS: And so as to not interrupt, if  
14 I may have a continuing objection to statements about  
15 what his experts believe or have said. It is just not  
16 proper. At best, it is repetitive, at worse, it's  
17 erroneous -- or not in front of you in any fashion.

18 So I have a continuing objection to his  
19 references to other experts' testimony.

20 COMMISSIONER CATANACH: You are not  
21 referencing the testimony; you are referencing the  
22 document that was a published document, right?

23 THE WITNESS: It's a published document. In  
24 fact, I believe these are in the 177 circular,  
25 referenced in there.

1                   MR. BRANCARD: The witness should testify as  
2 to what he knows.

3                   MR. ROGERS: That's what I meant.

4                   MR. LAKINS: Try to keep your testimony  
5 focused.

6                   THE WITNESS: Sure.

7           A. That is what this figure is. It's the  
8 temperature contour taken from Kinsinger 1956.

9                   And what I did, just using CAD overlay, was I  
10 took the statutory standard for correlative rights. It  
11 relates to each geothermal user's right to use their  
12 proportional share of practically obtainable geothermal.  
13 That's the standard.

14                   And we have seen no evidence. We have -- I have  
15 not heard any evidence of any practically obtainable  
16 geothermal under that blue section. And so that, we  
17 just simply blued this out.

18                   You can go to the next line.

19                   MR. ROGERS: And I object again. He has not  
20 been established as an expert in correlative rights or  
21 these matters. And it is improper testimony.

22                   MR. LAKINS: I don't think that any  
23 correlative right holder must necessarily be an expert  
24 in correlative rights to explain his concern about his  
25 correlative right. And I don't think we have seen

1 anybody qualified in this hearing as an expert on  
2 correlative rights.

3 MR. BRANCARD: The Commission will decide  
4 the issue of correlative rights.

5 MR. LAKINS: Yes.

6 MR. BRANCARD: The question that I think you  
7 want to focus on is AmeriCulture's rights to the  
8 geothermal resource and will they be impacted.

9 MR. LAKINS: Yes.

10 MR. ROGERS: And if I may -- and not claims  
11 of violation. He is not qualified to make that  
12 determination. He can tell you what he thinks the  
13 impact is. But suggesting the conclusion that that's a  
14 violation, he's not qualified to do that.

15 MR. LAKINS: I think he is qualified to give  
16 his opinion. And that is what he is doing, his opinion.

17 MR. ROGERS: You would have to be qualified  
18 as an expert to conclude that there has been a  
19 violation.

20 MR. LAKINS: I think that is an ultimate  
21 issue of fact for the Commission to decide.

22 MR. ROGERS: Exactly.

23 MR. LAKINS: But I think Mr. Seawright is  
24 entitled to give his opinion about his understanding of  
25 his correlative rights.

1 MR. ROGERS: That's --

2 MR. BRANCARD: You need to establish a  
3 factual basis for -- I am assuming that in your closing  
4 statement you will argue that correlative rights is an  
5 issue here. You have a witness who can help you  
6 establish a factual basis for that argument. That's  
7 what the Commission needs to hear, if there is a factual  
8 basis for that.

9 MR. ROGERS: Yes, that's right. I have no  
10 objection to his observations, to his personal  
11 observations. His conclusions that there has been a  
12 violation is improper, because he doesn't have that  
13 expertise, and it is an ultimate opinion of the  
14 Commission.

15 He doesn't have the expertise to come to  
16 that conclusion and it's wrong. It is prejudicial, it's  
17 wasteful.

18 MR. BRANCARD: Mr. Lakins, if you can ask  
19 your witness to continue to go through this exhibit,  
20 that would be helpful, I think.

21 BY MR. LAKINS (cont'd):

22 Q. Please continue to explain your concern about  
23 your correlative rights.

24 A. This figure here simply has superimposed upon it,  
25 in red here, the 313-acre state geothermal lease,

1 GTR-303 owned by Rosette. And this is the first slide  
2 in which our ten-acre geothermal lease is shown here.

3 If you would go to the next one.

4 Now, previous to the statutory change -- and this  
5 is the subject of considerable testimony -- in Chapter  
6 71 at 75.2.1, in which geothermal users which have  
7 resource temperatures in excess of 250 degrees and  
8 return water to the same source don't need a permit from  
9 the Office of the State Engineer.

10 And this is simply a reiteration of a statement  
11 that was made by Jim Witcher. There are two producing  
12 wells here which have shown production temperatures in  
13 excess of 250.

14 I believe there are other -- an injection or  
15 maybe even more injection wells that have shown  
16 temperature wells that I have seen in excess of that.

17 But this -- it is not a quantitative analysis.  
18 It is meant to convey an issue that the correlative  
19 rights picture overall, according to my understanding,  
20 cannot be simply determined based on acreage analysis  
21 because of the horizontal extent of this geothermal  
22 resource, the considerable lease acreage that the  
23 applicant holds outside of the geothermal resource  
24 extent in the shallow that they testified to. And  
25 that's the purpose of this figure insofar as our

1 concerns with respect to correlative rights and how we  
2 may be impacted directly.

3 The correlative rights picture that you see there  
4 has remained essentially unchanged except for the  
5 640-acre geothermal lease to the south and the west,  
6 and, according to my understanding, they have not  
7 demonstrated the existence of a practically obtainable  
8 geothermal resource.

9 They may dispute that. I don't -- I have not  
10 seen that data myself.

11 We believe that in the order of the Division the  
12 statement was made that the proposed application  
13 protects correlative rights. The correlative rights  
14 picture has remained essentially unchanged since the  
15 granting of that order. And, thus, our ability to  
16 produce water and produce the power that we could have  
17 generated at its then resource temperature is  
18 diminished. We do believe that our correlative rights  
19 would indeed be in fact impacted, because we believe  
20 that our right to produce that water nonconsumptively,  
21 for production and reinjection for geothermal power  
22 generation purposes, is part of our correlative right.

23 Q. So, in summary, your position on correlative  
24 rights is not based upon 2,500 acres versus 10 acres,  
25 but on what can actually be obtained?

1           A.   Yes.

2                   MR. LAKINS:  Move to admit Exhibit A.

3                   COMMISSIONER CATANACH:  Any objection?

4                   MR. ROGERS:  No objection.

5                   MR. BRANCARD:  Mr. Seawright, where is your  
6 land?

7                   THE WITNESS:  The state geothermal lease, if  
8 that's what you are asking, is right here.  Our  
9 physical -- our fee land is located --

10                  MR. BRANCARD:  But your geothermal rights  
11 are in that ten acres?

12                  THE WITNESS:  Yes, right there.

13                  MR. BRANCARD:  I just want to be clear  
14 because your exhibit does not clarify --

15                  THE WITNESS:  I apologize for that.

16                  COMMISSIONER CATANACH:  Exhibit A will be  
17 admitted.

18                               (AmeriCulture Exhibit A was offered and  
19 admitted.)

20           Q.  I would like you to turn to Exhibit N.  Are you  
21 there?

22           A.  Yes.

23           Q.  One of Ms. Mark's questions to Mr. Hand yesterday  
24 had to do with essentially the paperwork, the  
25 clearances, et cetera, that you needed to obtain -- that

1 AmeriCulture needed to obtain from the State in order to  
2 commence construction of your power plant. Could you  
3 tell me what Exhibit N is and how it sort of relates to  
4 that question?

5 A. Yes. Exhibit N is a copy of New Mexico State  
6 Land Office business lease BL-1418. It consists of 40  
7 surface acres, inclusive of the ten acres in our  
8 geothermal resource lease, GTR-304-1.

9 This lease, the lease language was crafted so as  
10 to accommodate the possibility of a future power plant.  
11 And that is embodied in paragraph 6 on page 2, under  
12 Permitted Use, which states: "Lessee shall use the  
13 leased premises for the sole and exclusive purpose of  
14 supporting structures, facilities, and systems for a  
15 fish-farming venture located upon adjacent land,  
16 including a live-in caretaker to provide security. No  
17 other uses shall be permitted."

18 The supporting systems for a fish-farming venture  
19 include the geothermal power plant. With greater  
20 specificity, if you move to the very last page, the last  
21 two pages, of Exhibit N, you'll see an accepted  
22 application to make improvements, which include a  
23 proposed improvement for power generation equipment.

24 In this case, it represents the first stage of  
25 power plant development, not the entire one megawatt

1 power plant. But that was because of the timing that  
2 was requested of us with respect to the build-out we  
3 expected to be partially done and sold consequently.

4 And when this application was approved, and in  
5 Exhibit A, which is the last page, it shows an  
6 approximate location, the proposed concrete pad that  
7 will house the geothermal power plant.

8 Q. So you have the permit from the OCD?

9 A. Yes.

10 Q. And you have water rights permit?

11 A. Yes.

12 Q. And you have geothermal lease?

13 A. Yes.

14 Q. And you have the state business lease?

15 A. Yes.

16 Q. And those documents essentially authorize you to  
17 construct the power plant?

18 A. Yes.

19 MR. LAKINS: Move to admit Exhibit N.

20 COMMISSIONER CATANACH: Any objections?

21 MR. ROGERS: No objection.

22 COMMISSIONER CATANACH: Exhibit N will be  
23 admitted.

24 (AmeriCulture Exhibit N was offered and  
25 admitted.)

1 Q. I think Commissioner Padilla made the point  
2 yesterday, What's taking so long? No. It was  
3 Chairman Catananch who made that point, What's taking so  
4 long? You've got this permit that has been sitting out  
5 there for years; what's taking so long?

6 A. Financing.

7 When we originally went through the process of  
8 obtaining the various permits we just walked through, we  
9 were working in collaboration with the company Exergy,  
10 which I mentioned. And that lasted a considerable  
11 amount of time, and ended up in a no result, where, at  
12 that time, there were some grant funds that were no  
13 longer available to us.

14 We shifted gears. We developed a relationship  
15 with Barber-Nichols in Colorado. And there was  
16 testimony from Dan Hand with respect to the report that  
17 came out of that relationship that we had with him and  
18 various recommendations with regard to the type of  
19 system that we should employ, the type of working fluid,  
20 the size of the plant, and various other plant  
21 attributes. And that was 2006.

22 2007 is when Lightning Dock acquired the lease.  
23 It took them six years to commission their plant. It  
24 takes time in business.

25 And, having been in business for 20 years, I can

1 attest that one of the most difficult aspects of  
2 business is raising capital. It is difficult, and it's  
3 extremely difficult -- we have been affected by the  
4 ambitions of Lightning Dock Geothermal with respect to  
5 their future geothermal power plant.

6 We have a chapter in our business plan, which is  
7 a primary document used for investor relations. There's  
8 an entire chapter devoted to critical risks and  
9 assumptions --

10 MR. ROGERS: Objection. Best evidence,  
11 hearsay, relevance.

12 Q. Move on from that. Mr. Seawright, just move on.

13 A. You asked why the issue is financing, and we are  
14 unaffected by the aspirations of Lightning Dock on the  
15 ability to raise money. It relates to financing.

16 Q. Mr. Seawright, I would like to turn you to  
17 Exhibit O. Do you recognize that document?

18 A. Yes.

19 Q. Can you tell me what that is?

20 A. It is a joint facility operating agreement  
21 entered into on the 6th day of September, 1995, between  
22 Lightning Dock Geothermal, Inc., and AmeriCulture  
23 Incorporated.

24 Q. Were you involved in discussions that led up to  
25 the execution of this document?

1 A. Yes.

2 Q. Give me an overview of your understanding of what  
3 this document is all about.

4 A. This document sets forth the mutual rights and  
5 responsibilities of Lightning Dock Geothermal, Inc., and  
6 AmeriCulture.

7 With respect to AmeriCulture, the utilization of  
8 geothermal resources underneath a specifically defined  
9 piece of fee land consisting of 15 surface acres, which  
10 is defined in the third paragraph of the agreement. And  
11 with respect to Lightning Dock, the rights to  
12 exploration and development under that same specifically  
13 defined piece of 15 acres of fee land.

14 Q. Have you ever utilized the geothermal resources  
15 under that 15-acre fee estate?

16 A. Not for thermal energy purposes.

17 Q. Have you at any time protested Lightning Dock's  
18 applications, permit requests, et cetera, to conduct  
19 activity on a 15-acre fee estate?

20 A. No.

21 Q. Flesh out for me your understanding of the power  
22 and nonpower aspect of AmeriCulture's operations and how  
23 that relates to that JFOA.

24 A. Well, previous testimony -- and this was an issue  
25 that was questioned also by Commissioner Padilla -- was

1 Lightning Dock has testified that there is a provision  
2 within this agreement that somehow protects us in the  
3 event that our temperature is diminished.

4 And if we read, the reference was made to section  
5 4 -- it is going to be on page 6, B-3. And it states  
6 that LDG's drilling activities result in a depletion of  
7 AmeriCulture's heat source for nonpower purposes, and  
8 that upon the commencement of geothermal production by  
9 Lightning Dock Geothermal, LDG shall provide  
10 AmeriCulture with effluent heat in an amount equivalent  
11 to that by which AmeriCulture's resource is depleted.

12 Q. That doesn't apply to power?

13 A. No, it doesn't apply to power. It applies only  
14 to nonpower.

15 Q. And your concern primarily is?

16 A. Power is what we have testified to; and also the  
17 activities that are proposed are outside the 15 acres,  
18 affecting a resource also outside of the 15 acres.

19 Q. So all of the activity that you are talking about  
20 is on land that's separate from and not covered by the  
21 JFOA?

22 A. Both the causative activity and the effect are  
23 outside the 15 acres covered by the JFOA.

24 Q. Do you think that Lightning Dock could actually  
25 supply you with heat under the terms of that agreement

1 under the terms of that paragraph?

2 A. It is my opinion they could not because they  
3 don't have a water right to do so.

4 I would refer you to -- it is Exhibit E.  
5 Exhibit E is the water right that is currently held by  
6 Lightning Dock Geothermal. This is the permit and  
7 application. And, as you will see on the very first  
8 page, it stipulates in section 5, paragraph B, that  
9 water to be used thereon for greenhouse irrigation,  
10 irrigation-related purposes. There is no permit for  
11 geothermal power generation use.

12 And this application, the amount of diversion  
13 allowed under this permit, which is comprised of  
14 150 acres, is not nearly sufficient to replace the  
15 diversion that we have under a nonconsumptive use  
16 permit, just from a water volume standpoint.

17 But they simply don't have an approved purpose of  
18 use within which to transfer rights to us. They don't  
19 have the water rights to give us even if they wanted to.

20 MR. LAKINS: I move to admit Exhibit O.

21 COMMISSIONER CATANACH: Any objections?

22 MR. ROGERS: No objection.

23 COMMISSIONER CATANACH: Exhibit O will be  
24 admitted.

25 (AmeriCulture Exhibits O was offered and

1 admitted.)

2 Q. (By Mr. Lakins:) Mr. Seawright, could you  
3 summarize your primary concern about the impact that the  
4 shallow wells, the proposed shallow wells, could have on  
5 AmeriCulture to form the basis of your protest?

6 A. We have seen impacts on our well A-444 already.  
7 We've seen a three-and-a-half-foot water rise since the  
8 inception of power generation. We have sign alteration  
9 in chemistry.

10 And this proposal, in stark contrast to the 2013  
11 proposal, proposes to inject directly into the reservoir  
12 without attempting to inject deep.

13 And going back to the 2008 hearing that  
14 culminated in the 2009 permit, that permit had a number  
15 of stipulations, including a stipulation that water  
16 would be reinjected back to the same level that it would  
17 be produced from.

18 There was indication of a need for confining cap  
19 rock. The possibility of migration from one strata to  
20 the next was not contemplated; in fact, in that original  
21 agreement --

22 MR. ROGERS: Objection. Best evidence. The  
23 agreement will speak for itself. His interpretation is  
24 something else.

25 Q. Turn to Exhibit D and talk to that.

1           A. I'll just read it. I turn to Exhibit D, page 5,  
2 paragraph 23. The permit reads, "There was some  
3 discussion during the second hearing about the  
4 possibility of injection into an intermediate zone  
5 between the shallow aquifers from which ground water is  
6 now being produced and the geothermal resource  
7 formation. This possibility, however, need not be  
8 considered since the draft permit would not authorize  
9 such injection.

10                 "Paragraph 21-F of the draft permit specifically  
11 provides that the injected fluids will be injected into  
12 the geothermal reservoir. From a reading of the  
13 entirety of paragraph 21-F, it is plain that it  
14 authorizes injection only into the reservoir from which  
15 the geothermal was produced.

16                 "Be it Horkia or some other formation, injection  
17 into an immediate formation would require a permit  
18 modification."

19                 And what we are talking about here is exactly  
20 that. They didn't say injection into water that is  
21 continuous with our water.

22                 And our concern is that we will see impacts  
23 immediately. And those impacts take several forms. One  
24 which is future because our plant doesn't exist, is  
25 impact on potential power generation from our State 1

1 and, ultimately, State 2 wells through temperature  
2 degradation.

3 But the Well A-444 is an important well. What  
4 hasn't come up, which I will mention now, is that that  
5 well is our backup well. If our cold water well goes  
6 down, we're reliant upon that well as a primary source  
7 of water for our operations.

8 And given the present fluoride level and given  
9 the level of fluoride at which we see physiological  
10 effects in tilapia -- and it's mainly analog skeletal  
11 fluorosis -- we see physiological, mainly skeletal  
12 deformities, sclerosis, lordosis, impaired growth,  
13 impaired health.

14 We are very concerned, the baseline level of  
15 fluoride in that well doesn't have much wiggle room with  
16 regard to further contamination. We have seen the  
17 leading edge of the contamination already, given the  
18 change in the water level in that well, which these  
19 measurements -- by the way, I'll refer you to Exhibit F  
20 to show you.

21 MR. ROGERS: At this point, I am going to  
22 object. This may be proper for summary from  
23 Mr. Seawright's attorney, but it's not proper for a  
24 nonexpert to delve through the record and pick out  
25 certain portions as he goes along. He is not an expert

1 in the fluoride measurement or impact.

2 Mr. Lakins is perfectly capable of  
3 summarizing things, but this witness should not on  
4 expert testimony.

5 MR. BRANCARD: I don't see any summarizing  
6 going on here. Mr. Seawright is testifying to the facts  
7 that are here.

8 A. I am testifying simply to -- Exhibit F was a  
9 compilation of various depth to water measurements made  
10 by the Office of the State Engineer District in Deming  
11 and sent to me.

12 One of the wells that is listed in there is  
13 A-444. It is on the fourth page. You can see the OSE  
14 file number in the upper left, A-444.

15 And, simply, this just shows the  
16 three-and-a-half-foot rise that we have referenced.  
17 This is where that data came from.

18 The first data point was taken about a month  
19 after the commissioning of the power plant. The last  
20 measurement listed here was from May of 2015. And so  
21 that is the data that we've used and I have referenced.

22 So we are concerned with regard to additional  
23 impacts. We anticipated that the chemical constituents  
24 in our A-444 will continue to degrade and that both our  
25 correlative rights would be impaired and our water

1 rights would impaired. And then exceedances that are  
2 prohibited in New Mexico State statute would result from  
3 the proposed injections.

4 MR. LAKINS: I move to admit this singular  
5 page, A-444 page.

6 COMMISSIONER CATANACH: Just the singular  
7 page?

8 MR. LAKINS: Yes. Because that is the only  
9 page that was discussed.

10 COMMISSIONER CATANACH: Any objection to  
11 that?

12 MR. ROGERS: No.

13 COMMISSIONER CATANACH: Page I believe 4 --  
14 is that correct?

15 (No verbal response.)

16 COMMISSIONER CATANACH: Page 4 of Exhibit F  
17 will be admitted.

18 (AmeriCulture Exhibit F, Page 4, was offered  
19 and admitted.)

20 MR. LAKINS: I think I am ready to pass the  
21 witness. May I take a break?

22 COMMISSIONER CATANACH: Yes. Let's take ten  
23 minutes.

24 (Brief recess.)

25 COMMISSIONER CATANACH: Okay. We will call

1 the hearing back to order. And I believe you had  
2 finished your direct, Mr. Lakins.

3 MR. LAKINS: Almost, almost.

4 COMMISSIONER CATANACH: I thought you had  
5 finished.

6 MR. LAKINS: I was close.

7 DIRECT EXAMINATION BY MR. LAKINS (cont'd)

8 Q. Mr. Seawright, two things. First, on the well  
9 A-444, that you were talking about, you talked about the  
10 rise into the water level shown in that document from  
11 the State Engineer.

12 There were other concerns you had about that well  
13 and how that well has been impacted?

14 A. The chemistry of the well has been impacted. And  
15 the fluoride levels have risen, and that's a known water  
16 contaminant, New Mexico State Statute.

17 And the TDS which complied with New Mexico State  
18 drinking water standards of less than 1,000 milligrams  
19 per liter is now exceeded.

20 The TDS has risen about 12 percent since the  
21 onset of the power plant operation.

22 Q. It says that onset operation -- how much has that  
23 well been pumped?

24 A. From our original sampling of that, which was  
25 January of 2014 to the second sampling, July 2015, that

1 pump was not pumped at all, except for a period of hours  
2 in anticipation of each sampling event to allow  
3 sufficient casing exchanges to get an accurate sampling  
4 of the surrounding water.

5 Q. I ask you to move to Exhibit S.

6 A. Yes.

7 Q. Can you tell me what that Exhibit S is.

8 A. The standard subdivision for geothermal resources  
9 leases, according to state statute, is 40 acres. When  
10 we purchased this property, 15-acre property, we  
11 purchased it from a rancher that lives adjacent to us --  
12 that lived historically adjacent to us.

13 And he held a 40-acre geothermal lease, which was  
14 denominated GTR-304. And as part of our agreement with  
15 him, he agreed to relinquish a ten-acre tract of that  
16 40 acres, retaining 30, which would have resulted in a  
17 nonstandard variance to the standard subdivision of  
18 40 acres.

19 There was a public hearing that was held as  
20 directed by the Commissioner of Public Lands. That  
21 hearing was held and attended by interested parties.  
22 And it culminated in the approval of lease GTR-304-1,  
23 which is a ten-acre exception to the normal subdivision  
24 size.

25 Q. That is your geothermal lease?

1 A. Yes.

2 Q. That is one of the documents we were talking  
3 about concerning your ability to operate --

4 A. Yes.

5 MR. LAKINS: Move to admit Exhibit S.

6 COMMISSIONER CATANACH: Any objection?

7 MR. ROGERS: No.

8 COMMISSIONER CATANACH: Exhibit S will be  
9 admitted.

10 MR. LAKINS: I pass the witness.

11 CROSS-EXAMINATION

12 BY MS. MARKS:

13 Q. Mr. Seawright, let's start with the -- are you  
14 familiar with this 1986 geothermal resources lease, I  
15 believe, GTR-304?

16 A. I have seen it before.

17 Q. Is this the lease under which you have your  
18 geothermal mineral rights?

19 A. Our lease is GTR-304-1.

20 Q. Okay. Maybe I put the wrong number. So 304-1,  
21 do you know the date -- how old that is?

22 A. The assignment of the New Mexico State Geothermal  
23 Lease GTR-304-1, as shown in Larry Keyho, who was the  
24 then director of the Oil, Gas, and Minerals Division,  
25 listed that as April -- rather January 26, 1996.

1 Q. So the geothermal resource, it was assigned to  
2 AmeriCulture, right?

3 A. Yes.

4 Q. I know we talked about and Mr. Lakins in  
5 follow-up to Commissioner Padilla's question that I had  
6 from the State Land Office lease.

7 Are you aware that State Land Office is working  
8 on an amendment to that lease, which has not been  
9 presented to the Commission, an amendment to the lease  
10 in Exhibit N so as to allow AmeriCulture to actually  
11 pull the geothermal resource out of the ground so  
12 AmeriCulture can actually do power plant operations  
13 similar to an oil and gas lease, where that is reflected  
14 on the lease?

15 I don't believe the lease in Exhibit N reflects  
16 anything that allows actual geothermal resources to be  
17 pulled and the equipment stored there, which I believe  
18 is standard in a State Land Office lease.

19 And I believe State Land Office is working on  
20 amendment. I am not sure if they had those  
21 communications with you. My understanding is that State  
22 Land Office is working on an amendment to this lease.

23 A. Was that a question?

24 Q. Yes, if you're aware of the amendment to the  
25 lease. It sounds like you are presenting this as a

1 fully executed and permission from State Land Office.

2 But I believe there's an outstanding amendment that

3 State Land Office is working on with AmeriCulture?

4 A. To our business lease BL-1418?

5 Q. Correct.

6 A. We did receive a letter that -- I rescind that.

7 That was related to another lease. I'm not aware of

8 that amendment at this time.

9 Q. I won't testify about my conversations with State  
10 Land Office about the amendment to this lease, so we'll  
11 move on.

12 The State Land Office surface field division,  
13 field personnel reviews -- do they review subsurface  
14 wells or underground installations?

15 A. Subsurface wells or installations?

16 Q. Yes, or underground installations. These  
17 documents are just surface-related, correct?

18 A. These documents relate to the utilization of the  
19 surface.

20 Q. Okay.

21 A. To answer your question, the same people from the  
22 State Land Office that observed the land see the wells,  
23 so...

24 Q. But the application AmeriCulture made was for  
25 surface improvements?

1 A. Uh-huh.

2 Q. Okay. And State Land Office didn't look at  
3 drilling depths or injection depths? That wasn't  
4 obviously discussed with State Land Office?

5 A. Is that a question?

6 Q. Yes. Did you discuss that with State Land  
7 Office?

8 A. Not to my recollection. In fact, we -- this  
9 business lease, the original business lease, I can't  
10 give you the exact date that we originally acquired this  
11 business lease, but it postdated the drilling of our  
12 geothermal well.

13 What was required under the geothermal lease, the  
14 geothermal lease had allowed for such activities as  
15 drilling and the utilization of the surface to the  
16 extent it promoted the use of geothermal resources.

17 For instance, the state geothermal lease that is  
18 held by the rose farm, which is 313 acres to the north  
19 of us, they don't hold a surface lease from the State of  
20 New Mexico for that. And, yet, they have five injection  
21 wells, a number of exploratory wells that they've  
22 drilled without having any State Land Office business  
23 lease or other surface lease attached to that.

24 Q. Did you have conversations with the surface field  
25 division of State Land Office?

1 A. I have.

2 Q. Did they discuss the lack of any environmental  
3 harm in the Burgett operations when they approved your  
4 application?

5 A. Which application?

6 Q. The one I guess that was applied for when you  
7 found out we are having a hearing here, in August, I  
8 guess.

9 A. Would you please rephrase the question.

10 Q. Which exhibit? Application to make improvements,  
11 Exhibit -- the Commissioner approved that on August 10,  
12 2015.

13 A. Uh-huh.

14 Q. I am just wondering if during those conversations  
15 the lack of any environmental harm from the Burgett  
16 wells was discussed. I know that appears in a State  
17 Land Office document.

18 A. There was one site visit corresponding to this.  
19 And I do not recall the subsurface damage.

20 Q. Any environmental damage? It seems as though the  
21 lack of environmental harm from the operation or the  
22 application that you were -- I don't know of the extent  
23 of harm that was discussed. I don't know.

24 I am asking you what kind of -- what conversation  
25 took place.

1       A. Diego VeAlba visited our facility in anticipation  
2 of this improvement application. And the subject of  
3 environmental damage, I don't recall it coming up.

4       Q. We can move on.

5             You talked about waste in a previous Commission  
6 order. Are you familiar with waste being defined in  
7 OCD's regulation 19.14.1.7(gg)?

8       A. The definition of waste?

9       Q. I think you are maybe reading Mr. Brooks's --

10      A. I have it before me.

11      Q. The definition of waste versus the condition of  
12 waste in the 2013 order differ. If you want to take a  
13 moment to read the definition of waste.

14      A. Okay. "Paragraph GG?

15      Q. Correct.

16      A. "Waste: Shall mean physical waste including but  
17 not limited to underground waste resulting from the  
18 inefficient, excessive, or improper use or dissipation  
19 of reservoir heat or energy or resulting from the  
20 location spacing, drilling, equipping, operating,  
21 operation or production of a geothermal resources well  
22 in such a manner as to reduce or tend to reduce the  
23 ultimate economic recovery of the geothermal resources  
24 within a reservoir and surface waste resulting from the  
25 inefficient production, gathering, transportation,

1 storage, utilization of geothermal resources and the  
2 handling of geothermal resources in such a manner that  
3 causes or tends to cause the unnecessary or excessive  
4 loss or destruction in geothermal resources obtained or  
5 released from a geothermal reservoir."

6 Q. Waste is also prohibited in 19.14.1.9.

7 A. I see that.

8 Q. Do you want to take a moment to --

9 A. Do you want me to read that?

10 Q. I just don't know if you are familiar with it.

11 A. I have seen it.

12 Q. Maybe -- would you --

13 A. Would you like me to --

14 Q. I just want to make sure you're familiar with --

15 A. Would you like me to refamiliarize myself --

16 Q. Sure, so everyone here knows what the regulation  
17 says.

18 A. Should I read it?

19 Q. Sure.

20 A. "19.14.1.9, Waste Prohibited, Paragraph A: The  
21 production or handling of a geothermal resources of any  
22 type or in any form or the handling of products thereof  
23 in such a manner or under such conditions or in such an  
24 amount as to constitute or result in waste is hereby  
25 prohibited."

1           "Paragraph B, All owners, operators, contractors,  
2     drillers, transporters, service companies, pipe pulling  
3     and salvage contractors and other persons shall at all  
4     times conduct their operations in the drilling,  
5     equipping, operating, producing, and plugging and  
6     amanning geothermal resource wells in a manner that  
7     will prevent waste of geothermal resources and shall not  
8     wastefully utilize geothermal resources or allow leakage  
9     of any such resources from a geothermal reservoir or  
10    from wells, tanks, containers, or pipe or other storage  
11    conduit or operating equipment."

12        Q. Do you think following the regulations would be  
13    appropriate in this -- in any Commission order as far as  
14    waste is concerned?

15        A. I would agree that the inclusion and prohibitions  
16    of waste be included in an order.

17        Q. Okay. And I know you said it takes time to raise  
18    capital, and the OCD issued a permit 13 years ago to  
19    you. Did you ever use that permit?

20        A. The injection permit?

21        Q. Correct.

22        A. No.

23        Q. So this was just an injection permit?

24        A. The order of the division which constituted the  
25    permit authorized the injection -- it was an injection

1 permit. So it was the approval of a G-112 application  
2 that we submitted, akin to the applications at hearing.

3 Q. And was that -- I looked at this at some point,  
4 but please correct me if I am wrong. This was going to  
5 be again -- you were going to produce the geothermal  
6 resource and inject it; is that correct?

7 A. Yes.

8 Q. And since the -- is this from the same well that  
9 is now just being discharged?

10 A. Would you please point to what well you're  
11 referring to?

12 Q. Just the geothermal resource that is just going  
13 to be dumped onto the ground now. What resource is  
14 supposed to be injected under this permit?

15 A. Under this permit, we would produce from State  
16 Well No. 1 and injection into a yet-to-be-drilled  
17 injection well named A-45806.

18 Q. So is AmeriCulture wasting the resource by not  
19 injecting and using the OCD permit?

20 MR. LAKINS: Objection. Calls for a legal  
21 conclusion.

22 MS. MARKS: Mr. Seawright talked about waste  
23 and gave his opinion and mentioned waste a lot. So I am  
24 just wondering what his opinion is since he has given  
25 lots of opinions about waste and the resource in

1 general.

2 One of his big contentions is the resource.  
3 It's very relevant to --

4 COMMISSIONER CATANACH: Answer the question.

5 A. No, we are not engaging in waste. Presently our  
6 water is pumped directly from our state well into a  
7 holding tank. That water flows into our fish tanks and  
8 achieves the -- through mixing arrives in an ambient  
9 temperature within those tanks.

10 It would be difficult to have any more  
11 utilization of that resource than they already have. In  
12 fact, it would be thermodynamically impossible to  
13 transfer any more heat than you are just adding water  
14 directly to the water in which the fish are growing.

15 Q. Let's just move on.

16 I have a question on Exhibit L. You were asked  
17 about Mr. Brancard's opinion that --

18 (Pause.)

19 I have here, Again, while working with OCD  
20 general counsel, determined that these wells are handled  
21 by OCD exclusively under the geothermal regulations.

22 Also, the OCD primacy agreement with EPA includes  
23 these wells; therefore, EPA/USE classified regulations  
24 also apply.

25 Your counsel admitted this. Do you agree with

1 Mr. Brancard's opinion?

2 A. I have no comment. I am not an expert in EPA  
3 primacy agreements with respect to the OCD. I am not  
4 able to attest to that.

5 I am not an expert in EPA regulations, a  
6 classified injection well. Injections, we were not in  
7 agreement with the dissipation of the permit, if that's  
8 what you're asking.

9 Q. What would your injection well be governed under?

10 A. When we got the injection well, it was my  
11 presumption -- because the Oil Conservation Division,  
12 the cognizant state agency over injection at the time  
13 and charged with the enforcement of WQCC regulations --  
14 that we were under WQCC.

15 As for the application of this legal  
16 determination, which I don't have the legal expertise to  
17 testify to, and its applicability to our proposed future  
18 injection well, I am unable to attest to the  
19 applicability of this legal determination to that  
20 situation.

21 Q. I saw that there used to be a discharge permit  
22 that AmeriCulture had and was renewed a number of times,  
23 theoretically, because you thought it was under WQCC  
24 regulations and that was not renewed.

25 MR. LAKINS: Objection. Relevance. And if

1 we are talking about an exhibit, a document, where is  
2 it? It wasn't presented by OCD as an exhibit.

3 MS. MARKS: I am just asking the witness why  
4 he didn't renew a discharge permit about this discharge  
5 that we talked a lot about.

6 MR. LAKINS: Relevance?

7 MS. MARKS: It is waste, it is what happened  
8 to the resource. At one point, he thought it obviously  
9 exceeded what was required under WQCC standards and got  
10 a discharge permit. And now he no longer has the  
11 discharge permit --

12 MR. LAKINS: AmeriCulture's operations and  
13 whether or not what they are doing constitutes waste,  
14 does not constitute waste, is or is not in compliance  
15 with any regulation, at this point in time is not on the  
16 table and is not at issue as far as what the applicant  
17 has to prove to bear its burden of proof on its  
18 applications. This is not relevant.

19 MS. MARKS: I think the discharge permit  
20 would have shown what was a -- in the constituents and  
21 in the discharge permit that affected the entire  
22 reservoir and all the fluoride levels, sulfates.

23 I don't know what was in the discharge  
24 permit and why Mr. Seawright received a discharge permit  
25 in the first place, about the need to renew it on

1 multiple occasions, and then just stopped it.

2 COMMISSIONER CATANACH: Ms. Marks, we don't  
3 have this document to review. And I don't think it is  
4 relevant right now.

5 MS. MARKS: Okay. I pass the witness, then.

6 CROSS-EXAMINATION

7 BY MS. HENRIE:

8 Q. So, apologies. These are not in any particular  
9 order. It's just kind of as they were written down.

10 I want to make sure I understand your wells, your  
11 infrastructure correctly. And so what I understand is  
12 that you got three wells that are now active, one is the  
13 cold water well in section 12. And I am going to ask  
14 you just to --

15 A. Yes.

16 Q. -- tell me when I am off and tell me when I am  
17 correct. 68 degrees on cold water well, about 70 GPM  
18 flow?

19 A. 68-degree at the well head.

20 Q. Okay. And about 70 GPM flow?

21 A. From the well head.

22 Q. Okay. And then it goes into a pipeline. And as  
23 I understand it, it can either be delivered directly or  
24 it can be delivered into a storage tank?

25 A. Yes.

1 Q. And, then, also, a separate well is State Well  
2 No. 1, and that's the hot production well. And the  
3 production interval would be 282 feet down to 399 feet,  
4 correct?

5 A. Correct.

6 Q. And the heat on that well is 232 degrees?

7 A. We measured it at 232 during the 48-hour flow  
8 test that I indicated earlier.

9 Q. In 2000?

10 A. Correct.

11 Q. And so that's, just to be clear, 232 Fahrenheit?

12 A. Fahrenheit. I apologize.

13 Q. Okay. And so that water likewise can be  
14 delivered directly or it can be delivered into the  
15 storage tank, the same as the cold water well?

16 A. No, only in the storage tank.

17 Q. It goes straight to the storage tank?

18 A. Yes.

19 Q. And, then, the third well, the federal well or  
20 also called A-444, you described as a backup well?

21 A. Yes.

22 Q. And that's the one that is -- we will talk about  
23 that in a minute. My understanding from State Engineer  
24 records is that that well was used prior to 2004 --  
25 sorry -- was used between 2004 and 2009; would that

1 sound correct?

2 A. That's correct.

3 Q. That water, too, can be both delivered directly  
4 to the fishponds and to a storage tank?

5 A. Presently only to the storage tank.

6 Q. Okay. And then the storage tank is plumbed to  
7 the fish tanks and to the domestic uses; how does  
8 that -- that is where I'm getting really confused.

9 A. I can explain. The check valve for the system is  
10 actually located at the well. And the water is  
11 pumped -- from our cold water well is pumped directly to  
12 the storage tank, but it branches off prior to that, to  
13 various locations, because there are times when you just  
14 simply need the well pressure available from the well  
15 pump to provide sufficient water at that temperature at  
16 that place in time.

17 The federal well goes directly in its present  
18 configuration into the large storage tank. And the  
19 reason it's that way is because we purchased a defunct  
20 rose farm business owned by Tommy McCants, previously by  
21 Tom Beale.

22 Roses are very sensitive to salt. And that is  
23 why the location for the cold water well was in section  
24 12. The TDS level there was compatible for rose culture  
25 without causing salt-induced stress in the roses.

1           So because that was a functioning business, that  
2 well line was already plumbed and the facility was  
3 plumbed into a domestic water supply system, which has  
4 been really modified since then, but nonetheless --

5       Q. And that's the cold water well?

6       A. Yes. And that feeds the domestic use that we  
7 have at our house.

8           The federal well is plumbed to the storage tank  
9 and it runs 24/7. Now, if the main well goes out, the  
10 cold water well in section 12, then what happens is that  
11 water in that storage tank then furnishes the water  
12 supply in those areas. It works backwards through the  
13 system and supplies water to those areas on the farm  
14 that would customarily be getting direct cold water.

15           So if you were to put a tracer dye in the fret of  
16 a well, it would eventually make its way to the faucets,  
17 but it would be the result of just hydraulic head  
18 differences.

19           Or in the extreme case, a power outage. We had a  
20 five-hour power outage three nights ago. And in that  
21 case, that water definitely can work into our domestic  
22 water system, and in fact does.

23           And if our domestic water supply is running low  
24 on water -- there is limited storage. That has its on  
25 storage tank -- like in times of intense pressure wash

1 usage, domestic use, we can actually divert the water  
2 from the federal well directly into that system for  
3 water provision purposes.

4 MR. LAKINS: Just for clarification, you are  
5 using the term "federal well," do you mean that  
6 interchangeably with A-444?

7 THE WITNESS: Yes. A-444 and federal well  
8 are one and the same well. The A-444 designation is an  
9 OS-E designation for domestic use, predated our arrival.

10 The term "federal" is simply because we are  
11 at the -- our fee land lies above the federal geothermal  
12 lease, so we just simply call it the federal well for  
13 convenience.

14 Q. Got it. So State Well 1 is your production well.  
15 And you have a State Well 2 as well. But I understand  
16 you don't produce from that right now?

17 A. We do have it and it has never been produced  
18 other than for a brief period of time upon well  
19 completion.

20 Q. So State Well 1, you said you relied on it for  
21 thermal energy. So heat is the primary use of the well?

22 A. Yes. Well, it serves a dual purpose. I mean  
23 there's thermal energy, but the water is also valuable.

24 Q. But the use of the heat is not incidental to the  
25 use of the water?

1           A. To this day, I am still not comfortable with the  
2 true definition of "incidental." I know there's been  
3 some discussion. There are legal discussions present on  
4 OCD online. And I'm just not comfortable attesting to  
5 the definition of "incidental."

6           As I referred to in the 2013 hearing, our use of  
7 that water for heat is intentional. We use it for  
8 thermal energy purposes.

9           Q. It's not an accident?

10          A. It is not accidental.

11          Q. And I understood you to say that the discharge  
12 from the greenhouses, I think you said at 40 GPM report  
13 different locations of discharge?

14          A. Collectively, and that's an estimation.

15          Q. And that was my question. So it's not 40 GPM  
16 from each point of discharge, it's a collective?

17          A. No. It is 40 as a composite number total.

18          Q. Okay. All right.

19                 And when you talked about the impact of mounding  
20 on the AmeriCulture wells, have you evidence of mounding  
21 in the state well?

22          A. We haven't measured that.

23          Q. Okay. Do you have evidence of mounding in the --

24          A. In the federal well alone.

25          Q. And you talked about the impact of mounding.

1 What is the impact or the harm of the mounding on that  
2 well?

3 A. Well, we suspected since the level of that well  
4 has remained relatively constant throughout the duration  
5 of our stay there in Animas, and then the data that we  
6 presented, which was the Office of State Engineer data  
7 in our exhibit, which showed mounding in our well and no  
8 mounding in other regional water wells, we were led to  
9 the conclusion that that mounding -- that rise in water  
10 table was a result of mounding resulting from the  
11 injection of water by the Lightning Dock Power Plant.

12 It stood to reason that the chemistry, if that  
13 water is, in fact, derived from a geothermal source, as  
14 opposed to the fresher source, as is presently found in  
15 the federal well, it would stand to reason that the  
16 chemistry itself would be affected.

17 And after we learned of the present applications,  
18 we made arrangements to make a post-operational sample,  
19 which we took in July of 2015.

20 Q. So you talked about a January 2014 sample and a  
21 July 2015 sample?

22 A. Correct.

23 Q. And those are for chemistry as well as depth to  
24 water?

25 A. No, we did measure depth to water ourselves.

1 Q. Okay.

2 A. I am relying upon the measurements made by the  
3 Office of State Engineer, which were corrected for the  
4 height of the top of the casing. And then last week we  
5 brought a surveyor there because of the allegation of  
6 mounding. The only way you can actually allege that  
7 there is mounding is -- you can't do it, in my  
8 understanding, with just a drop in water table or a rise  
9 in water table. You actually need a reference point  
10 with respect to elevation.

11 So we had a surveyor come and take the elevation  
12 of the federal well to the hundredth of a foot. And he  
13 compared that to the officially-filed elevation levels  
14 of the respective monitoring wells from which the  
15 concept of a trough was introduced.

16 And we compared those. And that's how Jim  
17 Witcher was able to come to the conclusion that no  
18 mounding existed there.

19 Q. So now I am confused about a few things. So  
20 there is or is not mounding in well A-444?

21 A. There is not based on the information that we  
22 have. The mounding is a result of our activities  
23 independent of the mounding caused by Lightning Dock  
24 Geothermal.

25 To be explicit, the mounding observed there, we

1 attribute that to the mounding resulting from the direct  
2 injection activities of Lightning Dock Geothermal.

3 Q. Let me try to say that back to you. Let's see if  
4 I got it right. So it is your testimony that as a  
5 result of the geothermal injection there is mounding at  
6 well A-444?

7 A. Maybe to use a more specific terminology, as a  
8 result of the injection by Lightning Dock Geothermal, it  
9 is our belief, that based upon the Office of the State  
10 Engineer measurements, that water table has risen  
11 between the dates depicted in the exhibit for those  
12 Office of State Engineer measurements by an amount of  
13 3.5 feet.

14 Q. Okay. And going back to the impact of the  
15 mounding, is the harm in the mounding, in your belief,  
16 related to chemistry, or is there a separate harm that's  
17 related to the level of the water?

18 A. The harm that we are most concerned with deals  
19 with chemistry. And what we believe we are seeing is  
20 the leading edge of what will ultimately become a much  
21 more exacerbated chemical alteration of water in that  
22 well.

23 Q. Is it your testimony -- let me back up. What I  
24 understood you to say is that there is higher fluoride  
25 since power plant startup and there is higher TDS,

1 12 percent, since power plant startup?

2 A. Those numbers are correct.

3 Q. And so is it your testimony that those numbers --  
4 the higher TDS and the higher fluoride -- are the result  
5 of the geothermal injection by Lightning Dock  
6 Geothermal?

7 A. Our experts believe that to be the case.

8 Q. So let me go back to the samples in January 2014,  
9 July 2015, which I believe are chemical samples, only  
10 for chemistry.

11 Do you have any analyticals from a state  
12 certified lab showing those constituents?

13 A. That would be a good question for Jim Witcher.  
14 He did --

15 Q. He did the work?

16 A. He did all the collection and the submission to  
17 the lab. And so he's a contractor to AmeriCulture for  
18 that purpose.

19 Q. Okay. So I think my team's concern about A-444  
20 being styled as a domestic well -- I understand that is  
21 how it was permitted at the State Land Office, your  
22 domestic well permit. I get that.

23 Our concern is if it is a high fluoride well,  
24 even if not as high as others, it's still a high  
25 fluoride, and if it's getting into your home's drinking

1 water system, we have concerns about that.

2 Do you test the water? Do you treat it? How do  
3 you deal with the higher fluoride from a well like  
4 A-444?

5 A. As I say, we used it between 2004 and 2009. And  
6 because of the pre-existing business that we purchased,  
7 we were reliant both at the domiciles that exist on  
8 property as well as at the farm, the domestic uses, the  
9 uses for showering, sanitation, our sinks, bathtubs,  
10 they operate from the cold water well.

11 The federal well is classified as a domestic  
12 well. The fluoride level in our cold water well is  
13 about 2 milligrams per liter. And then this well is  
14 about 3. -- well, now it's higher, but it is less  
15 than 4.

16 And so it is a possible backup source for us.  
17 But it is not one that we need contemplate because our  
18 domestic needs today are met through the water well.

19 Q. Okay. And if people -- if you didn't use your  
20 storage tank for domestic use, how many people are  
21 affected by that?

22 A. We have, including full- and part-time employees,  
23 about eight people.

24 Q. I'm sorry I am jumping around. I'm probably hard  
25 to follow.

1           You talked a bit about -- let me ask this  
2 differently. You talked a bit about the injection well  
3 that has been permitted up in section 6. I believe it  
4 has not been drilled?

5           A. No, it has not.

6           Q. And I think you described it as a way to generate  
7 electricity as self-sufficiency --

8           A. Uh-huh.

9           Q. -- but also a desire to be interconnected to the  
10 grid, so you could sell power if you didn't need it?  
11 Was that the idea?

12          A. I wouldn't characterize it like that. It's that  
13 there is a desire to be self-sufficient with respect to  
14 power production and a necessity to be connected to the  
15 grid.

16          Q. And explain that to me.

17          A. Well, the power generated -- up until the time of  
18 the full capacity of that power plant is utilized  
19 there's a disparity between power generated and the  
20 electrical load of use. That disparity has to be  
21 exported. It has to be placed on the grid, much like  
22 Lightning Dock's power plant exports power to the grid.

23          Q. And is that sale of power part of your economic  
24 feasibility financial model?

25          A. It's not a driving force for the production of

1 electricity. We are not interested in utility  
2 production or production explicitly for the sale of  
3 power generation or sale to a utility.

4           However, in the intervening period of time, until  
5 the full-time capacity is utilized, of course, the --  
6 it's a sale revenue that offset losses.

7       Q. And so full power plant capacity would be after  
8 you expand operations?

9       A. It would be when they build the plant, which we  
10 believe would be coincident with further expansion of  
11 our facility.

12       Q. So part of that electricity would be used by the  
13 power plant as a parasitical load; is that what you are  
14 saying?

15       A. That is a question for the electrical engineers.  
16 I know that with the Rosette electrical generation  
17 facility, if my understanding is correct, it wasn't a  
18 net metering issue. They had power coming in and power  
19 exiting. They were paying full market price for power  
20 that they were using for the inductive excitement of  
21 their generators. And they were exporting power.

22           And there was a net, that they were using money  
23 on the net, paying more for what they bought than what  
24 they were able to achieve through the sale.

25           And so the question is is the electrical wiring

1 going to simply take off excess or take the parasitic  
2 load and export the excess? I can't answer that. I am  
3 not an electrical engineer.

4 Q. And you have electrical engineers now or that's a  
5 future plan?

6 A. We would have relied heavily upon experts in the  
7 past, primarily in the geothermal power generation  
8 equipment. Ken Nichols, he's no longer in the business,  
9 but Ken Nichols is an expert. And I think it goes with  
10 the territory, that when you are in the geothermal power  
11 business, that you, at least peripherally, become an  
12 expert in power distribution and the impacts of  
13 inductive versus synchronous type generation. These are  
14 areas where they have expertise.

15 Q. I don't know Ken Nichols. But you've also  
16 referenced Barber-Nichols; is that --

17 A. He is the proprietor. He is one of the  
18 proprietors of Barber-Nichols. It was a turbo machinery  
19 company located in Colorado.

20 Q. And I want to go back to one thing because I  
21 think it is important. Dale Burgett generated  
22 electricity on site; that's what I heard you say.

23 A. They did, he did, in two phases.

24 Early on, shortly after we arrived, he utilized  
25 several older format units that were taken out of the

1 facility in Oregon. I don't think they were highly  
2 functional. And for a period of time he had some  
3 organic Rankine cycle pure cycle plant, these 400 KW  
4 modules that were made by United Technologies.

5 Q. Do you know, was that part of his water use on  
6 site, were those power plants?

7 A. Yes. He would produce geothermal water. He ran  
8 them through the plants. And the thermally-depleted  
9 water would go into a holding pond. I could point it  
10 out.

11 Q. Sure.

12 A. To my knowledge, through the duration of his  
13 Geothermal power generation, he utilized wells in this  
14 area (indicating). These were state wells.

15 The pipeline transects this quarter, quarter  
16 section. This is the power plant (indicating). This is  
17 the storage tank.

18 And the thermally-depleted discharge would go to  
19 a pipeline here, and then go to this. You can see the  
20 outline of what you used to be -- I believe it's seven  
21 acres, a pond, and then that water would flow around the  
22 facility and then behind this swale and then just move  
23 off it.

24 Q. Okay. I didn't realize it went all the way  
25 around and then back up.

1       A. Yes, it did.

2       Q. Okay. We started talking the injection well and  
3 the desire to generate electricity. I guess a question  
4 I may have asked one of the other witnesses is have you  
5 considered is there a more economical way to generate  
6 electricity, like solar?

7       A. Well, we have a very high duty cycle. And that's  
8 a term that just simply refers to -- it compares the  
9 minimal power utilization to the maximum power  
10 utilization.

11             That ratio would be very low for a rose growing  
12 facility, for instance, where they use exhaust fans to  
13 regulate environmental air temperature. They would run  
14 at full strength in the summer days, and, at night, when  
15 it's very cold, 30 to 40 degrees cooler, then they'd all  
16 be on. So what you see are rapid swings in power use in  
17 a facility like that.

18             Now, despite the fact that our operations are  
19 enclosed within greenhouses, the fish are swimming in  
20 water within those greenhouses. And they are  
21 indifferent to air temperature.

22             And the temperature can get very cold, it can get  
23 very hot, the temperature -- thermal mass of water  
24 resists temperature change, and so you can accommodate  
25 very high or very low air temperatures and still

1 maintain appropriate water temperatures.

2           So most of the power use in a facility like ours  
3 are for carriers and pumps. The majority of our power  
4 use is for those type devices, and they run 24/7. And  
5 so...

6       Q. So that kind of rules out solar unless you had a  
7 battery --

8       A. My understanding -- I'm not an expert in solar --  
9 is you need a method of storage.

10      Q. So I keep jumping around. Back to the injection  
11 well. That is up on state section 6 on the Rosette  
12 lease?

13      A. That is correct.

14      Q. Are there any State Land Office approvals that  
15 you need for that well to build the well?

16      A. Well, we presently have a grazing lease, which we  
17 intend to convert to a business lease, much like we did  
18 originally here.

19           Let me give you an example. This 40-acre  
20 business lease -- this is the 10-acre geothermal lease  
21 -- these are the bounds of the 40-acre business lease  
22 that we discussed previously. That originally was a  
23 grazing lease that was relinquished by accounts that we  
24 held. And then we converted it to a business lease.  
25 Actually ten acres initially and then we went to

1 40 acres. So the conversation from grazing to business  
2 is actually a very straightforward process.

3 We hold a grazing lease for an 80-acre parcel on  
4 the eastern half of section 6. Of course, you have to  
5 transport geothermal fluid from your production well  
6 through your geothermal power generation equipment and  
7 ultimately to your injection well. And that would have  
8 to take place necessarily on state land.

9 And that can be accomplished a couple of ways.  
10 The way that Dale Burgett accomplished it historically  
11 is simply to get an easement from the State Land Office,  
12 which, in his case, was for two pipelines that went from  
13 this location (indicating) to here (indicating). And  
14 it's my understanding that they were readily granted to  
15 him. So that is an alternative.

16 More likely, we would simply convert our grazing  
17 lease to a business lease and utilize that surface.

18 Q. Okay. And in siting that well, we had an OCD  
19 permit package. I think you talked about OCD working at  
20 trying to make sure that the injection and the location  
21 of the injection made sense; and so they looked at  
22 temperature, I believe, and a couple of constituents --  
23 gosh, I am going to have to -- my question was you  
24 looked at a couple of constituents for matches, did they  
25 consider fluoride -- do you know? -- that they said the

1 fluoride in this injection is going to match the  
2 location injection?

3 A. I don't recall that.

4 Q. So it is possible that the injection would be  
5 putting the higher fluoride geothermal water in a place  
6 where it doesn't match?

7 MR. LAKINS: Objection. Calls for  
8 speculation.

9 MS. HENRIE: That is fine. I will withdraw  
10 the question. I was just concerned about it.

11 Q. And we also heard testimony earlier about  
12 different reservoirs out there and a boundary condition  
13 or a fault that made a production reservoir different  
14 than an injection reservoir.

15 Is your production well and proposed injection  
16 well in the same reservoir, do you know?

17 A. This is a question for a geologist. Siting this  
18 was the result of a sophisticated analysis far beyond my  
19 core expertise.

20 Q. Fair enough.

21 So your hot production well and your cold well,  
22 the water is blended, it's run through the fish tanks,  
23 the temperature of the blend, when it hits the fish  
24 tanks, needs to be about 85 degrees for the fish; is  
25 that close?

1       A. There are a variety of ranges. It depends what  
2 the lifecycle is, the age of the fish, what part of the  
3 production cycle you are focusing on, what your goals  
4 are.

5               But as a general rule, our temperatures in the  
6 facility are all going to fall between 75 and 85  
7 degrees.

8       Q. There is some fluctuation?

9       A. Not fluctuation. I am just saying that -- for  
10 instance, in the event we are holding fish for sale, the  
11 shipment may be delayed by a week. What happens if you  
12 keep the fish at optimal growing temperatures -- and we  
13 don't want the fish to grow under this scenario, we want  
14 them to just maintain -- to grow a little, to remain  
15 healthy. What you will do is you will drop temperature  
16 and feed them a lesser amount.

17               And what happens is that the growth potential of  
18 that fish remains. It is unaffected by what would  
19 otherwise be insufficient feeding. And so we regulate  
20 temperature for processes like that.

21               But each part of the production process has an  
22 objective temperature. 85 is the upper limit. But  
23 between 75 and 85 is encompassing every use that we have  
24 on facility.

25       Q. And so then the discharge is warm; it's about 75,

1 maybe a little less. But it's not cold, it's not hot?

2 A. It is equal to the temperature of the tank from  
3 which the discharge comes.

4 Q. Okay.

5 A. Less losses to the point of discharge.

6 Q. Okay. So you have talked about the difficulties  
7 of the financing and getting a project like a power  
8 plant up and running.

9 Are you in the process -- when we talked in 2013,  
10 it felt like you guys were kind of on the verge of  
11 something. You've done more work. I'm just kind of  
12 curious how far off in the future this is.

13 A. I can't tell you.

14 Q. Are you in discussions on financing?

15 MR. LAKINS: Objection. Calls for  
16 confidential information.

17 Q. Our concern is that we have had testimony  
18 yesterday about damages to your power plant. And either  
19 they are speculative or they are not.

20 And I see you guys making progress. And I'm not  
21 sure, I guess, if it's real progress or if it's just  
22 meant to look like you are making progress. Because  
23 what I see in a timeline is June 20th, 2015,  
24 AmeriCulture objects to our injection well applications;  
25 On June 30th, 2015, they filed amendment to their

1 business lease with the State Land Office for power  
2 generation. And then in August of 2015, they commission  
3 Well A-444. And what I am trying to figure out is is  
4 this all really leading up to a power plant or is it  
5 just to show the Commission that you guys have an  
6 argument?

7 MR. LAKINS: Is there a question?

8 MS. HENRIE: I think there was.

9 THE WITNESS: I understood the question. I  
10 can answer this.

11 MR. LAKINS: Okay.

12 A. We filed our request for this hearing on  
13 June 20th, 2015, as you said. That Friday, which we  
14 have a letter from you to Allison Marks, which indicates  
15 that that very Friday you learned from Jim Griswald of  
16 our request for the hearing.

17 That very same day Lightning Dock filed a 22-page  
18 lawsuit in federal court against AmeriCulture and  
19 against me personally. Among the many allegations  
20 within that lawsuit was an allegation, which was untrue,  
21 which stated that our business lease would not permit  
22 the development of a geothermal power plant.

23 We have long considered the use of the state land  
24 for the construction of a geothermal power plant. The  
25 reason is that the technology for organic

1 Rankine cycle power plant has evolved, it's become more  
2 modular. It can be installed and commissioned quicker,  
3 and it also can be removed.

4 So the typical concerns that one has with deeded  
5 land versus state land have been lessened over the  
6 course of time. And it absolutely, just to confirm what  
7 we knew to be true, which was that allegation was  
8 meritless, we filed an application, an application that  
9 was very quickly approved.

10 As far as A-444 being commissioned, there is a  
11 very important history there. There was a -- I don't  
12 mean to get into the tracer dye issue. That's a dead  
13 horse. But there was a tracer dye study that was  
14 conducted by Lightning Dock in which a dye was injected  
15 into a well of Rosette's up here.

16 And in a month's time, it migrated retrograde  
17 over 1,000 feet to our state well. And we found that  
18 tracer in our well.

19 Now, that well -- the pump installed in that well  
20 only pumps 80 gallons per minute. At that time of year,  
21 it pumps at about a 50 percent duty. So on a daily  
22 basis, it averages about 40 gallons per minute of  
23 geothermal flow.

24 In a public meeting attended by Dr. Miller, he  
25 blamed the movement, the retrograde movement of that

1 tracer up hydraulic gradient to our state well to our  
2 pumping of our 40-gallon-a-minute pump.

3 With that hindsight experience, which we did not  
4 believe that 40 gallons a minute on a daily basis can  
5 reverse regional outflow in the outflow plume of this  
6 resource.

7 Out of an abundance of caution, we chose not to  
8 run A-444 between the period of January of 2014 and July  
9 of 2015, despite the fact that we really could have used  
10 that water. After we took the after sample, we began  
11 pumping it, because we simply need that water.

12 Q. So you are saying that production from State  
13 Well 1 at a range of 282 to 399, 30 gallons per minute,  
14 could not have pulled the tracer in?

15 A. It is not the belief of our experts that that  
16 pump could have reversed the outflow plume in the  
17 resource. If my memory serves me correctly -- and I  
18 believe it does -- there was a considerable pumping  
19 going on at that --

20 Q. That was my question, were the other wells being  
21 pumped right then?

22 A. Not ours, yours. But to blame the movement of  
23 tracer up hydraulic gradient to a well that on a daily  
24 basis is pumping on average 40 gallons a minute when at  
25 the same time large volumes of water were being produced

1 by Lightning Dock and contemporaneously with that tracer  
2 study -- we didn't want to utilize our federal well  
3 between the period of January of 2014 and July of 2015  
4 because we did not want to hear today at hearing that  
5 somehow our production in that well had somehow caused  
6 the exceedance.

7 And so out of an overabundance of caution and at  
8 the detriment of our business, we chose not to operate  
9 that well.

10 Q. I'm not sure I'm following. Because when  
11 Dr. Miller went out after the tracer incident and  
12 sampled different wells for tracer and did find a well,  
13 and admittedly your production well -- I don't believe  
14 any others -- but did you ask Dr. Miller to sample  
15 A-444?

16 A. He didn't have a functional pump in there at that  
17 time.

18 Q. So, no, he didn't?

19 A. No. We have no idea if the tracer ever reached  
20 A-444. We don't know. We never tested the water. We  
21 didn't have a pump installed at the time.

22 Q. And it sounds like you didn't actually need that  
23 A-444 water between 2009 and 2014?

24 A. We did not. But just to give you an example, I  
25 mean, we are in a building process right now. We just

1 purchased 44 tanks this year and we are in the process  
2 of installing these. Our business is growing. We are  
3 adding additional capacity. We have more biomass, more  
4 need for water. And we simply needed that water.

5 Q. Now, with your new tanks --

6 A. We do.

7 Q. I don't think we ever got on that issue of  
8 financing. As we explained to the Commission, we are  
9 talking damages to your power plant. And the question  
10 was, you know, It's been a long time coming. And your  
11 response was, Well, it's hard to get financing -- which  
12 I absolutely agree with. I absolutely agree with.

13 But I am just curious, are you in that process,  
14 where are you in the process, have you selected  
15 equipment, is that a threshold step to getting  
16 financing?

17 MR. LAKINS: This is asking to breach  
18 confidential information about this business. I think  
19 he can answer yes or no whether or not they are engaging  
20 in discussions. But anything past that breaches  
21 confidential business information.

22 MS. MARKS: I think with the timeframe that  
23 is somewhat relevant. Because since the application is  
24 five years, these might not even be relevant documents  
25 here. It's relevant to a lot of issues we've discussed,

1 that Mr. Seawright could maybe give a timeframe as to  
2 when this may occur -- the OCD issued a permit 13 years  
3 ago and nothing has happened. Maybe Mr. Seawright can  
4 give -- if he's been working on financing for 20 years  
5 or 13 years, maybe we can get some kind of timeframe as  
6 to when something actually is going to happen.

7 MR. LAKINS: I need to have a confidential  
8 discussion with my client.

9 MS. HENRIE: And we are not looking for  
10 names, just some milestones, some progress states,  
11 things like that.

12 MR. BRANCARD: I don't think we want to be  
13 forcing the client to provide us with anything you  
14 consider confidential. To the extent he can just  
15 generally summarize, that would be helpful, I think.

16 MS. HENRIE: Mr. Chairman, just to give  
17 context, this is an Extension to the Office of the State  
18 Engineer that was filed September 2, 2015, so not too  
19 long ago. And this is the extension to a water right.  
20 So as the water right is approved, we file extensions up  
21 to --

22 MR. BRANCARD: Ms. Henrie, I think we have  
23 instructions for the witness to answer your question.  
24 So maybe he can go ahead and then you can figure out  
25 what else you need to ask.

1           MR. LAKINS: And that is a document that is  
2 not an exhibit, never previously disclosed, so, of  
3 course, I'm going to object to it.

4           MS. HENRIE: We have instructions, so I'll  
5 be patient.

6           MR. BRANCARD: So, Mr. Seawright, I guess to  
7 characterize what the question is here, can you  
8 generally discuss any progress with moving forward on  
9 this project?

10          THE WITNESS: In my professional experience  
11 in business, it is not possible to put a time on a  
12 particular investment. But we have been seeking  
13 investment capital that would allow us to build this  
14 plant and build the corresponding aquaculture production  
15 facility to utilize power generated by that plant.

16          COMMISSIONER BALCH: Is this like a  
17 five-year plan, a ten-year plan, a one-year plan?

18          THE WITNESS: As soon as our investment  
19 capital materializes, which would be, in our hope, soon,  
20 within a year.

21          MR. LAKINS: Not to interrupt Ms. Henrie's  
22 cross, but I think sort of the elephant in the room  
23 question, Mr. Seawright, is how long have you been  
24 working on trying to get the capital? Would you feel  
25 comfortable answering that?

1           THE WITNESS: We have raised a lot of  
2 capital. We have invested millions of dollars over the  
3 years. We have a business we are very proud of.

4           But as far as the expansion that would  
5 require our own internal power production, that is yet  
6 future. And that is dependent on capital. And it is  
7 our hope that that will be shortly forthcoming.

8 BY MS. HENRIE (cont'd):

9       Q. I think I heard you say that it is your testimony  
10 that you can put the power plant on the fee land?

11       A. Well, the joint facility operating agreement, in  
12 it Lightning Dock grants the right to use geothermal  
13 resources under the property for nonpower uses, which is  
14 entirely different than prohibiting the use of  
15 geothermal resources on adjacent land on that land for  
16 power production uses.

17       Q. And I do understand that to be your position,  
18 that you feel that the obligations and the benefits of  
19 the joint facility operating agreement are attributable  
20 to that 15 acres only, and you have no obligations or  
21 limits next door on state land. I understand that to be  
22 your position.

23           I am asking kind of the reverse question, which  
24 is, does the prohibition against nonpower uses or the  
25 limitation to you that the only uses on the 15 acres

1 allowable are nonparties, as power uses were reserved to  
2 Lightning Dock Geothermal, Inc., does that allow you to  
3 place the power plant on the fee land?

4 A. I have reviewed the joint facility operating  
5 agreement many times, as has our counsel. And our  
6 counsel is unified on the opinion that nowhere in the  
7 joint facility operating agreement is the construction  
8 of the geothermal power plant for our use prohibited.

9 Q. And when AmeriCulture entered into the joint  
10 facility operating agreement -- and just so I'm clear,  
11 my client believes that they do have obligations under  
12 that agreement were they to harm the heat. Just so you  
13 know that.

14 But when AmeriCulture entered into that  
15 agreement, 1995, if I recall correctly, was it aware  
16 that the BLM mineral had been leased for geothermal  
17 power production?

18 A. I was aware that Lightning Dock Geothermal held  
19 federal lease and in 34790.

20 Q. So you purchased the property, entered into the  
21 joint facility operating agreement, built your business  
22 knowing that there would be or there could be a  
23 geothermal power plant built by Lightning Dock  
24 Geothermal to utilize this resource for power  
25 production?

1           A. Well, at the time Lightning Dock Geothermal was  
2 attempting to sell the lease. They have offered it to  
3 us for sale. They offered it to Dale Burgett for sale.

4           I'm not an expert in the inner workings or the  
5 intentions of Lightning Dock Geothermal at that point.  
6 It stands to reason that they would be interested in  
7 electric power transmission.

8           Q. I believe you said that you never used A-444 for  
9 heat; is that a correct understanding?

10          A. The reason for using A-444 has never been to feed  
11 our fish. I'll put it that way. It has thermal energy  
12 content in it because of its proximity to the resource.

13                 Its average well temperature is 180 degrees  
14 Fahrenheit. So it has very little utility in so far as  
15 thermal energy.

16          Q. So before AmeriCulture drilled its current  
17 production well, State Well 1, what was the source of  
18 heat for the fish?

19          A. In the time period between the drilling of State  
20 1 in 1996 and our arrival in 1995, that year?

21          Q. Right.

22          A. We actually utilized an nonconsumptive method of  
23 heat extraction. As I mentioned, Rosette has five wells  
24 on the state lease. There is one here, one here, one  
25 here, and one up here.

1           This one nearest us was available at the time,  
2           and Dale Burgett, the proprietor of the Rosette  
3           greenhouse, had a heat exchange concept he wanted to  
4           experiment with. He actually tried it at his home for  
5           heating his pool.

6           And he assisted us in installing a hairpin heat  
7           exchanger down to the bottom of that well, and it was  
8           suspended from an apparatus at the top that allowed the  
9           differential thermal expansion if the various -- the  
10          down line and the up line.

11          And we would get about 50 gallons per minute.  
12          The Delta T was about 50 degrees Fahrenheit.

13          And so what we did is, early on, we had far fewer  
14          tanks, far less growing area, far fewer fish than we do  
15          today. And we would use heat exchangers both in the  
16          fish tanks and in the well. And it was a closed system,  
17          semi-closed. There was a repository for a sump, from  
18          which a pump would draw water and would circulate it out  
19          to the well. It would go down in the well, and it would  
20          come back heated. It would return, go through a  
21          manifold of heat exchangers in various tanks or under  
22          tanks, and then that water would return to that sump.

23          The water was poor quality, because of rust and  
24          other processes that happen with any system. It is much  
25          like -- it is akin to the heating and cooling system in

1 a car, where the earth would be the engine and the  
2 radiator would be the fish tank.

3 And that was sufficient for a while, but we  
4 eventually outgrew it.

5 Q. I have always wondered who did the first State  
6 Well 1.

7 So let's see. Is it your testimony that with  
8 regard to the injection well up at section 6 that has  
9 been permitted, is it your testimony that the OCD permit  
10 issued in 2002 has not expired?

11 A. That is my belief.

12 Q. Do you have a financial feasibility study for the  
13 future power plant?

14 A. During the analyses -- these were all Department  
15 of Energy sponsored projects to which we contributed a  
16 cost share -- we had an expert in power plant economics,  
17 not specifically geothermal power plant economics, and,  
18 yet, his expertise in power plant economics was honed by  
19 experience, the experience base of the other team  
20 members who had rich experience in geothermal and  
21 geothermal power generation.

22 And in that there was a financial forecast that  
23 culminated, it wouldn't be worth it if it wasn't cost  
24 effective.

25 Q. Right.

1       A. So that, of course, is part and parcel to the  
2 need to develop a geothermal power plant.

3       Q. And that time frame would have been 2002 --

4       A. I can't put an exact time on it. I don't recall  
5 the exact time.

6       Q. In addition to what you described or perhaps it  
7 is within that, has anyone prepared profit projections?

8       A. For?

9       Q. For the geothermal power plant that's --

10               MR. LAKINS: Objection. Relevance.

11               MS. HENRIE: We are still at damages and the  
12 damages that have been alleged.

13               MR. LAKINS: We are not talking about  
14 damages, monetary damages, to a power plant. What we  
15 are talking about in the context of this hearing is  
16 waste and the reduction of the geothermal resource.  
17 That's the issue, not the financials of his power plant.

18               COMMISSIONER CATANACH: I agree --

19               MS. HENRIE: That makes sense. I got  
20 distracted.

21       Q. Have you hired any experts to help assist you  
22 with locating financing?

23       A. Yes.

24               MR. LAKINS: That is a confidential  
25 question. I object to that. And that is not relevant.

1                   COMMISSIONER CATANACH: And I agree with  
2 that.

3           Q. Have any of the studies or projections been  
4 provided to any financial entities?

5           MR. LAKINS: The same objection, relevance.  
6 This is getting into confidential business --

7           COMMISSIONER CATANACH: I think we've gone  
8 down this road far enough, Ms. Henrie.

9           MS. HENRIE: All right.

10          Q. Do you have a PPA with Columbus Electric Coop for  
11 the power you would sell to them?

12          MR. LAKINS: Relevance.

13          COMMISSIONER CATANACH: I think this is  
14 relevant.

15          A. No, we didn't.

16                 During that period of time, we were, I have  
17 stated before -- our primary objective was not the  
18 production of electricity for sale. It's not a business  
19 of interest. It's not within our core expertise.

20                 And so we were reliant on -- TriState Electric  
21 had a basic cost structure and they were obligated to  
22 buy power that was placed on the grid. It's very  
23 modest.

24                 It was -- the algorithm for that was linked to  
25 the field cost savings that they would experience by not

1 having to produce that amount of power. I forget the  
2 exact terminology used in that. But it was very modest,  
3 and we used that as a worse case scenario.

4 Again, our objective was not to be in the  
5 position of selling power, certainly not for a duration  
6 of time. That didn't interest us.

7 This was the dilemma that Dale Burgett ran into.  
8 He was under the belief that he could sell power for a  
9 much higher price than reality. That came as a  
10 surprise, not to me, but to him.

11 MS. HENRIE: Okay. Mr. Chairman, we will  
12 pass the witness.

13 COMMISSIONER CATANACH: Do you have some  
14 questions?

15 MS. GAULT: Yes, I do. I just have two  
16 questions.

17 QUESTIONING BY MS. GAULT

18 MS. GAULT: When the State Engineer was  
19 doing the testing of the water level and they noticed  
20 the mounding, did they express any concern to you?

21 I tried to call them and ask them and they  
22 would not -- they would not answer my question. And  
23 since they are not here, I would like to know if they  
24 raised any concerns to you about this mounding.

25 They are not here and that bothers me. But

1 I know they did testing. I called them several times.  
2 I know they did testing several times and every time I  
3 called, they are telling me there is rising and levers  
4 changing, going up, going down. But they wouldn't tell  
5 me if they were concerned. I want to know if they were  
6 concerned, if you felt or they told you they are  
7 concerned about it, because that can affect other  
8 people, not just like you.

9 THE WITNESS: Well, the only people that I  
10 had communication with were the gentlemen that sampled  
11 the well, which they do regularly. And it's generally  
12 the same team that does it.

13 And I don't recall them ever expressing to  
14 me a concern.

15 MS. GAULT: Okay. Another question is you  
16 test your -- you did not make chemical changes in your  
17 well and you're ascribing to the injection?

18 THE WITNESS: We do.

19 MS. GAULT: This comes to us groping, trying  
20 to find some information about changes, because, again,  
21 it concerns us because it's a change that we would like  
22 to know.

23 And Michelle said that she would give me  
24 some information from her side. Is that something that  
25 you can share with us, with the Soil and Water

1 Conservation District about the changes, so we can have  
2 at least something to go by? Because we do feel that  
3 there would be changes.

4 And I did hear from -- well, I read -- I  
5 didn't hear -- from Mr. Miller, his testimony, and  
6 Shomaker, and they both said that there would be  
7 chemical changes. They did say that.

8 And so we are concerned about these things  
9 but we don't have anything besides his saying there will  
10 be chemical changes.

11 But if you have some things, can you share  
12 it with us?

13 THE WITNESS: We share the concerns that you  
14 have, and it is certainly something that we would be  
15 willing to discuss with you.

16 MS. GAULT: Thank you.

17 EXAMINATION BY COMMISSIONER CATANACH

18 COMMISSIONER CATANACH: Mr. Seawright, with  
19 regards to the potential for reducing the temperature in  
20 your State No. 1, if that temperature is reduced by  
21 Lightning Dock's operations, it won't affect your fish  
22 operation because you are mixing that with cold water  
23 anyway, right?

24 THE WITNESS: At this present time, it would  
25 not have a significant impact on our pre-power plant

1 operations at our present scale.

2 COMMISSIONER CATANACH: So the concern with  
3 regards to the temperature reduction is more in line  
4 with the power plant operations; that's the main  
5 concern?

6 THE WITNESS: Well, both power plant  
7 operations and future production operations. One of the  
8 challenges -- right now there's a human safety issue  
9 involved here.

10 232-degree water is dangerous to work with.  
11 And, you know, the state statutes target not only the  
12 efficient use of geothermal but the protection of human  
13 health.

14 And our system is not a -- we maintain about  
15 40 p.s.i. of back pressure on our production well until  
16 it reaches the holding tank, at which time temperature  
17 does decrease, and it becomes subcritical below boiling.  
18 And we use that below-boiling water because it is much  
19 safer.

20 I have been burned twice. Once severely,  
21 and I ended up in a burn clinic in Tucson, just because  
22 I tripped and stepped in some hot water. The skin came  
23 off my ankles like rubber gloves. It is extremely hot.

24 And so at our present facility we have  
25 elected to utilize a subcritical delivery system. In

1 the future, we would utilize a pressured system that  
2 would employ both the use of heat exchange technology --  
3 or, basically, hydronic heating systems in the floors of  
4 the tanks themselves to allow the water to go  
5 subcritical, because it is so dangerous.

6 And then the remaining thermal energy  
7 content of that water would be fully utilized by that  
8 water directly passing into the fish directly.

9 So, eventually -- so this is a -- there is a  
10 time reference that is important with respect to your  
11 question. We have sufficient hot water, whether at 232  
12 or less than that in our present operations, although  
13 that issue is going to be become more acute at the  
14 passage of time.

15 You have to understand that our -- the  
16 utilization of water right now is under a water right.  
17 It's file No. A-45(AS). So this is a supplemental water  
18 right, which is part of a composite grouping of wells  
19 from which we can pull a total amount of annual  
20 diversion equal to our water right.

21 And so as our facility grows and the cold  
22 water requirement increases, the actual allotment of hot  
23 water will decrease, unless the temperature of that  
24 remaining allocation within our water right is going to  
25 become increasingly critical.

1           So temperature is very important to us for  
2 what we call direct use purposes. But it would not be  
3 critical today.

4           COMMISSIONER CATANACH: With regards to the  
5 proposed injection well and the producing well at some  
6 point in the future when you use that, wouldn't the  
7 temperature of the water that you are injecting be lower  
8 than the producing well? That would be spent water,  
9 right?

10           THE WITNESS: Under the set of assumptions  
11 that Roy Johnson of OCD utilized back when we got our  
12 injection permit, the assumptions was, 1,100 gallon per  
13 minute of continuous flow, 135 degrees Fahrenheit, and  
14 so the objective of that siting, which was Roy Johnson's  
15 directive, was to match chemistry and temperature.

16           And the data that we did have was Kingsinger  
17 1956, the one meter and two meter temperature contours.  
18 And so that was satisfactory to him, because this goes  
19 to the issue of waste. Roy Johnson took very seriously  
20 that diminution of resource temperature. He didn't want  
21 us to inject 135 water in a location which had hotter  
22 water.

23           But there was another objective as well.  
24 And that was that it was likely expected a mounding and  
25 we didn't want water returning back to the central part

1 of the geothermal resource.

2 And so that is why the distance of about  
3 two-thirds of a mile away. And the selection of that  
4 site involved a great deal of expertise, which I am not  
5 privy to.

6 But those were the various considerations in  
7 the siting of that well.

8 COMMISSIONER CATANACH: And wasn't the other  
9 part of that consideration that the injection -- that  
10 that water would flow in the outflow direction towards  
11 the north?

12 THE WITNESS: The siting was actually on the  
13 other side of what was regarded as a -- it was actually  
14 called a permeable barrier. I think it was in our  
15 application materials, there was some anticipated  
16 subsurface feature that would also aid in keeping that  
17 cooled water from moving retrograde, up hydraulic  
18 gradient.

19 COMMISSIONER CATANACH: So you wouldn't be  
20 degrading the reservoir temperature injecting into that  
21 well?

22 THE WITNESS: No. Because we operate in the  
23 outflow plume of the resource, that water has already  
24 come up, it's mixed to varying degrees, and it is on its  
25 way north. And, as I said before, at that point, it is

1 really a use it or lose it situation. So we produced  
2 from and returned to the injection -- the outflow plume.

3 COMMISSIONER CATANACH: In the agreement you  
4 have with Lightning Dock, in terms of them replacing the  
5 heat if there was some degradation -- could you not use  
6 some type of heat exchanger to recover the heat from  
7 water that they provided you, and not the water itself?

8 THE WITNESS: As a mechanical principle,  
9 that's possible. People have employed heat exchangers  
10 before.

11 COMMISSIONER CATANACH: So they could do  
12 that to provide you with a heat loss?

13 THE WITNESS: Yeah, the physical requirement  
14 for that -- well, this is a broad statement. Water  
15 could be transferred -- thermal energy could be  
16 transferred via heat exchanger to our facility. I am  
17 not attesting to the sufficiency of that solution.

18 And with respect to the JFOA, that only  
19 applies to the 15 acres. And the proposed situation  
20 involves an activity outside the 15 acres having an  
21 effect on our well outside the 15 acres.

22 And so they really don't have any legal  
23 obligation to supply us water as a result of the  
24 dimension of our temperature.

25 And it goes unsaid that our shareholders

1 would not be interested in a solution whereby Lightning  
2 Dock was our thermal energy utility, given our  
3 relational status.

4 COMMISSIONER CATANACH: You don't have any  
5 indication that your injection well permit has expired;  
6 as far as you know, it's still in effect?

7 THE WITNESS: Yes, there was no expiration  
8 date on it.

9 COMMISSIONER CATANACH: You talked about --  
10 I believe one of the wells you were concerned about was  
11 the -- was it the 63? -- I believe the closest injection  
12 well to your wells was the 63A-7, or something like  
13 that?

14 THE WITNESS: Yes.

15 COMMISSIONER CATANACH: Is it just that  
16 particular well that you are concerned about or are you  
17 concerned about all the injection wells proposed?

18 THE WITNESS: I would say that our concerns  
19 vary from well to well. And you have to understand, not  
20 being an expert in geochemistry and geothermal, I have a  
21 much more practical concern, which I can elaborate on  
22 just very briefly.

23 One was touched upon in earlier testimony  
24 in, as far as I recollect, an exhibit provided by LBG.  
25 This well, 13.7, is completed in alluvium. It's cased

1 to 500 feet, and to a total depth of 1,500 feet. That's  
2 just alluvial fill.

3 They have a monitoring well right here with  
4 a fluoride level of 4.3. How can you drill this well  
5 and have a BTV of 17 when you have a monitoring well  
6 here which is at 4.3 and our federal well is at 3.4?  
7 This makes no sense.

8 I just refer to Jim Witcher's testimony. He  
9 said that that water would take the path of least  
10 resistance, and he, in his professional opinion, did not  
11 believe it would return to the injection zone.

12 There is a well out here, and I know so  
13 little about the hydrological subsurface features there  
14 to even comment on it personally.

15 As far as 63A-7, which is here, this  
16 reservoir host that we targeted -- and we targeted  
17 because of the experience base of Dale Burgett and the  
18 Rosette operation. At one point he had, according to  
19 our account, 42 geothermal wells -- not according to our  
20 account, but according to his account, 42 geothermal  
21 wells.

22 He had his own drilling rig that he was in  
23 partnership with. He could drill wells very  
24 inexpensively. And that was his method of exploration.

25 And there was a preserved subsurface feature

1 throughout this area he called red rhyolite. And the  
2 actual nomenclature of that was corrected by Jim  
3 Witcher. He calls it a highly silicified Gila  
4 conglomerate with secondary faults and fractures.

5 I had mentioned earlier when we began  
6 pumping our State 1 Well, we saw a measurable drawdown  
7 in this well in 11 minutes. It's very close.

8 And most of these wells were intentionally  
9 completed in that same reservoir host, which differs in  
10 depth, as I recall. It has been over a decade since I  
11 talked to Dale about it. But the actual target  
12 reservoir host differs as you go north and south.

13 And, so, yes, we do believe that the water  
14 injected into 63A-7 would migrate extremely quickly to  
15 our well. And so we'd see effects very rapidly.

16 I just have one more comment and that is our  
17 concerns. The concern of the causation of exceedances  
18 is a real issue. Again, that level of sophistication of  
19 my understanding of these issues is limited to my own  
20 exposure to people who are expert.

21 But the movement of water from a location in  
22 a different hydrological domain as the injection  
23 wells -- and according to our expert, three of these,  
24 four of these wells bear that description. If it's  
25 going to result in the causation of exceedances for

1 fluoride, it's the opinion of our group that the amount  
2 of fluoride that could potentially migrate to our  
3 production well but other well locations -- New Mexico  
4 State Statute, they protect present and probable future  
5 sources of water, not just present sources of water.

6 So we believe that the injection into these  
7 sites will cause what we have already begun to see,  
8 which is changes in the chemistry of our well.

9 COMMISSIONER CATANACH: Okay. I have  
10 nothing further.

11 EXAMINATION BY COMMISSIONER BALCH

12 COMMISSIONER BALCH: Good afternoon, Dr.  
13 Seawright.

14 THE WITNESS: Good afternoon.

15 COMMISSIONER BALCH: I trust you don't have  
16 any more pink fish.

17 THE WITNESS: They went from pink to green  
18 and now that all went away.

19 COMMISSIONER BALCH: Back to their normal  
20 green.

21 THE WITNESS: Yeah.

22 COMMISSIONER CATANACH: What is a high  
23 performance tilapia?

24 THE WITNESS: The genetic base that we rely  
25 on is in its seventh generation from the wild. And the

1 selection intensity on that is as high as one to a  
2 1,000; in other words, one animal out of 1,000 is  
3 selected to represent that particular family in the next  
4 generation.

5 And so we have, as a result of years of  
6 effort, primarily with colleagues of ours, we have a  
7 fish that really grows fast.

8 In the aquaculture industry, which is  
9 aquatic farming, growth to market size is critical. And  
10 so high performance means they grow fast and --

11 COMMISSIONER BALCH: What makes them  
12 selected through eight generations, to grow fast?

13 THE WITNESS: Well, they grew fast  
14 initially.

15 COMMISSIONER BALCH: Well, faster.

16 THE WITNESS: Yes. We have a 15.8-pounder  
17 in our freezer.

18 COMMISSIONER BALCH: On the question of  
19 water chemistry and possible changes to it, when you mix  
20 your water for your fish tanks, how often do you monitor  
21 the chemistry of waters going into your wells?

22 THE WITNESS: Going into the different  
23 wells? The tanks?

24 COMMISSIONER BALCH: Each well has its own  
25 fluoride level and various other chemical constituents

1 in the water, right?

2 THE WITNESS: Yes.

3 COMMISSIONER BALCH: And you want to have a  
4 mix that is below certain thresholds --

5 THE WITNESS: Yes.

6 COMMISSIONER BALCH: I don't know, but  
7 tilapia like probably less than five TBS of chlorine,  
8 right?

9 THE WITNESS: Yes.

10 COMMISSIONER BALCH: -- or fluoride?

11 THE WITNESS: Yes.

12 COMMISSIONER BALCH: So you keep track of  
13 what is coming out of every well on a periodic basis?

14 THE WITNESS: Periodic, but long periodic.  
15 Jim Witcher has conducted most of the sampling for us.  
16 And throughout the years, we have taken a number of  
17 samples in our state geothermal well.

18 You have to understand, the federal well  
19 itself, it didn't have a pump in it from the time we  
20 purchased the property to 2004, and so it wasn't  
21 something that we tested.

22 The chemistry was looked at then. In fact,  
23 I think the chemistry, what we had tested then is what  
24 we had tested, too, in the last hearing. And, of  
25 course, the recent sampling events.

1                   We have a pump installed in the federal well  
2 now. And so we are just limited to those times. It's  
3 not a regular sampling event. The geothermal chemistry  
4 is very stable --

5                   COMMISSIONER BALCH: It has been anyway,  
6 right?

7                   THE WITNESS: Thus far. From the time that  
8 we arrived; I don't believe that it's shown any  
9 substantial changes since our arrival 20 years ago.

10                  COMMISSIONER BALCH: I know you don't  
11 monitor the A-444 well very often. But in any of the  
12 other wells that you do monitor, do you see any sort of  
13 seasonal variation? If you have a wet spring, do you  
14 have high water levels or a summer, lower water levels?

15                  THE WITNESS: We haven't observed that.

16                  COMMISSIONER BALCH: So nobody is really  
17 trying to track kind of seasonal variations?

18                  THE WITNESS: No. The only time we really  
19 were on top of water levels within our State 1 Well --  
20 and you have to understand, it's a hot well.

21                  Measuring water table is challenging. But  
22 we have a sampling cord, which is really large, and we  
23 have a float and a cord. And you can tell when it's  
24 floating.

25                  And we basically pull that out to a standard

1 point on the casing, and we measure it. And during an  
2 extensive pumping test by Lightning Dock, it was called  
3 an interference pumping test. We maintain very close  
4 watch on water table during that 30-day test.

5 And during that 30-day test, the water level  
6 in State 1 dropped 42 feet as a result of their pumping.

7 COMMISSIONER BALCH: And recovered after the  
8 end of the pumping?

9 THE WITNESS: Recovered very shortly. But  
10 in the intermediate time period, it actually ruined our  
11 pump.

12 We had a line shaft turbine pump that fed  
13 into a three-and-a-half inch discharge line. And  
14 unregulated, the back pressure on that pump was about 50  
15 p.s.i., just by virtue of the diameter of the pump, the  
16 diameter of the outflow pipe to our well, and the  
17 combination of flow that came from that pump at our  
18 standard operating level.

19 And what happened when that test took place  
20 is the water table dropped 42 feet and our production  
21 dropped to about 40 gallons a minute, full flow. What  
22 happened when that water recovered, it stayed at 40  
23 gallons per minute. It never actually recovered to the  
24 80 gallons a minute that it pumped previously.

25 And there was a substantial horizontal

1 travel in the shaft. There was obviously a lot of  
2 vibration going on. But because of the time of year, we  
3 had to continue to operate it.

4 Eventually, that pump just failed all  
5 together. We pulled it apart and the inside of the  
6 impeller bowls were totally encrusted with crystals that  
7 according to our expert would have been deposited during  
8 flashing.

9 We were basically cavitating. And the  
10 reason we were cavitating is because we weren't  
11 monitoring back pressure on the head because we were  
12 used to that standard operating level. Now we are more  
13 careful. We actually have a regulating valve right at  
14 the pump pressure gauge so that an event like this won't  
15 happen --

16 COMMISSIONER BALCH: It sounds like a good  
17 engineering practice.

18 In the State No. 1 Well, kind of what  
19 interval is that?

20 THE WITNESS: 282 feet to 399 feet.

21 COMMISSIONER BALCH: And the State No. 2  
22 Well, we haven't really talked about it very much, does  
23 have considerably more geologic information, at least  
24 from your point of view, attached to it.

25 You are pulling water out of the state 1 at

1 around 232 degrees, and that is going to be averaged  
2 over that column that you are extracting from.

3 Why aren't you using the State No. 2? What  
4 is going on with that well?

5 THE WITNESS: That well was the result of  
6 two subsequent DOE sponsored research efforts spaced  
7 years apart.

8 The initial one allowed to us drill down to  
9 910 feet, which, in our thinking, was really a staging  
10 point for the subsequent operation. We understood the  
11 shallow reservoir that existed between this 282 feet to  
12 399 feet.

13 So the second DOE sponsored activity was one  
14 corresponding to the EGS program or Enhanced Geothermal  
15 System Technology.

16 We worked together with a couple of the  
17 original hot dry rock experts, Dave Dushane and Don  
18 Brown from the Fenton Hill Project. They were our  
19 advisers. And this well was going to be our deep  
20 production well.

21 And what is important about this well is  
22 that we knew going into it that we could either fail and  
23 not find a sufficient thermal storage to allow the  
24 proper operation of an EGS system -- and so as kind of  
25 an insurance policy, we were going to have offset

1 depths. Instead of going horizontally, it was  
2 horizontally and vertically at the same time to increase  
3 the zone with which thermal energy could be mined.

4 But it was the possibility also that that  
5 would fail or, alternatively, that the DOE funding  
6 needed to complete that production injection paradigm  
7 would fall short.

8 And so what we ended up doing is we ended up  
9 completing -- that well actually is cased to 12 inch and  
10 cemented accordingly in that same production zone at  
11 approximately 282 to 399. Those numbers are not exact,  
12 but it's that same zone. And so --

13 COMMISSIONER BALCH: -- you're isolating the  
14 waters from the swamp cooler --

15 THE WITNESS: Yeah, we set casing down --

16 COMMISSIONER BALCH: -- the shallower  
17 aquifer?

18 THE WITNESS: Yeah. So that we could back  
19 and punch perforate later and use that as a back-up well  
20 for our power plant.

21 And we actually have the permit for that as  
22 well. And it's called A45-A Enlarged 2.

23 COMMISSIONER BALCH: Is there water at the  
24 bottom of that well, 2,100 feet?

25 THE WITNESS: Not much. I mean we cased all

1 the way to 2000 feet. And we only had 100 foot of open  
2 hole, which was the specification for the EGS effort.

3 COMMISSIONER BALCH: So there could be water  
4 behind pipe all the way up, you don't know?

5 THE WITNESS: That would be a good question  
6 for Jim. But we cored from 910 to 2,100. And experts  
7 like himself can look at core and know if geothermal  
8 waters flowed through it. And it was not promising.  
9 Much of that.

10 And also we logged that well thermally. And  
11 you could see the temperature was kicked out profoundly  
12 in that shallow production zone. And then it reversed.  
13 And he gave testimony earlier to that, which showed that  
14 there's a substantial flow in that silicified  
15 Gila conglomerate reservoir host, and not below.

16 COMMISSIONER BALCH: Down to maybe 500, 600  
17 or so, 700 feet or so?

18 THE WITNESS: I don't think it was that  
19 deep. It was about 400 feet.

20 COMMISSIONER BALCH: There is a silicified  
21 sediment; I presume you have seen this?

22 THE WITNESS: I have never seen that.

23 COMMISSIONER BALCH: This is your well.  
24 From around 300 to 400 feet, there's silicified  
25 sediments in both bowls. And right below that there's a

1 conglomerate. So that's my confusion.

2 THE WITNESS: I just remember that once  
3 you've reached the end of that reservoir host, the  
4 drilling gets extremely easy -- right -- and that is  
5 based on Dale Brugett's experience, that is when he  
6 stopped based on that experience. That's when we  
7 stopped.

8 And years later, when we did the EGS hole,  
9 we could tell, based on the temperature logs, that that  
10 indeed retrospectively was a good decision, to stop  
11 there.

12 The welcome completions are open hole.  
13 There's no perforations at all. The fractures that are  
14 experienced -- when we were drilling, we drilled with  
15 air through this particular zone because it is so prone  
16 to lost circulation.

17 And you could see the stepwise increase in  
18 flow, huge, you know, as you're drilling just a foot or  
19 two in the blue line. You would see the drill stem  
20 drop. Dale Burgett, he experienced in one of his  
21 geothermal wells, his drill stem dropped an entire foot  
22 as it was transecting a fault.

23 COMMISSIONER BALCH: So what I am maybe  
24 hearing you say a little bit is if you get below that  
25 silicified sediment, that conglomerate, that you become

1 a lot tighter if you are on Mr. Witcher's upthrown  
2 block?

3 THE WITNESS: Yes. The temperature is poor.  
4 There's a really distinct rollover and the temperature  
5 gets considerably cooler at depth down to -- I mean like  
6 well over 1,000 feet before you see the reinversion and  
7 the natural temperature gradient that one would expect  
8 from just natural heat flow from --

9 COMMISSIONER BALCH: If these proposed  
10 injection wells were cased down to 500 feet, that  
11 alleviates some of your concern?

12 THE WITNESS: It's a good question. One I  
13 haven't thought about. And I have so little experience  
14 in the impacts of that.

15 One of the -- it was a question that you had  
16 actually posed to one of the witnesses. And it was --  
17 it dealt with 150-foot casing completion drilled down to  
18 1,500 feet, you know, if it just can't find a way, won't  
19 it just go down lower?

20 Well, we are quite confident that this  
21 injection plan would be successful in receiving the  
22 water. We don't have any doubt that those wells drilled  
23 according to the specifications in the G-112 would  
24 likely take much more water than 500 gallons a minute,  
25 just from the experience of wells that are adjacent to

1 them that have similar well completions that are very  
2 old wells.

3 As far as injecting down deep, our concern,  
4 as I mentioned before, when we originally requested a  
5 hearing back in 2008, we did have the state statutes  
6 that provided certain protections. But we decided, for  
7 a variety of reasons, to become involved in that hearing  
8 process. And it resulted in this permit.

9 The permit was highly restrictive. And it  
10 embodied the spirit of much of the state statutes that  
11 we thought were applicable at that time. It's the  
12 reason we remained silent from 2008 to 2013 despite a  
13 lot of development activity production injection.

14 I mean, there was a lot going on, and, yet,  
15 we never requested a hearing in that intervening period  
16 of time from 2008 to 2013 simply because we had that  
17 permit in place. The permit was fairly restrictive.

18 But that permit, if you look at it and the  
19 conditions of approval, the order of the Division, there  
20 were requirements for the confining cap rock. The  
21 concept of deep production and deep injection was --  
22 provided a dimension of safety for us obviously.

23 We are not antidevelopment. Obviously, we  
24 want to build a geothermal plant ourselves. We are very  
25 pro green energy. We are very pro development. We had

1 a good relationship with Roy Caniff, who was the  
2 president of Lightning Dock Geothermal.

3 This option of deep production and shallow  
4 injection, at least the opportunity to apply for that,  
5 has existed since they acquired this lease in 2007, but  
6 we have only seen it now because -- my belief as to the  
7 reason is that it would draw concern from affected  
8 parties like ourselves and the local populace.

9 But the deep production, the deep injection  
10 was a concept that if it's all happening out of sight  
11 and out of mind, it doesn't result in the waste of  
12 geothermal resources --

13 COMMISSIONER BALCH: Waste is an interesting  
14 concept, for me at least, because we are much more used  
15 to thinking of waste in terms of a depletable resource,  
16 oil.

17 THE WITNESS: Uh-huh.

18 COMMISSIONER BALCH: I think there is an  
19 analog to a geothermal resource as well. If you utilize  
20 it, you are going to decrease the T content by nature  
21 deeming energy out of it. You're decreasing the  
22 temperature, and, eventually, you'll decrease it to the  
23 background or some level that no longer has utility.

24 Would that be a correct statement in your  
25 estimation?

1 THE WITNESS: No.

2 COMMISSIONER BALCH: When you are using the  
3 wait to mix with the cold water in your fish tanks  
4 you're completely depleting that geothermal resource  
5 down to ambient temperature.

6 THE WITNESS: Which is equivalent to --

7 COMMISSIONER BALCH: So you are using that  
8 resource.

9 THE WITNESS: Well, this has been part of  
10 the testimony here, in a properly scaled geothermal  
11 power plant that resource naturally -- the plant itself  
12 has an interest in a plant that endures and a resource  
13 that endures.

14 As far as the -- again, my knowledge of this  
15 is not direct by any means, but, you know, you can -- my  
16 understanding is that there are geothermal power  
17 development sites wherein they utilize fully the -- all  
18 the thermal energy inflow into that system, and, then,  
19 essentially, borrow against storage.

20 And if it's large enough storage, you can  
21 endure that for an extended period of time, many  
22 decades, even lifetimes perhaps.

23 Based on what we found when we drilled our  
24 State 2 Well -- and again this is not my area of  
25 expertise. This is Jim Witcher's interpretation -- is

1 that that extreme rollover which didn't re-rollover  
2 until a great depth suggested that the amount of storage  
3 in this system is not substantial.

4 And so I would disagree with the statement  
5 that the ultimate destination of geothermal use is  
6 ambient. I mean, when it comes to a resource like this,  
7 I think it should be thermal energy.

8 COMMISSIONER BALCH: If you think about the  
9 energy that is coming up at 250 plus, ultimately  
10 somewhere far north of the valley, it is mixed to  
11 ambient with the cold water aquifer.

12 So that is the natural process. It takes  
13 geologic time. We don't know exactly when or how. But  
14 that molecule of water at a certain temperature will  
15 eventually be at a much lower temperature 100 miles away  
16 somewhere along the way.

17 So you have the natural flow from the  
18 upwelling and then it goes downgradient. And Lightning  
19 Dock and yourself are interested in capturing that  
20 energy more or less as it goes by.

21 THE WITNESS: Yes.

22 COMMISSIONER BALCH: And that is where I am  
23 talking about a depletion of a resource is a use of a  
24 resource. It doesn't necessarily represent waste.

25 So I don't think you cooling the water for

1 the fish is wasting; you're using that heat instead of  
2 burning coal or something else to heat the water.

3 THE WITNESS: Waste, as I read in the  
4 testimony, includes a broad definition.

5 COMMISSIONER BALCH: Sure. There are  
6 subparts of that same statute, where you are supposed to  
7 put it in the same strata, which may be hard to define  
8 in a case like this.

9 THE WITNESS: Insofar as -- we subscribe to  
10 the notion that the reduction and resource temperature  
11 constitutes waste because -- and if it results from  
12 excessive thermal energy utilization.

13 You can over-do a resource. You know, if  
14 you put a -- we believe even a ten megawatt is far in  
15 excess of the capacity of this. This is not for me to  
16 attest to, but --

17 COMMISSIONER BALCH: That is kind of the  
18 problem. You have two different interpretations of the  
19 system. So the red line there is the interpretation  
20 that you're favoring and then the more recent shallow  
21 tests show a much broader surface expression of the  
22 geothermal anomaly.

23 So if you calculate it based off the  
24 smallest possible size it could be, then you are  
25 probably correct.

1           But I think that in the absence of the 3D  
2 and 2D seismic that we haven't been able to see or any  
3 other expressions that Cyrq or Lightning Dock could be  
4 showing us to present the size of the anomaly, we have  
5 to go with the data that is presented to us.

6           We have a more recent study that shows a  
7 larger anomaly than that of Kingsinger. And the larger  
8 the anomaly is -- you know, things don't scale linearly  
9 as far as the ability of it to produce heat energy.

10           THE WITNESS: Our view of waste is if you  
11 look at a site-specific prospective -- you know, I've  
12 explained that because of this fracture permeability,  
13 the transmission of water is -- I think the term is  
14 nonisotropic.

15           These pressure differentials are transmitted  
16 very quickly. As we saw -- like when we pumped this  
17 well, we saw measurable differences in the well 800 feet  
18 away in eleven minutes.

19           If they are injecting 5,000 gallons a minute  
20 at 160 Fahrenheit water in close proximity to our well,  
21 we expect the diminution of that temperature --

22           COMMISSIONER BALCH: I think 180 to 210 is  
23 their target; seasonally, they might get to 150, was  
24 what they testified to as far as injection temperature.

25           THE WITNESS: I thought I heard Monte

1 Morrison testify that his target was not less than 160.  
2 So whatever that temperature is it is considerably less,  
3 and we believe that we are likely to see the  
4 implications of that very quickly because --

5 COMMISSIONER BALCH: There are a couple of  
6 more things I want to ask you about waste.

7 (Interruption.)

8 COMMISSIONER CATANACH: Okay. We'll take a  
9 brief recess.

10 (Brief recess.)

11 COMMISSIONER CATANACH: Let's go back on the  
12 record. Mr. Balch.

13 EXAMINATION BY COMMISSIONER BALCH (cont'd):

14 COMMISSIONER BALCH: You noted when that  
15 tracer came back up. I guess you have a 40-gallon flow.  
16 Do you have any sense for what that hydraulic gradient  
17 is?

18 THE WITNESS: No.

19 COMMISSIONER BALCH: Nobody seems to know  
20 that.

21 THE WITNESS: It would be, I think, fairly  
22 easy to determine -- there's an open well. The northern  
23 Rosette well is open, I believe. It would be easy to  
24 measure.

25 COMMISSIONER BALCH: I think it is pretty

1 obvious that what you do -- at least in the shallow part  
2 of the aquifer everything is in communication at one  
3 level or another. So my question really is -- and I  
4 keep going back to that joint operating agreement, you  
5 are not supposed to separate power from the geothermal  
6 resources in that 15 acres, which I think is the left  
7 rectangle where most of your effluent is from the fish  
8 farm --

9 THE WITNESS: Yes.

10 COMMISSIONER BALCH: So your plan is to  
11 produce from the AC State 1 to generate power for your  
12 plant?

13 THE WITNESS: Yes.

14 COMMISSIONER BALCH: And if you're going to  
15 inject 1,100 barrels a minute into your disposal well,  
16 you're going to be drawing down 1,100 barrels a minute  
17 in your production well as well?

18 THE WITNESS: Gallons per minute.

19 COMMISSIONER BALCH: Sorry. Gallons per  
20 minute, not barrels.

21 THE WITNESS: Aside from thermal expansion.  
22 It's a closed system. Production --

23 COMMISSIONER BALCH: And you did a roughly  
24 equivalent sized drawdown test on the State 1 and saw a  
25 response in a nearby Rosette well, I believe.

1 THE WITNESS: Yes.

2 COMMISSIONER BALCH: And how far did that  
3 draw down?

4 THE WITNESS: I would have to either refer  
5 to the document or --

6 COMMISSIONER BALCH: Tens of feet, hundreds  
7 of feet?

8 THE WITNESS: Tens, as I recall.

9 COMMISSIONER BALCH: Tens of feet?

10 THE WITNESS: Yes.

11 COMMISSIONER BALCH: Is that the Rosette  
12 State No. 2 that you were referring to?

13 THE WITNESS: Yes.

14 COMMISSIONER BALCH: I'm going to guess  
15 that's 700 feet, the State 1?

16 THE WITNESS: Good guess. I have been  
17 estimating it at about 800 feet, which was the number  
18 that was thrown around early in the early hearings --

19 COMMISSIONER BALCH: But it's further away  
20 than the edge of the 15-acre lease that's under question  
21 in your JFOA, right? That's closer?

22 THE WITNESS: It is.

23 COMMISSIONER BALCH: So you would be drawing  
24 down the geothermal resource underneath the 15-acre  
25 lease for that power plant production, wouldn't you?

1 THE WITNESS: Quite likely, although I don't  
2 know that --

3 COMMISSIONER BALCH: I am trying to figure  
4 out -- I mean, if it was oil, if you were drawing oil  
5 from somebody else's lease next to yours that you didn't  
6 have a right to, you would have to compensate them for  
7 that.

8 So I am trying to figure out how using the  
9 hot water underneath that 15-acre lease would not be  
10 violating that JFOA since you're using it for power  
11 production.

12 Maybe I am thinking about it wrong, because  
13 I am used to oil, and not geothermal. So please  
14 enlighten me if I'm not getting it correct.

15 You have been pulling hot water from  
16 underneath the 15 acres that you're not supposed to use  
17 for power generation?

18 THE WITNESS: That's possible.

19 COMMISSIONER BALCH: Do you think that that  
20 would impact you based off the JFOA?

21 THE WITNESS: No. That's a legal opinion.  
22 I'm not --

23 COMMISSIONER BALCH: Okay. That is for the  
24 future lawsuit, right? I was just curious about that.

25 Also kind of going back to waste -- and this

1 also ties a little bit to correlative rights. But there  
2 has been a lot of talk about your 1 megawatt facility  
3 and if the water temperature drops, as you suspect it  
4 may, due to the shallow injection, you lose a quarter of  
5 your efficiency, so you go to .75 megawatts.

6 The way to stop that from occurring might be  
7 to not allow 7 megawatt expansion by Lightning Dock. So  
8 to save your quarter of a megawatt, you might be losing  
9 6.75 megawatts out of the potential of the geothermal  
10 anomaly.

11 Now, I agree -- or I understand that there's  
12 a lot of different opinions about what the capacity of  
13 that anomaly is. And some of that may only be found out  
14 by trying.

15 Do you understand what I am talking about  
16 with waste, where I have to balance maybe a quarter  
17 megawatt versus 6.75 megawatts?

18 THE WITNESS: In the definition, "waste" is  
19 defined as excessive and improper use or dissipation of  
20 reservoir energy resulting -- I mean, we went through  
21 this definition.

22 COMMISSIONER BALCH: Right. I read through  
23 it myself as well.

24 THE WITNESS: And the diminishment of  
25 temperatures is, we believe, part and parcel to that

1 definition.

2 COMMISSIONER BALCH: But it is much more  
3 complicated than that when you're talking about waste.  
4 And it's more complicated when you're talking about  
5 correlative rights as well. Because Lightning Dock does  
6 have a right to produce their resource.

7 So let me put it to you this way. The way  
8 waste was explained to me on my first day on the  
9 Commission was not producing an available resource. So  
10 not producing that 6.7 megawatts is wasting that  
11 resource if it's possible to do it.

12 THE WITNESS: We've been relying upon the  
13 definitions within Title 19.

14 COMMISSIONER BALCH: I think that is a  
15 pretty well understood definition of "waste," isn't it?  
16 -- "Leaving production in the ground is waste."

17 MR. BRANCARD: If you are going to produce  
18 in that area.

19 THE WITNESS: So the corollary -- your  
20 corollary may be true, that the prevention of us  
21 producing power would also result in waste since that  
22 water is passing through.

23 COMMISSIONER BALCH: Absolutely. Sure. If  
24 your ability is diminished by .25 megawatts, then that  
25 kind of becomes more of a correlative rights issue. But

1 the net gain to the system would be if you produce .75  
2 and they produce 7., and then you produce 7.75 megawatts  
3 of power, assuming the system can sustain that level of  
4 production. But if they don't produce theirs so you can  
5 produce one megawatt, 6.75 megawatts difference, that's  
6 waste.

7 THE WITNESS: I guess their position is that  
8 under existing statute, we don't believe that a  
9 situation in which the diminishment of temperature can  
10 actually statutorily occur, because that would  
11 constitute --

12 COMMISSIONER BALCH: It occurs in your fish  
13 tanks right now.

14 THE WITNESS: But there is no reference to  
15 fish tanks or aquaculture systems in the definition of  
16 waste. It's subsurface. It's the impact --

17 COMMISSIONER BALCH: You're taking water out  
18 of the strata and putting it on the surface, which goes  
19 back to 7-1-58.b, which was put it back in the same  
20 strata. I mean it's debatable. If you're pulling from  
21 alluvium and putting back into alluvium, maybe that is  
22 the same strata. But you are definitely diminishing the  
23 heat of that. And I think you are using it, and you're  
24 using it well. You are making a great use of that  
25 resource.

1           THE WITNESS: If we stopped using it, if we  
2 stopped using that well at all, entirely, just  
3 disappeared as a business, and that outflow plume just  
4 continued on its way, that would be analogous to the  
5 unused example that you brought up earlier.

6           COMMISSIONER BALCH: Sure. I guess my point  
7 is, you know, there's a matter of scales going on here.  
8 Lightning Dock is proposing to use more of the resource  
9 than you are at this time; although, if you had a power  
10 plant, then those numbers equalize a little bit,  
11 especially when you start to consider the proportion of  
12 the right, of the geothermal right.

13           But I think that you do have an effect down  
14 plume because of your operation on the temperature. You  
15 are extracting hot water from the State 1 and not  
16 putting it back in. And that's fine. I have not  
17 problem with that at all. You are using the resource.

18           And you are using it completely because  
19 using in the mix of cold water to get to ambient  
20 temperature. So it is a very efficient use of the  
21 water, a very efficient use of the resource in my  
22 opinion.

23           But I mean -- do you understand the kind of  
24 issues that we are faced with? We have to look at  
25 correlative rights, we have to look at waste, which is

1 perhaps defined in a way that is hard to understand if  
2 you are not used to thinking about it like that.

3 THE WITNESS: Well, the example --

4 COMMISSIONER BALCH: The best thing we could  
5 do is come up with a balance where you can both do fully  
6 what you want to do, that's the optimal solution.

7 And if there is a situation where you need  
8 additional fresh hot water for your farm or you need  
9 additional thermal heat for your power plant, that's  
10 when it becomes an issue of correlative rights, and  
11 people may have to make adjustments.

12 But if we do nothing, then the resource  
13 really is wasted. It just flows down hill into the  
14 valley. So we are trying -- at least in my mind, I am  
15 trying to figure out the best way to accommodate both  
16 parties. All right. Let's see.

17 Water rights is something that I think  
18 nobody here in this room seems to understand. But the  
19 use of -- apparently, Lightning Dock just can't give you  
20 hot water that you would then expend by putting onto the  
21 surface at your fish farm

22 THE WITNESS: I missed the last sentence. I  
23 had a hard time understanding --

24 COMMISSIONER BALCH: Lightning Dock just  
25 can't give you hot water.

1 THE WITNESS: That's our understanding.

2 COMMISSIONER BALCH: They would have to have  
3 a water right. I presume that those are purchasable.  
4 There should be something that they could buy that would  
5 offset it as a potential solution.

6 THE WITNESS: We don't believe so. And the  
7 reason is -- that has been shared with us by the Office  
8 of the State Engineer, they believe our area is actually  
9 overappropriated already, because of the sheer volume of  
10 water rights that could be diverted within the vicinity  
11 of our respective projects. So that would be a real  
12 issue.

13 COMMISSIONER BALCH: I guess it's yet to be  
14 tested whether the geothermal water with high fluorides  
15 falls under potable water rights.

16 THE WITNESS: Ours do. I mean, we have  
17 water rights for ours. We would not be able to pump  
18 water --

19 COMMISSIONER BALCH: You wouldn't be able to  
20 dispose of it on the surface if you didn't have water --

21 THE WITNESS: We wouldn't be able to pump it  
22 at all we if didn't have a water right. We are below  
23 250, and we use it as water. We have a senior water  
24 right for that particular use.

25 And, of course, you have the issue of the

1 temperature of the water. That water, in that case,  
2 would necessarily have to have thermal energy content,  
3 so it would have to be from the reservoir so it would  
4 have to exacerbate the impairment that has already  
5 occurred. It's a vicious circle.

6 COMMISSIONER BALCH: So in your mind, they  
7 are really down to heat exchangers or some similar  
8 mechanism?

9 THE WITNESS: Yes. And that ties into a  
10 concept that I have alluded to, we don't have a viable  
11 working relationship with them. Our shareholders would  
12 not be interested in being completely dependent on them  
13 for thermal energy needs.

14 COMMISSIONER BALCH: So within an oil patch,  
15 usually what happens, in a case like that, is one owner  
16 becomes dominant and the other one kind of has no choice  
17 but to go along. So it's really to the best benefit of  
18 everybody to come with a good operating agreement.

19 We can't stress that enough to both parties.  
20 You don't want to be in a situation where one party has  
21 their utilization become dominant. But that may well  
22 end up being what happens. Depending on the results of  
23 this hearing and depending upon any lawsuits that may  
24 follow or be going on concurrently, ultimately, if you  
25 can't play along, they are going to decide who is more

1 right and they're going to get it all.

2 That is all I have. I am sorry.

3 What would be your solution, really? What  
4 would you do in our situation?

5 THE WITNESS: Well, the paradigm that was  
6 promoted by Lightning Dock for so many years, which was  
7 deep production and deep injection, and was embodied in  
8 the original GTHD permit, while there were parts of that  
9 permit we weren't entirely happy with -- I guess I  
10 mentioned that we remained uninvolved in their  
11 development activities, drilling activities for a period  
12 of five years after that, relying --

13 COMMISSIONER BALCH: So if you get somewhere  
14 below the alluvium, there's silicified sediments, which  
15 are also highly permeable. And when you get below that,  
16 you start to look at clays and then volcanoclastics and  
17 various conglomerates.

18 If they are only injecting below those near  
19 surface permeable intervals, would that provide a  
20 solution?

21 That is going to probably still have some  
22 upwelling, but it would be much less than if they are  
23 injecting straight into those permeable formations.

24 THE WITNESS: It's an interesting question.  
25 You know, our concerns here at this hearing are the

1 effects on correlative rights, underground sources of  
2 drinking water, contamination, which we've seen. That's  
3 a vital issue for us. It's not the baseline of the  
4 federal well --

5 COMMISSIONER BALCH: I think the well we  
6 have to look most closely at is that 76-7, because  
7 that's not a -- for a contaminated well at this point --  
8 I think there's a well near there that is already  
9 drilled, a monitor well -- or maybe this monitor well  
10 will be converted. So that's the one that could go out  
11 of compliance, as far as your drinking water standard.

12 So I think it is in Lightning Dock's  
13 interest to also make sure that doesn't occur.

14 THE WITNESS: Exactly.

15 COMMISSIONER BALCH: So if you could  
16 minimize the upwelling and then maybe less directly  
17 disturb the heat flow in the shallower part of the  
18 plume, that might be a solution that would work for both  
19 parties.

20 All right.

21 EXAMINATION BY COMMISSIONER PADILLA

22 COMMISSIONER PADILLA: Good afternoon,  
23 Dr. Seawright.

24 THE WITNESS: Good afternoon.

25 COMMISSIONER PADILLA: I know we are coming

1 to the bewitching hour, so I'll try to keep this brief.  
2 We talked about heat replacements.

3 Mr. Witcher testified on AmeriCulture's  
4 behalf that he thinks that the capacity of this anomaly  
5 is about 2 megawatts. Do you agree with that  
6 assessment?

7 THE WITNESS: I defer to his opinion on it.  
8 His rationale for the heat flow basis of that made sense  
9 to me and the conversion for thermal energy to  
10 electrical energy is -- the two-megawatt electrical is  
11 not out of line, which I've heard represented by experts  
12 in that discipline.

13 COMMISSIONER PADILLA: In that case given  
14 that Lightning Dock is currently producing, ballpark, 2  
15 megawatts, depending on net gross, and you are proposing  
16 to produce another megawatt on top of that, what do you  
17 think will happen to the resource, assuming Lightning  
18 Dock does nothing as far as their expansion plans go?

19 THE WITNESS: As Jim Witcher testified and  
20 he believe we're fairly close to the maximum production  
21 of that resource for -- presumed to maintain status quo  
22 in the reservoir.

23 COMMISSIONER PADILLA: So that extra  
24 megawatt is not going to tip the scales and start  
25 depleting --

1           THE WITNESS: Actually, we are on the  
2 outflow plume, and it's our contention that our  
3 operations in the outflow plume, producing from and  
4 returning to the periphery of that outflow plume, will  
5 not have retrograde effects.

6           COMMISSIONER PADILLA: So I guess the  
7 location of your operations are the basis for my  
8 question yesterday about the differentiation between one  
9 power plant and the other and the effects on the  
10 anomaly.

11          THE WITNESS: Yes, I think so. I'm not sure  
12 it's -- I mean, we are essentially a thermal-bottoming  
13 cycle out in the outflow plume. It is a tail water  
14 geothermal power plant that is using water that already  
15 exists that's traveling to the north.

16          And our discharge is strategically located  
17 in a location that would limit its return.

18          COMMISSIONER PADILLA: Okay.

19          Dr. Balch touched on the idea of allowables,  
20 is the best way we would call it in oil and gas, based  
21 on an acre spacing unit. If you have a ten-acre  
22 geothermal lease, in your mind -- and correct me if I am  
23 wrong -- but that OSE permit allows you to pull 775  
24 acre feet a year for your proposal --

25          THE WITNESS: I would have to -- let me take

1 a look at it.

2 COMMISSIONER PADILLA: Sorry. I don't  
3 remember what exhibit that is.

4 THE WITNESS: It is T. 1,775.52 acre feet  
5 per year.

6 COMMISSIONER PADILLA: Do you think that  
7 amount of drawdown adequately represents your ten acres  
8 and can you make a defense of that?

9 THE WITNESS: Sure.

10 At the time that we acquired these permits,  
11 the state of New Mexico required both a valid geothermal  
12 lease and a water right. There were no exceptions. The  
13 water right may have been nonconsumptive, which is --  
14 for instance, the Masson Greenhouse Facility north of  
15 Las Cruces, that's a nonconsumptive use permit, but,  
16 yet, it is a valid water right. There is a permit from  
17 the Office of the State Engineer.

18 That requirement changed with the passage of  
19 the revised statute using 250 degrees as a separation  
20 point. And our production -- would you repeat the  
21 question?

22 COMMISSIONER PADILLA: I am just wondering  
23 if based on a ten-acre geothermal lease -- and this may  
24 not relate --

25 THE WITNESS: That's where I lost my train

1 of thought.

2           The standard for correlative rights -- and  
3 again, I am not an expert in correlative rights. I've  
4 never claimed to be -- is based on practical  
5 obtainability, that is just the simple reading of the  
6 statutes. And the right for Lightning Dock to pump  
7 water is predicated upon a multiple stage test. You  
8 have to satisfy certain prerequisites. It has to be  
9 above 250 degrees Fahrenheit. It has to be returned to  
10 the source. It has to be used for geothermal power  
11 production.

12           And if you look at that map, and we are  
13 just -- for instance, we have ten acres, two wells, and  
14 if you just say, five acres per well, just spatially,  
15 and you were to take that same five acres per well that  
16 is exhibiting temperatures in excess of 250 degrees for  
17 Lightning Dock Geothermal, that are a capable,  
18 meaningful production. They only have two wells.

19           In other words, if they were to -- let's  
20 say, for instance, that Lightning Dock Geothermal wanted  
21 to move here and drill a well, produce water, they could  
22 not, because the temperature at this point here, will be  
23 less than 250 degrees and they don't have a water right.

24           Is that practically attainable? It's  
25 certainly not legally attainable. You can drill it, you

1 can produce it, but is it actually part of the  
2 correlative right? It is a question not a statement.  
3 It's complicated.

4 That series of figures that I showed was  
5 simply to illustrate that a surface area algorithm  
6 doesn't embody the correlative rights picture here.

7 COMMISSIONER PADILLA: Would a simple  
8 definition or a simple understanding of that maybe just  
9 relate to the statutory cutoff and, therefore, your  
10 ten-acre geothermal lease does not relate to the amount  
11 of water you're pulling because you are governed by the  
12 OSE, rather than geothermal regulations?

13 THE WITNESS: I am not clear on the  
14 question.

15 COMMISSIONER PADILLA: I am just saying is  
16 it safe to say that your water right -- and that's  
17 1,775.5 acre feet -- does not fall under the governance  
18 of specifically your geothermal lease, but, rather, it  
19 falls under the OSE who has granted that right  
20 independent of your geothermal lease because it is under  
21 250?

22 THE WITNESS: This gets to the issue that I  
23 stated I was uncertain about, and that is the use of  
24 "incidental." I mean we are less than 250 degrees. We  
25 do require an Office of the State Engineer permit. We

1 do operate under a valid geothermal lease.

2 And, as I said, our use is intentional. And  
3 Ms. Henrie mentioned accidental as incidental, and I  
4 don't know how to comment on that.

5 COMMISSIONER PADILLA: My question is, in  
6 your favor, because of your temperature, you're not  
7 hitting that 250 degrees; therefore, your water right is  
8 governed by OSE, rather than geothermal statute.

9 THE WITNESS: I don't know that that is  
10 true. I think that statute stipulates "incidental" use.

11 COMMISSIONER PADILLA: Okay. I'll move on.  
12 I have to go to Exhibit M, the State Land Office  
13 document. And I'll refer to the last page, which has  
14 the -- not the last page. Sorry -- to the page before  
15 Exhibit A, which is the new application to make  
16 improvements that includes power generation for  
17 (inaudible) of \$5,000,000.

18 When you filed this application, did you  
19 make the Commercial Resources Division aware of the fact  
20 that this would involve geothermal power generation part  
21 of which or the product of which might be sold to a grid  
22 at some point?

23 THE WITNESS: We mentioned that it would  
24 involve geothermal power generation. But as far as the  
25 subject of selling onto the grid, that was not included

1 in our discussion.

2 COMMISSIONER PADILLA: Because the one other  
3 thing that I don't see in here anywhere is a royalty  
4 stipulation and/or a percent rent, which would normally  
5 be part of any discussion about commercial power  
6 generation.

7 THE WITNESS: I believe that is covered  
8 under PT-R-304-1 lease language, as far as leases  
9 relating to revenues resulting from the use of  
10 geothermal.

11 COMMISSIONER PADILLA: Okay.

12 On page 2 of this business lease is a  
13 reservation section. How does the fact that the lessor  
14 reserves the right to geothermal resources affect your  
15 plans --

16 THE WITNESS: Well, it is not inconsistent  
17 with this. This is probably standard language. They  
18 are saying they reserve the right to execute leases for  
19 geothermal resources, which they have, and we have.

20 COMMISSIONER PADILLA: Does this overlay the  
21 geothermal lease?

22 THE WITNESS: Yes.

23 COMMISSIONER PADILLA: Can you put up -- I  
24 think it was Exhibit A --

25 MR. LAKINS: I turned this all off.

1 THE WITNESS: If I could do it just steady  
2 enough, I could do it -- okay. This block, this ten  
3 acres.

4 COMMISSIONER PADILLA: That is the  
5 geothermal lease?

6 THE WITNESS: Yes. Now, this block is the  
7 business lease.

8 COMMISSIONER PADILLA: And where is the  
9 power plant going to be sited?

10 THE WITNESS: About right there.

11 COMMISSIONER PADILLA: So it is actually on  
12 the geothermal lease?

13 THE WITNESS: Yes.

14 COMMISSIONER PADILLA: So this really  
15 wouldn't apply. There is no gray area; you are putting  
16 a geothermal plant on a geothermal lease?

17 THE WITNESS: Yes. The rationale for that,  
18 as I explained before, the concerns with regard to fee  
19 land versus lease land, that's largely gone away just  
20 because of the transportability of these projects. The  
21 plants can be installed and removed quickly. But, also,  
22 from a thermodynamic standpoint, it's just simpler to  
23 have the production well just feed directly into the  
24 power plant itself.

25 COMMISSIONER PADILLA: Okay. Now, where is

1 the injection well? If you could point it out.

2 THE WITNESS: It is not on the map. It is  
3 in our exhibit, which we could bring up if it is  
4 important.

5 COMMISSIONER PADILLA: Ballpark.

6 THE WITNESS: Ballpark.

7 This is section 6 here. If you visualize  
8 this as being half of a section line and you go up a  
9 half mile from here, it's about right here.

10 COMMISSIONER PADILLA: Okay.

11 THE WITNESS: It is two-thirds of a mile at  
12 about this angle.

13 COMMISSIONER PADILLA: And that is grazing  
14 lease you currently hold?

15 THE WITNESS: A grazing lease, yes. We  
16 would have to change that to a business lease. Business  
17 leases are costly.

18 COMMISSIONER PADILLA: I know you have a  
19 commercial lease in the bottom part. And I know you  
20 have an OCD injection permit. Have you started the  
21 process or do you hold an injection easement for the  
22 injection site with the State Land Office?

23 THE WITNESS: No.

24 COMMISSIONER PADILLA: Have you had any  
25 conversations with anyone about that? Is there a reason

1 you don't have it?

2 THE WITNESS: This site, just to reiterate,  
3 this site was really driven by the desires of Roy  
4 Johnson at OCD.

5 Dale Burgett and I and Roy Johnson sat  
6 around a table and Roy said, I want this.

7 You know, I just remind you that same half a  
8 section, approximately, the eastern section of that is a  
9 geothermal lease held by Dale Burgett. And he is  
10 saying, I don't have a problem with you putting a well  
11 on my lease. I just don't want the water coming back to  
12 my wells on the southern end of section 6.

13 And, so, with the various criterion that Roy  
14 Johnson wanted to see and the concerns that Rosette  
15 addressed, they said, X marks the spot.

16 That's where they wanted it. And so it  
17 falls within the Rosette geothermal lease. Rosette  
18 doesn't have a surface lease there, and they have a lot  
19 of well development transmission lines, pipelines, all  
20 sort of supporting structures. And that just goes with,  
21 there are certain allowances that are made for holders  
22 of state geothermal leases. They can use the surface to  
23 the -- it promotes the utilization of the mineral  
24 resource.

25 COMMISSIONER PADILLA: Sure. It is the same

1 with oil and gas.

2 THE WITNESS: Yeah. So that is how that  
3 site was selected as far as detailed discussions with  
4 the state. I mean, it would just be premature --

5 COMMISSIONER PADILLA: You've just haven't  
6 gotten to the point of applying for easement?

7 THE WITNESS: Exactly, for that particular  
8 site. Well, a lot of time has passed since we got these  
9 various permits in place. And we were of the belief  
10 that that would be a short lead time item, and not  
11 controversial, and so we didn't see much of a reason to.

12 COMMISSIONER PADILLA: So do you hold a  
13 grazing lease over Burgett's geothermal lease?

14 THE WITNESS: Part of it, a quarter of it.  
15 His is 313 acres, a little less than a half a section.  
16 And ours is 80 acres.

17 This would be the southern -- just right  
18 there would be the southern part of the 80 acres and  
19 then it extends -- it would be a half a mile.

20 COMMISSIONER PADILLA: Okay. I won't ask  
21 you about a timeframe for your power plant. I think  
22 that will be it for me.

23 Thank you. I appreciate it.

24 THE WITNESS: Thank you.

25 COMMISSIONER CATANACH: Go ahead.

1 EXAMINATION BY MR. BRANCARD

2 MR. BRANCARD: Just a couple of quick  
3 questions. I got confused on your discussion of your  
4 wells.

5 THE WITNESS: Okay.

6 MR. BRANCARD: So the State No. 1, that is  
7 your 232-degree warm, not extremely hot, but warm  
8 geothermal well?

9 THE WITNESS: It is our 230-degree  
10 Fahrenheit well.

11 MR. BRANCARD: State No. 2 is cased deeper,  
12 but you're not using that?

13 THE WITNESS: We are not using it. We  
14 intend to use it as a potential well for the power plant  
15 that was constructed in such a way. And the temperature  
16 is about the same based on what we observed during our  
17 initial well completion.

18 MR. BRANCARD: You referred to a cold water  
19 well?

20 THE WITNESS: We have a cold water well  
21 which is -- at a well head temperature, year-round, at  
22 about 68 degrees. It is in section 12. It is 1.6 miles  
23 to the west of this point here (indicating). Using this  
24 as a base, it is 1.6 miles down this road.

25 MR. BRANCARD: So that's the cold water you

1 are mixing with the hot water on site --

2 THE WITNESS: Yes.

3 MR. BRANCARD: And you said 70 GPM. How is  
4 that divided between the Well No. 1 and the cold water  
5 well?

6 THE WITNESS: That is just the cold water  
7 well. And that's a wellhead production. The arrival  
8 volume is going to be somewhat less than that, because  
9 of the leakage.

10 And then you have on top of that, the water  
11 that is produced from State 1, which goes directly into  
12 the storage tank and then directly into fish tanks from  
13 there.

14 MR. BRANCARD: And how much comes out of  
15 State 1?

16 THE WITNESS: The well itself pumps 80  
17 gallons per minute when it's pumping. The amount of  
18 time that it's pumped varies from season to season. But  
19 it is pumped every day of the year, even in the summer.

20 MR. BRANCARD: But not 24/7?

21 THE WITNESS: No, not even close.

22 MR. BRANCARD: Okay. Thank you.

23 So if you would look at Exhibit F then. You  
24 earlier discussed A-444. But if you look at the page  
25 before that, the third page in, there is a reference to

1 AmeriCulture Well A45-A. Which well is that?

2 THE WITNESS: I believe that is one and the  
3 same as the cold water well that you just referred to.

4 MR. BRANCARD: This is the cold water well?

5 THE WITNESS: If it's in section 12. The  
6 nomenclature at the top is A45-S2. We don't have a well  
7 by that designation. We do have an A45-AS-2.

8 COMMISSIONER BALCH: It says, "A45-A  
9 (A45-S2)."

10 THE WITNESS: A45 is the base permit.

11 And so the section 12 well, that is the OSE  
12 designation for it, A45-A. And the others are  
13 supplemental to that.

14 MR. BRANCARD: So then the next page is  
15 A-444, and the next page after that, it says, State  
16 Geothermal/State Burgett.

17 Do you know which well that is?

18 THE WITNESS: I don't know which one that  
19 is. We could find it easy enough, the latitude and  
20 longitude.

21 But there are -- I don't recall if any of  
22 the four wells on the southern boundary of section 6 are  
23 actually open and accessible. I don't know. If they  
24 were, it may be one of those. It's his only state  
25 resource. It could also very well be the well to the

1 north. That's not here. It's out this way --

2 MR. LAKINS: If I may lend a little help. I  
3 just happen to be on Google Earth. And where I am at  
4 here in 32.9 -- that's pretty close -- essentially right  
5 where that hand is is I think a pretty darn good  
6 indication, pretty darn close, of where that one would  
7 be, Mr. Brancard.

8 MR. BRANCARD: So it's like one of these  
9 Rosette wells here?

10 THE WITNESS: If you are looking at it here,  
11 there's a well here, here, here. And then the one that  
12 we've mentioned previously is here. And then there is  
13 another one up here.

14 Now this one is open.

15 MR. LAKINS: 49 --

16 THE WITNESS: And this location is  
17 approximate. But that's the location where the tracer  
18 dye was added. So I really don't know exactly, but I  
19 would suspect it's that one.

20 MR. BRANCARD: It's likely one of those just  
21 north of your facility?

22 THE WITNESS: Yes.

23 MR. BRANCARD: So then the next page, A64,  
24 Lightning Dock Geothermal, it's an old well. Do you  
25 know which one that is?

1 THE WITNESS: I can't tell you exactly where  
2 it is. But if you would -- Charles, if you would move  
3 south -- there you go. I may be incorrect --

4 MR. LAKINS: It says 32828.

5 THE WITNESS: Lightning Dock could almost  
6 certainly answer this. It may be in this area  
7 (indicating).

8 It was a well -- it's a historical well.  
9 It's not being drilled. I don't know of its exact  
10 location. But I believe it may be on the -- in and  
11 around or on the property that Lightning Dock owns,  
12 which is represented by this inverted L.

13 MR. BRANCARD: And, finally, you've made  
14 numerous references to changes in water chemistry at  
15 A-444. Am I correct here that there is no exhibit  
16 presented to the Commission that documents that?

17 THE WITNESS: No, there is not.

18 MR. BRANCARD: That is it for me.

19 EXAMINATION BY COMMISSIONER PADILLA

20 COMMISSIONER PADILLA: I have one quick  
21 clarification. Exhibit A, page 4, the two red dots,  
22 kind of left of center of the temperature gradient start  
23 point I guess, what are those?

24 THE WITNESS: That was a spatial metric of  
25 an equivalent of five acres, and one was on Well 45-7

1 and one was on 55-7, the two wells that have shown  
2 250-degree temperature or greater and are good  
3 producers.

4 COMMISSIONER PADILLA: So they don't have  
5 any leasehold importance?

6 THE WITNESS: No.

7 COMMISSIONER PADILLA: Those are well within  
8 Lightning Dock leases?

9 THE WITNESS: Yes. The purpose of the  
10 sequence again was to just say that it's not a simple  
11 arithmetic acreage calculation to come up with a  
12 correlative rights calculation; that it is not intended  
13 to quantitate anything.

14 COMMISSIONER PADILLA: Okay. Just so I am  
15 absolutely clear, the smaller red square above the  
16 number 20 is AmeriCulture --

17 THE WITNESS: AmeriCulture's ten-acre state  
18 lease.

19 COMMISSIONER PADILLA: And Burgett's  
20 geothermal lease is above that --

21 THE WITNESS: Yes.

22 COMMISSIONER PADILLA: 320 acres?

23 THE WITNESS: Yes.?

24 COMMISSIONER PADILLA: Thank you.

25 COMMISSIONER CATANACH: So what is the plan?

1 Are you done with your direct?

2 MR. LAKINS: Yes, sir.

3 COMMISSIONER CATANACH: And what do we still  
4 have to do tomorrow?

5 MS. HENRIE: Mr. Chairman, I have two  
6 rebuttal witnesses, a total of seven questions right  
7 now -- it might go to eight on the discussion we just  
8 had. And then that's all we have for recall and  
9 redirect. And I believe we have closing argument after  
10 that. And that's it.

11 COMMISSIONER CATANACH: Do you have a time  
12 estimate on your rebuttal?

13 MS. HENRIE: A half hour, maybe. It is  
14 seven questions, two witnesses, and I expect you all --  
15 it would be Dr. Shomaker and Roger Bowers.

16 COMMISSIONER CATANACH: Mr. Lakins, are you  
17 planning on calling anybody else tomorrow?

18 MR. LAKINS: No, sir. My witnesses are  
19 done.

20 COMMISSIONER CATANACH: Okay. So I guess  
21 we'll adjourn at this point and start up again at 8:30.

22 MR. BRANCARD: 8:30.

23 MR. BALCH: 8:30.

24 MR. LAKINS: Could we make it 9:00? I drive  
25 back and forth from Albuquerque. That's all.

1                   COMMISSIONER CATANACH: I already told  
2 Ms. Marks it was 8:30, so she'll get mad at me if she's  
3 here and we're not.

4                   COMMISSIONER BALCH: And to be timely, we  
5 would like to be able deliberate this tomorrow and come  
6 up with a decision.

7                   MR. LAKINS: 8:30 it is.

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11                   (Time noted 5:20 p.m.)

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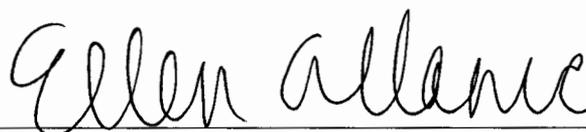
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1 STATE OF NEW MEXICO )  
2 ) ss.  
3 COUNTY OF BERNALILLO )  
4  
5  
6

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